IBM Informix Migration Guide

IBM Informix Dynamic Server, Version 9.40, 9.3x, 9.2x, 7.3x, or 7.24
IBM Informix Dynamic Server, Linux Edition, Version 7.3x
IBM Informix Dynamic Server, Workgroup Edition, Version 7.3x or 7.24

IBM Informix Extended Parallel Server, Version 8.4, 8.3x

IBM Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options, Version 8.21

IBM Informix SE, Version 7.25, 7.24, 7.23, 7.22, or 5.1x

IBM Informix OnLine, Version 5.1x

March 2003
Part No. CT1SUNA

Note:
Before using this information and the product it supports, read the information in the appendix entitled "Notices."

Table of Contents

Introduction

Section I Overview of Informix Migration

Chapter 1 Database Server Migration

Chapter 2 Data Migration

Section II Migration to a Later Version of a Database Server

Chapter 3 Migrating to Dynamic Server 9.40 or 9.30 from 9.x, 7.3x, or 7.24

Section IV Data Migration Utilities

Chapter 11 The dbexport and dbimport Utilities

Chapter 12 The dbload Utility

Chapter 13 The dbschema Utility

Introduction

In This Introduction

This introduction provides an overview of the information in this manual and describes the conventions it uses.

About This Manual

This manual describes the migration procedures to convert to newer Informix database servers, revert to older database servers, and move data between databases, database servers, and computers. This manual explains migration for Version 9.x, Version 8.x, Version 7.x, and Version 5.x Informix database servers. It also explains how to use the **dbexport**, **dbimport**, **dbload**, **dbschema**, **onload**, **onunload**, and **onxfer** data migration utilities and the LOAD and UNLOAD SQL statements.

Migration includes conversion (upgrading) to a later version of a database server, reversion to an earlier version of a database server, and movement of data between databases, database servers on the same operating system, database servers on different operating systems, and different kinds of database servers. Conversion or reversion often involves changing connectivity information in the **sqlhosts** file or registry key, host environment variables, configuration parameters, and other database server features.

Types of Users

This manual is for the following users:

- Database users
- Database administrators
- Database server administrators
- System administrators
- Database-application programmers
- Backup operators
- Performance engineers

To understand this manual, you need to have the following background:

- A working knowledge of your computer, your operating system, and the utilities that your operating system provides
- Some experience working with relational databases or exposure to database concepts
- Some experience with computer programming
- Some experience with database server administration, operating system administration, or network administration

If you have limited experience with relational databases, SQL, or your operating system, refer to the *Getting Started Guide* for your database server for a list of supplementary titles.

Software Dependencies

This guide covers migration to or from the Informix database servers that Figure 1 lists. The chapters in this guide use the short database server names to refer to the database servers.

Figure 1
Informix 9.x, 8.x, 7.x, and 5.x Database Servers

Short Database Server Name	Complete Database Server Name
Dynamic Server 9.40	IBM Informix Dynamic Server, Version 9.40
Dynamic Server 9.30	IBM Informix Dynamic Server, Version 9.30
Dynamic Server 9.21	IBM Informix Dynamic Server, Version 9.21
Workgroup Edition 9.21	IBM Informix Dynamic Server, Workgroup Edition, Version 9.21
Dynamic Server 9.20	IBM Informix Dynamic Server, Version 9.20
Extended Parallel Server 8.40	IBM Informix Extended Parallel Server, Version 8.40
Extended Parallel Server 8.32	IBM Informix Extended Parallel Server, Version 8.32
Extended Parallel Server 8.31	IBM Informix Extended Parallel Server, Version 8.31
Extended Parallel Server 8.30	IBM Informix Extended Parallel Server, Version 8.30
Dynamic Server with AD and XP Options 8.21	IBM Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options , Version 8.21
Dynamic Server 7.31	IBM Informix Dynamic Server, Version 7.31
Workgroup Edition 7.31	IBM Informix Dynamic Server, Workgroup Edition, Version 7.31
Dynamic Server, Linux Edition 7.31	IBM Informix Dynamic Server, Linux Edition, Version 7.31
Dynamic Server 7.30	IBM Informix Dynamic Server, Version 7.30
Workgroup Edition 7.30	IBM Informix Dynamic Server, Workgroup Edition, Version 7.30
Dynamic Server, Linux Edition 7.30	IBM Informix Dynamic Server, Linux Edition, Version 7.30
Dynamic Server 7.24	IBM Informix Dynamic Server, Version 7.24
Workgroup Edition 7.24	IBM Informix Dynamic Server, Workgroup Edition, Version 7.24

(1 of 2)

Short Database Server Name	Complete Database Server Name
OnLine 5.1x	IBM Informix OnLine, Version 5.1x
SE 7.25	IBM Informix SE, Version 7.25
SE 7.24	IBM Informix SE, Version 7.24
SE 7.23	IBM Informix SE, Version 7.23
SE 7.22	IBM Informix SE, Version 7.22
SE 5.1x	IBM Informix SE, Version 5.1x

(2 of 2)

In this guide, a short database server name followed by a version number refers only to that version, or set of versions, of the database server. A version number without an "x" refers to a single version of the database server; for example, Dynamic Server 9.21 refers only to IBM Informix Dynamic Server, Version 9.21. A version number with an "x" can refer to more than one version of the database server; for example, Extended Parallel Server 8.3x refers to IBM Informix Extended Parallel Server, Version 8.31 and Version 8.32.

The migration can be between operating systems. Each of the Informix database servers can run on one or more of the following operating systems:

- UNIX
- Linux
- Windows 2000
- Windows NT
- Windows XP
- Windows 95

Assumptions About Your Locale

IBM Informix products can support many languages, cultures, and code sets. All the information related to character set, collation, and representation of numeric data, currency, date, and time is brought together in a single environment, called a GLS (Global Language Support) locale.

The examples in this manual are for the default locale, **en_us.8859-1**. This locale supports U.S. English format conventions for date, time, and currency. In addition, this locale supports the ISO 8859-1 code set, which includes the ASCII code set plus many 8-bit characters such as é, è, and ñ.

If you plan to use nondefault characters in your data or your SQL identifiers, or if you want to conform to the nondefault collation rules of character data, you need to specify the appropriate nondefault locale.

For instructions on how to specify a nondefault locale, additional syntax, and other considerations related to GLS locales, see the *IBM Informix GLS User's Guide*.

Demonstration Databases

The DB-Access utility, which is provided with the database server products, includes one or more of the following demonstration databases:

- The **stores_demo** database illustrates a relational schema with information about a fictitious wholesale sporting-goods distributor. Many examples in IBM Informix manuals are based on the **stores_demo** database.
- The **superstores_demo** database illustrates an object-relational schema. The **superstores_demo** database contains examples of extended data types, type and table inheritance, and user-defined routines.

For information about how to create and populate the demonstration databases, see the *IBM Informix DB-Access User's Guide*. For descriptions of the databases and their contents, see the *IBM Informix Guide to SQL: Reference*.

The scripts that you use to install the demonstration databases reside in the **$INFORMIXDIR/bin** directory on UNIX or Linux and in the **%INFORMIXDIR%\bin** directory on Windows.

New Features in Database Servers

For a comprehensive list of new database server features, see your *Getting Started Guide* and your release notes. This manual includes information about new features in the following sections:

- "Changes in Dynamic Server 9.40, 9.30, and 9.2x" on page 3-5
- "Changes in Extended Parallel Server 8.40" on page 4-5
- "Changes in Dynamic Server 7.3x" on page 5-7
- "Changes in Database Servers Since OnLine 5.1x" on page 6-7

Documentation Conventions

This section describes the conventions that this manual uses for typography, icons, function syntax, and DataBlade API module code. These conventions make it easier to gather information from this and other volumes in the documentation set.

Typographical Conventions

This manual uses the following typographical conventions to introduce new terms, illustrate screen displays, describe command syntax, and so forth.

Convention	Meaning
KEYWORD	All primary elements in a programming language statement (keywords) appear in uppercase letters in a serif font.
italics ***italics*** `italics`	Within text, new terms and emphasized words appear in italics. Within syntax and code examples, variable values that you are to specify appear in italics.
boldface ***boldface***	Names of program entities (such as classes, events, and tables), environment variables, file and pathnames, and interface elements (such as icons, menu items, and buttons) appear in boldface.

(1 of 2)

Convention	Meaning
`monospace` *`monospace`*	Information that the product displays and information that you enter appear in a monospace typeface.
KEYSTROKE	Keys that you are to press appear in uppercase letters in a sans serif font.
♦	This symbol indicates the end of one or more product- or platform-specific paragraphs.
→	This symbol indicates a menu item. For example, "Choose **Tools→Options**" means choose the **Options** item from the **Tools** menu.

(2 of 2)

Tip: *When you are instructed to "enter" characters or to "execute" a command, immediately press* RETURN *after the entry. When you are instructed to "type" the text or to "press" other keys, no* RETURN *is required.*

Icon Conventions

Throughout this guide, several different icons identify comment text or text that applies only to a specific product, feature, or computer platform. This section describes these icons.

Comment Icons

Comment icons identify three types of information, as the following table describes. This information always appears in italics.

Icon	Label	Description
	***Warning:***	Identifies paragraphs that contain vital instructions, cautions, or critical information
	***Important:***	Identifies paragraphs that contain significant information about the feature or operation that is being described
	***Tip:***	Identifies paragraphs that offer additional details or shortcuts for the functionality that is being described

Feature, Product, and Platform Icons

Feature, product, and platform icons identify paragraphs that contain feature-specific, product-specific, or platform-specific information.

Icon	Description
AD/XP	Identifies information that is specific to Dynamic Server with AD and XP Options 8.21
ALS	Identifies information that is specific to an Asian Language Support (ALS) database or application
D/B	Identifies information that is valid only for DB-Access

(1 of 3)

Icon	Description
E/C	Identifies information that is specific to the IBM Informix ESQL/C product
GLS	Identifies information that relates to the IBM Informix Global Language Support (GLS) feature
IDS	Identifies information that is specific to Dynamic Server 9.40, 9.30, 9.21, 9.20, 7.31, 7.30, or 7.24
IDS 9.x	Identifies information that is specific to Dynamic Server 9.40, 9.30, 9.21, or 9.20
IDS 9.2x	Identifies information that is specific to Dynamic Server 9.21 or 9.20
IDS 7.3x	Identifies information that is specific to Dynamic Server 7.31 or 7.30
IDS 7.24	Identifies information that is specific to Dynamic Server 7.24
LINUX	Identifies information that is specific to Linux
NLS	Identifies information that is specific to a Native Language Support (NLS) database or application
OL 5.1x	Identifies information that is specific to OnLine 5.1x
SE	Identifies information that is specific to SE 7.25, 7.24, 7.23, 7.22, or 5.1x
UNIX	Identifies information that is specific to UNIX
UNIX/Linux	Identifies information that is specific to UNIX or Linux
WE	Identifies information that is specific to Workgroup Edition 7.31, 7.30, or 7.24
WIN 2000	Identifies information that is specific to Windows 2000

(2 of 3)

Icon	Description
WIN 95	Identifies information that is specific to Windows 95
WIN NT	Identifies information that is specific to Windows NT
WIN XP	Identifies information that is specific to Windows XP
Windows	Identifies information that applies to all Windows environments
XPS 8.40	Identifies information that is specific to Extended Parallel Server 8.40
XPS 8.3x	Identifies information that is specific to Extended Parallel Server 8.31 or 8.32

(3 of 3)

Any of these icons can apply to an entire section or to one or more paragraphs within a section. If an icon appears next to a section heading, the information that applies to the indicated feature, product, or platform ends at the next heading at the same or higher level. A ♦ symbol indicates the end of feature-, product-, or platform-specific information that appears within one or more paragraphs within a section.

Syntax Conventions

This section describes conventions for syntax diagrams. Each diagram displays the sequences of required and optional keywords, terms, and symbols that are valid in a given statement or segment, as Figure 2 shows.

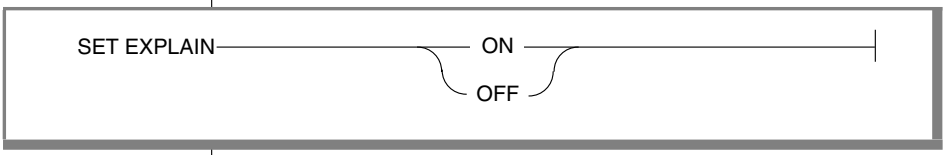


Figure 2 *Example of a Simple Syntax Diagram*

Each syntax diagram begins at the upper-left corner and ends at the upper-right corner with a vertical terminator. Between these points, any path that does not stop or reverse direction describes a possible form of the statement.

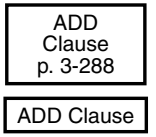
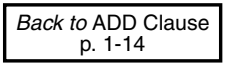
Syntax elements in a path represent terms, keywords, symbols, and segments that can appear in your statement. The path always approaches elements from the left and continues to the right, except in the case of separators in loops. For separators in loops, the path approaches counterclockwise. Unless otherwise noted, at least one blank character separates syntax elements.

Syntax Elements in a Statement Path

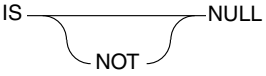
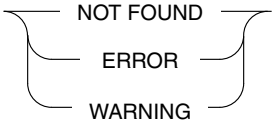
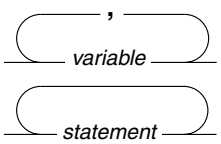
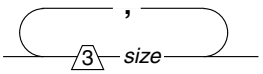
You might encounter one or more of the following syntax elements in the diagram of a statement path.

Element	Description
KEYWORD	A word in UPPERCASE letters is a keyword. You must spell the word exactly as shown; however, you can use either uppercase or lowercase letters.
(. , ; @ + * - /)	Punctuation and other nonalphanumeric characters are literal symbols that you must enter exactly as shown.
' '	Single quotation marks are literal symbols that you must enter as shown.

(1 of 3)

Element	Description
variable	A word in *italics* represents a value that you must supply. A table immediately following the diagram explains the value.
	A reference in a box represents a subdiagram. Imagine that the subdiagram is spliced into the main diagram at this point. When a page number is not specified, the subdiagram appears on the same page.
	A reference in a box in the upper-right corner of a subdiagram refers to the next higher-level diagram of which this subdiagram is a member.
	An icon is a warning that this path is valid only for some products, or only under certain conditions. Characters on the icons indicate what products or conditions support the path. These icons might appear in a syntax diagram:
	Path is valid only for Extended Parallel Server 8.40.
	Path is valid only for Dynamic Server with AD and XP Options.
	Path is valid only for DB-Access.
	Path is valid only for ESQL/C.
	Path is valid only for Dynamic Server 9.40, 9.30, 9.21, 9.20, 7.31, 7.30, or 7.24.
	A shaded option is the default action.
	Syntax within a pair of arrows is a subdiagram.

(2 of 3)

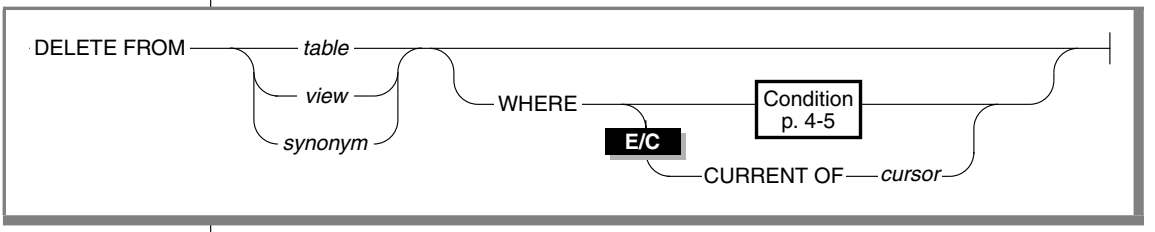
Element	Description
	The vertical line terminates the syntax diagram.
	A branch below the main path indicates an optional path. (Any term on the main path is required, unless a branch can circumvent it.)
	A set of multiple branches indicates that a choice among more than two different paths is available.
	A loop indicates a path that you can repeat. Punctuation along the top of the loop indicates the separator symbol for list items. If no symbol appears, a blank space is the separator.
	A gate (3) on a path indicates that you can only use that path the indicated number of times, even if it is part of a larger loop. You can specify *size* no more than three times within this statement segment.

(3 of 3)

How to Read a Syntax Diagram

Figure 3 shows a syntax diagram that uses most of the path elements that the previous table lists.

Figure 3
Example of a Syntax Diagram



To use this diagram to construct a statement, start at the top left with the keyword DELETE FROM. Then follow the diagram to the right, proceeding through the options that you want.

Figure 3 illustrates the following steps:

1. Type `DELETE FROM`.
2. You can delete a table, view, or synonym:
   - Type the table name, view name, or synonym.
   - You can type `WHERE` to limit the rows to delete.
   - If you type `WHERE` and you are using DB-Access or the SQL Editor, you must include the Condition clause to specify a condition to delete. To find the syntax for specifying a condition, go to the "Condition" segment on the specified page.
   - If you are using ESQL/C, you can include either the Condition clause to delete a specific condition or the CURRENT OF *cursor* clause to delete a row from the table.
3. Follow the diagram to the terminator.

   Your DELETE statement is complete.

Command-Line Conventions

This section defines and illustrates the format of commands that are available in IBM Informix products. These commands have their own conventions, which might include alternative forms of a command, required and optional parts of the command, and so forth.

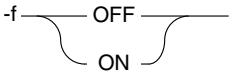
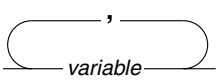
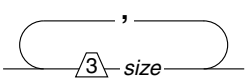
Each diagram displays the sequences of required and optional elements that are valid in a command. A diagram begins at the upper-left corner with a command. It ends at the upper-right corner with a vertical line. Between these points, you can trace any path that does not stop or back up. Each path describes a valid form of the command. You must supply a value for words that are in italics.

Syntax Elements in a Command-Line Path

You might encounter one or more of the following syntax elements in the diagram of a command-line path.

Element	Description
command	This required element is usually the product name or other short word that invokes the product or calls the compiler or preprocessor script for a compiled IBM Informix product. It might appear alone or precede one or more options. You must spell a command exactly as shown and use lowercase letters.
variable	A word in italics represents a value that you must supply, such as a database, file, or program name. A table following the diagram explains the value.
-flag	A flag is usually an abbreviation for a function, menu, or option name, or for a compiler or preprocessor argument. You must enter a flag exactly as shown, including the preceding hyphen.
.ext	A filename extension, such as **.sql** or **.cob**, might follow a variable that represents a filename. Type this extension exactly as shown, immediately after the name of the file. The extension might be optional in certain products.

(1 of 2)

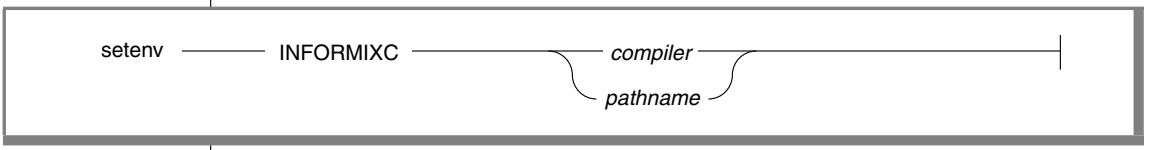
Element	Description
(. , ; + * - /)	Punctuation and mathematical notations are literal symbols that you must enter exactly as shown.
' '	Single quotation marks are literal symbols that you must enter as shown.
	A reference in a box represents a subdiagram. The subdiagram fits into the main diagram at this point. When a page number is not specified, the subdiagram appears on the same page.
	A shaded option is the default action.
	Syntax within a pair of arrows indicates a subdiagram.
	The vertical line terminates the command.
	A branch below the main path indicates an optional path. (Any term on the main path is required, unless a branch can circumvent it.)
	A loop indicates a path that you can repeat. Punctuation along the top of the loop indicates the separator symbol for list items.
	A gate (/3\ ) on a path indicates that you can only use that path the indicated number of times, even if it is part of a larger loop. You can specify *size* no more than three times within this statement segment.

(2 of 2)

How to Read a Command-Line Diagram

Figure 4 shows a command-line diagram that uses some of the elements that are listed in the preceding table.

Figure 4
Example of a Command-Line Diagram



To construct a command correctly, start at the top left with the command. Follow the diagram to the right, including the elements that you want. The elements in the diagram are case sensitive.

Figure 4 illustrates the following steps:

1. Type `setenv`.
2. Type `INFORMIXC`.
3. Supply either a compiler name or a pathname.

   After you choose *compiler* or *pathname*, you come to the terminator. Your command is complete.
4. Press RETURN to execute the command.

Sample-Code Conventions

Examples of SQL code occur throughout this manual. Except where noted, the code is not specific to any single IBM Informix application development tool. If only SQL statements are listed in the example, they are not delimited by semicolons. For instance, you might see the code in the following example:

```
CONNECT TO stores_demo
...

DELETE FROM customer
   WHERE customer_num = 121
...

COMMIT WORK
DISCONNECT CURRENT
```

To use this SQL code for a specific product, you must apply the syntax rules for that product. For example, if you are using DB-Access, you must delimit multiple statements with semicolons. If you are using an SQL API, you must use EXEC SQL at the start of each statement and a semicolon (or other appropriate delimiter) at the end of the statement.

Tip: *Ellipsis points in a code example indicate that more code would be added in a full application, but it is not necessary to show it to describe the concept being discussed.*

For detailed directions on using SQL statements for a particular application development tool or SQL API, see the manual for your product.

Additional Documentation

IBM Informix Dynamic Server documentation is provided in a variety of formats:

- **Online manuals.** The documentation CD in your media pack allows you to print the product documentation. You can obtain the same online manuals at the IBM Informix Online Documentation site at http://www-3.ibm.com/software/data/informix/pubs/library/.
- **Online help.** This facility provides context-sensitive help, an error message reference, language syntax, and more.
- **Documentation notes, release notes, and machine notes.** Documentation notes, which contain additions and corrections to the manuals, and release notes and machine notes are located in the directory where the product is installed.

  Please examine these files because they contain vital information about application and performance issues.

  The following table describes these files.

UNIX/Linux

On UNIX or Linux, the following online files are in the **$INFORMIXDIR/release/en_us/0333** directory.

Online File	Purpose
ids_migrate_docnotes_9.40.html **xps_migrate_docnotes_8.40.html**	The documentation notes file for your version of this manual describes topics that are not covered in the manual or that were modified since publication.
ids_unix_release_notes_9.40.html **ids_unix_release_notes_9.40.txt** **xps_unix_release_notes_8.40.html** **xps_unix_release_notes_8.40.txt**	The release notes file (in HTML or text format) describes feature differences from earlier versions of IBM Informix products and how these differences might affect current products. This file also contains information about known problems and their workarounds.
ids_machine_notes_9.40.txt **xps_machine_notes_8.40.txt**	The machine notes file describes special actions that you must take to configure and use IBM Informix products on your computer.

♦

Windows

On Windows, the following items are in the **Informix** folder. To display this folder, choose **Start→Programs→Informix→ Documentation Notes** or **Release Notes** from the task bar.

Program Group Item	Description
Documentation Notes	The documentation notes file for your version of this manual describes topics that are not covered in the manual or that were modified since publication.
Release Notes	The release notes file describes feature differences from earlier versions of IBM Informix products and how these differences might affect current products. This file also contains information about known problems and their workarounds.

Machine notes do not apply to Windows. ♦

- **Error message files.** IBM Informix software products provide ASCII files that contain error messages and their corrective actions.

  UNIX/Linux

  To read error messages and corrective actions on UNIX or Linux, you can use the **finderr** command to display the error messages online. ♦

  Windows

  To read error messages and corrective actions on Windows, use the **Informix Error Messages** utility. To display this utility, choose **Start→Programs→Informix** from the task bar. ♦

Related Reading

For a list of publications that provide an introduction to database servers and operating-system platforms, see your *Getting Started Guide*.

Compliance with Industry Standards

The American National Standards Institute (ANSI) has established a set of industry standards for SQL. IBM Informix SQL-based products are fully compliant with SQL-92 Entry Level (published as ANSI X3.135-1992), which is identical to ISO 9075:1992. In addition, many features of Informix database servers comply with the SQL-92 Intermediate and Full Level and X/Open SQL CAE (Common Applications Environment) standards.

IBM Welcomes Your Comments

To help us with future versions of our manuals, let us know about any corrections or clarifications that you would find useful. Include the following information:

- The name and version of your manual
- Any comments that you have about the manual
- Your name, address, and phone number

Send electronic mail to us at the following address:

docinf@us.ibm.com

This address is reserved for reporting errors and omissions in our documentation. For immediate help with a technical problem, contact Customer Services.

Section I

Overview of Informix Migration

Chapter

1

Database Server Migration

In This Chapter

This chapter provides an overview of database server migration, including the following topics:

- IBM Informix database server products
- Migration on the same operating system
- Database server migration paths

For information about how to move data between database servers on different operating systems, see Chapter 10, "Migrating Between Database Servers and Operating Systems."

IBM Informix Database Server Products

Figure 1-1 lists Version 9.x, 8.x, 7.x, and 5.1x Informix database servers with the operating systems on which you can run them. Figure 1-1 uses short names for the database servers. For the complete database server names that correspond to these short names, see "Software Dependencies" on page 5 of the Introduction.

Figure 1-1
Operating Systems on Which to Run Informix Database Servers

Database Server	Operating Systems
Dynamic Server 9.40	UNIX Linux Windows 2000 Windows XP
Dynamic Server 9.30	UNIX Linux Windows 2000 Windows NT
Extended Parallel Server 8.40	UNIX
Extended Parallel Server 8.32	UNIX
Extended Parallel Server 8.31	UNIX
Extended Parallel Server 8.30	UNIX
Dynamic Server with AD and XP Options 8.21	UNIX Linux Windows NT
Dynamic Server 7.31	UNIX Windows 2000 Windows NT Windows 95
Workgroup Edition 7.31	UNIX Windows 2000 Windows NT Windows 95
Dynamic Server, Linux Edition 7.31	Linux UNIX
Dynamic Server 7.30	UNIX Linux Windows NT Windows 95

(1 of 2)

Database Server	Operating Systems
Workgroup Edition 7.30	UNIX Windows NT Windows 95
Dynamic Server, Linux Edition 7.30	Linux UNIX
Dynamic Server 7.24	UNIX Windows NT Windows 95
Workgroup Edition 7.24	UNIX Windows NT Windows 95
OnLine 5.1x	UNIX Linux
SE 7.25	UNIX
SE 7.24	UNIX Linux Windows NT
SE 7.23	UNIX Windows NT
SE 7.22	UNIX Windows NT
SE 5.1x	UNIX

(2 of 2)

You can also convert from the following obsolete database servers to a later database server:

- IBM Informix Dynamic Server, Version 9.20 through Version 9.21
- IBM Informix Universal Server, Version 9.14 (Universal Server 9.14)
- IBM Informix OnLine Dynamic Server, Version 7.22 through Version 7.23 (OnLine Dynamic Server 7.22 through 7.23)

For more information on migration paths, see "Database Server Migration Paths" on page 1-13.

To become more familiar with the Informix client-server environment, read *Getting Started with IBM Informix Database Server Products*. It discusses the differences between Informix database servers plus network and server configurations. Also, read the *Getting Started Guide* for your database server.

Migration on the Same Operating System

This section provides tables that show migration paths between database servers on the same operating system.

UNIX

Source and Target Database Servers on UNIX

Figure 1-2 lists the source and target versions for migration of database servers on UNIX.

Figure 1-2
Migrating Between Database Servers on UNIX

	Target Version															
Source Version	9.40.U	9.30.U	9.21.U	9.20.U	9.14.U	8.40.U	8.32.U	8.31.U	8.30.U	8.21.UD4	8.21.U	7.31.U	7.30.U	7.25.U	7.24.U	5.1x.U
9.30.U	●	●	●	●	●							●	●		●	
9.21.U	●	●	●	●	●							●	●		●	
9.20.U	●	●	●	●	●							●	●		●	
9.14.U		●	●	●	●							●	●		●	
8.40.U						●	●	●	●	●		●	●		●	
8.32.U						●	●	●	●	●		●	●		●	
8.31.U						●	●	●	●	●		●	●		●	
8.30.U						●	●	●	●	●		●	●		●	
8.21.UD4									●	●	●				●	
8.21.U										●	●				●	
7.31.U	●	●	●	●	●	●	●	●	●			●	●		●	●
7.30.U	●	●	●	●	●	●	●	●	●			●	●		●	●
7.25.U														●	●	●
7.24.U	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
7.23.U			●	●	●							●	●	●	●	●
7.22.U			●	●	●							●	●	●	●	●
5.1x.U												●	●	●	●	●

Linux

Source and Target Database Servers on Linux

Figure 1-3 lists the source and target versions for migration of Informix database servers on Linux.

Figure 1-3
Migrating Between Database Servers on Linux

	Target Version			
Source Version	**9.40.U**	**9.30.U**	**7.31.U**	**7.30.U**
9.40.U	●	●	●	●
9.30.U	●	●	●	●
9.21.U	●	●	●	●
9.20.U	●	●	●	●
7.31.U	●	●	●	●
7.30.U	●	●	●	●

WIN XP

Source and Target Database Server on Windows XP

Currently, only Dynamic Server Version 9.4 is available on Windows XP.

WIN NT

Source and Target Database Servers on Windows NT

Important: *Dynamic Server Version 9.4 is not available on Windows NT.*

Figure 1-4 lists the source and target versions for migration of Informix database servers on Windows NT.

Figure 1-4
Migrating Between Database Servers on Windows NT

	Target Version						
Source Version	**9.30.T**	**8.21.T**	**7.31.T**	**7.30.T**	**7.24.T**	**7.23.T**	**7.22.T**
9.30.T	●		●	●	●		
9.21.T	●		●	●	●	●	●
9.20.T	●		●	●	●	●	●
9.14.T	●		●	●	●	●	●
8.21.T		●			●	●	●
7.31.T	●	●	●	●	●	●	●
7.30.T	●	●	●	●	●	●	●
7.24.T	●	●	●	●	●	●	●
7.23.T		●	●	●	●	●	●
7.22.T		●	●	●	●	●	●

WIN 2000

Source and Target Database Servers on Windows 2000

Figure 1-5 lists the source and target versions for migration of Informix database servers on Windows 2000.

Figure 1-5
Migrating Between Database Servers on Windows 2000

	Target Version		
Source Version	**9.40.T**	**9.30.T**	**7.31.T**
9.40.T	●	●	●
9.30.T	●	●	●
9.21.T	●	●	●
7.31.T	●	●	●

WIN 95

Source and Target Database Servers on Windows 95

Figure 1-6 lists the source and target versions for migration of Informix database servers on Windows 95.

Figure 1-6
Migrating Between Database Servers on Windows 95

	Target Version		
Source Version	**7.31.T**	**7.30.T**	**7.24.T**
7.31.T	●	●	●
7.30.T	●	●	●
7.24.T	●	●	●

Migration on Different Operating Systems

If you are using Dynamic Server on Windows NT and migrating to Dynamic Server Version 9.40, you also need to migrate to Windows 2000 or Windows XP.

For specific information on migrating between operating systems, see Chapter 10, "Migrating Between Database Servers and Operating Systems."

Figure 1-7 lists the operating systems supported by each version of Dynamic Server.

Figure 1-7
Migrating Between Operating Systems

	Operating System					
Server Version	**UNIX**	**Linux**	**Windows XP**	**Windows NT**	**Windows 2000**	**Windows 95**
9.40	●	●	●		●	
9.30	●	●		●	●	
9.21	●	●		●	●	
9.20	●	●		●		
9.14	●			●		
8.40	●					
8.31	●					
8.30	●					
8.21	●			●		
7.31	●	●		●	●	●
7.30	●	●		●		●
7.25	●					
7.24	●			●		●
7.23	●			●		
7.22	●			●		
5.1x	●					

Database Server Migration Paths

Figure 1-8 lists migration paths for converting from an existing source database server to a newer target database server. The **Page** column shows where to find information in this manual about how to convert.

Figure 1-8
Converting to a Newer Database Server

Source Database Server	Target Database Server	Page
Dynamic Server 9.30	Dynamic Server 9.40	3-1
Dynamic Server 9.21	Dynamic Server 9.40 Dynamic Server 9.30	3-1
Dynamic Server 9.20	Dynamic Server 9.30	3-1
Universal Server 9.14	Dynamic Server 9.30	3-1
Extended Parallel Server 8.31 or 8.32	Extended Parallel Server Version 8.40	4-1
Dynamic Server with AD and XP Options 8.21	Extended Parallel Server 8.3x	
Dynamic Server 7.31	Dynamic Server 9.40 Dynamic Server 9.30 Extended Parallel Server 8.40 Extended Parallel Server 8.3x	3-1 3-1 8-1
Dynamic Server, Linux Edition 7.31	Dynamic Server 9.40 Dynamic Server 9.30 Extended Parallel Server Version 8.40 Extended Parallel Server 8.3x	3-1 3-1 8-1
Workgroup Edition 7.31	Dynamic Server 9.40 Dynamic Server 9.30 Extended Parallel Server Version 8.40 Extended Parallel Server 8.3x	3-1 3-1 8-1

(1 of 3)

Source Database Server	Target Database Server	Page
Dynamic Server 7.30	Dynamic Server 9.40	3-1
	Dynamic Server 9.30	
	Extended Parallel Server 8.40	8-1
	Extended Parallel Server 8.3	
	Dynamic Server 7.31	5-1
Dynamic Server, Linux Edition 7.30	Dynamic Server 9.40	3-1
	Dynamic Server 9.30	
	Extended Parallel Server 8.3	8-1
	Dynamic Server, Linux Edition 7.31	5-1
Workgroup Edition 7.30	Dynamic Server 9.40	3-1
	Dynamic Server 9.30	
	Extended Parallel Server 8.3	8-1
	Workgroup Edition 7.31	5-1
Dynamic Server 7.24	Dynamic Server 9.40	3-1
	Dynamic Server 9.30	3-1
	Extended Parallel Server 8.40	8-1
	Extended Parallel Server 8.3	
	Dynamic Server with AD and XP Options 8.21	9-1
	Dynamic Server 7.3x	5-1
Workgroup Edition 7.24	Dynamic Server 9.40	3-1
	Dynamic Server 9.30	3-1
	Extended Parallel Server 8.3	8-1
	Dynamic Server with AD and XP Options 8.21	9-1
	Workgroup Edition 7.3x	5-1
OnLine Dynamic Server 7.23	Dynamic Server 7.3x	5-1
	Dynamic Server 7.24	5-1
OnLine Dynamic Server 7.22	Dynamic Server 7.3x	5-1
	Dynamic Server 7.24	5-1
	OnLine Dynamic Server 7.23	5-1
OnLine 5.1x	Dynamic Server 7.3x	6-1
	Dynamic Server 7.24	
	OnLine Dynamic Server 7.2x	
SE 7.24	SE 7.25	7-1

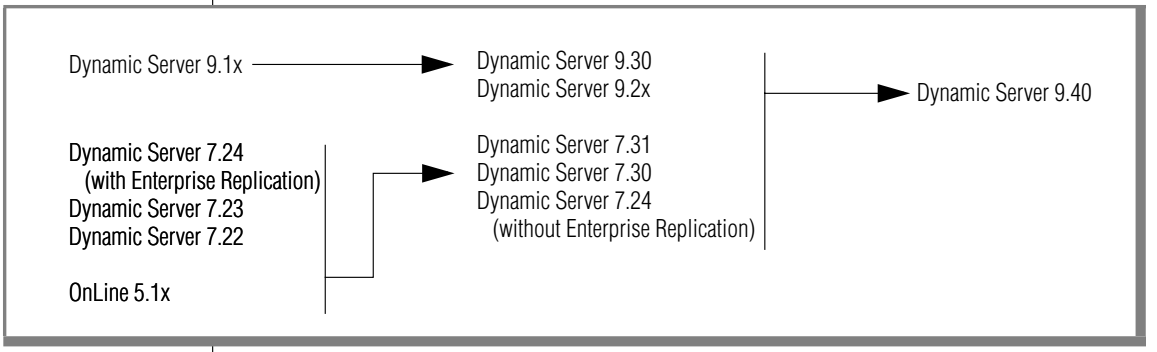
(2 of 3)

Source Database Server	Target Database Server	Page
SE 7.23	SE 7.25 SE 7.24	7-1
SE 7.22	SE 7.25 SE 7.24 SE 7.23	7-1
SE 5.1x	SE 7.2x	7-1

(3 of 3)

Figure 1-9 shows the paths for converting from older database servers to Dynamic Server Version 9.40.

Figure 1-9
Migration Paths to Dynamic Server 9.40



For information on migrating directly to Dynamic Server Version 9.40, see Chapter 3, "Migrating to Dynamic Server 9.40 or 9.30 from 9.x, 7.3x, or 7.24."

For information on migrating to Dynamic Server Version 7.31, see Chapter 5, "Migrating to Dynamic Server 7.3x from Dynamic Server 7.30 or 7.24." or Chapter 6, "Migrating to Dynamic Server 7.3x or 7.24 from OnLine 5.1x."

Figure 1-10 shows migration paths for reverting from an existing target database server to an older source database server. The **Page** column shows where to find information in this manual about how to revert.

Figure 1-10
Reverting to an Older Database Server

Source	Target	Page
Dynamic Server 9.40	Dynamic Server 9.30 Dynamic Server 9.2x Dynamic Server 7.3x Dynamic Server, Linux Edition Version 7.3x Workgroup Edition 7.3x Dynamic Server 7.24 Dynamic Server, Linux Edition Version 7.3x Workgroup Edition 7.24	3-1
Dynamic Server 9.30	Dynamic Server 9.2x Universal Server 9.14 Dynamic Server 7.3x Dynamic Server, Linux Edition Version 7.3x Workgroup Edition 7.3x Dynamic Server 7.24 Dynamic Server, Linux Edition Version 7.3x Workgroup Edition 7.24	3-1
Extended Parallel Server Version 8.40	Extended Parallel Server 8.3x	
Extended Parallel Server 8.3x	Dynamic Server with AD and XP Options 8.21 Dynamic Server 7.3x Dynamic Server, Linux Edition Version 7.3x Workgroup Edition 7.3x Dynamic Server 7.24 Workgroup Edition 7.24	8-1
Dynamic Server with AD and XP Options 8.21	Dynamic Server 7.24 Workgroup Edition 7.24	9-1

(1 of 2)

Source	Target	Page
Dynamic Server 7.31	Dynamic Server 7.30	9-1
	Dynamic Server, Linux Edition 7.30	9-1
	Workgroup Edition 7.30	9-1
	Dynamic Server 7.24	9-1
	Workgroup Edition 7.24	9-1
	OnLine Dynamic Server 7.23	9-1
	OnLine Dynamic Server 7.22	9-1
	OnLine 5.1x	5-1
Dynamic Server, Linux Edition 7.31	Dynamic Server, Linux Edition 7.30	5-1
Workgroup Edition 7.31	Workgroup Edition 7.30	5-1
	Workgroup Edition 7.24	
Workgroup Edition 7.30	Workgroup Edition 7.24	5-1
Dynamic Server 7.30	Dynamic Server 7.24	9-1
	Workgroup Edition 7.24	9-1
	OnLine Dynamic Server 7.23	9-1
	OnLine Dynamic Server 7.22	9-1
	OnLine 5.1x	5-1
Dynamic Server 7.24	OnLine Dynamic Server 7.23	9-1
	OnLine Dynamic Server 7.22	9-1
	OnLine 5.1x	5-1
SE 7.25	SE 7.24	7-1
	SE 7.23	
	SE 7.22	
	SE 5.1x	
SE 7.24	SE 7.23	7-1
	SE 7.22	
	SE 5.1x	
SE 7.23	SE 7.22	7-1
	SE 5.1x	
SE 7.22	SE 7.25	7-1
	SE 7.24	
	SE 7.23	
SE 5.1x	SE 7.2x	7-1

(2 of 2)

Chapter

2

Data Migration

In This Chapter

This chapter provides an overview of data migration and compares the IBM Informix migration utilities. This chapter covers the following topics:

- Migrating a database or selected data
- Setting environment variables before using utilities
- Choosing the most effective data migration tool
- Moving data between computers and dbspaces

Migrating a Database or Selected Data

You might need to perform data migration on a database or selected data to complete any of the following tasks:

- Migrating between different versions of a database server
- Changing database servers, operating systems, or GLS locales
- Distributing a client application
- Importing non-Informix data

Migrating Between Different Versions of a Database Server

When you convert to a later version of a database server or revert to an earlier version, you need to consider the following data migration issues:

- Changes in the configuration parameters and environment variables
- Amount of memory and dbspace space required
- Organization of the data

Later chapters discuss these issues in detail.

Changing Database Servers, Operating Systems, or GLS Locales

You might want to move between database servers, to a different operating system, or to a different GLS locale. You also might want to change the database schema to accommodate more information, to provide for growth, or to enhance performance.

AD/XP
SE

If you are migrating to Dynamic Server with AD and XP Options 8.21 on a different operating system or to SE, you must unload the data into text files and then load it back again into the target database server. ♦

For information about how to move data to a different operating system, see Chapter 10, "Migrating Between Database Servers and Operating Systems."

GLS

For information about how to move to a different GLS locale, see the *IBM Informix GLS User's Guide*. ♦

Distributing a Client Application

After you convert a database server on the same operating system or move the database server to another, compatible computer, review the client applications and **sqlhosts** file or registry-key connections. You might need to recompile or modify client applications, or update the **sqlhosts** file or registry key.

Verify that the client-application version you use is compatible with your database server version. Update the **sqlhosts** file or registry key for the client applications with the new database server information.

For more information about interactions between client applications and different database servers, refer to a client manual.

Importing Non-Informix Data

You can use the **dbimport** and **dbload** utilities, the High-Performance Loader (HPL), the IBM Informix Enterprise Gateway products, or external tables to import data from non-Informix sources.

Setting Environment Variables Before Using Utilities

Before you use any data migration utility, you must set your PATH, INFORMIXDIR, and INFORMIXSERVER environment variables. For information about environment variables, see the *IBM Informix Guide to SQL: Reference*.

Tip: *If you are using SE, we recommend that you not use the* ***.dbs*** *directory as your current directory when you use a database-related utility. This practice keeps the* ***.dbs*** *directory free from file clutter and prevents multiple users from overwriting files that belong to other users.*

SE

For information about SE administration utilities, see your *IBM Informix SE Administrator's Guide*. ♦

Choosing Data Migration Tools

You can use the following tools, utilities, and SQL statements to move data from one database to another:

- The **onunload** and **onload** utilities (only between database servers of the same version)
- The **dbexport** and **dbimport** utilities
- UNLOAD and LOAD statements and the **dbload** utility
- The **dbschema** utility
- External tables
- The High-Performance Loader (HPL)
- Nonlogging raw tables
- The **onxfer** utility
- IBM Informix Enterprise Command Center (IECC)

  You can use this tool for Dynamic Server with AD and XP Options 8.21, Dynamic Server 7.3x, and some earlier database servers

This section provides brief descriptions of these data migration tools and information to help you choose the most effective ones to move your data. For additional details about how to use these tools and for utility command and statement syntax, see the chapters in Section IV, "Data Migration Utilities." For more information about external tables and the HPL, see the *Administrator's Reference*, your *Administrator's Guide*, or the *IBM Informix Guide to SQL: Syntax*. For more information about IECC, see the *IBM Informix Enterprise Command Center User Guide*.

Figure 2-1 lists which tools you can use for each database server.

Figure 2-1
Utilities for Moving Data

	Database Server							
Utility	**IDS 9.40**	**IDS 9.30**	**XPS 8.40**	**XPS 8.3x**	**AD/XP 8.21**	**IDS 7.3x or 7.24**	**SE 7.2x and 5.1x**	**OL 5.1x**
dbexport/ dbimport	●	●				●	●	●
dbload	●	●				●	●	●
External tables			●	●	●			
HPL	●	●				●		
IECC					●	●		
onunload/ onload	●	●				●		
onxfer			●	●	●			
UNLOAD/ LOAD	●	●	●	●	●	●	●	●

The best method for moving data depends on your operating system and whether you want to move an entire database, selected tables, or selected columns from a table. Figure 2-2 summarizes the characteristics of the methods for loading data and the constraints and advantages of each method.

Figure 2-2
Comparison of Tools for Loading Data

	dbexport/ dbimport	dbload	External Tables	HPL	IECC	onunload/ onload	onxfer	UNLOAD/ LOAD
Granularity of Data	Database only	Partial or complete table	Partial or complete table	Partial or complete table	Table or database	Table or database	Table or database	Partial or complete table
Performance	Moder-ate	Slow	Very fast	Fast	Moder-ate	Fast	Very fast	Moder-ate
Source of Data	Usually prod-uced by **dbexport**	Any data in the format specified by the input file	Any data in the format specified by the input file	Any ASCII or COBOL data. User can create custom read capabil-ities.	Data must be unloaded by IECC	Must be prod-uced by **on-unload**	Table or database	Any data in the specified format, usually prod-uced by UN-LOAD
Database Schema	Can modify	Can modify	Can modify	Can modify	Cannot modify	Cannot modify	Can modify	Can modify
Location of Data	Disk or tape	Disk only	Disk, tape, or pipe	Disk, tape, or pipe	Disk or tape	Disk or tape	Disk or pipe	Disk only
Type of File	Text	Text	Text	Text	Text	Binary	Text	Text
Logging Status	Logging optional	Logging optional	Logging optional	Logging optional	Logging optional	Logging must be turned off	Logging optional	Logging optional
Move Data Between Operating Systems?	Yes	Yes	Yes, or from a non-Informix database	Yes, or from a non-Informix database	Yes	No	Yes	Yes
Ease of Use	Moder-ate	Moder-ate	Most difficult	Most difficult	Easy to use	More difficult	Moder-ate	Easiest

The following sections provide guidelines on how to choose the appropriate migration tool or tools.

Automatic Data Migration

Data migration is automatic. Automatic data migration means that when you migrate from one database server to another, you do not need to use any data migration tools to move the data. The data migrates automatically from the source database server to the target database server after you bring up the target database server. For example, data migration between Dynamic Server 7.3x and Workgroup Edition 7.3x is automatic if the database servers use the same operating system.

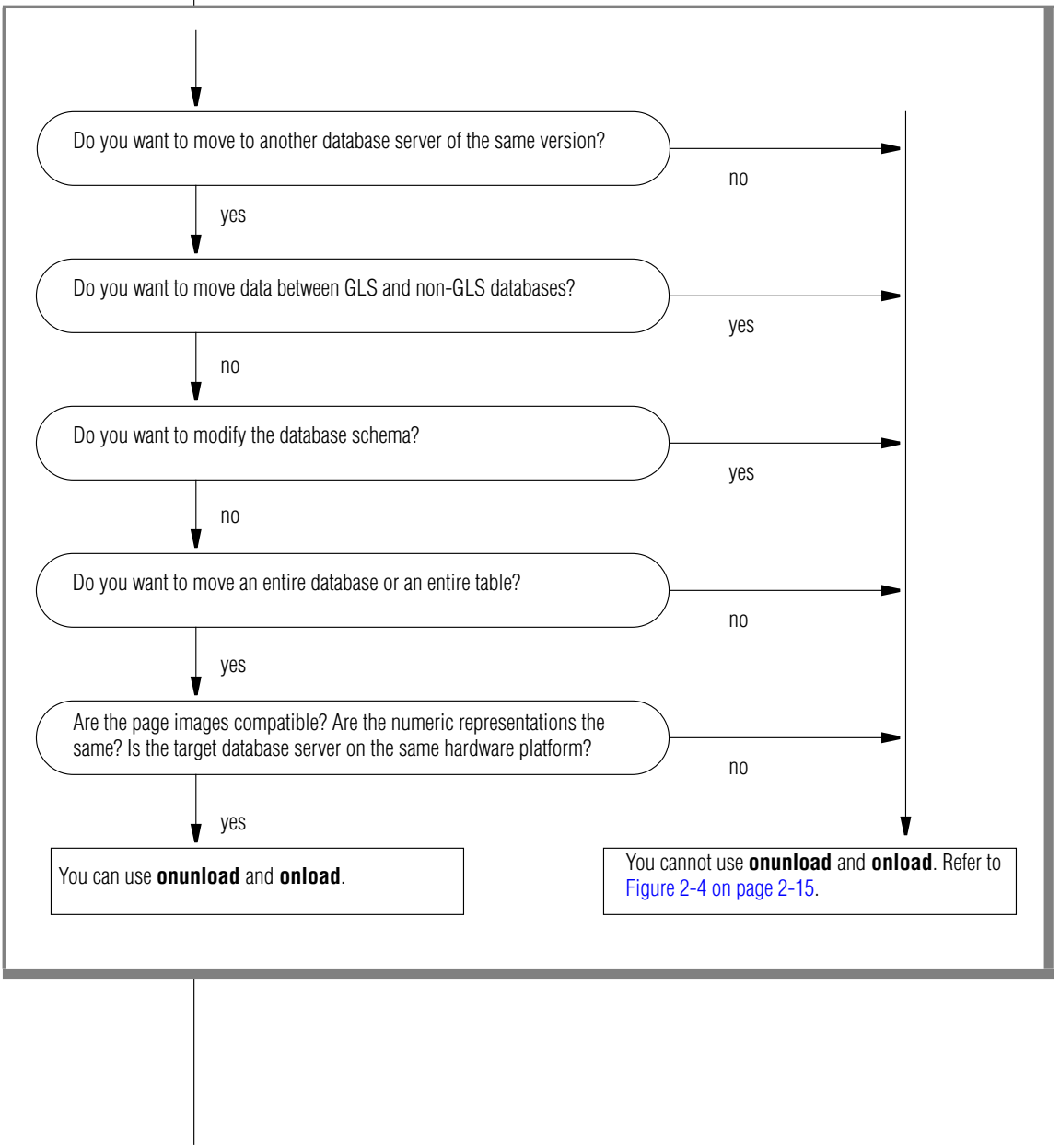
Data migration can also be automatic when you move between different versions of a database server in the same operating system.

The onunload and onload Utilities

The **onunload** and **onload** utilities provide the fastest way to move data, but they do not let you modify the database schema or move from one operating system or database server version to another. The **onunload** utility unloads data from the specified database or table onto a tape or a file on disk in disk-page-sized units, making this utility more efficient than **dbexport**. The **onload** utility takes a tape or a file that the **onunload** utility creates and re-creates the database or the table. The **onunload** and **onload** utilities are faster than **dbimport**, **dbload**, or LOAD but are much less flexible.

Because the data is written in page-sized units, you can use **onunload** and **onload** only when certain constraints are met. For example, you cannot use **onunload** and **onload** to move data between UNIX and Windows. You can, however, use the **onunload** and **onload** utilities to move data between computers that use the same database server on the same platform. Figure 2-3 summarizes the questions that you need to ask before you use **onunload** and **onload**.

Figure 2-3
Criteria for Using the onunload and onload Utilities



Constraints on Using onunload and onload

The **onunload** and **onload** utilities are the fastest way to unload and load data, but you can use them only when all the following criteria are the same for the source and target computers:

- Page size
- Representation of numeric data
- Byte alignment for structures and unions
- Informix database server version

You cannot use **onunload** and **onload** to move data between UNIX or Linux and Windows because they use different page sizes. For example, the page size is two kilobytes on some UNIX systems and four kilobytes on Windows.

You can use the **onunload** and **onload** utilities to unload from and load data into the following database servers between computers that have the same operating system:

- Dynamic Server 9.40, 9.30, or 9.2x (only databases that do not contain extended data types)
- Dynamic Server 7.3x or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24

For example, your site purchases a more powerful UNIX computer to allow faster access for users. You need to transfer existing databases to the new database server on the new computer. Use **onunload** to unload data from the first database server and then use **onload** to load the data into the second database server. Both database servers must have the same version number, or they must have compatible version numbers. You can move an entire database or selected tables only, but you cannot modify the database schema.

Restrictions on Using onunload and onload

The **onunload** and **onload** utilities have the following restrictions:

GLS

- You cannot use **onunload** and **onload** to move data between non-GLS and GLS locales. ♦

IDS 9.x

- Do not use **onunload** and **onload** to move data between two Dynamic Server 9.40, 9.30, or 9.2x databases if either database contains an extended data type.

  Use the HPL instead to move the data. ♦

SE

- SE does not support **onunload** and **onload**.

  Use **dbexport** and **dbimport** to move data between SE database servers. ♦

XPS 8.40

AD/XP

- Extended Parallel Server Version 8.40 and Dynamic Server with AD and XP Options 8.2x do not support **onunload** and **onload**.

  For Dynamic Server with AD and XP Options 8.21, use external tables to unload and load your data or to move data between operating systems. For more information on how to unload and load this data, see "External Tables" on page 2-18 and "Loading and Unloading Data" on page 9-20. ♦

You can use **onunload** and **onload** to move data between databases if the NLS and GLS locales are identical. For example, if user A has a French locale NLS table on server A and tries to load data into a German locale GLS table on server B, **onload** and **onunload** report errors. However, if both the NLS and GLS tables were created with the same French locale, **onload** and **onunload** would work.

The tape that **onload** reads contains binary data that is stored in disk-page-sized units. For this reason, the computers where the original database resides (where you use **onunload**) and where the target database will reside (where you use **onload**) must have the following characteristics:

- The same page size
- The same representation of numeric data
- The same byte alignment for structures and unions

If the page sizes are different, **onload** fails. If the alignment or numeric data types on the two computers are different (for example, with the most-significant byte last instead of first or different float-type representations), the contents of the data page could be misinterpreted.

Important: *You cannot use the **onload** and **onunload** utilities to move data from one version of a database server to another. You also cannot use these utilities to move data between different types of database servers.*

For additional constraints and restrictions, see Chapter 16, "The onunload and onload Utilities."

The dbexport and dbimport Utilities

If you cannot use **onunload** and **onload**, you have three other methods to choose from:

- The **dbload** utility (to load data)
- The **dbexport** and **dbimport** utilities
- The UNLOAD and LOAD SQL statements

All these methods enable you to modify the database schema. The **dbexport** and **dbimport** utilities provide some flexibility, but you must move an entire database.

If you cannot use **onunload** and **onload** to export and import data, you can unload your data to text files. You can use the **dbexport** utility to unload data to tape from any of the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x, or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE

The UNLOAD statement lets you manipulate the data as you unload it, but it requires that you unload to files on disk instead of to tape. If you unload to disk files, you might need to use UNIX, Linux, or Windows utilities to load those files onto tape.

The **dbexport** utility unloads a database into text files and creates a schema file. You can use the schema file with **dbimport** to re-create the database schema in another Informix environment. You can edit the schema file to modify the database that **dbimport** creates. The **dbexport** utility supports Dynamic Server 9.40, 9.30, and 9.2x data types.

Destination Options

The **dbexport** utility supports the following destination options:

- Unload a database and its schema file to disk
- Unload a database and its schema file to tape
- Unload the schema file to disk and unload the data to tape

The **dbimport** utility creates a database and loads it with data from text files. The input files consist of a schema file that is used to re-create the database and data files that contain the database data. Normally, you generate the input files with the **dbexport** utility, but you can use any properly formatted input files. The **dbimport** utility supports new data types in Dynamic Server 9.40, 9.30, and 9.2x.

Location Options

The **dbimport** utility can use files from the following location options:

- All input files are located on disk
- All input files are located on tape
- The schema file is located on disk, and the data files are located on tape

Database Server Options

The **dbimport** utility supports the following options for a new Informix database server (except SE):

- Create an ANSI-compliant database (includes unbuffered logging).
- Establish transaction logging for a database (unbuffered or buffered logging).
- Specify the dbspace where the database will reside.

SE

SE Options

The **dbimport** utility supports the following options for a new SE database:

- Create an ANSI-compliant database (ANSI-compliant logging).
- Establish transaction logging for a database (unbuffered logging).

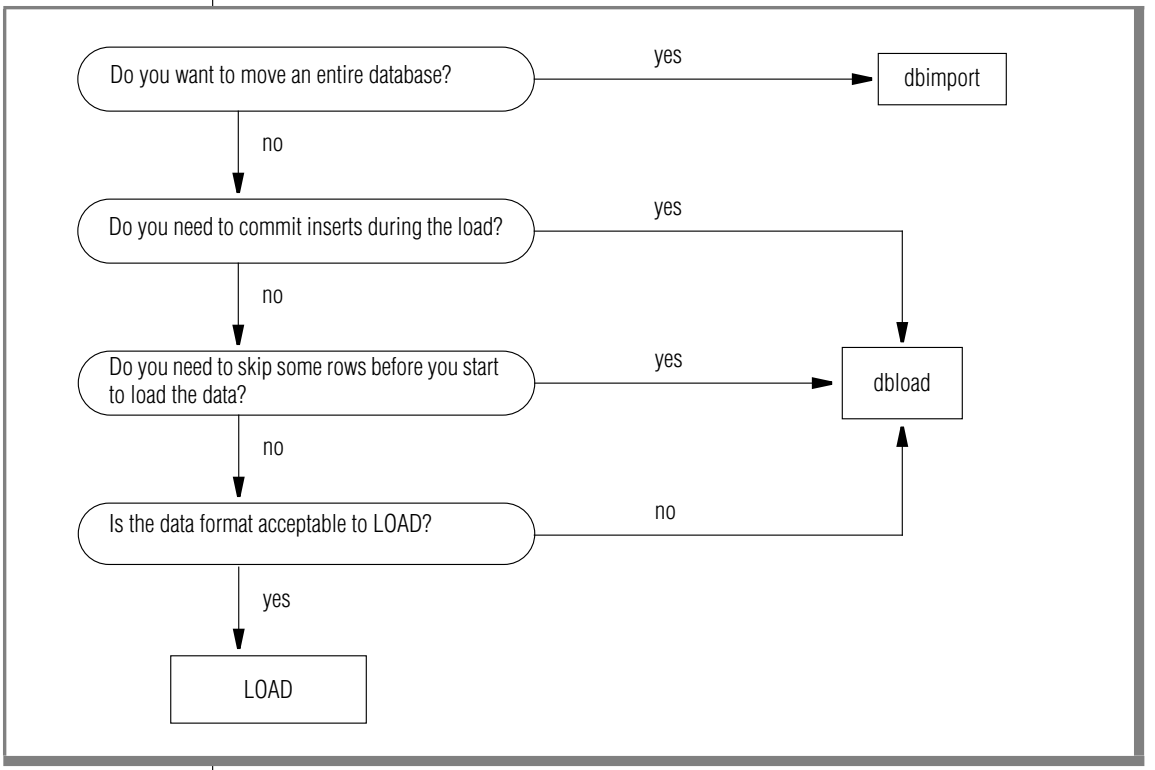
LOAD, UNLOAD, and dbload

The LOAD statement is moderately fast and easy to use, but it can only accept specified data formats. You usually use LOAD with data that is prepared with an UNLOAD statement.

You can use the UNLOAD statement in DB-Access to unload selected rows from a table into a text file.

To load tables, use LOAD or **dbload**. To manipulate a data file that you are loading or to access a database while it is loading, use the **dbload** utility. The cost of the flexibility is the time you spend creating the **dbload** command file and slower execution. When possible, use the LOAD statement, which is faster than **dbload**. Figure 2-4 summarizes questions to help you choose among these methods.

Figure 2-4
Choosing Among dbimport, dbload, and LOAD



The **dbload** utility gives you a great deal of flexibility, but it is not as fast as the other methods, and you must prepare a command file to control the input. You can use **dbload** with data in a variety of formats.

The **dbload** utility offers the following advantages over the LOAD statement:

- You can use **dbload** to load data from input files that were created with a variety of format arrangements. The **dbload** command file can accommodate data from entirely different database management systems.
- You can specify a starting point in the load by directing **dbload** to read but ignore *x* number of rows.

- You can specify a batch size so that after every *x* number of rows are inserted, the insert is committed.
- You can limit the number of bad rows read, beyond which **dbload** ends.

The cost of **dbload** flexibility is the time and effort spent creating the **dbload** command file, which is required for **dbload** operation. The input files are not specified as part of the **dbload** command line, and neither are the tables into which the data is inserted. This information is contained in the command file.

The dbschema Utility

You can use the **dbschema** utility for the following purposes:

- To display the SQL statements (the *schema*) that are required to replicate a database or a specific table, view, or procedure
- To display the schema for the Information Schema views
- To display the distribution information that is stored for one or more tables in the database
- To display information on user-defined data types and row types

Guidelines for Using dbschema

XPS 8.x
AD/XP

For Extended Parallel Server Version 8.40, 8.3x, or Dynamic Server with AD and XP Options 8.21, you need to edit your schema files to incorporate the dbslices feature and the syntax definition of dbspaces. In these database servers, the **dbschema** utility produces dbslice information. For information on these schema issues, see Chapter 8, "Migrating to Extended Parallel Server 8.40 from a 7.3x or 7.2x Database Server" and Chapter 9, "Migrating to Dynamic Server AD/XP 8.21 from a 7.2x Database Server." ♦

SE

If you are using SE, the database must exist in your current directory or in a directory that is cited in your **DBPATH** environment variable. ♦

GLS

When the GLS environment variables are set correctly, as the *IBM Informix GLS User's Guide* describes, **dbschema** can handle foreign characters in Dynamic Server 9.40, 9.30, 9.2x, 7.3x, or 7.24; Dynamic Server, Linux Edition 7.3x; or Workgroup Edition 7.3x or 7.24. ♦

You can use delimited identifiers with the **dbschema** utility. It detects database objects that are keywords, mixed case, or have special characters, and places double quotation marks around them.

DB-Access Input from dbschema Output

You can use the **dbschema** utility to get the schema of a database and redirect the **dbschema** output to a file. Later, you can feed this file to DB-Access to re-create the database.

Object Modes and Violation Detection

The **dbschema** output supports object modes and violation detection, as follows:

- The output shows the names of not-null constraints after the not-null specifications.

  You can use the output of the utility as input to create another database. If the same names were not used for not-null constraints in both databases, problems could result.
- The output shows the object mode of objects that are in the disabled state. These objects can be constraints, triggers, or indexes.
- The output shows the object mode of objects that are in the filtering state. These objects can be constraints or unique indexes.
- The output shows the violations and diagnostics tables that are associated with a base table (if violations and diagnostics tables were started for the base table).

For more information about object modes and violation detection, see the SET, START VIOLATIONS TABLE, and STOP VIOLATIONS TABLE statements in the *IBM Informix Guide to SQL: Syntax*.

External Tables

You can use external tables to unload and load data when no other data migration tool is available.

AD/XP

For Dynamic Server with AD and XP Options 8.21, you need to use external tables to unload and load data. These database servers use high-performance parallel loading with external tables. External tables can hold data that you back up from a database server. You can move the data from the external tables to another database server.

To load and unload data in an 8.21 database server, use external tables formatted in the Informix internal data representation format. You can load and unload files with the default delimiter (|) format. ♦

For detailed information on external tables, see the description of the CREATE EXTERNAL TABLE statement in the *IBM Informix Guide to SQL: Syntax*.

The High-Performance Loader

The High-Performance Loader (HPL) utility uses parallel processing to perform fast data loading and unloading. The HPL is available with the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x, and 7.24
- Workgroup Edition 7.3x and 7.24

The HPL requires significant preparation time but is fast. Use the HPL for large migration jobs. The HPL can load data from any ASCII or COBOL file that meets certain format requirements.

You can use the HPL to load from large ASCII or COBOL databases. COBOL is supported up to Version 7.3.

HPL Tools

In addition to the advantage of speed, the following HPL features provide powerful tools for handling data from non-Informix sources:

- Drivers to handle different database types
- Filters and functions to manipulate data
- Code-set conversion
- The **ipload** GUI for both UNIX
- The **onpladm** command-line utility for UNIX and Windows

Performance Advantage of the HPL

For extremely large databases, the HPL has a performance advantage over other IBM Informix data-migration utilities because it performs I/O and code-set conversions in parallel. The user, however, must invest significant preparation time before using the HPL, and the HPL program has a significant start-up time. Therefore, use the HPL only for large databases, for which the time savings in the actual loading or unloading of data makes the preparation time worthwhile.

For more information about the HPL, refer to the *IBM Informix High-Performance Loader User's Guide.*

IDS 9.x

Nonlogging Raw Tables

You can use nonlogging raw tables in a logging database to speed up the initial loading and validation of data in Dynamic Server 9.40, 9.30, or 9.2x, which creates standard tables that use logging by default. Data warehousing and other applications can have very large tables that take a long time to load. Nonlogging tables are faster to load than logging tables.

To create a nonlogging table for loading, you can use the CREATE RAW TABLE statement, or you can use the ALTER TABLE statement to change the table type from STANDARD to RAW. Tables of type RAW do not allow indexes or referential constraints, so the initial loading is faster than with tables of type STANDARD. After the loading of a raw table is complete, you can change it to a logging table (in a logging database) by changing the table type to STANDARD. Then you can use ALTER TABLE statements to add referential constraints to the table and CREATE INDEX statements to add indexes. For more information on these SQL statements, see the *IBM Informix Guide to SQL: Syntax*.

To load raw tables, you can use any data loading utility, such as **dbimport** or HPL in express mode. After you load data, perform a level-0 backup. Before you modify any data in a raw table or use it in a transaction, change the table type to STANDARD.

If an error or failure occurs during the loading of a raw table, the resulting data is whatever was on the disk at the time of the failure.

The **dbexport** and **dbschema** utilities support the CREATE RAW TABLE and ALTER TABLE...TYPE (RAW) statements.

For more information on nonlogging tables, see your *Administrator's Guide*. For more information on how to improve the performance of loading very large tables, see your *Performance Guide*. For more information on the ALTER TABLE statement, see the *IBM Informix Guide to SQL: Syntax*.

XPS

The onxfer Utility

You can use the **onxfer** utility to move a database or individual tables to Extended Parallel Server from IBM Informix Dynamic Server 7.24 and 7.3x. You can use **onxfer** to transfer a database or selected tables to disk. This data movement utility combines the speed of the HPL and external tables functionality with the usability of the **dbexport** and **dbimport** utilities.

Movement of TEXT and BYTE Data

An Informix database server scans TEXT and BYTE data into an existing table in one of the following ways.

- SQL LOAD statement
- The **dbload** utility
- Informix ESQL/C program
- The HPL
- External table

Informix database servers do not have any mechanisms for compressing TEXT and BYTE data after the data has been scanned into a database.

Moving Data Between Computers and Dbspaces

This section discusses moving data between different computers and importing data from non-Informix environments. Except when you use the HPL or external tables, you must unload your data to ASCII files before you move the data to another computer.

If you are moving to an Informix database server on another computer, you can use the **dbimport** and **dbload** utilities to load the data that you exported.

If you are moving data to a non-Informix application, you might need to use the UNLOAD statement because it lets you specify the delimiter that is used in the data files.

Importing Data from a Non-Informix Source

The **dbimport** and **dbload** utilities can import data from any ASCII file that is properly formatted. Most applications that produce data can export the data into files that have a suitable format for **dbimport**. If the format of the data is not suitable, use UNIX, Linux, or Windows utilities to reformat the data before you import it into one of the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x, or 7.24
- Dynamic Server, Linux Edition 7.3x

- Workgroup Edition 7.3x or 7.24
- SE

In addition to **dbimport** and **dbload**, the IBM Informix Enterprise Gateway products and the HPL provide ways to access information from non-Informix sources.

Importing Data with IBM Informix Enterprise Gateway Products

IBM Informix Enterprise Gateway with DRDA lets you query databases that conform to the DRDA protocol published by IBM. You can use this Gateway product to query a DRDA database and then insert the results into an Informix database. For example, to import data, execute a SELECT statement to select data from the non-Informix database and then execute an INSERT statement to insert data into the Informix database. For more information, refer to the *IBM Informix Enterprise Gateway with DRDA User Manual*.

UNIX/Linux

IBM Informix Enterprise Gateway provides a single, standards-based gateway to multiple data sources. Gateway Manager connects the Informix environment with that of any shared-library ODBC Level 2-compliant driver manager and driver on UNIX or Linux. For instance, you can use Gateway Manager with the IBM Informix Enterprise Gateway driver products to access UNIX or Linux database server products such as SYBASE SQL Server 10 and ORACLE7 Server. For more information, refer to the *IBM Informix Enterprise Gateway Manager User Manual*. ♦

Section II

Migration to a Later Version of a Database Server

Chapter

3

Migrating to Dynamic Server 9.40 or 9.30 from 9.x, 7.3x, or 7.24

In This Chapter

This chapter describes migrating to Dynamic Server 9.40 and Dynamic Server 9.30, including conversion (upgrading) and reversion. You can convert to Dynamic Server 9.40 from the following database servers:

UNIX

UNIX

- Dynamic Server 9.30
- Dynamic Server 9.21
- Dynamic Server 9.20 ♦
- Dynamic Server 7.31
- Dynamic Server 7.30
- Dynamic Server 7.24 (without Enterprise Replication) ♦

If necessary, you can revert to the database server that you converted from.

The instructions for Dynamic Server 7.3x in this chapter also apply to Dynamic Server, Linux Edition 7.3x and Workgroup Edition 7.3x. The instructions for Dynamic Server 7.24 in this chapter also apply to Workgroup Edition 7.24.

Important: *To convert from another database server, including Universal Server 9.14, you need to convert to an intermediate database server first. For information on which intermediate database servers to use, see* *"Database Server Migration Paths" on page 1-13*.

Preparing for Migration

To prepare for migration to Dynamic Server 9.40 from a 9.30, 9.2x, 7.3x, or 7.24 database server, read this section to understand the guidelines for migrating between database servers. This section also discusses any new features that might affect migration.

Migration Guidelines

Observe the following guidelines when you migrate to Dynamic Server 9.40:

- Check the release notes for information about the correct operating-system release and any patches that you need for successful installation and operation of the database server.

  The release notes are in one of the following directories:

  Windows

  - The **Informix** folder on Windows

    To display the release notes, you can choose **Start→Programs→Informix Dynamic Server 9.40→Release Notes** from the task bar. ♦

  UNIX/Linux

  - **$INFORMIXDIR/release/en_us/0333** on UNIX or Linux ♦
- On UNIX or Linux, retain both versions of the IBM Informix product software on disk, if you have enough disk resources. You cannot retain both versions of the IBM Informix product software on disk on Windows.
- Retain the installation media from both versions of the IBM Informix product software.
- Before you convert to the target database server from the source database server, make sure that no open transactions exist in the source database server.

  Fast recovery will fail when rolling back open transactions during the conversion. For information about how to close the source database server properly prior to conversion, see "Close All Transactions and Shut Down the Source Database Server" on page 3-52.

- Before migration, perform a level-0 backup of all storage spaces with the source database server. After you complete the migration, perform another level-0 backup with Dynamic Server 9.40.

  You need to make a backup with each database server because you can restore a backup only with the same version of the database server on which you did the backup.
- It is recommended that you use a test instance of your database server to test the new version of the database server.
- Verify storage-manager validation for the target database server.

  For details, see "Storage-Manager Validation and Installation" on page 3-41.

For additional installation information and guidelines, refer to your *Installation Guide* and your *Getting Started Guide*.

Changes in Dynamic Server 9.40, 9.30, and 9.2x

This section describes changes in Dynamic Server 9.40, 9.30, 9.20, and 9.21:

- New and changed environment variables
- New and changed configuration parameters
- New SQL reserved words
- System catalog and **sysmaster** changes
- Feature changes
- New features

Environment Variables

Dynamic Server 9.40, 9.30, 9.21, and 9.20 introduced new environment variables that might affect your installation. You might also need to adjust the values of existing environment variables. For more information on environment variables, see the *IBM Informix Guide to SQL: Reference* and your *Administrator's Guide*.

Figure 3-1 lists the new environment variables in Dynamic Server 9.40, 9.30, 9.21, and 9.20.

Figure 3-1
New Environment Variables

Version	Environment Variable	Description
9.40	CDR_LOGDELTA	Determines when spooling of the Enterprise Replication queue occurs, based on the percentage of the logical log size. Use as directed by Technical Support.
	CDR_PERFLOG	Enables Enterprise Replication queue tracing. Use as directed by Technical Support.
	CDR_ROUTER	Determines whether intermediate processing for Enterprise Replication is allowed in a hierachical topology. Use as directed by Technical Support.
	CDR_RMSCALEFACT	Sets the maximum number of Enterprise Replication DataSync threads per CPU VP. Use as directed by Technical Support.
	USETABLENAME	Disallows the use of a synonym of the table in certain SQL statements.
9.30	IFX_DEF_TABLE_LOCKMODE	Specifies the default lock mode for database tables.
9.21	AFDEBUG	Forces the database system to hang when a failure occurs.
	JAR_TEMP_PATH	Specifies a non-default local file system location for temporary **.jar** files of the Java virtual machine.
	JAVA_COMPILER	Disables JIT compilation.
	JVM_MAX_HEAP_SIZE	Sets a non-default upper limit on the size of the heap for the Java virtual machine.

(1 of 2)

Version	Environment Variable	Description
9.20	IFX_LONGID	Determines whether a given client application is capable of handling long identifiers.
	IFX_UPDDESC	Allows the execution of a DESCRIBE of an UPDATE statement.
	STMT_CACHE	Controls the use of the shared statement cache on a session.

(2 of 2)

In Dynamic Server 9.30, the environment variable **DELIMIDENT** must be set before a client starts to manipulate a table with an SQL DELETE statement that omits the FROM keyword.

Configuration Parameters

Dynamic Server 9.40, 9.30, 9.21, and 9.20 introduced new configuration parameters that might affect your installation. You might also need to adjust the values of existing parameters. For more information on configuration parameters, see the *Administrator's Reference* and your *Administrator's Guide*.

Figure 3-2 lists the new configuration parameters in Dynamic Server 9.40, 9.30, 9.21, and 9.20. All parameters are located in the ONCONFIG file, unless otherwise noted.

Figure 3-2
New Configuration Parameters

Version	New Configuration Parameter	Description
9.40	ASF_SOCTCP_BACKLOG	Specifies the number of connections queuing when using Sockets (SOCTCP).
	CDR_DBSPACE	Defines the default dbspace for the Enterprise Replication **syscdr** database.
	CDR_ENV	Sets Enterprise Replication environment variables CDR_LOGDELTA, CDR_PERFLOG, CDR_ROUTER, and CDR_RMSCALEFACT.
	CDR_MAX_DYNAMIC_LOGS	Specifies the number of dynamic log file requests that Enterprise Replication can make in one server session.
	ENCRYPT_CDR	Enables and sets the level of network encryption for Enterprise Replication.
	ENCRYPT_CIPHER	Specifies the ciphers to use for encryption for Enterprise Replication.
	ENCRYPT_MAC	Specifies the level of message authentication coding to use for Enterprise Replication.
	ENCRYPT_MACFILE	Specifies MAC key files for Enterprise Replication.
	ENCRYPT_SWITCH	Defines the frequency at which ciphers and secret keys are re-negotiated for Enterprise Replication.
	HPL_DYNAMIC_LIB_PATH	For the High-Performance Loader, sets the location of the shared-library file containing custom-code functions. Located in the **plconfig** file.
	HPLAPIVERSION	For the High-Performance Loader, sets whether custom-code functions can use different input and output data lengths. Located in the **plconfig** file.

(1 of 4)

Version	New Configuration Parameter	Description
	PLOG_OVERFLOW_PATH	Sets the location of the temporary space to extend the physical log during fast recovery.
9.30	CDR_QHDR_DBSPACE	Specifies the dbspace Enterprise Replication uses to store the transaction record headers spooled from the send and receive queues.
	CDR_QDATA_SBSPACE	Specifies the sbspace Enterprise Replication uses to store spooled transaction row data.
	DEF_TABLE_LOCKMODE	Sets the lock mode to row for every newly created table.
	DYNAMIC_LOGS	Controls dynamic log allocation. This parameter is not in the default ONCONFIG file.
	SBSPACETEMP	Specifies the name of the default temporary sbspace for storing temporary smart large objects.

(2 of 4)

Version	New Configuration Parameter	Description
9.21	DS_HASHSIZE	Specifies the number of hash buckets in the data-distribution cache for statistics generated by the UPDATE STATISTICS statement.
	DS_POOLSIZE	Specifies the maximum number of entries in each hash bucket for statistics generated by the UPDATE STATISTICS statement.
	STMT_CACHE_HITS	Specifies the number of references to a statement before it is fully inserted in the SQL statement cache.
	STMT_CACHE_NOLIMIT	Controls whether to insert qualified statements into the SQL statement cache after its size is greater than the STMT_CACHE_SIZE value.
	STMT_CACHE_NUMPOOL	Specifies the number of memory pools for the SQL statement cache.

(3 of 4)

Version	New Configuration Parameter	Description
9.20	ALLOW_NEWLINE	Controls whether the database server allows the newline character (**\n**) in a quoted string.
	DD_HASHMAX	Specifies the maximum number of tables in each hash bucket in the data-dictionary cache.
	DD_HASHSIZE	Specifies the number of hash buckets or lists in the datadictionary cache.
	OPT_GOAL	Specifies optimization goals.
	PC_HASHSIZE	Specifies the number of hash buckets in the caches that the database server uses.
	PC_POOLSIZE	Specifies the maximum number of entries in several memory caches that the database server uses.
	STMT_CACHE	Determines whether the database server uses the SQL statement cache.
	STMT_CACHE_SIZE	Specifies the size of the SQL statement cache.
	SYSSBSPACENAME	Specifies the name of the sbspace for statistics collected by the UPDATE STATISTICS statement for certain user-defined data types.

(4 of 4)

Figure 3-3 lists the configuration parameters that were altered or removed in Dynamic Server 9.40 and 9.30. No changes were made to configuration parameters in Dynamic Server 9.21 and 9.20.

Figure 3-3
Altered Configuration Parameters

Version	Altered Configuration Parameter	Description of Change
9.40	ALARMPROGRAM	Can be set to the **alarmprogram.sh** file to enable event alarms.
	CDR_QDATA_SBSPACE	Can accept up to 32 sbspaces.
	CDR_QDATA_SBFLAGS	Removed. Enterprise Replication always uses the default log mode of the sbspace for spooling row data.
	DBSERVERALIASES	Can accept up to 32 server alias values.
	LTAPEBLK	The default value is 32 KB.
	LTAPESIZE	Can accept a value of 0 to read or write to the end of the tape device.
	LRU_MAX_DIRTY	Can accept a value of type INTEGER or FLOAT.
	LRU_MIN_DIRTY	Can accept a value of type INTEGER or FLOAT.
	OPTICAL_LIB_PATH	Is valid for both UNIX and Windows. Must be set to the location of the storage manager library.
	TAPEBLK	The default value is 32 KB.
	TAPESIZE	Can accept a value of 0 to read or write to the end of the tape device.

(1 of 3)

Version	Altered Configuration Parameter	Description of Change
9.30	AFF_NPROCS	Removed; superseded by the VPCLASS configuration parameter.
	AFF_SPROC	Removed; superseded by the VPCLASS configuration parameter.
	CDR_LOGBUFFERS	Removed.
	CDR_LOGDELTA	Removed.
	CDR_NIFRETRY	Removed.
	CDR_NUMCONNECT	Removed.
	DRAUTO	Removed; you must now perform the transition from HDR secondary to standard mode manually.
	JDKVERSION	New default value of 1.3.
	JVPJAVAHOME	New default value of **/usr/informix/extend/krakatoa**.

(2 of 3)

Version	Altered Configuration Parameter	Description of Change
9.30	JVPJAVALIB	New default value that is platform dependent.
	JVPJAVAVM	New default value that is platform dependent.
	LBU_PRESERVE	Removed; configured an obsolete utility.
	LOGSMAX	Removed.
	LTXHWM	Removed from the default ONCONFIG file, but is still valid.
	LTXEHWM	Removed from the default ONCONFIG file, but is still valid.
	NOAGE	Removed; superseded by the VPCLASS configuration parameter.
	NUMAIOVPS	Removed; superseded by the VPCLASS configuration parameter.
	NUMCPUVPS	Removed; superseded by the VPCLASS configuration parameter.

(3 of 3)

SQL Reserved Words

Dynamic Server 9.40, 9.30, 9.21, and 9.20 support new SQL keywords that are reserved words and might affect migration of your applications. Although you can use almost any word as an SQL identifier, syntactic ambiguities might occur if you use an SQL reserved word. An ambiguous statement might not produce the results you want.

Figure 3-4 lists the new SQL reserved words. For more information about SQL reserved words, see the *IBM Informix Guide to SQL: Syntax*.

Figure 3-4
New SQL Reserved Words

Version	SQL Reserved Words	
9.40	COLLATION CROSS FULL	INSTEAD RESTART RIGHT
9.30	AVOID_EXECUTE AVOID_SUBQF	USE_SUBQF
9.21	RAW	STANDARD
9.20	AGGREGATE CACHE COSTFUNC ITEM	NAME REF SELCONST
9.20 and 7.31	INNER JOIN LEFT	LOCKS RETAIN
9.20 and 7.30	ALL_ROWS CASE CRCOLS DECODE FIRST_ROWS MEMORY_RESIDENT	NON_RESIDENT NVL REPLICATION SUBSTR SUBSTRING

System Catalog and sysmaster Changes

The system catalog tables and **sysmaster** database are different from those for database servers earlier than Dynamic Server 9.20, which includes changes to some column widths, data types, and treatment of null values. Also, some tables have additional columns, and some tables were added or deleted.

Remote Queries on System Catalog Tables Between 7.x and 9.x

Certain system catalog tables use data types in Dynamic Server 9.x that are not supported in Dynamic Server 7.x. Remote queries that issue a SELECT * statement on these system catalog tables from Dynamic Server 7.x to Dynamic Server 9.x will fail.

For example, the following queries that originate on a Dynamic Server 7.x fail against Dynamic Server 9.x:

```
SELECT * FROM dbname@remoteserver:sysindices;
SELECT * FROM dbname@remoteserver:sysindexes;
```

Instead of using an asterisk as the Projection clause, specify the required column names explicitly. You cannot specify any columns that have user-defined types.

Difference in sysindexes

In Version 7.x, **sysindexes** is a table. In Dynamic Server 9.40, 9.30, and 9.2x, **sysindexes** is a view. The ALTER TABLE statement fails for **sysindexes** because this statement is not valid for altering a view.

Column-Width Changes

Version 9.20 and later versions of Dynamic Server provide long identifiers. All identifiers in the system catalog tables and the **sysmaster** database reflect these new limits on identifier length. The *IBM Informix Guide to SQL: Syntax* defines *identifiers*, which specify the names of database objects.

The column widths for identifiers that refer to database objects and other identifiers changed from CHAR(18) to VARCHAR(128,0) in the following system catalog tables:

sysaggregates
sysams
sysattrtypes
sysblobs
syscasts
syscolattribs
syscolumns
sysconstraints
sysdomains
sysfragauth
sysfragments
sysindexes
sysindices
sysobjstate
sysopclasses
sysopclstr
sysprocedures
sysroutinelangs
syssynonyms
syssyntable
systabamdata
systables
systracemsgs
systriggers
sysxtdtypes

Identifiers changed from CHAR(18) to CHAR(128) in the following **sysmaster** database tables:

arc_dbspace	**syscrtadt**	**syslocks**
arc_dbspace_set	**sysdatabases**	**sysopendb**
arc_phys_dev	**sysdbslocale**	**sysprc**
arc_rep_table	**sysdbspaces**	**sysproccache**
arc_replicate	**sysdbspartn**	**sysptprof**
arc_server	**sysdbstab**	**syssdblock**
arc_version	**sysdic**	**syssqlcurall**
arc_vset	**sysdiccache**	**syssqlcurses**
arc_vset_view	**sysdistcache**	**syssqlstat**
flags_text	**sysdsc**	**systabnames**
syscfgtab	**sysextents**	**systrans**
sysconfig	**sysextspaces**	**systxptab**

Column widths for user login identifiers changed from CHAR(8) to CHAR(32) in some system catalog tables and **sysmaster** database tables. The following system catalog tables changed:

sysaggregates	**sysindices**	**syssynonyms**
sysams	**syslangauth**	**syssyntable**
syscasts	**sysobjstate**	**systabauth**
syscolauth	**sysopclasses**	**systables**
sysconstraints	**sysopclstr**	**systriggers**
sysdomains	**sysprocauth**	**sysusers**
sysfragauth	**sysprocedures**	**sysxtdtypeauth**
sysindexes	**sysroleauth**	**sysxtdtypes**

The following **sysmaster** database tables changed:

sysaudit	**sysdiccache**	**sysrstcb**
sysdatabases	**sysdistcache**	**sysscblst**
sysdbspaces	**sysdsc**	**syssessions**
sysdbspartn	**sysextspaces**	**systabnames**
sysdbstab	**sysprc**	**sysuserthreads**
sysdic	**sysproccache**	

Columns that include pathnames or other values changed from CHAR(128) to CHAR(256) in the following **sysmaster** database tables:

sysadtinfo	**syscrtadt**	**sysmchktab**
syschktab	**sysdrcb**	
syschunks	**sysdri**	

The path for a physical device changed from CHAR(128) to CHAR(260) in the following **sysmaster** database table:

arc_phys_dev

Columns widths changed from CHAR(20) to CHAR(128) for longer object names in the following **sysmaster** database tables:

sysdrcb	**sysdri**

Column widths changed from CHAR(37) to CHAR(257) in the following **sysmaster** database tables:

sysdistcache	**sysprc**
sysdsc	**sysproccache**

Column widths changed from DECIMAL(16,0) to DECIMAL(32,0) in the following **sysmaster** database table:

syssesprof

The **tabauth** column of the **systabauth** system catalog table is now CHAR(9) instead of CHAR(8). The 9th character indicates the Under privilege.

Data Type Changes

The preceding section on column-width changes lists columns that have changed from the CHAR data type to the VARCHAR data type.

One or more columns changed from the SMALLINT data type to the INTEGER data type in the following **sysmaster** database tables:

sysdbspaces	**sysdic**	**syssdblock**
sysdbstab	**sysrstcb**	

The CHAR data type changed to the STAT data type in the following system catalog table:

sysdistrib

Changes in Treatment of Null Values

No nulls allowed changed to nulls allowed for some columns in the following **sysmaster** database tables:

arc_ae_view	**arc_pendreq_view**	**arc_volume_view**
arc_db_file_view	**arc_req_vset_view**	**arc_vset_user_view**
arc_directory_view	**arc_request_view**	**arc_vset_view**
arc_file_copy_view	**arc_save_set_view**	
arc_file_view	**arc_vol_lock_view**	

Columns Added

One or more columns have been added to the following system catalog tables:

sysams	**sysprocedures**
sysdistrib	**sysroutinelangs**

Several columns have been added to the following **sysmaster** database table:

sysdbstab

Tables Added or Deleted

The following tables have been added to the **sysmaster** database:

logmessage	**syscdrctrl_txn**	**syscdrrecv_txn**
syscdrack_buf	**syscdrprog**	**syscdrtx**
syscdrack_txn	**syscdrq**	
syscdrctrl_buf	**syscdrrecv_buf**	

The following table has been deleted from the **sysmaster** database:

arc_change_log

Changes for Dynamic Server 9.30

The following tables have been deleted from the **sysmaster** database as of Version 9.30:

arc_ae_view	**arc_pendreq_view**	**arc_server**
arc_db_file_view	**arc_phys_dev**	**arc_version**
arc_dbspace	**arc_rep_table**	**arc_vol_lock_view**
arc_dbspace_set	**arc_replicate**	**arc_volume_view**
arc_directory_view	**arc_req_vset_view**	**arc_vset**
arc_file_view	**arc_request_view**	**arc_vset_user_view**
arc_file_copy_view	**arc_save_set_view**	**arc_vset_view**

Changes for Dynamic Server 9.40

The following new system catalog table was added:

syssequences

A new **collation** column has been added to the following system catalog tables:

sysconstraints	**sysprocplan**	**systrigbody**
sysindices		

Feature Changes

The following feature changes are in Dynamic Server 9.40, 9.30, and 9.2x:

- Detached indexes
- Changes in ON-Bar commands
- Chunk format
- Libraries no longer installed in the /usr/lib directory
- VARCHAR column limit
- Stored procedure parameter limit
- Limitation on using routines in distributed transactions
- Case-sensitive name space
- New administration tools
- Management of the SQLHOSTS connectivity information on Windows

Detached Indexes

By default, all new indexes that the CREATE INDEX statement creates in Dynamic Server 9.40, 9.30, or 9.2x are detached and stored in separate tablespaces from the data. However, indexes created in Version 7.x remain attached until you rebuild them.

You cannot revert detached indexes to Version 7.x. To enable reversion to Version 7.x, retain the Version 7.x attached index behavior by setting the environment variable **DEFAULT_ATTACH** in the application environment. You can attach only B-tree indexes that are nonfragmented and that are on nonfragmented tables (the Version 7.x behavior). All other indexes, including extensibility related indexes such as R-trees and UDT indexes, must be detached.

Changes in ON-Bar Commands

Between Dynamic Server 7.x and Dynamic Server 9.x, the syntax of the following ON-Bar commands changed:

- Backup verification syntax:

  Dynamic Server 7.x: **onbar -r -v**

  Dynamic Server 9.x: **onbar -v**

- Logical log backup syntax:

  Dynamic Server 7.x: **onbar -l**

  Dynamic Server 9.x: **onbar -b - l**

Chunk Format

Dynamic Server 9.40 introduces for the following chunk features that cannot be reverted:

- Chunks greater than 2 GB in size
- Chunk offsets greater than 2 GB in size
- Greater than 2047 chunks

To facilitate backward compatibility, these features are not enabled by default. To enable these features, use the **onmode -BC** command.

The **onmode -BC** command has the following options that allow you to stage your migration to these features:

- **onmode -BC 1**

  Allows chunks and offsets of greater than 2 GB to be created, but dbspaces and blobspaces that do not contain large chunks remain in the Version 9.3 format. After a chunk larger than 2 GB is added to a dbspace or blobspace, then all chunks added or altered in that dbspace or blobspace are in the new format. To revert, drop any dbspaces or blobspaces using the new chunk features.

- **onmode -BC 2**

  Enables the Version 9.4 chunk features for all dbspaces and blobspaces. Any chunk or offset added or modified has the new format. All page writes are in the new format, including those to chunks created prior to Version 9.4. Reversion is no longer possible.

Libraries No Longer Installed in the /usr/lib Directory

Dynamic Server 9.40 no longer installs the following libraries in the /usr/lib directory on UNIX:

- Optical storage manager library

  If you use an optical storage manager, set the OPTICAL_LIB_PATH configuration parameter in the ONCONFIG file to the location of the optical storage manager library. For more information, see the *IBM Informix Optical Subsystem Guide*.

- High-Performance Loader custom-code shared library

  If you use custom-code files with the High-Performance Loader, set the HPL_DYNAMIC_LIB_PATH configuration parameter in the **plconfig** file to the location of the shared library. For Dynamic Server 9.40, the default location of this library is **$INFORMIXDIR/lib/ipldd09a.so**. For more information, see the *IBM Informix High-Performance Loader User's Guide*.

VARCHAR Column Limit

If you are migrating from Dynamic Server 7.3x, the number of VARCHAR columns per table for Dynamic Server 9.40, 9.30, or 9.2x has been reduced from 231 to 195, within a row size of 32,762 bytes and based on a page size of 2 K. Before you upgrade to Dynamic Server 9.40, ensure that your tables obey this restriction.

Stored Procedure Parameter Limit

Dynamic Server 9.40, 9.30, or 9.2x have a limit of 341 parameters for each stored procedure.

Limitation on Using Routines in Distributed Transactions

User-defined routines and built-in routines, such as **round()**, cannot be used in distributed transactions involving Dynamic Server 9.2x or 9.30. For Dynamic Server 9.40, routines in distributed transactions are only supported among Version 9.40 database servers.

Case-Sensitive Name Space

If you have case-insensitive schemas, you might need to revise them because Dynamic Server 9.40, 9.30, or 9.2x have a case-sensitive name space. This can affect the resolution of blobspaces and SPL names.

New Administration Tools

Dynamic Server 9.40, 9.30, and 9.21 do not support IECC. The IECC functionality for these database servers comes from the following sources:

- Server Studio JE
- IBM Informix Server Administrator (ISA)

Server Studio JE

Included in the IBM Informix Dynamic Server bundle is a CD containing Server Studio JE (Java Edition). Server Studio JE is the result of an extensive collaboration between IBM and Advanced Global Systems LTD (AGS).

Before using any Server Studio features, you must first register with AGS. When you use Server Studio to build the first connection to a database server, you will find information on how to register. Once registered, you will receive an email with a certificate to install. You must install this certificate to access Server Studio features.

Once you have registered, you can use the following features for an unlimited period of time:

- Object Explorer
- Schema Editor
- SQL Editor

In addition, during the first 30 days of use, several other modules are enabled on a trial basis. After the 30-day-trial period, the unlicensed add-on modules will not work and will generate expiration messages. To continue using the add-on modules after 30 days, you must obtain a license for those modules directly from Advanced Global Systems LTD (AGS).

Some of the add-on modules that are available inside Server Studio JE are:

- Enhanced SQL Editor
- Database Difference Analyzer
- Dependency Analyzer
- Permission Manager
- XPS 8.3 connectivity
- OnLine 5 connectivity

For a complete list of the currently available add-on modules visit the AGS website at www.agsltd.com.

IBM Informix Server Administrator

IBM Informix Server Administrator (ISA) is a browser-based tool that provides Web-based system administration for all Informix 9.40, 9.30, 9.2x, 8.40, 8.3x, 8.21, 7.3x, and 7.24 database servers. ISA provides access to database server command-line functions and presents the output in an easy-to-read format.

With ISA, you can use a browser to perform these common database-server administration tasks:

- Check dbspaces, database catalogs, logs, and other objects.
- Change configuration parameters temporarily or permanently.
- Manage logical and physical logs.
- Examine memory use and add free memory segments.
- Read the message log.
- Change the database server mode between online and offline and intermediate states.
- Back up and restore dbspaces and logical logs.
- Run **onstat** commands to monitor performance.
- Enter SQL statements and examine database schemas.
- Examine and manage user sessions.
- Examine and manage Virtual Processors (VPs).
- Add and remove storage spaces, including spaces that are unique to Dynamic Server database servers.

The database server CD-ROM distributed with your product includes ISA. For information on how to install ISA, see the following file on the CD-ROM.

Operating System	File
UNIX or Linux	**/SVR_ADM/README**
Windows	**\SVR_ADM\readme.txt**

Management of the SQLHOSTS Connectivity Information on Windows

On Windows, IBM Informix products store the SQLHOSTS information in registry keys. Windows provides the **regedt32** utility, which enables you to manage registry keys, but it is recommended that you do not use **regedt32**.

If you have used **Setnet32** to manage SQLHOSTS information, you can continue to do so; however, **Setnet32** does not enable you to assign a database server to a database server group.

If you have used the Network Properties dialog box that is part of IECC, you can now use IBM Informix Server Administrator (ISA).

For Enterprise Replication, use ISA.

New Features

This section list new features in Dynamic Server 9.40, 9.30, 9.21, and 9.20. Read your release notes and documentation notes for late-breaking information on new features.

New Features in Dynamic Server 9.40

Dynamic Server 9.40 introduces the following new features:

- Security enhancements
  - Encryption for networked transactions
  - Authentication
- Database server usability enhancements
  - Chunks up to 4 TB in size
  - Chunk offsets up to 4 TB in size
  - New chunk limit of 32,766
  - Greater than 2 GB file size
  - The default size of the TAPEBLK and LTAPEBLK configuration parameters is 32 KB
  - Chunks can be added when the root chunk is full by storing metadata in extended chunk reserve pages allocated from non-root chunks in the root dbspace
  - Buffer cleaning can be tuned by setting the LRU configuration parameters to a value of type FLOAT
  - Event alarms can be set with a modifiable shell script, **alarmprogram.sh**
  - Ability to specify up to 32 database server aliases with the DBSERVERALIASES configuration parameter

- During fast recovery, the physical log space is extended if the physical log overflows
- Microsoft Transaction Server/XA support

- Performance enhancements
  - PDQ is enabled for hold cursors
  - B-tree cleaner improves transaction processing for logged databases when rows are deleted from a table with indexes
  - Improved priority management for the buffer manager
- Reliability, availability, and supportability features
  - Ability to monitor queries dynamically using the **onmode -Y** command
  - Print the session control block address with the **onstat -g ses** command
  - Display the setting and values of environment variables with the **onstat -g env** command
  - Ability to specify the number of pages to print, whether to print just the page headers, and to print pages from chunks that are online with the **oncheck** utility
  - Display the types and values of host variables in SQL statements, show the stored procedure stack, and show the current SQL statement in a stored procedure using the **onstat -g sql** command
- SQL enhancements
  - Ability to specify an expression or a column in the ORDER BY clause of a SELECT statement that is not listed in the projection of the SELECT statement
  - Change the collation used by the session for comparisons and sorts on NCHAR and NVARCHAR objects
  - Functional indexes can be created on 102 parameters for C UDRs, or 341 parameters for SPL and Java UDRs
  - The LVARCHAR(*m*) data type can be set to sizes larger than 2 KB
  - INSTEAD OF triggers on views
  - Sequence objects
  - Additional in-place alters on clauses of the ALTER TABLE statement

- DESCRIBE INPUT and DESCRIBE OUTPUT statements to return information about multiple input and output parameters
- The SET EXPLAIN statement AVOID EXECUTE option displays the query plan without executing the query
- ANSI join syntax support for cross, right outer, and full outer joins
- Unions allowed in subqueries of SELECT statements
- USETABLENAME environment variable to invalidate synonyms in ALTER TABLE and DROP TABLE statements

- GLS enhancements
  - Session-level non-default collation
  - Unicode and Unicode collation support
  - Support for the Chinese locale 18030-2000
- Enterprise Replication enhancements
  - Encrypted transactions implemented with configuration parameters
  - Support for replicating row data types and collection data types
  - Faster queue recovery
  - Replication during queue recovery
  - Support for large transactions up to 4 TB in size
  - Improved availability by combining High-Availability Data Replication (HDR) and Enterprise Replication
  - Dynamic log file
  - A **brief** option for the **cdr list replicate** command to display a summary of participants for all replicates
  - The **cdr remove** command to remove Enterprise Replication from an HDR server
  - The CDR_QDATA_SBSPACE configuration parameter now accepts up to 32 sbspace names. Enterprise Replication uses all sbspaces in round-robin order.
  - The CDR_DBSPACE configuration parameter to specify the dbspace of the **syscdr** table

- The CDR_ENV configuration parameter to set Enterprise Replication environment variables
- The CDR_LOGDELTA environment variable to determine when the send and receive queues are spooled to disk
- The CDR_PERFLOG environment variable to enable queue tracing
- The CDR_ROUTER environment variable to disables intermediate acknowledgements of transactions in hierarchical topologies
- The CDR_RMSCALEFACT environment variable to set the number of DataSync threads started for each CPU VP

- Extensibility enhancements
  - Ability to create user-defined selectivity functions calculate the cost of using an R-tree index to allow the optimizer to make accurate decisions about which index to use
  - HDR support for extended data types and UDRs
  - Using an iterator function in the FROM clause of a SELECT statement and returning the result set using a virtual-table interface
  - Naming the return parameters of a UDR
  - Using multiple OUT parameters and statement local variables
- DataBlade API enhancements
  - Ability to return the value of the current database server locale with the **mi_get_db_locale( )** function
  - Ability to return the ID of the current transaction with the **mi_get_transaction_id( )** function
  - Ability to change the size of an existing memory block with the **mi_realloc( )** function
  - Ability to determine whether the current user stack has the specified amount of free space with the **mi_stack_limit( )** function
  - Ability to execute operating system commands in a separate thread with the **mi_system( )** function
  - Stream support for files larger than 2 GB

- High-Performance Loader enhancements
  - Use the full capacity of a storage device
  - Ability to set the location of the custom-code shared library file with the HPL_DYNAMIC_LIB_PATH configuration parameter
  - Ability to use a different length for data in the input and output arguments of custom-code functions by setting the HPLAPIVERSION configuration parameter
- Backup and restore enhancements
  - Renaming chunks to a different path and offset during a cold restore
  - Using the full capacity of a storage device with **ontape**
- Installation enhancements
  - Components previously installed in **/usr/lib** are now installed in **$INFORMIXDIR/lib**.
  - On UNIX, the installation program prompts the user to avoid overwriting existing client or GLS files that are more recent than those included with the database server.

New Features in Dynamic Server 9.30

Dynamic Server 9.30 has the following new features:

- The ability to display the maximum number of connections
- DataBlade API enhancements
  - New PER_STMT_EXEC and PER_STMT_PREP memory durations
  - The ability to use **mi_lo** routines without a connection
  - New **mi_collection_card( )** function to return the cardinality for a collection (number of items in the collection)
  - Access to files on a client computer one buffer at a time
  - New **mi_transaction_state( )** function to return the current transaction state (none, implicit, or explicit)

- Enterprise Replication enhancements
  - Improvements to parallel processing
  - External Enterprise Replication conversion
  - SERIAL column primary keys
  - Replicate sets

    Pre-Version 9.30 replicate groups are not supported in Version 9.30. Before you migrate to Version 9.30, you must remove any replicate groups. For instructions, see "Migrating to Dynamic Server 9.40 with Enterprise Replication" on page 3-42.
  - Replicating only changed columns
  - Spooling changes
  - In-place processing of ALTER statements to add or drop shadow columns
  - Command-line changes to support new features
- Extensibility enhancements
  - New **deepcopy( )** function for multirepresentational data types
  - Nearest neighbor queries in R-trees
  - Temporary sbspaces
  - Temporary smart large objects
  - Improved partitioning of user data and metadata in sbspaces
- Java Virtual Machine (JVM) 1.3 support
- Performance enhancements
  - The **onstat -g stm** option
  - The ability to display the query plan without executing the query
  - Optimizer directives for subqueries
  - Dynamic addition of logical logs
  - Performance improvement for smart large objects
- SQL enhancements
  - Configurable default lock modes
  - REVOKE...AS USER statement
  - DELETE statement that does not require the FROM keyword

New Features in Dynamic Server 9.21

Dynamic Server 9.21 introduced the following new features:

- Database server features
  - The **onpladm** utility for High-Performance Loader (HPL) jobs
  - SQL statement cache to store SQL statements for re-execution
  - Access to synonyms on remote 7.x database servers through DB-Access
- Extensibility features
  - C++ support for writing user-defined routines (UDRs) with fewer restrictions
  - DataBlade API functions for controlling the virtual processor environment
  - The **mi_fp_funcname( )** function to get the SQL name of a function
- Java features
  - JVM 1.2 support
  - Changes in default values of Java configuration parameters
  - GLS support for J/Foundation
  - The **update_jars.sql** script
  - Run-time environment variables
  - JVP virtual-processor classes dropped dynamically
  - Support for variable-length opaque types and opaque-type send/receive, import/export, and importbin/exportbin functions
- Support for MaxConnect and new network protocols: **ontliimc** and **onsocimc**

New Features in Dynamic Server 9.20

Dynamic Server 9.20 introduced the following new features:

- Extensibility enhancements
  - Dynamic lock allocation
  - SQL enhancements

    Embedded newline characters in quoted strings

    Nested dot expressions for row types

    Triggers on SELECT statements
  - Enhancements to smart large objects

    Round-robin fragmentation for smart large objects

    ALTER TABLE for smart large objects

    Data type conversion: BYTE to BLOB and TEXT to CLOB

    Change of sbspace characteristics (**onspaces -ch**)

    Immediate deletion of smart large objects
  - Enhancements to collections

    Collection constructors that use arbitrary expression elements

    Collection-derived tables

    Collection subqueries
  - Enhancements to row types

    Serial types in row types

    GRANT/REVOKE UNDER on row types
  - Enhancements to UDRs

    Ability to write UDRs in the Java language

    GRANT/REVOKE on UDR external languages

    ALTER FUNCTION/PROCEDURE/ROUTINE statements

    User-defined aggregates

- Extensions to the DataBlade API

  Ability to obtain database server environment values with the **mi_get_serverenv( )** function

  Ability to obtain database connection information with the **mi_get_connection_option( )** function

  Ability to obtain a function descriptor from a routine identifier with the **mi_funcdesc_by_typeid( )** function

  Ability to obtain a DATETIME or INTERVAL qualifier from a type descriptor with the **mi_type_qualifier( )** function

  Ability to access a collection subquery with the **mi_collection_open_with_options( )** function

  Ability to delete a smart large object immediately with the **mi_lo_delete_immediate( )** function

  Removal of restrictions on callback extensions

- Extensions to the ON-Bar suite

  onsmsync tool for object expiration and synchronization

  onbar tools: override (with -O option), progress feedback, restartable restore, and external backup and restore

- The **oncheck** and **onlog** utilities for R-tree indexes

- Enhancements to R-tree indexes

  A support interface for bulk loading of R-tree indexes

  A new SQL UDR that lets users access the bounding box of the root page of an R-tree index

- Performance improvements
  - Fuzzy checkpoints
  - Parallel statement-local variables (SLVs)
  - SQL statement cache
  - Compiled expressions
  - Improvements for smart large objects

    Incremental backup support

    Lightweight I/O

    Metadata compaction

    Byte-range locking

    Dirty read
  - Improvements for UDRs

    Expensive-function optimization

    Parallel UDRs

    Support for parallel UDR execution in HPL

    User-defined statistics routines
  - Parallel scan for Virtual-Table Interface (VTI) and Virtual-Index Interface (VII)
  - Set read and write for VTI and VII
- Enterprise Replication enhancements
  - Improvements in management of storage queues
  - Faster processing for large transactions
  - Better management to avoid long transactions
  - Improvements in the log reader
  - Updates to the command-line interface
  - Hierarchical routing; direct connections no longer required
  - Support for database servers with intermittent connections
  - Reduced global catalog available
  - New CONNECT and DISCONNECT functions in the Enterprise Replication Manager

- Special features
  - Long identifiers: 128-byte identifiers and 32-byte user names
  - Ability to retain update locks

Version 9.20 Features from Universal Server 9.14

Dynamic Server 9.20 includes the following features that were first released in Universal Server 9.1x:

- Lightweight I/O
- Dynamic addition of locks
- Nonroot execution of virtual processors (VPs)
- EXECUTE FUNCTION in FOREACH EXECUTE statement
- Re-entrant triggers
- Limit of SET SESSION AUTHORIZATION scope to the current database
- **INFORMIXCONTIME** environment variable, which needs to be set to a large number to make the DCE CSM work (not necessary for non-CSM environments)
- TP/XA support added
- ON-Bar support for GLS
- **oncheck** enhancement to display access-method data
- **onstat** enhancement to display the access-method cache
- New interface routines added to the Virtual Table Interface and Virtual Index Interface:
  - **mi_string *mi_qual_funcname(MI_AM_QUAL_DESC *qd)**
  - **mi_integer mi_scan_nprojs(MI_AM_SCAN_DESC *sd)**
  - **mi_smallint *mi_scan_projs(MI_AM_SCAN_DESC *sd)**
  - **MI_UPDATE_STAT_MODE mi_tab_update_stat_mode(MI_AM_TABLE_DESC *td)**
- DataBlade API functions **mi_current_command_name( ), mi_file_errno( ), and mi_get_id( )**
- The **superstores_demo** database
- The **ifxrltree.1.00** DataBlade module

Version 9.20 Features from Dynamic Server 7.30

Dynamic Server 9.20 also has features first released in Dynamic Server 7.30:

- ALTER FRAGMENT ATTACH/DETACH enhancements
- In-place ALTER TABLE MODIFY/DROP (for built-in data types)
- External backup and restore and restartable restore
- Performance enhancements, including new optimizer directives, select first *n* rows, SET OPTIMIZATION statement enhancements, memory-resident tables, correlated subquery enhancements, and key-first index scan
- Features for a database server on Windows
  - Multiple residency
  - Raw device support
  - High-Performance Loader (HPL)
  - ON-Bar XBSA certification
  - ON-Bar parallelism
  - Nondomain Administrator install
  - Microsoft cluster support
  - Local-connection support with named pipes
  - Three gigabytes of shared memory

- Application migration
  - UPPER, LOWER, and INITCAP functions for case-insensitive search (for built-in data types)
  - REPLACE, SUBSTR, LPAD, and RPAD functions for string manipulation (for built-in data types)
  - UNION operator in CREATE VIEW statement
  - CASE expression
  - NVL and DECODE functions
  - TO_CHAR and TO_DATE date-conversion functions (for built-in data types)
  - **IFX_UPDDESC** environment variable to describe an UPDATE statement
  - EXECUTE PROCEDURE syntax to update triggering columns
  - New arguments to the **dbinfo( )** function to obtain the hostname and version of the database server
- ISM to manage the storage devices and media that contain backups
- Additional information for **onsnmp** Management Information Bases
- Connectivity features
  - Greater network security available through support of third-party security services
  - Client interfaces (ESQL/C, CLI, C++, Java, JDBC, GLS) supported in a single package
  - Compatible with Data Director 3.6 and higher

- Enterprise Replication features
  - Hierarchical routing; direct connections no longer required
  - Additional support and performance enhancements for database servers with intermittent connections
  - Reduced global catalog available
  - Enhanced Global Language Support (GLS) to replicate multiple locales within a single replication environment
  - Command-line utility
  - Scripting view in the Replication Manager graphical interface
  - CONNECT and DISCONNECT functions in the Enterprise Replication application programming interface
- Optical Subsystem shared-library support
- Additional options for the **oncheck** utility
  - The **oncheck -w** option to check and print an index without placing a shared lock on the table
  - The **oncheck -R** option to check the reserved pages, physical-log pages, and logical-log pages

Storage-Manager Validation and Installation

When you convert or revert an Informix database server, the storage manager that you used on the old version might not be certified for the version to which you are migrating. Verify that the storage manager is certified for the target database server version and platform at the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a certified storage manager before you perform backups with ON-Bar.

Before you convert to a later version of the database server, save a copy of your current **sm_versions** file, which should be in the **$INFORMIXDIR/etc** directory on UNIX or Linux or the **%INFORMIXDIR%\etc** directory on Windows. If you are using a different directory as **INFORMIXDIR** for the new database server, copy **sm_versions** to the new **$INFORMIXDIR/etc** or **%INFORMIXDIR%\etc** directory, or copy **sm_versions.std** to **sm_versions** in the new directory, and then edit the **sm_versions** file with appropriate values before starting the conversion. If you are migrating from Version 7.3x before 7.31.xC5 or from Version 7.24, create the **sm_versions** file by unloading the information from the **sysutils:bar_version** table.

When you convert to the new database server version, install the storage manager *before* you bring up the database server. That way if you have automatic log backup set up on the database server, ON-Bar can start backing up the logs when the database server comes online.

Warning: *If you migrate ISM Version 1.0 catalogs to Version 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. When the ISM 2.0 server is restarted after catalog migration, error messages occur in various logs.*

Dynamic Server 9.40 uses ISM 2.2. When setting up ISM, you might need setup information about the following features:

- ISMData or ISMLogs name change
- NSRADMIN utility
- Year 2000 compliant status
- ISM installation and certification during migration

Important: *If you are using NetWare IPX/SPX, it should be installed on the same computer as the ISM server.*

For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Migrating to Dynamic Server 9.40 with Enterprise Replication

This section describes how to convert to and revert from Dynamic Server 9.40 if you are running Enterprise Replication. All the conversion and reversion operations must be performed as user **informix**.

Converting to Dynamic Server 9.40 with Enterprise Replication

You can only use the following procedures to convert to Dynamic Server 9.40 from Dynamic Server 9.30, 9.2x, or 7.31. To convert from an earlier database server, you need to convert to an intermediate database server first. For information on which intermediate database server to use, see "Database Server Migration Paths" on page 1-13.

To prepare for conversion to Dynamic Server 9.40 with Enterprise Replication

1. If you have replicate groups, which Dynamic Server 9.40 does not support, remove all of them.
2. Stop applications doing replicable transactions.
3. Make sure that control and TRG send queues are empty:
   - Run **onstat -g grp** to ensure that grouper does not have any pending transactions.
   - Run **onstat -g rqm** to check for queued messages.
4. Shut down Enterprise Replication with the following command:

   ```
   cdr stop
   ```

To convert to Dynamic Server 9.40 with Enterprise Replication

1. Perform the conversion tasks described in "Converting to Dynamic Server 9.40" on page 3-47, including starting Dynamic Server 9.40.
2. If the CDR_QDATA_SBSPACE configuration parameter is not set, set it in the ONCONFIG file to the sbspaces for Enterprise Replication to use for storing spooled row data.
3. Back up the **syscdr** databases with the **dbschema** or the UNLOAD statement.
4. Make sure that no replicatable transactions occur before Enterprise Replication starts.
5. Run the conversion script, named **concdr.sh**, in the **$INFORMIXDIR/etc/conv** directory on, or **concdr.bat**, in the **%INFORMIXDIR%\etc\conv** directory on Windows:

   ```
   % sh concdr.sh from_version 9.4
   ```

   Valid *from_version* values follow:

   ```
   9.30
   9.21
   9.20
   7.31
   ```

6. Wait for one of the following messages:

   ```
   'syscdr' conversion completed successfully.
   'syscdr' conversion failed.
   ```

   For details about the conversion, see the following file:

   $INFORMIXDIR/etc/concdr.out or
   %INFORMIXDIR%\etc\concdr.out

7. If conversion fails, resolve the problem reported in the **concdr.out** file, restore the **syscdr** database from a backup, and then attempt conversion again.
8. After successful conversion, start Enterprise Replication:

   ```
   % cdr start
   ```

Warning: *After you convert to Dynamic Server 9.40 with Enterprise Replication from Dynamic Server 9.30, 9.2x, or 7.31, do not drop the **syscdr** database. If **syscdr** is dropped, then you cannot revert from Dynamic Server 9.40 to the older database server with Enterprise Replication because the data required to carry out the reversion is stored in the **syscdr** database.*

Converting Replication of 9.2x User-Defined Data Types

Dynamic Server 9.2x has limited support for the replication of user-defined data types (UDTs). To take advantage of 9.40 UDT replication, the user-defined routines (UDRs) for a UDT must contain **streamwrite( )** and **streamread( )** functions. After you migrate to Dynamic Server 9.40, implement the **streamwrite( )** and **streamread( )** functions for any currently replicated UDTs on all database servers within the enterprise.

Reverting from Dynamic Server 9.40 with Enterprise Replication

You can only use the following procedures to revert from Dynamic Server 9.40 to Dynamic Server 9.30, 9.2x, or 7.31.

The procedure reverting to Dynamic Server 9.30 is slightly different than the procedure for reverting to Dynamic Server 9.2x or 7.31. To revert to Dynamic Server 7.31, the database server must be an Enterprise Replication root server (the uppermost level in a hierarchically organized set of database servers).

To revert to Dynamic Server 9.30 from Dynamic Server 9.40 with Enterprise Replication

1. Stop applications doing replicatable transactions.
2. Make sure that control and TRG send queues are empty:
   - Run **onstat -g grp** to ensure that grouper does not have any pending transactions.
   - Run **onstat -g rqm** to check for queued messages.
3. Shut down Enterprise Replication with the following command:

   ```
   cdr stop
   ```
4. Back up the **syscdr** databases with **dbschema** or UNLOAD.
5. Run the reversion script, named **revcdr.sh,** in the **$INFORMIXDIR/etc/conv** directory on UNIX, or **revcdr.bat,** in the **%INFORMIXDIR%\etc\conv** directory on Windows:

   ```
   % sh revcdr.sh 9.4 9.30
   ```

   This script does a reversion test followed by the actual Enterprise Replication reversion.

6. If the reversion test or actual reversion fails, then check the file **$INFORMIXDIR/etc/revtestcdr.out** or **revcdr.out**, respectively. Attempt reversion after resolving problems reported.
7. Perform database server reversion tasks, as described in "Reverting from Dynamic Server 9.40" on page 3-64.
8. Start Enterprise Replication:

```
% cdr start
```

To revert to Dynamic Server 9.2x or 7.31 from Dynamic Server 9.40 with Enterprise Replication

1. Drop all replicate sets.
2. Drop any replicate that contains a smart large object or user-defined data type.
3. Stop applications doing replicatable transactions.
4. Make sure that control and TRG send queues are empty:
   - Run **onstat -g grp** to ensure that grouper does not have any pending transactions.
   - Run **onstat -g rqm** to check for queued messages.
5. Shut down Enterprise Replication with the following command:

```
cdr stop
```

6. Back up the **syscdr** databases with **dbschema** or UNLOAD.
7. Run the reversion script, named **revcdr.sh,** in the **$INFORMIXDIR/etc/conv** directory on UNIX, or **revcdr.bat,** in the **%INFORMIXDIR%\etc\conv** directory on Windows:

```
% sh revcdr.sh 9.4 to_version
```

   Valid *to_version* values follow:

```
9.21
9.20
7.31
```

   This script does a reversion test followed by the actual Enterprise Replication reversion.
8. If the reversion test or actual reversion fails, then check the file **$INFORMIXDIR/etc/revtestcdr.out** or **revcdr.out**, respectively. Attempt reversion after resolving problems reported.
9. Drop the Enterprise Replication sbspaces.

10. Perform database server reversion tasks, as described in "Reverting from Dynamic Server 9.40" on page 3-64.
11. Start Enterprise Replication:

```
% cdr start
```

Migrating Between 32-bit and 64-Bit Database Servers

To migrate to or from a 64-bit version of Dynamic Server 9.40 and an earlier database server (64-bit as well as 32-bit), follow the same migration process as "Converting to Dynamic Server 9.40" on page 3-47 and "Reverting from Dynamic Server 9.40" on page 3-64 describe.

Some additional steps would be required in the following cases:

- If you are migrating from a 32-bit version of Dynamic Server 9.40 to a 64-bit version of Dynamic Server 9.40
- If you are reverting from 64-bit version of Dynamic Server 9.40 to a 9.40, 9.30, or 9.2x 32-bit version

These steps are required to update certain internal tables. These steps are documented in the platform-specific machine notes that are provided with your database server, as "Additional Documentation" on page 20 of the Introduction indicates.

All UDRs and DataBlade modules that were built in 32-bit mode need to be recompiled in 64-bit mode because they will not work with the 64-bit database server. If you have any UDRs that were developed in a 32-bit mode, make sure that proper size and alignment of the data structures are used in order to work correctly on a 64-bit computer after recompilation in 64-bit mode. For more information, refer to your machine notes.

Converting to Dynamic Server 9.40

This section describes the procedures for converting to Dynamic Server 9.40 from any of the following database servers:

- Dynamic Server 9.30
- Dynamic Server 9.2x
- Dynamic Server 7.31, 7.30, or 7.24

When you migrate to Dynamic Server 9.40, you can install and test a database server instance with the same configuration files, environment variables, and **sqlhosts** information that you used for your source database server.

After successful conversion to Dynamic Server 9.40, you might want to modify configuration files and environment variables to take advantage of Dynamic Server 9.40 features. For more information, refer to your *Getting Started Guide* and your *Administrator's Guide*.

Important: *Read your release notes and machine notes for any late-breaking information.*

To convert to Dynamic Server 9.40, complete the following conversion steps. The subsections below describe these steps in detail.

To convert to Dynamic Server 9.40

1. If necessary, perform Enterprise Replication preconversion tasks. For more information, see "Migrating to Dynamic Server 9.40 with Enterprise Replication" on page 3-42.
2. Check and configure available space.
3. Save copies of the current configuration files.
4. Remove outstanding in-place alters.
5. Close all transactions and shut down the source database server.
6. Check for any open transactions.
7. Verify the integrity of the data.
8. Verify the database server mode.
9. If necessary, disable High-Availability Data Replication.
10. Make a final backup of the source database server.

UNIX/Linux

11. Verify that the source database server is offline.
12. On UNIX or Linux, modify kernel parameters. ♦
13. Install Dynamic Server 9.40.

    Monitor the message log, **online.log**, during the conversion for any error messages.
14. Set environment variables.
15. Customize configuration files.
16. Add any Communications Support Modules.
17. Install and configure any DataBlade modules.
18. Initialize Dynamic Server 9.40.
19. Monitor the conversion complete status.
20. For ON-Bar, rename or edit the **sm_versions.std** file.
21. Update statistics.
22. Verify the integrity of the data.
23. Make an initial backup of Dynamic Server 9.40.
24. Tune Dynamic Server 9.40 for performance.
25. If necessary, perform Enterprise Replication conversion tasks. For more information, see "Converting to Dynamic Server 9.40 with Enterprise Replication" on page 3-42.
26. If necessary, enable HDR.

Repeat this procedure for each instance of Dynamic Server 9.40 that you plan to run on the computer.

Warning: *If a serious error occurs during the conversion, it might be necessary to return to the previous version, restore from a backup, and then correct the problem prior to restarting the conversion tasks.*

Check and Configure Available Space

During conversion, Dynamic Server drops and then recreates the **sysmaster** database. Depending on which version of Dynamic Server you convert from, the Version 9.40 **sysmaster** database can be significantly larger.

UNIX/Linux

Dynamic Server 9.40 requires 3000 free pages of logical-log space (approximately 6000 kilobytes for a 2-kilobyte page size) to build the **sysmaster** database on UNIX or Linux. ♦

Windows

Dynamic Server 9.40 requires 1500 to 3000 free pages of logical-log space (approximately 6000 kilobytes for a 4-kilobyte page size) to build the **sysmaster** database on Windows. ♦

Partition header pages should not be full; key descriptors will occupy slightly more space after conversion to Dynamic Server 9.40. Use the **oncheck -me** command to compress extents and reduce the amount of storage used in partition headers.

The root chunk should contain at least 10% free space when converting to Dynamic Server 9.40.

In some cases, even if the database server conversion is successful, internal conversion of some databases might fail because of insufficient space for system catalog tables. For more information, see your release notes, as "Additional Documentation" on page 20 of the Introduction indicates.

You need to add any additional free space to the system prior to the conversion. If the dbspaces are nearly full, you need to add space before you start the conversion procedure. When you initialize Dynamic Server 9.40 on the same root dbspace of the earlier database server, Dynamic Server 9.40 automatically converts the **sysmaster** database and then each database individually. For a successful conversion of each database, ensure that 2000 kilobytes of free space per database is available in each dbspace.

To ensure enough free space is available

1. Calculate the amount of free space that each dbspace requires.

   In the following equation, *n* is the number of databases in the dbspace and *X* is the amount of free space they require:

   ```
   X kilobytes free space = 2000 kilobytes * n
   ```

2. Check the amount of free space in each dbspace to determine whether you need to add more space.

Use the following SQL statements to determine the free space that each dbspace requires and the free space available. These statements return the free-space calculation in page-size units. The **free_space_req** column value is the free-space requirement, and the **free_space_avail** column value is the free space available.

The following SQL statement shows how to determine the free space that each dbspace requires:

```
DATABASE sysmaster;
SELECT partdbsnum(partnum) dbspace_num,
       trunc(count(*) * 2000) free_space_req
   FROM sysdatabases
GROUP BY 1
ORDER BY 1;
```

The following SQL statement queries the **syschunks** table and displays the free space available for each dbspace:

```
SELECT dbsnum dbspace_num, sum(nfree) free_space_avail
   FROM syschunks
GROUP BY 1
ORDER BY 1;
```

Important: *If less free space is available than the dbspace requires, either move a table from the dbspace to another dbspace or add a chunk to the dbspace.*

The dbspace estimates could be higher if you have an unusually large number of SPL routines or indexes in the database.

Save Copies of the Current Configuration Files

Save copies of the configuration files for each instance of your source database server. Keep the copies available to use later. Save the configuration files that Figure 3-5 lists, if they exist.

Figure 3-5
Configuration Files to Save from the Source Database Server

UNIX or Linux	Windows
$INFORMIXDIR/etc/$ONCONFIG	**%INFORMIXDIR%\etc\%ONCONFIG%**
$INFORMIXDIR/etc/onconfig.std	**%INFORMIXDIR%\etc\onconfig.std**
$INFORMIXDIR/etc/oncfg*	**%INFORMIXDIR%\etc\oncfg***
$INFORMIXDIR/etc/sm_versions	**%INFORMIXDIR%\etc\sm_versions**
$INFORMIXDIR/aaodir/adtcfg	**%INFORMIXDIR%\aaodir\adtcfg.***
$INFORMIXDIR/dbssodir/adtmasks	**%INFORMIXDIR%\dbssodir\adtmasks.***
$INFORMIXDIR/etc/sqlhosts	
$INFORMIXDIR/etc/tctermcap	
$INFORMIXDIR/etc/termcap	

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of any important storage manager files as well as the following file:

UNIX or Linux: **$INFORMIXDIR/etc/ixbar.*servernum***

Windows: **%INFORMIXDIR%\etc\ixbar.*servernum***

Removing Outstanding In-Place Alters

Remove any outstanding in-place alters on tables before converting by running a dummy UPDATE statement against each table. The database server cannot revert if there are outstanding in-place alters.

To find outstanding in-place alters, execute the following SQL statements:

```
set OPTCOMPIND to 0

database sysmaster;
set index to dirty read;
select pg_partnum + pg_pagenum - 1 partn
from syspaghdr, sysdbspaces a
where pg_partnum = 1048576 * a.dbsnum + 1
and pg_next != 0
into temp pp with no log

select b.dbsname database, b.tabname table
from systabnames b, pp where path = partnum
```

Close All Transactions and Shut Down the Source Database Server

Communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and shut down your source database server. This lets users exit and shuts down the database server gracefully. If necessary, you can perform an immediate shutdown of the database server, which does not let users save their work.

Before you convert the source database server to the target database server, make sure that no open transactions exist. Otherwise, fast recovery will fail when rolling back open transactions during the conversion.

To let users exit and shut down the database server gracefully

1. Execute the **onmode –sy** command to put the database server in quiescent mode.
2. Wait for all users to exit.
3. Execute the **onmode –l** command to move to the next logical log.
4. Execute the **onmode -c** to force a checkpoint.

5. Make a level-0 backup of the database server.
6. Execute the **onmode –yuk** command to shut down the system.

To perform an immediate shutdown of the database server

```
onmode -l
onmode -c
onmode -ky
```

Check for Any Open Transactions

A shutdown procedure does not guarantee a rollback of all open transactions. To guarantee that the source database server has no open transactions prior to the conversion, you need to put the source database server in quiescent mode. Execute the following command to enter quiescent mode and initiate a fast recovery:

```
oninit -s
```

UNIX/Linux

On UNIX or Linux, the **oninit –s** command rolls forward all committed transactions and rolls back all incomplete transactions since the last checkpoint and then leaves a new checkpoint record in the log with no open transactions pending. You need to execute **oninit -s** before you initialize Dynamic Server 9.40. If the source database server is not left in quiescent mode, you will receive the following error when you try to initialize the new database server, and it goes offline:

```
Open transaction detected when changing log versions.
```

For more information about fast recovery, see your *Administrator's Guide*. ♦

After you put the database server in quiescent mode and initiate fast recovery, issue the **onmode -yuk** command again to shut down the database server. Then review **online.log** for any possible problems and fix them.

Only after proper shutdown can you bring the new database server (Dynamic Server 9.40) through the conversion path. Any open transaction during the conversion would cause an execution failure in fast recovery.

Verify the Integrity of the Data

Use the **oncheck** utility to verify the integrity of the data before you make a level-0 backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes.

To obtain the database names, use the following statements with DB-Access:

```
DATABASE sysmaster;
SELECT name FROM sysdatabases;
```

Figure 3-6 lists the commands that verify the data integrity.

Figure 3-6
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information on **oncheck**, refer to your *Administrator's Guide*.

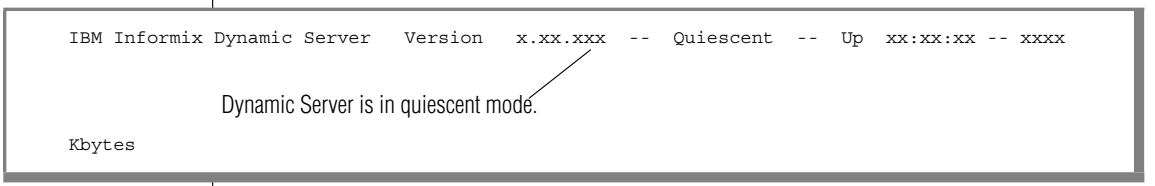
Verify the Database Server Mode

Before you make a backup, execute the following command to verify that your source database server is in quiescent mode:

```
onstat -
```

The first line of the onstat output contains the status of your source database server. Figure 3-7 shows that the database server is in quiescent mode.

Figure 3-7
Example of onstat Status Line



Disable High-Availability Data Replication

If you use High-Availability Data Replication (HDR), you must disable it before conversion to Dynamic Server 9.40.

To disable HDR, set the primary database server to standard with the following command on the primary database server:

```
onmode -d standard
```

For more information on HDR, see the *Administrator's Guide*.

Tip: *You do not need to perform the whole conversion process on the secondary database server. For more information, see* *"Enable HDR" on page 3-64*.

Make a Final Backup of the Source Database Server

Use ON-Bar or **ontape** to make a level-0 backup of the source database server, including all storage spaces and all used logs. After you make a level-0 backup, also perform a complete backup of the logical log, including the current logical-log file. Be sure to retain and properly label the tape volume that contains the backup. For more information about making backups, refer to the *Backup and Restore Guide*.

Important: *Make a final backup for each source database server instance that you plan to convert.*

For ON-Bar, remove the **ixbar** file, if any, from the **$INFORMIXDIR%/etc** or **%INFORMIXDIR%\etc** directory after the final backup. This ensures that backups for the source database server are not confused with backups about to be done for the target database server. Follow the instructions regarding expiration in your storage-manager documentation.

Verify That the Source Database Server Is Offline

The source database server must be offline because the target database server uses the same files. You cannot install the target database server if any of the files that it uses are active.

Check the message log to verify that you obtain the following message for offline mode.

```
shared memory not initialized…
```

UNIX/Linux

On UNIX or Linux, Modify Kernel Parameters

You might need to change some of the kernel parameters for your UNIX or Linux operating system before you install Dynamic Server 9.40. To reconfigure the operating system, follow the directions in the machine notes file included on your database server distribution media, and the kernel-configuration instructions for your operating system.

Install Dynamic Server 9.40

On UNIX or Linux, you must be logged in as user **root** to install Dynamic Server 9.40. On Windows, you must be a member of the **Informix-Admin** group. Set the **INFORMIXDIR** environment variable to the directory where you plan to install the database server.

Warning: *If you install the target database server in the same directory where the source database server resided, the installation script overwrites the older files. If you want to preserve your source database server files, you must install the target database server in a different directory. If you install the target database server in a different directory, you need to change the value of the* ***INFORMIXDIR*** *environment variable, or the older version of the database server will start up when you reboot.*

Before you overwrite the source database server, you must take the following precautions:

- If you do not have the original media for the source database server, back up the **INFORMIXDIR** directory before you install Dynamic Server 9.40.
- Copy the configuration and **sqlhosts** files from the **etc** directory of **INFORMIXDIR** to another location in the file system.

To install and configure Dynamic Server 9.40, follow the directions in your *Installation Guide* and in your *Administrator's Guide*. The installation script installs Dynamic Server 9.40 into the **INFORMIXDIR** directory specified for user **root** on UNIX or Linux or for the **Informix-Admin** group on Windows.

Important: *Monitor the database server message log,* ***online.log****, during the conversion for any error messages. If you see an error message, resolve the error condition before you continue the conversion procedure.*

Set Environment Variables

After you install Dynamic Server 9.40, verify that the following environment variables are set to the correct values:

INFORMIXSERVER	**PATH**
ONCONFIG	**INFORMIXSQLHOSTS** (if used)

Important: *On UNIX or Linux, the client application looks for the* ***sqlhosts*** *file in the* ***etc*** *directory in the* ***INFORMIXDIR*** *directory. However, you can use the* ***INFORMIXSQLHOSTS*** *environment variable to change the location or name of the* ***sqlhosts*** *file.*

Customize Configuration Files

You can customize your ONCONFIG configuration file and environment variables to take advantage of the new features that Dynamic Server 9.40 introduced. When you initialize Dynamic Server 9.40, use the same configuration that the source database server used. After you observe the performance of Dynamic Server 9.40, you might want to adjust the configuration.

It is recommended that you set the ALARMPROGRAM configuration parameter to either nothing or **no_log.sh** to prevent the generation of errors if the logical log fills during the conversion. For more details, see "Initialize Dynamic Server 9.40" on page 3-60. After the conversion, change the value of ALARMPROGRAM to **log_full.sh**.

If you use an optical storage manager, set the OPTICAL_LIB_PATH configuration parameter in the ONCONFIG file to the location of the optical storage manager library. For more information, see the *IBM Informix Optical Subsystem Guide*.

If you use custom-code files with the High-Performance Loader, set the HPL_DYNAMIC_LIB_PATH configuration parameter in the **plconfig** file to the location of the shared library. For Dynamic Server 9.40, the default location of this library is **$INFORMIXDIR/lib/ipldd09a.so**. For more information, see the *IBM Informix High-Performance Loader User's Guide*.

For information on how to configure Dynamic Server 9.40, refer to your *Administrator's Guide*. For information about environment variables, refer to the *IBM Informix Guide to SQL: Reference*. For information about how to tune the configuration parameters, refer to your *Performance Guide*.

Important: *To facilitate reversion, use the same values for your target database server for ROOTOFFSET, ROOTSIZE, and ROOTPATH that you used for the source database server. Also, keep the same size for physical logs and logical logs, including the same number of logical logs, and the same* ***sqlhosts*** *file.*

UNIX/Linux

Add Any Communications Support Modules

You can use a Communications Support Module (CSM) with Dynamic Server 9.40. After you install the CSM components, create entries in the **concsm.cfg** file and in the options field of the **sqlhosts** file to configure the CSM. For information on how to set up the CSM, refer to your *Administrator's Guide*.

Existing client applications do not need to be recompiled or relinked if your database server does not use CSMs. If your database server uses a CSM, client applications must relink with new Informix libraries. The client applications must also have a CSM installed and configured.

Install and Configure Any DataBlade Modules

After you install Dynamic Server 9.40, and before you initialize the database server, install and register any DataBlade modules supplied by IBM or third-party vendors that you want to add to the database server. *Registration* is the process that makes the DataBlade module code available to use in a particular database. For more information on how to use DataBlade modules, refer to the DataBlade documentation.

Initialize Dynamic Server 9.40

Initialize Dynamic Server 9.40 without disk initialization.

Warning: *Dynamic Server 9.40 writes to the logical logs with the transactions that result from creating the* ***sysmaster*** *database. If you run out of log space before the creation of the* ***sysmaster*** *database is complete, Dynamic Server 9.40 halts and indicates that you must back up the logical logs. After you back up the logical logs, the database server can finish building the* ***sysmaster*** *database.*

You cannot use ON-Bar to back up the logical logs because the database has not been converted yet.

If you have ALARMPROGRAM set to ***log_full.sh*** *in the ONCONFIG configuration file, errors are generated as each log file fills during the conversion. Set the value of ALARMPROGRAM to either nothing or* ***no_log.sh*** *so that these errors are not generated.*

If your logical log does fill up during the conversion, you need to back it up with ***ontape****, the only backup tool you can use at this point. Issue the* ***ontape -a*** *command.*

Execute the following command to bring Dynamic Server 9.40 online for the first time:

```
oninit
```

As Dynamic Server 9.40 comes online for the first time, it modifies certain disk structures. This operation should extend the initialization process by only a minute or two. In the unlikely event that your disks cannot accommodate the growth in disk structures, you will find a message in the message-log file that instructs you to run **oncheck** on a table. The **oncheck** utility will tell you that you need to rebuild an index. You should rebuild the index as instructed.

Monitor the Conversion Complete Status

Check your message log (**online.log**) for status messages that pertain to bringing Dynamic Server 9.40 online. The conversion process ends when the following message is written to **online.log**:

```
Conversion completed successfully
```

This message indicates that the conversion process completed successfully, but it does not guarantee that each individual database was converted successfully. The message log could contain additional information regarding the success or failure of each individual database conversion. If a particular database conversion fails, then you should try to connect to the database to find out the exact cause of the failure.

At the end of the conversion of each individual database, the conversion process runs a script to update some system catalog table entries. The message log includes messages related to this script. The success or failure of the script does not prevent the usage of a database. If the script fails for a database, however, for better performance run the following scripts as user **informix** while connected to the database for converting to Dynamic Server 9.40 from Dynamic Server 7.3x or 7.24:

$INFORMIXDIR/etc/dummyupds7x.sql

If you encounter a failure during the conversion, you should revert to the source database server and then restore it from a backup.

The conversion process involves two phases: internal conversion and external conversion. Internal conversion is the process of converting each individual database in the system. External conversion is the process of converting the utilities, such as ON-Bar.

For information about any messages in the message log, refer to the *Administrator's Guide*.

Important: *If the message file notes problems, solve the problems before you continue to the next step.*

For ON-Bar, Rename the sm_versions.std File

After installation of the database server, rename the **sm_versions.std** file to **sm_versions** for the ON-Bar backup and restore system to run. Use one of the following methods:

- If you are using the same version of ISM, copy the same **sm_versions** file from your source database server to the target database server installation.
- If you are using other storage managers, copy your previous **sm_versions** file from the source **$INFORMIXDIR/etc** directory to the target **$INFORMIXDIR/etc** directory.
- If you are upgrading from Version 7.3x before 7.31.xC5 or from Version 7.24, unload the contents of the **sysutils:bar_version** table.

Update Statistics

After a successful conversion, you need to run UPDATE STATISTICS on some of the system catalog tables in your databases, as the following lists show.

For a conversion to Dynamic Server 9.40 from a Version 7.3x or Version 7.24 database server, run UPDATE STATISTICS on the following system catalog tables in Dynamic Server 9.40:

sysblobs	**sysfragments**	**syssynonyms**
syscolauth	**sysindices**	**syssyntable**
syscolumns	**sysobjstate**	**systabauth**
sysconstraints	**sysopclstr**	**systables**
sysdefaults	**sysprocauth**	**systriggers**
sysdistrib	**sysprocedures**	**sysusers**
sysfragauth	**sysroleauth**	

Verify the Integrity of the Data

After Dynamic Server 9.40 finishes converting the system catalog tables, open each database with DB-Access and use **oncheck** to verify that no data was corrupted in the migration process. You can verify the integrity of the reserve pages, extents, system catalog tables, data, indexes, and smart large objects, as Figure 3-8 shows.

Figure 3-8
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***
Check smart large objects	**oncheck -cs** ***sbspace_name***
Check smart large objects plus extents	**oncheck -cS** ***sbspace_name***

Make an Initial Backup of Dynamic Server 9.40

Use a Dynamic Server 9.40 backup and restore tool (ON-Bar or **ontape**) to make a level-0 backup of the new database server. Do not overwrite the tapes that contain the final backup of the source database server. For more information, see the *Backup and Restore Guide*.

Important: *Do not restore the backed up logical-log files from your source database server for your target database server.*

Tune Dynamic Server 9.40 for Performance

When you finish the level-0 backup, the migration process is complete and users can safely use Dynamic Server 9.40 to access data.

After successful migration to Dynamic Server 9.40, you can tune the database server to obtain maximum performance. If you created sample queries for comparison, you can use them to characterize the performance differences between the source database server and Dynamic Server 9.40. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on performance topics, refer to your *Performance Guide*.

Enable HDR

You do not need to perform the conversion process on the secondary server. On the secondary server, install the new database server and any user-defined objects or DataBlade modules, and then copy the necessary supporting files from the primary server: for example, the ONCONFIG file. For a list of requirements, see the section on configuring a system for HDR in the *Administrator's Guide*. The secondary server is converted automatically when you start HDR. To start HDR, follow the procedure for starting HDR for the first time in the *Administrator's Guide*.

Reverting from Dynamic Server 9.40

This section describes the steps for reverting from Dynamic Server 9.40 to Dynamic Server 9.30, 9.2x, 7.3x, or 7.24.

Important: *Before you revert from Dynamic Server 9.40, remove all objects from the databases that the old database server does not support, except those that the boot scripts created in the system catalog. Do not remove the objects that the* ***boot90.sql*** *and* ***boot901.sql*** *scripts created because the reversion utility uses them.*

Important: *Read your release notes and machine notes for any late-breaking information.*

To revert from Dynamic Server 9.40, complete the following steps. The subsections below describe these steps in detail.

To revert from Dynamic Server 9.40

1. Review the database schema to determine whether reversion is possible.
2. Check and configure available space.
3. Save copies of the current configuration files.
4. Verify the integrity of the data.
5. Back up Dynamic Server 9.40.
6. Remove new features.
7. Remove BladeManager extensions.
8. If necessary, disable HDR.
9. If necessary, perform Enterprise Replication reversion tasks (see "Reverting from Dynamic Server 9.40 with Enterprise Replication" on page 3-44).
10. Run the reversion utility (**onmode -b**).
11. Modify configuration parameters.
12. Reset environment variables.
13. If necessary, remove any Communications Support Module settings.
14. Reinstall and start the target database server.
15. Update statistics.
16. Verify the integrity of the data.
17. Back up the target database server.
18. Return the target database server to online mode.

Determine Whether Reversion Is Possible

The easiest reversion scenario is a Dynamic Server 9.40 database that does not contain any new features. Run the reversion utility and modify the values of the configuration parameters.

You can revert from Dynamic Server 9.40 to a 9.30, 9.2x, 7.3x, or 7.24 database server if you have not added any extensions to the 9.40 database server.

Warning: *When you revert to a previous version of the database server, do not reinitialize the database server by using the* ***-i*** *command-line parameter. Using the* ***-i*** *parameter for reversion would reinitialize the root dbspace, which would destroy your databases.*

When you revert to the older version, you see a message similar to the following:

```
This will make all necessary modifications to disk structures
so that the Informix Dynamic Server space will be
compatible with Informix Dynamic Server Version 7.31
Beginning process of reverting system to 7.31 ...
...
Reversion complete.
Install Informix Dynamic Server Version 7.31 before
reinitializing.
Do you wish to continue (y/n)? qaonmode  -b 7.31: passed
```

In the next-to-last line of the message, *reinitializing* refers to restarting the database server (sometimes referred to as reinitializing shared memory), *not* to reinitializing the existing root dbspace.

Review the database schema to determine whether reversion to the earlier database server is possible. Ask the following questions:

- Does the schema file contain SQL statements that the earlier database server does not support?
- Does the database contain features that the earlier database server does not support, such as long identifiers?
- Have any new SPL routines been created in Dynamic Server 9.40, or have you imported existing routines using **dbimport**?
- Have tables or indexes using expression fragmentation had expressions changed or new fragments added?
- Have any new triggers been created?
- Have any new check constraints been created?

To review the database schema, execute the **dbschema** utility command. The following example displays complete information about the database **db1**:

```
dbschema -d db1 -ss
```

Database reversion occurs in two phases: a check phase and an actual reversion phase. If a database cannot be reverted, the check phase highlights it and prevents reversion.

Figure 3-9 lists the restrictions for reverting to a Version 9.30, 9.2x, or 7.x (7.31, 7.30, or 7.24) database server.

Figure 3-9
Reversion Restrictions

7.x	9.2x	9.30	Restriction
●	●	●	Dbspaces cannot have chunks larger than 2 GB or in the new chunk format, chunks that extend further than 2 GB into their device or file, or contain more than 2047 chunks. For more information, see "Chunk Format" on page 3-22.
●	●	●	No files larger than 2 GB should be stored in or in use by the database server.
●	●	●	The TAPESIZE or LTAPESIZE configuration parameters cannot be set to 0.
●	●	●	The ALARMPROGRAM configuration parameter cannot be set to the **alarmprogram.sh** file.
●	●	●	The LRU_MAX_DIRTY or LRU_MIN_DIRTY configuration parameters must not be set to a value of type FLOAT. To revert, set them to integers.
●	●	●	UDRs should not use multiple IN or OUT parameters. Drop all such UDRs before reversion.
●	●	●	UDRs and stored procedures should not use named return parameters.
●	●	●	Sequence objects should not be in use. Drop all sequences before reversion.
●	●	●	No triggers created with the INSTEAD OF clause should be in use. Drop all such triggers before reversion.
●	●	●	Multiple collations among indexes, stored procedures, triggers, and constraints should not be in use.
●	●	●	Functional indexes cannot contain more than 16 parameters.
●	●	●	High-Data Availability Replication and Enterprise Replication cannot co-exist on the same database server.
●	●	●	The LVARCHAR(*n*) data types should not be in use if *n* is not equal to `2042`.

(1 of 4)

7.x	9.2x	9.30	Restriction
●	●	●	You cannot revert to an earlier database server from a database server that has had extensions added unless you remove the extensions. You need to remove any new data types or routines that you created either explicitly or by registering a different version of a DataBlade module. To be able to revert, you need to downgrade any DataBlade module to the version that was registered prior to reversion and explicitly drop any data types and routines that were created outside of any DataBlade registration. For information on how to use DataBlade modules, see the DataBlade documentation.
●	●	●	No new user-defined or SPL routines should have been created in the converted databases (either implicitly or explicitly). If you plan to use **dbexport** to export a database containing existing user-defined or SPL routines, you must drop these routines prior to reversion.
●	●	●	No new triggers should have been defined in the converted databases.
●	●	●	No fragment expressions or check constraints created on the 9.40 database server should exist in the databases. To revert, convert fragmented tables to nonfragmented tables by detaching fragment expressions. You cannot use ALTER TABLE or ALTER INDEX statements to change fragment strategies that existed before the conversion to Dynamic Server 9.40.
●			Indexes created with Dynamic Server 9.40 and an **opclass** that supports nearest-neighbor search cannot be reverted to the earlier database server.
●			If Dynamic Server 9.40 uses a newly added log file, you cannot reset the status of the file to "newly added" after reversion to the earlier database server.
●			A DataBlade module that uses the PER_STMT_EXEC or PER_STMT_PREP memory duration cannot be used with the earlier database server.
●			You cannot revert a database that was created with the database server from which you are reverting. Drop the database before you attempt reversion.
●			Select triggers should not be in use.
●			User-defined statistics should not be in use.

(2 of 4)

7.x	9.2x	9.30	Restriction
●			No long identifiers or long usernames should be in use. Before reversion, make sure that the R-tree indexes do not use long identifiers as indexed column names, opclass names, or opclass function names. Also, make sure that the following disk structures do not use long identifiers: ■ Database tablespaces (owner and database name length) ■ Tablespace tablespaces (owner and tablespace name length) ■ Dbspaces (owner and dbspace name length) and chunks (path length)
●			No storage space should have a name more than 18 characters long.
●			No in-place ALTER TABLE statement should be outstanding against any table. If a user table has an incomplete in-place ALTER operation, then you need to ensure that the in-place ALTER operation is complete by running a dummy UPDATE statement against the table. If the reversion process does not complete successfully because of in-place ALTER operations, it lists all the tables that need dummy updates. You need to perform a dummy update on each of the tables in the list before you can revert to the older database server. If an in-place ALTER operation is incomplete against a system table, run the following script while connected to the database for reversion to a 7.3x or 7.24 database server from Dynamic Server 9.40: **$INFORMIXDIR/etc/dummyupds7x.sq**l
●			No new routine languages should be defined in the converted databases.
●			No new language authorizations must have been done in the converted databases.
●			No new operator classes, casts, or extended types should be defined in the 9.40 database server.
●			No semidetached indexes should be in the databases.
●			The databases cannot have tables whose primary access method is a user-defined access method.
●			Databases cannot have typed tables.
●			Tables cannot have any user-defined type columns.
●			Tables cannot have named row types with default values.

(3 of 4)

7.x	9.2x	9.30	Restriction
●			All indexes must be B-tree indexes with a total key length less than or equal to 255.
●			Tables cannot have any functional or VII indexes.
●			Databases cannot use any extensibility features, including user-defined access methods, user-defined types, aggregates, routine languages, language authorizations, trace messages, trace message classes, operator classes, errors, type authorizations, and casts.

(4 of 4)

Check and Configure Available Space

For Dynamic Server 9.40, chunk reserve pages can be allocated in non-root chunks. If the 9.40 root chunk is full and chunk reserve pages were allocated in non-root chunks, make sure you have enough space in the root chunk of the target database server. During reversion, all chunk reserve pages are written to the root chunk of the 9.30, 9.2x, 7.3x, or 7.24 database server.

UNIX/Linux

Save Copies of the Current Configuration Files

Save copies of the ONCONFIG and **concsm.cfg** files for when you convert to Dynamic Server 9.40 again. Dynamic Server 9.40 uses the **concsm.cfg** file to configure CSMs.

Verify the Integrity of the Data

Execute the following commands to verify the integrity of the data:

```
oncheck -cI database_name
oncheck -cD database_name
oncheck -cr
oncheck -cc database_name
```

Back Up Dynamic Server 9.40

Before you begin the reversion, make a complete level-0 backup of Dynamic Server 9.40. For more information, see the *Backup and Restore Guide*.

Remove BladeManager Extensions

When you run BladeManager against a database, you automatically create extensions because BladeManager registers its utility DataBlade module, which adds extensions to the database. If you need to revert from a 9.40 database server, and you have run BladeManager against a database, you must first run BladeManager and specify the following command to remove the BladeManager extensions:

```
unprep database name
```

Remove Version 9.40 Features

Before you revert, remove all features that your older database server does not support. For a list of features that you need to remove before reversion, see "Determine Whether Reversion Is Possible" on page 3-65.

Disable HDR

If you use High-Availability Data Replication (HDR), you must disable it before conversion from Dynamic Server 9.40.

To disable HDR, set the primary database server to standard with the following command on the primary database server:

```
onmode -d standard
```

For more information on HDR, see the *Administrator's Guide*.

Tip: *You do not need to perform the whole reversion process on the secondary database server. For more information, see "Enable HDR" on page 3-74.*

Run the Reversion Utility

Dynamic Server 9.40 must be running when you execute the reversion utility. The reversion utility detects and lists any remaining features that are specific to Dynamic Server 9.40. You need to remove these features before reversion can complete.

Execute the reversion utility with one of the following commands:

```
onmode -b 9.30
onmode -b 9.21
onmode -b 9.20
onmode -b 7.3
onmode -b 7.2
```

After the reversion is complete, Dynamic Server 9.40 is offline. The reversion utility drops the Dynamic Server 9.40 system catalog tables and restores compatibility so that users can access the data with the earlier database server. The reversion utility does not revert changes made to the layout of the data that do not affect compatibility.

For more information about the **onmode -b** command, see Chapter 15, "The onmode Utility."

Modify Configuration Parameters

Replace the Dynamic Server 9.40 ONCONFIG configuration file with the ONCONFIG file that you used before you converted. Alternatively, you can remove configuration parameters that the earlier database server does not support. You might also need to adjust the values of existing configuration parameters.

For a list of new configuration parameters by server version, see "Configuration Parameters" on page 3-7.

Reset Environment Variables

Reset the environment variables to values that are appropriate for the earlier database server.

UNIX/Linux

Remove Any Communications Support Module Settings

If your Dynamic Server 9.40 instance used CSMs, remove any **csm** option settings that are not supported in the older database server from the **sqlhosts** file entries for the database server. Otherwise, the older database server will return an invalid **sqlhosts** options error. Delete the **concsm.cfg** file if the older database server does not support CSMs.

Reinstall and Start the Target Database Server

Reinstall and configure the 9.30, 9.2x, 7.3x, or 7.24 database server according to the instructions in your *Installation Guide* and your *Administrator's Guide*.

Execute the **oninit -s** command to put the 9.30, 9.2x, 7.3x, or 7.24 database server in quiescent mode.

Update Statistics

After a successful reversion, you need to run UPDATE STATISTICS on some of the system catalog tables in your databases when the database server starts.

For reversion to a 7.3x or 7.24 database server from Dynamic Server 9.40 run UPDATE STATISTICS on the following system catalog tables in the 7.3x or 7.24 database server:

SYSBLOBS	**SYSFRAGMENTS**	**SYSSYNONYMS**
SYSCOLAUTH	**SYSINDEXES**	**SYSSYNTABLE**
SYSCOLUMNS	**SYSOBJSTATE**	**SYSTABAUTH**
SYSCONSTRAINTS	**SYSOPCLSTR**	**SYSTABLES**
SYSDEFAULTS	**SYSPROCAUTH**	**SYSTRIGGERS**
SYSDISTRIB	**SYSPROCEDURES**	**SYSUSERS**
SYSFRAGAUTH	**SYSROLEAUTH**	

Verify the Integrity of the Data

Before you allow users to access the databases, check the integrity of the data. Follow the steps under "Verify the Integrity of the Data" on page 3-54.

Back Up the Target Database Server

After you complete the reversion, use ON-Bar or **ontape** to make a level-0 backup of the 9.30, 9.2x, 7.3x, or 7.24 database server. For more information about making backups, refer to your *Backup and Restore Guide*.

Important: *Do not overwrite the tapes that you used to back up your source database server.*

Return the Target Database Server to Online Mode

To bring the 9.30, 9.2x, 7.3x, or 7.24 database server online, execute the **onmode -m** command. Then users can access the data.

Enable HDR

You do not need to perform the reversion process on the secondary server. On the secondary server, install the target database server and any user-defined objects or DataBlade modules, and then copy the necessary supporting files from the primary server: for example, the ONCONFIG file. For a list of requirements, see the section on configuring a system for HDR in the *Administrator's Guide*. The secondary server is reverted automatically when you start HDR. To start HDR, follow the procedure for starting HDR for the first time in the *Administrator's Guide*.

Chapter

4

Migrating to Extended Parallel Server 8.40

UNIX

In This Chapter

This chapter describes the procedures for migrating to Extended Parallel Server, Version 8.40, from Extended Parallel Server 8.31 or 8.32. The description covers the following topics:

- Preparing for migration
- Converting to Extended Parallel Server, Version 8.40
- Moving Extended Parallel Server, Version 8.40 between 32-bit and 64-bit operating systems
- Reverting from Extended Parallel Server, Version 8.40

Important: *You can convert directly to Extended Parallel Server, Version 8.40, only from Extended Parallel Server 8.31 or 8.32.*

Preparing for Migration

To prepare for migration to Extended Parallel Server, Version 8.40, you need to understand the guidelines for migrating between database servers. You also need to know about any new features that might affect migration.

Migration Guidelines

It is recommended that you observe the following guidelines when you migrate to Extended Parallel Server, Version 8.40:

- Check the release notes and machine notes for information about the correct operating-system release and any patches that you need for successful installation and operation of the database server.

  The release notes and machine notes are in the following directory:

  $INFORMIXDIR/release/en_us/0333

- Retain the installation media for both versions of the IBM Informix product software.
- Before you convert to Extended Parallel Server, Version 8.40, make sure that no open transactions exist in the source database server. Open transactions can cause problems during the fast recovery phase of conversion.

  For information about how to close the source database server properly prior to migration, see "Put the Source Database Server in Quiescent Mode" on page 4-10.
- Before you start the migration procedure, perform a level-0 backup of all dbspaces of the source database server. After you complete the migration, perform another level-0 backup of the target database server.

  For information about how to perform level-0 backups, see "Make a Final Backup of the Source Database Server" on page 4-12 and "Make an Initial Backup of Extended Parallel Server 8.40" on page 4-17.
- Use a test instance of your database server to test the migration procedure.
- Verify storage-manager validation for the target database server.

  For details, see "Storage-Manager Validation and Installation" on page 4-8.

For additional installation information and guidelines, refer to the *IBM Informix Extended Parallel Server Installation Guide for UNIX* and *IBM Informix Extended Parallel Server Getting Started Guide*.

Changes in Extended Parallel Server 8.40

This section describes the changes in Extended Parallel Server, 8.40 that can affect migration or initial configuration. For a complete list of new features in Extended Parallel Server 8.40, see *IBM Informix Extended Parallel Server Getting Started Guide*.

Environment Variables

Extended Parallel Server, Version 8.40 introduces new environment variables that might affect your installation. You might also need to adjust the values of existing environment variables. For more information on environment variables, see the *IBM Informix Guide to SQL: Reference* and the *IBM Informix Extended Parallel Server Administrator's Guide*.

New Environment Variables in Extended Parallel Server 8.40

Extended Parallel Server, Version 8.40, introduces the following new environment variables:

BIG_FET_BUF_SIZE
IFMX_OPT_FACT_TABS
IFMX_OPT_NON_DIM_TABS
DEBUG NODBPROC
TEMP_TAB_EXT_SIZE
TEMP_TAB_NEXT_SIZE

Configuration Parameters

Extended Parallel Server, Version 8.40, introduces new configuration parameters that might affect your installation. You might also need to adjust the values of existing parameters. For more information on configuration parameters, see the *IBM Informix Extended Parallel Server Administrator's Guide* and the *IBM Informix Extended Parallel Server Administrator's Reference*.

You might also need to adjust platform-specific parameters that specify communication buffers between coservers. For more information, refer to your UNIX machine notes.

New Configuration Parameters in Extended Parallel Server 8.40

Extended Parallel Server, Version 8.40, introduces the following new configuration parameters:

DEADLOCK_TIMEOUT
FRAGS_PER_DBS
MSGDATE
TXTIMEOUT

New Features in Extended Parallel Server 8.40

Following is a list of some of the new features introduced in Extended Parallel Server, Version 8.40. For a complete description of new features, see the *IBM Informix Extended Parallel Server Getting Started Guide*.

- Long identifiers
- Role functionality
- Distributed queries
- Select into new table
- Default table types
- Explain without execution
- Change table ownership
- Extent size configuration

Conversion and Reversion Paths for 32-Bit and 64-Bit Database Servers

Extended Parallel Server, Version 8.40, offers a 32-bit or 64-bit database server and supports the following conversion paths.

Source Database Server	Target Database Server
Extended Parallel Server 8.31/8.32, 32-bit	Extended Parallel Server, Version 8.40, 32-bit
Extended Parallel Server 8.31/8.32, 32-bit	Extended Parallel Server, Version 8.40, 64-bit
Extended Parallel Server 8.31/8.32, 64-bit	Extended Parallel Server, Version 8.40, 32-bit
Extended Parallel Server 8.31/8.32, 64-bit	Extended Parallel Server, Version 8.40, 64-bit

Extended Parallel Server Version 8.40 supports the following reversion paths.

Source Database Server	Target Database Server
Extended Parallel Server, Version 8.40, 32-bit	Extended Parallel Server 8.31/8.32, 32-bit
Extended Parallel Server, Version 8.40, 32-bit	Extended Parallel Server 8.31/8.32, 64-bit
Extended Parallel Server, Version 8.40, 64-bit	Extended Parallel Server 8.31/8.32, 32-bit
Extended Parallel Server, Version 8.40, 64-bit	Extended Parallel Server 8.31/8.32, 64-bit

Storage-Manager Validation and Installation

When you convert or revert an Informix database server, the storage manager that you used on the source database server might not be validated for the version of the database server to which you are migrating. Verify that the storage manager is validated for the target database server version and platform by checking the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a validated storage manager before you perform backups with the ON-Bar backup and restore system.

When you convert to a new database server version, install the storage manager before you bring up the database server. That way, if you have automatic log backup set up on the database server, ON-Bar can start backing up the logs when the database server comes online.

Warning: *If you migrate IBM Informix Storage Manager (ISM)Version 1.0 catalogs to ISM Version 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. Once the ISM Version 2.0 server is restarted after catalog migration, error messages occur in various logs.*

For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Converting to Extended Parallel Server 8.40

This section describes the procedures for converting to Extended Parallel Server,Version 8.40, from Extended Parallel Server, Version 8.31 or 8.32.

When you convert to Extended Parallel Server, Version 8.40, you must install a database server instance with the same configuration files, environment variables, and **sqlhosts** information that you used for your source database server. After that, you might want to modify configuration files and environment variables to take advantage of the Extended Parallel Server, Version 8.40 features.

For more information, refer to *IBM Informix Extended Parallel Server Getting Started Guide*, the *IBM Informix Extended Parallel Server Performance Guide*, and the *IBM Informix Extended Parallel Server Administrator's Reference*.

To convert to Extended Parallel Server, Version 8.40, complete the following steps, which later sections describe in detail:

1. Check the available space.
2. Save copies of the current configuration files.
3. Put the source database server to quiescent mode.
4. Verify the integrity of the data.
5. Make a final backup of the source database server.
6. Check for open transactions and shut down the source database server.

Important: *Repeat steps 1 through 6 for each instance of Extended Parallel Server 8.31 or 8.32.*

7. Install Extended Parallel Server, Version 8.40.
8. Copy the 8.31/8.32 configuration files to the 8.40 installation.
9. Verify environment variable settings on each node.
10. Start Extended Parallel Server, Version 8.40.
11. Rename the **sm_versions.std** file for ON-Bar.
12. Make an initial backup of Extended Parallel Server.
13. Tune Extended Parallel Server, Version 8.40 for performance.

Important: *Repeat steps 7 through 13 for each instance of Extended Parallel Server 8.40. The sections that follow describe these steps in detail.*

The conversion procedure might not be restartable. In case of a failure, you might need to restore your source database server from a backup.

Check the Available Space

Converting to Extended Parallel Server, Version 8.40, does not affect the data pages. A minor amount of extra space is required for new and updated tables in the **sysmaster** database and system catalogs.

To determine the minimum amount of free space required in the 8.31 or 8.32 database server before converting to Extended Parallel Server, Version 8.40, use the following formula:

```
freespace = (MAX_SYSIND_SIZE_BYTES + (MAX_SYSIND_NROWS * 4) +
   16384) bytes
```

In the formula, MAX_SYSIND_SIZE_BYTES is the size of the biggest **SYSINDEXES** table and MAX_SYSIND_NROWS is the number of rows in the biggest **SYSINDEXES** table.

Save Copies of the Current Configuration Files

Save copies of the following configuration files, if they are present, for each instance of the source database server. Keep the copies available for later use.

$INFORMIXDIR/etc/$ONCONFIG
$INFORMIXDIR/etc/sqlhosts
$INFORMIXDIR/etc/tctermcap
$INFORMIXDIR/etc/termcap
$INFORMIXDIR/etc/oncfg*
$INFORMIXDIR/etc/xcfg*
$INFORMIXDIR/etc/sm_versions

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of any important storage manager files as well as the following file from all nodes:

$INFORMIXDIR/etc/*ixbar_*.*servernum*

Important: *Log backups attempted during conversion would fail, so you need to set* ***LOG_BACKUP_MODE*** *to MANUAL in the* ***ONCONFIG*** *configuration file before the conversion. Later you can set* ***LOG_BACKUP_MODE*** *to CONT to have log files backed up automatically as they fill.*

Put the Source Database Server in Quiescent Mode

Before you convert to Extended Parallel Server, Version 8.40, you need to make sure that no connections to the source database server exist. Communicate to client users how long you expect the database server to be offline for the migration.

You also need to make sure that no open transactions exist in the source database server. Fast recovery would fail when rolling back open transactions during the conversion.

To put the source database server in quiescent mode

1. Make sure that there are no user sessions on the 8.31/8.32 database server.
2. Put the database server in quiescent mode with the following command:

   ```
   xctl onmode -sy
   ```
3. Move the database server to the next logical log with the following command:

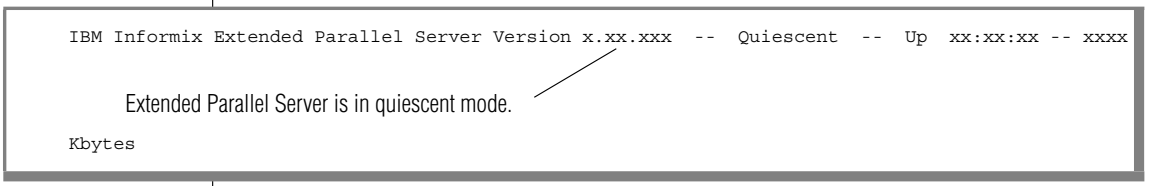
   ```
   xctl onmode -l
   ```
4. Force a checkpoint with the following command:

   ```
   xctl onmode -c
   ```
5. Execute the following command to verify that your database server is in quiescent mode:

   ```
   onstat -
   ```

   The first line of the onstat output contains the status of the database server. Figure 4-1 shows that the database server is in quiescent mode.

Figure 4-1
Example of onstat Status Line



Verify the Integrity of the Data

Use the **onutil** utility to verify the integrity of the data before you make a level-0 backup of the source database server. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes.

To obtain the database names, use the following statements with DB-Access:

```
DATABASE sysmaster;
SELECT name FROM sysdatabases;
```

Figure 4-2 lists the **onutil** commands you can use to verify data integrity.

Figure 4-2
Commands for Verifying Data Integrity

Action	onutil Command
Check reserve pages	**onutil** CHECK RESERVED
Check extents	**onutil** CHECK SPACE
Check system catalog tables	**onutil** CHECK CATALOGS
Check indexes for every database in the database server	**onutil** CHECK INDEX IN DATABASE *database_name* DISPLAY DATA

It is recommended that you also run the following **onutil** command for every table in the database server before the conversion to make sure that all data pages are in a consistent state:

```
CHECK DATA [WITH BLOBS] IN database_name.table_name
```

Important: *If any of these integrity checks fails, you have to resolve the detected integrity violations before you can proceed with the Version 8.40 conversion.*

You might want to test and run your queries on Extended Parallel Server, Version 8.40, to make sure they produce the same results.

For more information about **onutil**, refer to the *Administrator's Reference*.

Make a Final Backup of the Source Database Server

Use ON-Bar or external tables to make a level-0 backup of the 8.31 or 8.32 database server. After you make a level-0 backup, perform a complete backup of the logical log, including the current logical-log file.

To back up each instance of the 8.31 or 8.32 database server, execute the following commands:

```
xctl onmode -l    -- to advance server to the next logical log
xctl onmode -c    -- to force a checkpoint
onbar -b -L 0     -- to take a level-0 backup
```

For more information about making backups, refer to your *Backup and Restore Guide*.

Important: *Make a final backup for each source database server instance that you plan to convert.*

For ON-Bar, remove the ***ixbar** file, if any from the **$INFORMIXDIR%** or **%INFORMIXDIR%\etc** directory on each node after the final backup. This ensures that backups for the source database server are not confused with backups about to be done for the target database server. Follow the instructions regarding expiration in your storage manager documentation.

Check for Open Transactions and Shut Down the Source Database Server

You should have no open transactions when you convert to Extended Parallel Server, Version 8.40, from the 8.31 or 8.32 database server. To verify that no open transactions remain, run the following command:

```
xctl onstat -g xtm | grep IDLE
```

This command should return the following status:

```
Coordinator state =     IDLE
```

If the coordinator state is IDLE, you can shut down the database server. If the state is not IDLE, take the following steps:

1. Make sure that the 8.31/8.32 database server is in quiescent mode, as described under "Put the Source Database Server in Quiescent Mode" on page 4-10.
2. Run **xctl onmode –l**.
3. Run **xctl onmode –c**.

If coordinator state is IDLE, you can shut down the database server. If coordinator state is still not IDLE, contact Technical Support.

You can let users exit and shut down the database server gracefully or, if necessary, you can perform an immediate shutdown of the database server.

To let users exit and shut down the system gracefully

1. Execute the **xctl onmode –sy** command.
2. Wait for all users to exit.
3. Execute the **xctl onmode –l** command.
4. Execute the **xctl onmode –c** command.
5. Execute the **xctl onmode –yuk** command.

To perform an immediate shutdown

```
xctl onmode -ky
```

Verify that you get the message `shared memory not initialized...` for offline mode, as follows:

```
onstat -
```

Install Extended Parallel Server 8.40

To install Extended Parallel Server, Version 8.40, follow the instructions in your *Installation Guide*.

Warning: *If you install Extended Parallel Server, Version 8.40 in the same directory where the 8.31/8.32 database server resides, the installation script overwrites the older files. If you want to preserve your 8.31 or 8.32 files, copy them to a different directory and then install Extended Parallel Server, Version 8.40 in the same directory.*

Check the machine notes and release notes for information about the correct operating-system patches, recommended shared-memory parameters, and configurations that successful installation and operation of the database server requires. The release notes are in the following directory:

$INFORMIXDIR/release/en_us/0333

Make any changes that the machine notes or release notes recommend on every node. For more information on how to install Extended Parallel Server, Version 8.40, refer to your *Installation Guide* and your *Performance Guide*.

Converting to Extended Parallel Server, Version 8.40 from the 8.31 or 8.32 database server begins when you start the 8.40 database server. It detects an older version stamp and verifies that the last log record is an 8.31 or 8.32 checkpoint log record. The 8.31/8.32 database server needs to be shut down before the conversion because any open transactions would cause the conversion to fail in fast recovery.

Copy Configuration Files to Extended Parallel Server 8.40

Before you start the conversion to Extended Parallel Server, Version 8.40, copy the following files to the Version 8.40 installation from the 8.31/8.32 installation:

$INFORMIXDIR/etc/oncfg*	**$INFORMIXDIR/etc/$ONCONFIG**
$INFORMIXDIR/etc/xcfg*	**$INFORMIXDIR/etc/sqlhosts**

It is recommended that the 8.40 ONCONFIG configuration file be identical to the 8.31/8.32 ONCONFIG file before you start the conversion to Extended Parallel Server, Version 8.40, except for necessary changes. You cannot change the values for some of the ONCONFIG parameters until after the conversion is complete.

After the conversion, you can customize your configuration files and environment variables to take advantage of the new features that Extended Parallel Server, Version 8.40, introduced. After you observe the performance of Extended Parallel Server, Version 8.40, you might want to make further adjustments.

For configuration information, refer to your *Administrator's Guide*. For information about environment variables, refer to the *IBM Informix Guide to SQL: Reference*. For performance monitoring and tuning information, refer to your *Performance Guide*.

Verify Environment Variable Settings on Each Node

Verify that the following environment variables are set correctly on every node:

INFORMIXDIR **ONCONFIG** **INFORMIXSQLHOSTS**
INFORMIXSERVER **PATH**

The client applications look for the **sqlhosts** file in the **$INFORMIXDIR/etc** directory. However, you can use the **INFORMIXSQLHOSTS** environment variable to change the location or name of the **sqlhosts** file.

Set the environment variable **PATH** so that the local directory is searched before the **INFORMIXDIR** directory. The installation script installs Extended Parallel Server, Version 8.40, into the **INFORMIXDIR** directory specified for user **root** or **informix**.

You can change the values of these environment variables after you install Extended Parallel Server, Version 8.40, and before you invoke DB-Access.

Important: *If continuous logs backup was configured on the 8.31/8.32 database server, you either need to switch logs backup to off by setting logs backup to NONE in the **$INFORMIXDIR/etc/$ONCONFIG** file or you need to have a validated storage manager installed and configured for Extended Parallel Server, Version 8.40. Failure to take one of these actions might cause conversion errors.*

Start Extended Parallel Server 8.40

Using the same configuration parameters as the 8.31/8.32 database server, start Extended Parallel Server,Version 8.40, without initializing the disks. To do this, issue the following command:

```
xctl -C oninit
```

Warning: *Do not use **oninit -iy** because the **-iy** option would initialize your disks, which would erase your data.*

Log messages that refer to the conversion are written to the message log file. The message log should contain transaction log records. The results of the conversion for each subsystem are written to the file until the conversion is complete.

To view the message log, run the following command:

```
onstat -m
```

The following message indicates the end of the conversion process:

```
Conversion to 8.40 completed successfully.
```

After the conversion is complete, review the message log to verify that your **sysmaster** and **sysutils** databases were created successfully.

Also check the message log for information about coservers. To verify that all your coservers are up and running, execute the following command:

```
xctl onstat -
```

If the message log reports any conversion failure, contact Technical Support.

For more information about messages in the message log, see your *Administrator's Guide*. For a list of conversion/reversion messages, see the information on error messages in the *Administrator's Reference*.

Important: *If the message log indicates any problems, solve each problem before you continue with the next step.*

Rename the sm_versions.std File for ON-Bar

After installation of the database server, you need to rename the **sm_versions.std** file to **sm_versions** for the ON-Bar backup and restore system to run. If you did not upgrade ISM, you can copy the same **sm_versions** file from your source database server to the target database server installation.

Make an Initial Backup of Extended Parallel Server 8.40

Use the ON-Bar backup and restore system to make a level-0 backup of Extended Parallel Server. The 8.31/8.32 backups are not readable by Extended Parallel Server, Version 8.40. If the conversion completed successfully, you need to do a level-0 backup of the new database server instance.

Make sure that the storage manager is installed and properly configured, as "Storage-Manager Validation and Installation" on page 4-8 describes. Also make sure that the 8.31/8.32 backup tapes will not be overwritten.

You can then take the database server to quiescent mode and run the following command:

```
onbar -b -L 0
```

For more information about ON-Bar, see the *Backup and Restore Guide*.

Extended Parallel Server, Version 8.40, supports unloading directly to a pipe or to a tape drive. You do not need to unload data first to disk.

Instead of ON-Bar, you can use external tables to perform a backup. For information about loading data with external tables, see the description of the CREATE EXTERNAL TABLE statement in the *IBM Informix Guide to SQL: Syntax*.

Important: *Do not restore the backed up logical-log files from the 8.31/8.32 database server for Extended Parallel Server, Version 8.40.*

Tune Extended Parallel Server 8.40 for Performance

When you finish the level-0 backup, the migration process is complete and users can use Extended Parallel Server, Version 8.40, to access data safely. After you have your applications running normally on Extended Parallel Server, Version 8.40, consider using new features in Version 8.40 to improve application performance.

If you created sample queries for comparison, you can use them to characterize the performance differences between the 8.31/8.32 database server and Extended Parallel Server, Version 8.40. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on performance topics, refer to your *Performance Guide*.

Moving Extended Parallel Server 8.40 Between 32-Bit and 64-Bit Operating Systems

To move Extended Parallel Server, Version 8.40, to a 64-bit operating system from a 32-bit operating system, shut down the database server cleanly and bring it back up on the 64-bit operating system.

Similarly, to move Extended Parallel Server, Version 8.40 to a 32-bit operating system from a 64-bit operating system, shut down the database server cleanly and bring it back up on the 32-bit operating system.

Reverting from Extended Parallel Server 8.40

You can revert from Extended Parallel Server, Version 8.40, to the same version of the 8.31/8.32 database server from which you converted. Before the reversion, you need to remove all Version 8.40 objects from the databases except those created by the boot scripts in the system catalog.

This section describes the steps for reverting from Extended Parallel Server, Version 8.40:

1. Save copies of the current configuration files.
2. Verify the integrity of the data.
3. Back up Extended Parallel Server, Version 8.40.
4. Run the reversion script in check mode.
5. Remove features that Extended Parallel Server, Version 8.40 introduced.
6. Leave Extended Parallel Server, Version 8.40, in online mode.
7. Run the reversion script.
8. Reset environment variables.
9. Install the target database server.
10. Copy and customize configuration files.
11. Start the target database server without initializing disks.

12. Verify the integrity of the data.
13. Back up the target database server.

The following sections describe these steps in detail.

Important: *The reversion procedure might not be restartable. In case of a failure, you might need to restore your database server from a backup.*

Save Copies of the Current Configuration Files

Save copies of the current configuration files for when you convert to Extended Parallel Server, Version 8.40, again.

Important: *Log backups attempted during reversion would fail, so you need to set* ***LOG_BACKUP_MODE*** *to MANUAL in the* ***ONCONFIG*** *configuration file before the reversion.*

Verify the Integrity of the Data

Execute the following commands to check the integrity of the data:

```
onutil CHECK RESERVED DISPLAY DATA
onutil CHECK SPACE DISPLAY DATA
onutil CHECK CATALOGS
onutil CHECK DATA IN DATABASE database_name DISPLAY DATA
onutil CHECK INDEX IN DATABASE DISPLAY DATA
```

For details on how to use these commands, see "Verify the Integrity of the Data" on page 4-11.

Back Up Extended Parallel Server 8.40

Before you begin the reversion script, make a complete backup of Extended Parallel Server, Version 8.40. You can use ON-Bar or external tables to make the backup. For information about how to use ON-Bar, see your *Backup and Restore Guide*. For information about how to unload data to external tables, see the *Administrator's Reference*.

Run the Reversion Script in Check Mode

You can run the **revert_to** reversion script in check mode to list the Version 8.40 features that you need to remove before reverting to the 8.31/8.32 database server. This script is in the **$INFORMIXDIR/bin** directory.

To execute this script, you must be user **informix** and you must be connected to the primary coserver. Before you run the script, place Extended Parallel Server 8.40 in online mode. While the database server is in online mode, do not allow any user activity because modified data would cause the check script to fail. To run the script in check mode, issue one of the following commands, depending on whether you are reverting to a 32-bit or 64-bit database server:

```
revert_to 8.31 32b check

revert_to 8.31 64b check

revert_to 8.32 32b check

revert_to 8.32 64b check
```

Look in the message log file for messages about the progress of the operation. The ONCONFIG parameter MSGPATH specifies the name of the message log file.

Remove Version 8.40 Features

Before you revert, remove any Version 8.40 features that the 8.32 or 8.31 database server does not support, according to the instructions in the message log file.

For reversion to Extended Parallel Server, Version 8.32 or 8.31, you need to remove any of the following Version 8.40 features that your database server uses:

- Long IDs

  Drop or delete any objects containing Long IDs.
- Roles

  Drop any tables containing roles.

- Rename table owner

  Drop any stored procedures using the RENAME TABLE statement to change the ownership of a table.

- Select into new table

  Drop any stored procedures using the SELECT INTO statement to create a permanent table.

- Default table type

  Drop any stored procedures containing the SET TABLE_TYPE statement.

- Extent size for temporary tables

  Drop any stored procedures using the SET ENVIRONMENT statement to specify the extent size for temporary tables.

You can run the reversion script in check mode to determine what features you need to remove from Extended Parallel Server, Version 8.40. If you start the reversion without removing a 8.40 feature that is incompatible with the 8.31 or 8.32 database server, the message log contains messages like the following ones:

```
[001] 03:03:08 SQL reversion test for database 'testdb2' failed.
               See also /tmp/revtest_db.found.testdb2
```

The following message indicates that the reversion process was cancelled due to a failure in the test phase:

```
[001] 03:03:10 Reversion Cancelled due to Reversion Test Failure.
               See /tmp/rev.out
```

Such a failure means that you need to remove one or more incompatible features before reversion can complete successfully. At this point Extended Parallel Server, Version 8.40, is in online mode and none of the actual reversion changes has taken place. You can remove the incompatible feature or features and attempt reversion again.

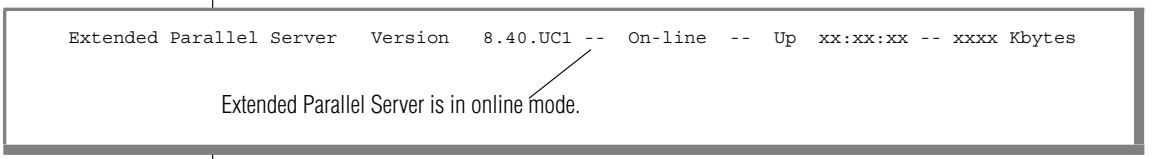
Leave Extended Parallel Server 8.40 in Online Mode

Before you start the reversion, execute the following command to verify that Extended Parallel Server, Version 8.40, is in online mode:

```
onstat -
```

The first line of the onstat output contains the status of the database server. Figure 4-3 shows that the database server is in online mode.

Figure 4-3
Verification of the Database Server Mode



Run the Reversion Script

The reversion script, **revert_to**, performs the reversion from Extended Parallel Server, Version 8.40, to Extended Parallel Server, Version 8.31 or 8.32. This script is in the **$INFORMIXDIR/bin** directory.

To execute this script, you must be user **informix** and you must be connected to the primary coserver. Before you run the script, place Extended Parallel Server, Version 8.40, in online mode. While the database server is in online mode, do not allow any user activity because modified data would cause the check script to fail. To run the script, issue one of the following commands, depending on whether you are reverting to a 32-bit or 64-bit database server:

```
revert_to 8.32 32b

revert_to 8.32 64b

revert_to 8.31 32b

revert_to 8.31 64b
```

Before the reversion, the database server implicitly checks for any features that are incompatible with the 8.32 or 8.31 database server and reports them (similar to the check mode, which "Run the Reversion Script in Check Mode" on page 4-21 describes). The database server will not proceed with the actual reversion until all incompatibilities are resolved.

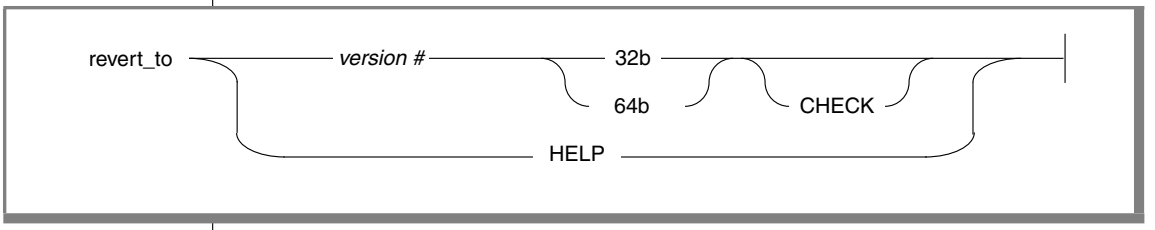
Messages like the following ones can appear in the message log file during reversion:

```
[001] 19:16:46  Reversion test started...
[001] 19:16:46  Doing internal reversion test...
[001] 19:16:47  Internal reversion test complete.
[001] 19:16:48  SQL reversion test for database 'sysmaster' started.
[001] 19:16:57  SQL reversion test for database 'sysmaster' passed.
[001] 19:16:58  SQL reversion test for database 'orders' started.
[001] 19:17:02  SQL reversion test for database 'orders' passed.
[001] 19:17:07  ON-Bar reversion test start:
[001] 19:17:07  ON-Bar reversion test completed successfully.
[001] 19:17:07  Reversion test done.
[001] 19:17:08  ON-Bar reversion start:
[001] 19:17:10  WARNING: Target server version must have a certified
Storage Manager installed after conversion/reversion and before bringing up
server.
[001] 19:17:10  ON-Bar reversion completed successfully.
[001] 19:17:11  External reversion done. Continuing with internal
reversion...
[001] 19:17:11  System catalog reversion for database 'sysmaster' Started
[001] 19:17:12  Quiescent Mode
[001] 19:17:13  Logical Log 11 Complete.
[001] 19:17:17  Checkpoint Completed:  duration was 3 seconds.
[001] 19:17:20  Transaction committed for database 'sysmaster'.
[001] 19:17:20  System catalog reversion for database 'sysmaster' Succeeded
[001] 19:17:20  System catalog reversion for database 'orders' Started
[001] 19:17:27  Transaction committed for database 'orders'.
[001] 19:17:27  System catalog reversion for database 'orders' Succeeded
[001] 19:17:33  Reverting database database partition.
[001] 19:17:33  db='sysmaster' owner='informix'
[001] 19:17:33  db='orders' owner='user1'
[001] 19:17:33  Database database partition reversion complete.
[001] 19:17:34  Reverting Partition Header Pages Started
[001] 19:17:37  Checkpoint Completed:  duration was 3 seconds.
[001] 19:17:39  Reverting Partition Header Pages Succeeded
[001] 19:17:41  Checkpoint Completed:  duration was 2 seconds.
[001] 19:17:41  Internal reversion transaction committed.
[001] 19:17:41  Reversion complete. WARNING: A restart of the current IBM
Informix-XPS version will undo this reversion. Install the IBM Informix
Server that you reverted to.
[001] 19:17:41  Bringing coserver down.
[001] 19:17:41  IBM Informix Extended Parallel Server is shutting down
[001] 19:17:41  IBM Informix Extended Parallel Server Stopped.
```

The *Administrator's Reference* lists conversion and reversion messages, with recovery actions for error messages.

When reversion is complete, the database server writes a checkpoint log record that is compatible with the 8.32 or 8.31 database server and shuts down Extended Parallel Server, Version 8.40.

The syntax of the **revert_to** command follows.



Element	Purpose	Key Considerations
version #	Specifies the version of the target database server for reversion	For reversion from Extended Parallel Server, this value must be `8.32` or `8.31`.
32b	Indicates that the reversion is to a 32-bit database server	
64b	Indicates that the reversion is to a 64-bit database server	
CHECK	Displays the source database server features that you need to remove before reversion, with instructions for removing the features	
HELP	Displays information about the reversion script	

Reset Environment Variables

Reset the environment variables to values that are appropriate for the 8.32 or 8.31 database server.

Install the Target Database Server

Install the 8.32 or 8.31 database server, according to the instructions in your *Installation Guide*.

Copy and Customize Configuration Files

After reversion is complete and before you bring up the target database server, copy the following files to the 8.32 or 8.31 installation from the Version 8.40 installation:

$INFORMIXDIR/etc/oncfg*
$INFORMIXDIR/etc/xcfg*

Remove any configuration parameters that the 8.32 or 8.31 database servers do not support.

You might also need to adjust the values of existing configuration parameters. Alternatively, you can replace the 8.40 ONCONFIG configuration file with the ONCONFIG file that you used before the conversion.

You can customize configuration files for the 8.32 or 8.31 database server. Configure the database server according to the instructions in your *Administrator's Guide*.

Start the Target Database Server Without Initializing Disks

Start the 8.32 or 8.31 database server without initializing the disks. To do this, issue the following command:

```
xctl -C oninit
```

Warning: *Do not use* ***oninit -iy*** *because the* ***-iy*** *option will initialize your disks, which will erase your data.*

Verify the Integrity of the Data

Before you allow users to access the databases, verify the integrity of the data and fix any problems. Follow the steps under "Verify the Integrity of the Data" on page 4-11.

Back Up the Target Database Server

After you complete the reversion, make a level-0 backup of the target database server. You can use ON-Bar or external tables to make the backup. For information about how to use ON-Bar, refer to your *Backup and Restore Guide*. For information about how to unload data to external tables, see the *Administrator's Reference*.

Important: *Do not overwrite the tapes that you used to back up Extended Parallel Server, Version 8.40.*

Chapter

5

Migrating to Dynamic Server 7.3x from Dynamic Server 7.30 or 7.24

In This Chapter

This chapter describes migrating to Dynamic Server 7.3x from the following database servers, including conversion (upgrading) and reversion:

- Dynamic Server 7.30
- Dynamic Server 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x
- Workgroup Edition 7.24

The information in this chapter for Dynamic Server 7.3x also applies to Dynamic Server, Linux Edition 7.3x, and the information for Dynamic Server 7.24 also applies to Workgroup Edition 7.24. Except for the conversion procedure, the information for Dynamic Server 7.3x also applies to Workgroup Edition 7.3x.

This chapter does not describe the procedures for migrating from earlier database servers. For information on how to migrate to Dynamic Server 7.3x or 7.24 from OnLine 5.1x, see Chapter 6, "Migrating to Dynamic Server 7.3x or 7.24 from OnLine 5.1x." For information on how to migrate to Dynamic Server 7.3x or 7.24 from other earlier database servers, see the 9.2/8.3 version of the *IBM Informix Migration Guide*.

For information on how to convert from OnLine 5.1x, see Chapter 6, "Migrating to Dynamic Server 7.3x or 7.24 from OnLine 5.1x." For information on how to move data between different kinds of database servers or between database servers on different operating systems, see Chapter 8, "Migrating to Extended Parallel Server 8.40 from a 7.3x or 7.2x Database Server," Chapter 9, "Migrating to Dynamic Server AD/XP 8.21 from a 7.2x Database Server,", or Chapter 10, "Migrating Between Database Servers and Operating Systems."

When you convert to a newer version of a database server, you might want to convert database applications to take advantage of new features. The release notes files that accompany the software describe new features.

This chapter covers the following topics:

- Preparing for migration
- Converting to Dynamic Server 7.3x
- Migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x
- Reverting from Dynamic Server 7.3x

Preparing for Migration

To prepare for migration to Dynamic Server 7.3x, you need to understand the guidelines for migrating between database servers. You also need to know about any new features that might affect migration, described under "Changes in Dynamic Server 7.3x" on page 5-7.

When you migrate from one version of the database server to another, consider the following guidelines:

- Review the release notes for the version of your database server for information about new features, installation, and fixes to problems. Modify applications as needed.

  The release notes are in one of the following directories:

  UNIX/Linux

  - **$INFORMIXDIR/release/en_us/0333**. ♦

  Windows

  - **%INFORMIXDIR%\release\en_us\0333**

    Release notes are in the **Informix** folder. To display this folder, choose **Start→Programs→Informix** from the Task Bar. ♦
- Retain both versions of the IBM Informix product software on disk, if you have enough disk resources. On Windows, you can retain multiple versions of IBM Informix products as of Dynamic Server 7.30.
- Check the documentation notes for information about features not covered in the manuals.
- Retain the installation media from both versions of the IBM Informix product software.

- Make a level-0 backup of the database server before and after migration.
- Verify storage-manager validation for the target database server.

  For details, see "Verify and Install a Validated Storage Manager" on page 5-13.

For additional installation information and guidelines, refer to your *Installation Guide* and your *Getting Started Guide*.

Changes in Dynamic Server 7.3x

This section lists new and changed environment variables, configuration parameters, new SQL reserved words, and new and changed features that affect migration.

Environment Variable Changes in Dynamic Server 7.3x

Dynamic Server 7.3x introduced several new environment variables and maintains several otherwise obsolete environment variables for backward compatibility. The *IBM Informix Guide to SQL: Reference* describes the following new environment variables:

INFORMIXKEYTAB
IFX_DIRECTIVES

Dynamic Server 7.3x includes the IBM Informix Storage Manager (ISM), a backup and recovery media-management utility, with new environment variables. For more information, refer to the *IBM Informix Storage Manager Administrator's Guide*.

New Configuration Parameters in Dynamic Server 7.3x

Dynamic Server 7.3x introduced the following new configuration parameters. The *IBM Informix Dynamic Server Enterprise Replication Guide* describes configuration parameters that start with CDR. The *IBM Informix Storage Manager Administrator's Guide* describes ISM parameters. Your *Performance Guide* describes optimizer configuration parameters. Your *Administrator's Guide* describes other parameters.

UNIX/Linux

- CDR_DSLOCKWAIT
- CDR_EVALTHREADS
- CDR_LOGBUFFERS
- CDR_QUEUEMEM
- DIRECTIVES (optimizer directives)
- ISM_DATA_POOL
- ISM_LOG_POOL
- OPT_GOAL
- RESTARTABLE_RESTORE (defaults to 'Off')
- SYSALARMPROGRAM
- TBLSPACE_STATS ♦

Windows

- LOG_BACKUP_MODE
- OPTICAL_LIB_PATH (For new optical functionality)
- STAGEBLOB (new for Windows) ♦

New SQL Reserved Words in Dynamic Server 7.3x

Dynamic Server 7.3x supports new SQL keywords that are reserved words and might affect migration of your applications. Although you can use almost any word as an SQL identifier, syntactic ambiguities can occur. An ambiguous statement might not produce the results you want.

This section lists the new SQL reserved words. For more information about SQL reserved words, see the *IBM Informix Guide to SQL: Syntax*.

The following SQL keywords are new in Dynamic Server 7.31:

INNER	LEFT	RETAIN
JOIN	LOCKS	

The following SQL keywords are new in Dynamic Server 7.30:

ALL_ROWS	FIRST_ROWS	REPLICATION
CASE	MEMORY_RESIDENT	SUBSTR
CRCOLS	NON_RESIDENT	SUBSTRING
DECODE	NVL	

New Features in Dynamic Server 7.3x

Dynamic Server 7.3x introduced several features that affect migration. These features include new built-in functions to the database server, changes to backup and restore mechanisms, and multiple residency options on Windows. For Dynamic Server 7.3x, the IBM Informix Enterprise Command Center (IECC) interface is available on UNIX or Linux and Windows.

New Functions

The following new built-in functions are available in Dynamic Server 7.3x to facilitate migration to Informix database servers:

DECODE	**TO_CHAR**	**SUBSTR**
NVL	**LPAD**	**SUBSTRING**
TO_DATE	**RPAD**	**REPLACE**

The names of these functions are reserved words in the database server. For more information on these functions, see the *IBM Informix Guide to SQL: Syntax*.

ON-Bar Backup and Restore System

Dynamic Server 7.30 includes ON-Bar, **ontape**, and ON-Archive for backup and recovery. If you migrate from an earlier version of the database server, you might want to convert to ON-Bar from **ontape** or ON-Archive. For more information on ON-Bar, refer to your *Backup and Restore Guide*.

In 7.3x, ON-Bar uses ISM to read data from or to write data to tape or disk. You can administer ISM through the ISM Administrator, which you can start from IECC. For more information on ISM, refer to the *IBM Informix Storage Manager Administrator's Guide*.

Important: *To restore data, always use the same backup and restore method you used to create your backup.*

Windows

Multiple Residency and High Availability

As of Dynamic Server 7.30, *multiple residency* is available on Windows. Multiple residency enables multiple database servers and their associated shared memory and disk structures to coexist on a single computer. Each instance of the database server has its own **INFORMIXSERVER**, **INFORMIXDIR**, and **ONCONFIG** values.

In Dynamic Server 7.3x on Windows, multiple residency enables you to install the database server as a cluster-aware application, which in turn can facilitate high availability. A cluster-aware application is an application that is registered with the resource manager and provides dynamically linked libraries (resource DLLs).

Tip: *A 7.2x or 5.1x database server cannot coexist with Dynamic Server 7.3x because multiple residency is available only as of 7.30. If an earlier version of the database server is present, you must uninstall it and reinstall the new version to migrate on Windows. The installation process uses configuration files from the earlier version. For more information on how to install Dynamic Server 7.3x on Windows, see your "Installation Guide."*

High availability provides redundant components in a cluster of two or more nodes at an operating-system level. Whenever a failure occurs on one node (one Windows computer), the cluster manager restarts the failed application on the surviving node. The cluster manager and resource manager detect failures and communicate to other subsystems and applications.

Tip: *When you convert a database server, you might need to reinstall backups of the target database server to ensure that an entire cluster is converted.*

For more information on multiple residency and high availability, see your *Administrator's Guide*.

Converting to Dynamic Server 7.3x

This section describes how to convert to Dynamic Server 7.31 from Dynamic Server 7.30 or to Dynamic Server 7.3x from Dynamic Server 7.24. The instructions for Dynamic Server 7.3x also apply to Dynamic Server, Linux Edition 7.3x. The instructions for Dynamic Server 7.3x and 7.24 also apply to Workgroup Edition 7.3x and 7.24, respectively. You should have completed the preparatory steps, described in "Preparing for Migration" on page 5-6.

When you convert, you can install and test Dynamic Server 7.3x with the same database server name, configuration files, environment variables, and **sqlhosts** information or registry information that you used for the earlier version. After you install Dynamic Server 7.3x and verify that it works, you might want to modify the configuration files and environment variables to take advantage of new features.

Important: *When you convert to Dynamic Server 7.31 from Dynamic Server 7.30, keep track of all newly created or modified objects in the 7.31 database server. This will ensure a timely reversion to Dynamic Server 7.30 in case of problems. Any new or modified objects would need to be dropped before reversion because they cannot be reverted. The reversion utility,* ***onmode -b****, does not have a 7.30 option to find and revert incompatible database objects from Version 7.31 to Version 7.30.*

Before you migrate your database server, complete the following steps, which the next sections describe:

1. Install the latest maintenance release for the source database server.
2. Verify and, if necessary, install a storage manager.
3. Check available space and system requirements.
4. Save copies of the current configuration files.
5. Shut down your database server.
6. Verify the integrity of the data.
7. Back up your database server files.

Important: *Repeat steps 4 through 7 for each instance of the database server that you are migrating.*

When you convert your database server, complete the following steps, which the sections that follow describe in detail:

1. Save an output file of SQL statements for access paths.
2. Bring the source database server offline.
3. On UNIX or Linux, change kernel parameters. ♦ (UNIX/Linux)
4. Install Dynamic Server 7.3x.
5. Install IECC.
6. Customize the database server environment.
7. Update the ONCONFIG configuration file. (UNIX/Linux)
8. For ON-Archive, update the configuration files. ♦
9. For Enterprise Replication, configure the database server.
10. Install and configure SNMP. ♦ (Windows)
11. Bring Dynamic Server 7.3x online.
12. For ON-Bar, rename the **sm_versions.std** file.
13. Update statistics.
14. Verify the integrity of the data.
15. Make an initial backup of Dynamic Server 7.3x.
16. Verify the access paths of your SQL statements.
17. Complete migration.
18. Adapt your programs for Dynamic Server 7.3x.
19. Change database server definitions.

Install the Latest Maintenance Release for the Source Database Server

Install the latest maintenance release for your current database server before you migrate to a new version. For additional information, refer to the installation guide for your database server and the chapters on installation and configuration in your *Administrator's Guide*.

Verify and Install a Validated Storage Manager

When you convert to a new version of Dynamic Server, the storage manager that you used on the source database server might not be validated for the version of the database server to which you are migrating. Verify that the storage manager has been validated for the target database server version and platform by checking the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a validated storage manager before you perform backups with the ON-Bar backup and restore system.

When you migrate to Dynamic Server 7.3x, install the storage manager before you bring up the database server. Then if you have automatic log backup set up on the Dynamic Server 7.3x, ON-Bar can start backing up the logs when the new database server comes online.

Warning: *If you migrate IBM Informix Storage Manager (ISM) Version 1.0 catalogs to ISM Version 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. Once the ISM Version 2.0 server is restarted after catalog migration, error messages occur in various logs.*

For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Check Available Space and System Requirements

The database server requires 1100 free pages of logical-log space (around 2000 kilobytes) to build the **sysmaster** database. Before you install your database server and IECC, verify that your system meets the minimum space and hardware requirements. Dynamic Server 7.3x requires 15 to 20 percent more space than Dynamic Server 7.24 because 7.3x includes administration tools, such as IECC and the Relational Object Manager.

Save Copies of the Current Configuration Files

Save copies of the configuration files for each instance of your source database server. Keep the copies available to use later. Save the configuration files that Figure 5-1 lists, if they exist.

Figure 5-1
Dynamic Server 7.30 or 7.24 Configuration Files

UNIX or Linux	Windows
$INFORMIXDIR/etc/$ONCONFIG	**%INFORMIXDIR%\etc\ONCONFIG**
$INFORMIXDIR/etc/onconfig	**%INFORMIXDIR%\etc\onconfig**
$INFORMIXDIR/etc/onconfig.std	**%INFORMIXDIR%\etc\onconfig.std**
$INFORMIXDIR/etc/sm_versions	**%INFORMIXDIR%\etc\sm_versions**
$INFORMIXDIR/aaodir/adtcfg *	**%INFORMIXDIR%\aaodir\adtcfg.***
$INFORMIXDIR/dbssodir/adtmasks *	**%INFORMIXDIR%\dbssodir\adtmasks.***
$INFORMIXDIR/etc/sqlhosts	
$INFORMIXDIR/etc/termcap	
$INFORMIXSQLHOSTS	

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of the following file:

UNIX or Linux: **$INFORMIXDIR/etc/ixbar.<*servernum*>**

Windows: **$INFORMIXDIR\etc\ixbar.<*servernum*>**

UNIX/Linux

If you use ON-Archive to back up and restore your database server and the logical logs, you must also copy and save the configuration files in the following list:

$INFORMIXDIR/etc/$ARC_CONFIG
$INFORMIXDIR/etc/config.arc
$INFORMIXDIR/etc/oper_deflt.arc
$INFORMIXDIR/etc/tctermcap
♦

Windows

ON-Archive is not available on Windows. ♦

Shut Down the Source Database Server

Before you shut down the source database server, communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and place your database server in quiescent mode (also called *administration mode*).

To shut down the database server gracefully

1. Warn all users that you plan to shut down the database server and wait for them to exit.
2. Become user **informix** on UNIX or Linux or a member of the **Informix-Admin** group on Windows.

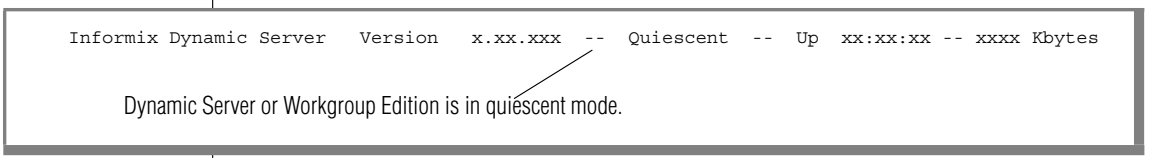
   Windows

   Use **Services** in the Windows **Control Panel**. ♦
3. Execute the following command to put the database server in quiescent mode:

   ```
   onmode -sy
   ```
4. Wait until your database server is in quiescent mode.

   To verify the mode of your database server, execute the **onstat -** command. The first line of the onstat output contains the status of your database server. Figure 5-2 shows that the database server is in quiescent mode.

Figure 5-2
Example of onstat Status Line



5. Execute the following command to force a new logical log:

   ```
   onmode -l
   ```

6. Execute the following command to force a checkpoint:

```
onmode-c
```

7. Execute the following command to shut down the database server:

```
onmode -yuk
```

Tip: *Monitor your log activity to verify that all commands were executed properly and to check for inconsistencies prior to migration.*

Verify the Integrity of the Data

Use the oncheck utility to verify the integrity of the data before you make a level-0 (complete) backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes. First, you need to obtain a list of the databases on your database server.

Figure 5-3 lists the **oncheck** commands that verify data integrity. It is recommended that at a minimum you run the **-cr** and **-ce** options.

Figure 5-3
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

Back Up the Source Database Server Files

Use your preferred backup method (ON-Bar, **ontape**, or ON-Archive) to make a complete (level-0) backup of each database server that you plan to migrate.

UNIX/Linux

To start a backup of the database server on UNIX or Linux, you can enter **$INFORMIXDIR/bin/bar** where the database server is installed. ♦

Windows

On Windows, you can double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group.

The Windows environment does not support ON-Archive. ♦

Tape parameters must specify a valid tape device. Be sure to retain and properly label every tape volume that contains a backup.

For more information about how to use ON-Bar, **ontape**, or ON-Archive to back up your database server, refer to your *Backup and Restore Guide* or your *Archive and Backup Guide*.

Warning: *Backups that you make under earlier versions of the database server are not compatible with later versions. Do not try to restore a backup of an earlier database server to a later version.*

Save an Output File of SQL Statements for Access Paths

Save a file of output from any SET EXPLAIN statements. Later you can use this file to verify that access paths of your SQL statements do not change when you migrate to your target database server. SET EXPLAIN writes the access path that the optimizer chooses for each query to the SET EXPLAIN output file. The optimizer chooses the fastest path of execution for table joins.

Windows

For Windows, the SET EXPLAIN output filename is **%INFORMIXDIR%\sqlexpln***username***.out**. ♦

Bring the Source Database Server Offline

Shut down your database server to ensure that all common files are inactive.

The database server must be offline because the older and newer versions of the database server share common files. You cannot install the new database server if any of the common files are active.

Windows

The installation program automatically shuts down the old database server and starts the new database server. ♦

UNIX/Linux

On UNIX or Linux, Change Kernel Parameters

You might need to change some of the kernel parameters for your UNIX or Linux operating system before you install Dynamic Server 7.3x. To reconfigure the operating system, follow the directions in the machine notes file included on your Dynamic Server 7.3x distribution media and the kernel-configuration instructions for your operating system.

Install Dynamic Server 7.3x

To install Dynamic Server 7.3x, you must be logged in as user **root** on UNIX or Linux, or you must be a member of the **Administration** group on Windows. Set the **INFORMIXDIR** environment variable to the directory where you plan to install your database server.

UNIX/Linux

The installation script installs your database server into the **INFORMIXDIR** directory specified for user **root.** The installation script does not bring the database server online. ♦

Windows

The setup program installs and brings up the database server on Windows.

Use the **Setup** program to specify the network protocol and the computer on which Dynamic Server 7.3x looks for the database server definitions (**sqlhosts** and **osahosts** definitions). ♦

To install your database server, follow the directions in your *Installation Guide*.

Warning: *If you install Dynamic Server 7.3x in the same directory where the earlier version of the database server resides, the newer version overwrites the older files. If you want to preserve the files for the earlier version, you must install the newer database server in a different directory.*

Before you overwrite the older version, take the following precautions:

- If you do not have the original media for the older version, back up the **INFORMIXDIR** directory before you install your target database server.
- Copy the configuration file(s) in **INFORMIXDIR** in the **etc** directory to another location on the file system.

UNIX/Linux

When you finish the installation and system reconfiguration, exit as user **root** and log on as user **informix**. ♦

Windows

On Windows, you need to run the Installation wizard twice. First, convert the database server and then install the administration tools.

The Installation wizard replaces the files but does not reconfigure the database server. If a previous version of the database server is on the computer, the **Upgrade** page appears when you install the new product.

The installation program automatically verifies and brings down your source database server, copies the new files, and preserves the database configuration information. The installation program starts your target database server with the same configuration and shared-server computer. ♦

Install IBM Informix Enterprise Command Center

After you install the database server, install the administration tool, IECC.

Windows

After you install the database server or IECC or both, IECC is available in your Windows environment. ♦

You can install Dynamic Server 7.3x and IECC either on the same computer or on different computers. For example, you can install IECC on a personal computer that runs Windows 95 or Windows NT and the database server on a UNIX computer. The installation program also starts the server agent, which is the communications link between Dynamic Server 7.3x and the IECC client.

For information on how to install IECC, refer to the *IBM Informix Enterprise Command Center Installation Guide*. For information about how to use IECC, refer to the *IBM Informix Enterprise Command Center User Guide*.

Verify Port Numbers and Services File

The **services** file contains service names, port numbers, and protocol information. If you installed the database server and the administration tools on different computers, verify that the port number listed in the **services** file is the same on the client and on the server computers.

UNIX/Linux

For UNIX or Linux operating systems not running NIS, the **services** file resides in the **/etc/services** directory on the database server and in the **\windir\services** directory on the Windows 95 client. ♦

Windows

The **services** file resides in the **\windir\system32\drivers\etc** directory on Windows. ♦

Customize the Dynamic Server 7.3x Environment

After you install your database server, ensure that the following environment variables are set to the correct values:

INFORMIXSERVER	**PATH**
ONCONFIG	**INFORMIXSQLHOSTS** (if used)

Important: *On UNIX or Linux, the client application looks for the* ***sqlhosts*** *file in the* ***etc*** *directory in the* ***INFORMIXDIR*** *directory. On Windows,* ***INFORMIXSQLHOSTS*** *points to the computer that contains the* ***sqlhosts*** *registry information. However, you can use the* ***INFORMIXSQLHOSTS*** *environment variable to change the location or name of the* ***sqlhosts*** *file.*

Windows

On Windows, the installation program sets the configuration parameters and environment variables for you. However, you can customize the configuration parameters in the ONCONFIG file and environment variables for your database server. Use **Setnet32** to customize the environment variables on the client computer. ♦

For more information on environment variables, see the *IBM Informix Guide to SQL: Reference*.

UNIX/Linux

Update the ONCONFIG Configuration Parameters

You can customize your ONCONFIG configuration file to take advantage of the new features that Dynamic Server 7.3x introduced. Use a text editor to edit the ONCONFIG file. For more information on customizing configuration parameters, see your *Installation Guide*.

For example, you can add and adjust new ISM configuration parameters. After you observe the performance of your database server, you might want to make further adjustments.

Important: *Use the same values for the target database server for ROOTOFFSET, ROOTSIZE, and ROOTPATH that you used for the source database server. Also, use the same values for size and number of physical logs, logical logs, and for mirroring (if available).*

For information on how to configure your database server, see your *Administrator's Guide*. For information about how to tune the configuration parameters, see your *Performance Guide*.

Update the Configuration Files

During the installation procedure, the install script checks the **etc** directory in the **INFORMIXDIR** directory for files named **config.arc**, **oper_deflt.arc, termcap, logevent.sh, sessalrm,** and **permalrm**. If these files do not exist, the install script provides them. If the files do exist, the install script does not overwrite the files. Instead, the install script provides additional files named **Config.arc**, **Oper_deflt.arc, Termcap, Logevent.sh, Sessalrm,** and **Permalrm** (note the initial uppercase letters).

Compare your current versions of the files with the new versions and determine whether new or changed configuration parameters or qualifiers exist.

Prepare Dynamic Server 7.3x to Use Enterprise Replication

Perform this step only if you plan to use Enterprise Replication with your database server.

Before you can activate Enterprise Replication, you need to update the **sqlhosts** file or registry key for each database server that participates in Enterprise Replication.

To activate Enterprise Replication for the first time

1. Bring your database server offline.
2. Define a **group name** for Enterprise Replication.
3. Assign a **group identifier** to the group and include this group ID in the **sqlhosts** option key or column.
4. Bring your database server online.
5. If you plan to use the Enterprise Replication Monitoring Program, verify that the SNMP service is installed on the host and that the SNMP subagents are registered.

   Dynamic Server 7.31 does not include the Enterprise Replication Monitoring Program.
6. Use the Replication Manager to define each database server for replication.

   This step starts Enterprise Replication.

When you convert to Dynamic Server 7.3x, the conversion upgrades the **syscdr** database and the **sysmaster** and **sysutils** databases and system tables to Version 7.3x. When you convert to Dynamic Server 7.3x from Dynamic Server 7.24, the Enterprise Replication state is the same in Version 7.3x as it was in Version 7.24.

For information on how to configure Enterprise Replication, refer to the *IBM Informix Dynamic Server Enterprise Replication Guide*. For information on how to use SNMP, refer to the *IBM Informix SNMP Subagent Guide*.

Windows

Install and Configure SNMP

If you plan to use the Enterprise Replication Monitoring Program in Dynamic Server 7.30, you must install SNMP. Enterprise Replication does not require SNMP. The SNMP management tools use the **OnSnmpSubagent** to respond to queries.

Bring Dynamic Server 7.3x Online

UNIX

When you bring your target database server online for the first time, bring it first to quiescent mode and then to online mode. Execute the following command to bring your database server from offline mode to quiescent mode:

```
oninit -s
```

After the database server is in quiescent mode, check the message log for status messages.

Important: *If you note problems in the message file, solve the problems before you continue to the next step.*

Execute the following command to change your database server mode from quiescent mode to online mode:

```
onmode -m
```

The **sysmaster** and **sysutils** databases are created after your database server is brought online.

Warning: *The logical logs continue to fill with the transactions that result from the creation of the* ***sysmaster*** *database. If you run out of log space before the creation of the* ***sysmaster*** *database is complete, the database server halts with a "Logs Full" error. Thus, you must back up the logical logs.*

Use ON-Bar, **ontape**, or ON-Archive to back up logical logs. ♦

Windows

The setup program on Windows brings your database server online automatically. ♦

If you customized the database server environment, you can use IECC to bring down and restart the database server. When you restart the database server, the changes to the configuration parameters and environment variables take effect.

You can start the database server with or without the IECC interface. For more information, see the *IBM Informix Enterprise Command Center User Guide* or your *Installation Guide*.

Rename the sm_versions.std File for ON-Bar

After installation of the database server, you need to rename the **sm_versions.std** file to **sm_versions** for the ON-Bar backup and restore system to run. If you did not upgrade IBM Informix Storage Manager (ISM), you can copy the same **sm_versions** file from your source database server to the target database server installation.

Update Statistics

After you complete the migration procedure, execute the UPDATE STATISTICS statement according to the recommended procedure in the *IBM Informix Guide to SQL: Syntax*. UPDATE STATISTICS updates the information that your database server uses to plan efficient queries. For more information about UPDATE STATISTICS, refer to the *IBM Informix Guide to SQL: Syntax*.

Verify the Integrity of the Data

Before you give users access to the databases, use the oncheck utility to verify that no data was corrupted in the migration process. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes. For more information, see "Verify the Integrity of the Data" on page 5-16.

Make an Initial Backup of Dynamic Server 7.3x

Use your database server backup utility to make a level-0 backup. Do not overwrite the tapes you used earlier when you made the final backup of your source database server.

UNIX/Linux

On UNIX or Linux, use ON-Bar, **ontape**, or ON-Archive to make the backup. ♦

Windows

On Windows, double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group. ♦

For more information about making a backup, refer to your *Backup and Restore Guide* or your *Archive and Backup Guide*.

Important: *Do not restore the backed-up logical logs from the earlier version of your database server to the newer version of your database server.*

Verify the Access Path of the SQL Statements

Use the SET EXPLAIN statement to verify that the access path of your SQL statements did not change when you migrated to your target database server. If you have SET EXPLAIN output from the source database server, run SET EXPLAIN for your target database server. Compare the SET EXPLAIN output from both the source and target database servers. SET EXPLAIN writes the access path that the optimizer chooses for each query to the SET EXPLAIN output file. The optimizer chooses the fastest path of execution for table joins.

Windows

For Windows, the SET EXPLAIN output filename is **%INFORMIXDIR%\sqlexpln***username***.out**. ♦

If the SET EXPLAIN output file shows that a different access path was used, complete the following steps:

1. Check the **OPTCOMPIND** environment variable or configuration parameter.
2. Check the **DBSPACETEMP** environment variable or configuration parameter to ensure that adequate temporary dbspaces are defined. You might need to define more temporary dbspaces.
3. Analyze the query access paths and modify the schema to improve the performance, if necessary.

Complete Migration

The first time your target database server is brought online, the **sysmaster** database is built. Check the message log to ensure that the **sysmaster** database build is complete before you allow users to access the database server. After you complete a level-0 backup and you ensure that client users can access data on your database server, the migration process is complete.

After you successfully migrate to Dynamic Server 7.3x, you might want to seek ways to obtain maximum performance. If you created sample queries for comparison, you can use them to characterize the performance differences between your earlier version and your new version. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on topics related to performance, refer to your *Performance Guide*.

Adapt Your Programs for Dynamic Server 7.3x

After you successfully migrate to Dynamic Server 7.3x from Workgroup Edition 7.3x or 7.24, verify that your application developers know the differences between the database servers. Workgroup Edition supports the same features as Dynamic Server 7.3x except for the High-Performance Loader (HPL) and the following features:

- Fragmentation (also known as partitioning)
- Parallel data query (PDQ)
- Role separation

For information on the SQL statements that Workgroup Edition supports, see the *IBM Informix Guide to SQL: Syntax* and the *IBM Informix Guide to SQL: Reference*.

Change Database Server Definitions

Use IECC if you want to change the **informix** user password, specify a different computer as the shared-server computer, or edit database server definitions (the database server name, TCP/IP host names, network types, and the service names). For example, you might specify a different shared-server computer if you have migrated the database server to a new computer or connected a single client to several database servers.

Windows

The installation program automatically updates the Windows registry information. ♦

For information on how to use IECC to configure database servers, see the *IBM Informix Enterprise Command Center User Guide*. For information on connectivity, see your *Administrator's Guide*.

Migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x

This section describes the steps for migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x on the same operating system.

Migration of data to Workgroup Edition 7.3x from Dynamic Server 7.3x is automatic if the database servers share the same operating system. Automatic migration means you do not need to use a migration utility such as **dbexport** to move the data; the migration occurs automatically when you bring up the target database server. The same operating system can be UNIX on the same computer, Windows NT on the same computer, or the same version of Windows NT on different computers.

For information about migrating to a different operating system, see "Moving Data to a Database Server on a Different Operating System" on page 10-5.

To migrate on the same operating system, complete the following migration steps, which later sections describe in detail:

1. Save a copy of the current configuration files.
2. Verify the integrity of the data.
3. Make a final, complete backup of the source database server.
4. Bring the source database server offline.
5. Install and configure the Workgroup Edition 7.3x.
6. Verify port numbers and **services** file.
7. Customize the database server environment. (This step is optional.)
8. Bring Workgroup Edition 7.3x online.
9. Verify the integrity of the data.
10. Make an initial, complete backup of Workgroup Edition 7.3x.
11. Run UPDATE STATISTICS.
12. Complete migration.
13. Adapt your programs for Workgroup Edition 7.3x.

Save a Copy of the Current Configuration Files

Save a copy of the current configuration files that you have modified. These should include the following files:

- Current ONCONFIG file, located in the **etc** subdirectory of your installation directory
- **sqlhosts** information
- **adtcfg**, located in the **aaodir** subdirectory
- **adtmasks.***, located in the **dbssodir** subdirectory
- ON-Archive configuration files, located in the **etc** subdirectory

Verify the Integrity of the Data

Use the **oncheck** utility to verify the integrity of the data. Figure 5-4 lists the commands for verifying data integrity.

Figure 5-4
Commands for Verifying Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

Back Up the Source Database Server

Use your preferred backup method to make a complete (level-0) backup of Dynamic Server 7.3x.

Windows

The Windows environment does not support ON-Archive. ♦

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup. For more information on how to make backups, refer to your *Archive and Backup Guide*.

Shut Down the Source Database Server

Before you shut down Dynamic Server 7.3x, communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and place your database server in quiescent mode (also called *administration mode*).

To shut down the source database server gracefully

1. Warn all users that you plan to shut down the database server and wait for them to exit.
2. Become user **informix** on UNIX or Linux. On Windows, you must be a member of the **Informix-Admin** group

   Windows

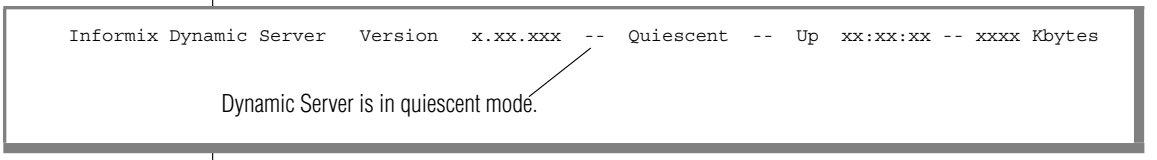
   Use **Services** in the Windows **Control Panel**. ♦
3. Execute the following command to take the database server to quiescent mode:

   ```
   onmode -sy
   ```

4. Wait until your database server is in quiescent mode.

   To verify the mode of your database server, execute the **onstat -** command. The first line of the onstat output contains the status of your database server. Figure 5-5 shows that the database server is in quiescent mode.

Figure 5-5
Example of onstat Status Line



5. Execute the following command to force a new logical log:

   ```
   onmode -l
   ```

6. Execute the following command to force a checkpoint:

   ```
   onmode -c
   ```

7. Execute the following command to shut down the database server:

   ```
   onmode -yuk
   ```

Tip: *Monitor your log activity to verify that all commands were executed properly and to check for inconsistencies prior to migration.*

Install and Configure Workgroup Edition 7.3x

Follow the instructions in your *Installation Guide* to install and configure Workgroup Edition 7.3x.

You can install Workgroup Edition 7.3x and IBM Informix Enterprise Command Center (IECC) either on the same computer or on different computers. For example, you can install IECC on a personal computer that runs Windows 95 or Windows NT and the database server on a UNIX computer. The installation program also starts the server agent, which is the communications link between Dynamic Server, Workgroup and Developer Editions, and the IECC client.

Use the **Setup** program to specify the network protocol and the computer on which Workgroup Edition 7.3x looks for the database server definitions (**sqlhosts** and **osahosts** definitions).

Verify Port Numbers and Services File

The **services** file contains service names, port numbers, and protocol information. If you installed the database server and the administration tools on different computers, verify that the port number listed in the **services** file is the same on the client and on the server computers.

UNIX/Linux

For UNIX or Linux operating systems not running NIS, the **services** file resides in the **/etc/services** directory on the database server and in the **\windir\services** directory on the Windows 95 client. ♦

Windows

The **services** file resides in the **\windir\system32\drivers\etc** directory on Windows. ♦

Customize the Environment for Workgroup Edition 7.3x

If you are an advanced user, you can customize the ONCONFIG configuration file and environment variables for Workgroup Edition 7.3x. Use a text editor to edit the ONCONFIG file. For more information on configuration parameters, refer to your *Installation Guide*.

Important: *Use the same values for your target database server for ROOTOFFSET, ROOTSIZE, and ROOTPATH that you used for your source database server.*

You might want to customize new environment variables on the client. For more information on environment variables, refer to the *IBM Informix Guide to SQL: Reference*.

Bring Workgroup Edition 7.3x Online

UNIX/Linux

To start Workgroup Edition 7.3x at the UNIX or Linux command line, enter `oninit` on the server computer. ♦

Windows

The installation program on Windows brings the target database server online automatically. ♦

If you customized the database server environment, you can bring down and restart your database server with IECC. For more information, refer to the *IBM Informix Enterprise Command Center User Guide*.

When you restart Workgroup Edition 7.3x, the changes to the configuration parameters and environment variables take effect.

Verify the Integrity of the Data

To verify the integrity of data, use the **oncheck** utility, as "Verify the Integrity of the Data" on page 5-28 describes.

Back Up Workgroup Edition 7.3x

Make a complete, whole-system backup of Workgroup Edition 7.3x.

UNIX/Linux

On UNIX or Linux, use ON-Bar, **ontape**, or ON-Archive to make the backup. ♦

Windows

On Windows, double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group. ♦

For more information on backing up, refer to your *Backup and Restore Guide* or *Archive and Backup Guide*.

Update Statistics

After you complete the migration procedure, run the UPDATE STATISTICS statement on the databases. The UPDATE STATISTICS statement updates the information that Workgroup Edition 7.3x uses to plan efficient queries. For more information about UPDATE STATISTICS, see the *IBM Informix Guide to SQL: Syntax*.

Complete Migration

The first time your target database server is brought online, the **sysmaster** and the **sysutils** databases are built. Check the message log to ensure that the **sysutils** and **sysmaster** databases are created successfully before you allow users to access the database server. After you ensure that client users can access data on Workgroup Edition 7.3x, the migration process is complete.

Adapt Your Programs for Workgroup Edition 7.3x

After you successfully migrate the database server data, verify that your application developers know the differences between the source and target database servers. Workgroup Edition 7.3x supports the same features as Dynamic Server 7.3x, except for the High-Performance Loader (HPL) and the following features:

- Fragmentation (also known as partitioning)
- Parallel data query (PDQ)
- Role separation

For information on the SQL statements that Workgroup Edition 7.3x supports, see the *IBM Informix Guide to SQL: Syntax* and the *IBM Informix Guide to SQL: Reference*.

Reverting from Dynamic Server 7.3x

This section describes the steps to revert from Dynamic Server 7.3x to Dynamic Server 7.30 or Dynamic Server 7.24. When you revert, you need to consider changes in the definitions of configuration parameters and environment variables.

Follow the preparatory steps, described in "Preparing for Migration" on page 5-6, and then complete the following steps.

To revert from Dynamic Server 7.3x to a 7.30 or 7.24 database server

1. Remove unsupported SQL features and newly created objects.
2. Save system catalog information (for reversion to Version 7.24).
3. Stop and uninstall Enterprise Replication, if it is installed.
4. Uninstall IECC.
5. Close all transactions and put the source database server in quiescent mode.
6. Verify the integrity of the data.
7. Back up the source database server.
8. For reversion to Dynamic Server 7.24, run the reversion utility (**onmode -b 7.2**).
9. Modify configuration parameters.
10. Reset environment variables.
11. Reinstall the 7.30 or 7.24 database server.
12. Install and configure SNMP.
13. Bring the 7.30 or 7.24 database server online.
14. Verify the integrity of the data.
15. Back up the 7.30 or 7.24 database server files.
16. Return the 7.30 or 7.24 database server to online mode.
17. Complete the reversion.

Warning: *On Windows, for reversion from Dynamic Server 7.30, you need to uninstall Enterprise Replication Manager and your database server and then reinstall the old version of your database server. You cannot have two versions installed concurrently.*

Remove Unsupported SQL Features and Newly Created Objects

Before you revert, you must remove SQL features that the earlier version of your database server does not support. For reversion from Dynamic Server 7.31 to Dynamic Server 7.30, you also need to drop all database objects that were created since conversion to Dynamic Server 7.31.

For information about new SQL features, see "Changes in Dynamic Server 7.3x" on page 5-7 and the *IBM Informix Guide to SQL: Syntax*.

Save System Catalog Information

If your current database server instance uses secure-auditing masks or ON-Archive, and you want to preserve the associated catalog information, you must unload these system catalog tables before you continue. Execute the following command to unload the system catalog tables:

```
$INFORMIXDIR/etc/smi_unld
```

When the **smi_unld** utility finishes unloading the information, the utility displays instructions for reloading the information. *Save these instructions.*

After you complete the reversion and initialize your database server, you can reload the data that you preserved. Follow the instructions given with the **smi_unld** utility for reloading the information. Typically, you should execute the following command:

```
$INFORMIXDIR/etc/smi_load $INFORMIXDIR/etc/
```

Stop Enterprise Replication

Skip this section if Enterprise Replication is not installed on your system.

To revert to an earlier version if Enterprise Replication is active

1. Stop Enterprise Replication.
2. For altered tables with CRCOLS, issue the following command:

UNIX/Linux

```
alter table drop CRCOLS
```

♦

3. Modify any SQL SELECT statements that are larger than 255 bytes in the **partdef** table. These SELECT statements are truncated during reversion so that they fit into the table definition of the source version. Fix any SQL SELECT statements that might have been truncated before making Enterprise Replication active again.
4. Execute the **onmode -b** command to revert to the 7.30 or 7.24 database server.

Warning: *If you try to revert to a previous version of the database server while Enterprise Replication is active, the reversion will fail.*

5. After you bring up the 7.30 or 7.24 database server, type the following command to change the Enterprise Replication state to ACTIVE:

```
start_cdr
```

To revert to an earlier version if Enterprise Replication is inactive

UNIX/Linux

1. In this situation, Enterprise Replication was previously active on the source database server. For altered tables with CRCOLS, issue the command:

```
alter table drop CRCOLS
```

♦

2. Modify any SQL SELECT statements that are larger than 255 bytes in the **partdef** table. These SELECT statements are truncated during reversion so that they fit into the table definition for the older version. Fix any SQL SELECT statements that might have been truncated before you make Enterprise Replication active again.
3. Execute the **onmode -b** command to revert to the 7.30 or 7.24 database server. The **syscdr** database is dropped during reversion.

For more information, see the *IBM Informix Dynamic Server Enterprise Replication Guide*.

Uninstall IBM Informix Enterprise Command Center

Uninstall the administration tool, IECC.

Warning: *Do not check* ***Remove all OnLine databases, supporting files and all database information****. If you check this option, your configuration, dbspaces, and database information will be lost, making reversion impossible.*

For more information, see the *IBM Informix Enterprise Command Center Installation Guide*.

Close All Transactions and Put the Source Database Server in Quiescent Mode

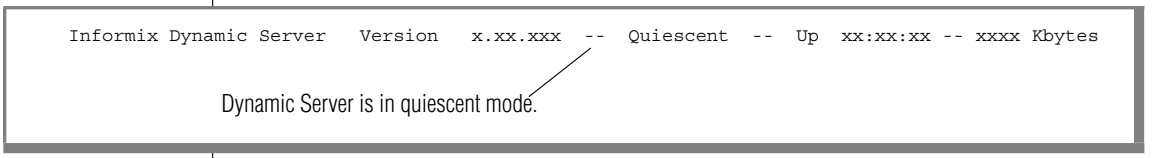
Communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and place your database server in quiescent mode (also called *administration mode*).

To shut down the database server gracefully

1. Warn all users that you plan to shut down the database server and wait for them to exit.
2. Become user **informix** on UNIX or Linux. On Windows, you must be a member of the **Informix-Admin** group.
3. Execute the **onmode –sy** command.
4. To verify the mode of your database server, execute the **onstat -** command.

   The first line of the onstat output contains the status of your database server. Figure 5-6 shows that the database server is in quiescent mode.

Figure 5-6
Example of onstat Status Line



5. Execute the following command to force a new logical log:

```
onmode -l
```

6. Execute the following command to force a checkpoint:

```
onmode-c
```

Important: *Monitor your log to verify that all commands were executed properly and to check for inconsistencies prior to migration.*

Verify the Integrity of the Data

Use the oncheck utility to verify the integrity of data before you make a level-0 (complete) backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes. First, you need to obtain a list of the databases on your database server.

Figure 5-7 lists the **oncheck** commands that verify data integrity. It is recommended that, at a minimum, you run the **-cr** and **-ce** options.

Figure 5-7
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

Back Up the Source Database Server

Make a level-0 backup of each database server that you plan to migrate. Use ON-Bar, ON-Archive, or the **ontape** utility to perform the backup.

Windows

The Windows environment does not support ON-Archive. ♦

For information about how to perform a backup, see your *Backup and Restore Guide* or your *Archive and Backup Guide*.

Warning: *Backups that you perform under older versions of your database server are not compatible with the newer version. Do not try to restore these backups to the newer version.*

Run the Reversion Utility to Revert to Dynamic Server 7.24

If you are reverting to a 7.24 database server, you need to run the reversion utility, **onmode -b**, to restore the databases to a format that is compatible with the earlier version. The 7.3x database server must be running when you execute the reversion utility. You must use this reversion utility to restore compatibility before users can access the data with the earlier version. The **onmode** utility does not revert changes made to the layout of the data that do not affect compatibility.

To revert to a 7.24 database server, execute the reversion utility:

```
onmode -b 7.2
```

The reversion utility forcibly removes all users and shuts down the database server. After the reversion is complete, the database server is offline. For more information about the **onmode -b** command, see Chapter 15, "The onmode Utility."

Tip: *The **onmode -b** command also rebuilds the user-table indexes automatically.*

Modify Configuration Parameters

Dynamic Server 7.3x uses configuration parameters that were not in earlier versions of the database server. You might want to remove or modify these configuration parameters. For more information, see "New Configuration Parameters in Dynamic Server 7.3x" on page 5-8.

Reset Environment Variables

Reset the environment variables to values that are appropriate for your version of your database server. For information on environment variables, refer to the *IBM Informix Guide to SQL: Reference*.

Reinstall the 7.30 or 7.24 Database Server

Reinstall the 7.30 or 7.24 database server in the same directory as the files for Dynamic Server 7.3x.

For installation instructions, see your *Installation Guide*.

Warning: *Do not select* ***Copy all files and reconfigure the product****. If you select this option, your configuration and database information will be lost.*

Windows

WE 7.24

Install and Configure SNMP

For Workgroup Edition 7.24, if you use Workgroup Replication on Windows NT or Windows 95, the **onsnmp** utility requires Windows SNMP. The installation and conversion program checks the registry for the SNMP master agent. If the master agent was not installed, the program displays a warning message but does not configure the registry for Workgroup Replication or **onsnmp**. If you later choose to install the SNMP master agent, you must run the **%INFORMIXDIR%\bin\inssnmp.exe** command-line utility to install the SNMP subagents. You do not need to reinstall the database server.

Bring the Target Database Server Online

Execute the following command to bring the 7.30 or 7.24 database server from offline mode to quiescent mode:

```
oninit -s
```

After the database server is in quiescent mode, check the message log for status messages.

Important: *If you note problems in the message file, solve the problems before you continue to the next step.*

Execute the following command to change your database server mode from quiescent mode to online mode:

```
onmode -m
```

The database server initializes the shared memory and builds the **sysmaster** database. After the **sysmaster** database is built, the reversion process is complete.

Warning: *If you start the database server with the* ***-iy*** *parameters after the first time, it will overwrite the existing root dbspace unless you first change the ROOTPATH parameter in the ONCONFIG file. If the database server overwrites the existing root dbspace, it destroys the information that the root dbspace contains, including information about any databases that you created. Consequently, you must then restore the databases from backup tapes.*

Verify the Integrity of the Data

Use the oncheck utility to verify the integrity of data before you make a level-0 (complete) backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes. First, you need to obtain a list of the databases on your database server.

Figure 5-8 lists the **oncheck** commands that verify data integrity. It is recommended that, at a minimum, you run the **-cr** and **-ce** options.

Figure 5-8
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

Back Up the Target Database Server Files

After you complete the reversion, make a level-0 backup. Use your preferred backup administration utility, ON-Bar, ON-Archive, or **ontape**, to make the backup. For information about how to make a backup, refer to your *Backup and Restore Guide* or your *Archive and Backup Guide*.

Important: *Do not overwrite the tapes that you used to back up your database server.*

Return the Target Database Server to Online Mode

To bring the database server online, execute the following command:

```
onmode -m
```

Complete Reversion

To complete the reversion, ensure that client users can access data on the earlier version of the database server.

Chapter

6

Migrating to Dynamic Server 7.3x or 7.24 from OnLine 5.1x

UNIX

In This Chapter

This chapter describes how to migrate to Dynamic Server 7.3x or 7.24 from OnLine 5.1x. This chapter covers the following topics:

- Preparing for migration
- Converting to a 7.3x or 7.24 database server from OnLine 5.1x
- Reverting from a 7.3x or 7.24 database server to OnLine 5.1x

Under "Preparing for Migration," this chapter lists new features since Version 5.1x in database servers earlier than 7.3x. For new features in Dynamic Server 7.3x, see "Changes in Dynamic Server 7.3x" on page 5-7.

For information about how to migrate from OnLine Dynamic Server 7.x or 6.x or from OnLine 5.0x or 4.1 to a later database server, see the 9.2/8.3 version of the *IBM Informix Migration Guide*.

ALS

If you are migrating from OnLine 5.1x with Asian Language Support (ALS), see the 9.2/8.3 version of the *IBM Informix Migration Guide* for instructions on converting databases to Global Language Support (GLS) and reverting databases to ALS. ♦

Preparing for Migration

To prepare for migration to Dynamic Server 7.3x or 7.24, you need to understand the guidelines for migration. You also need to know about any new features that might affect migration. This section describes the planning and preparations required to migrate to a 7.3x or 7.24 database server because of the changes that occurred since Version 5.1x.

Migration Guidelines

When you migrate from one version of a database server to another, consider the following guidelines:

- Review the release notes for the version of your database server for information about new features, installation, and fixes to problems. Modify applications as needed.

  The release notes are in **$INFORMIXDIR/release/en_us/0333**.
- Retain both versions of the IBM Informix product software on disk (if you have enough disk resources).
- Check the documentation notes for information about features not covered in the manuals.
- Retain the installation media from both versions of the IBM Informix product software.
- Make a level-0 backup of the database server before and after migration.
- Verify storage-manager validation.

  For details, see "Storage-Manager Validation and Installation" on page 6-33.

For installation and configuration, refer to your *Installation Guide* and your *Administrator's Guide*.

Changes in Database Servers Since OnLine 5.1x

This section describes changes to environment variables and configuration parameters and discusses database server functionality and new features that affect migration. Different versions of Informix database servers introduced the changes, which this section describes in descending version order.

Changes in Dynamic Server 7.3x

Dynamic Server 7.3x introduced new and changed environment variables, new and changed configuration parameters, new SQL reserved words, and new and changed features that affect migration. For information about these changes, see "Changes in Dynamic Server 7.3x" on page 5-7.

Changes in Earlier Database Servers

This section describes changes in database servers between Dynamic Server 7.3x and OnLine 5.1x.

In-Place ALTER TABLE New in Dynamic Server 7.24

Dynamic Server 7.24 introduced an In-Place option to the ALTER TABLE statements that was not available in previous versions. With the In-Place modifier, you can change a table without creating a duplicate copy of the table. For more information on In-Place ALTER TABLE statements, see your *Performance Guide*.

Enhancements to sqlhosts File or Registry Key in OnLine Dynamic Server 7.23

Version 7.23 of OnLine Dynamic Server introduced formatting changes and new syntax options in the **sqlhosts** file or registry key. The fifth field, the **options** field, was modified to accommodate new syntax options.

The following list is a review of the **sqlhosts** or registry fields:

```
field 1          field 2     field 3     field 4          field 5
dbservername     nettype     hostname    servicename      options
```

The **options** field can contain columns separated by a comma or white space that represents the end of the column. Client and database server applications check each column to determine whether the option is supported in the database server release.

In earlier versions, the **options** field could contain only a single character. Version 7.23 and later versions of the database server support longer names. Earlier versions, such as Version 7.10, cannot process the longer syntax.

Tip: *If you maintain more than one version of the database server on UNIX, use separate* ***sqlhosts*** *file entries for each version. Alternatively, you can use separate entries with an alias to the appropriate database server.*

Figure 6-1 lists the OnLine Dynamic Server 7.23 and later **sqlhosts** file or registry key components.

Figure 6-1
sqlhosts File or Registry Fields

dbservername	nettype	hostname	servicename	options
dbservername.server1	olsoctcp	clipper	14000	k=1,r=1 b=2000

In the sample **sqlhosts** file, the **options** field contains three options in three columns.

Column	Option
Column 1	`k=1`
Column 2	`r=1`
Column 3	`b=2000`

Important: *It is recommended that you use field 5,* ***options****, in Version 7.23 and later, for the following options only:* ***b****,* ***k****,* ***r****,* ***s****. If you do not want any of these options but do want other options, use* `k=1` *in column 5, which is the default. Place other options in subsequent columns.*

For more information on the components of the **sqlhosts** file or registry key or on how to define two **sqlhosts** files, see your *Administrator's Guide*.

Environment Variable Changes in OnLine Dynamic Server 7.2x

OnLine Dynamic Server 7.20 introduced several new environment variables and maintains several otherwise obsolete environment variables for backward compatibility.

New Environment Variables in OnLine Dynamic Server 7.2x

Figure 6-2 on page 6-10 shows new environment variables in OnLine Dynamic Server 7.2x. Review the descriptions of these environment variables to determine whether you need to set them. The **Reference** column in Figure 6-2 indicates the Version 7.2 IBM Informix manuals that provide information about these environment variables. Figure 6-2 uses the following abbreviations for the manuals:

- HPL: *IBM Informix High-Performance Loader User's Guide*
- GLS: *IBM Informix GLS User's Guide*
- ESQL/C: *IBM Informix ESQL/C Programmer's Manual*
- SQL-R: *IBM Informix Guide to SQL: Reference*

Figure 6-2
Environment Variables Introduced in Version 7.2x

Environment Variable	Variable Affects	Reference
CC8BITLEVEL	ESQL/C only	GLS
CLIENT_LOCALE	Client applications only	GLS
DBCENTURY	SQL APIs only	SQL-R, GLS
DBONPLOAD	High-Performance Loader only	SQL-R, HPL
DB_LOCALE	Database locale	GLS
ESQLMF	ESQL/C compilation	GLS
GLS8BITFSYS	8-bit clean	GLS
GL_DATE	Date format	GLS
GL_DATETIME	Time format	GLS
IFX_AUTOFREE	ESQL/C compilation	ESQL/C
NODEFDAC	Default privileges	SQL-R
ONPLOAD	High-Performance Loader	SQL-R, HPL
OPTOFC	ESQL/C compilation	ESQL/C
PLCONFIG	High-Performance Loader	SQL-R, HPL
SERVER_LOCALE	Database server locale	GLS
THREADLIB	ESQL/C only	SQL-R, ESQL/C

Tip: *The* ***IFX_AUTOFREE*** *environment variable introduced in Version 7.22 is discontinued in future releases. If you want to take advantage of this feature, use SET AUTOFREE syntax in your application.*

NLS

Environment Variables for Backward Compatibility

OnLine Dynamic Server 7.2x supports the environment variables in the following list for backward compatibility with earlier IBM Informix products. If you do not have databases and applications from pre-7.20 versions, you would not use these environment variables. Version 7.1x of the *IBM Informix Guide to SQL: Reference* describes these environment variables. The *IBM Informix GLS User's Guide* describes the interaction of these environment variables with variables that control GLS. The following environment variables maintain backward compatibility:

COLLCSHAR	**LANG**	**LC_MONETARY**
DBAPICODE	**LC_COLLATE**	**LC_NUMERIC**
DBNLS	**LC_CTYPE**	**LC_TIME**

Configuration Parameter Changes in OnLine Dynamic Server 7.2x

OnLine Dynamic Server 7.2x includes new configuration parameters that might affect your installation. You might also need to adjust the values of existing parameters. These configuration parameters are described in your *Administrator's Guide*.

Configuration Parameter Changes in OnLine Dynamic Server 7.22

The default value of ALARMPROGRAM changed.

New Configuration Parameters in OnLine Dynamic Server 7.20

OnLine Dynamic Server 7.20 introduced the following new configuration parameters:

BUFFERS (new definition)
HETERO_COMMIT
MAX_PDQPRIORITY (new definition)

Configuration Parameters That Online Dynamic Server 7.20 Dropped

OnLine Dynamic Server 7.20 did not include the following configuration parameters:

BUFFSIZE
PDQPRIORITY (the default value is always zero)

If you do not set PDQPRIORITY through the environment variable or SQL statement, PDQPRIORITY is turned off for queries (PDQPRIORITY = 0). For information on where to set environment variables, refer to the *IBM Informix Guide to SQL: Reference*.

Language Support Changes in OnLine Dynamic Server 6.0 to 7.2x

NLS

Version 6.0 of OnLine Dynamic Server introduced Native Language Support (NLS). NLS supports single-byte locales but not multibyte locales. ♦

GLS

IBM Informix Version 7.2x products use Global Language Support (GLS). GLS enables Version 7.2x and later versions of the database server to handle different languages, cultural conventions, and code sets for Asian, European, Latin American, and Middle Eastern countries. The *IBM Informix GLS User's Guide* provides a full description of GLS. ♦

Environment Variable Changes in OnLine Dynamic Server 7.10.UD1

Version 7.10.UD1 of OnLine Dynamic Server introduced the following new environment variables:

INFORMIXOPCACHE
INFORMIXSQLHOSTS
NODEFDAC
OPTCOMPIND (new definition)
PSORT_NPROCS (new definition)

Configuration Parameter Changes in OnLine Dynamic Server 7.10.UD1

Version 7.10.UD1 of OnLine Dynamic Server introduced several new configuration parameters and dropped several others.

New Configuration Parameters in OnLine Dynamic Server 7.10.UD1

Version 7.10.UD1 of OnLine Dynamic Server introduced the following configuration parameters:

LBUPRESERVE	OPCACHEMAX
ONDBSPACEDOWN	OPTCOMPIND (new default value)

Configuration Parameters That OnLine Dynamic Server 7.10.UD1 Dropped

Version 7.10.UD1 of OnLine Dynamic Server dropped the following configuration parameters. OnLine Dynamic Server allocates resources dynamically for the structures that these parameters controlled in previous releases.

CHUNKS	TBLSPACES
DBSPACES	TRANSACTIONS
USERTHREADS	

You might need to reset the value of the LOCKS configuration parameter because it previously depended on the value of TRANSACTIONS.

Configuration Parameters OnLine Dynamic Server 7.10.UD1 Moved

Version 7.10.UD1 of OnLine Dynamic Server moved the following configuration parameters from the ONCONFIG configuration file:

ADTPATH	ADTERR
ADTSIZE	ADTMODE

These configuration parameters are in the audit configuration file, **$INFORMIXDIR/aaodir/adtcfg.std**.

Changes to Blobspace Requirements in OnLine Dynamic Server 7.10.UD1

Versions of OnLine Dynamic Server before Version 7.10.UD1 marked a partition blob page as full if the page was more than one-third full. Version 7.10.UD1 uses a threshold of one-half the page size.

In cases where partition blobs have a random size, both schemas use about the same amount of disk space. However, in certain situations the required disk space changes. If you have many partition blobs that are just larger than one-third of a page but less than one-half of a page, the new schema reduces your space requirements by a factor of two. On the other hand, if you have partition blobs that are just less than one-third of a page and others that are just less than two-thirds of a page, you might see an increase in disk requirements of about 33 percent.

Environment Variable Changes in OnLine Dynamic Server 7.10

Version 7.10 of OnLine Dynamic Server introduced the following environment variables:

DELIMIDENT
FET_BUF_SIZE

Configuration Parameter Changes in OnLine Dynamic Server 7.10

Version 7.10 of OnLine Dynamic Server introduced the following configuration parameters:

ALARMPROGRAM
DATASKIP
DS_MAX_QUERIES
DS_MAX_SCANS
DS_TOTAL_MEMORY
MAX_PDQPRIORITY
OPTCOMPIND

In addition, the PDQPRIORITY configuration parameter was introduced in Version 7.10 but dropped in Version 7.20.

In Version 7.10, the default values for the configuration parameters LTXHWM and LTXEHWM changed from `80` and `90` to `50` and `60`, respectively. OnLine Dynamic Server initialization provides a warning if your **ONCONFIG** configuration file contains values for these parameters greater than `50` and `60`.

ON-Archive Changes in OnLine Dynamic Server 7.10

The names of the ON-Archive error message and help files changed between Version 6.0 and Version 7.10. If you use a **config.arc** file from Version 6.0, you must change the filenames in $**INFORMIXDIR/etc/config.arc**. If you use the default **Config.arc** file (with initial uppercase letter) that is installed with Version 7.10, you do not need to make any changes. For more information, refer to your *Archive and Backup Guide*.

Changes in OnLine Dynamic Server 6.0

Version 6.0 of OnLine Dynamic Server introduced an architecture that differs greatly from the architecture used in OnLine 5.1x. This new architecture requires significant changes in allocation and disk usage.

Major Changes in OnLine Dynamic Server 6.0

Figure 6-3 describes the major changes in OnLine Dynamic Server 6.0.

Figure 6-3
Changes Introduced in Version 6.0

Area of Change	Comments
Backup-tape format	Backups and logical-log backups made with pre-Version 6.0 **tbtape** are not compatible with either of the two Version 7.2x tape utilities, ON-Archive and **ontape**. It is recommended that you make a backup before you convert to Version 7.2x and then make a second backup after you complete the conversion.
sqlhosts file	The **sqlhosts** file is mandatory. You must create an **sqlhosts** file or modify your current **sqlhosts** file to the format for OnLine Dynamic Server 7.2x.
Utility names	Version 6.0 introduced a new naming convention for the utilities. The OnLine Dynamic Server utilities use the prefix **on** (for example, **oninit**) and the IBM Informix SE utilities use the prefix **se** (for example, **selog**).

(1 of 2)

Area of Change	Comments
sysmaster database	When you initialize Dynamic Server 7.3x or 7.24, a script automatically creates the **sysmaster** and **sysutils** databases. You must ensure that at least 1,100 free pages exist in the root dbspace to build these databases.
System resources	The Version 6.0 changes include new requirements for system resources such as shared memory, semaphores, and disk space. When you migrate to a later version from OnLine 5.1x, you must reconfigure the operating-system kernel.
Index requirements	To accommodate new features such as key-value locking, the indexing scheme requires an additional 1 byte of disk space per index-key entry. You must rebuild all user indexes after you migrate from OnLine 5.1x. An index on a table with one million records requires approximately 1 additional megabyte of disk space.

(2 of 2)

Changes to Database Utilities

Utility names that began with **tb** in a 5.1x database server begin with **on** in later versions. For instance, **tbcheck** was replaced by **oncheck**. For the complete list of utilities, refer to your *Administrator's Guide*.

Tip: *Plan to update all references to **tb*** utilities.*

You cannot use utilities that use binary formats to load and unload data between a 5.1x database server and a later version. To transfer data between a 5.1x database server and a later version, you can use only those utilities that load and unload data in ASCII format. For instance, the **tbload**, **tbunload**, and **tbtape** utilities in 5.1x use binary data, so you cannot use them to transfer data to Dynamic Server 7.3x or 7.24. The **onload**, **onunload**, and **ontape** utilities in Version 7.3x and Version 7.24 use binary data, so you cannot use them to transfer data to OnLine 5.1x. You can use **dbexport** (5.1x version) and **dbimport** (7.3x or 7.24 version) to transfer ASCII data to a 7.3x or 7.24 database server. You can also use the SQL LOAD and UNLOAD statements to transfer data between versions.

Environment Variable Changes in OnLine Dynamic Server 6.0

Version 6.0 of OnLine Dynamic Server introduced name changes for environment variables and utilities. Environment variable names that began with **TB** in a 5.1x database server begin with **ON** in later versions. For instance, the **TBCONFIG** environment variable was replaced by the **ONCONFIG** environment variable.

Utility names that began with **tb** in earlier versions begin with **on** in OnLine Dynamic Server 6.0 and later. For instance, **tbcheck** was replaced by **oncheck**. For a complete list of utilities, refer to your *Administrator's Guide*.

If you have not already changed the names of these environment variables and utilities in your shell scripts and in the login files of your users, make the changes now.

Operating-System Configuration Issues

Database servers later than Version 5.1x require system resources in addition to those required in OnLine 5.1x. These resources include additional shared-memory segments, additional semaphores, and additional open-file descriptors per process.

The specific tunable parameters and methods that you use to configure these resources into the operating system vary from platform to platform. For more information, consult the machine notes file that is installed with your distribution of your target database server and the configuration instructions for your operating system.

Estimating the Size and Number of Shared-Memory Segments

When you convert from OnLine 5.1x, you must recalculate your memory requirements. Database servers later than Version 5.1x make more extensive use of shared memory. For example, in database servers later than Version 5.1x, in addition to housing the buffer cache, virtual processors use shared memory to manage user threads and other activities that individual server processes handled in earlier versions. When you convert to Dynamic Server 7.3x or 7.24 from OnLine 5.1x, add an additional 8 megabytes of shared memory.

From the standpoint of the operating system, virtual memory that previously was allocated to individual server processes in Version 5.1x is now included in the virtual segment attached by Version 7.20 or later.

This new arrangement requires a new method for calculating shared-memory requirements in the target database server that takes the following items into account:

- The *virtual segment*, which is used to manage multiple user threads, data distributions, and other data
- The familiar RSAM or *resident segment*, which is used to manage the buffer cache
- A new *message segment*, which is used to support the shared-memory communication interface

Tip: *Data distributions in the database server provide the query optimizer with statistical information about the contents of columns and tables. For information about data distributions, refer to UPDATE STATISTICS in the "IBM Informix Guide to SQL: Syntax."*

The overall system requirement for user virtual memory includes all three shared-memory segments as well as the space that is needed to hold process images. However, the system requirement for actual physical memory includes only the resident segment and the working sets from other segments and processes. Thus, the physical memory that the target database server requires is proportional to the resident segment, while the requirement for swap space is proportional to the total amount of shared memory that the database server uses.

Database servers since Version 5.1x require at least one virtual shared-memory segment. The default size of a shared-memory segment is 8 megabytes.

You can use the following steps to generate a rough estimate for the size and number of shared-memory segments that are required for your instance of your target database server:

1. Estimate the total amount of shared memory that you need to initialize the target database server. You must make separate estimates for each of the three shared-memory segments, as described in the following paragraphs, and add up the total:

   - For an initial estimate of the resident segment size, use the size of shared memory as displayed in the output of **tbmonitor** under OnLine 5.1x. Because the resident segment in your target database server does not include big buffers, you can deduct 4 kilobytes for each 100 buffers in the BUFFERS parameter of your OnLine 5.1x **tbconfig** file.
   - Depending on your application, an initial estimate for the virtual segment might be as low as 100 kilobytes per user, or as high as 500 kilobytes per user, plus up to 4 megabytes in addition if you intend to use data distributions. You can obtain an estimate of the number of users under your target database server by adding 12 to the value of the USERS parameter in your OnLine 5.1x **tbconfig** file. The initial size of the virtual segment corresponds to the SHMVIRTSIZE configuration parameter in your target database server configuration file.
   - Use the following formula to estimate the size of the message segment:

     ```
     msgseg = (10,531 * connections) + 50,000
     ```

     connections is the number of user sessions that can connect through the shared-memory interface. You can set the number of sessions with the NETTYPE parameter in the Dynamic Server 7.3x or Dynamic Server 7.24 ONCONFIG configuration file.

     After you start your target database server, you can obtain a more precise value for SHMVIRTSIZE with **onstat –g mem**. You can then reconfigure shared memory more precisely with the actual value for SHMVIRTSIZE reported by this command.

2. A 7.3x or 7.24 database server can attach additional shared-memory resources during operation when it performs a large sort or other operation that might require more memory than it has previously acquired. To allow the database server to expand its use of shared memory while it is operating, reserve a suitable margin of shared memory over that which you estimate is necessary to initialize your target database server. The SHMADD parameter in the ONCONFIG file specifies the size of a dynamically added segment. If you do not specify a value for this parameter in your ONCONFIG file, the database server attempts to attach additional shared memory in 8-megabyte segments.

   The SHMTOTAL parameter in the ONCONFIG file places an absolute maximum on the amount of shared memory that an instance of your target database server can request. To avoid the risk of exceeding the shared memory provided for a given instance of your target database server, you can set this parameter to indicate the maximum amount of shared memory for that instance. If you set SHMTOTAL to `0` or leave it unassigned, the database server continues to attach additional shared memory as needed until no more virtual memory is available on the system.

3. Estimate the size and number of shared-memory segments that the operating system needs to provide and then modify your kernel.

   If your operating system *does not* have a segment-size limit, take the following actions:

   a. Set the maximum-segment-size parameter, typically SHMMAX or SHMSIZE, to the total size that is required for your target database server. Include both the amount of memory that is required to initialize the database server as calculated in step 1 on page 6-19, and the amount of memory that you want to allow for dynamic growth as described in step 2 on page 6-20.

   b. Set the operating-system configuration parameter for the maximum number of segments, typically SHMMNI, to at least `1` per instance of the database server.

   If your operating system *does* have a segment-size limit, take the following actions:

   a. Set the maximum segment-size parameter for the operating system, typically SHMMAX or SHMSIZE, to the largest value that your system allows.

   b. Use the following formula to calculate the number of segments for your instance of your target database server:

      ```
      SHMMNI =((initial_segment) / SHMMAX) + dynamic_segments
      ```

initial_segment	is the segment size that is required to initialize your target database server.
dynamic_segments	is the number of segments that you allow to be added during operation of your target database server.

      If a remainder exists, round up to the nearest integer value.

4. If your operating system uses the SHMSEG configuration parameter to indicate the maximum number of shared-memory segments to which a process can attach, set this system-configuration parameter to a value that is equal to or greater than the largest number of segments that you allocated for any one instance of your target database server.

Configuring Semaphore Parameters

The operating-system configuration parameters for semaphores are calculated differently for Dynamic Server 7.3x or 7.24 than for OnLine 5.1x. On UNIX or Linux, the SEMMNI parameter gives the number of semaphore sets. Each instance of your target database server requires one set of semaphores for each group of (up to) 100 virtual processors (VPs) that are initialized with the database server, one set for each additional VP that you might add dynamically (while the database server is running), and one set for each group of 100 (or fewer) user sessions that are connected through the shared-memory communication interface. Because the target database server utilities such as **onmode** use shared-memory connections, you must configure a minimum of two semaphore sets for each instance of your target database server: one for the initial set of VPs and one for the shared-memory connections that the database server utilities use.

The SEMMSL operating-system configuration parameter typically gives the maximum number of semaphores per set; set this parameter to (no less than) `100`.

On systems that require you to configure a maximum for the total number of semaphores across all sets, typically given by the SEMMNS operating-system configuration parameter, use the following formula to calculate the total required for each instance of your target database server:

```
SEMMNS = init_vps + added_vps + shmem_users + concurrent_utils
```

init_vps is the number of VPs that are initialized with your target database server. This number includes CPU, PIO, LIO, AIO, SHM, TLI, SOC, and ADM VPs. (For a description of these virtual processors, see your *Administrator's Guide*.) The minimum value for this term is `15`.

added_vps is the number of VPs that you can add dynamically.

shmem_users is the number of shared-memory connections that are allowed for this instance of your target database server.

concurrent_utils is the number of concurrent database server utilities that can connect to this instance. Allow for a minimum of six utility connections: two for **onarchive** and four for other utilities such as **onmonitor, oncheck**, and **onstat**.

For example, if you start a single instance of your target database server with two CPU VPs and 110 shared-memory users, and you intend to add two CPU VPs dynamically as needed, you must include at least five semaphore sets in the SEMMNI parameter: one set for the initial VPs, two sets for the dynamically added CPU VPs, and two sets for the shared-memory connections. You must set the SEMMSL parameter to at least `100`. If your system requires a value for the SEMMNS parameter, you must indicate a total of no less than `133` (`15 + 2 + 110 + 6`).

If your system uses software packages that require semaphores in addition to the ones that your target database server needs, you must include the total number of semaphore sets that are required by both the database server and your other software packages in the SEMMNI parameter. You must set the SEMMSL parameter to the largest number of semaphores per set that any package requires. For systems that require the SEMMNS parameter, you can multiply SEMMNI by the value of SEMMSL to calculate an acceptable value. Or, to arrive at a more precise value for SEMMNS, you can calculate the number of semaphores that are needed for each software package and add those numbers to obtain the total.

Configuring the Number of Open File Descriptors

Some operating systems require you to specify a limit on the number of file descriptors that a process can have open at any one time. You specify this limit with an operating-system configuration parameter, typically NOFILE, NOFILES, NFILE, or NFILES. The number of open file descriptors that each instance of your target database server needs is the number of chunks in your database plus the number of network connections that your database server instance must support.

Installing Operating-System Updates

The target database server might require you to install operating-system updates or *patch releases*. For information about operating-system patches that your target database server installation might require, refer to the machine notes file.

Disk-Utilization Issues

When you convert from a 5.1x database server, you must allow for increased disk use both during and after the conversion process. Some disk resources that must be allocated to the root dbspace during the conversion process can be freed for other uses after the process completes. The additional disk space that is required falls into the following categories:

- Space for the conversion processes
- Space in each index entry
- Space for data distributions

The initial requirements during the conversion include 1,100 additional pages in the root dbspace over its size in a 5.1x database server. The database server uses these added pages to build the **sysmaster** database. You must also provide additional space in the root dbspace for automatic conversion of system catalog indexes.

An additional byte per index entry for each user-table index must be allocated to the dbspace in which each corresponding table resides.

If you intend to use data distributions, you must provide enough temporary space to hold the largest table for which you intend to establish a distribution. For information about data distributions, refer to UPDATE STATISTICS in the *IBM Informix Guide to SQL: Syntax*.

The remainder of this section outlines the additional hard-disk requirements for migration to your target database server. You need to examine carefully the amount of disk space left in each dbspace.

The first time that you start up your target database server, the database server performs the following tasks automatically:

- Conversion of system catalog indexes to your target database server, (occurs at the start of quiescent mode)
- Creation of **sysmaster** and **sysutils** databases (occurs at the start of online mode)

You must provide enough space for these actions to take effect. After the database server begins normal operation, you must rebuild the indexes for user tables. You must allocate adequate disk resources for those indexes as well.

Accommodating System Catalog Indexes

The following formula indicates how many additional pages you must provide to accommodate the growth in system catalog indexes for a given database:

```
growth_in_pages = (Total * .10) + (Largest * 1.10)
```

Total is the total number of leaf pages for all system catalog indexes.

Largest is the number of leaf pages in the largest index.

The additional space that is available during the conversion process must include room for the following items:

- A copy of the largest index plus 10 percent
- 10 percent of the current total of system catalog index pages

The database server requires this amount of additional space to accommodate those brief periods in which the old and new versions of an index both reside on disk. The additional 10 percent allows for the case in which the largest index also is the last one to be converted.

You can use the following SQL query within DB-Access or IBM Informix SQL to determine how many added pages the new system catalog indexes require:

```
UPDATE STATISTICS;
SELECT ((SUM(leaves) * 0.10) + (MAX(leaves) * 1.10)) sci_added
   FROM sysindexes
   WHERE tabid < 100;
```

Important: *You must perform this query from OnLine 5.1x.*

If sufficient space is not already available in the root dbspace, you must allocate additional chunks or move tables to other dbspaces to make room. You can use the **tbstat –d** command to find the number of free pages in the root dbspace. For details, refer to your *Administrator's Guide*, Version 5.1x.

Accommodating the sysmaster Database

The **sysmaster** database is created in the root dbspace and cannot be moved or redirected. The **sysmaster** database contains *pseudotables* for monitoring and real tables to store backup information for ON-Archive. To create the **sysmaster** database, you need up to 1,100 free pages in the root dbspace.

Locating Temporary Files and Tables

Version 6.0 and later versions of the database server let you use the DBSPACETEMP configuration parameter or the **DBSPACETEMP** environment variable to specify the location of temporary files and tables in either raw or cooked space in UNIX or Linux. (Previous versions of the database server create temporary tables in the root dbspace by default. Version 6.0 and later versions of the database server do not use the **DBPATH** environment variable to locate sort files.) If your computer has at least two hard disks, you might consider mirroring your root dbspace and redirecting the temporary table creation elsewhere. This setup prevents hard-disk failures on the root dbspace from affecting your day-to-day business activities.

Accommodating Data Distributions

If you intend to use data distributions, you must provide adequate space for them in the dbspace that contains the system catalog tables for each database in which they are used. (Use the UPDATE STATISTICS statement, described in the *IBM Informix Guide to SQL: Syntax*, to create data distributions.) The following formula gives the maximum amount of space in bytes that might be required for a data distribution on an individual column. Add the results for each column to obtain the total amount of additional space that is needed for the distributions themselves:

```
dist_space = (ceil((4 * ((1/d_res) + 1) *
   (4 + c_len))/765) * 1,116) + 2
```

ceil represents a mathematical function that rounds its argument to the next larger integer. On many systems, this function is called *ceil* or *ceiling*.

d_res is the decimal representation of the resolution that is specified in the UPDATE STATISTICS statement. The default resolution for a HIGH-mode data distribution is 0.5 percent, or 0.005 in this formula.

c_len is the length in bytes for the column. A FLOAT column typically contains 8 bytes; a CHAR 20 column contains 20 bytes.

Tip: *This formula yields the maximum possible size for a distribution that contains a number of overflow entries. A typical distribution with few or no overflow entries uses only 25 percent of the maximum space that this formula projects.*

For MEDIUM-mode distributions, you must also provide sort space in the dbspace equivalent to 3,000 rows of the widest table. For HIGH-mode distributions, you must provide space for a complete copy of the largest table for which you want a HIGH-mode data distribution.

For example, if you intend to use a HIGH-mode data distribution with the default resolution of 0.5 percent on a CHAR 20 column, the following calculation shows the maximum space that is needed for that distribution in bytes:

```
(ceil((4 * ((1/0.005) +1) * (4 + 20))/765) * 1,116) + 26
```

This formula works out to 29,042 bytes, as the following calculations show:

```
(ceil((4 * (200 +1) * 24)/765) * 1,116) + 26
(ceil((4 * 201 * 24)/765) * 1,116) + 26
(ceil(19,296/765) * 1,116) + 26
(ceil(25.223) * 1,116) + 26
(26 * 1,116) + 26
29,016 + 26
```

If this column appears in a table that contains 100,000 rows of 28 bytes each, you must provide a minimum of approximately 2.8 megabytes of sort space in the dbspace to build this distribution.

For a MEDIUM-mode distribution, calculate the required amount of sort space as follows:

```
sort_space = 28B * 3,000 = 84,000B
```

Accommodating User-Table Indexes

The following formula indicates the number of additional pages necessary to accommodate the growth in user-table indexes for a given database:

```
index_growth_pages = (total * 0.10)
```

total is the total number of leaf pages for all user-table indexes.

You might need to add chunks to your existing dbspaces or perhaps add new dbspaces and move tables to that dbspace to provide additional room. You can use the **tbstat –d** command to find out the number of free pages in the current dbspace. For details, refer to your *Administrator's Guide*, Version 5.1x.

You can use the following SQL query in DB-Access or IBM Informix SQL to determine the number of additional pages that user-table indexes need for an entire database:

```
SELECT (SUM(leaves) * 0.1) uti_added
   FROM sysindexes
   WHERE tabid >= 100;
```

Indexes reside in the same dbspace as the tables to which they refer. Tables can be located in different dbspaces than the databases in which they are managed. If all your tables reside in the current dbspace, the result of this query indicates the number of pages to add to the database. However, if one or more tables reside in separate dbspaces, you must make sure that those dbspaces include enough room for the new indexes.

To find out the dbspace in which each external table resides, use the following SQL query:

```
SELECT tabname, tabid, (partnum / "0x100000") dbspace_num
   FROM systables
   WHERE tabid >= 100
   AND partnum > 0;
```

For each table that resides in a separate dbspace, use the following SQL query to find out how many additional index pages must be added to the estimate for its dbspace. Add the resulting number of pages to the estimate for that dbspace and deduct it from your estimate for the current dbspace, as follows:

```
SELECT (leaves * 0.1) tbl_added
   FROM sysindexes
   WHERE tabid = alt_tabid;
```

alt_tabid is the tabid (table ID number) of the table in a separate dbspace as returned by the previous query.

Accommodating the Conversion of User-Table Indexes

The process of converting user-table indexes for your target database server to use is not automatic and requires preliminary planning. You convert user indexes in the last steps of the conversion procedure, after you install the target database server. For more information, refer to "Using the oncheck Utility to Convert Indexes" on page 6-48.

You can choose from three different methods to convert indexes for a user table. The method that you choose for a given table depends on the size of the table, the degree to which availability of the table is seen as critical, the logging mode of the database, and the time that you can allow for your target database server to stay closed to other users.

You can use the following conversion methods:

- The **oncheck –cI –y** command
- The UPDATE STATISTICS statement
- The DROP INDEX and CREATE INDEX statements

Tip: *The time you need to convert user-table indexes is proportional to the time you need to rebuild indexes in pre-6.0 versions of the database server. Factors that affect the conversion time include the number of indexes per table, the size of each index, the number of available CPUs, and the absence or presence of other user activity on the system.*

The **oncheck –cI –y** command converts indexes while the database is in quiescent mode. This method is preferred for converting large or critical tables. You can also use this method to convert an entire ANSI-compliant database in a single operation. Usually, this method is also the easiest method to use for any table or database. However, the database server remains unavailable to other users as long as the **oncheck** utility is running. For more information about the **oncheck** utility, refer to your *Administrator's Guide*.

The UPDATE STATISTICS statement provides added flexibility. You can use it to convert indexes while other users are online. However, if you execute this statement within a transaction while other users are working, you risk bringing the database server offline with a long-transaction error. Handle small tables in ANSI-compliant databases one at a time if other users are working on the database server. Do not use this method to convert large or multiple tables in ANSI-compliant databases.

Dropping and rebuilding indexes is another conversion option that you can use in place of UPDATE STATISTICS. Because the UPDATE STATISTICS statement also allows you to generate data distributions, it is generally preferred over dropping and rebuilding indexes with the DROP INDEX and CREATE INDEX statements. For more information about these statements, refer to the *IBM Informix Guide to SQL: Syntax*.

To prepare for converting a user index

1. Execute the following query in each database:

```
SELECT tabname
   FROM systables
   WHERE tabid >= 100
```

2. Determine which method to use for each table in your list.

   The following chart gives recommendations for tables depending on their size, importance, the type of database in which they reside, and the urgency with which the database server must be brought back online. Use **oncheck** to convert large, critical tables. The choice for small, but critical, or large, but noncritical tables depends on which scenario produces the smaller effect: having the database server unavailable or rebuilding indexes while your system is active.

Type of Table	Needed Quickly	Less Urgent
Large, critical	**oncheck -cI -y**	**oncheck -cI -y**
Small, critical	**oncheck -cI -y**	UPDATE STATISTICS
Large, noncritical	**oncheck -cI -y**	UPDATE STATISTICS
Small, noncritical	UPDATE STATISTICS	UPDATE STATISTICS

Tip: *You might be able to use a single method to convert the indexes on all or most tables within a database. Both the* ***oncheck*** *command and UPDATE STATISTICS statement allow you to use a single command to convert the indexes for an entire database. For details, see the "IBM Informix Guide to SQL: Syntax."*

Managing Secure-Auditing Log Files

If you intend to use the secure-auditing features of the target database server, be advised that the database server audit-record log files can grow rapidly to take up a significant amount of space in the file system. Be sure to allow adequate space for the file system in which these files reside. You can configure audit records to minimize the effect of secure auditing on disk use. For details, refer to your *Trusted Facility Guide*.

Database Server Configuration Issues

This section provides an overview of database configuration issues involved in the migration process. The following discussions describe only those configuration issues that affect the migration process. For detailed information about the database server configuration parameters, refer to your *Administrator's Guide*.

Changing Environment Variables

Version 6.0 and later versions of the database server include new environment variables that replace those in OnLine 5.1x. Environment variable names that began with **TB** in a 5.1x database server begin with **ON** in later versions. For instance, the **TBCONFIG** environment variable is replaced by the **ONCONFIG** environment variable. The **SQLEXEC** environment variable is not used in database servers later than Version 5.1x.

When you initialize an instance of your target database server, you must set the **INFORMIXSERVER** environment variable to the dbservername of that instance. Applications must also set the **INFORMIXSERVER** environment variable to gain access to databases that your target database server manages.

Revising Configuration Parameter Values

Database servers later than Version 5.1x recognize new minimum values for certain configuration parameters.

As of Version 7.10, the BUFFERS parameter indicates the maximum number of buffers for disk I/O. To improve performance, increase the BUFFERS and DBSPACETEMP values, if necessary.

You must increase the value of the LOCKS parameter to at least 2,000. The database server puts a message in the message log if more locks are needed.

Increasing Logical-Log Space

Make sure that at least 2,000 total log pages are allocated and free for logical logs because the building of the **sysmaster** database requires 1,000 log pages. A 1,000 log-page safety factor is recommended. Run **tbstat -l** for your current log-usage status.

Planning for Additional Shared-Memory Usage

The later database server architecture, introduced withVersion 6.0, combines all the memory that **sqlturbo** processes use in previous versions of the database server into a shared-memory section called the *virtual segment* of shared memory. When you migrate from OnLine 5.1x, you must allocate enough shared memory with the SHMVIRTSIZE configuration parameter, in the ONCONFIG file, to accommodate the user threads that separate database server processes serviced in Version 5.1x. A reasonable initial estimate for SHMVIRTSIZE is 500 kilobytes for each user thread. Additional space might be required for use with data distributions. Use the SHMVIRTSIZE configuration parameter to specify the amount of shared memory for the database server.

The database server requires three segments of shared memory as opposed to the one segment that was required in a 5.1x database server. For information about how to configure shared-memory segments in the operating system, refer to "Estimating the Size and Number of Shared-Memory Segments" on page 6-17.

You use the SHMADD parameter in the ONCONFIG file to set the size of a dynamically added segment. If you do not specify a value for this parameter, the database server attempts to attach additional shared memory in 8-megabyte segments.

The SHMTOTAL parameter in the ONCONFIG file places an absolute maximum on the amount of shared memory that an instance of Dynamic Server 7.3x or 7.24 can request. To avoid the risk of exceeding the shared memory provided for the database server, set this parameter to the maximum amount of shared memory for that instance requires. If you set SHMTOTAL to 0 or leave it unassigned, the database server continues to attach additional shared memory as needed until no more virtual memory is available on the system.

Saving Pre-Existing sysmaster Databases

OnLine 5.1x includes the **makeps.sql** script, which creates a **sysmaster** database. If this database exists on your system, you can run **dropps.sql** to drop it. If you do not drop the old **sysmaster** database, the conversion process renames it **sysmaster_pre60**.

Configuring Secondary Database Servers for Data Replication

When you configure a secondary database server for use in data replication, the version of your target database server on the secondary host computer must match that on the primary host computer. Chunk names and offsets must also match between instances of your target database server on the primary and secondary hosts. For more information about data replication, refer to your *Administrator's Guide*.

Managing Backups

The ON-Archive backup-management system, introduced in OnLine Dynamic Server 6.0, and table fragmentation, introduced in OnLine Dynamic Server 7.10, might change the placement of databases and tables on disk.

The ON-Archive menu uses a special termcap file that is located in the **tctermcap** file in **$INFORMIXDIR/etc**. If your terminal is not listed in this file, you might need to add a new entry to use the menu interface. For more information about backup strategies, table organization, and the **tctermcap** file, refer to your *Administrator's Guide*.

Making Performance Comparisons

It is recommended that you run and record time- and resource-use statistics for sample queries and other operations to help you compare performance before and after migration to your target database server. You can compare these statistics with equivalent operations you perform after the conversion to characterize performance enhancement or degradation. The comparison might help you identify database configuration parameters that you can adjust to obtain better performance.

Storage-Manager Validation and Installation

When you convert or revert an Informix database server, the storage manager that you used on the source database server might not be validated for the version of the database server to which you are migrating. Verify that the storage manager is validated for the target database server version and platform by checking the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a validated storage manager before you perform backups with the ON-Bar backup and restore system.

When you migrate to a new database server version, install the storage manager before you bring up the database server. Then if you have automatic log backup set up on the database server, ON-Bar can start backing up the logs when the new database server comes online. For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Warning: *If you migrate IBM Informix Storage Manager (ISM) 1.0 catalogs to ISM 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. Once the ISM 2.0 server is restarted after catalog migration, error messages occur in various logs.*

Converting to a 7.3x or 7.24 Database Server from OnLine 5.1x

The procedure for converting to Dynamic Server 7.3x or 7.24 from OnLine 5.1x includes the following steps, which the rest of this section describes:

1. Install the latest maintenance release for the source database server.
2. Capture configuration and chunk-layout information in the source database server.
3. Close all transactions and make a final (level-0) backup of the source database server.
4. Bring the source database server offline.
5. Configure a relay module for Version 5.1x tools.
6. Install and configure Dynamic Server 7.3x or 7.24.
7. Reconfigure the operating system.
8. Bring Dynamic Server 7.3x or 7.24 online.
9. Convert user-table indexes.
10. Verify the integrity of the database.
11. Make an initial (level-0) backup of Dynamic Server 7.3x or 7.24.

12. Add rowid columns to fragmented tables.
13. Complete migration.
14. Convert a database to a different locale (optional).

Install the Latest Maintenance Release for the Source Database Server

Install the latest maintenance release for OnLine 5.1x before you migrate to Dynamic Server 7.3x or 7.24.

Capture Configuration and Chunk-Layout Information

Before you can safely configure your target database server, you need to capture the configuration and chunk-layout information in each instance of OnLine 5.1x. You use this information when you configure your target database server.

To copy database server configuration files

1. Log in as user **informix**.
2. Ask all database server users to exit their applications.
3. Rename or make a copy of the configuration file(s) if the current name is in the following list:

   $INFORMIXDIR/etc/onconfig
   $INFORMIXDIR/etc/onconfig.std
   $INFORMIXDIR/etc/sqlhosts
   $INFORMIXDIR/etc/tbconfig
   $INFORMIXDIR/etc/tbconfig.std
   $INFORMIXDIR/etc/tctermcap
   $INFORMIXDIR/etc/termcap

   You need to save these files because the installation procedure for your target database server overwrites them during the installation. Keep the copies available to use later.

Copying Chunk-Layout and Space-Use Information

Execute the following command to save a listing of your chunk layout and space use in case you need to refer to it:

```
tbstat -d > $INFORMIXDIR/chunk.layout
```

Adding Chunks or Moving Tables for Disk-Use Requirements

If you need to add chunks or to move tables out of the root dbspace to make room for the **sysmaster** database and system catalog indexes, you can do so at this time. You can also add chunks or move tables in this and other dbspaces to accommodate user-table indexes.

For more information about disk-space requirements in your target database server, refer to "Disk-Utilization Issues" on page 6-24. For information about adding chunks or moving tables, refer to your *Administrator's Guide*, Version 5.1x.

Close All Transactions and Make a Final Backup of the Source Database Server

Communicate to client users how long you expect the database server to be offline for migration. Then close all transactions and make a final backup of each instance of the source database server. The following procedures prepare the transaction log for migration to your target database server and creates a final backup of OnLine 5.1x.

To perform an immediate shutdown

1. Execute the following command to perform an immediate shutdown:

   ```
   tbmode -k
   ```

2. Answer `yes` to all the prompts.

   This step terminates all database server processes that might still be running.

To shut down the system gracefully

1. Execute the **tbmode –sy** command.
2. Wait for all users to exit.
3. Execute the **tbmode –k** command and then answer `yes` to all the prompts.

Make sure the system has shut down completely before you proceed to the next step.

Initiating a Fast Recovery

Execute the following command to enter quiescent mode and initiate a fast recovery:

```
tbinit -s
```

The **tbinit –s** option rolls forward all committed transactions, rolls back all incomplete transactions since the last checkpoint, and leaves a new checkpoint record in the log with no open transactions pending. (Refer to your *Administrator's Guide*, Version 5.1x.)

Verifying the Operating Mode

Execute the following command to verify that OnLine 5.1x is in quiescent mode:

```
tbstat -
```

The first line of the tbstat output contains the status of OnLine 5.1x. Figure 6-4 shows that OnLine 5.1x is in quiescent mode.

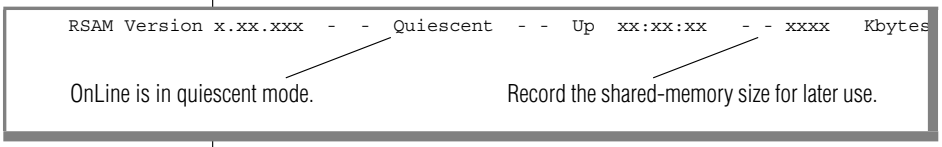


Figure 6-4
Example of tbstat Status Line

Verifying the Integrity of the Data

Before you make a level-0 backup, you might want to verify the integrity of the data.

Use the tbcheck utility to verify the integrity of data before you start the backup. You can verify the integrity of the reserve pages, system catalog tables, data, and indexes. (Refer to your *Administrator's Guide*, Version 5.1x.) Execute the following commands.

To check	Use the command
Reserve pages	**tbcheck -cr**
System catalog tables	**tbcheck -cc** ***database_name***
Data	**tbcheck -cD** ***database_name***
Indexes	**tbcheck -cI** ***database_name***

Making a Final Backup of OnLine 5.1x

Use **tbtape** or **tbmonitor** to make a level-0 backup of OnLine 5.1x. The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup. (For more information on making a level-0 tape backup, refer to your *Administrator's Guide*, Version 5.1x.)

Important: *Backups that you made of OnLine 5.1x are not compatible with your target database server tape format. Use only the older version of the source database server to restore the backup tape that you made in this step. You cannot use this backup tape with your target database server.*

Bring OnLine 5.1x Offline

Use the following procedure to shut down each instance of OnLine 5.1x.

To shut down the instance of OnLine 5.1x

1. Execute the following command:

   ```
   tbmode -k
   ```

2. Answer `yes` to all prompts.
3. Execute the following command to verify that OnLine 5.1x is in offline mode:

   ```
   tbmonitor
   ```

Tip: *Use tbmonitor instead of tbstat to verify the operating mode. The tbstat utility is not designed to return the operating-mode status when the database server is offline.*

The third line of the DB-Monitor main menu contains the status of OnLine 5.1x. The screen in Figure 6-5 indicates that the database server is offline. (Refer to your *Administrator's Guide*, Version 5.1x.)

```
INFORMIX-OnLine:   Status    Parameters    Dbspaces    Mode    Force-Ckpt
Status menu to view INFORMIX-OnLine
-------------Off-Line-------------Press CRTL-W for Help --------------------
```

Figure 6-5
DB-Monitor Main Menu

The database server must be offline because the older and the newer versions share common files. You cannot install the new database server if any of the common files are active. Bring the older database server offline to ensure that all common files are inactive.

Configure a Relay Module for Version 5.1x Tools

This section describes how to configure a database server later than Version 5.1x to use a relay module for Version 5.1x tools.

To use the relay module for Version 5.x tools with a later database server

1. Verify that a shared-memory connection between the database server and a client application of the same version works correctly.

   The **sqlhosts** file does not contain an entry for the connection between the client and the relay module. The relay module does not affect the **sqlhosts** file.

2. Install the database server in the same directory as the Version 5.1x products, if you can.

   In this case, set the **SQLEXEC** environment variable to the pathname of the relay module, as the following example shows. (The installation process stores the relay module as **$INFORMIXDIR/lib/sqlrm**.)

   ```
   setenv SQLEXEC  $INFORMIXDIR/lib/sqlrm
   ```

3. If you cannot install the database server in the same directory as the Version 5.1x IBM Informix products, take the following steps:

   a. Copy or symbolically link the subdirectories from the **$INFORMIXDIR/msg** directory of the database server products to the **$INFORMIXDIR/msg** directory of the Version 5.1x products.

   b. Change the **INFORMIXDIR** environment variable to point to the directory that contains the Version 5.1x products.

   c. Modify the **PATH** environment variable to include the **$INFORMIXDIR/bin** directory of the Version 5.1x database server.

   d. Set the **SQLEXEC** environment variable to the complete pathname of the of the relay module.

      You cannot use the variable **$INFORMIXDIR** to set the **SQLEXEC** environment variable because the **INFORMIXDIR** environment variable now points to the directory of the Version 5.1x products instead of to the directory that contains the later database server products. You must use the exact pathname; for example:

      ```
      setenv SQLEXEC /usr/versionUSvr/informix/lib/sqlrm
      ```

   e. Remove any extra environment variables.

      If the Version 5.1x IBM Informix products are in use, your environment might include two environment variables that the Version 5.1x database server required: **SQLRM** and **SQLRMDIR**. You need to unset these environment variables before the client application can use a database server later than Version 5.1x, as the following example shows:

      ```
      unsetenv SQLRM
      unsetenv SQLRMDIR
      ```

   f. Copy or symbolically link the **gls** subdirectory of the database server to the **$INFORMIXDIR** directory of the Version 5.1x products.

   Then the relay module can find the GLS files.

Install and Configure the Target Database Server

You must be user **root** to install the target database server. Set the **$INFORMIXDIR** environment variable to the directory where you plan to install the database server.

Follow the directions in your *Installation Guide* and your *Administrator's Guide* to install the target database server. The installation script installs the database server into the **$INFORMIXDIR** directory specified for user **root**. The installation script does not bring the database server online.

Warning: *If you install the target database server in the same directory where the older version of the database server currently resides, the newer version overwrites the older files. If you want to preserve your product files of earlier versions, you must install your target database server in a different directory.*

Before you overwrite the older version, you must take the following precautions:

- If you do not have the original media for the older version, back up the **$INFORMIXDIR** directory before you install your target database server.
- Copy the configuration file(s) in **$INFORMIXDIR/etc** to another location on the file system.

When the installation is complete, exit as user **root** and log in as user **informix**.

Important: *The target database server includes networking capabilities that are not present in OnLine 5.1x. These capabilities use networking information from configuration files such as the ONCONFIG and* ***sqlhosts*** *files to establish communications with application processes. You must ensure that these files are present and contain the needed information. To verify these files, establish a connection from DB-Access to test the database server instance before you proceed with your installation. If your configuration calls for it, you can also test a remote client-server system.*

Setting up the Configuration File

To set up the configuration file, copy the standard Dynamic Server 7.3x or 7.24 configuration file to the name of your working configuration file and then edit it. For example, if your configuration filename is **onconfig.1**, you might use the following commands:

```
cd $INFORMIXDIR/etc
cp onconfig.std onconfig.1
vi onconfig.1
```

Refer to the backed-up copy of the OnLine 5.1x configuration file that you saved in "Capture Configuration and Chunk-Layout Information" on page 6-35. Copy the values from matching parameters in the backed-up file to your working configuration file (for example, **onconfig.1**). Modify those values to conform with revised minimums for Dynamic Server 7.3x or 7.24, as described in "Revising Configuration Parameter Values" on page 6-31.

Setting Environment Variables for the Target Database Server

At this point, you must set up the environment variables that both the client applications and your target database server need to communicate. Make sure that the **INFORMIXDIR** and **PATH** environment variables were set during the installation. (For more information, refer to your *Administrator's Guide*.)

Set the **ONCONFIG** environment variable to the name of your target database server configuration file, as the following examples show:

C shell:

```
setenv ONCONFIG onconfig.1
```

Bourne shell:

```
NCONFIG=onconfig.1;
export ONCONFIG
```

Set the **INFORMIXSERVER** environment variable for all users that need to access the target database server. Set this variable to the name that is listed in the **sqlhosts** file and in the DBSERVERNAME or DBSERVERALIASES parameter of your target database server configuration file, as follows:

C shell:

```
setenv INFORMIXSERVER dbserver1
```

Bourne shell:

```
INFORMIXSERVER=dbserver1;
export INFORMIXSERVER
```

If you use a dbspace or file to store temporary tables, set the DBSPACETEMP configuration parameter or **DBSPACETEMP** environment variable to the name of the dbspace or full pathname of that file.

Modifying the sqlhosts File

The target database server requires an **sqlhosts** file. An **sqlhosts.demo** file is included in **$INFORMIXDIR/etc** as an example of the setup that your target database server requires. If you do not have an **sqlhosts** file already, the installation program renames the **sqlhosts.demo** file to **sqlhosts**. The **sqlhosts** file should include an entry with the following information for each instance of your target database server:

```
dbservername   nettype   hostname   service_name   options
```

You must modify the entries in this file to support your configuration. For more information on how to modify the **sqlhosts** file, refer to your *Administrator's Guide*.

Important: *The client application looks for the* ***sqlhosts*** *file in the* ***$INFORMIXDIR/etc*** *directory. However, you can use the* ***INFORMIXSQLHOSTS*** *environment variable to change the location or name of the* ***sqlhosts*** *file.*

Reconfigure the UNIX Operating System

For this step, you need to reconfigure your operating system based on the estimates that you determined in "Preparing for Migration" on page 6-6. You need to provide additional shared memory, additional semaphores, and possibly additional hardware resources such as disk drives. To reconfigure the operating system, follow the directions in the machine notes file included in your target database server distribution and the kernel-configuration instructions for your operating system.

Bring the Target Database Server Online

This step brings Dynamic Server 7.3x or 7.24 to quiescent mode and then to online mode. The success of this step depends on adequate operating-system and disk resources, as discussed in "Preparing for Migration" on page 6-6. If the system is not brought up in quiescent mode, you get the following error when you attempt to initialize your target database server, and the database server goes offline:

```
Open transaction detected when changing log versions.
```

Bringing the Target Database Server to Quiescent Mode

To bring Dynamic Server 7.3x or 7.24 from offline to quiescent mode, execute the following command:

```
oninit -s
```

Execute the **onstat -m** command to check the message log for the status of the mode change and to create the **sysmaster** database.

The system automatically creates the **sysmaster** database when the target database server is brought online. If the system fails to create this database, the root dbspace might not include the additional 550 pages that are needed for the conversion. Return to "Install and Configure the Target Database Server" on page 6-42, provide enough space in the root dbspace, and repeat the steps in this section. If the **sysmaster** database does not already exist, the database server keeps trying to create it each time that you start the database server.

Warning: *The logical logs continue to fill with the transactions that result from the creation of the **sysmaster** database. If you run out of log space before the creation of the **sysmaster** database is complete, the database server halts with a long-transaction error. Thus, you must back up the logical logs.*

Execute the **ontape -a** or **ontape -c** command. Once the logical logs are backed up, processing resumes.

When the system reaches quiescent mode successfully, you can note whether you need to adjust the shared memory and semaphore values for your operating system, which you configured in "Reconfigure the UNIX Operating System" on page 6-44. Check your database server message log for status messages that pertain to the change to quiescent mode.

Bringing the Target Database Server to Online Mode

To change the database server mode from quiescent to online mode, execute the following command:

```
onmode -m
```

At this point, the system attempts to rebuild system catalog indexes. If you try to access them at this time, you might find some of them locked. If these catalogs cannot be rebuilt, you might need to allocate more space in your root dbspace. To the 1,100 extra pages that you need to create the **sysmaster** database, add the number of additional pages that the formula gives in "Accommodating System Catalog Indexes" on page 6-25. Return to this section and allocate sufficient space.

Convert User-Table Indexes

If you have not already done so, use the formula provided in "Accommodating User-Table Indexes" on page 6-27 to allocate the additional disk space that you need for user-table indexes in your target database server. You can now begin converting user-table indexes.

The conversion of user-table indexes requires planning. You can use several methods to convert indexes for various tables. Depending on the size and demand for a table, you might prefer one method over another. If you have not already done so, generate a list of tables in each of your databases and identify the appropriate conversion method for each index, as "Accommodating the Conversion of User-Table Indexes" on page 6-28 describes.

Before you make the database server available to regular users, execute the **oncheck -cI -y** command to convert indexes for large or critical tables, as "Using the oncheck Utility to Convert Indexes" on page 6-48 describes. You can defer smaller and less-critical tables until after the database server is brought online. You can then convert these tables through SQL with the UPDATE STATISTICS statement or the DROP INDEX and CREATE INDEX statements.

You might be able to expedite the process of converting indexes by taking advantage of enhanced features that are provided with your target database server, such as support for multiple CPUs or parallel index builds. For more information, see your *Administrator's Guide*.

The new indexes will be larger than the old indexes no matter which method you choose. Make sure that you allocate enough room in each dbspace for the new indexes. Otherwise, you might need to move tables to other dbspaces before you convert indexes, as the following section describes.

Moving Tables to Another dbspace

If you neglected to make the proper adjustments to your dbspaces as described under "Accommodating User-Table Indexes" on page 6-27, you might need to move one or more tables to another dbspace to accommodate the larger index in your target database server. If you know that you have enough room for your new indexes, you can skip ahead to "Using the oncheck Utility to Convert Indexes."

You can use either of the following techniques to move tables during the conversion process:

- The INSERT statement
- The **onunload** and **onload** utilities

To use INSERT to move tables to a new dbspace

1. Create a table in the new dbspace with a temporary name.
2. Use INSERT INTO *newtab* SELECT * FROM *oldtab*.
3. Drop the old table.
4. Create all the indexes in the new table.
5. Rename the new table to the original name.

To use onunload and onload to move tables to a new dbspace

1. Create a new table in another dbspace.
2. Drop all the indexes from the old table.
3. Use **onunload** to copy the old table to a file.
4. Drop the table and then update the database to create a new version of the table in the new dbspace.
5. Use **onload** to load the data back into the table.
6. Create all the indexes in the new table.

Using the oncheck Utility to Convert Indexes

The **oncheck** utility can be helpful when you convert ANSI-compliant databases, and in situations where critical tables must be made accessible as soon as possible.

You can run **oncheck –cI –y** to convert indexes for a single table or an entire database when your target database server is in quiescent mode. After you make sure that no users are present, use **onmode –s** to bring the system into quiescent mode.

To convert indexes for a single table, issue the following command:

```
oncheck -cI -y database_name:table_name
```

database_name is the name of the database.

table_name is the name of the table.

To convert indexes for the entire database, issue the following command:

```
oncheck -cI -y database_name
```

The **oncheck** command displays messages of the following form:

```
Index index-name is bad. OK to repair it?
```

This message indicates that the existing (5.1x) index is not in the correct format for your target database server. The **–y** option automatically answers `yes` to this prompt, allowing your target database server to convert each index in turn automatically.

Using UPDATE STATISTICS to Convert Indexes

Tip: *The UPDATE STATISTICS statement includes new options that were introduced in OnLine Dynamic Server 6.0. For details, see the "IBM Informix Guide to SQL: Syntax."*

You can execute an UPDATE STATISTICS statement to convert the indexes for a single table or, in some circumstances, for an entire database. On the target database server, the UPDATE STATISTICS statement automatically converts Version 5.1x indexes, provided that the dbspace has enough space. For more information, see "Moving Tables to Another dbspace" on page 6-47.

This method is especially useful for nonlogging databases. Or you can use UPDATE STATISTICS in a database without ANSI logging by issuing the statement *outside of a transaction*. When you take the proper precautions, you can even use this method within a transaction or an ANSI-compliant database.

Warning: *If you execute an UPDATE STATISTICS statement within a transaction, you must follow up with a COMMIT WORK or ROLLBACK WORK statement to close the transaction. Otherwise, the Dynamic Server 7.3x or 7.24 instance eventually halts with a long-transaction error.*

When you convert indexes within a transaction or an ANSI-compliant database, it is recommended that you use one of the following approaches to limit the risk of encountering a long transaction:

- Limit the scope of each UPDATE STATISTICS statement to a single table. This approach reduces your risk of encountering a long transaction. Execute separate UPDATE STATISTICS statements for each table, followed by separate COMMIT WORK statements.
- Update statistics for an entire database only when no other users have access to the current instance of your target database server.
- Use **oncheck** to convert indexes while the database server is in quiescent mode. For more information, see "Using the oncheck Utility to Convert Indexes" on page 6-48.

Using DROP INDEX and CREATE INDEX to Convert Indexes

If neither of the previous two methods seem suitable, you can drop and rebuild the indexes for your tables individually. When you drop and rebuild indexes, you can override the default fill factor that is specified in the FILLFACTOR parameter in the ONCONFIG file. For details, refer to the *IBM Informix Guide to SQL: Syntax*.

Verify the Integrity of the Data

Verify the integrity of your data before you run the reversion utility. Figure 6-6 lists the oncheck commands for verifying data integrity.

Figure 6-6
Commands for Verifying Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

Tip: *You might see the following warning. It means that you have not defined any synonyms.*

```
WARNING: No syssyntable records found.
```

Make an Initial Backup of the Target Database Server

Use your target database server backup tool (ON-Bar, ON-Archive, or **ontape)** to make a level-0 backup. Do not overwrite the tapes you used earlier when you made your final backup of your database server. For more information, refer to your *Archive and Backup Guide* or your *Backup and Restore Guide*.

Important: *Do not restore the backed up logical logs to the newer version of your database server from your source database server.*

Add rowid Columns to Fragmented Tables

In the 7.x database servers, fragmented tables do not have a **rowid** field by default. If you migrate fragmented data tables to Dynamic Server 7.3x or 7.24, you must add a **rowid** column to each table before you use applications that use **rowid** values to access data.

Complete Migration

When you finish the level-0 backup, the migration process is complete and users can use your database server to access data safely.

The first time you bring up the target database server, the **sysmaster** database is built in 15 to 30 minutes. Check the message log to ensure that the **sysmaster** database build has completed before you allow users to access the database server.

After you successfully migrate to your target database server, you might want to seek ways to obtain maximum performance. If you created sample queries for comparison, you can use them to characterize the performance differences between your earlier version and your target database server. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on topics related to performance, refer to your *Performance Guide*.

GLS

Convert a Database to a Different Locale

When you complete the migration to Dynamic Server 7.3x or 7.24 from OnLine 5.1x, your databases use the default locale, U.S. English. After the target database server is running successfully, you can take the following steps to convert a database to a nondefault locale.

To convert a database to a nondefault locale

1. Use the UNLOAD statement or the **dbexport** utility to unload data from the database to be converted.
2. Set the **CLIENT_LOCALE** and **DB_LOCALE** environment variables to support the new GLS locale.
3. Create a database with the new locale by issuing the CREATE DATABASE statement from an application that has the correct client locale variables set in its environment.
4. Modify the schema representation to replace CHAR and VARCHAR columns with NCHAR and NVARCHAR columns, respectively.
5. Use the LOAD statement or the **dbimport** utility to load the data into the new database.

For more information about the GLS feature, see the *IBM Informix GLS User's Guide*.

Reverting from Dynamic Server 7.3x or 7.24 to OnLine 5.1x

This section describes the process to revert from Dynamic Server 7.3x or 7.24 to OnLine 5.1x. Before you can revert to OnLine 5.1x, you must modify the configuration limits and remove constructs that OnLine 5.1x does not support.

The procedure for reverting to OnLine 5.1x includes the following steps, which the rest of this section describes:

1. Save copies of the current configuration files.
2. Remove database server users.
3. Verify the integrity of the data.
4. Back up the source database server.
5. Remove features that later versions introduced.
6. Update altered tables.
7. Run the reversion utility (**onmode -b**).
8. Prepare the **TBCONFIG** configuration file.
9. Reset environment variables.
10. Bring up OnLine 5.1x in quiescent mode.
11. Verify the integrity of the data.
12. Back up OnLine 5.1x.
13. Return OnLine 5.1x to online mode.

Save Copies of the Current Configuration Files

Before you start the reversion process, save copies of your configuration files.

Remove Database Server Users

Remove all users from the source database server before you begin the reversion process. Warn the users that you plan to shut down the database server and then execute the following command:

```
onmode -s
```

The **-s** flag on **onmode** restricts new access to the database server but allows current processing to finish. When all processing is finished, the database server goes to quiescent mode, and you can continue the reversion process.

Verify the Integrity of the Data

Before you allow users to access the databases, use the oncheck utility to verify that no data was corrupted in the migration process. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes. For more information, see "Verify the Integrity of the Data" on page 6-50.

Back Up the Source Database Server

It is recommended that you use **ontape** or ON-Archive to make a level-0 backup. For details on how to make backups, refer to your *Archive and Backup Guide*.

Remove Features That Later Versions Introduced

Before you can revert to OnLine 5.1x, you must remove features that later versions of the database server introduced, as follows:

- Modify In-Place ALTER TABLE.
- Remove any GLS databases.
- Disable data replication.
- Change all fragmented tables back into unfragmented tables.

  For instructions on how to defragment tables, see your *Administrator's Guide*.
- Disable role separation.

- Remove unsupported SQL statements.
- Adjust configuration parameters.

Figure 6-7 shows configuration parameter limits for Version 5.1x.

Figure 6-7
Configuration Parameter Limits for Version 5.1x

Resource	Parameter	5.0 Limit
Logical logs	LOGFILES, LOGSMAX	<= 1 page of entries
Dbspaces	DBSPACES	<= 40
Chunks	CHUNKS	<= 1 page of entries
Buffers	BUFFERS	<= 512 kilobytes

The chunk limit depends on the length of the pathname that you choose for the chunk. The limit could range from `13` to `58`.

Tip: *Logical-log files of differing sizes that were created after initialization of 7.3x or 7.24 do not impair the reversion.*

Update Altered Tables

Reverting to an earlier version of the database server from Version 7.24 or later is not possible if outstanding In-Place ALTER TABLE statements exist. An In-Place ALTER TABLE statement is outstanding when data pages exist with the old definition.

If you attempt to revert to a previous version, the code checks for outstanding alter operations and lists any that it finds. You need to update every row of each table in the outstanding alter list with an ALTER TABLE version and then perform the reversion.

If an In-Place ALTER TABLE statement was performed on a table, you can convert the older version to the newest version by running a test UPDATE statement.

For example, run the following test UPDATE statement:

```
update tab1 set column1 = column1
```

For more information on In-Place ALTER TABLE, see your *Performance Guide*.

Run the Reversion Utility

To restore the database server files to a form that is compatible with OnLine 5.1x, execute the following command:

```
onmode -b 5.0
```

The reversion utility includes an implicit **onmode –yuk**. This command forcibly removes all users. After the reversion is complete, the database server is in offline mode.

Tip: *The* ***onmode -b*** *command also rebuilds the user-table indexes automatically.*

Depending on the version of the database server from which you are reverting, the **onmode** utility performs the following actions:

- Verifies that no GLS database exists
- Verifies that data replication is off
- Removes the second slot in the archive reserved page for data replication
- Drops the **sysmaster** database
- Rewrites leaf pages of all indexes
- Frees reserved-page extensions
- Removes the data-replication slot from the archive reserved page
- Rewrites all partnums on disk (systables, database tablespace, tablespace pages, blob freemap pages) in their old formats
- Rewrites dbspace page in the old format
- Writes a checkpoint record in Version 5.1x format to a clean logical-log file

The reformatting does not make the data space identical to its earlier format. Some of the changes made during a conversion to Dynamic Server 7.3x or 7.24 from an earlier version do not make the space incompatible with earlier versions, and the **-b** option does not modify these changes.

Prepare the TBCONFIG Configuration File

Modify the configuration file to eliminate parameters that OnLine 5.1x does not recognize. You might find it easier to compare your saved configuration file with the **tbconfig.std** file and make adjustments accordingly.

Be sure to include the USERS configuration parameter, which was replaced by USERTHREADS in later versions.

Important: *Use the same values for ROOTPATH, ROOTSIZE, and ROOTOFFSET for both versions of your database server.*

Reset Environment Variables

Reset the environment variables to values that are appropriate for the selected version of your database server. Remember that in Version 5.1x you specify the configuration file with the **TBCONFIG** environment variable instead of **ONCONFIG**.

Put OnLine 5.1x in Quiescent Mode

Bring up OnLine 5.1x from offline to quiescent mode. Execute the following command:

```
tbinit -s
```

Verify the Integrity of the Data

Before you allow users to access the databases, check the integrity of the data. Figure 6-8 lists the tbcheck commands for verifying data integrity.

Figure 6-8
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**tbcheck -cr**
Check system catalog tables	**tbcheck -cc** ***database_name***
Check data	**tbcheck -cD** ***database_name***
Check indexes	**tbcheck -cI** ***database_name***

When you run **tbcheck**, you might see the following message:

```
OLD pn_bytes != NEW pn_nbytes
```

This message does not require any action on your part. It indicates that a later version of the database server accessed your database.

Back Up OnLine 5.1x

After you complete the reversion, it is recommended that you make a level-0 backup of OnLine 5.1x. Use the **tbtape** utility to prepare backups. For details on making backups, refer to the appropriate *Administrator's Guide*.

Return Online 5.1x to Online Mode

To change your OnLine 5.1x mode from quiescent to online, execute the following command:

```
tbmode -m
```

The reversion is now complete, and users can access the data.

Chapter

7

Migrating to SE 7.2x

In This Chapter

This chapter describes how to migrate to IBM Informix SE 7.2x from an earlier version of SE. This chapter also describes how to convert C-ISAM files to SE.

The latest version of SE is Version 7.25. You can convert to any 7.2x version of SE from an earlier version. To convert from Version 5.1x, you need to change the environment variables and the **sqlhosts** file.

If you are migrating from SE 5.1x with Asian Language Support (ALS), see the 9.2/8.3 version of the *IBM Informix Migration Guide* for instructions on converting databases to Global Language Support (GLS) and reverting databases to ALS.

For information about migration between SE and Dynamic Server 7.3x, see "Moving Data Between SE and Dynamic Server 7.3x or Workgroup Edition 7.3x" on page 10-29.

Importing and Exporting Data

You can use the following utilities to import and export data to and from SE database servers:

- **dbexport**/**dbimport**
- UNLOAD/**dbschema**/LOAD
- UNLOAD/**dbschema**/**dbload**

Let your target database server, performance, and ease-of-use requirements determine the method that you use. For details, see Figure 2-2 on page 2-7. Chapter 10, "Migrating Between Database Servers and Operating Systems," describes the procedures for exporting and importing data. Section IV, "Data Migration Utilities," describes the syntax of the **dbexport**, **dbimport**, UNLOAD, **dbschema**, LOAD, and **dbload** utilities.

Migrating Between Different Versions of SE

Unlike Dynamic Server data, SE data is stored in ordinary UNIX or Linux files. The structure of these files remained the same between versions of SE, so that migrating from one version to a later version requires little preparation. SE manages the file contents, but the operating system manages the input and output.

Preparing to Convert to SE 7.2x

Since Version 5.1x, SE and other IBM Informix products introduced changes in the way clients connect to database servers. The names of database server utilities also changed.

UNIX/Linux

The sqlhosts File

SE 5.1x did not require an **sqlhosts** file on UNIX unless you used SE with IBM Informix NET. SE 7.2x requires an **sqlhosts** file on UNIX or Linux to specify connections between clients and servers. For information about how to prepare your **sqlhosts** file, refer to your *Administrator's Guide*.

Environment Variables

SE 7.2x requires the following environment variables:

INFORMIXDIR **PATH** **INFORMIXSERVER**

Depending on your network configuration, you might also need the following environment variables:

SQLEXEC **SQLRMDIR** **SQLRM**

For information about how to set these environment variables, refer to your *Administrator's Guide*.

SE Utilities

After Version 5.1x, the names of the SE utilities **bcheck** and **dblog** changed to **secheck** and **selog**, respectively. If you have scripts that use these utilities, you must update the names of the utilities.

To migrate to SE 7.2x from SE 5.1x or earlier

1. Ask all users to exit from their applications.
2. Verify the validity of your data.

   Execute the following command for each table in the database:

   ```
   bcheck tablename
   ```

   For more information about the **bcheck** utility, refer to your *Administrator's Guide*.
3. Use the **dbexport** utility to export the data from the 5.1x database server.

   For more information, see Chapter 11, "The dbexport and dbimport Utilities."
4. Install SE 7.2x.

   For information on how to install SE, refer to your *Installation Guide*.
5. Use the **dbimport** utilities to import the data into the 7.2x database server.

   For more information, see Chapter 11, "The dbexport and dbimport Utilities."

Preparing to Convert to a Later Version of SE 7.2x

When you convert to SE 7.2x from a version of SE later than Version 5.1x, you do not need to change the **sqlhosts** file or the environment variables.

To migrate to SE 7.2x from a version of SE later than 5.1x

1. Ask all users to exit from their applications.
2. Verify the validity of the data.

   Execute the following command for each table in the database:

   ```
   secheck tablename
   ```

   For more information about the **secheck** utility, refer to your *Administrator's Guide*.
3. Install SE 7.2x.

   For information on how to install SE, refer to your *Installation Guide*.

Reverting to an Earlier Version of SE

A reversion utility is not provided for SE. To move your database to an earlier version of SE, you must unload and then reload your data. For information about how to use **dbexport**, **dbimport**, and UNLOAD to move your data, see "Importing and Exporting Data" on page 7-4.

Converting C-ISAM Files to SE

This section describes how to convert C-ISAM files to SE format. C-ISAM files are organized differently than relational tables. C-ISAM files tend to be much larger and are not normalized. Therefore, you need to convert C-ISAM applications to the SQL format that you can use with SE, as follows:

1. In SE, use the SQL CREATE TABLE statement to create a table that corresponds to the data fields in the C-ISAM application. (Do not use the name of the C-ISAM file for the table name.)
2. Delete the empty **.dat** file that SE created in the CREATE TABLE statement. It has the name `tabname|tabid|".dat"`. Also, delete the empty **.idx** file.
3. Either move the C-ISAM file to the **.dbs** directory or update the **systables** system catalog with the name of the C-ISAM data file.

   If you update both the C-ISAM and SE files with logging turned on, you must use common logging.

Section III

Migration of Data Between Database Servers

Chapter

8

Migrating to Extended Parallel Server 8.40 from a 7.3x or 7.2x Database Server

UNIX

In This Chapter

This chapter describes the procedures to migrate to Extended Parallel Server 8.40 from Dynamic Server 7.3x or 7.24. The description covers the following topics:

- Preparing for migration
- Converting to Extended Parallel Server 8.40 from Dynamic Server 7.3x or 7.24.
- Reverting from Extended Parallel Server 8.40 to Dynamic Server 7.3x or 7.24

Preparing for Migration

To prepare for migration to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server, you need to understand the guidelines for migrating between database servers. You also need to know about any new features that might affect migration. The data movement utility, **onxfer**, facilitates database schema and data transfer to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server.

Migration Guidelines

Observe the following precautions when you migrate to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server:

- Check the release notes and machine notes for information about the proper operating-system release and any patches that you need for successful installation and operation of the database server.

  The release notes and machine notes are in the following directory:

  $INFORMIXDIR/release/en_us/0333.

  Retain both versions of the IBM Informix product software on disk (if you have enough disk resources).
- Retain the installation media from both versions of the IBM Informix product software.
- Perform a level-0 backup of the 7.3x or 7.24 database server. After you complete the migration, perform another level-0 backup with Extended Parallel Server 8.40.
- Use a test instance of your database server to test the installation and migration procedures.
- Verify storage-manager validation for Extended Parallel Server 8.40.

  For details, see, "Storage-Manager Validation and Installation" on page 8-6.

For additional installation information and guidelines, refer to your *Installation Guide* and your *Getting Started Guide*.

Changes That Extended Parallel Server 8.40 Introduced

This section describes changes that Extended Parallel Server 8.40 introduced that can affect migration or initial configuration.

Environment Variables

Extended Parallel Server 8.40 introduced the following new environment variables:.

BIG_FET_BUF_SIZE
DEBUG NODBPROC
IFMX_OPT_FACT_TABS
IFMX_OPT_NON_DIM_TABS
TEMP_TAB_EXT_SIZE
TEMP_TAB_NEXT_SIZE

The *IBM Informix Guide to SQL: Reference* describes these environment variables. For performance implications and guidelines, refer to your *Performance Guide*.

Configuration Parameters

Extended Parallel Server 8.40 introduced new configuration parameters that might affect your installation. You might also need to adjust the values of existing parameters. Your *Administrator's Reference* describes the following new configuration parameters:

DEADLOCK_TIMEOUT
FRAGS_PER_DBS
MSGDATE
TXTIMEOUT

Data Movement Utility

The **onxfer** utility facilitates data movement to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server. This chapter includes information about using **onxfer** to unload the 7.3x or 7.24 data and database schema and to load them into Extended Parallel Server 8.40.

This utility can unload and load data between database servers in iterative mode, when the source and target database servers are running simultaneously, or in staged mode, when the database servers are not running simultaneously. For the iterative mode, you can configure **onxfer** to unload and load a subset of the database tables.

For details about **onxfer** syntax and configuration parameters, see Chapter 17, "The onxfer Utility."

Backup Tools and ON-Bar Configuration

Extended Parallel Server 8.40 does not support the **ontape** utility or ON-Archive. To back up Extended Parallel Server 8.40, you need to use ON-Bar or data migration tools.

If you use ON-Bar when you migrate to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server, you need to make substantial changes in the ON-Bar configuration. For details about how to configure ON-Bar, refer to your *Backup and Restore Guide*.

Storage-Manager Validation and Installation

When you convert or revert an Informix database server, the storage manager that you used on the source database server might not be validated for the version of the database server to which you are migrating. Verify that the storage manager is validated for the target database server version and platform by checking the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a validated storage manager before you perform backups with the ON-Bar backup and restore system.

When you migrate to a new database server version, install the storage manager before you bring up the database server. Then if you have automatic log backup set up on the database server, ON-Bar can start backing up the logs when the new database server comes online.

Warning: *If you migrate IBM Informix Storage Manager (ISM) 1.0 catalogs to ISM 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. Once the ISM 2.0 server is restarted after catalog migration, error messages occur in various logs.*

For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Converting to Extended Parallel Server 8.40 from a 7.3x or 7.24 Database Server

This section describes the procedures for converting to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server.

When you convert to Extended Parallel Server 8.40, complete the following steps, which the sections that follow describe in more detail:

1. Configure and check available space.
2. Save copies of the current configuration files.
3. Close all transactions in the source database server.
4. Put the source database server in quiescent mode.
5. Verify the integrity of the data.
6. Verify the mode.
7. Back up the source database server.
8. Change UNIX kernel parameters.
9. Edit the schema file to suit Extended Parallel Server 8.40.
10. Set environment variables.
11. Install Extended Parallel Server 8.40.
12. Copy database server utilities to each node.
13. Update the ONCONFIG configuration file.
14. Bring Extended Parallel Server 8.40 online.
15. Use **onutil** to create cogroups and dbslices.
16. Edit the **onxfer** configuration file.
17. Unload the 7.3x or 7.24 database schema and data.
18. Load the database schema and data.
19. Make an initial backup of Extended Parallel Server 8.40.
20. Tune Extended Parallel Server 8.40 for performance.

Important: *Repeat steps 12 through 20 for each instance of Extended Parallel Server 8.40.*

Configure and Check Available Space

Configure your computer memory equally among all the nodes. Because only one ONCONFIG file exists in Extended Parallel Server 8.40 and the configuration parameter is configured globally, the amount of memory you configure in your ONCONFIG file is limited to the node with the smallest amount of memory. If your system memory is configured unequally, Extended Parallel Server 8.40 cannot take advantage of the nodes that have extra memory.

If you want multiple coservers in Extended Parallel Server 8.40, add a COSERVER section to the ONCONFIG file. You can copy the **onconfig.xps** template file and customize it for your database server. For more information about multiple coserver configuration, see your *Administrator's Guide* and the *Administrator's Reference*.

When you calculate disk-space requirements for Extended Parallel Server 8.40, take into account the size of your tables. You need additional space for control information for your tables (approximately 60 bytes per page). Also consider disk space for the following needs:

- Root dbspace for all your nodes
- Physical logs
- Logical-log space

  (If you require logging during loads, add the additional space.)
- Temporary dbspace
- Indexes
- Summary tables and index from your online transaction processing (OLAP) tools
- Mirroring
- Future growth
- File-system space for your operating system and IBM Informix products
- Staging space for loading and unloading files

- Safe write area
- New system catalog tables
- New **sysmaster** tables

For information on disk-space requirements for Extended Parallel Server 8.40, refer to your *Administrator's Guide*.

To ensure that sufficient space is available, check the amount of free space in each dbspace to determine whether you need to add more space. Use the following SQL statements to determine the free space you require and the free space available. These statements return the free-space calculation in page-size units. The **free_space_req** column value is the free space you require and the **free_space_avail** column value is the free space available.

The following SQL statement shows how to determine the free space that each dbspace requires:

```
DATABASE sysmaster;
SELECT partdbsnum(partnum) dbspace_num,
       trunc(count(*) * x) free_space_req
   FROM sysdatabases
GROUP BY 1
ORDER BY 1;
```

The following SQL statement queries the **syschunks** table and displays the free space available for each dbspace:

```
SELECT dbsnum dbspace_num, sum(nfree) free_space_avail
   FROM syschunks
GROUP BY 1
ORDER BY 1;
```

Important: *If a dbspace has less free space available than it requires, either move a table from the dbspace to another dbspace or add a chunk to it. The dbspace estimates could be higher if you have an unusually large number of SPL routines or indexes in the database.*

Save Copies of the Current Configuration Files

Save copies of the configuration files for each instance of the 7.3x or 7.24 database server. Keep the copies available to use later. Save the configuration files that the following list shows, if they exist:

$INFORMIXDIR/etc/$ONCONFIG
$INFORMIXDIR/etc/ONCONFIG.std
$INFORMIXDIR/aaodir/adtcfg
$INFORMIXDIR/dbssodir/adtmasks
$INFORMIXDIR/etc/sqlhosts
$INFORMIXDIR/etc/tctermcap
$INFORMIXDIR/etc/termcap
$INFORMIXDIR/etc/$ONCONFIG

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of the following file:

$INFORMIXDIR/etc/ixbar.<*servernum*>

If you use ON-Archive to back up the 7.3x or 7.24 database server and logical logs, you must also copy and save the configuration files in the following list:

$INFORMIXDIR/etc/$ARC_CONFIG
$INFORMIXDIR/etc/config.arc
$INFORMIXDIR/etc/oper_deflt.arc

Close All Transactions in the Source Database Server

Communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and shut down the 7.3x or 7.24 database server.

To let users exit and shut down the source database server gracefully

1. Execute the **onmode –sy** command.
2. Wait for all users to exit.
3. Execute the **onmode –ky** command.

Put the Source Database Server in Quiescent Mode

Execute the following command to put the 7.3x or 7.24 database server in quiescent mode and initiate a fast recovery of your current database:

```
oninit -s
```

The **oninit –s** option rolls forward all committed transactions and rolls back all incomplete transactions since the last checkpoint and then leaves a new checkpoint record in the log with no open transactions pending. (For more information about fast recovery, refer to your *Administrator's Guide*.)

Verify the Integrity of the Data

Use the onutil utility to verify the integrity of data before you make a level-0 backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes.

To obtain the database names, use the following statements with DB-Access:

```
DATABASE sysmaster;
SELECT name FROM sysdatabases;
```

Figure 8-1 lists the **onutil** commands you can use to verify data integrity.

Figure 8-1
Commands for Verifying Data Integrity

Action	onutil Command
Check reserve pages	**onutil** CHECK RESERVED DISPLAY DATA
Check extents	**onutil** CHECK SPACE DISPLAY DATA
Check system catalog tables	**onutil** CHECK CATALOGS
Check data	**onutil** CHECK TABLE DATA DISPLAY DATA
Check indexes	**onutil** CHECK INDEX DISPLAY DATA

For information about **onutil**, refer to the *Administrator's Reference*.

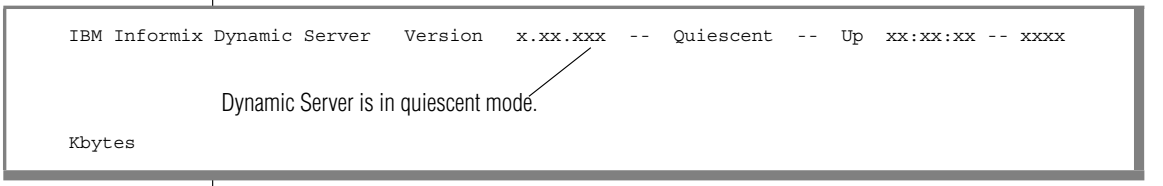
Verify the Mode

Before you make a backup, execute the following command to verify that your source database server is in quiescent mode:

```
onstat -
```

The first line of the onstat output contains the status of your source database server. Figure 8-2 shows that the database server is in quiescent mode.

Figure 8-2
Example of onstat Status Line



Back Up the Source Database Server

Use ON-Bar, **ontape**, or ON-Archive to make a level-0 backup and logical-log backup of the 7.3x or 7.24 database server. If you use **ontape**, execute the following command to make a level-0 backup:

```
ontape -s
```

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup. (For more information, see your *Archive and Backup Guide*.)

After you make a level-0 backup, perform a complete backup of the logical log, including the current logical-log file.

If you use ON-Archive, execute the following command to make a full-system, level-0 backup:

```
Onarchive> ARCHIVE/DBSPACESET=*
```

Change UNIX Kernel Parameters

You might need to change some of the UNIX kernel parameters before you install Extended Parallel Server 8.40. To reconfigure the operating system, follow the directions in the machine notes file included on your database server distribution media and the kernel-configuration instructions for your operating system.

For information on the location of the machine notes file, see "Additional Documentation" on page 20 of the Introduction.

Important: *Make sure you modify the kernel parameters on every node.*

Edit the Schema File to Suit Extended Parallel Server 8.3x

Configure the downloaded schema for Extended Parallel Server 8.40. For information about schema configuration for Extended Parallel Server 8.40, see "Database Schema" on page 9-11.

Set Environment Variables

Before you install Extended Parallel Server 8.40 or invoke DB-Access, set up the following environment variables on every node:

INFORMIXDIR	**ONCONFIG**	**INFORMIXSQLHOSTS**
INFORMIXSERVER	**PATH**	

The client application looks for the **sqlhosts** file in the **$INFORMIXDIR/etc** directory. However, you can use the **INFORMIXSQLHOSTS** environment variable to change the location or name of the **sqlhosts** file.

Set the environment variable **PATH** so that the local directory that contains Informix commands is searched before the **INFORMIXDIR** directory.

Important: *The installation script installs Extended Parallel Server 8.40 into the **INFORMIXDIR** directory specified for user **root** or **informix** on UNIX. The installation script does not bring Extended Parallel Server 8.40 online.*

Install Extended Parallel Server 8.40

To install and configure Extended Parallel Server 8.40, follow the directions in your *Installation Guide* and in your *Administrator's Guide*.

You must log in as user **root** or **informix** and set the **INFORMIXDIR** environment variable to the directory where you plan to install the database server. Install it on the node that contains the connection coserver in the directory that was NFS mounted on all the other nodes. Install the entire distribution on a single node within a file system that is shared across all the nodes that are assigned to Extended Parallel Server 8.40.

Important: *IBM Informix database servers support only certified versions of NFS. For information about the NFS products you can use to NFS mount a storage space for an IBM Informix database server, see the product compatibility information at http://www.ibm.com/software/data/informix/pubs/smv/index.html.*

Check that the file system can hold the entire Extended Parallel Server 8.40 distribution of approximately 180 megabytes. Export this file system with write access as user **root** or **informix** over the NFS and mount it to the same mount point on every node.

Warning: *If you install Extended Parallel Server 8.40 in the same directory where the 7.3x or 7.24 database server resides, the installation script overwrites the older files. If you want to transfer data directly to Extended Parallel Server 8.40 from the 7.3x or 7.24 database server, install Extended Parallel Server 8.40 in a different directory. If you want to install Extended Parallel Server 8.40 in the same directory, copy the the 7.3x or 7.24 database server files to a different directory before you begin the installation.*

Before you overwrite the source database server, take the following precautions:

- If you do not have the original media for the source database server, back up the **INFORMIXDIR** directory before you install Extended Parallel Server 8.40.
- Copy the configuration files in the **etc** directory of **INFORMIXDIR** to another location on the file system.

The installation script installs Extended Parallel Server 8.40 into the **INFORMIXDIR** directory specified for user **root**. The installation script does not bring Extended Parallel Server 8.40 online.

Check the release notes for information about the correct operating-system patches, recommended shared-memory parameters, and configurations that are required for successful installation and operation of the database server. The machine notes and release notes are in the following directory:

$INFORMIXDIR/release/en_us/0333

Make any changes that the machine notes and release notes recommend on every node. For more information on how to install Extended Parallel Server 8.40, refer to your *Installation Guide* and your *Administrator's Guide*.

Copy Database Server Utilities to Each Node

To ensure rapid and proper initialization, create local copies of the following utilities on each node:

oninit
onmode
onstat

When you finish copying the utilities to each node, log out as **root**.

Update the ONCONFIG Configuration File

You can customize your ONCONFIG configuration file and environment variables to take advantage of the new features that Extended Parallel Server 8.40 introduced. After you observe the performance of Extended Parallel Server 8.40, you might want to make further adjustments.

For information on how to configure Extended Parallel Server 8.40, refer to your *Administrator's Guide*. For information about environment variables, refer to the *IBM Informix Guide to SQL: Reference*. For information about how to tune the configuration parameters, refer to your *Performance Guide*.

Bring Extended Parallel Server 8.40 Online

Execute the following command to bring Extended Parallel Server 8.40 online for the first time:

```
xctl -C oninit -iy
```

Check your database server message log to verify that all coservers are up. To view the message log, execute:

```
onstat -m
```

To verify that all your coservers are up and running, execute:

```
xctl onstat -
```

For information about messages in the message log, refer to your *Administrator's Guide*.

Important: *If the message file notes problems, solve the problems before you continue to the next step.*

Use onutil to Create Cogroups and Dbslices

Create cogroups and dbslices of equal sizes across all coservers. When you create a dbslice, you specify the cogroup name so that Extended Parallel Server 8.40 knows the coservers on which to create dbspaces. For example, you might create a dbslice from an accounting cogroup. The following example shows how to create a cogroup and a dbslice:

```
% onutil
1> CREATE COGROUP acctg_cogroup
2> FROM xps.%r(1..8);
Cogroup successfully created.
3> CREATE DBSLICE acctg_dbslc
6> FROM COGROUP acctg_cogroup ...
```

You do not need to specify the names explicitly for all the individual dbspaces that are associated with the partitioned tables. Extended Parallel Server 8.40 generates the dbspace names for you.

Run **xctl** to verify that all your dbspaces were created correctly on each coserver:

```
xctl onstat -d
```

Edit the onxfer Configuration File

You can configure each **onxfer** process by setting parameters in the configuration file before you start the utility. The default name of the **onxfer** configuration file is **xfer_config** in the **$INFORMIXDIR/etc** directory. You can specify a different directory in the **XFER_CONFIG** environment variable.

For details about onxfer configuration parameters, see Chapter 17, "The onxfer Utility."

Unload the 7.3x or 7.2x Database Schema and Data

Start the **onxfer** utility to unload the 7.3x or 7.24 schema and data. For details about **onxfer** syntax, see Chapter 17, "The onxfer Utility."

The schema on the source database is downloaded into the directory that you specified. The directory contains the following three unloaded files:

db_pre.sql
db_post.sql
db_incompat.sql

Load the Database Schema and Data

The schema is created based on the **db_pre.sql** and **db_post.sql** files. You need to check the **db_incompat.sql** file for parts of the schema that you might need to create after the initial loading.

Make an Initial Backup of Extended Parallel Server 8.40

Use the ON-Bar backup and restore system to make a level-0 backup of Extended Parallel Server 8.40. Do not overwrite the tapes you used to make the final backup of the 7.3x or 7.24 database server. For more information about ON-Bar, see your *Backup and Restore Guide*.

Extended Parallel Server 8.40 supports unloading directly to a pipe or to a tape drive. You do not need to unload data first to disk.

You can also use external tables to perform a backup. For information about loading data into and unloading data from external tables, see your *Administrator's Guide*.

Tune Extended Parallel Server 8.40 for Performance

When you finish the level-0 backup, the migration process is complete and users can use Extended Parallel Server 8.40 to access data safely.

After you successfully migrate to Extended Parallel Server 8.40, you might want to seek ways to obtain maximum performance. If you created sample queries for comparison, you can use them to characterize the performance differences from the 7.3x or 7.24 database server. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on performance, refer to your *Performance Guide*.

Reverting from Extended Parallel Server 8.40 to a 7.3x or 7.2x Database Server

After you migrate to Extended Parallel Server 8.40 from a 7.3x or 7.24 database server, you cannot revert back automatically. To revert, you need to unload the data into an external table from the 8.40 database server and then load it back into the 7.3x or 7.24 database server.

Use the **onutil** utility to check for outstanding in-place ALTER TABLE versions, as follows:

```
>onutil
>CHECK TABLE INFO
```

If pages exist with old table definitions, update and convert all data pages to current table definitions. To do this, run a dummy update to change all data pages to the latest definition, as your *Performance Guide* describes.

Unloading Data to External Tables

To unload data to an external file, issue SELECT with INTO EXTERNAL statements. You can implicitly or explicitly specify an external table. (If you are loading data, an explicit definition is mandatory.) The SELECT with INTO EXTERNAL statements create a default external table description for unloading data. Issue the following SQL statement:

```
SELECT *
FROM customer
WHERE customerNum > 100
AND lastName [1] = "A"
INTO EXTERNAL TABLE custExtII
USING
(
FORMAT "informix",
DATAFILES
( "DISK:1:/tmp/dat.out",
"DISK:2:/tmp/dat.out",
"DISK:3:/tmp/dat.out"
));
```

In this example, the external table is implicitly defined when the table is unloaded. If the external table already exists, you can use the following syntax:

```
INSERT INTO extTableName
SELECT *
FROM tableName
WHERE...;
```

For more information about external tables, see the description of the CREATE EXTERNAL TABLE statement in the *IBM Informix Guide to SQL: Syntax*.

Loading Data from External Tables

After the data is unloaded into external tables, you can use the load utilities in the 7.3x or 7.24 database server to load the data. For load-utility information, see Chapter 2, "Data Migration."

Chapter

9

Migrating to Dynamic Server AD/XP 8.21 from a 7.2x Database Server

In This Chapter

This chapter describes the procedure to migrate between Dynamic Server with AD and XP Options 8.21 and Dynamic Server 7.24 or OnLine Dynamic Server 7.2x.

This chapter covers the following topics:

- Preparing for migration
- Loading and unloading data
- Converting to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server
- Reverting from Dynamic Server with AD and XP Options 8.21 to a 7.2x database server

Tip: *To migrate to Dynamic Server with AD and XP Options 8.21 from Dynamic Server 7.3x, revert to Dynamic Server 7.24 first.*

Preparing for Migration

To prepare for migration to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server, you need to understand the guidelines for migrating between database servers. You also need to know about any new features that might affect migration.

Observe the following precautions when you migrate to Dynamic Server with AD and XP Options 8.21:

- Check the release notes for information about the proper operating-system release and any patches that you require for successful installation and operation of the database server.

  The release notes are in one of the following directories:

  UNIX/Linux

  - **$INFORMIXDIR/release/en_us/0333** ♦

  Windows

  - **%INFORMIXDIR%\release\en_us\0333.**

    Release notes are in the Informix folder. To display this folder, choose **Start→Programs→Informix** from the Task Bar. ♦

  On UNIX or Linux, retain both versions of the IBM Informix product software on disk (if you have enough disk resources). On Windows NT, you cannot retain two versions of the IBM Informix product on disk.
- Retain the installation media from both versions of the IBM Informix product software.
- Perform a level-0 backup of all dbspaces and blobspaces with the 7.2x database server.

  After you complete the migration, perform another level-0 backup with Dynamic Server with AD and XP Options 8.21.
- Use a test instance of Dynamic Server with AD and XP Options 8.21 to test the installation and migration procedures.

  Use a test instance in the desired communications mode to practice bringing the new database server online before you attempt to convert the production database.
- Verify storage-manager validation for the target database server.

  For details, see, "Storage-Manager Validation and Installation" on page 9-19.

For additional installation information and guidelines, refer to your *Installation Guide* and your *Getting Started Guide*.

Changes That Dynamic Server AD/XP 8.21 Introduced

This section describes the changes that Dynamic Server with AD and XP Options 8.21 introduced that can affect initial configuration and migration. Dynamic Server with AD and XP Options introduced new features and associated terminology, including coservers, cogroups, and dbslices that facilitate a high degree of parallelism. For descriptions of these features and terms, see your *Getting Started Guide*.

Environment Variables

Dynamic Server with AD and XP Options 8.21 introduced significant changes to the following environment variables:

INFORMIXSERVER
PDQPRIORITY
PSORT_NPROCS

The *IBM Informix Guide to SQL: Reference* describes these environment variables. For performance implications and guidelines, see the *Performance Guide for IBM Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options*.

Configuration Parameters

Dynamic Server with AD and XP Options 8.21 introduced new configuration parameters that might affect installation. You might also need to adjust the values of existing parameters. The following figures list the parameters. For more information on these configuration parameters, see your *Administrator's Guide* or the *Administrator's Reference*.

Figure 9-1 lists the ON-Bar and ISM parameters for a database server.

Figure 9-1
ON-Bar and ISM Configuration Parameters for a Database Server

ON-Bar Parameters Added	ISM Parameters Added
BAR_ACT_LOG	ISM_DATA_POOL
BAR_BSALIB_PATH	ISM_LOG_POOL
BAR_DBS_COSVR	
BAR_IDLE_TIMEOUT	
BAR_LOG_COSVR	
BAR_RETRY	
BAR_SM	
BAR_SM_NAME	
BAR_WORKER_COSVR	
BAR_WORKER_MAX	
BAR_XFER_BUFSIZE	
BAR_XPORT_COUNT	

Single Coserver

For a single coserver configuration, use the default values in the **onconfig.std** template in the **etc** directory in **INFORMIXDIR.**

Important: *Do not modify* ***onconfig.std****. The database server provides the* ***onconfig.std*** *configuration file as a template and not as a functional configuration.*

Figure 9-2 lists the ONCONFIG parameters for a single coserver configuration for Dynamic Server with AD and XP Options 8.21.

Figure 9-2
Single Coserver Configuration Parameters

Parameters Added	Parameters Changed	Parameters Dropped
BAR_ACT_LOG	DBSERVERNAME	DS_MAX_SCANS
BAR_BSALIB_PATH	DBTEMPSPACE	
BAR_RETRY	DS_TOTAL_MEMORY	
BAR_WORKER_MAX	MAX_PDQPRIORITY	
BAR_XFER_BUFSIZE	MIRRORPATH	
BAR_XPORT_COUNT	ROOTNAME	
CONFIGSIZE	ROOTPATH	
DS_ADM_POLICY		
ISM_LOG_POOL		
ISO_CURLOCKS		
LOG_BACKUP_MODE		
PHYSDBS		
ROOTSLICE		

Multiple Coservers

For a multiple coserver configuration, use the default values in the **onconfig.xps** template that is located in the **etc** directory in **INFORMIXDIR.**

Important: *Do not modify **onconfig.xps**. The database server provides the **onconfig.xps** configuration file as a template and not as a functional configuration.*

Figure 9-3 lists the ONCONFIG parameters for a multiple coserver configuration for Dynamic Server with AD and XP Options 8.21.

Figure 9-3
Multiple Coserver Configuration Parameters

Parameters Added	Parameters Changed	Parameters Dropped
BAR_ACT_LOG	DBSERVERNAME	DS_MAX_SCANS
BAR_BSALIB_PATH	DBTEMPSPACE	
BAR_DBS_COSVR	DS_TOTAL_MEMORY	
BAR_IDLE_TIMEOUT	MAX_PDQPRIORITY	
BAR_LOG_COSVR	MIRRORPATH	
BAR_RETRY	ROOTNAME	
BAR_SM	ROOTPATH	
BAR_SM_NAME		
BAR_WORKER_COSVR		
BAR_WORKER_MAX		
BAR_XFER_BUFSIZE		
BAR_XPORT_COUNT		
CONFIGSIZE		
COSERVER		
DS_ADM_POLICY		
END		
ISM_DATA_POOL		
ISM_LOG_POOL		
ISO_CURLOCKS		
LOG_BACKUP_MODE		

(1 of 2)

Parameters Added	Parameters Changed	Parameters Dropped
NODE		
PHYSSLICE		
ROOTSLICE		

(2 of 2)

The sqlhosts File or Registry Key

Dynamic Server with AD and XP Options 8.21 contains formatting changes and new options in the **sqlhosts** file or registry key. The **dbservername** format and the options within the options field are different from any prior version.

The dbservername Identifier

Within the **sqlhosts** file or registry key for Dynamic Server with AD and XP Options 8.21, the value of the **dbservername** field identifies each connection coserver uniquely, in the following format:

```
dbservername.coserver-number
```

dbservername The value that you specify in the DBSERVERNAME or DBSERVERALIASES configuration parameter

coserver-number The integer that you specify in each COSERVER configuration parameter

This form of the **dbservername** value is referred to as a *coserver name*. Dynamic Server with AD and XP Options 8.21 uses the DBSERVERNAME (or DBSERVERALIASES) and COSERVER values specified in the ONCONFIG configuration file to generate the following coserver names automatically:

```
dbservername.1
⋮
dbservername.n
```

New Options Syntax

The fifth field in the **sqlhosts** or registry fields, the **options** field, accommodates new options and future options.

The following list is a review of the **sqlhosts** or registry key fields:

```
field 1          field 2     field 3      field 4          field 5
dbservername     nettype     hostname     servicename      options
```

The **dbservername** value in field 1 is a key for connectivity information in the remaining fields in the **sqlhosts** file or registry key.

The **options** field contains columns. Each column is separated by a comma or white space that represents an end of the column. Client and database server applications check each column to determine whether the option is supported in the database server release.

Tip: *If you maintain more than one version of the database server, use separate* ***sqlhosts*** *files or registry entries for older versions of the database server. Alternatively, you can use separate entries with an alias to the appropriate database server.*

For Dynamic Server with AD and XP Options 8.21, an **sqlhosts** entry must exist for every coserver. The **sqlhosts** file or registry key contains a line for each connection type that the database server provides, for each coserver that makes up Dynamic Server with AD and XP Options, and for each Version 8.21 database server to which a client connects.

Figure 9-4 lists sample **sqlhosts** file or registry key fields for Dynamic Server with AD and XP Options 8.21.

Figure 9-4
The sqlhosts File or Registry Fields

dbservername	nettype	hostname	servicename	options
servername.1	onsoctcp	node1	sqlexec.1	e=x100,r=1,s=1
servername.2	onsoctcp	node2	sqlexec.2	k=1,r=1, b=200
⋮	⋮	⋮	⋮	⋮
servername.8	onsoctcp	node8	sqlexec.8	g=abcd,i=2300

In the sample **sqlhosts** file, the **options** field for the first coserver contains three options in three columns, as follows.

Column	Option
Column 1	e=x100
Column 2	r=1
Column 3	s=1

Important: *It is recommended that you use field 5,* ***options****, for Dynamic Server with AD and XP Options 8.21 for the following options only:* ***b****,* ***k****,* ***r****,* ***s****,* ***g****,* ***e****,* ***c****,* ***i****. Place any other options in subsequent columns. If you do not want any of these options but do want other options, use* `k=1` *in column 5, which is the default. For example, for options for* ***dbservername.coserver_8****, use* `k=1, g=abcd,i=2300`.

For more information on the components of the **sqlhosts** file or registry key, see the *Administrator's Guide for IBM Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options*.

Database Schema

The Version 8.21 database schema supports flexible fragmentation strategies, system-defined hash fragmentation, hybrid fragmentation, and unique serial columns across coservers. When you migrate to Dynamic Server with AD and XP Options, make sure to configure your database schema to take advantage of these features, which allow for a high degree of parallelism.

Hybrid Fragmentation

Hybrid fragmentation is a schema that incorporates multiple fragmentation strategies. Prior to Dynamic Server with AD and XP Options 8.21, table-fragmentation strategy was based on a single strategy, either hash, expression, or round-robin. Dynamic Server with AD and XP Options 8.21 allows fragmentation by system-defined hash and you can combine two fragmentation strategies on the same table.

When you prepare to migrate to Dynamic Server with AD and XP Options 8.21, define the dbspace or dbspaces where your fragmented tables reside, as the following example shows:

```
CREATE TABLE account
  (account_id integer,
   account_bal integer,
   account_date date,
   account_name char(30)
  )
 FRAGMENT BY HASH(account_date)
    IN account_dbsp1,
       account_dbsp2,
    ⋮
account_dbspn;
```

This CREATE TABLE statement fragments the table across multiple dbspaces, which can reside on different coservers. You can create dbslices to manage the multiple dbspaces across coservers. The dbslices simplify administration of multiple dbspaces that reside on different coservers. For example, you can create a **dbslice account_dbslc** dbslice that includes the **dbspaces account_dbsp1** to **account_dbspn** dbspaces

The following statement shows how the CREATE TABLE statement is simpler with the IN dbslice clause:

```
CREATE TABLE account
  (account_id integer,
   account_bal integer,
   account_date date,
   account_name char(30)
  )
FRAGMENT BY HASH(account_date)
    IN account_dbslc;
```

For more information on how to create a dbslice, refer to your *Administrator's Guide*.

Hybrid fragmentation allows you to further fragment the table within each dbslice. You might want to fragment each time period by account number, as the following sample CREATE TABLE statement shows:

```
CREATE TABLE account
  (account_id integer,
   account_bal integer,
   account_date date,
   account_name char(30)
  )
 FRAGMENT BY HYBRID (HASH (account_date)) EXPRESSION
   account_id < 100 IN account_dbslc.1
   account_id >= 100 AND account_id > 200 IN account_dbslc.2
   ⋮
   <expression_n> in account_dbslc.n;
```

For more information on hybrid fragmentation syntax, see the *IBM Informix Guide to SQL: Syntax*. For more information and performance implications of using various fragmentation strategies, see your *Performance Guide*.

Unique Record Identifiers: Serial Columns

Serial columns in Dynamic Server with AD and XP Options are unique identifiers across coservers. In a 7.2x database server, ROWIDs uniquely identify records, but Dynamic Server with AD and XP Options 8.21 does not use ROWIDs across multiple coservers as unique record identifiers. You can use ROWIDs in Dynamic Server with AD and XP Options, but they act as unique identifiers only if your tables are not fragmented.

Tip: *When you migrate to Dynamic Server with AD and XP Options 8.21, make sure your applications do not assume that ROWIDs are unique.*

Dynamic Server with AD and XP Options 8.21 uses serial columns that are contiguous within each coserver to serve as unique identifiers, although a gap in numbers between coservers might occur. You can load values into serial columns, such as from the original data file, or use values that Dynamic Server with AD and XP Options generates automatically. However, when you create a table, you must specify that you want serial columns.

Design your database schema to take advantage of fragmentation strategies and serial columns before you migrate to it. For general information about fragmentation and serial columns, see the *IBM Informix Database Design and Implementation Guide*.

Logging and Nonlogging Table Types

In Dynamic Server with AD and XP Options 8.21, no method exists to create a nonlogging database. The default logging mode is set to unbuffered logging. This database server, however, offers the ability to have logging and nonlogging *tables*, and you can mix logging and nonlogging tables within the same database.

Dynamic Server with AD and XP Options 8.21 has *permanent* and *temporary* tables with logging or nonlogging capabilities. Permanent tables have four classes: *raw*, *standard*, *operational*, and *static*. Temporary tables have two classes: *scratch* and *temp*. Both permanent and temporary tables can be altered from one class to another.

The logging mode of a table restricts the type of data load you can use for a table as well as the recoverability of the table.

Tip: *Use raw tables to initially load and scrub data and later alter the tables to another class, if necessary. Raw tables can be loaded in express mode only. For a description of express-load mode, see* *"Express Mode" on page 9-20*.

The following table lists the logging and loading characteristics of permanent and temporary table types. Express- and deluxe-loading modes are discussed in "Loading and Unloading Data" on page 9-20.

Table Type		Logging or Nonlogging	Load Mode Options
Permanent	Raw	Nonlogging	Express
	Standard	Logging	Deluxe
	Operational	Logging	Express or deluxe
	Static	Nonlogging	No loading
Temporary	Scratch	Nonlogging	
	Temp	Logging	

Permanent Tables

Use raw tables to initially load and scrub data. Raw tables use light appends that bypass the buffer cache and allow fast loading. They do not support indexes, referential constraints, rollback and recovery, or restoration from backup. You can use raw tables only with express-mode loads. For a description of express-load mode, see "Express Mode" on page 9-20.

Standard tables are similar to tables in a logged database in a 7.2x database server. They do not use light appends but support recovery and rollback. Standard tables allow restores. However, you cannot use express mode to load standard tables.

Use operational tables to load data from a source outside the database system. Operational tables use light appends—unbuffered, unlogged insert operations. They allow rollback and recovery but do not allow restoration from backup. If indexes are enabled, deluxe-mode load is automatic. For descriptions, see "Deluxe Mode" on page 9-21.

Use static tables for read-only operations. Static tables use light scans and do not need locking. They allow constraints and nonclustered indexes but do not allow rollback and recovery or restoration from backup. Static tables permit advanced indexing methods created especially for decision-support system (DSS) queries.

Static tables do not support data manipulation operations (inserts, updates, and deletes) and they cannot be used for loading. To load the tables, alter the table type to load and then change the table type back to static.

Temporary Tables

Scratch tables are unlogged and use light appends. They do not support indexes, referential constraints, or rollback.

Temporary tables are logged and support bulk operations, including light appends. Temporary tables also support indexes, referential constraints, and rollback but do not support recovery.

For information on correct SQL statement syntax and use when you create and change tables, see the *IBM Informix Guide to SQL: Syntax*. For more details about table characteristics, see your *Administrator's Guide*. For more information on how to work with table types and fragmentation to design your database, see the *IBM Informix Database Design and Implementation Guide*.

Utilities

Dynamic Server with AD and XP Options 8.21 uses new command-line utilities, **onutil** and **xctl**. The **onutil** utility consolidates much of the functionality of **oncheck**, **onparams**, and **onspaces** into one command. (Dynamic Server with AD and XP Options does not support the **oncheck** utility.)

For a multiple coserver configuration, the **xctl** utility lets you execute command utilities and operating-system commands on one or more coservers. It is recommended that you use **onutil** in Dynamic Server with AD and XP Options rather than other command utilities.

onutil

For a single coserver, use **onutil** to define or modify the following objects in Dynamic Server with AD and XP Options 8.21:

- Cogroups
- Dbslices
- Dbspaces
- Logical logs
- Logslices (an object name for a collection of logs)

Tip: *The **onutil** utility replaces the functionality of the **-cd**, **-pd**, **-pt**, **-pT**, **-pr**, **-pd**, **-cI**, **-ci**, **-pk**, **-pp**, **-pP**, and **-cc** options of **oncheck**.*

To define or modify physical logs, use **onparams**.

Figure 9-5 compares the **oncheck** commands to the **onutil** equivalent.

Figure 9-5
Comparable oncheck and onutil Commands

oncheck Command	onutil Command
-cd, -pd	CHECK TABLE DATA
-pt, -pT	CHECK TABLE INFO
-cr, -pr	CHECK RESERVED

(1 of 2)

oncheck Command	onutil Command
-cI	CHECK INDEX WITH DATA
-ci, -pk	CHECK INDEX
-pp, -pP	DISPLAY PAGE
-cc	CHECK CATALOGS
-ce, -pe	CHECK SPACE

(2 of 2)

Windows

The installation procedure prepares a file, **setenv.cmd**, that sets the environment variables to their correct values. The **setenv.cmd** file is stored in the **%INFORMIXDIR%** directory. You must execute **setenv.cmd** before you can use any of the command-line utilities. You can execute the file automatically from IBM Informix Enterprise Command Center (IECC). You can also execute **setenv.cmd** from the command line. ♦

xctl

For a multiple coserver configuration, you can use **xctl** with **onstat**, **oninit**, and **onmode** to execute command-line utilities and operating-system commands on a per-coserver basis.

For example, use **xctl** to initiate Dynamic Server with AD and XP Options 8.21 on all your coservers:

```
xctl -C oninit -y
```

Several new options to **onstat** are available to check for database server statistics. Use the following command to view the new **onstat** options:

```
xctl -onstat --
```

The following command brings down all coservers on a Dynamic Server with AD and XP Options 8.21 instance:

```
xctl onmode -ky
```

For more information on **onutil** and **xctl**, see your *Administrator's Guide*.

Windows

IBM Informix Enterprise Command Center

IECC for Dynamic Server with AD and XP Options 8.21 runs on Windows NT. It enables the database server administrator to configure, control, and monitor the status of Dynamic Server with AD and XP Options 8.21. IECC provides a graphical interface that simplifies the process of database server administration and automates common database server administration functions.

IECC includes online help files. For additional information about IECC, see the *IBM Informix Enterprise Command Center User Guide*.

New Indexes

Dynamic Server with AD and XP Options 8.21 supports *generalized-key (GK)* and *bitmap* indexes. GK indexes enable you to create indexes with any of the following key values:

- Subset of rows from a table
- Derived from an expression
- Join of columns from multiple tables
- Combination of various indexes on a table

Bitmap indexes can store a list of record identifiers (ROWIDS) for key values in a compressed bitmap format. GK indexes can be bitmap indexes as well.

When you convert to Dynamic Server with AD and XP Options 8.21, system catalog tables are added automatically to support GK indexes. However, because GK indexes are not supported in earlier versions of the database server, if you revert to an earlier version of the database server, drop GK indexes.

When you migrate to Dynamic Server with AD and XP Options 8.21, bitmap indexes that you create with the USING BITMAP syntax are not accessible by earlier versions of the database server. If you revert to an earlier version, drop bitmap indexes.

For more information on GK indexes and bitmap indexes, refer to your *Administrator's Guide* and your *Performance Guide*. For strategic use of different index types, refer to the *IBM Informix Database Design and Implementation Guide*.

GLS

Global Language Support

Dynamic Server with AD and XP Options 8.21 incorporates Global Language Support (GLS). GLS enables Dynamic Server with AD and XP Options 8.21 to handle different languages, cultural conventions, and code sets for Asian, European, Latin American, and Middle Eastern countries. The *IBM Informix GLS User's Guide* provides a full description of GLS.

Backup Tools and ON-Bar Configuration

Dynamic Server with AD and XP Options 8.21 does not support the **ontape** utility or ON-Archive. To back up a 8.21 database server, you need to use ON-Bar or data migration tools.

If you use ON-Bar, when you migrate to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server, you need to make substantial changes in the ON-Bar configuration. For details about how to configure ON-Bar, refer to your *Backup and Restore Guide*.

Storage-Manager Validation and Installation

When you convert or revert an Informix database server, the storage manager that you used on the source database server might not be validated for the version of the database server to which you are migrating. Verify that the storage manager is validated for the target database server version and platform by checking the following web site:

```
http://www7b.software.ibm.com/dmdd/zones/informix/corner_sm.html
```

If not, you need to install a validated storage manager before you perform backups with the ON-Bar backup and restore system.

When you migrate to a new database server version, install the storage manager before you bring up the database server. That way, if you have automatic log backup set up on the database server, ON-Bar can start backing up the logs when the database server comes online.

Warning: *If you migrate IBM Informix Storage Manager (ISM) 1.0 catalogs to ISM 2.0 using the* ***ism_catalog*** *utility, the catalogs become corrupted. Once the ISM 2.0 server is restarted after catalog migration, error messages occur in various logs.*

For information on how to install and upgrade the storage manager, see the *IBM Informix Storage Manager Administrator's Guide*.

Loading and Unloading Data

Dynamic Server with AD and XP Options 8.21 uses high-performance parallel loading with *external tables* to load and unload data. You can load tables from different sources and perform a variety of data-format conversions with external tables. The database server uses multiple threads to read data files in parallel and then convert the data into internal Informix format. A round-robin algorithm distributes the database server to the conversion threads.

You can use the default delimiter (|) format to load and unload files with INSERT...SELECT statements. You can also use other formats. For loading instructions, see "Create a Database" on page 9-35.

High-performance parallel loading in Dynamic Server with AD and XP Options 8.21 uses two modes: *express* and *deluxe*.

Express Mode

Express mode provides the highest performance during loads because it uses light appends. Light-append operations append rows to a table and bypass the buffer cache that eliminates buffer-management overhead. The table is locked exclusively during an express load so that no other user can access the table during the load. You cannot use express mode on a table with BYTE and TEXT data.

Use express mode on tables that do not have active indexes or referential constraints. Express mode is the default mode.

Warning: *Data is not logged during an express-mode load, so you cannot recover data automatically.*

Deluxe Mode

Deluxe mode combines fast parallel loading with an evaluation of indexes and unique constraints on a per-row basis. Deluxe mode is preferred if the cost of rebuilding an index is too high for the amount of data loaded. Data is logged during the load. If errors occur during a deluxe load, the load fails.

You can lock the table in shared mode to allow concurrent access by users, or alternatively, you can lock the table exclusively until the load is complete. Use deluxe mode if indexes, triggers, and referential constraints are enabled.

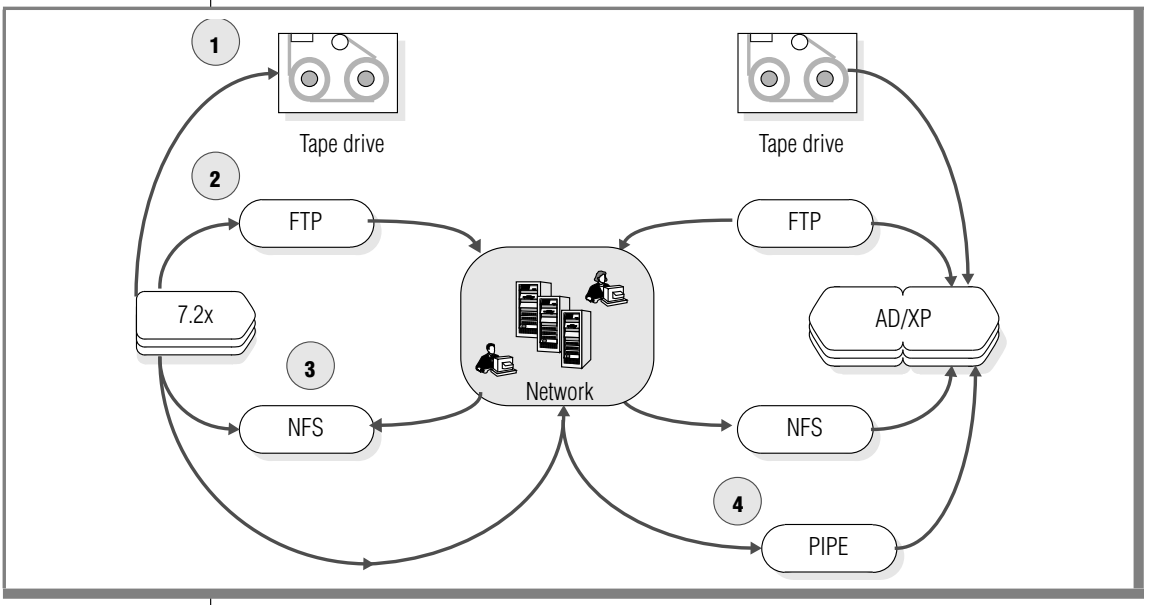
For complete documentation on external tables and deluxe- and express-mode loading syntax, see your *Administrator's Guide* and the *IBM Informix Guide to SQL: Syntax*.

Converting to Dynamic Server AD/XP 8.21 from a 7.2x Database Server

You can use four options to migrate data to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server. Your data-migration options depend primarily on connectivity between the source and target database servers and on the amount of disk space available for staging files.

Figure 9-6 illustrates the four options for migrating data to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server.

Figure 9-6
7.2x to AD/XP Migration



- **Option 1.** To migrate from a 7.2x database server when no connectivity is available between source and target database servers, unload tables to tape before you load to Dynamic Server with AD and XP Options 8.21.
- **Option 2.** To migrate when the required disk space for staging files is available on *both* the source database server *and* the target database server, unload data from the source database to file.

  Use file transfer protocol (FTP) to transfer the file to Dynamic Server with AD and XP Options 8.21.
- **Option 3.** To migrate when you have sufficient disk space for staging files *only* on Dynamic Server with AD and XP Options 8.21 or the source database, use network file system (NFS) mount points.

  For example, if Dynamic Server with AD and XP Options 8.21 has enough disk space to handle your staging files, you can NFS mount a directory from Dynamic Server with AD and XP Options 8.21 to a 7.2x database server and unload your data from the 7.2x database server to that NFS mounted directory.

Important: *Informix database servers support only certified versions of NFS. For information about the NFS products you can use to NFS mount a storage space for an Informix database server, see the product compatibility information on the web site at http://www.ibm.com/software/data/informix/pubs/smv/index.html.*

- **Option 4.** You can use named pipes to support loading data to and unloading data from storage devices, including tape drives and direct network connections to mainframes.

  UNIX/Linux

  To convert data when you load, you can create a filter program that writes converted data to a named pipe. The 8.21 database server then reads its input from the named pipe in one of the common formats. ♦

Tip: *Option 4 is the fastest. Options 2 and 3 are faster than option 1 because of the time required to read and write to tape.*

This section describes the procedure for migrating to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server. When you migrate, complete the following steps, which the sections that follow describe in more detail:

1. Configure and check available space.
2. Save copies of the current configuration files.
3. Close all transactions in the source database server.

4. Go to quiescent mode.
5. Verify the integrity of the data.
6. Verify the mode.
7. Make a final (level-0) backup.
8. Unload the data.
9. Take the source database server offline.

Important: *Repeat steps 1 through 9 for each instance of the 7.2x database server that you are migrating to Dynamic Server with AD and XP Options 8.21*

10. Reconfigure the operating system, if necessary.
11. Install Dynamic Server with AD and XP Options 8.21 and copy **INFORMIXDIR** to each node.
12. Set environment variables on each node.
13. Copy database server utilities to each node.
14. Update the ONCONFIG configuration files.
15. Update the **sqlhosts** file or registry key.
16. Update the backup and restore configuration parameters.
17. Bring Dynamic Server with AD and XP Options 8.21 online.
18. Use **onutil** to create cogroups and dbslices.
19. Create a database instance.
20. Load data from external tables.
21. Run UPDATE STATISTICS and build indexes.
22. Verify the integrity of the data.
23. Make an initial backup of Dynamic Server with AD and XP Options 8.21.
24. Check rejection files for each table you load.
25. Recompile ESQL/C programs.
26. Complete migration.

Important: *Repeat steps 11 through 23 for each instance of Dynamic Server with AD and XP Options 8.21.*

Configure and Check Available Space

Configure your computer memory equally among all the nodes. Because only one ONCONFIG file exists in Dynamic Server with AD and XP Options 8.21 and the configuration parameter is configured globally, the amount of memory you configure in your ONCONFIG file is limited to the node with the smallest amount of memory. If your system memory is configured unequally, Dynamic Server with AD and XP Options 8.21 cannot take advantage of the nodes that have extra memory.

When you calculate disk-space requirements for Dynamic Server with AD and XP Options 8.21, take into account the size of your tables. You need additional space for control information for your tables (approximately 60 bytes per page). Also consider disk space for the following needs:

- Root dbspace for all your nodes
- Physical logs
- Logical-log space

  (If you require logging during loads, add the additional space.)
- Temporary dbspace
- Indexes
- Summary tables and index from your online transaction processing (OLTP) tools
- Mirroring
- Future growth
- File-system space for your operating system and IBM Informix products
- Staging space for loading and unloading files
- Safe write area
- New system catalog tables
- New **sysmaster** tables

UNIX/Linux

Make sure you modify the kernel parameter on every node. ♦

For information on disk-space requirements for Dynamic Server with AD and XP Options 8.21, refer to your *Administrator's Guide*.

Important: *If a dbspace has less free space available than it requires, either move a table from the dbspace to another dbspace or add a chunk to it. The dbspace estimates could be higher if you have an unusually large number of SPL routines or indexes in the database.*

Save Copies of the Current Configuration Files

Save copies of the configuration files, if they are present, for each instance of the 7.2x database server. Keep the copies available for later use. Figure 9-7 lists the configuration files for each operating system.

Figure 9-7
7.2x Configuration Files

UNIX or Linux	Windows NT
$INFORMIXDIR/etc/$ONCONFIG	**%INFORMIXDIR%\etc\ONCONFIG**
$INFORMIXDIR/etc/onconfig	**%INFORMIXDIR%\etc\onconfig**
$INFORMIXDIR/etc/onconfig.std	**%INFORMIXDIR%\etc\onconfig.std**
$INFORMIXDIR/etc/sm_versions	**%INFORMIXDIR%\etc\sm_versions**
$INFORMIXDIR/aaodir/adtcfg	**%INFORMIXDIR%\aaodir\adtcfg.***
$INFOMIXDIR/dbssodir/adtmasks	**%INFORMIXDIR%\dbssodir\adtmasks.***
$INFORMIXDIR/etc/sqlhosts	
$INFORMIXDIR/etc/tctermcap	
$INFORMIXDIR/etc/termcap	

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of the following file:

UNIX or Linux: **$INFORMIXDIR/etc/ixbar.<*servernum*>**

Windows NT: **$INFORMIXDIR\etc\ixbar.<*servernum*>**

UNIX/Linux

If you use ON-Archive to back up the 7.2x database server and logical logs, you must also copy and save the configuration files in the following list:

$INFORMIXDIR/etc/$ARC_CONFIG
$INFORMIXDIR/etc/config.arc
$INFORMIXDIR/etc/oper_deflt.arc

♦

Windows

You do not need to copy these files for Windows NT because the Windows NT version of the 7.2x database server does not use ON-Archive. ♦

Close All Transactions in the Source Database Server

Communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and shut down the source database server. This procedure lets users exit and shuts down the 7.2x database server gracefully. If necessary, you can perform an immediate shutdown.

To let users exit and shut down the source database server gracefully

1. Execute the **onmode –sy** command.
2. Wait for all users to exit.
3. Execute the **onmode –ky** command.

To perform an immediate shutdown

```
onmode -ky
```

Put the 7.2x Database Server in Quiescent Mode

Execute the following command to enter quiescent mode and initiate a fast recovery of the 7.2x database server:

```
oninit -s
```

The **oninit –s** option rolls forward all committed transactions and rolls back all incomplete transactions since the last checkpoint and then leaves a new checkpoint record in the log with no open transactions pending. (For more information about fast recovery and quiescent mode, refer to your *Administrator's Guide*.)

You must execute **oninit -s** before you initialize your target database server. If the system is not left in a quiescent state, you receive the following error when you attempt to initialize Dynamic Server with AD and XP Options 8.21, and the 8.21 database server goes offline:

```
Open transaction detected when changing log versions.
```

Verify the Integrity of the Data

Use the oncheck utility to verify the integrity of the data before you make a level-0 backup. If you find any problems with the data, fix them before you make the backup. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes.

To obtain the database names, use the following statements with DB-Access:

```
DATABASE sysmaster;
SELECT name FROM sysdatabases;
```

Figure 9-8 lists the **oncheck** commands you can use to verify data integrity.

Figure 9-8
Commands for Verifying the Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

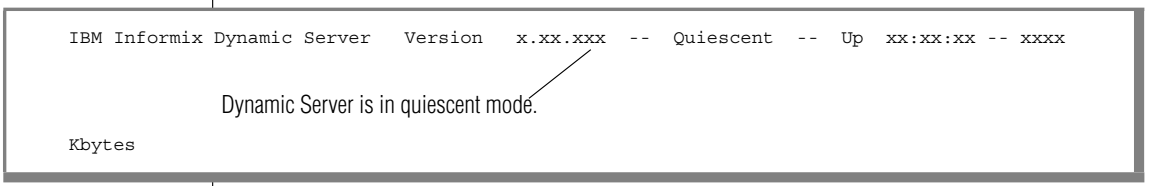
Verify the Mode

Before you make a backup, execute the following command to verify that your database server is in quiescent mode:

```
onstat -
```

The first line of the onstat output contains the status of the database server. Figure 9-9 shows that the database server is in quiescent mode.

Figure 9-9
Example of onstat Status Line



Make a Final Backup of the 7.2x Database Server

Use ON-Bar, **ontape**, or ON-Archive to make a level-0 backup and logical-log backup of the 7.2x database server. If you use **ontape**, execute the following command to make a level-0 backup:

```
ontape -s
```

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup.

After you make a level-0 backup, perform a complete backup of the logical log, including the current logical-log file.

UNIX/Linux

If you use ON-Archive, execute the following command to make a full-system, level-0 backup:

```
Onarchive> ARCHIVE/DBSPACESET=*
```

♦

For details about making backups, refer to your *Backup and Restore Guide* for ON-Bar information or to your *Archive and Backup Guide* for **ontape** or ON-Archive information.

Unload the Data

You can unload your data from your source database server into ASCII or internal Informix format, which yields the fastest unload. You can use the UNLOAD statement, the High-Performance Loader (HPL), or **dbexport**. The HPL is the fastest of these methods. For information about these options to unload your data, refer to Chapter 2, "Data Migration."

When unloading floats or small floats to a fixed-position file, if the internal precision of the float is greater than the fixed field can support, the number is truncated to fit the field. If you want more control over the formatted result of a float, use the SQL functions **ROUND()** or **TRUNC()** to define the output precision and to convert the float to a decimal.

Take the 7.2x Database Server Offline

Execute the following command to put the 7.2x database server in offline mode:

```
onmode -ky
```

Bring your source database server offline to ensure that all common files are inactive. Your source database server must be offline because Dynamic Server with AD and XP Options 8.21 uses the same files. You cannot install Dynamic Server with AD and XP Options 8.21 if any of the files that it uses are active.

After you shut down your source database server, execute the following command to verify that it is offline:

```
onstat -
```

Verify that you get the message `shared memory not initialized...` for offline mode.

Important: *Make a final backup for each source database server instance that you plan to convert.*

UNIX/Linux

Change UNIX or Linux Kernel Parameters

You might need to change some of the kernel parameters for your operating system before you install Dynamic Server with AD and XP Options 8.21. To reconfigure the operating system, follow the directions in the machine notes file included in your distribution media for your operating system.

For information on the location of the machine notes file, refer to "Additional Documentation" on page 20 of the Introduction.

Important: *Make sure you modify the kernel parameters on every node.*

Install Dynamic Server AD/XP 8.21

To install Dynamic Server with AD and XP Options 8.21 on UNIX or Linux, you must log in as user **root** or **informix.** To install Dynamic Server with AD and XP Options 8.21 on Windows NT, you must be a member of the **Informix-Admin** group. Set the **INFORMIXDIR** environment variable to the directory where you plan to install the database server. Install it on the node that contains the connection coserver in the directory that was NFS mounted on all the other nodes. Install the entire distribution on a single node within a file system that is shared across all the nodes that are assigned to Dynamic Server with AD and XP Options 8.21.

Important: *Informix database servers support only certified versions of NFS. For information about the NFS products you can use to NFS mount a storage space for an Informix database server, see the product compatibility information on the web site at http://www.ibm.com/software/data/informix/pubs/smv/index.html.*

Check that the file system can hold the entire Dynamic Server with AD and XP Options 8.21 distribution of approximately 180 megabytes. Export this file system with write access as user **root** or **informix** over the NFS and mount it to the same mount point on every node.

Warning: *If you install Dynamic Server with AD and XP Options 8.21 in the same directory where the 7.2x database server resides, the installation script overwrites the older files. If you want to preserve your 7.2x database server files, you must install Dynamic Server with AD and XP Options 8.21 in a different directory on UNIX or Linux or on different computers on Windows NT.*

Check the release notes for information about the proper operating-system patches, recommended shared-memory parameters, and configurations that are required for successful installation and operation of the database server.

UNIX/Linux

The release notes are in the **$INFORMIXDIR/release/en_us/0333** directory. ♦

Windows

The release notes are in **%INFORMIXDIR%\release\en_us\0333**. ♦

Make any required changes that the release notes recommend on every node. For more information on how to install Dynamic Server with AD and XP Options 8.21, see your *Installation Guide* and your *Performance Guide*.

Set Environment Variables

After you install Dynamic Server with AD and XP Options 8.21 and before you invoke DB-Access, set up the following environment variables on every node:

INFORMIXDIR **ONCONFIG** **INFORMIXSQLHOSTS**
INFORMIXSERVER **PATH**

UNIX/Linux

The client application looks for the **sqlhosts** file in the **$INFORMIXDIR/etc** directory. However, you can use the **INFORMIXSQLHOSTS** environment variable to change the location or name of the **sqlhosts** file. ♦

Windows

The client application looks for connectivity information in a key in the Windows NT registry named HKEY_LOCAL_MACHINE\SOFTWARE\Informix\SQLHOSTS. ♦

Set the environment variable **PATH** so that the local directory that contains the Informix commands is searched before the **INFORMIXDIR** directory is searched.

Important: *The installation script installs Dynamic Server with AD and XP Options 8.21 into the* ***INFORMIXDIR*** *directory specified for user* ***root*** *or* ***informix*** *on UNIX or Linux or for a member of the* ***Informix-Admin*** *group on Windows NT. The installation script does not bring Dynamic Server with AD and XP Options 8.21 online.*

Copy Database Server Utilities to Each Node

To ensure rapid and proper initialization, create local copies of the following utilities on each node:

oninit
onmode
onstat

When you finish copying the utilities to each node, log out as **root**.

Update the ONCONFIG Configuration File

You can customize your ONCONFIG configuration file and environment variables to take advantage of the new features that Dynamic Server with AD and XP Options 8.21 introduced. After you observe the performance of Dynamic Server with AD and XP Options 8.21, you might want to make further adjustments.

For configuration information, refer to your *Administrator's Guide*. For information about environment variables, refer to the *IBM Informix Guide to SQL: Reference*.

Update the sqlhosts File or Registry Key

The **sqlhosts** file or registry key contains a line for each connection type that the database server provides, for each coserver that makes up Dynamic Server with AD and XP Options 8.21, and for each Version 8.21 database server to which a client connects. An **sqlhosts** entry must exist for every coserver.

For details, see "The sqlhosts File or Registry Key" on page 9-9.

Update the Backup and Restore Configuration Parameters

You might need to change the values of the backup and restore configuration parameters. Figure 9-2 on page 9-7 lists these parameters.

Bring Dynamic Server AD/XP 8.21 Online

Execute the following command to bring Dynamic Server with AD and XP Options 8.21 online for the first time:

```
xctl -C oninit -iy
```

Review the message logs to verify that your **sysmaster** database and **sysmaster** catalog tables were created successfully.

Check your database server message log to verify that all coservers are up. To view the message log, run:

```
onstat -m
```

To verify that all your coservers are up and running, execute:

```
xctl onstat -
```

For information about messages in the message log, see your *Administrator's Guide*.

Important: *If the message file indicates problems, solve the problems before you continue to the next step.*

Use onutil to Create Cogroups and Dbslices

Create cogroups and dbslices of equal sizes across all coservers. When you create a dbslice, you specify the cogroup name so that Dynamic Server with AD and XP Options 8.21 knows the coservers on which to create dbspaces. For example, you might create a dbslice from an accounting cogroup. The following example shows how to create a cogroup and a dbslice:

```
% onutil
1> CREATE COGROUP acctg_group
   ⋮
5> CREATE DBSLICE acctg_dbslc
6>    FROM acctg_group ...
```

You do not need to specify the names explicitly for all the individual dbspaces that are associated with the partitioned tables. Dynamic Server with AD and XP Options 8.21 generates the dbspace names for you.

Run **xctl** to verify that all your dbspaces were created correctly:

```
xctl onstat -d
```

Create a Database

Create a database instance on Dynamic Server with AD and XP Options 8.21 and choose the optimal loading scheme from the data-loading options discussed in "Loading and Unloading Data" on page 9-20. After you install Dynamic Server with AD and XP Options 8.21, you can create a database using DB-Access as your client application or issue SQL statements to connect to and disconnect from Dynamic Server with AD and XP Options 8.21.

You can start IECC from a Windows NT console to customize one or more database servers. For instructions on how to customize a database server, see your *Administrator's Guide*.

Load Data from External Tables

This section describes how to load data into Dynamic Server with AD and XP Options 8.21 external tables and convert the data into internal Informix format. To create tables for loading data, you can issue SQL statements in the DB-Access utility or embed them in IBM Informix ESQL/C.

Use a CREATE TABLE statement to create a table in your database to which you plan to load the data from a 7.2x database server. For example:

```
CREATE TABLE account
   (account_id integer,
   account_bal integer,
   account_date date,
   account_name char(30)
   )
 FRAGMENT BY HASH(account_date)
   IN account_dbsp1,
      account_dbsp2,
   .
   .
   .
   account_dbspn;
```

Issue a series of SQL statements to create external tables for loading data. The CREATE EXTERNAL TABLE statement describes the location of the external file (on file or from pipe) and the format of external data. When you load with external tables, you can select FILE or PIPE for named pipes for your data source. You can load DELIMITED format data, FIXED format data or Informix internal format data (which is created when you unload data in this format). Loading with Informix internal format is fast because no conversion is required. Delimited or fixed-format data can be in ASCII or EBCDIC code sets.

The CREATE EXTERNAL TABLE statement can also describe data-conversion information and specify a file for error and diagnostic information, as in the following example:

```
CREATE EXTERNAL TABLE extTableName
   SAME AS sourceTableName
   USING
   FORMAT "informix",
   DATAFILES
(
   "DISK: COGROUP_ALL:/data/file.%c",
   REJECTFILE "/pload/reject"
);
```

If the files you are loading were unloaded from a database in Informix internal format, specify an Informix format in the USING clause. The SAME AS clause creates the external table with the same definitions for the columns of the data files from the existing database.

Specify DATAFILES

The USING DATAFILES clause specifies the file type, coserver or cogroup, and the location of the file, and the file format definition and location for a reject file for error and diagnostic information. The USING DATAFILES clause takes double quoted strings separated by commas. The DATAFILES statement has three parts, separated by colons: the data type, the data location, and the absolute path to the file.

To move data between external tables and internal tables, issue data manipulation language (DML) SQL statements. Load data files into the database by issuing the INSERT AND SELECT statements. The INSERT and SELECT statements map the movement of the external data from or to the database table. The data in the data files is loaded from the external table into an internal table using the INSERT into SELECT statements, as in the following example:

```
LOCK TABLE IN EXCLUSIVE MODE; # for deluxe mode

INSERT INTO account
(account_id, account_bal, account_date date, account_name)
SELECT *
FROM extTableName
USING
(FORMAT "informix",
```

```
DATAFILES
(
"DISK:3:/tmp/data.1"
"DISK:5:/tmp/data.1"
)
WHERE account_name [1] = "A";
```

Tip: *Specify the format* `informix` *only for data files you unload from an Informix database. The WHERE clause can specify which data file rows to load.*

Set Log File and Maximum Errors

You can set a log file that stores session information and statistics gathered about each load and unload when it completes. The log file also lists reject files. For information on reject files, see "Check Rejection Files" on page 9-39. If the WITH APPEND keywords are used, the new log information is appended to an existing file; otherwise the file is truncated. To set this log file, issue the following statement:

```
SET PLOAD FILE TO filename
[WITH APPEND];
```

Tip: *You can only have one file open at a time. If you issue multiple SET PLOAD FILE statements, the last one you issue is in effect.*

To control the maximum number of errors allowed per coserver before a load is aborted, you can set the MAXERRORS option in the external table. Include the following statement in your CREATE EXTERNAL TABLE statement:

```
MAXERRORS maxNumErrPerCoserver
```

For more information on the CREATE EXTERNAL TABLE statement, refer to the *IBM Informix Guide to SQL: Syntax*.

You can also use **onstat -g xmp** and **onstat -g dfm** to monitor the query segments and data flow. For more information, see your *Performance Guide*.

Run UPDATE STATISTICS and Build Indexes

Run UPDATE STATISTICS on all the tables you load into your database.

Build indexes on the tables in Dynamic Server with AD and XP Options 8.21 that were indexed in the 7.2x database server. You might want to wait before you build indexes to see if your queries run fast enough without them.

Verify the Integrity of the Data

After Dynamic Server with AD and XP Options 8.21 finishes converting the system catalog tables, use **onutil** to verify that no data was corrupted in the migration process. The **onutil** commands are not SQL statements; neither DB-Access nor any other SQL utility or application supports them.

Only user **informix** or **root** can use the CHECK and DISPLAY DATA clauses. The **onutil** CHECK options place a shared lock on tables when they check indexes. They also place shared locks on system catalog tables when they check them. You can verify the integrity of the reserve pages, extents, system catalog tables, data, and indexes, as Figure 9-10 shows.

Figure 9-10
Commands for Verifying Data Integrity

Action	onutil Command
Check reserve pages	**onutil** CHECK RESERVED DISPLAY DATA
Check extents	**onutil** CHECK SPACE DISPLAY DATA
Check system catalog tables	**onutil** CHECK CATALOGS
Check data	**onutil** CHECK TABLE DATA DISPLAY DATA
Check indexes	**onutil** CHECK INDEX DISPLAY DATA

You might want to test and run your queries on Dynamic Server with AD and XP Options 8.21 and make sure they produce the same results.

For more information about **onutil**, see your *Administrator's Guide*.

Make an Initial Backup of Dynamic Server AD/XP 8.21

Use your backup and restore tool (ON-Bar) to make a level-0 backup. Do not overwrite the tapes you used earlier when you made your final backup of your source database server.

Dynamic Server with AD and XP Options 8.21 supports unloading to pipes, so you can unload directly to a tape device. You do not need to unload data first to disk.

You can use external tables to perform a backup. This process requires adequate disk space to stage your data for loading and unloading. To back up, unload a table to an external table and back up to tape. To restore, load data from your external tables.

For more information about ON-Bar, see your *Backup and Restore Guide*.

Important: *Do not restore the backed up logical-log files from the 7.2x database server for Dynamic Server with AD and XP Options 8.21.*

Check Rejection Files

The REJECTFILE file specifies which rows were rejected during a load for each coserver. Each coserver must have a unique REJECTFILE name. Enter the REJECTFILE parameter in the USING clause of the CREATE EXTERNAL TABLE statement, as the example on page 9-36 and the following example show:

```
REJECTFILE absolutePathName
```

Warning: *Do not use shared files across coservers to ensure that the data in the reject files retains integrity.*

Check the REJECTFILE file from your load command and see if any records were not loaded during the load. If necessary, manually update tables. You can also monitor message files using **onstat -g xmf**. For more information on how to monitor options, see your *Performance Guide*.

Recompile ESQL/C Programs

IBM Informix ESQL/C enables programmers to embed SQL statements directly into a C program. Once your database server migration is complete, recompile your ESQL/C programs. Make sure to set the environment variables before you invoke an ESQL/C program.

When the ESQL/C program is recompiled, check the functionality of your ESQL/C programs to make sure they run as you expect them to. For more information, see your *IBM Informix ESQL/C Programmer's Manual*.

Complete Migration

When you finish the level-0 backup, the migration process is complete and users can use Dynamic Server with AD and XP Options 8.21 to access data safely.

Once you successfully migrate to Dynamic Server with AD and XP Options 8.21, you might want to seek ways to obtain maximum performance. If you created sample queries for comparison, you can use them to characterize the performance differences between the 7.2x database server and Dynamic Server with AD and XP Options 8.21. The results of these comparisons might suggest adjustments to configuration parameters or to the layout of databases, tables, and chunks. For details on performance topics, see your *Performance Guide*.

Reverting from Dynamic Server AD/XP 8.21 to a 7.2x Database Server

After you convert to Dynamic Server with AD and XP Options 8.21 from a 7.2x database server, you cannot revert back automatically. To revert, you need to unload the data into an external table from Dynamic Server with AD and XP Options 8.21and then load it back into the 7.2x database server.

Unloading Data to External Tables

To unload data to an external file, issue SELECT and INTO EXTERNAL statements. You can implicitly or explicitly specify an external table. (If you are loading data, an explicit definition is mandatory.) The SELECT and INTO EXTERNAL statements create a default external table description for unloading data. Issue the following SQL statement:

```
SELECT *
FROM customer
WHERE customerNum > 100
AND lastName [1] = "A"
INTO EXTERNAL TABLE custExtII
USING
(
```

```
FORMAT "informix",
DATAFILES
( "DISK:1:/tmp/dat.out",
"DISK:2:/tmp/dat.out",
"DSIK:3:/tmp/dat.out"
));
```

In this example, the external table is implicitly defined when the table is unloaded. If the external table already exists, you can use the following syntax:

```
INSERT INTO extTableName
SELECT *
FROM tableName
WHERE...;
```

For more information about external tables, see the description of the CREATE EXTERNAL TABLE statement in the *IBM Informix Guide to SQL: Syntax*.

Loading Data from External Tables

After the data is unloaded into external tables, you can use Version 7.2x load utilities to load the data. For load utility information, see Chapter 2, "Data Migration."

Chapter

10

Migrating Between Database Servers and Operating Systems

In This Chapter

This chapter describes the steps for moving data between database servers. This chapter covers the following topics:

- Choosing a migration method
- Adjusting database tables for file-system variations
- Moving data to a database server on a different operating system
- Moving data between Dynamic Server and Workgroup Edition on different operating systems
- Migrating to Dynamic Server 7.3x from Workgroup Edition 7.3x on a different operating system
- Migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x on a different operating system
- Moving data between SE and Dynamic Server 7.3x or Workgroup Edition 7.3x

Choosing a Migration Method

UNIX or Linux and Windows store data in different page sizes. When your migration involves different operating systems, you must export data and its schema information from one database server and import the exported data into the other database server.

The method that you choose for exporting and importing data depends on how much data you plan to move. All these methods deliver similar performance and enable you to modify the schema of the database. You can use the following migration methods:

- **dbexport** and **dbimport**

  To move an entire database, use the **dbexport** and **dbimport** utilities.

- UNLOAD and LOAD

  To move selected columns or tables, use the UNLOAD statement. Use LOAD when you do not want to change the data format.

- UNLOAD, **dbload**, and **dbschema**

  To move selected columns or tables, use the UNLOAD statement. Use **dbload** to change the data format.

- **onunload** and **onload**

  To unload data in page-sized chunks, use the **onunload** utility. Use the **onload** utility to move data to an identical database server on a computer of the same type.

- The High-Performance Loader (HPL)

  To move selected columns or tables or an entire database, use the HPL.

AD/XP

- External Tables

  To load and unload data in Dynamic Server with AD and XP Options 8.21, use external tables. For more information on this topic, see "External Tables" on page 2-18 and "Loading and Unloading Data" on page 9-20. ♦

Important: *Do not use onunload and/or onload with Dynamic Server 9.30 or 9.2x, Extended Parallel Server 8.3x, or Dynamic Server with AD and XP Options 8.21 data. Instead, use the HPL for Dynamic Server 9.2x,* ***onxfer*** *for Extended Parallel Server 8.3x, or external tables for Dynamic Server with AD and XP Options 8.21.*

SE stores data in a different format than does Dynamic Server 7.3x. When your migration involves SE, you must export data and its schema information from one database server and import the exported data into the other database server.

Adjusting Database Tables for File-System Variations

File-system limitations vary between NFS and non-NFS file systems. You might need to break up large tables when you migrate to a new operating system.

For example, if you have a three-gigabyte table, but your operating system allows only two-gigabyte files, break up your table into separate files before you migrate. For more information, see your *Administrator's Guide*.

Important: *Informix database servers support only certified versions of NFS. For information about the NFS products you can use to NFS mount a storage space for an Informix database server, check product compatibility information at http://www.ibm.com/software/data/informix/pubs/smv/index.html.*

Moving Data to a Database Server on a Different Operating System

This section describes the steps for moving data between Informix database servers on UNIX or Linux and Windows.

To move data to a database server on a different operating system

1. Save a copy of the current configuration files. For detailed steps, see "Save Copies of the Current Configuration Files" on page 10-21.
2. Use ON-Bar, ON-Archive, or **ontape** to make a final level-0 backup.

   For more information, refer to your *Backup and Restore Guide* or your *Archive and Backup Guide*.

   Extended Parallel Server 8.3x and Dynamic Server with AD and XP Options 8.21 do not support ON-Archive or **ontape**. ♦

XPS 8.3x

AD/XP

3. Choose one of the following sets of migration utilities to unload the databases:
   - **dbexport** and **dbimport**
   - UNLOAD, **dbschema**, and LOAD
   - UNLOAD, **dbschema**, and **dbload**
   - External tables with **dbschema** (for Dynamic Server with AD and XP Options 8.21) ♦

AD/XP

4. Bring the source database server offline.
5. Install and configure the target database server. If you are migrating to Windows, also install the administration tools.
6. Bring the target database server online.
7. Use **dbimport**, LOAD, or **dbload**, or external tables to load the databases into the target database server, depending on which utility you used to export the databases.
8. Make an initial level-0 backup of the target database server.
9. Run UPDATE STATISTICS to update the information that the target database server uses to plan efficient queries.

Using the Migration Utilities

Choose one of the following migration utilities:

IDS

- If you intend to move an entire database on Dynamic Server 9.40, 9.30, 9.2x, 7.3x, or 7.24 between different environments, the **dbexport** and **dbimport** combination is the easiest migration method. Follow the steps in "Using the dbexport and dbimport Utilities" on page 10-35. ♦
- If you want to move selected tables or columns, instead of an entire database, use the UNLOAD and LOAD statements with the **dbschema** utility. Follow the steps in "Using the UNLOAD Statement" on page 10-24.

- If you need to manipulate the data in the specified UNLOAD file before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities. Follow the steps in "Using UNLOAD, dbschema, and dbload" on page 10-25.

AD/XP

- For Dynamic Server with AD and XP Options 8.21, use external tables, as the *Administrator's Reference* describes. ♦

Adapting Your Programs for UNIX or Windows

Certain database server configuration parameters and environment variables are environment dependent, as follows:

- Dynamic Server 9.40, 9.30 and 9.2x support Enterprise Replication.
- Dynamic Server 7.3x supports Enterprise Replication and uses Version 3.0 of IBM Informix Enterprise Replication (IECC).
- Workgroup Edition 7.3x on Windows supports GLS, ON-Bar, Enterprise Replication, and the Gateway products and uses Version 3.0 of IECC.
- Workgroup Edition 7.24 on UNIX supports GLS and uses Version 1.0 of IECC.

For details, see the information on configuration parameters in your *Administrator's Guide* and the *Administrator's Reference* and the information on environment variables in your *Administrator's Guide* and the *IBM Informix Guide to SQL: Reference*.

Completing Migration

The first time the target database server is brought online, the **sysmaster** and **sysutils** databases are built. Check the message log to ensure that the **sysmaster** and **sysutils** databases have been created successfully before you allow users to access the database server. After you ensure that client users can access data on the database server, the migration process is complete.

Then you might want to seek ways to obtain maximum performance. For details on topics related to performance, see your *Performance Guide*.

Moving Data Between Dynamic Server and Workgroup Edition on Different Operating Systems

The UNLOAD statement lets you retrieve selected rows from a database and write those rows to a text file. If you want to move selected tables or columns instead of an entire database between Dynamic Server and Workgroup Edition, use the UNLOAD and LOAD statements in the DB-Access utility with the **dbschema** utility.

To use UNLOAD, dbschema, and LOAD to move data between Dynamic Server 7.3x or 7.24 and Workgroup Edition

1. Make sure that you have sufficient disk space to store the unloaded data. (The UNLOAD statement does not allow you to unload to tape.)
2. Invoke the DB-Access utility.
3. To move the selected data into text files, use the UNLOAD statement. Use a separate UNLOAD statement for each target table.
4. Exit from DB-Access.
5. If you plan to load data into a table or tables that do not exist, follow these steps:
   a. Use the **dbschema** utility to create a schema file from the source database server.
   b. Edit the schema file so that it describes the new table or tables.

   If you prefer, you can omit this step and, in step 12, enter the statements that create the tables.
6. Follow the instructions in your *Installation Guide* and your *Administrator's Guide* to install and configure the target database servers.
7. Change the **INFORMIXSERVER** environment variable to specify your new database server.
8. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
9. Invoke the DB-Access utility.
10. Select the target database.

11. If you are creating a new database, execute the CREATE DATABASE statement or choose **Database→Create** from the DB-Access menu.
12. If you plan to load data into a new table or tables, choose and run the schema file that you prepared in step 5, or enter CREATE TABLE statements to create the new tables.
13. If you created a new database, you might need to update the **DBPATH** environment variable with the new database location.
14. To load the data into the desired tables, use LOAD statements.

If you need to manipulate the data in the specified UNLOAD file before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities.

To use UNLOAD, dbschema, and dbload to move data between Dynamic Server 7.3x or 7.24 and Workgroup Edition

1. Follow steps 1 through 13 from "Using UNLOAD, dbschema, and LOAD" on page 10-14.
2. Build a command file to use with the **dbload** utility, which loads the data files into the tables.
3. Execute **dbload** to load the data as your command file directs.

For information on UNLOAD, LOAD, **dbload**, and **dbschema**, see Section IV, "Data Migration Utilities." For information on how to use DB-Access, see the *IBM Informix DB-Access User's Guide*.

Migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x on a Different Operating System

The following sections describe the steps for migrating to Workgroup Edition 7.3x from Dynamic Server 7.3x on a different operating system.

When you move data between UNIX or Linux and Windows, you must choose a migration utility, eliminate features that are specific to the database server or environment, migrate the data, and modify applications. Complete the following migration steps, which later subsections describe in detail:

1. Save copies of the current configuration files.
2. Verify the integrity of the data.
3. Make a final backup of Dynamic Server 7.3x.
4. Export data from Dynamic Server 7.3x.
5. Shut down Dynamic Server 7.3x.
6. Install and configure Workgroup Edition.
7. Verify port numbers and the **services** file.
8. Customize the database server environment (optional).
9. Bring Workgroup Edition 7.3x online.
10. Import data into Workgroup Edition 7.3x.
11. Verify the integrity of the data.
12. Make an initial backup of Workgroup Edition 7.3x.
13. Run UPDATE STATISTICS.
14. Complete migration.
15. Adapt your programs for Workgroup Edition 7.3x.

Save Copies of the Current Configuration Files

Save copies of the current configuration files that you modified. These should include the following files:

- Current ONCONFIG file, located in the **etc** subdirectory of your installation directory
- **sqlhosts** information
- **adtcfg**, located in the **aaodir** subdirectory
- **adtmasks.***, located in the **dbssodir** subdirectory
- ON-Archive configuration files, located in the **etc** subdirectory

If you use ON-Bar to back up your source database server and the logical logs, you also need to save a copy of the following file:

UNIX or Linux: **$INFORMIXDIR/etc/ixbar.<*servernum*>**

Windows: **$INFORMIXDIR\etc\ixbar.<*servernum*>**

Verify the Integrity of the Data

Use the **oncheck** utility to verify the integrity of the data. Figure 10-1 lists the commands for verifying data integrity.

Figure 10-1
Commands for Verifying Data Integrity

Action	oncheck Command
Check reserve pages	**oncheck -cr**
Check extents	**oncheck -ce**
Check system catalog tables	**oncheck -cc** ***database_name***
Check data	**oncheck -cD** ***database_name***
Check indexes	**oncheck -cI** ***database_name***

For information about **oncheck**, refer to your *Administrator's Guide*.

Back Up Dynamic Server 7.3x

Use your preferred backup method to make a complete (level-0) backup of your database server. You can use ON-Bar, **ontape**, or ON-Archive to perform a backup.

UNIX/Linux

To start a backup of the database server on UNIX or Linux, you can enter **$INFORMIXDIR/bin/bar** where the database server is installed. ♦

Windows

On Windows, you can double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group.

Windows does not support ON-Archive. ♦

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup.

For more information on how to make backups, see your *Backup and Restore Guide* or your *Archive and Backup Guide*.

Export Data from Dynamic Server 7.3x

If you are migrating to a different environment (for example, to UNIX from Windows NT), choose one of the following sets of migration utilities:

- **dbexport** and **dbimport** (see "Using the dbexport and dbimport Utilities")
- UNLOAD, **dbschema**, and LOAD (see "Using UNLOAD, dbschema, and LOAD" on page 10-14)
- UNLOAD, **dbschema**, and **dbload** (see "Using UNLOAD, dbschema, and dbload" on page 10-15)

Using the dbexport and dbimport Utilities

If you intend to move an entire database to Workgroup Edition 7.3x from Dynamic Server 7.3x in different environments, the **dbexport** and **dbimport** combination is the easiest migration method. Perform the following steps:

1. Use **dbexport** to export the data from Dynamic Server 7.3x.

   You can move the data to a directory or directly to tape. Do not use the **-ss** option when you move data between database servers.
2. Remove table-fragmentation expressions from the CREATE TABLE statements in the schema file (the.**sql** file that **dbexport** creates).

   If tables are fragmented, **dbimport** might not work. It is recommended that you defragment the tables before you export the database.
3. You can also make the following changes in the schema file:
   - Alter ownership or SQL privileges for specific tables and indexes
   - Change the logging status of the database
   - Change the ANSI-compliance status of the database
   - Remove unsupported SQL syntax, if necessary
4. Follow the instructions in your *Installation Guide* and your *Administrator's Guide* to install and configure Workgroup Edition 7.3x.
5. Change the **INFORMIXSERVER** environment variable to specify your target database server.
6. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
7. Move to the directory where **dbimport** will store the Workgroup Edition 7.3x database.
8. Use **dbimport** to move the data to a Workgroup Edition 7.3x database.

For detailed descriptions of the **dbexport** and **dbimport** utilities, refer to Chapter 11, "The dbexport and dbimport Utilities."

Using the UNLOAD Statement

The UNLOAD statement lets you retrieve selected rows from a database and write those rows to a text file.

Using UNLOAD, dbschema, and LOAD

If you want to move selected tables or columns instead of an entire Dynamic Server 7.3x database to Workgroup Edition 7.3x, use the UNLOAD and LOAD statements in the DB-Access utility with the **dbschema** utility.

To use UNLOAD, dbschema, and LOAD to move data to Workgroup Edition 7.3x from Dynamic Server 7.3x

1. Make sure that you have sufficient disk space to store the unloaded data. (The UNLOAD statement does not allow you to unload to tape.)
2. Invoke the DB-Access utility.
3. To move the selected data into text files, use UNLOAD statements. Use a separate UNLOAD statement for each target table.
4. Exit DB-Access.
5. If you plan to load data into a table or tables that do not exist, follow these steps:
   a. To create a schema file from the source database server, use the **dbschema** utility.
   b. Edit the schema file so that it describes the new tables.

   If you prefer, you can omit this step and, in step 12, enter the statements that create the tables.
6. Follow the instructions in your *Installation Guide* and your *Administrator's Guide* to install and configure Workgroup Edition 7.3x.
7. Change the **INFORMIXSERVER** environment variable to specify your target database server.
8. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
9. Invoke the DB-Access utility.
10. Select the target database.

11. If you are creating a new database, execute the CREATE DATABASE statement or choose **Database→Create** from the DB-Access menu.
12. If you plan to load data into a new table, choose and run the schema file that you prepared in step 5 or enter CREATE TABLE statements to create the new tables.
13. If you created a new database, you might need to update the **DBPATH** environment variable with the new database location.
14. To load the data into the desired tables, use LOAD statements.

Using UNLOAD, dbschema, and dbload

If you need to manipulate the data in the specified UNLOAD file before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities.

To use UNLOAD, dbschema, and dbload to move data to Workgroup Edition 7.3x from Dynamic Server 7.3x

1. Follow steps 1 through 13 from "Using UNLOAD, dbschema, and LOAD" on page 10-14.
2. Build a command file to use with the **dbload** utility, which loads the data files into the tables.
3. Execute **dbload** to load the data as your command file directs.

For information on UNLOAD, LOAD, **dbload**, and **dbschema**, refer to Section IV, "Data Migration Utilities." For information on how to use DB-Access, refer to the *IBM Informix DB-Access User's Guide*.

Shut Down Dynamic Server 7.3x

Communicate to client users how long you expect the database server to be offline for the migration. Terminate all database server processes and place your database server in quiescent mode (also called *administration mode*).

To shut down the source database server gracefully

1. Warn all users that you plan to shut down the database server and wait for them to exit.
2. Become user **informix** on UNIX. On Windows, you must be a member of the **Informix-Admin** group.

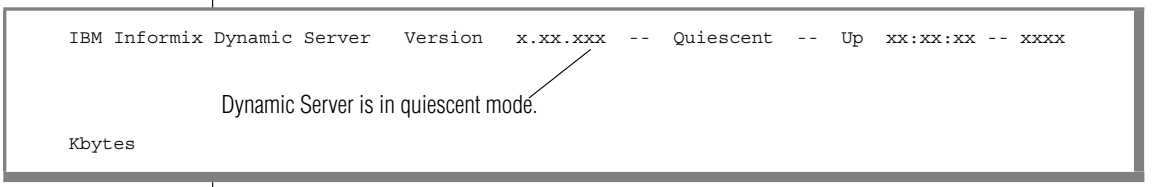
   Use **Services** in the Windows **Control Panel**. ♦

   Windows
3. Execute the following command to take the database server to quiescent mode:

   ```
   onmode -sy
   ```
4. Wait until your database server is in quiescent mode.

   To verify the mode of your database server, execute the **onstat -** command. The first line of the onstat output contains the status of your database server. Figure 10-2 shows that the database server is in quiescent mode.

Figure 10-2
Example of onstat Status Line



5. Execute the following command to force a new logical log:

   ```
   onmode -l
   ```
6. Execute the following command to force a checkpoint:

   ```
   onmode -c
   ```
7. Execute the following command to shut down the database server:

   ```
   onmode -yuk
   ```

Tip: *Monitor your log activity to verify that all commands were executed properly and to check for inconsistencies prior to migration.*

Install and Configure Workgroup Edition 7.3x

If you have not already done so, follow the instructions in your *Installation Guide* to install and configure your target database server.

You can install Workgroup Edition 7.3x and IECC either on the same computer or on different computers. For example, you can install IECC on a personal computer that runs Windows 95 or Windows NT and the database server on a UNIX computer. The installation program also starts the server agent, which is the communications link between Workgroup Edition 7.3x and the IECC client.

Use the **Setup** program to specify the network protocol and the computer on which Workgroup Edition 7.3x looks for the database server definitions (**sqlhosts** and **osahosts** definitions).

Verify Port Numbers and the Services File

The **services** file contains service names, port numbers, and protocol information. If you have installed the database server and the administration tools on different computers, verify that the port number listed in the **services** file is the same on the client and on the server computers.

UNIX/Linux

For UNIX or Linux operating systems not running NIS, the **services** file resides in the **/etc/services** directory on the database server and in the **\windir\services** directory on the Windows 95 client. ♦

Windows

The **services** file resides in the **\windir\system32\drivers\etc** directory on Windows. ♦

Customize the Database Server Environment

If you are an advanced user, you can customize the ONCONFIG configuration file and environment variables for Workgroup Edition 7.3x. Use a text editor to edit the ONCONFIG file. For more information on configuration parameters, see your *Installation Guide*.

Important: *Use the same values for your target database server for ROOTOFFSET, ROOTSIZE, and ROOTPATH that you used for your source database server.*

You might want to customize new environment variables on the client. For more information on environment variables, refer to the *IBM Informix Guide to SQL: Reference*.

Bring Workgroup Edition 7.3x Online

UNIX/Linux

To start your database server at the UNIX or Linux command line, enter `oninit` on the server computer. ♦

If you customized the database server environment, you can bring down and restart your database server with IECC. When you restart Workgroup Edition 7.3x, the changes to the configuration parameters and environment variables take effect.

Windows

To start the database server with IECC on Windows

1. In the **Informix Administration Tools** program group, double-click the **Command Center** icon.
2. In IECC, select the database server in the **All Servers** tree view or the **Servers** list box.
3. Choose **Server→Online**.

For more information, refer to the Version 7.3 IECC manual. ♦

Import Data into Workgroup Edition 7.3x

To load data into Workgroup Edition 7.3x, use **dbimport**, LOAD, or **dbload,** depending on which utility you used to export the databases.

Verify the Integrity of the Data

To verify the integrity of data, use the **oncheck** utility, as described in your *Administrator's Guide*.

Make an Initial Backup of Workgroup Edition 7.3x

Use your preferred backup method to make a complete (level-0) backup of your database server. You can use ON-Bar, **ontape**, or ON-Archive to perform a backup.

UNIX/Linux

To start a backup of the database server on UNIX or Linux, you can enter **$INFORMIXDIR/bin/bar** where the database server is installed. ♦

Windows

On Windows, you can double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group.

Windows does not support ON-Archive. ♦

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup.

For more information on how to make backups, see your *Backup and Restore Guide* or *Archive and Backup Guide*.

Run UPDATE STATISTICS

After you complete the migration procedure, run the UPDATE STATISTICS statement on the database server. The UPDATE STATISTICS statement updates the information that Workgroup Edition 7.3x uses to plan efficient queries. For more information about UPDATE STATISTICS, refer to the *IBM Informix Guide to SQL: Syntax*.

Complete Migration

The first time your target database server is brought online, the **sysmaster** and the **sysutils** databases are built. Check the message log to ensure that the **sysutils** and **sysmaster** databases are created successfully before you allow users to access the database server. After you ensure that client users can access data on your target database server, the migration process is complete.

Adapt Your Programs for Workgroup Edition 7.3x

After you successfully migrate the database server data, verify that your application developers know the differences between the source and target database servers. Workgroup Edition 7.3x supports the same products and features as Dynamic Server 7.3x, except for the High-Performance Loader (HPL) and the following features:

- Fragmentation (also known as partitioning)
- Parallel data query (PDQ)
- Role separation

For information on the SQL statements that Workgroup Edition 7.3x supports, see the *IBM Informix Guide to SQL: Syntax* and the *IBM Informix Guide to SQL: Reference*.

Migrating to Dynamic Server 7.3x from Workgroup Edition 7.3x on a Different Operating System

The following sections describe the steps for moving data to Dynamic Server 7.3x from Workgroup Edition 7.3x on a different operating system.

When you move data between UNIX or Linux and Windows, you must choose a migration utility, eliminate features that are specific to the database server or environment, migrate the data, and modify applications.

Complete the following migration steps:

1. Save copies of the current configuration files.
2. Verify the integrity of the data.
3. Make a final backup of the source database server.
4. Export data from the source database server.
5. Bring the source database server offline.
6. Install and configure Dynamic Server 7.3x.
7. Verify port numbers and the **services** file.
8. Customize the database server environment (optional).

9. Bring Dynamic Server 7.3x online.
10. Import data into Dynamic Server 7.3x.
11. Verify the integrity of the data.
12. Make an initial backup of Dynamic Server 7.3x.
13. Run UPDATE STATISTICS.
14. Complete migration.
15. Adapt your programs for Dynamic Server 7.3x.

Save Copies of the Current Configuration Files

Save copies of the current configuration files that you have modified, as follows:

- Current ONCONFIG file, located in the **etc** subdirectory of your installation directory
- **sqlhosts** information
- **adtcfg**, located in the **aaodir** subdirectory
- **adtmasks.***, located in the **dbssodir** subdirectory
- ON-Archive configuration files, located in the **etc** subdirectory

Verify the Integrity of the Data

Use the **oncheck** utility to verify the integrity of data, as described in your *Administrator's Guide*.

Back Up Workgroup Edition 7.3x

Use your preferred backup method to make a complete (level-0) backup of your database server. You can use ON-Bar, **ontape**, or ON-Archive to perform a backup.

UNIX/Linux

To start a backup of the database server on UNIX or Linux, you can enter **$INFORMIXDIR/bin/bar** where the database server is installed. ♦

Windows

On Windows, you can double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group.

Windows does not support ON-Archive. ♦

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup.

For more information on how to make backups, refer to your *Backup and Restore Guide* or the *Archive and Backup Guide*.

Export Data from Workgroup Edition 7.3x

To migrate to a different operating system (such as to Windows NT from UNIX), choose one of the following sets of data migration utilities:

- **dbexport** and **dbimport** (see "Using the dbexport and dbimport Utilities" on page 10-23)
- UNLOAD, **dbschema**, and LOAD (see "Using UNLOAD, LOAD, and dbschema" on page 10-24)
- UNLOAD, **dbschema**, and **dbload** (see "Using UNLOAD, dbschema, and dbload" on page 10-25)

Using the dbexport and dbimport Utilities

If you intend to move an entire database to Dynamic Server 7.3x from Workgroup Edition 7.3x in different environments, the **dbexport** and **dbimport** combination is the easiest migration method. Take the following steps:

1. Use **dbexport** to export the data from the source database server.

   You can move the data to a directory or directly to tape. Do not use the **-ss** option when you move data between database servers.

UNIX

2. You might want to add the following information that Dynamic Server 7.3x databases and tables can use:
   - Fragmentation schemes
   - PDQ support ♦
3. You can also make the following changes in the schema file:
   - Alter ownership or SQL privileges for specific tables and indexes.
   - Change the logging status of the database.
   - Change the ANSI-compliance status of the database.
   - Remove unsupported SQL syntax, if necessary.
4. Follow the instructions to install and configure Dynamic Server 7.3x.
5. Change the **INFORMIXSERVER** environment variable to specify your new database server.
6. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
7. Move to the directory where **dbimport** will store the Dynamic Server 7.3x database.
8. Use **dbimport** to move the data to a Dynamic Server 7.3x database.

For detailed descriptions of the **dbexport** and **dbimport** utilities, refer to Chapter 11, "The dbexport and dbimport Utilities."

Using the UNLOAD Statement

The UNLOAD statement lets you retrieve selected rows from a database and write those rows to a text file.

Using UNLOAD, LOAD, and dbschema

If you want to move selected tables or columns instead of an entire Workgroup Edition database to Dynamic Server 7.3x, use the UNLOAD and LOAD statements in DB-Access with the **dbschema** utility.

To use UNLOAD, LOAD, and dbschema to move data to Dynamic Server 7.3x from Workgroup Edition 7.3x

1. Make sure that you have sufficient disk space to store the unloaded data. (The UNLOAD statement does not allow you to unload to tape.)
2. Invoke DB-Access.
3. Use UNLOAD statements to move the selected data into text files. Use a separate UNLOAD statement for each target table.
4. Exit from DB-Access.
5. If you plan to load data into a table or tables that do not exist, follow these steps:
   a. Use the **dbschema** utility to create a schema file from the Dynamic Server 7.3x database.
   b. Edit the schema file so that it describes the new tables.

   If you prefer, you can omit this step and, in step 12, enter the statements that create the tables.
6. Follow the instructions to install and configure Dynamic Server 7.3x.
7. Change the **INFORMIXSERVER** environment variable to specify your new database server.
8. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
9. Invoke the DB-Access utility.
10. Select the target database.
11. If you are creating a new database, execute the CREATE DATABASE statement or choose **Database→Create** from the DB-Access menu.

12. If you plan to load data into a new table, choose and run the schema file that you prepared in step 5 or enter CREATE TABLE statements to create the new tables.
13. If you created a new database, you might need to update the **DBPATH** environment variable with the new database location.
14. Use LOAD statements to load the data into the desired tables.

Using UNLOAD, dbschema, and dbload

If you need to manipulate the data in the specified UNLOAD file before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities.

To use UNLOAD, dbschema, and dbload to move data to Dynamic Server 7.3x from Workgroup Edition 7.3x

1. Follow steps 1 through 13 from "Using UNLOAD, LOAD, and dbschema" on page 10-24.
2. Build a command file to use with the **dbload** utility, which loads the data files into the tables.
3. Execute **dbload** to load the data as your command file directs.

For information on UNLOAD, LOAD, **dbload**, and **dbschema**, refer to Section IV, "Data Migration Utilities." For information on how to use DB-Access, see the *IBM Informix DB-Access User's Guide*.

Shut Down Workgroup Edition 7.3x

UNIX

Select **Off-Line** from the **Server Mode** list box in the **General** tab of IECC. ♦

Windows

In IECC, select the database server in the **All Servers** tree view or the **Servers** list box. Choose **Server→Off-line**. ♦

Install and Configure Dynamic Server 7.3x

Install and configure Dynamic Server 7.3x according to the instructions in your *Installation Guide*.

UNIX

You must be user **root** to install the product. When you finish the installation and system reconfiguration, exit as user **root** and log in as user **informix**. ♦

Windows

You can install the target database server and the administration tools on either the same or different computers.

The installation program automatically starts the target database server.

You can install Dynamic Server 7.3x and IECC either on the same computer or on different computers. For example, you can install IECC on a personal computer that runs Windows 95 or Windows NT and the database server on a UNIX computer. The installation program also starts the server agent, which is the communications link between Dynamic Server 7.3x and the IECC client.

Use **Setup** to specify the network protocol and the computer on which the target database server looks for the database server definitions. ♦

Verify Port Numbers and the Services File

The **services** file contains service names, port numbers, and protocol information. If you have installed the database server and the administration tools on different computers, verify that the port number listed in the **services** file is the same on the client and the server computers.

UNIX

The **services** file resides in the **/etc/services** directory on the server and in the **\windir\services** directory on the Windows 95 client. ♦

Windows

The **services** file resides in the **\windir\system32\drivers\etc** directory. ♦

Customize the Database Server Environment

If you are an advanced user, you can customize the ONCONFIG configuration file and environment variables for Dynamic Server 7.3x. To edit the **ONCONFIG** file, use a text editor. For more information on configuration parameters, see your *Administrator's Guide*. For more information on environment variables, see the *IBM Informix Guide to SQL: Reference*.

Important: *Use the same values for your target database server for ROOTOFFSET, ROOTSIZE, and ROOTPATH that you used for your source database server.*

Bring Dynamic Server 7.3x Online

The installation program brings Dynamic Server 7.3x online automatically.

If you customized the database server environment, you can bring down and restart the target database server with IECC. When you restart the target database server, the changes to the configuration parameters and environment variables take effect.

UNIX/Linux

To start Dynamic Server 7.3x on UNIX or Linux

1. Enter **oninit** at the command-line prompt.
2. If you want to initialize the database server, enter **oninit -i**.

Windows

To start Dynamic Server 7.3x on Windows

1. In the **Informix Administration Tools** program group, double-click the IECC icon.
2. In IECC, select the database server in the **All Servers** tree view or the **Servers** list box.
3. Choose **Server→Online**.

For more information, refer to the Version 7.3 IECC manual.

Import the Data into the Dynamic Server 7.3x

Use **dbimport**, LOAD, or **dbload** to load the data into Dynamic Server 7.3x, depending on which utility you used to export the data.

Verify the Integrity of the Data

Use the **oncheck** utility to verify the integrity of data, as described in your *Administrator's Guide*.

Back Up Dynamic Server 7.3x

Use your preferred backup method to make a complete (level-0) backup of your database server. You can use ON-Bar, **ontape**, or ON-Archive to perform a backup.

UNIX/Linux

To start a backup of the database server on UNIX or Linux, you can enter **$INFORMIXDIR/bin/bar** where the database server is installed. ♦

Windows

On Windows, you can double-click the **Backup and Restore** icon in the **Informix Administration Tools** program group.

Windows does not support ON-Archive. ♦

The tape parameters must specify a valid tape device. Be sure to retain and properly label the tape volume that contains the backup.

For more information on how to make backups, refer to your *Backup and Restore Guide* or *Archive and Backup Guide*.

Run UPDATE STATISTICS

After you complete the migration procedure, run the UPDATE STATISTICS statement on the database server. The UPDATE STATISTICS statement updates the information that Dynamic Server 7.3x uses to plan efficient queries. For more information about UPDATE STATISTICS, refer to the *IBM Informix Guide to SQL: Syntax*.

Complete Migration

The first time the target database server is brought online, the **sysmaster** and **sysutils** databases are built. Check the message log to ensure that the database builds are complete before you allow users to access the database server. After you ensure that client users can access data on your target database server, the migration process is complete.

Adapt Your Programs for Dynamic Server 7.3x

After you successfully move the data to Dynamic Server 7.3x, verify that your application developers know the differences between both database servers. Dynamic Server 7.3x supports the same products and features as Workgroup Edition 7.3x, plus the High-Performance Loader (HPL) and the following features:

- Fragmentation (also known as partitioning)
- Parallel data query (PDQ)
- Role separation

For information on the SQL statements that Dynamic Server 7.3x supports, see the *IBM Informix Guide to SQL: Syntax* and the *IBM Informix Guide to SQL: Reference*.

Moving Data Between SE and Dynamic Server 7.3x or Workgroup Edition 7.3x

This section describes the following procedures:

- Moving data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE
- Moving data to SE from Dynamic Server 7.3x or Workgroup Edition 7.3x

Moving Data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE

The following sections describe the steps for moving data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE. To move the data, you need to choose a migration method, eliminate SE-specific features, migrate the data from SE, and modify client applications.

Using the dbexport and dbimport Utilities

If you intend to move an entire database to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE, the **dbexport** and **dbimport** combination is the easiest migration method.

To use dbexport and dbimport to move data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE

1. Use the **dbexport** utility to export the data from SE.

   You can move the data to another directory or directly to tape.

Warning: *Do not use the* ***-ss*** *option with* ***dbexport*** *when you move data between database servers. The* ***-ss*** *option generates SE-specific syntax that Dynamic Server 7.3x or Workgroup Edition 7.3x does not recognize.*

2. Edit the database schema file (the .**sql** file that **dbexport** creates).

   You might want to add information that Dynamic Server 7.3x or Workgroup Edition 7.3x databases and tables can use, such as the following data:

   - Initial- and next-extent values for a table
   - Lock mode for a table
   - Blobspace where TEXT or BYTE data types should reside
   - Dbspace where the tables should reside
   - VARCHAR or NVARCHAR column specifications
   - Fragmentation schemes

3. You can also make the following changes to the schema file:
   - Alter ownership or SQL privileges on specific tables and indexes.
   - Specify the dbspace location of the database.
   - Change the logging status of the database.
   - Change the ANSI-compliance status of the database.
   - Remove unsupported SQL syntax, if necessary. (You can write a script to automate the task of modifying the SQL statements.)

   For details about supported SQL statements, see the *IBM Informix Guide to SQL: Syntax*.
4. If necessary, install the new database server. For installation procedures, see your *Installation Guide*.

Important: *For Dynamic Server 7.3x, you must access rows that were fragmented using column values (primary key values) in a row rather than ROWID.*

5. Change the **INFORMIXSERVER** environment variable to specify your target database server.
6. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
7. Start the new database server.
8. Use the **dbimport** utility to move the database data into the new database server.

For detailed descriptions of the **dbexport** and **dbimport** utilities, see Chapter 11, "The dbexport and dbimport Utilities."

Using the UNLOAD Statement

The UNLOAD statement lets you retrieve selected rows from a database and write those rows into a text file.

Using UNLOAD, LOAD, and dbschema

If you want to move selected tables or columns instead of an entire SE database to your target database server, use the SQL statements UNLOAD and LOAD in the DB-Access utility with the **dbschema** database utility.

To use UNLOAD, LOAD, and dbschema to move data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE

1. Make sure that you have sufficient disk space to store the unloaded data. (You cannot unload data to tape with UNLOAD.)
2. Invoke DB-Access.
3. Use the UNLOAD statement to move the selected data into a text file. Use a separate UNLOAD statement for each target table.
4. Exit from DB-Access.
5. If you plan to load data into a table or tables that do not exist, follow these steps:
   a. Use the **dbschema** utility to create a schema file from the SE database.
   b. Edit the schema file so that it describes the new tables.
   c. Make any of the following changes to the schema file:
   - Alter ownership or SQL privileges on specific tables and indexes.
   - Specify the dbspace location for the table.
   - Change the logging status of the database.
   - Change the ANSI-compliance status of the database.
   - Remove unsupported SQL syntax, if necessary.

   For details about supported SQL statements, see the *IBM Informix Guide to SQL: Syntax*.

   If you prefer, you can omit this step and, in step 12, enter the statements that create the tables.
6. If necessary, install your target database server.
7. Change the **INFORMIXSERVER** environment variable to specify your target database server.
8. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
9. Start the new database server.
10. Invoke the DB-Access utility.

11. Select the target database.

    If you are creating a new database, execute the CREATE DATABASE statement or choose **Database→Create** from the DB-Access menu.

12. If you plan to load data into a new table or tables, choose and run the schema file that you prepared in step 5 or enter CREATE TABLE statements to create the new tables.

13. If you created a new database, you might need to update the **DBPATH** environment variable with the new database location.

14. Use LOAD statements to load the data into the desired tables.

Using UNLOAD, dbload, and dbschema

If you need to manipulate the data before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities.

To use UNLOAD, dbload, and dbschema to move data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE

1. Follow steps 1 through 13 of "Using UNLOAD, LOAD, and dbschema" on page 10-31.

2. Build a command file to use with the **dbload** utility, which loads the data files into the tables.

3. Execute **dbload** to load the data as your command file directs.

For information on UNLOAD, LOAD, **dbload**, and **dbschema**, see Section IV, "Data Migration Utilities." For information on how to use DB-Access, see the *IBM Informix DB-Access User's Guide*.

Moving C-ISAM Data to Dynamic Server 7.3x or Workgroup Edition 7.3x

After you convert the C-ISAM data files to SE format, use **dbexport** and **dbimport** to move the data to Dynamic Server 7.3x or Workgroup Edition 7.3x from SE. To convert the data files to SE format, follow the procedure under "Converting C-ISAM Files to SE" on page 7-7. For more information on how to work with C-ISAM files, see the *C-ISAM Programmer's Manual*.

Tip: *For details on how to convert C-ISAM data files to SE, contact your local systems engineer for assistance.*

Adapting Programs for Dynamic Server 7.3x or Workgroup Edition 7.3x

After you successfully move the SE data to Dynamic Server 7.3x or Workgroup Edition 7.3x, verify that your application developers know the differences between the database servers. For more information about the server-specific limitations of SQL statements, see the *IBM Informix Guide to SQL: Syntax* and the *IBM Informix Guide to SQL: Reference*. For information about environment variables, see the *IBM Informix Guide to SQL: Reference*.

For more information about how to configure your database server, see your *Administrator's Guide*.

SE

The following statements contain syntax and keywords that only SE recognizes:

CHECK TABLE
CREATE AUDIT
DROP AUDIT
RECOVER TABLE
REPAIR TABLE
ROLLFORWARD DATABASE
START DATABASE ♦

Moving Data to SE from Dynamic Server 7.3x or Workgroup Edition 7.3x

When you move data to SE from Dynamic Server 7.3x or Workgroup Edition 7.3x, you must choose a migration method, eliminate features that SE does not support, migrate the data, and modify applications.

Eliminating Features That SE Does Not Support

Before you export your source database server data to SE, you must eliminate all occurrences of the following unsupported data types or convert them to data types that SE supports:

VARCHAR
BYTE
TEXT

Using the dbexport and dbimport Utilities

If you intend to move an entire database to SE, the **dbexport** and **dbimport** combination is the easiest migration method.

To use dbexport and dbimport to move data to SE from your source database server

1. Use **dbexport** to export the data from your source database server.

   You can move the data to a directory or directly to tape.

Warning: *Do not use the* ***-ss*** *option with* ***dbexport*** *when you move data between database servers. The* ***-ss*** *option generates Dynamic Server 7.3x or Workgroup Edition 7.3x syntax that SE does not recognize.*

2. Remove the following information from the CREATE TABLE statements in the schema file (the **sql** file that **dbexport** creates):
   - Initial- and next-extent sizes
   - Lock modes
   - Dbspace names
   - Blobspace names
   - Logging modes
   - Table-fragmentation expressions

3. You can also make the following changes in the schema file:
   - Alter ownership or SQL privileges on specific tables and indexes
   - Change the logging status of the database
   - Change the ANSI-compliance status of the database
4. If necessary, install SE. For installation instructions, see your *Installation Guide*.
5. Change the **INFORMIXSERVER** environment variable to specify your new database server.
6. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
7. Move to the directory where **dbimport** will store the SE database.
8. Use **dbimport** to move the data into an SE database.

For detailed descriptions of the **dbexport** and **dbimport** utilities, refer to Chapter 11, "The dbexport and dbimport Utilities."

Using the UNLOAD Statement

The UNLOAD statement lets you retrieve selected rows from a database and write those rows into a text file.

Using UNLOAD, LOAD, and dbschema

If you want to move selected tables or columns to SE instead of moving an entire database, use the UNLOAD and LOAD statements in DB-Access with the **dbschema** utility.

To use UNLOAD, LOAD, and dbschema to move data to SE

1. Make sure that you have sufficient disk space to store the unloaded data. (The UNLOAD statement does not allow you to unload to tape.)
2. Invoke DB-Access.
3. Use UNLOAD statements to move the selected data into text files. Use a separate UNLOAD statement for each target table.
4. Exit from DB-Access.

5. If you plan to load data into a table or tables that do not exist, follow these steps:
   a. Use the **dbschema** utility to create a schema file from the source database server.
   b. Edit the schema file so that it describes the new tables.

   If you prefer, you can omit this step and, in step 11, enter the statements that create the tables.
6. If necessary, install SE.
7. Change the **INFORMIXSERVER** environment variable to specify your new database server.
8. If necessary, use your standard file-transfer process to move the export files to the target computer. Ensure that both database servers use the same **DBDATE** and **DBMONEY** formats.
9. Invoke DB-Access.
10. Select the target database.

    If you are creating a new database, execute the CREATE DATABASE statement or choose **Database→Create** from the DB-Access menu.
11. If you plan to load data into a new table, choose and run the schema file that you prepared in step 5 or enter CREATE TABLE statements to create the new tables.
12. If you created a new database, you might need to update the **DBPATH** environment variable with the new database location.
13. Use LOAD statements to load the data into the desired tables.

Using UNLOAD, dbload, and dbschema

If you need to manipulate the data before you load it into a new table, use a combination of the UNLOAD statement and the **dbschema** and **dbload** utilities.

To use UNLOAD, dbload, and dbschema to move data to SE from Dynamic Server 7.3x or Workgroup Edition 7.3x

1. Follow steps 1 through 12 of "Using UNLOAD, LOAD, and dbschema" on page 10-36.
2. Build a command file to use with the **dbload** utility, which loads the data files into the tables.

3. Execute **dbload** to load the data as your command file directs.

For more information on UNLOAD, LOAD, **dbload**, and **dbschema**, see Section IV, "Data Migration Utilities." For information on how to use DB-Access, refer to the *IBM Informix DB-Access User's Guide*.

Adapting Your Programs for SE

After you migrate data to SE, verify that your application developers know the differences between both database servers.

SE

SE does not use the ONCONFIG configuration file. SE supports a subset of the environment variables that Dynamic Server 7.3x or Workgroup Edition 7.3x support. For more information about how to use SE, see the *IBM Informix SE Administrator's Guide*. ♦

For more information about the differences between database servers and their interpretation of SQL, refer to the *IBM Informix Guide to SQL: Reference*.

IDS 7.3x

Dynamic Server 7.3x supports the following SQL statements, which SE does not support:

ALTER FRAGMENT
GRANT FRAGMENT
REVOKE FRAGMENT
SET DATASKIP
SET PDQPRIORITY ♦

IDS 7.3x
WE

Dynamic Server 7.3x and Workgroup Edition 7.3x support the following SQL statements, which SE does not support:

CREATE ROLE
DROP ROLE
RENAME DATABASE
SET ISOLATION
SET LOG
SET ROLE
SET SESSION AUTHORIZATION ♦

If you change the name or pathname of the database server, update the **DBPATH** environment variable with the location of the new database. For information about **DBPATH**, see the *IBM Informix Guide to SQL: Reference*.

Data Migration Utilities

Section IV

Chapter

11

The dbexport and dbimport Utilities

In This Chapter

This chapter describes the **dbexport** and **dbimport** utilities and how to use them. You can use **dbexport** and **dbimport** with the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x, or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE
- OnLine 5.1x

The **dbexport** and **dbimport** utilities are not part of the following database servers:

- Extended Parallel Server 8.40 or 8.3x
- Dynamic Server with AD and XP Options 8.21

The **dbexport** utility unloads a database into text files for later import into another database and creates a schema file. The **dbimport** utility creates and populates a database from text files. You can use the schema file with **dbimport** to re-create the database schema in another Informix environment. You can edit the schema file to modify the database that **dbimport** creates. The **dbexport** and **dbimport** utilities support Dynamic Server 9.40, 9.30, and 9.2x extended data types.

Dates are stored in four-digit years. By default, **dbexport** exports dates in four-digit year dates unless the environment variable **DBDATE** is set to "`mdy2`" or to some other value that specifies abbreviated years. We do not recommend this setting for exporting a database because data imported back into the database depends on either the **DBCENTURY** environment variable, if set, or the current century if **DBCENTURY** is not set.

Important: *Disable SELECT triggers before exporting a database with dbexport. The dbexport utility executes SELECT statements during exportation. SELECT triggers can result in modifications of the database content.*

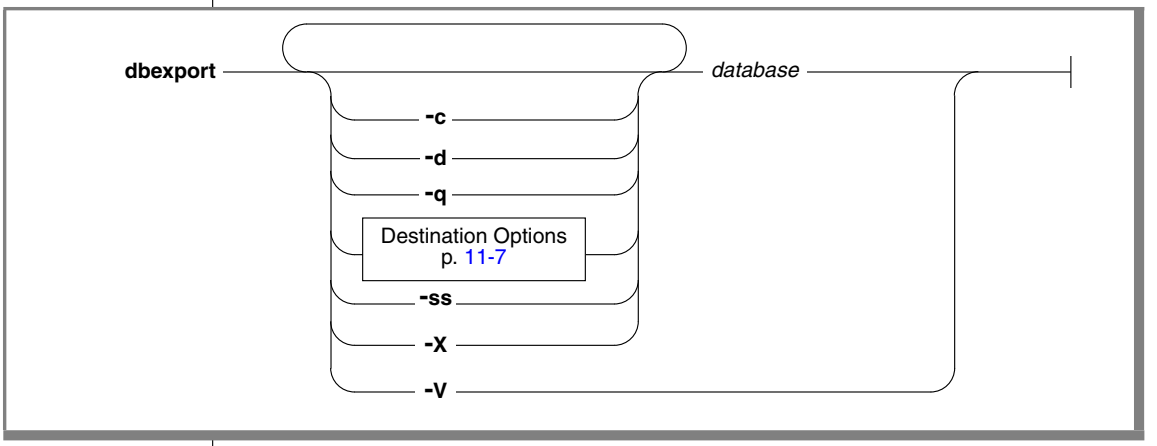
Warning: *When you import a database, use the same environment variable settings that were used when the database was created or you might get unexpected results. If any fragmentation expressions, check constraints, triggers, or user-defined routines were created with different settings than you use with* ***dbimport****, you cannot reproduce the database accurately with a single import.*

If the date context during import is not the same as when these objects were created, you might get explicit errors, you might not be able to find your data, a check constraint might not work as expected, and so forth. Many of these problems do not generate errors. The date context for an object includes the date on which the object was created, the values of the ***DBCENTURY*** *and* ***DBDATE*** *environment variables, and some other environment variables. To avoid such problems with the date context, use four-digit dates in all cases.*

GLS

Similar problems might occur with environment variables that specify GLS locales. such as ***DB_LOCALE****,* ***SERVER_LOCALE****, and* ***CLIENT_LOCALE****. For more information, see the "IBM Informix GLS User's Guide."* ♦

Syntax of the dbexport Command



Element	Purpose	Key Considerations
-c	Makes **dbexport** complete exporting unless a fatal error occurs	**References**: For details on this option, see "Errors" on page 11-6.
-d	Makes **dbexport** export simple-large-object descriptors only, not simple-large-object data	**References**: For information about simple-large-object descriptors, see the *IBM Informix Optical Subsystem Guide*. **Restrictions**: Not supported by SE.
-q	Suppresses the display of error messages, warnings, and generated SQL data-definition statements	None.
-ss	Generates database server-specific information for all tables in the specified database	**References**: For details on this option, see "Server-Specific Information" on page 11-7.
-X	Recognizes HEX binary data in character fields	None.
-V	Displays product version information	None.
database	Specifies the name of the database that you want to export	**Additional Information**: If your locale is set to use multibyte characters, you can use multibyte characters for the database name. **References:** If you want to use more than the simple name of the database, refer to the Database Name section of the *IBM Informix Guide to SQL: Syntax*.

You must have DBA privileges or log in as user **informix** to export a database.

GLS

When the environment variables are set correctly, as described in the *IBM Informix GLS User's Guide*, **dbexport** can handle foreign characters in data and export the data from GLS databases. For more information, refer to "Database Renaming" on page 11-16. ♦

You can use delimited identifiers with the **dbexport** utility. The utility detects database objects that are keywords, mixed case, or have special characters and places double quotes around them.

In addition to the data files and the schema file, **dbexport** creates a file of messages named **dbexport.out** in the current directory. This file contains error messages, warnings, and a display of the SQL data definition statements that it generates. The same material is also written to the standard output unless you specify the **-q** option.

During the export, the database is locked in exclusive mode. If **dbexport** cannot obtain an exclusive lock, it displays a diagnostic message and exits.

Tip: *The **dbexport** utility can create files larger than 2 GB. To support such large files, make sure your operating system file-size limits are set sufficiently high. For example, on UNIX, set **ulimit** to unlimited.*

Termination of dbexport

You can press the INTERRUPT key at any time to cancel **dbexport**. The **dbexport** utility asks for confirmation before it terminates.

Errors

The **-c** option tells **dbexport** to complete exporting unless a fatal error occurs. Even if you use the **-c** option, **dbimport** interrupts processing if one of the following fatal errors occurs:

- Unable to open the tape device specified
- Bad writes to the tape or disk
- Invalid command parameters
- Cannot open database or no system permission

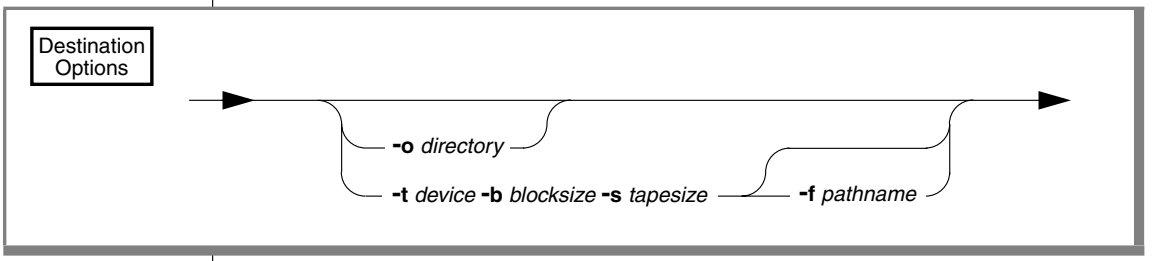
Server-Specific Information

The **-ss** option generates server-specific information. The **-ss** option specifies initial- and next-extent sizes, fragmentation information if the table is fragmented, the locking mode, the dbspace for a table, the blobspace for any simple large objects, and the dbspace for any smart large objects.

SE

For SE databases, the **-ss** option generates the pathname of each table that is in a path other than the database directory. ♦

Destination Options



Element	Purpose	Key Considerations
-b ***blocksize***	Specifies, in kilobytes, the block size of the tape device	None.
-f ***pathname***	Specifies the pathname where you want the schema file stored, if you are storing the data files on tape	**Additional Information:** The pathname can be a complete pathname or simply a filename. If only a filename is given, the file is stored in the current directory.
-o ***directory***	The directory on disk in which **dbexport** creates the ***database*.exp** directory. This holds the data files and the schema file that **dbexport** creates for the ***database***.	**Restrictions:** The directory specified as *directory name* must already exist.
-s ***tapesize***	Specifies, in kilobytes, the amount of data that you can store on the tape	**Additional Information:** To write to the end of the tape, specify *tapesize* as 0. **Restrictions:** If you do not specify 0, then the maximum *tapesize* is 2,097,151 kilobytes.
-t ***device***	Specifies the pathname of the tape device where you want the text files and, possibly, the schema file stored	**Restrictions:** The -t option does not allow you to specify a remote tape device.

When you write to disk, **dbexport** creates a subdirectory, ***database*.exp**, in the directory that the **-o** option specifies. The **dbexport** utility creates a file with the **.unl** extension for each table in the database. The schema file is written to the file ***database*.sql**. The **.unl** and **.sql** files are in the ***database*.exp** directory.

If you do not specify a destination for the data and schema files, the subdirectory ***database*.exp** is placed in the current working directory.

When you write the data files to tape, you can use the **-f** option to store the schema file to disk. You are not required to name the schema file ***database*.sql**. You can give it any name.

SE

The following **dbexport** command creates a **reports.exp** subdirectory in the current directory. It then unloads the **reports** database in the **turku** directory on the SE database server called **finland** and places the resulting files in the **reports.exp** directory, as follows:

```
dbexport //finland/turku/reports
```

♦

UNIX/Linux

For non-SE database servers on UNIX or Linux, the command is as follows:

```
dbexport //finland/reports
```

The following command exports the database **stores_demo** to tape with a block size of 16 kilobytes and a tape capacity of 24,000 kilobytes. The schema file is written to **/tmp/stores_demo.imp**.

```
dbexport -t /dev/rmt0 -b 16 -s 24000 -f /tmp/stores_demo.imp
   stores_demo
```

The following command exports the same **stores_demo** database to the directory named **/work/exports/stores_demo.exp**. The resulting schema file is **/work/exports/stores_demo.exp/stores_demo.sql**.

```
dbexport -o /work/exports stores_demo
```

♦

Windows

For Windows, the following command exports the database **stores_demo** to tape with a block size of 16 kilobytes and a tape capacity of 24,000 kilobytes. The schema file is written to C**:\temp\stores_demo.imp**.

```
dbexport -t \\.\TAPE2 -b 16 -s 24000 -f
   C:\temp\stores_demo.imp  stores_demo
```

The following command exports the same **stores_demo** database to the directory named D**:\work\exports\stores_demo.exp**. The resulting schema file is D**:\work\exports\stores_demo.exp\stores_demo.sql**.

```
dbexport -o D:\work\exports stores_demo
```

♦

Contents of the Schema File

The schema file contains the SQL statements that you need to re-create the exported database. You can edit the schema file to modify the schema of the database.

IDS 9.x

The schema file supports all Dynamic Server 9.40, 9.30, and 9.2x data types. ♦

If you use the **-ss** option, the schema file contains server-specific information, such as initial- and next-extent sizes, fragmentation information, lock mode, the dbspace where each table resides, the blobspace where each simple-large-object column resides, and the dbspace for smart large objects. The following information is not retained:

- Logging mode of the database

  For information about logging modes, see the *IBM Informix Guide to SQL: Reference*.
- The starting values of SERIAL columns

The statements in the schema file that create tables, views, indexes, roles, and grant privileges do so with the name of the user who originally created the database. In this way, the original owner retains DBA privileges for the database and is the owner of all the tables, indexes, and views. In addition, the person who executes the **dbimport** command also has DBA privileges for the database.

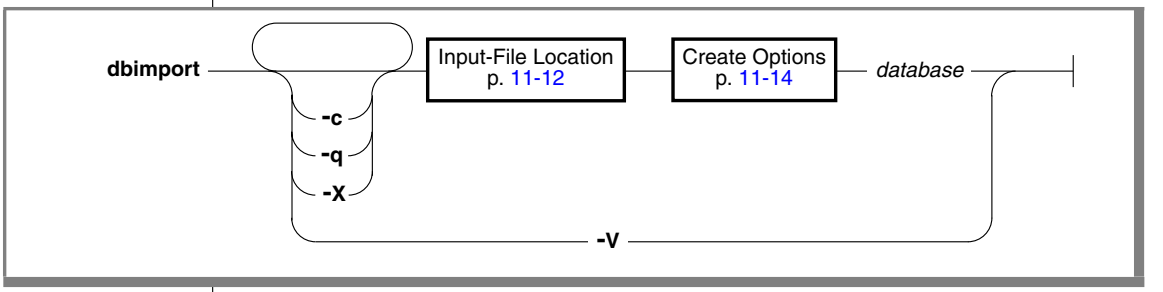
The schema file that **dbexport** creates contains comments, enclosed in braces, with information about the number of rows, columns, and indexes in tables, and information about the unload files. The **dbimport** utility uses the information in these comments to load the database.

Warning: *Do not delete any comments in the schema file. It is strongly recommended that you do not change any existing comments or add any new comments, or the* ***dbimport*** *might abort or produce unpredictable results.*

The number of rows should match in the unload file and the corresponding unload comment in the schema file. If you change the number of rows in the unload file but not the number of rows in the schema file, a mismatch occurs.

Tip: *If you delete rows from an unload file, update the comment in the schema file with the correct number of rows in the unload file. Then* ***dbimport*** *will be successful.*

Syntax of the dbimport Command



Element	Purpose	Key Considerations
-c	Instructs **dbimport** to complete importing even though it encounters certain nonfatal errors	**References**: For more information, see "Errors and Warnings" on page 11-11.
-q	Suppresses the display of error messages, warnings, and generated SQL data-definition statements	None.
-V	Displays product version information	None.
-X	Recognizes HEX binary data in character fields	None.
database	Specifies the name of the database to create	**Additional Information**: To use more than the simple name of the database, see the Database Names segment in the *IBM Informix Guide to SQL: Syntax*.

The **dbimport** utility can use files from the following location options:

- All input files are located on disk.
- All input files are located on tape.
- The schema file is located on disk, and the data files are on tape.

Important: *Do not put comments into your input file. Comments might cause unpredictable results when the* ***dbimport*** *utility reads them.*

The **dbimport** utility supports the following tasks for a new Informix database server (excluding SE):

- Create an ANSI-compliant database (includes unbuffered logging)
- Establish transaction logging for a database (unbuffered or buffered logging)
- Specify the dbspace where the database will reside

SE

The **dbimport** utility supports the following tasks for a new SE database:

- Create an ANSI-compliant database (ANSI-compliant logging)
- Establish transaction logging for a database (unbuffered logging) ♦

The user who runs **dbimport** is granted the DBA privilege on the newly created database. The **dbimport** process locks each table as it is being loaded and unlocks the table when the loading is complete.

GLS

When the GLS environment variables are set correctly, as the *IBM Informix GLS User's Guide* describes, **dbimport** can import data into database versions that support GLS. ♦

Termination of dbimport

To cancel **dbimport**, press the INTERRUPT key at any time. The **dbimport** program asks for confirmation before it terminates.

Errors and Warnings

If you include the **-c** option, **dbimport** ignores the following errors:

- A data row that contains too many columns
- Inability to put a lock on a table
- Inability to release a lock

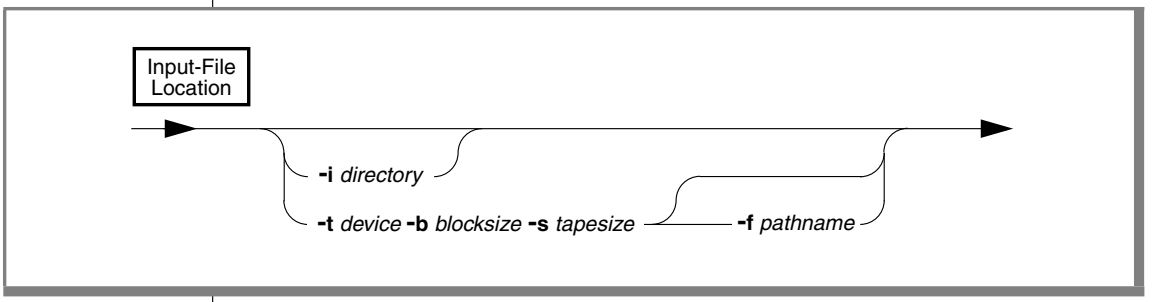
Even if you use the **-c** option, **dbimport** interrupts processing if one of the following fatal errors occurs:

- Unable to open the tape device specified
- Bad writes to the tape or disk
- Invalid command parameters
- Cannot open database or no system permission
- Cannot convert the data

The **dbimport** utility creates a file of messages called **dbimport.out** in the current directory. This file contains any error messages and warnings that are related to **dbimport** processing. The same information is also written to the standard output unless you specify the **-q** option.

Input-File Location Options

The input-file location tells **dbimport** where to look for the ***database*.exp** directory, which contains the files that **dbimport** will import. If you do not specify an input-file location, **dbimport** looks for data files in the directory ***database*.exp** under the current directory and for the schema file in ***database*.exp/*database*.sql**.



Element	Purpose	Key Considerations
-b ***blocksize***	Specifies, in kilobytes, the block size of the tape device	**Restrictions:** If you are importing from tape, you must use the same block size that you used to export the database.

Element	Purpose	Key Considerations
-f *pathname*	Specifies where **dbimport** can find the schema file to use as input to create the database when the data files are read from tape	**Additional Information:** If you use the **-f** option to export a database, you typically use the same pathname that you specified in the **dbexport** command. If you specify only a filename, **dbimport** looks for the file in the **.exp** subdirectory of your current directory.
-i *directory*	Specifies the complete pathname on disk of the ***database*.exp** directory, which holds the input data files and schema file that **dbimport** uses to create and load the new database. The directory name should be the same as the database name.	**Additional Information:** This directory should be the same directory that you specified with the **dbexport -o** option. If you change the directory name, you also rename your database.
-s *tapesize*	Specifies, in kilobytes, the amount of data that you can store on the tape	**Additional Information:** To read to the end of the tape, specify a tape size of `0`. **Restrictions:** If you are importing from tape, you must use the same tape size that you used to export the database. If you do not specify 0 as the ***tapesize***, then the maximum ***tapesize*** is 2,097,151 kilobytes.
-t *device*	Specifies the pathname of the tape device that holds the input files	**Restrictions:** The **-t** option does *not* allow you to specify a remote tape device.

UNIX/Linux

The following command imports the **stores_demo** database from a tape with a block size of 16 kilobytes and a capacity of 24,000 kilobytes. The schema file is read from **/tmp/stores_demo.imp**.

```
dbimport -c  -t /dev/rmt0 -b 16 -s 24000 -f
   /tmp/stores_demo.imp stores_demo
```

The following command imports the **stores_demo** database from the **stores_demo.exp** directory under the **/work/exports** directory. The schema file is assumed to be **/work/exports/stores_demo.exp/stores_demo.sql**.

```
dbimport -c -i /work/exports stores_demo
```

♦

Windows

The following command imports the **stores_demo** database from a tape with a block size of 16 kilobytes and a capacity of 24,000 kilobytes. The schema file is read from **C:\temp\stores_demo.imp**.

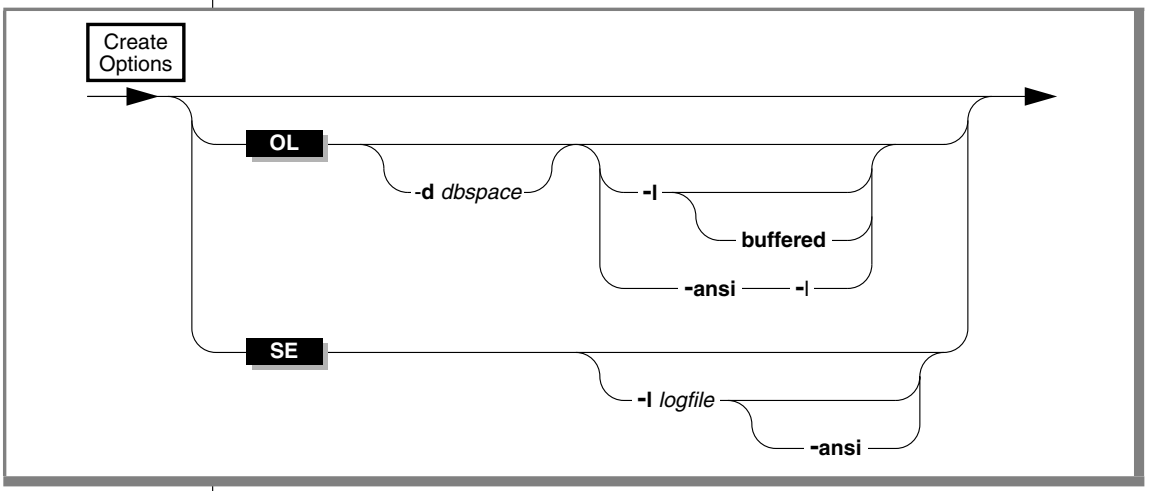
```
dbimport -c  -t \\.\TAPEDRIVE -b 16 -s 24000 -f
   C:\temp\stores_demo.imp stores_demo
```

The following command imports the **stores_demo** database from the **stores_demo.exp** directory under the **D:\work\exports** directory. The schema file is assumed to be **D:\work\exports\stores_demo.exp\stores_demo.sql**.

```
dbimport -c -i D:\work\exports stores_demo
```

♦

Create Options



Element	Purpose	Key Considerations
-ansi	Creates an ANSI-compliant database in which the ANSI rules for transaction logging are enabled	**Additional Information:** If you specify the **-ansi** option, you must also specify the **-l** *logfile* option. For more information about ANSI-compliant databases, see the *IBM Informix Guide to SQL: Reference*.
-d ***dbspace***	Specifies the dbspace where the database is created. The default dbspace location is the rootdbs.	**Additional Information:** For SE, the database is always in the current directory.

Element	Purpose	Key Considerations
-l	Establishes unbuffered transaction logging for the imported database	**References:** For more information, see "Database-Logging Mode" on page 11-15.
-l buffered	Establishes buffered transaction logging for the imported database	**References:** For more information, see "Database-Logging Mode" on page 11-15.
-l *logfile*	Establishes transaction logging for the imported database and specifies the name of the transaction-log file	**Restrictions:** For SE, the *logfile* filename must be an absolute pathname or in the current directory. **References:** For more information, see "Database-Logging Mode" on page 11-15.

UNIX/Linux

The following command imports the **stores_demo** database from the **/usr/informix/port/stores_demo.exp** directory. The new database is ANSI compliant, and the transaction-log file is specified as **stores_demo.log** in **/usr/work**.

```
dbimport -c stores_demo -i /usr/informix/port -l
   /usr/work/stores_demo.log -ansi
```

♦

Windows

The following command imports the **stores_demo** database from the **C:\USER\informix\port\stores_demo.exp** directory. The new database is ANSI compliant, and the transaction-log file is specified as **stores_demo.log** in **C:\USER\work**.

```
dbimport -c stores_demo -i C:\USER\informix\port -l
   C:\USER\work\stores_demo.log -ansi
```

♦

Database-Logging Mode

The logging mode is not retained in the schema file. You can specify any of the following options when you use **dbimport** to import a database:

- ANSI-compliant database with unbuffered logging
- Unbuffered logging
- Buffered logging

For more information, see "Create Options" on page 11-14.

The **-l** options are equivalent to the logging clauses of the CREATE DATABASE statement, as follows:

- The **-l** option is equivalent to the WITH LOG clause.
- The **-l buffered** option is equivalent to the WITH BUFFERED LOG.
- The **-l** ***logfile*** option is equivalent to the WITH LOG IN clause. ♦

SE

For more information about the CREATE DATABASE statement, see the *IBM Informix Guide to SQL: Syntax*.

Database Renaming

The **dbimport** utility gives the new database the same name as the database that you exported. If you export a database to tape, you cannot change its name when you import it with **dbimport**.

If you export a database to disk, you can change the database name.

In the following example, assume that **dbexport** unloaded the database **stores_demo** into the directory **/work/exports/stores_demo.exp**. Thus, the data files (the **.unl** files) are stored in **/work/exports/stores_demo.exp**, and the schema file is **/work/exports/stores_demo.exp/stores_demo.sql**.

UNIX/Linux

To change the database name to new name on UNIX or Linux

1. Change the name of the **.exp** directory. That is, change **/work/exports/stores_demo.exp** to **/work/exports/newname.exp**.
2. Change the name of the schema file. That is, change **/work/exports/stores_demo.exp/stores_demo.sql** to **/work/exports/stores_demo.exp/newname.sql**. Do not change the names of the **.unl** files.
3. Import the database with the following command:

```
dbimport -i /work/exports newname
```

Windows

To change the database name to new name on Windows

In the following example, assume that **dbexport** unloaded the database **stores_demo** into the directory **D:\work\exports\stores_demo.exp**. Thus, the data files (the **.unl** files) are stored in **D:\work\exports\stores_demo.exp**, and the schema file is **D:\work\exports\stores_demo.exp\stores_demo.sql**.

1. Change the name of the **.exp** directory. That is, change **D:\work\exports\stores_demo.exp** to **D:\work\exports\newname.exp**.
2. Change the name of the schema file. That is, change **D:\work\exports\stores_demo.exp\stores_demo.sql** to **D:\work\exports\stores_demo.exp\newname.sql**. Do not change the names of the **.unl** files.
3. Import the database with the following command:

```
dbimport -i D:\work\exports
```

IDS 9.x

Simple Large Objects

When **dbimport**, **dbexport**, and DB-Access process simple-large-object data, they create temporary files for that data. Before you export or import data from tables that contain simple large objects, you must have one of the following items:

- A **\tmp** directory on your currently active drive
- The **DBTEMP** environment variable set to point to a directory that is available for temporary storage of the simple large objects

Windows

Windows sets the **TMP** and **TEMP** environment variables in the command prompt sessions, by default. However, if the **TMP**, **TEMP**, and **DBTEMP** environment variables are not set, **dbimport** places the temporary files for the simple large objects in the **\tmp** directory. ♦

Warning: *If a table has a CLOB or BLOB in a column, you cannot use* ***dbexport*** *to export the table to a tape. If a table has a user-defined type in a column, using* ***dbexport*** *to export the table to a tape might yield unpredictable results, depending on the export function of the user-defined type. Exported CLOB sizes are stored in hex format in the unload file.*

Database Locale Changes

You can use **dbimport** to change the locale of a database.

To change the locale of a database

1. Set the **DB_LOCALE** environment variable to the name of the current database locale.
2. Run **dbexport** on the database.
3. Use the DROP DATABASE statement to drop the database that has the current locale name.
4. Set the **DB_LOCALE** environment variable to the desired database locale for the database.
5. Run **dbimport** to create a new database with the desired locale and import the data into this database.

Chapter

12

The dbload Utility

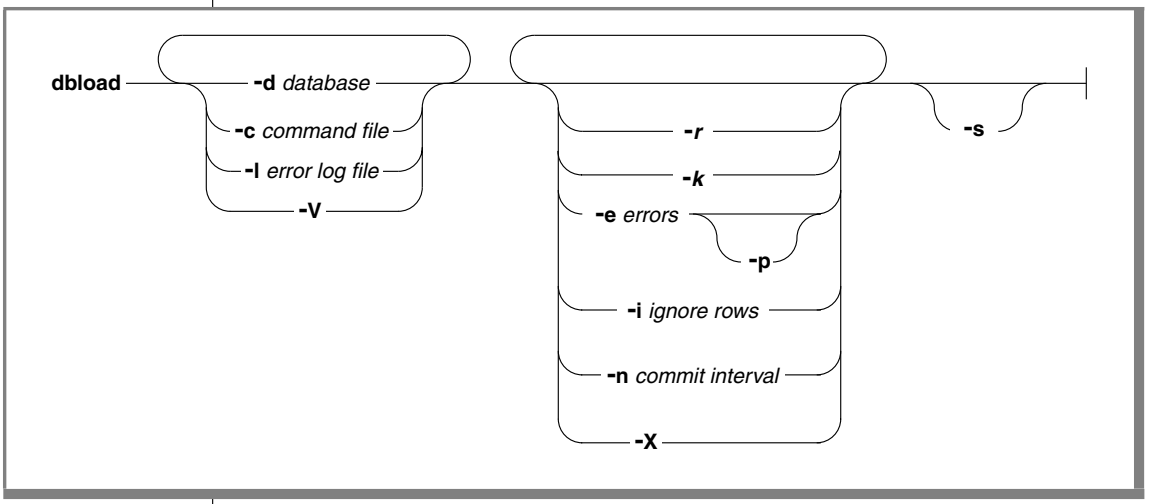
In This Chapter

This chapter describes the **dbload** utility and how to use it. You can use **dbload** with the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE
- OnLine 5.1x

The **dbload** utility loads data into databases or tables that IBM Informix products created. It transfers data from one or more text files into one or more existing tables. This utility supports new data types in Dynamic Server 9.40, 9.30 and 9.2x.

Syntax of the dbload Command



Element	Purpose	Key Considerations
-c *command file*	Specifies the filename or pathname of a **dbload** command file	**References:** For information about building the command file, see "Command File for dbload" on page 12-9.
-d *database*	Specifies the name of the database to receive the data	**Additional Information:** If you want to use more than the simple name of the database, see the Database Name section of the *IBM Informix Guide to SQL: Syntax*.
-e *errors*	Specifies the number of bad rows that **dbload** reads before terminating . The default value for *errors* is 10.	**References:** For more information, see "Bad-Row Limit" on page 12-6.
-i *ignore rows*	Specifies the number of rows to ignore in the input file	**References:** For more information, see "Rows to Ignore" on page 12-6.
-k	Instructs **dbload** to lock the tables listed in the command file in exclusive mode during the load operation	**References:** For more information, see "Table Locking" on page 12-6. **Restrictions:** You cannot use the **-k** option with the **-r** option because the **-r** option specifies that no tables are locked during the load operation.

(1 of 2)

Element	Purpose	Key Considerations
-l *error log file*	Specifies the filename or pathname of an error log file	**Restrictions:** If you specify an existing file, its contents are overwritten. If you specify a file that does not exist, **dbload** creates the file. **Additional Information:** The error log file stores diagnostic information and any input file rows that **dbload** cannot insert into the database.
-n *commit interval*	Specifies the commit interval in number of rows The default interval is 100 rows.	**Additional Information:** If your database supports transactions, **dbload** commits a transaction after the specified number of new rows is read and inserted. A message appears after each commit. **References:** For information about transactions, see the *IBM Informix Guide to SQL: Tutorial*.
-p	Prompts for instructions if the number of bad rows exceeds the limit	**References:** For more information, see "Bad-Row Limit" on page 12-6.
-r	Prevents **dbload** from locking the tables during a load, thus enabling other users to update data in the table during the load	**Additional Information:** For more information, see "Table Locking" on page 12-6. **Restrictions:** You cannot use the **-r** option with the **-k** option because the **-r** option specifies that the tables are not locked during the load operation while the **-k** option specifies that the tables are locked in exclusive mode.
-s	Checks the syntax of the statements in the command file without inserting data	**Additional Information:** The standard output displays the command file with any errors marked where they are found.
-V	Displays product version information	
-X	Recognizes HEX binary data in character fields	

(2 of 2)

Tip: *If you specify part (but not all) of the required information, dbload prompts you for additional specifications. The database name, command file, and error log file are all required. If you are missing all three options, you receive an error message.*

Table Locking

If you do not specify the **-k** option, the tables specified in the command file are locked in shared mode. When tables are locked in shared mode, the database server still has to acquire exclusive row or page locks when it inserts rows into the table.

When you specify the **-k** option, the database server places an exclusive lock on the entire table. The **-k** option increases performance for large loads because the database server does not have to acquire exclusive locks on rows or pages as it inserts rows during the load operation.

If you do not specify the **-r** option, the tables specified in the command file are locked during loading so that other users cannot update data in the table. Table locking reduces the number of locks needed during the load but reduces concurrency. If you are planning to load a large number of rows, use table locking and load during nonpeak hours.

To override this default lock mode, specify the **-k** option. The **-k** option instructs **dbload** to lock the tables in exclusive mode rather than shared mode during the load operation.

Rows to Ignore

The **-i** option instructs **dbload** to read and ignore the specified number of new-line characters in the input file before it begins to process. This option is useful if your most recent **dbload** session ended prematurely. For example, if **dbload** ends after it inserts 240 lines of input, you can begin to load again at line 241 if you set *number rows ignore* to `240`. It is also useful if header information in the input file precedes the data records.

Bad-Row Limit

The **-e** option lets you specify how many bad rows to allow before **dbload** terminates.

If you set *errors* to a positive integer, **dbload** terminates when it reads (*errors* + 1) bad rows. If you set *errors* to zero, **dbload** terminates when it reads the first bad row.

If **dbload** exceeds the bad-row limit and the **-p** option is specified, **dbload** prompts you for instructions before it terminates. The prompt asks whether you want to roll back or to commit all rows that were inserted since the last transaction.

If **dbload** exceeds the bad-row limit and the **-p** option is not specified, **dbload** commits all rows that were inserted since the last transaction.

Guidelines for Using dbload

This section includes the following guidelines for using the **dbload** utility:

- Termination of dbload
- Network names
- Simple large objects
- Indexes
- Delimited identifiers
- SE Example

Termination of dbload

If you press the INTERRUPT key, **dbload** terminates and discards any new rows that were inserted but not yet committed to the database (if the database has transactions).

Network Names

If you are on a network, include the database server name and directory path with the database name to specify a database on another database server or coserver.

Simple Large Objects

You can load simple large objects with the **dbload** utility as long as the simple large objects are in text files.

Indexes

The presence of indexes greatly affects the speed with which the **dbload** utility loads data. For best performance, drop any indexes on the tables that receive the data before you run **dbload**. You can create new indexes after **dbload** has finished.

Delimited Identifiers

You can use delimited identifiers with the **dbload** utility. The utility detects database objects that are keywords, mixed case, or have special characters, and places double quotes around them.

If your most recent **dbload** session ended prematurely, specify the starting line number in the command-line syntax to resume loading with the next record in the file.

SE

SE Example

The following command loads data into the **stores_demo** database in the **turku** directory on the SE database server **finland**:

```
dbload -d //finland/turku/stores_demo -c commands -l errlog
```

Command File for dbload

Before you use **dbload**, you must create a command file that names the input data files and the tables that receive the data. The command file maps fields from one or more input files into columns of one or more tables within your database.

The command file contains only FILE and INSERT statements. Each FILE statement names an input data file. The FILE statement also defines the data fields from the input file that are inserted into the table. Each INSERT statement names a table to receive the data. The INSERT statement also defines how **dbload** places the data that is described in the FILE statement into the table columns.

Within the command file, the FILE statement can appear in these forms:

- Delimiter form
- Character-position form

The FILE statement has a size limit of 4,096 bytes.

Use the delimiter form of the FILE statement when every field in the input data row uses the same delimiter and every row ends with a new-line character. This format is typical of data rows with variable-length fields. You can also use the delimiter form of the FILE statement with fixed-length fields as long as the data rows meet the delimiter and new-line requirements. The delimiter form of the FILE and INSERT statements is easier to use than the character-position form.

Use the character-position form of the FILE statement when you cannot rely on delimiters and you need to identify the input data fields by character position within the input row. For example, use this form to indicate that the first input data field begins at character position `1` and continues until character position `20`. You can also use this form if you must translate a character string into a null value. For example, if your input data file uses a sequence of blanks to indicate a null value, you must use this form if you want to instruct **dbload** to substitute null at every occurrence of the blank-character string.

You can use both forms of the FILE statement in a single command file. For clarity, however, the two forms are described separately in sections that follow.

FILE and INSERT Statements: Delimiter Form

The following example of a **dbload** command file illustrates a simple delimiter form of the FILE and INSERT statements. The example is based on the **stores_demo** database. An UNLOAD statement created the three input data files, **stock.unl**, **customer.unl**, and **manufact.unl**. To see the **.unl** input data files, refer to the directory **$INFORMIXDIR/demo/***prod_name* (UNIX or Linux) or **%INFORMIXDIR%\demo***prod_name* (Windows).

```
FILE stock.unl DELIMITER '|' 6;
INSERT INTO stock;
FILE customer.unl DELIMITER '|' 10;
INSERT INTO customer;
FILE manufact.unl DELIMITER '|' 3;
INSERT INTO manufact;
```

Syntax for the Delimiter Form

The following diagram shows the syntax of the delimiter FILE statement.

Element	Purpose	Key Considerations
c	Character that you specify here as the field delimiter for the specific input file	**Restrictions**: If the delimiter specified by **c** appears as a literal character anywhere in the input file, the character must be preceded with a backslash (\) in the input file. For example, if the value of **c** is specified as a square bracket ([), you must place a backslash before any literal square bracket that appears in the input file. Similarly, you must precede any backslash that appears in the input file with an additional backslash.
filename	Specifies the input file	None.
nfields	Indicates the number of fields in each data row	None.

The **dbload** utility assigns the sequential names **f01**, **f02**, **f03**, and so on to fields in the input file. You cannot see these names, but if you refer to these fields to specify a value list in an associated INSERT statement, you must use the **f01**, **f02**, **f03** format. For details, refer to "How to Write a dbload Command File in Delimiter Form" on page 12-13.

Two consecutive delimiters define a null field. As a precaution, you can place a delimiter immediately before the new-line character that marks the end of each data row. If the last field of a data row has data, you must use a delimiter. If you omit this delimiter, an error results whenever the last field of a data row is not empty.

Inserted data types correspond to the explicit or default column list. If the data field width is different from its corresponding character column width, the data is made to fit. That is, inserted values are padded with blanks if the data is not wide enough for the column or truncated if the data is too wide for the column.

If the number of columns named is fewer than the number of columns in the table, **dbload** inserts the default value that was specified when the table was created for the unnamed columns. If no default value is specified, **dbload** attempts to insert a null value. If the attempt violates a not null restriction or a unique constraint, the insert fails, and an error message is returned.

If the INSERT statement omits the column names, the default INSERT specification is every column in the named table. If the INSERT statement omits the VALUES clause, the default INSERT specification is every field of the previous FILE statement.

An error results if the number of column names listed (or implied by default) does not match the number of values listed (or implied by default).

The syntax of **dbload** INSERT statements resembles INSERT statements in SQL, except that in **dbload**, INSERT statements cannot incorporate SELECT statements.

Warning: *Do not use the CURRENT, TODAY, and USER keywords of the INSERT INTO statement in a* ***dbload*** *command file; they are not supported in the* ***dbload*** *command file. These keywords are supported in SQL only.*

For example, the following **dbload** command is not supported:

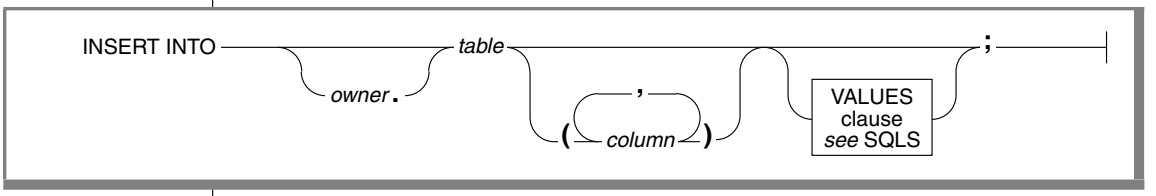
```
FILE "testtbl2.unl" DELIMITER '|' 1;
            INSERT INTO testtbl
                 (testuser, testtime, testfield)
              VALUES
                 ('kae', CURRENT, f01);
```

Load the existing data first and then write an SQL query to insert or update the data with the current time, date, or user login. You could write the following SQL statement:

```
INSERT INTO testtbl
               (testuser, testtime, testfield)
            VALUES
               ('kae', CURRENT, f01);
```

The CURRENT keyword returns the system date and time. The TODAY keyword returns the system date. The USER keyword returns the user login name.

The following diagram shows the syntax of the **dbload** INSERT statement for delimiter form.



Element	Purpose	Key Considerations
column	Specifies the column that receives the new data	None.
owner.	Specifies the user name of the table owner	None.
table	Specifies the table that receives the new data	None.

Users who execute **dbload** with this command file must have the Insert privilege on the named table.

How to Write a dbload Command File in Delimiter Form

The first FILE and INSERT statement set in the delimiter example on page 12-10 is repeated in the following example:

```
FILE stock.unl DELIMITER '|' 6;
INSERT INTO stock;
```

The FILE statement describes the **stock.unl** data rows as composed of six fields, each separated by a vertical bar (|) as the delimiter. Two consecutive delimiters define a null field. As a precaution, you can place a delimiter immediately before the new-line character that marks the end of each data row. If the last field of a data row has data, you must use a delimiter. If you omit this delimiter, an error results.

Compare the FILE statement with the data rows in the following example, which appear in the input file **stock.unl**. (Because the last field is not followed by a delimiter, an error results if any data row ends with an empty field.)

```
1|SMT|baseball gloves|450.00|case|10 gloves/case
2|HRO|baseball|126.00|case|24/case
3|SHK|baseball bat|240.00|case|12/case
```

The example INSERT statement contains only the required elements. Because the column list is omitted, the INSERT statement implies that values are to be inserted into every field in the **stock** table. Because the VALUES clause is omitted, the INSERT statement implies that the input values for every field are defined in the most-recent FILE statement. This INSERT statement is valid because the **stock** table contains six fields, which is the same number of values that the FILE statement defines. The following example shows the first data row that is inserted into **stock** from this INSERT statement.

Field	Column	Value
f01	stock_num	1
f02	manu_code	SMT
f03	description	baseball gloves

(1 of 2)

Field	Column	Value
f04	unit_price	450.00
f05	unit	case
f06	unit_descr	10 gloves/case

(2 of 2)

The FILE and INSERT statement in the following example illustrates a more complex INSERT statement syntax:

```
FILE stock.unl DELIMITER '|' 6;
INSERT INTO new_stock (col1, col2, col3, col5, col6)
   VALUES (f01, f03, f02, f05, 'autographed');
```

In this example, the VALUES clause uses the field names that **dbload** assigns automatically. You must reference the automatically assigned field names with the letter **f** followed by a number: **f01**, **f02**, **f10**, **f100**, **f999**, **f1000**, and so on. All other formats are incorrect.

Tip: *The first nine fields must include a zero: f01, f02, ..., f09.*

The user changed the column names, the order of the data, and the meaning of **col6** in the new **stock** table. Because the fourth column in **new_stock** (**col4**) is not named in the column list, the new data row contains a null in the **col4** position (assuming that the column permits nulls). If no default is specified for **col4**, the inserted value is null.

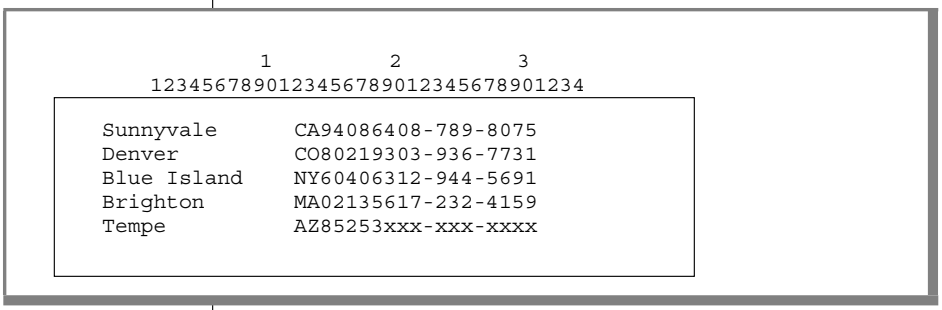
The following table shows the first data row that is inserted into **new_stock** from this INSERT statement.

Column	Value
col1	1
col2	baseball gloves
col3	SMT
col4	null
col5	case
col6	autographed

FILE and INSERT Statements: Character-Position Form

The examples in this section are based on an input data file, **cust_loc_data**, that contains the last four columns (**city**, **state**, **zipcode**, and **phone**) of the **customer** table. Fields in the input file are padded with blanks to create data rows in which the location of data fields and the number of characters are the same across all rows. The definitions for these fields are CHAR(15), CHAR(2), CHAR(5), and CHAR(12), respectively. Figure 12-1 displays the character positions and five example data rows from the **cust_loc_data** file.

Figure 12-1
A Sample Data File

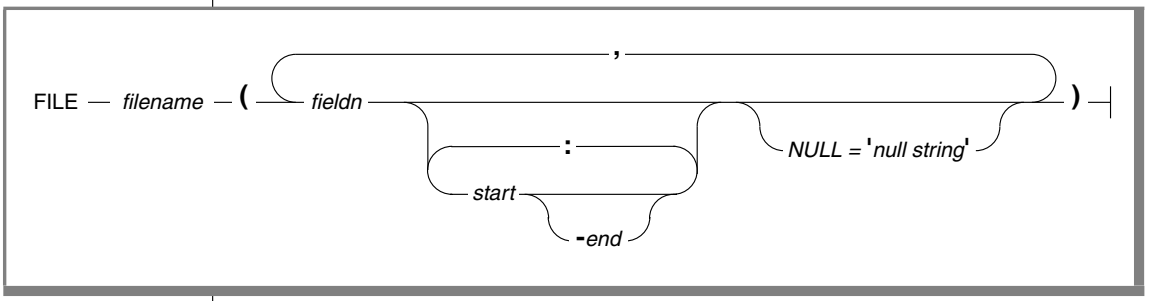


The following example of a **dbload** command file illustrates the character-position form of the FILE and INSERT statements. The example includes two new tables, **cust_address** and **cust_sort**, to receive the data. For the purpose of this example, **cust_address** contains four columns, the second of which is omitted from the column list. The **cust_sort** table contains two columns.

```
FILE cust_loc_data
   (city 1-15,
    state 16-17,
    area_cd 23-25 NULL = 'xxx',
    phone 23-34 NULL = 'xxx-xxx-xxxx',
    zip 18-22,
    state_area 16-17 : 23-25);
INSERT INTO cust_address (col1, col3, col4)
   VALUES (city, state, zip);
INSERT INTO cust_sort
   VALUES (area_cd, zip);
```

Syntax for the Character-Position Form

The following diagram shows the syntax of the character-position FILE statement.



Element	Purpose	Key Considerations
-end	Indicates the character position within a data row that ends a range of character positions	**Restrictions:** A hyphen must precede the *end* value.
fieldn	Assigns a name to the data field that you are defining with the range of character positions	None.
filename	Specifies the name of the input file	None.
null string	Specifies the data value for which **dbload** should substitute a null	**Restrictions**: Must be a quoted string.
start	Indicates the character position within a data row that starts a range of character positions. If you specify *start* without *end*, it represents a single character.	None.

You can repeat the same character position in a data-field definition or in different fields.

The *null string* scope of reference is the data field for which you define it. You can define an explicit null string for each field that allows null entries.

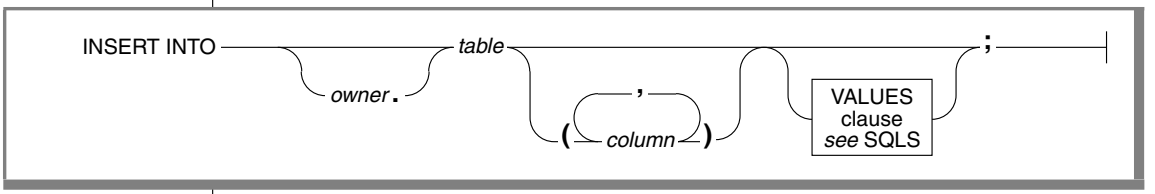
Inserted data types correspond to the explicit or default column list. If the data-field width is different from its corresponding character column, inserted values are padded with blanks if the column is wider or are truncated if the field is wider.

If the number of columns named is fewer than the number of columns in the table, **dbload** inserts the default value that is specified for the unnamed columns. If no default value is specified, **dbload** attempts to insert a null value. If the attempt violates a not-null restriction or a unique constraint, the insert fails, and an error message is returned.

If the INSERT statement omits the column names, the default INSERT specification is every column in the named table. If the INSERT statement omits the VALUES clause, the default INSERT specification is every field of the previous FILE statement.

An error results if the number of column names listed (or implied by default) does not match the number of values listed (or implied by default).

The syntax of **dbload** INSERT statements resembles INSERT statements in SQL, except that in **dbload**, INSERT statements cannot incorporate SELECT statements. The following diagram shows the syntax of the **dbload** INSERT statement for character-position form.



Element	Purpose	Key Considerations
column	Specifies the column that receives the new data	None.
owner.	Specifies the user name of the table owner	None.
table	Specifies the table that receives the new data	None.

The syntax for character-position form is identical to the syntax for delimiter form.

The user who executes **dbload** with this command file must have the Insert privilege on the named table.

SE

In SE, the **dbload** utility recognizes valid SE table references, including owner designations. That is, the owner name can precede the table name but the database server name or the database name cannot precede the table name. Valid table-name syntax is defined in detail in the *IBM Informix Guide to SQL: Syntax*. ♦

How to Write a dbload Command File in Character-Position Form

The first FILE and INSERT statement set in the character-position example on page 12-15 is repeated in the following example:

```
FILE cust_loc_data
   (city 1-15,
    state 16-17,
    area_cd 23-25 NULL = 'xxx',
    phone 23-34 NULL = 'xxx-xxx-xxxx',
    zip 18-22,
    state_area 16-17 : 23-25);
INSERT INTO cust_address (col1, col3, col4)
   VALUES (city, state, zip);
```

The FILE statement defines six data fields from the **cust_loc_data** table data rows. The statement names the fields and uses character positions to define the length of each field. Compare the FILE statement in the preceding example with the data rows in Figure 12-2.

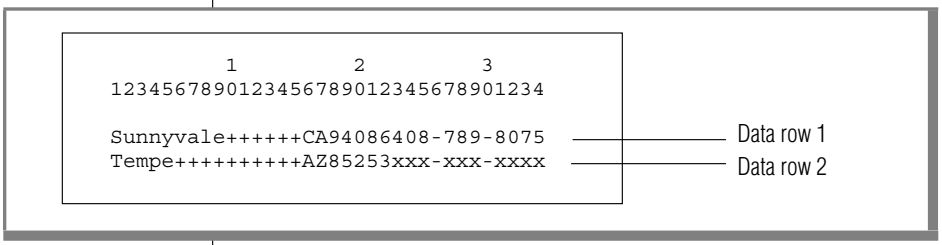


Figure 12-2
A Sample Data File

The FILE statement defines the following data fields, which are derived from the data rows in Figure 12-2.

Column	Values from Data Row 1	Values from Data Row 2
city	Sunnyvale++++++	Tempe++++++++++
state	CA	AZ
area_cd	408	null
phone	408-789-8075	null
zip	94086	85253
state_area	CA408	AZxxx

The null strings that are defined for the **phone** and **area_cd** fields generate the null values in those columns but do not affect the values that are stored in the **state_area** column.

The INSERT statement uses the field names and values that are derived from the FILE statement as the value-list input. Consider the following INSERT statement:

```
INSERT INTO cust_address (col1, col3, col4)
   VALUES (city, state, zip);
```

The INSERT statement uses the data in Figure 12-2 and the FILE statement on page 12-18 to put the following information into the **cust_address** table.

Column	Values from Data Row 1	Values from Data Row 2
col1	Sunnyvale++++++	Tempe++++++++++
col2	null	null
col3	CA	AZ
col4	94086	85253

Because the second column (**col2**) in **cust_address** is not named, the new data row contains a null (assuming that the column permits nulls).

Consider the following INSERT statement:

```
INSERT INTO cust_sort
   VALUES (area_cd, zip);
```

This INSERT statement inserts the following data rows into the **cust_sort** table.

Column	Values from Data Row 1	Values from Data Row 2
col1	408	null
col2	94086	85253

Because no column list is provided, **dbload** reads the names of all the columns in **cust_sort** from the system catalog. (You cannot insert data into a temporary table because temporary tables are not entered into the system catalog.) Field names from the previous FILE statement specify the values to load into each column. You do not need one FILE statement for each INSERT statement.

IDS 9.x

Command File to Load Complex Data Types

This section describes how to write **dbload** command files that load columns that contain complex data types into tables. The examples cover how to use **dbload** with named row types, unnamed row types, sets, and lists.

Using dbload with Named Row Types

The procedure for how to use **dbload** with named row types is somewhat different than for other complex data types because named row types are actually user-defined data types. In fact, you can follow these steps for any user-defined data type.

This example uses a table **person** that contains one column with a named row type. The **person_t** named row type contains six fields: **name**, **address**, **city**, **state**, **zip**, and **bdate**.

The following syntax shows how to create the named row type and the table used in this example:

```
CREATE ROW TYPE person_t
(
   name VARCHAR(30) NOT NULL,
   address VARCHAR(20),
   city VARCHAR(20),
   state CHAR(2),
   zip VARCHAR(9),
   bdate DATE
);
CREATE TABLE person of TYPE person_t;
```

To load data for a named row type

1. Use the UNLOAD statement to unload the table to an input file. In this example, the input file sees the named row type as six separate fields:

```
Brown, James|13 First St.|San Francisco|CA|94070|01/04/1940|
Karen Smith|5820 Easy Ave #100|Fremont|CA|94502|01/13/1983|
```

2. Use the **dbschema** utility to capture the schema of the table and the row type. You must use the **dbschema -u** option to pick up the named row type.

```
dbschema -d stores_demo -u person_t > schema.sql
dbschema -d stores_demo -t person > schema.sql
```

3. Use DB-Access to re-create the **person** table in the new database.

   For detailed steps, see "DB-Access Input from dbschema Output" on page 13-20.

4. Create the **dbload** command file. This **dbload** command file inserts two rows into the **person** table in the new database.

```
FILE person.unl DELIMITER '|' 6;
INSERT INTO person;
```

   This **dbload** example shows how to insert new data rows into the **person** table. The number of rows in the INSERT statement and the **dbload** command file must match:

```
FILE person.unl DELIMITER '|' 6;
   INSERT INTO person
   VALUES ('Jones, Richard', '95 East Ave.',
           'Philadelphia', 'PA',
   '19115',
   '03/15/97');
```

5. Execute the **dbload** command:

```
dbload -d newdb -c uds_command -l errlog
```

Tip: *To find the number of fields in an unloaded table that contains a named row type, count the number of fields between each vertical bar (|) delimiter.*

Using dbload with Unnamed Row Types

You can use **dbload** with unnamed row types. In the following example, the **devtest** table contains two columns with unnamed row types, **s_name** and **s_address**. The **s_name** column contains three fields: **f_name**, **m_init**, and **l_name**. The **s_address** column contains four fields: **street**, **city**, **state**, and **zip**.

```
CREATE TABLE devtest
   (
   s_name ROW(f_name varchar(20), m_init char(1), l_name
varchar(20) not null),
   s_address ROW(street varchar(20), city varchar(20), state
char(20), zip varchar(9)
   );
```

The data from the **devtest** table is unloaded into the **devtest.unl** file. Each data row contains two delimited fields, one for each unnamed row type. The ROW constructor precedes each unnamed row type, as follows:

```
ROW('Jim','K','Johnson')|ROW('10 Grove St.','Eldorado','CA','94108')|
ROW('Candy','S','Cane')|ROW('7 Willy Wonka
Ave.','Hershey','PA','17033')|
```

This **dbload** example shows how to insert data that contains unnamed row types into the **devtest** table. Put double quotes around each unnamed row type or the insert will not work.

```
FILE devtest.unl DELIMITER '|' 2;
   INSERT INTO devtest (s_name, s_address)
   VALUES ("row('Craig', 'X', 'Smith')",
      "row('1200 Cheese Ave.', 'Rainy City', 'OR', '97200')");
```

Using dbload with Collection Data Types

You can use **dbload** with collection data types such as SET, LIST, and MULTISET.

SET Data Type Example

In a SET, each element is unique, and no nulls are allowed. The number of elements in a SET can vary. The following statement creates a table in which the **children** column is defined as a SET:

```
CREATE TABLE employee
   (
      name char(30),
      address char(40),
      children SET (varchar(30) NOT NULL)
   );
```

The data from the **employee** table is unloaded into the **employee.unl** file. Each data row contains four delimited fields. The first set contains three elements (**Karen**, **Lauren**, and **Andrea**) while the second set contains four elements. The SET constructor precedes each SET data row.

```
Muriel|5555 SW Merry
Sailing Dr.|02/06/1926|SET{'Karen','Lauren','Andrea'}|
   Larry|1234 Indian Lane|07/31/1927|SET{'Martha',
      'Melissa','Craig','Larry'}|
```

This **dbload** example shows how to insert data that contains SET data types into the **employee** table in the new database. Put double quotes around each SET data type or the insert does not work.

```
FILE employee.unl DELIMITER '|' 4;
INSERT INTO employee
VALUES ('Marvin', '10734 Pardee', '06/17/27',
   "SET{'Joe', 'Ann'}");
```

LIST Data Type Example

A list is an ordered collection of elements that allows duplicate values. The following statement creates a table in which the **month_sales** column is defined as a LIST:

```
CREATE TABLE sales_person
   (
      name CHAR(30),
      month_sales LIST(MONEY NOT NULL)
   );
```

The data from the **sales_person** table is unloaded into the **sales.unl** file. Each data row contains two delimited fields, as follows:

```
Jane Doe|LIST{'4.00','20.45','000.99'}|
Big Earner|LIST{'0000.00','00000.00','999.99'}|
```

This **dbload** example shows how to insert data that contains LIST data types into the **sales_person** table in the new database. Put double quotes around each LIST data type or else the insert does not work.

```
FILE sales_person.unl DELIMITER '|' 2;
INSERT INTO sales_person
VALUES ('Jenny Chow', "{587900, 600000}");
```

You can load multisets in a similar manner.

Using dbload with Other Data Types

You can use **dbload** with the following data types:

- A BLOB or CLOB
- A SET inside a ROW type

The **dbload** utility does not work with the following data types:

- A CLOB or BLOB inside a ROW type
- A ROW type inside a SET

Warning: *All the load utilities (**dbexport**, **dbimport**, **dbload**, **onload**, **onunload**, and **onxfer**) rely on an export and import function. If you do not define this function when you write a user-defined data type, you cannot use these utilities.*

Loading a new data type inside another data type can cause problems if the representation of the data contains handles. If a string represents the data, you should be able to load it.

Chapter

13

The dbschema Utility

In This Chapter

This chapter describes the **dbschema** utility and how to use it. You can use **dbschema** with the following database servers:

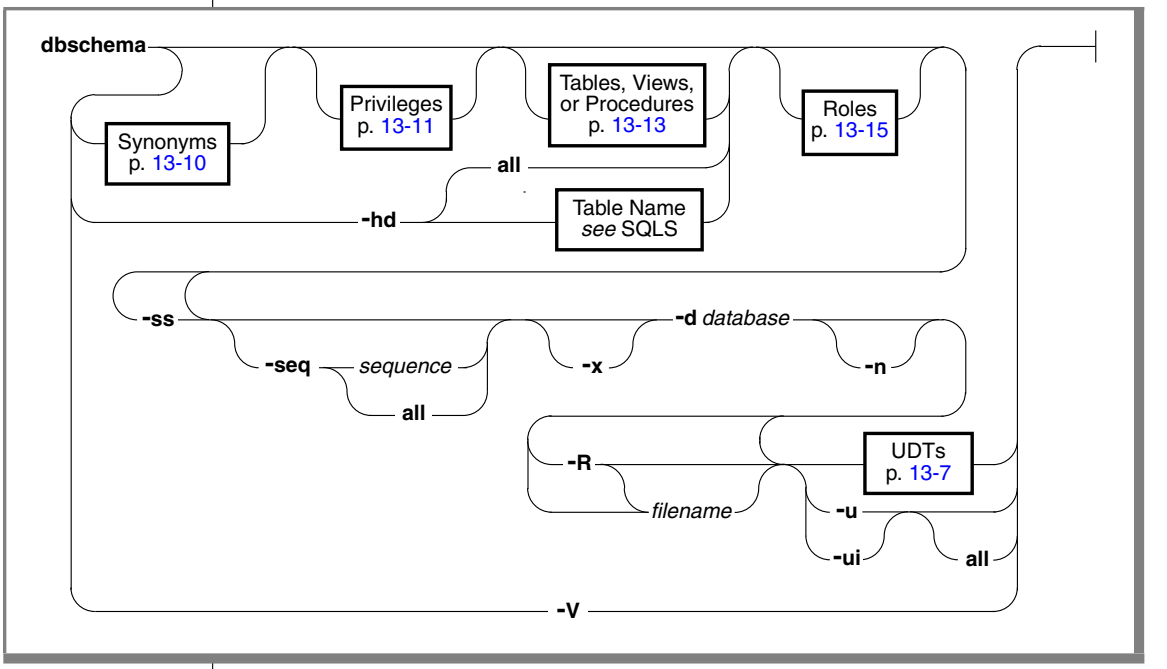
- Dynamic Server 9.40, 9.30, 9.2x, 7.3x or 7.24
- Extended Parallel Server 8.40 or 8.3x
- Dynamic Server with AD and XP Options 8.21
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE
- OnLine 5.1x

The **dbschema** utility prints SQL statements necessary to replicate a specified table, view, or database. It also shows the distributions that UPDATE STATISTICS creates.

You can use the **dbschema** utility for the following purposes:

- To display the SQL statements (the *schema*) that are required to replicate a database or a specific table, view, synonym, sequence, or procedure
- To display the schema for the Information Schema views
- To display the distribution information that is stored for one or more tables in the database
- To display information on user-defined data types and row types

Syntax of the dbschema Command



Element	Purpose	Key Considerations
all	Directs **dbschema** to include all the tables or sequence objects in the database, or all the user-defined data types in the display of distributions	None.
-d ***database***	Specifies the database or co-server to which the schema applies. *Database* can be on a remote database server.	**References:** If you want to qualify the name of the *database*, refer to the Database Name section of the *IBM Informix Guide to SQL: Syntax*.
filename	Specifies the filename to contain the **dbschema** output	**Additional Information:** If you omit ***filename***, **dbschema** sends output to the screen. If you specify a ***filename***, **dbschema** creates a file named ***filename*** to contain the **dbschema** output.
-hd	Displays the distribution as data values	**References:** For more information, refer to "Distribution Information for Tables" on page 13-16.
-n	Prints rowcount information in **dbschema** output	**References:** For more information, refer to "Printing Row Count Information" on page 13-9

Element	Purpose	Key Considerations
-R	Enables the dirty-read option	**References:** For more information, refer to "Using dbschema With Dirty Reads" on page 13-9
-ss	Generates server-specific information	**Restrictions:** This option is ignored if no table schema is generated. **References:** For more information, refer to "Server-Specific Information" on page 13-7.
-seq ***sequence***	Generates the DDL statement to define the specified *sequence* object	**References:** For more information, refer to "Sequence Creation" on page 13-9.
-u	Prints the definitions of user-defined data types	**References:** For more information, refer to "User-Defined and Complex Data Types" on page 13-7.
-ui	Prints the definitions of user-defined data types, including type inheritance	**References:** For more information, refer to "User-Defined and Complex Data Types" on page 13-7.
-V	Displays product version information	None.
-x	Expands dbslice names into dbspace name lists in **-ss** output	None.

You must be the DBA or have the Connect or Resource privilege for the database before you can run **dbschema** on it.

Database Schema Creation

You can create the schema for an entire database or for a portion of the database. The options for **dbschema** allow you to perform the following actions:

- Display CREATE SYNONYM statements by owner, for a specific table or for the entire database.
- Display the CREATE TABLE, CREATE VIEW, CREATE FUNCTION, or CREATE PROCEDURE statement for a specific table or for the entire database.
- Display all GRANT privilege statements that affect a specified user or that affect all users for a database or a specific table. The user can be either a user name or role name.

IDS 9.x

- Display user-defined and row data types with or without type inheritance.
- Display the CREATE SEQUENCE statement defining the specified *sequence* object, or defining all sequence objects in the database. ♦

When you use **dbschema** and specify only the database name, it is equivalent to using **dbschema** with all its options (except for the **-hd** and **-ss** options). In addition, if Information Schema views were created for the database, this schema is shown. For example, the following two commands are equivalent:

```
dbschema -d stores_demo
dbschema -s all -p all -t all -f all -d stores_demo
```

SERIAL fields included in CREATE TABLE statements that **dbschema** displays do not specify a starting value. New SERIAL fields created with the schema file have a starting value of 1, regardless of their starting value in the original database. If this value is not acceptable, you must modify the schema file.

Creating Schemas for Databases Across a Network

UNIX/Linux

You can specify a database on any accessible non-SE Informix database server with the **-d** database syntax. The following command displays the schema for the **stores_demo** database on the **finland** database server on the UNIX or Linux system console:

```
dbschema -d //finland/stores_demo
```

♦

SE

To specify a database on an SE database server, include the database server name and directory path with the database name. The command in the following example displays the schema for the **stores_demo** database in the **turku** directory on the **finland** database server on the system console:

```
dbschema -d //finland/turku/stores_demo
```

♦

Changing the Owner of an Object

The **dbschema** utility uses the *owner.object* convention when it generates any CREATE TABLE, CREATE INDEX, CREATE SYNONYM, CREATE VIEW, CREATE SEQUENCE, CREATE PROCEDURE, CREATE FUNCTION, or GRANT statement, and when it reproduces any unique, referential, or check constraint. As a result, if you use the **dbschema** output to create a new object (table, index, view, procedure, constraint, sequence, or synonym), the owner of the original object owns the new object. If you want to change the owner of the new object, you must edit the **dbschema** output before you run it as an SQL script.

You can use the output of **dbschema** to create a new function if you also specify the *pathname* to a file in which compile-time warnings are stored. This pathname is displayed in the **dbschema** output.

For more information about the CREATE TABLE, CREATE INDEX, CREATE SYNONYM, CREATE VIEW, CREATE SEQUENCE, CREATE PROCEDURE, CREATE FUNCTION, and GRANT statements, see the *IBM Informix Guide to SQL: Syntax*.

Server-Specific Information

The **-ss** option generates server-specific information. In all Informix database servers except SE, the **-ss** option always generates the lock mode, extent sizes, and the dbspace name if the dbspace name is different from the database dbspace. In addition, if tables are fragmented, the **-ss** option displays information about the fragmentation strategy.

When you specify the **dbschema -ss** option, the output also displays any GRANT FRAGMENT statements that are issued for a particular user or in the entire schema.

The **-x** option expands dbslice names into dbspace name lists in **-ss** output.

Important: *Use the **dbschema -ss** option to obtain information specific to a database server, including fragmentation and storage options.*

For information about fragment-level authority, see the GRANT FRAGMENT and REVOKE FRAGMENT statements in the *IBM Informix Guide to SQL: Syntax*.

SE

In SE, the **-ss** option generates the pathname where the table was created if the table is not in the database directory. ♦

IDS 9.x

User-Defined and Complex Data Types

When you specify the **dbschema -u** option, the output displays the definitions of any user-defined and complex data types that the database contains. The suboption **i** lets you display the type inheritance.

The following command displays all the user-defined and complex data types for the **stork** database:

```
dbschema -d stork -u all
```

Output from **dbschema** that is executed with the specified option `-u all` might appear as the following example shows:

```
create row type 'informix'.person_t
   (
   name varchar(30, 10) not null,
   address varchar(20, 10),
   city varchar(20, 10),
   state char(2),
   zip integer,
   bdate date
   );
create row type 'informix'.employee_t
   (
   salary integer,
   manager varchar(30, 10)
   ) under person_t;
```

The following command displays the user-defined and complex data types, as well as their type inheritance for the **person_t** table in the **stork** database:

```
dbschema -d stork -ui person_t
```

Output from **dbschema** executed with the option `-ui person_t` might appear as the following example shows:

```
create row type 'informix'.person_t
   (
   name varchar(30, 10) not null,
   address varchar(20, 10),
   city varchar(20, 10),
   state char(2),
   zip integer,
   bdate date
   );
create row type 'informix'.employee_t
   (
   salary integer,
   manager varchar(30, 10)
   ) under person_t;
create row type 'informix'.sales_rep_t
   (
   rep_num integer,
   region_num integer,
   commission decimal(16),
   home_office boolean
   ) under employee_t;
```

XPS

Printing Row Count Information

When you specify the **dbschema -n** option, the row count information of a table is printed to the comment section of the **dbschema** output. This information might appear as follows:

```
{TABLE 'customer'.tabname row size=8 number of columns = 2 index
size = 0 number of rows = 20}
```

The **-n** option is valid only when the **-d** and/or **-t** options are also specified.

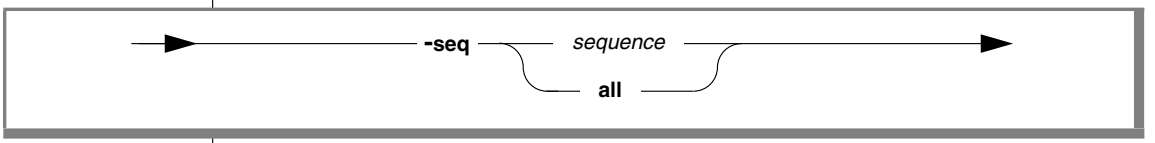
XPS

Using dbschema With Dirty Reads

When you specify the **dbschema -R** option, **dbschema** is allowed to run with dirty-read permission. This means that **dbschema** can access tables that are concurrently being modified by other applications.

Important: *If you specify the* ***-R*** *option, the accuracy of the* ***dbschema*** *output cannot be guaranteed.*

Sequence Creation



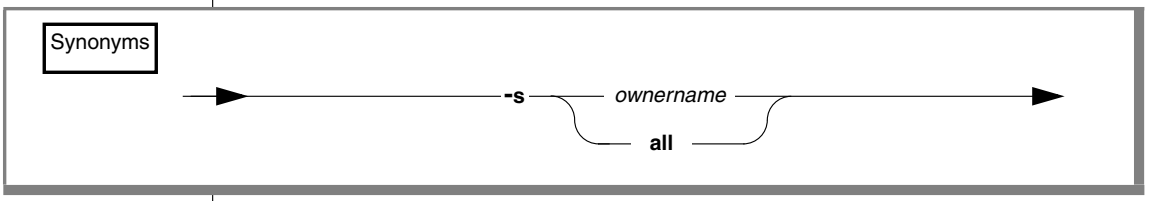
Element	Purpose	Key Considerations
-seq ***sequence***	Displays the CREATE SEQUENCE statement defining ***sequence***	None.
-seq all	Displays all CREATE SEQUENCE statements for the database	None.

Executing **dbschema** with option **`-seq sequitur`** might produce this output:

```
CREATE SEQUENCE sequitur INCREMENT 10 START 100 NOCACHE CYCLE
```

For more information about the CREATE SEQUENCE statement, see the *IBM Informix Guide to SQL: Syntax*.

Synonym Creation



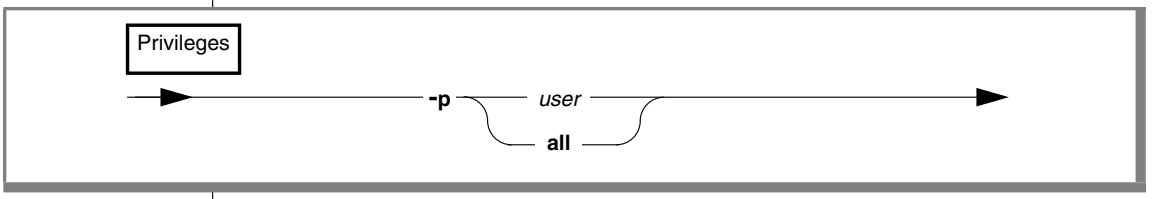
Element	Purpose	Key Considerations
-s ***ownername***	Displays the CREATE SYNONYM statements owned by *ownername*	None.
-s all	Displays all CREATE SYNONYM statements for the database, table, or view specified	None.

Output from **dbschema** that is executed with the specified option `-s alice` might appear as the following example shows:

```
CREATE SYNONYM 'alice'.cust FOR 'alice'.customer
```

For more information about the CREATE SYNONYM statement, see the *IBM Informix Guide to SQL: Syntax*.

Privileges



Element	Purpose	Key Considerations
-p *user*	Displays the GRANT statements that grant privileges to *user*, where *user* is a user name or role name. Specify only one user or role	**Restriction:** You cannot specify a specific list of users with the **-p** option. You can specify either one user or role, or all users and roles.
-p all	Displays the GRANT statements for all users for the database, table, or view specified, or to all roles for the table specified	None.

The output also displays any GRANT FRAGMENT statements that are issued for a specified user or role or (with the **all** option) for the entire schema.

Granting Privileges

In the **dbschema** output, the AS keyword indicates the grantor of a GRANT statement. The following example output indicates that **norma** issued the GRANT statement:

```
GRANT ALL ON 'tom'.customer TO 'claire' AS 'norma'
```

When the GRANT and AS keywords appear in the **dbschema** output, you might need to grant privileges before you run the **dbschema** output as an SQL script. Referring to the previous example output line, the following conditions must be true before you can run the statement as part of a script:

- User **norma** must have the Connect privilege to the database.
- User **norma** must have all privileges WITH GRANT OPTION for the table **tom.customer**.

For more information about the GRANT, GRANT FRAGMENT, and REVOKE FRAGMENT statements, see the *IBM Informix Guide to SQL: Syntax*.

Displaying Privilege Information for a Role

A *role* is a classification with privileges on database objects granted to the role. The DBA can assign the privileges of a related work task, such as an engineer, to a role and then grant that role to users, instead of granting the same set of privileges to every user. After a role is created, the DBA can use the GRANT statement to grant the role to users or to other roles.

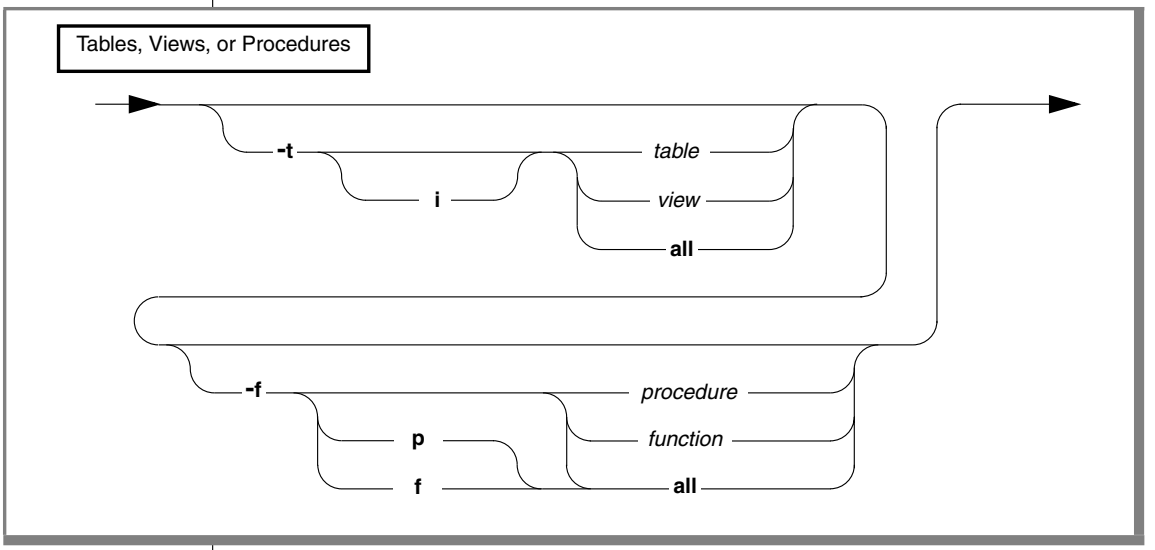
The following **dbschema** command and output show the privileges that were granted for the **calen** role:

```
sharky% dbschema -p calen -d stores_demo
```

```
DBSCHEMA Schema Utility       INFORMIX-SQL Version 7.22
Copyright (C) Informix Software, Inc., 1984-1996
Software Serial Number RDS#N000000

grant alter on table1 to 'calen'
```

Table, View, or Procedure Creation



Element	Purpose	Key Considerations
-f all	Limits the SQL statement output to those statements that are needed to replicate all functions and procedures	None.
-f *function*	Limits the SQL statement output to only those statements that are needed to replicate the specified function	None.
-f *procedure*	Limits the SQL statement output to only those statements that are needed to replicate the specified procedure	None.
-ff all	Limits the SQL statement output to those statements that are needed to replicate all functions	None.
-fp all	Limits the SQL statement output to those statements that are needed to replicate all procedures	None.
-t *table*	Limits the SQL statement output to only those statements that are needed to replicate the specified table	None.
-t *view*	Limits the SQL statement output to only those statements that are needed to replicate the specified view	None.
-t all	Includes in the SQL statement output all statements that are needed to replicate all tables and views	None.

Element	Purpose	Key Considerations
-ti *table*	Includes in the SQL statement output all statements that are needed to replicate all table levels	None.
-ti all	Includes in the SQL statement output all statements that are needed to replicate all tables and views Functionally equivalent to **-t all**.	None.

For more information about the CREATE PROCEDURE and CREATE FUNCTION statements, see the *IBM Informix Guide to SQL: Syntax*.

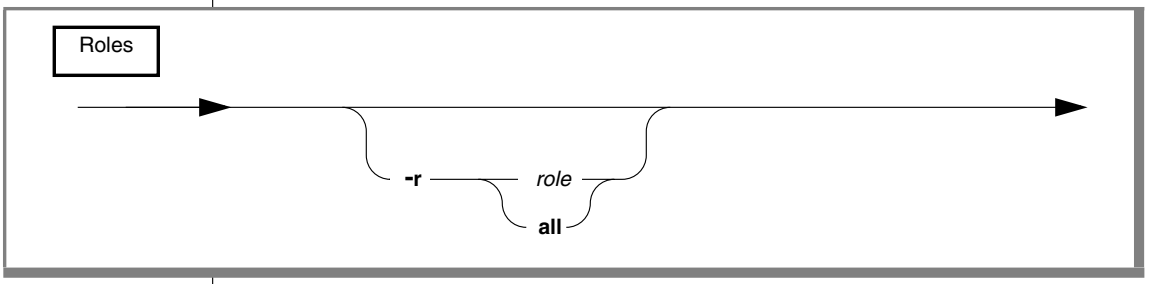
Table Information

When you use the **-ss** option, you can retrieve information about fragmented tables, the lock mode, and extent sizes.

The following **dbschema** output shows the expressions specified for fragmented table.

```
DBSCHEMA Schema Utility       INFORMIX-SQL Version 7.20.UC1
Copyright (C) Informix Software, Inc., 1984-1995
{ TABLE "sallyc".t1 row size = 8 number of columns = 1 index size = 0 }
create table "sallyc".t1
(
c1 integer
) fragment by expression
(c1 < 100 ) in db1 ,
((c1 >= 100 ) AND (c1 < 200 ) ) in db2 ,
remainder in db4
extent size 16 next size 16 lock mode page;
revoke all on "sallyc".t1 from "public";
```

Role Creation



Element	Purpose	Key Considerations
-r *role*	Displays the CREATE ROLE and GRANT statements that are needed to replicate and grant the specified role	**Restriction:** You cannot specify a list of users or roles with the **-r** option. You can specify either one role or all roles. SE does not support the **-r** option.
-r all	Displays all CREATE ROLE and GRANT statements that are needed to replicate and grant all roles	None.

The following **dbschema** command and output show that the role **calen** was created and was granted to **cathl**, **judith,** and **sallyc**:

```
sharky% dbschema -r calen -d stores_demo
```

```
DBSCHEMA Schema Utility       INFORMIX-SQL Version 7.22
Copyright (C) Informix Software, Inc., 1984-1996
Software Serial Number RDS#N000000
create role calen;

grant calen to cathl with grant option;
grant calen to judith ;
grant calen to sallyc ;
```

Distribution Information for Tables

To display the distribution information that is stored for a table in a database, use the **-hd** option with the name of the table. If you specify the ALL keyword for the table name, the distributions for all the tables in the database are displayed.

Distribution information is stored only if you have run the UPDATE STATISTICS...MEDIUM or HIGH statement for one or more columns of a table. For information about the UPDATE STATISTICS statement, refer to the *IBM Informix Guide to SQL: Syntax*.

The output of **dbschema** for distributions is provided in the following parts:

- Distribution description
- Distribution information
- Overflow information

Each section of **dbschema** output is explained in the following sections. As an example, the discussion uses the following distribution for the fictional table called **invoices**. This table contains 165 rows, including duplicates.

You can generate the output for this discussion with a call to **dbschema** that is similar to the following example:

```
dbschema -hd invoices -d pubs_stores_demo
```

Example Output

```
DBSCHEMA Schema Utility       INFORMIX-SQL Version 7.20.UC1
Copyright (C) Informix Software, Inc., 1984-1995
{

Distribution for cathl.invoices.invoice_num

Constructed on 03/10/1995

High Mode, 10.000000 Resolution


--- DISTRIBUTION ---

     (                          5)
  1: (  16,      7,            11)
  2: (  16,      6,            17)
  3: (  16,      8,            25)
  4: (  16,      8,            38)
  5: (  16,      7,            52)
  6: (  16,      8,            73)
  7: (  16,     12,            95)
  8: (  16,     12,           139)
  9: (  16,     11,           182)
 10: (  10,      5,           200)


--- OVERFLOW ---

  1: (   5,                   56)
  2: (   6,                   63)
}
```

Distribution Description

The first part of the **dbschema** output describes which data distributions have been created for the specified table. The name of the table is stated in the following example:

```
Distribution for cathl.invoices.invoice_num
```

The output is for the **invoices** table, which is owned by user `cathl`. This data distribution describes the column **invoice_num**. If a table has distributions that are built on more than one column, **dbschema** lists the distributions for each column separately.

The date on which the distributions are constructed is listed. In this example, the date is `03/10/1995`, which is the date when the UPDATE STATISTICS statement that generated the distributions was executed. You can use this date to tell how outdated your distributions are. Although the system records the date, it does not record the time.

The last line of the description portion of the output describes the mode (medium or high) in which the distributions were created, and the resolution. If you create the distributions with medium mode, the confidence of the sample is also listed. For example, if the UPDATE STATISTICS statement is executed with high mode with a resolution of `10`, the last line appears as the following example shows:

```
High Mode, 10.000000 Resolution
```

Distribution Information

The distribution information describes the bins that are created for the distribution, the range of values in the table and in each bin, and the number of distinct values in each bin. Consider the following example:

```
        (                          5)
    1: (  16,      7,             11)
    2: (  16,      6,             17)
    3: (  16,      8,             25)
    4: (  16,      8,             38)
    5: (  16,      7,             52)
    6: (  16,      8,             73)
    7: (  16,     12,             95)
    8: (  16,     12,            139)
    9: (  16,     11,            182)
   10: (  10,      5,            200)
```

The first value in the rightmost column is the smallest value in this column. In this example, it is `5`.

The column on the left shows the bin number, in this case `1` through `10`. The first number in parentheses shows how many values are in the bin. For this table, 10 percent of the total number of rows (`165`) is rounded down to `16`. The first number is the same for all the bins except for the last. The last row might have a smaller value, indicating that it does not have as many row values. In this example, all the bins contain 16 rows except the last one, which contains 10.

The middle column within the parentheses indicates how many distinct values are contained in this bin. Thus, if there are 11 distinct values for a 16-value bin, it implies that one or more of those values are duplicated at least once.

The right column within the parentheses is the highest value in the bin. The highest value in the last bin is also the highest value in the table. For this example, the highest value in the last bin is `200`.

Overflow Information

The last portion of the **dbschema** output shows values that have many duplicates. The number of duplicates of indicated values must be greater than a critical amount that is determined as approximately 25 percent of the resolution times the number of rows. If left in the general distribution data, the duplicates would skew the distribution, so they are moved from the distribution to a separate list, as the following example shows:

```
--- OVERFLOW ---

   1: (   5,            56)
   2: (   6,            63)
```

For this example, the critical amount is `0.25 * 0.10 * 165`, or `4.125`. Therefore, any value that is duplicated five or more times is listed in the overflow section. Two values in this distribution are duplicated five or more times in the table: the value `56` is duplicated five times, and the value `63` is duplicated six times.

DB-Access Input from dbschema Output

You can use the **dbschema** utility to get the schema of a database and redirect the **dbschema** output to a file. Later, you can use this file as input to DB-Access to re-create the database.

Inserting a Table into a Database Example

The following example copies the CREATE TABLE statements for the customer table into the **dbschema** output file, **tab.sql**:

```
dbschema -d db -t customer > tab.sql
```

Remove the header information about **dbschema** from the output file, **tab.sql**, and then use DB-Access to re-create the table in another database, as follows:

```
dbaccess db1 tab.sql
```

Re-Creating the Schema of a Database

You can use **dbschema** and DB-Access to save the schema from a database and then re-create the schema in another database. A **dbschema** output file can contain the statements for creating an entire database.

To save a database schema and re-create the database

1. Use **dbschema** to save the schema to an output file, such as **db.sql**:

   ```
   dbschema -d db > db.sql
   ```

   You can also use the **-ss** option to generate server-specific information:

   ```
   dbschema -d db -ss > db.sql
   ```

2. Remove the header information about **dbschema**, if any, from the output file.
3. Add a CREATE DATABASE statement at the beginning of the output file or use DB-Access to create a new database.

4. Use DB-Access to re-create the schema in a new database:

   ```
   dbaccess - db.sql
   ```

   When you use **db.sql** to create a database on a different database server, confirm that dbspaces exist.

The databases **db** and **testdb** differ in name but have the same schema.

Chapter

14

The LOAD and UNLOAD Statements

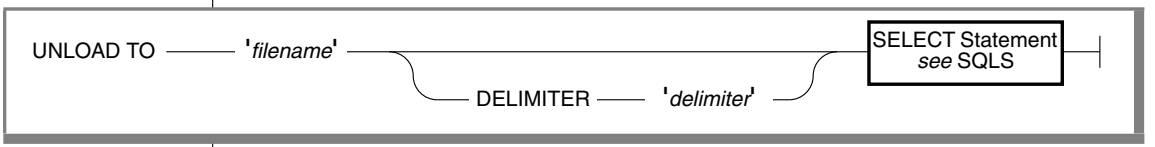
In This Chapter

This chapter shows the syntax of the SQL UNLOAD and LOAD statements. You can use UNLOAD and LOAD with the following database servers:

- Dynamic Server 9.40, 9.3x, 9.2x, 7.3x or 7.24
- Extended Parallel Server 8.40, 8.3x
- Dynamic Server with AD and XP Options 8.21
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE
- OnLine 5.1x

Syntax of the UNLOAD Statement

You can use the UNLOAD statement in DB-Access to unload selected rows from a table into a text file.

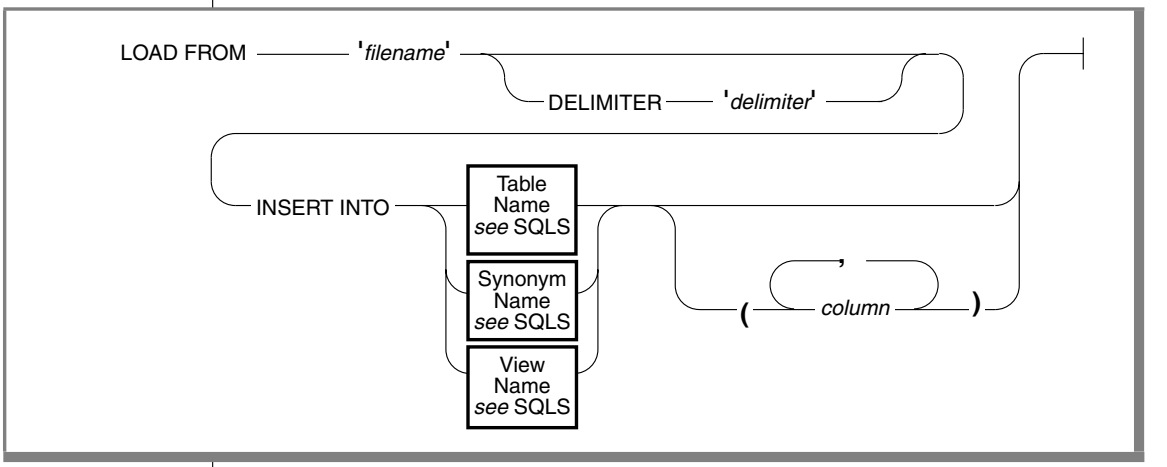


Element	Purpose	Key Considerations
delimiter	Character to use as delimiter	**Restrictions**: See "Syntax for the Delimiter Form" on page 12-10
filename	Specifies the input file	None.

This syntax diagram is only for quick reference. For details about the syntax and use of the UNLOAD statement, see the *IBM Informix Guide to SQL: Syntax*.

Syntax of the LOAD Statement

You can use the LOAD statement in DB-Access to append rows to an existing table of a database.



Element	Purpose	Key Considerations
column	The name of a column to receive data from *filename*	**Restrictions**: Must be a column in the specified table or view.
delimiter	Character to use as delimiter	**Restrictions**: See "Syntax for the Delimiter Form" on page 12-10
filename	Specifies the input file	None.

This syntax diagram is only for quick reference. For details about the syntax and use of the LOAD statement, see the *IBM Informix Guide to SQL: Syntax*.

Chapter

15

The onmode Utility

In This Chapter

This chapter describes the **-b** option of the **onmode** utility and how to use it. You can use **onmode -b** with the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24
- SE
- OnLine 5.1x

After you convert to a newer database server, you can use the **-b** option of the **onmode** utility for reversion to the older database server from which you converted. The **onmode** utility modifies the data in an Informix database so that the earlier version of the database server can access it. For information about other **onmode** options, see your *Administrator's Guide*.

Use of the onmode -b Command for Reversion

When you convert a database server, several modifications make the format of the databases incompatible with the older version. The **onmode -b** command restores the databases to a format that is compatible with the earlier version. You must revert the databases before users can access the data with the earlier database server version. The utility does not revert changes made to the layout of the data that do not affect compatibility.

UNIX/Linux

You must be user **root** or user **informix** to execute **onmode**. ♦

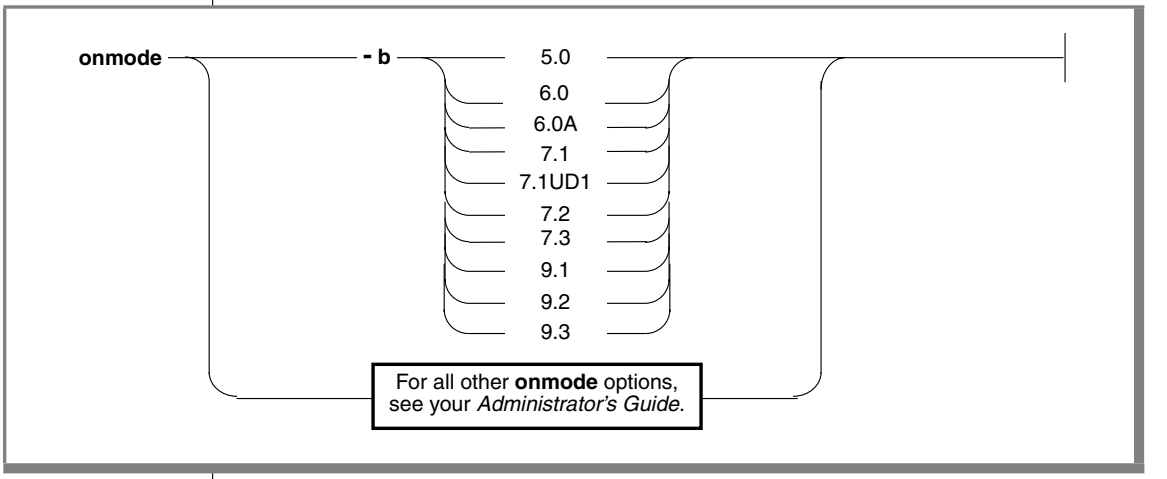
Windows

You must be a member of the **Informix-Admin** group to execute **onmode**. ♦

Preparation for Reversion

Before you use the **-b** option, notify users that you are going to bring the database server offline. The reversion utility forcibly removes all users and shuts down the database server. The **-b** option includes an implicit **-yuk**. Make sure that the **INFORMIXSERVER** environment variable is set to the correct database server.

Syntax of the onmode -b Command



Element	Purpose	Key Considerations
-b 5.0	Changes the database to the Version 5.x format	**Additional Information:** See "Reverting from Dynamic Server 7.3x or 7.24 to OnLine 5.1x" on page 6-52.
-b 6.0	Changes the database to the Version 6.0 format	**Additional Information:** See the 9.2/8.3 version of the *IBM Informix Migration Guide*.
-b 6.0A	Changes the database to the Version 6.0 ALS format	**Additional Information:** See the 9.2/8.3 version of the *IBM Informix Migration Guide*.

(1 of 2)

Element	Purpose	Key Considerations
-b 7.1	Changes the database to the Version 7.10.UC1 format, which is compatible with all 7.10.UCx formats	**Additional Information:** See the 9.2/8.3 version of the *IBM Informix Migration Guide*.
-b 7.1UD1	Changes the database to the Version 7.1UD1 format, which is compatible with 7.11, 7.12, 7.13, and 7.14 formats	**Additional Information:** See the 9.2/8.3 version of the *IBM Informix Migration Guide*.
-b 7.2	Changes the database to the Version 7.2x format	**Additional Information:** See "Reverting from Dynamic Server 9.40" on page 3-64 or "Reverting from Dynamic Server 7.3x" on page 5-34.
-b 7.3	Changes the database to the Version 7.3x format	**Additional Information:** See "Reverting from Dynamic Server 9.40" on page 3-64.
-b 9.1	Changes the database to the Version 9.14 format	**Additional Information:** See "Reverting from Dynamic Server 9.40" on page 3-64.
-b 9.2	Changes the database to the Version 9.2x format	**Additional Information:** See "Reverting from Dynamic Server 9.40" on page 3-64.
-b 9.3	Changes the database to the Version 9.30 format	**Additional Information:** See "Reverting from Dynamic Server 9.40" on page 3-64.

(2 of 2)

Important: *You cannot use redirection to a file when you execute* ***onmode -b 7.2*** *because this command does not function with redirection.*

Tip: *To list the available options for your database server, type* ***onmode -b -****.*

Chapter

16

The onunload and onload Utilities

In This Chapter

This chapter describes the **onunload** and **onload** utilities and how to use them. You can use **onunload** and **onload** with the following database servers:

- Dynamic Server 9.40, 9.30, 9.2x, 7.3x or 7.24
- Dynamic Server, Linux Edition 7.3x
- Workgroup Edition 7.3x or 7.24

Important: *You can use **onunload** and **onload** with Dynamic Server 9.40, 9.30, or 9.2x only if the databases contain only legacy data types and no extended data types.*

XPS 8.3x

To load and unload data in Extended Parallel Server 8.3x, use the **onxfer** utility, which Chapter 17 describes. ♦

AD/XP

To load and unload data in Dynamic Server with AD and XP Options 8.21, use external tables formatted in the Informix internal data representation format. You can load and unload files with the default delimiter (|) format. For the syntax of the CREATE EXTERNAL TABLE statement and details about external tables, see the *IBM Informix Guide to SQL: Syntax*. ♦

The **onunload** and **onload** utilities unload and load databases and tables.

How onunload and onload Work

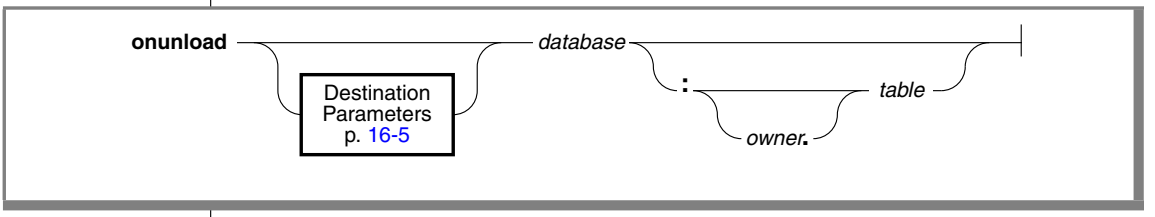
The **onunload** utility unloads data from a database. The **onunload** utility writes a database or table into a file on tape or disk. The **onunload** utility unloads the data in binary form in disk-page units, making this utility more efficient than **dbexport**. You can use the **onunload** utility to move data between computers that have the same version of the database server.

Warning: *You cannot use onunload and onload to move data between different versions of Dynamic Server.*

The **onload** utility loads data that was created with the **onunload** command into the database server. The **onload** utility creates a database or table in a specified dbspace. Then **onload** loads it with data from an input tape or disk file that the **onunload** utility creates.

During the load, you can move simple large objects that are stored in a blobspace to another blobspace.

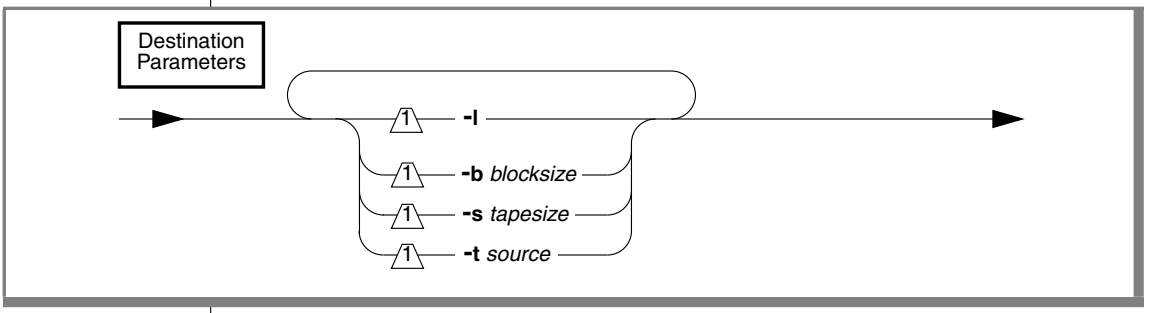
Syntax of the onunload Command



Element	Purpose	Key Considerations
database	Specifies the name of a database	**Additional Information**: The database name cannot be qualified by a database server name (***database@dbservername***). **References**: Syntax must conform to the Identifier segment; see the *IBM Informix Guide to SQL: Syntax*.
owner.	Specifies the owner of the table	**Additional Information**: The owner name must not include invalid characters. **References**: For pathname syntax, see your operating-system documentation.
table	Specifies the name of the table	**Restriction**: The table must exist. **References**: Syntax must conform to the Table Name segment; see the *IBM Informix Guide to SQL: Syntax*.

If you do not specify any destination parameter options, **onunload** uses the device that TAPEDEV SPECIFIES. The block size and tape size are the values specified as TAPEBLK and TAPESIZE, respectively. (For information about TAPEDEV, TAPEBLK, and TAPESIZE, see your *Administrator's Guide*.)

Destination Parameters



Element	Purpose	Key Considerations
-b *blocksize*	Specifies in kilobytes the block size of the tape device	**Restrictions**: The ***blocksize*** must be an integer. **Additional Information**: This option overrides the default value in TAPEBLK or LTAPEBLK.
-l	Directs **onunload** to read the values for tape device, block size, and tape size from LTAPEDEV, LTAPEBLK, and LTAPESIZE, respectively	None.
-s *tapesize*	Specifies in kilobytes the amount of data that can be stored on the tape	**Restrictions**: The ***tapesize*** must be an integer. If you do not specify 0, then the maximum ***tapesize*** is 2,097,151 kilobytes **Additional Information**: This option overrides the default value in TAPESIZE or LTAPESIZE. To write to the end of the tape, specify a tape size of `0`.
-t *source*	Specifies the pathname of the file on disk or of the tape device where the input tape is mounted	**Additional Information**: This option overrides the tape device specified by TAPEDEV or LTAPEDEV. It must be a valid pathname.

Constraints That Affect onunload

The **onunload** utility can unload data more quickly than either **dbexport** or the UNLOAD statement because **onunload** copies the data in binary format and in page-sized units. The following constraints apply to **onunload**:

- You must load the data on the **onunload** tape into a database or table that your database server (excluding SE) manages.
- IDS 9.x
  You can use **onunload** and **onload** with Dynamic Server 9.40, 9.30, or 9.2x if the databases contain only legacy data types and no extended data types. ♦
- You must load the tape that **onunload** writes onto a computer with the same page size and the same representation of numeric data as the original computer.
- You must read the file that **onunload** creates with the **onload** utility of the same version of your database server. You cannot use **onunload** and **onload** to move data from one version to another.
- When you unload a complete database, you cannot modify the ownership of database objects (such as tables, indexes, and views) until after you finish reloading the database.
- When you unload and load a table, **onunload** does not preserve access privileges, synonyms, views, constraints, triggers, or default values that were associated with the original tables. Before you run **onunload**, use the **dbschema** utility to obtain a listing of the access privileges, synonyms, views, constraints, triggers, and default values. After you finish loading the table, use **dbschema** to re-create the specific information for the table.

Database or Table Unloading

To unload a database, you must have DBA privileges for the database or be user **informix**. To unload a table, you must either own the table, have DBA privileges for the database in which the table resides, or be user **informix**. (User **root** does not have special privileges with respect to **onunload** and **onload**.)

Unloading a Database

If you unload a database, all the tables in the database, including the system catalog tables, are unloaded. All the triggers, SPL routines, defaults, constraints, and synonyms for all the tables in the database are also unloaded.

Unloading a Table

If you unload a table, **onunload** unloads the table data and information from the following system catalog tables:

systables
syscolumns
sysindexes
sysblobs

When you unload a table, **onunload** does not unload information about constraints, triggers, or default values that are associated with a table. In addition, access privileges that are defined for the table and synonyms or views that are associated with the table are not unloaded.

Logging Mode

The **onunload** utility does not preserve the logging mode of a database. After you load the database with **onload**, you can make a database ANSI compliant or add logging. For information about logging modes, refer to the *IBM Informix Guide to SQL: Syntax*.

During the load, you can move simple large objects that are stored in a blobspace to another blobspace.

If you do not specify any source-parameter options, **onload** uses the device that is specified as TAPEDEV. The block size and tape size are the values that are specified as TAPEBLK and TAPESIZE, respectively. (For more information about TAPEDEV, TAPEBLK, and TAPESIZE, refer to your *Administrator's Guide*.)

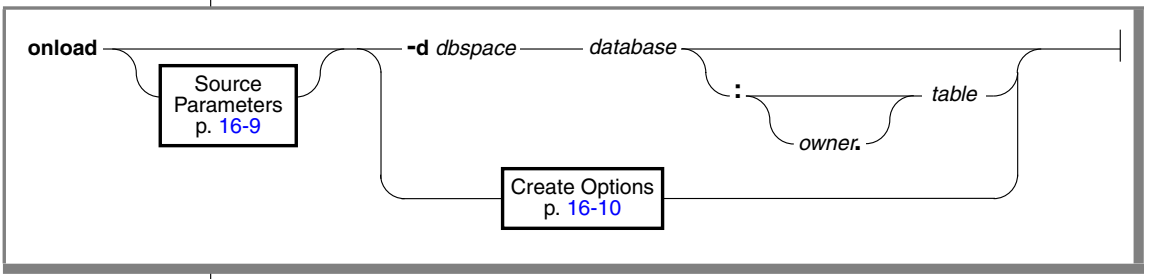
If you do not specify creation options, onload stores the database or table in the root dbspace.

Locking During Unload Operation

During the unload operation, the database or table is locked in shared mode. An error is returned if **onunload** cannot obtain a shared lock.

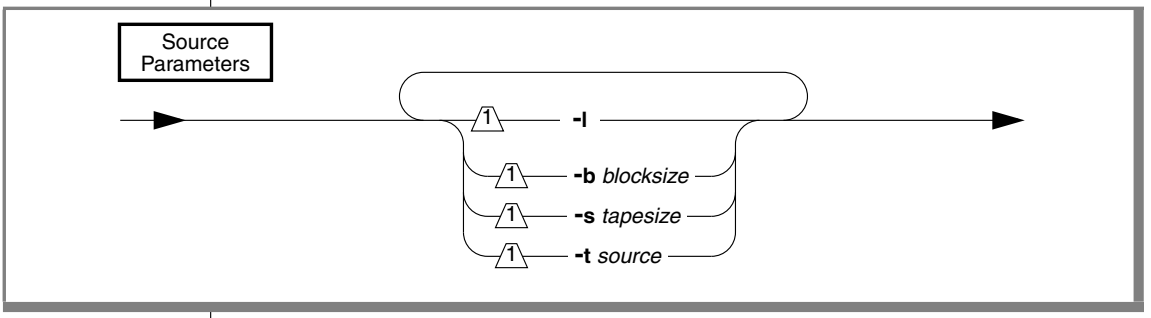
The **onload** utility creates a database or table in a specified dbspace (excluding SE). Then **onload** loads it with data from an input tape or disk file that the **onunload** utility creates.

Syntax of the onload Command



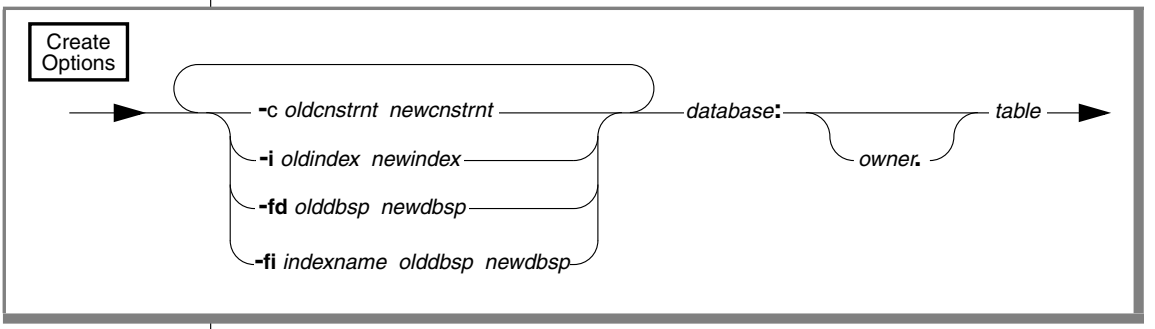
Element	Purpose	Key Considerations
-d ***dbspace***	Loads a database or table into the specified dbspace	**Restriction:** The tape being loaded must contain the specified database or table.
database	Specifies the name of the database	**Restriction**: The database name cannot include a database server name, such as ***database@dbservername***. **References**: Syntax must conform to the Identifier segment; see the *IBM Informix Guide to SQL: Syntax.*
owner.	Specifies the owner of the table	**Restriction**: The owner name must not include invalid characters. **References**: For pathname syntax, refer to your operating-system documentation.
table	Specifies the name of the table	**Restriction**: The table must not exist. **References**: Syntax must conform to the Table Name segment; see the *IBM Informix Guide to SQL: Syntax.*

Source Parameters



Element	Purpose	Key Considerations
-b ***blocksize***	Specifies in kilobytes the block size of the tape device	**Restrictions**: Unsigned integer. Must specify the block size of the tape device. **Additional Information**: This option overrides the default value in TAPEBLK or LTAPEBLK.
-l	Directs **onload** to read the values for tape device, block size, and tape size from the configuration parameters LTAPEDEV, LTAPEBLK, and LTAPESIZE, respectively	**Additional Information**: If you specify **-l** and then **-b**, **-s**, or **-t**, the value that you specify overrides the value in the configuration file.
-s ***tapesize***	Specifies in kilobytes the amount of data that the database server can store on the tape	**Restrictions**: Unsigned integer. If you do not specify 0, then the maximum ***tapesize*** is 2,097,151 kilobytes. **Additional Information**: This option overrides the default value in TAPESIZE or LTAPESIZE. To write to the end of the tape, specify a tape size of `0`.
-t ***source***	Specifies the pathname of the file on disk or of the tape device where the input tape is mounted	**Restriction**: Must be a legal pathname. **Additional Information**: This option overrides the tape device that TAPEDEV or LTAPEDEV specifies. **References**: For pathname syntax, see your operating-system documentation.

Create Options



Element	Purpose	Key Considerations
-c ***oldcnstrnt newcnstrnt***	Directs **onload** to rename the specified constraint.	None.
-i ***oldindex newindex***	Directs **onload** to rename the table index when it stores the index on disk.	**Additional Information:** Use the **-i** option to rename indexes during the load to avoid conflict with existing index names. **References**: Syntax must conform to the Identifier segment; see the *IBM Informix Guide to SQL: Syntax.*
-fd ***olddbsp newdbsp***	Allows you to move a data fragment from one dbspace to another.	**Restriction:** The new dbspace must exist and not already contain another data fragment for the table. **Additional Information:** This option is used with parallel data query (PDQ) and table fragmentation.
-fi ***indexname olddbs newdbsp***	Allows you to move index fragments from one dbspace to another.	**Restriction:** The new dbspace must exist and not already contain another index fragment for the table. **Additional Information:** This option is used with PDQ and table fragmentation.
database	Specifies the name of the database	**Restriction**: The database name cannot include a database server name, such as ***database@dbservername***. **References**: Syntax must conform to the Identifier segment; see the *IBM Informix Guide to SQL: Syntax.*
owner.	Specifies the owner of the table	**Restriction**: The owner name must not include illegal characters. **References**: For pathname syntax, refer to your operating-system documentation.
table	Specifies the name of the table	**Restriction**: The table must not exist. **References**: Syntax must conform to the Table Name segment; see the *IBM Informix Guide to SQL: Syntax.*

If you do not specify any create options, the **onload** utility stores the database or table in the root dbspace.

You can use the **-c**, **-i**, **-fd**, and **-fi** options in any order and as often as necessary as long as you use unique pairs.

Constraints That Affect onload

The **onload** utility performs faster than the **dbimport**, **dbload**, or LOAD methods. In exchange for this higher performance, **onload** has the following constraints:

- The **onload** utility can only create a new database or table; you must drop or rename an existing database or table of the same name before you run **onload**. The **onload** utility prompts you to rename blobspaces during execution, if desired.
- The **onload** utility places a shared lock on each of the tables in the database during the load. While you cannot update a table row with the lock in place, the database is available for queries.
- When you load a complete database, the user who executes **onload** becomes the owner of the database.
- The **onload** utility creates a database without logging; you must initiate logging after **onload** loads the database.
- When you use **onload** to load a table into a logged database, you must turn off logging for the database during the operation.
- The **onload** utility does not preserve dbspace assignments of table creation or table fragmentation.

Constraints That Affect onload and onunload

GLS

NLS

You can use **onunload** and **onload** to move data between databases if the NLS and GLS locales are identical. For example, if user A has a French locale NLS table on server A and tries to load data into a German locale GLS table on server B, **onload** and **onunload** report errors. However, if both the NLS and GLS tables were created with the same French locale, **onload** and **onunload** would work. ♦

The tape that **onload** reads contains binary data that is stored in disk-page-sized units. For this reason, the computer where the original database resides (where you use **onunload**) and the computer where the target database will reside (where you use **onload**) must have the following characteristics:

- The same page size
- The same representation of numeric data
- The same byte alignment for structures and unions

If the page sizes are different, **onload** fails. If the alignment or numeric data types on the two computers are different (for example, with the most significant byte last instead of first, or different float-type representations), the contents of the data page could be misinterpreted.

Restrictions That Affect onload and onunload

The **onload** and **onunload** utilities have the following restrictions:

- The original database and the target database must be from the same version of the database server.
- GLS: You cannot use **onload** and **onunload** to move data between non-GLS and GLS locales. ♦
- IDS 9.x: Do not use **onload** and **onunload** to move data between two Dynamic Server 9.40, 9.30, or 9.2x databases if they contain extended data types. Use the HPL instead to move 9.40, 9.30, or 9.2x data. However, you can use **onload** and **onunload** with this data if the databases contain only legacy data types. ♦
- SE: SE does not support **onload** and **onunload**. ♦

Important: *You cannot use the **onload** and **onunload** utilities to move data from one version to another. You also cannot use these utilities to move data between different types of database servers.*

Logging During Loading

The **onload** utility performs all its loading within a transaction. This feature allows the changes to be rolled back if an error occurs.

When you use **onload** to create tables from an **onunload** input tape, **onload** can only load information into a database without logging. Thus, before you load a table into an existing, logged database, end logging for the database. You also might want to consider loading during off-peak hours. Otherwise, you might fill the logical-log files or consume excessive shared-memory resources. After you load the table, create a level-0 dbspace backup before you resume database logging.

When you use **onload** to create databases from an **onunload** input tape, the databases that result are not ANSI compliant and do not use transaction logging. You can make a database ANSI compliant or add logging after you load the database. (For more information about logging, refer to the *IBM Informix Guide to SQL: Reference*.)

Movement of Simple Large Objects to a Blobspace

If you load a table that contains simple large objects stored in a blobspace, **onload** asks you if you want to move them to another blobspace. If you respond `yes`, **onload** displays the blobspace name where the simple large objects were stored when the tape was created. It then asks you to enter the name of the blobspace where you want the simple large objects stored. If you enter a valid blobspace name, **onload** moves all simple-large-object columns in the table to the new blobspace. Otherwise, **onload** prompts you again for a valid blobspace name.

Ownership and Privileges

When you load a new database, the user who runs **onload** becomes the owner. Ownership within the database (tables, views, and indexes) remains the same as when the database was unloaded to tape with **onunload**.

To load a table, you must have the Resource privilege on the database. When onload loads a new table, the user who runs **onload** becomes the owner unless you specify an owner in the table name. (You need the DBA privilege for the database to specify an owner in the table name.)

The **onunload** utility does not preserve synonyms or access privileges. To obtain a listing of defined synonyms or access privileges, use the **dbschema** utility, which Chapter 13, "The dbschema Utility," describes, before you run **onunload**.

Exclusive Locking During Load Operation

During the load operation, onload places an exclusive lock on the new database or table. Loading proceeds as a single transaction, and onload drops the new database or table if an error or system failure occurs.

Steps for Using onunload and onload

This section describes the procedure for using **onunload** and **onload** to move a database. You can use these commands to move either a complete database or a table from one computer to another. The syntax and description of the **onunload** utility starts on page 16-4. The syntax and description of the **onload** utility starts on page 16-8.

To move a database from one computer to another

1. Make sure that the page size, numeric representations, and byte alignment on structures and unions are the same on both computers.

   (The page size is two kilobytes on certain UNIX systems and four kilobytes on Windows NT.) The page size is an Informix characteristic. For information about page size, see your *Administrator's Guide*. The numeric representation and the byte alignment are characteristics of your operating system. For information about numeric representation and byte alignment, refer to the manuals for your operating systems.

2. Decide where to store the unloaded data:

   - **On disk.** Create an empty file for **onunload** to hold the data. Make sure that you have write permission for the file.
   - **On tape.** Use the tape device and characteristics specified in the ONCONFIG configuration file by either TAPEDEV or LTAPEDEV or specify another tape device. Make sure that the tape device that you specify is available for **onunload.**

3. Run the **oncheck** utility to make sure that your database is consistent.

   For information about **oncheck**, see your *Administrator's Guide*.

4. Run the **onunload** utility to unload the data from the database.

5. If necessary, transfer the storage medium (tape or disk) to the new computer.

   If the two computers are on the same network, you can read or write the data remotely.

6. Run the **onload** utility to load the data into the new database.

7. Set the desired logging status for the new database.

   For information about logging status, see your *Administrator's Guide*.

8. If necessary, change the DBA privileges of the database.

9. If you want to restore the triggers, access privileges, SPL routines, defaults, constraints, and synonyms for the tables in the database, run the **dbschema** utility.

10. Create a level-0 backup of the new database.

To move a table from one computer to another

1. Make sure that the page size, numeric representations, and byte alignment on structures and unions are the same on both computers. (The page size is two kilobytes on certain UNIX systems and four kilobytes on Windows NT.)

2. Decide where to store the unloaded data. (See step 2 of the previous section.)

3. Run the **oncheck** utility to make sure that your database is consistent.

4. If you want to save the triggers, access privileges, SPL routines, defaults, constraints, and synonyms for the table, run the **dbschema** utility.

5. Run the **onunload** utility.

6. If necessary, transfer the storage medium to the new computer.

7. If the table includes simple large objects that are stored in blobspaces, decide where to store the simple large objects. If necessary, create new blobspaces.

8. Turn off logging.

   When you are loading a table, logging on the target database must be turned off. (When you are creating and loading an entire database, the logging status does not matter.)

9. Run the **onload** utility.

10. Create a level-0 backup of the modified database.
11. Turn logging back on, if you want logging.
12. If you want to restore the triggers, access privileges, SPL routines, defaults, constraints, and synonyms for the table, run the **dbschema** utility or create them manually.

To move a table from one dbspace to another dbspace on the same computer

1. Run the **onunload** utility to unload the table.
2. Turn off logging.

   When you are loading a table, logging on the target database must be turned off.
3. Run the **onload** utility.

   Specify a new table name and new dbspace name in the **onload** statement.
4. If the data loads successfully, delete the old table in the old dbspace and rename the new table to the old table name.
5. Create a level-0 backup of the modified database.
6. Turn logging back on, if you want logging.

Chapter

17

The onxfer Utility

UNIX

In This Chapter

This chapter describes the **onxfer** utility and how to use it. You can use **onxfer** with the following database servers:

- Extended Parallel Server 8.40 (move data to only)
- Dynamic Server with AD and XP Options 8.21(move data to only)
- Dynamic Server 7.3x or 7.24 (move data from only)
- Dynamic Server, Linux Edition 7.3x (move data from only)
- Workgroup Edition 7.3x or 7.24 (move data from only)

This chapter describes how to use the **onxfer** utility for moving data to Extended Parallel Server 8.40 or Dynamic Server with AD and XP Options 8.21 from a 7.3x or 7.24 database server on UNIX. The **onxfer** utility moves a database or tables to the target database server from the source database server.

Environment Variables for onxfer

The **onxfer** utility uses the following environment variables:

- **SOURCE_REMOTE_SHELL**
- **XFER_CONFIG**

SOURCE_REMOTE_SHELL Environment Variable

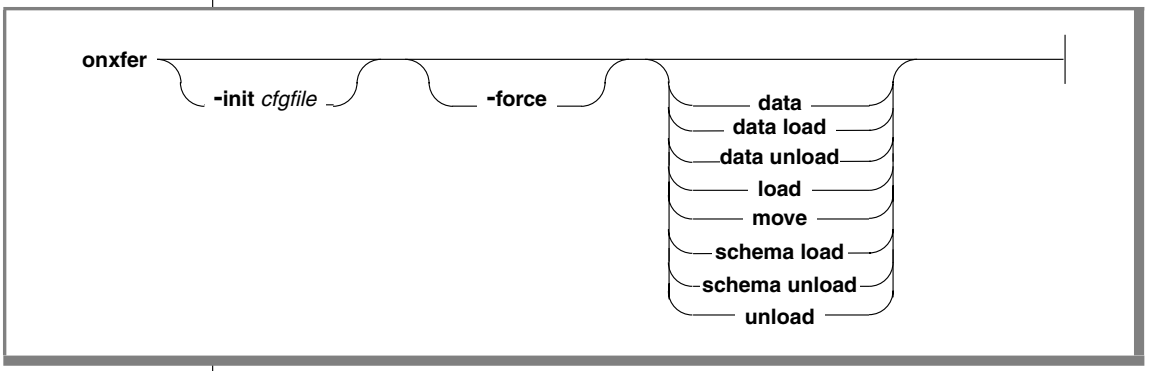
When the source and target database servers are installed on different computers, **onxfer** might use a remote shell command on the source computer to perform certain operations. However, the name of the remote shell command might be different on different computers.

If the **onxfer** utility is not able to find the correct pathname for the remote shell command, **onxfer** uses **rsh** as the default remote shell command. You can set the **SOURCE_REMOTE_SHELL** environment variable to specify the remote shell command that the operating system supports on the source computer. If this environment variable is set, **onxfer** uses its value as the remote shell command.

XFER_CONFIG Environment Variable

The default name of the **onxfer** configuration file is **xfer_config** in the **$INFORMIXDIR/etc** directory. You can specify a different directory in the **XFER_CONFIG** environment variable.

Syntax of the onxfer Command



Element	Purpose	Key Considerations
data	Moves the data transparently	The **onxfer** utility moves the tables iteratively.
data load	Loads data from disk	
data unload	Unloads all the specified files to disk	You can use this option only when the DEVICE configuration parameter is set to DISK. See "DEVICE Configuration Parameter" on page 7.
-force	Before unloading data or schema onto disks, **onxfer** checks to see if the directories already contain previously unloaded schema or data. If they do, the default behavior is to not perform the unload operation and to ask the user to validate the unload operation by cleaning up the directories first. You can use the **-force** option to override the default behavior and force the unload operation even if the directories contain unloaded schema or data. If you use this option, **onxfer** deletes any previously unloaded schema and data from the directories that you specify in the DISK option and performs a fresh unload operation.	

(1 of 2)

Element	Purpose	Key Considerations
-init *cfgfile*	Specifies a configuration file that contains parameters for **onxfer**	The default configuration file is **xfer_config**. You can edit this file to change **onxfer** parameters or make your own copy of the file and specify it in the **onxfer** command. The **XFER_CONFIG** environment variable specifies the location of the **xfer_config** file. The default location is **$INFORMIXDIR/etc**.
load	Loads both the schema and the data from disk	
move	Moves the data and the schema transparently	The **onxfer** utility moves the tables iteratively. You need to edit the schema.
schema load	Loads the schema into the target database server	The schema load option uses the same configuration file that schema unload used.
schema unload	Unloads the source schema to a file	
unload	Unloads both the schema and the data from disk	

(2 of 2)

Configuration File for onxfer

You can specify a configuration file in the **onxfer** command. The configuration file includes the configuration parameters to use for data movement. If you do not specify a configuration file, **onxfer** uses the default configuration file, **xfer_config**.

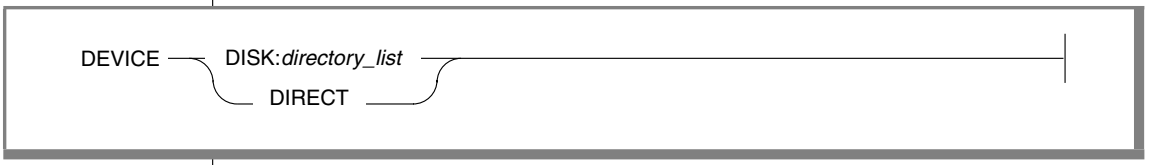
The default location of the **xfer_config** file is **$INFORMIXDIR/etc**. You can specify a different location in the **XFER_CONFIG** environment variable.

An **onxfer** configuration file can include the following configuration parameters:

DEVICE	NSTREAMS	SOURCE and TARGET
FORMAT	REJECT_DIR	SOURCE_DIR
MSGPATH	SCHEMA_DIR	TARGET_DIR

DEVICE Configuration Parameter

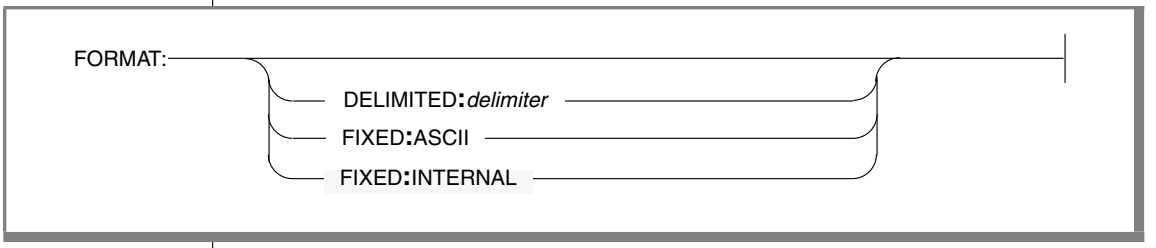
The DEVICE configuration parameter specifies a destination device and can specify destination directories. This configuration parameter is optional.



Element	Purpose	Key Considerations
DISK:*directory_list*	Specifies the directories for unloading data	The number of directories should equal the value of NSTREAMS, which specifies the number of parallel data streams. A directory name cannot exceed 18 characters. See "NSTREAMS Configuration Parameter" on page 17-9. The default ***directory_list*** is a number of subdirectories under the **SCHEMA_DIR** directory in the form ***database*.data.*suffix***, in which ***database*** is the name of the source database and ***suffix*** ranges from 1 to NSTREAMS. See "SCHEMA_DIR Configuration Parameter" on page 17-11. The directories need enough disk space to hold all the unloaded data. You must specify DISK for all **onxfer** command-line options except **-move** and except when you use the **-data** option without the **load** or **unload** suboption.
DIRECT	Specifies direct transfer of table data using the network and pipes	For schema transfer, **onxfer** uses the disk directory that the SCHEMA_DIR parameter specifies. See "SCHEMA_DIR Configuration Parameter" on page 17-11. You must specify DIRECT for the **-move** command-line option and when you use the **-data** option without the **load** or **unload** suboption. See "Syntax of the onxfer Command" on page 17-5.

FORMAT Configuration Parameter

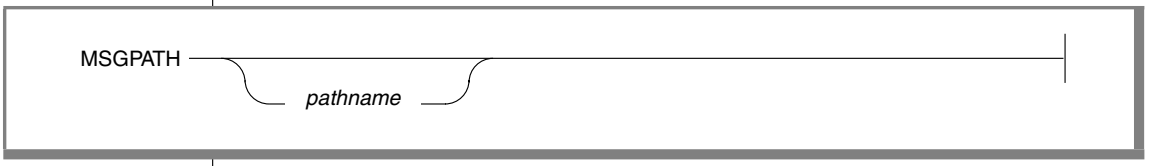
The FORMAT configuration parameter specifies the format of the data during transfer. This configuration parameter is optional.



Element	Purpose	Key Considerations
DELIMITED:***delimiter***	Suggests the use of ASCII-delimited format to transfer data. The value of ***delimiter*** is a field delimiter	The row delimiter is always the new-line character.
FIXED:ASCII	Suggests the use of FIXED format ASCII representation to transfer data	
FIXED:INTERNAL	Indicates that the loaders have to use Informix internal format to transfer data	FIXED:INTERNAL, the default FORMAT option, provides the fastest transfer mechanism. This format does not work well for certain data types, such as DATETIME, INTERVAL, and MONEY.

MSGPATH Configuration Parameter

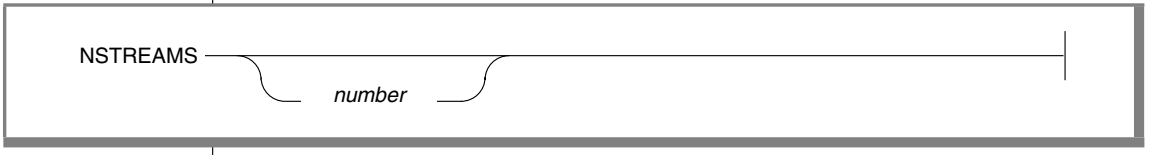
The MSGPATH configuration parameter specifies the location of the **onxfer** message log. This configuration parameter is optional. This onxfer configuration parameter is different from the onconfig MSGPATH configuration parameter.



Element	Purpose	Key Considerations
pathname	Specifies the name of the message log where the **onxfer** utility can log errors and post progress messages	The default message log file is database.msg in the SCHEMA_DIR directory, in which database is the name of the source database. See "SCHEMA_DIR Configuration Parameter" on page 11.

NSTREAMS Configuration Parameter

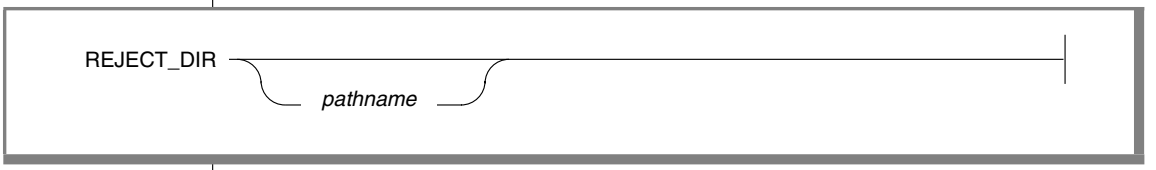
The NSTREAMS configuration parameter specifies the number of parallel streams for moving data, one stream for each coserver. This configuration parameter is optional.



Element	Purpose	Key Considerations
number	Suggests the number of parallel streams to use for unloading or loading a table	The default value of NSTREAMS is the number of coservers in Extended Parallel Server. The **onxfer** utility feeds each stream of data to one coserver.

REJECT_DIR Configuration Parameter

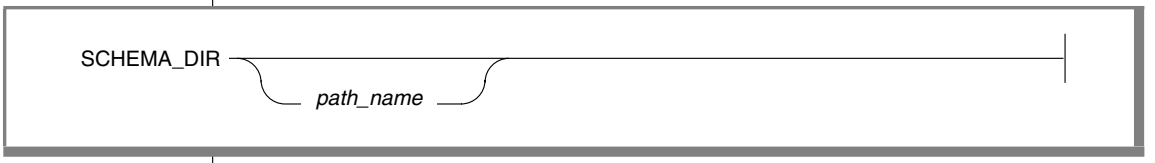
The REJECT_DIR configuration parameter specifies a location for reject files, which contain incompatible SQL statements after data unloading or loading. This configuration parameter is optional.



Element	Purpose	Key Considerations
pathname	Specifies the directory in which **onxfer** can create reject files for unload and load operations	The default directory for reject files is SCHEMA_DIR. The REJECT_DIR pathname cannot exceed 18 characters. See "SCHEMA_DIR Configuration Parameter" on page 17-11. Reject file names are in the form ***database*.rej.*suffix***, in which ***database*** is the name of the source database and ***suffix*** is a number from 1 to the value of NSTREAMS. See "NSTREAMS Configuration Parameter" on page 17-9.

SCHEMA_DIR Configuration Parameter

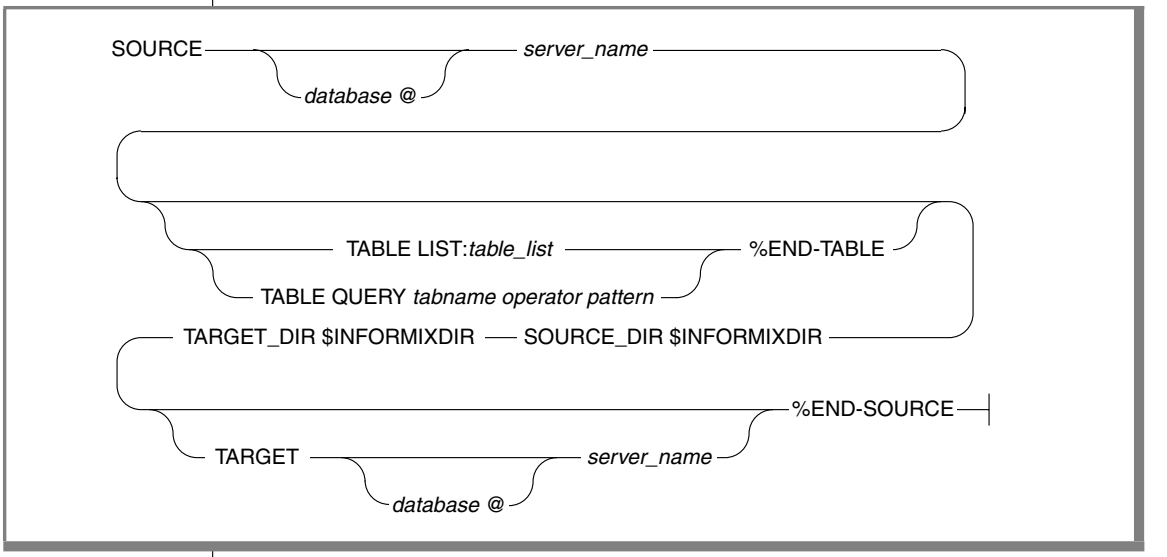
The SCHEMA_DIR configuration parameter specifies a destination directory for the schema file. The pathname for the destination directory is the path from the computer on which the target database server is installed, where **onxfer** is running. This configuration parameter is required.



Element	Purpose	Key Considerations
path_name	Specifies the directory into which **onxfer** is to unload the schema file	The name of an unloaded schema file is ***database*.sql**, in which ***database*** is the name of the source database. You need to change the contents of the schema file to suit your database server requirements.

SOURCE and TARGET Configuration Parameters

The SOURCE configuration parameter can specify individual tables to transfer as well as the source database and database server. The TARGET configuration parameter can specify the target database and database server. The **onxfer** configuration file can contain any number of SOURCE and TARGET configuration parameters.



Element	Purpose	Key Considerations
database @	Names the source or target database	If you omit the source database name, **onxfer** transfers the entire instance of the source database server to the target. In this case, the **sysmaster** database must exist on the source database server. The target database name can be the same as or different from the source name. The **onxfer** utility transfers the schema for the entire database and data from selected tables. If you do not specify any tables in the TABLE LIST or TABLE QUERY option, **onxfer** transfers all the data from the source database server.
server_name	Names the source or target database server	

(1 of 2)

Element	Purpose	Key Considerations
TABLE LIST *table_list*	Lists the database tables from which to transfer data	If you do not specify any tables, **onxfer** transfers all the data from the source database server.
TABLE QUERY *tabname operator pattern*	Specifies part of a WHERE clause for table selection	If you do not specify any tables, **onxfer** transfers all the data from the source database server.

(2 of 2)

SOURCE_DIR Configuration Parameter

The SOURCE_DIR configuration parameter specifies the source database server. The pathname for the source database server is the path from the computer on which the source database server is installed. This configuration parameter is required.

TARGET_DIR Configuration Parameter

The TARGET_DIR configuration parameter specifies the target database and database server. The pathname for the target database server is the path from the computer on which the target database server is installed, where **onxfer** is running. This configuration parameter is required.

Guidelines and Restrictions for Using onxfer

The following guidelines and restrictions provide information about using **onxfer**:

- You must execute the **onxfer** command from the computer on which the target database server is installed. When invoked, the **$INFORMIXDIR** environment variable should point to the installed target database server distribution.
- Currently, **onxfer** supports the **unload** and **data unload** command-line options when you execute it from the computer on which the source database server is installed, the same computer on which the target database server is installed.
- For the **load** and **data load** command-line options, the directory pathnames that you specify in the DISK device option must be the pathnames as seen on the computer(s) on which the target database server instance is installed. The directories, however can be NFS mounted from other computers.

Important: *Informix database servers support only certified versions of NFS. For information about the NFS products you can use to NFS mount a storage space for an Informix database server, see the product compatibility information at http://www.ibm.com/software/data/informix/pubs/smv/index.html.*

- When you use the **move** command-line option, **onxfer** optimizes the speed of data transfer by first creating all the tables with the RAW type on the target database server instance, by executing the **<*database*>_pre.sql** file from the SCHEMA_DIR destination directory.

  The **onxfer** utility then transfers data in iterative mode, one table at a time, from the source database to the target database using the EXPRESS mode of loading. Finally, **onxfer** creates the rest of the schema by executing the **<*database*>_post.sql** file from the SCHEMA_DIR destination directory.

  When, however, you specify the **data** or **data load** command-line option, **onxfer** cannot use the EXPRESS mode of loading because the tables are typically not of the RAW type and there might be pre-existing constructs like indexes, check constraints, and triggers defined on the tables. **Onxfer** uses DELUXE mode to load data in such cases.

- The DELUXE mode of loading can be considerably slower than the EXPRESS mode. Also, in DELUXE mode, the insertion of each record into the table and corresponding index updates are logically logged. Each table load is treated as a unit of transaction.

  This requires creation of logical-log space large enough to hold log records for the single largest table load before an attempt to load data with the **data** or **data load** option.
- The NSTREAMS parameter, when specified, applies to all the tables in the TABLE section.
- The NSTREAMS parameter should not be set to a value greater than ((number of CPU VPs per co-server) * (number of co-servers)) as configured on the target database server instance.
- Do not use the co-server extension while specifying the TARGET database server name (for example, do not use **my_db@my_adxp.2**). Use the prefix without the extension instead (for example, use **my_db@my_adxp**).
- Do not modify or delete files under the directories that **onxfer** uses to load or unload data.
- Do not modify or delete any file under the SCHEMA_DIR destination directory, except **<*database*>_pre.sql** and **<*database*>_pre.sql**, which you can edit as needed.

- Before completing execution, **onxfer** does the necessary cleanup, whether the operation was successful or not. In case of certain fatal errors, **onxfer** might not be able to do so and can flag an error message for users to perform cleanup manually.

  In such cases, you might need to clean up the following objects:

  - Source database server object

    The **onxfer** database, typically set to **xferdb_#####**, in which ##### is the process ID of the **onxfer** program

  - Target database server objects

    The **ifmx_xfer_status** database, used to store results of pipe-based data transfers

    External table definitions in the target database that correspond to the tables listed under TABLE section

  - Disk objects

    Files under the SCHEMA_DIR destination directory

    Files under directories specified in the DISK option, if any

Appendix

A

Notices

IBM may not offer the products, services, or features discussed in this document in all countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

IBM World Trade Asia Corporation
Licensing
2-31 Roppongi 3-chome, Minato-ku
Tokyo 106-0032, Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation
J46A/G4
555 Bailey Avenue
San Jose, CA 95141-1003
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this information and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement, or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

> © (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. (enter the year or years). All rights reserved.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

Trademarks

AIX; DB2; DB2 Universal Database; Distributed Relational Database Architecture; NUMA-Q; OS/2, OS/390, and OS/400; IBM Informix®; C-ISAM®; Foundation.2000™; IBM Informix® 4GL; IBM Informix® DataBlade® Module; Client SDK™; Cloudscape™; Cloudsync™; IBM Informix® Connect; IBM Informix® Driver for JDBC; Dynamic Connect™; IBM Informix® Dynamic Scalable Architecture™ (DSA); IBM Informix® Dynamic Server™; IBM Informix® Enterprise Gateway Manager (Enterprise Gateway Manager); IBM Informix® Extended Parallel Server™; i.Financial Services™; J/Foundation™; MaxConnect™; Object Translator™; Red Brick Decision Server™; IBM Informix® SE; IBM Informix® SQL; InformiXML™; RedBack®; SystemBuilder™; U2™; UniData®; UniVerse®; wintegrate® are trademarks or registered trademarks of International Business Machines Corporation.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

Windows, Windows NT, and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Other company, product, and service names used in this publication may be trademarks or service marks of others.

Index

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

X

Symbols