Backup and Restore Guide

for Informix® Dynamic Server™

with Advanced Decision Support and Extended Parallel Options

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Introduction

Read this introduction for an overview of the information provided in this manual and for an understanding of the documentation conventions used.

About This Manual

This manual is both a reference manual and a user guide for backing up and restoring data that Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options manages. This manual explains the concepts and methods that you can use to back up and restore your data.

Types of Users

This manual is for the following users:

- Database server administrators
- Backup operators

This manual assumes that you 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 database server administration, operating-system administration, or network administration

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

Software Dependencies

This manual assumes that you are using Dynamic Server with AD and XP Options, Version 8.2, as your database server.

Assumptions About Your Locale

Informix products can support many languages, cultures, and code sets. All culture-specific information is brought together in a single environment, called a GLS (Global Language Support) locale.

This manual assumes that you are using the default locale, **en_us.8859-1**. This locale supports U.S. English format conventions for dates, times, 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 *Informix Guide to GLS Functionality*.

Demonstration Databases

The DB-Access utility, which is provided with your Informix database server products, includes a demonstration database called **stores7** that contains information about a fictitious wholesale sporting-goods distributor. A second database, called **sales_demo**, illustrates a dimensional schema for data-warehousing applications. Sample command files are also included for creating and populating these databases.

Many examples in Informix manuals are based on the **stores7** demonstration database. The **stores7** database is described in detail and its contents are listed in the *Informix Guide to SQL: Reference*.

The scripts that you use to install the demonstration databases reside in the **$INFORMIXDIR/bin** directory on UNIX platforms and the **%INFORMIXDIR%\bin** directory on Windows NT platforms. For a complete explanation of how to create and populate the **stores7** demonstration database, refer to the *DB-Access User Manual*. For an explanation of how to create and populate the **sales_demo** database, refer to the *Informix Guide to Database Design and Implementation*.

New Features

The Introduction to each Informix product manual contains a list of major features for that product. New features for Informix products also appear in release notes.

This manual describes the following new features that have been implemented in Version 8.2 of Dynamic Server with AD and XP Options:

- Informix Storage Manager (ISM), a native storage manager for backup media
- The **onbar** command file (shell script on UNIX, batch file on Windows NT), which allows you to set up ISM and execute other commands
- Global language support (GLS)
- Informix Enterprise Command Center (IECC), a new graphical interface for performance monitoring and administration

This manual also discusses the following features, which were introduced in Version 8.1 of INFORMIX-OnLine XPS:

- Nonlogging tables
- Dbslices for centralized administration of storage spaces

Documentation Conventions

This section describes the conventions that this manual uses. These conventions make it easier to gather information from this and other Informix manuals.

The following conventions are covered:

- Typographical conventions
- Icon conventions
- Command-line conventions
- Sample-code conventions

Typographical Conventions

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

Convention	Meaning
KEYWORD	All keywords appear in uppercase letters in a serif font.
italics	Within text, new terms and emphasized words appear in italics. Within syntax diagrams, values that you are to specify appear in italics.
boldface	Identifiers (names of classes, objects, constants, events, functions, program variables, forms, labels, and reports), environment variables, database names, filenames, table names, column names, icons, menu items, command names, and other similar terms appear in boldface.
`monospace`	Information that the product displays and information that you enter appear in a monospace typeface.

(1 of 2)

Convention	Meaning
KEYSTROKE	Keys that you are to press appear in uppercase letters in a sans serif font.
♦	This symbol indicates the end of feature-, platform-, or compliance-specific information within a table or section.
→	This symbol indicates a menu item. For example, "Choose **Tools→Options**" means choose the **Options** item from the **Tools** menu.

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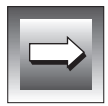
Tip: *When you are instructed to "enter" characters or to "execute" a command, immediately press* RETURN *after you type the indicated information on your keyboard. When you are instructed to "type" the text or to "press" other keys, you do not need to press* RETURN.

Icon Conventions

Throughout the documentation, you will find text that is identified by several different types of icons. This section describes these icons.

Comment Icons

Comment icons identify warnings, important notes, or tips. This information is always displayed in italics.

Icon	Description
	The *warning* icon identifies vital instructions, cautions, or critical information.
	The *important* icon identifies significant information about the feature or operation that is being described.

(1 of 2)

Icon	Description
	The *tip* icon identifies additional details or shortcuts for the functionality that is being described.

(2 of 2)

Feature and Platform Icons

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

Icon	Description
GLS	Identifies information that relates to the Informix Global Language Support (GLS) feature.
UNIX	Identifies information that is specific to UNIX platforms.
WIN NT	Identifies information that is specific to the Windows NT environment.

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

Compliance Icons

Compliance icons indicate paragraphs that provide guidelines for complying with a standard.

Icon	Description
ANSI	Identifies information that is specific to an ANSI-compliant database.
X/O	Identifies functionality that conforms to X/Open.

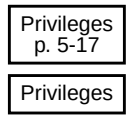
These icons can apply to a row in a table, one or more paragraphs, or an entire section. If an icon appears next to a section heading, the compliance information ends at the next heading at the same or higher level. A ♦ symbol indicates the end of compliance information that appears in a table row or a set of paragraphs within a section.

Command-Line Conventions

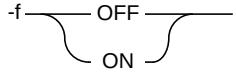
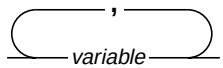
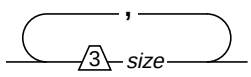
This section defines and illustrates the format of commands that are available in Informix products. These commands have their own conventions, which might include alternative forms of a command, required and optional parts of the command, and so forth.

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.

You might encounter one or more of the following elements on 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 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.
(. , ; + * - /)	Punctuation and mathematical notations are literal symbols that you must enter exactly as shown.
' '	Single quotes are literal symbols that you must enter as shown.
	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 shaded option is the default action.
	Syntax within a pair of arrows indicates a subdiagram.
	The vertical line terminates the command.

(1 of 2)

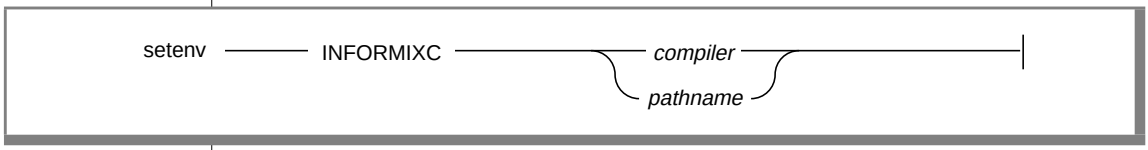
Element	Description
	A branch below the main path indicates an optional path. (Any term on the main path is required, unless a branch can circumvent it.)
	A loop indicates a path that you can repeat. Punctuation along the top of the loop indicates the separator symbol for list items.
	A gate (3) on a path indicates that you can only use that path the indicated number of times, even if it is part of a larger loop. Here you can specify *size* no more than three times within this statement segment.

(2 of 2)

How to Read a Command-Line Diagram

Figure 1 shows a command-line diagram that uses some of the elements that are listed in the previous table.

Figure 1
Example of a Command-Line Diagram



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

Figure 1 diagrams the following steps:

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

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

Additional Documentation

For additional information, you might want to refer to the following types of documentation:

- On-line manuals
- Printed manuals
- On-line help
- Error message files
- Documentation notes, release notes, and machine notes
- Related reading

On-Line Manuals

An Answers OnLine CD that contains Informix manuals in electronic format is provided with your Informix products. You can install the documentation or access it directly from the CD. For information about how to install, read, and print on-line manuals, see the installation insert that accompanies Answers OnLine.

Printed Manuals

To order printed manuals, call 1-800-331-1763 or send email to moreinfo@informix.com. Please provide the following information when you place your order:

- The documentation that you need
- The quantity that you need
- Your name, address, and telephone number

WIN NT

On-Line Help

Informix provides Help screens with each graphical user interface (GUI) that display information about the interfaces and the functions that they perform. To display these Help screens, use the Help facilities provided with each GUI.

Error Message Files

Informix software products provide ASCII files that contain all the Informix error messages and their corrective actions. For a detailed description of these error messages, refer to *Informix Error Messages* in Answers OnLine.

UNIX

To read error messages on UNIX, use the following commands.

Command	Description
finderr	Displays error messages on line
rofferr	Formats error messages for printing

♦

WIN NT

To read error messages and corrective actions on Windows NT, use the **Informix Find Error** utility. To display this utility, choose **Start→Programs→Informix** from the Task Bar. ♦

Documentation Notes, Release Notes, Machine Notes

In addition to printed documentation, the following sections describe the on-line files that supplement the information in this manual. Please examine these files before you begin using your database server. They contain vital information about application and performance issues.

UNIX

On UNIX platforms, the following on-line files appear in the **$INFORMIXDIR/release/en_us/0333** directory.

On-Line File	Purpose
BARDOC_8.2	The documentation-notes file describes features that are not covered in this manual or that have been modified since publication.
SERVERS_8.2	The release-notes file describes feature differences from earlier versions of Informix products and how these differences might affect current products. This file also contains information about any known problems and their workarounds.
IDS_8.2	The machine-notes file describes any special actions that are required to configure and use Informix products on your computer. Machine notes are named for the product described.

♦

WIN NT

The following items appear in the Informix folder. To display this folder, choose **Start→Programs→Informix** from the Task Bar.

Item	Description
Documentation Notes	This item includes additions or corrections to manuals, along with information about features that may not be covered in the manuals or that have been modified since publication.
Release Notes	This item describes feature differences from earlier versions of Informix products and how these differences might affect current products. This file also contains information about any known problems and their workarounds.

Machine notes do not apply to Windows NT platforms. ♦

Related Reading

The following publications provide additional information about the topics that are discussed in this manual. For a list of publications that provide an introduction to database servers and operating-system platforms, refer to your *Getting Started* manual.

- *An Introduction to Database Systems* by C. J. Date (Addison-Wesley Publishing, 1995)
- *Transaction Processing: Concepts and Techniques* by Jim Gray and Andreas Reuter (Morgan Kaufmann Publishers, Inc., 1993)

Informix manuals assume that you are familiar with your computer operating system. If you have limited experience with your operating system, consult your operating-system manual or a good introductory text before you read this manual.

UNIX

The following texts provide a good introduction to UNIX systems:

- *Introducing the UNIX System* by H. McGilton and R. Morgan (McGraw-Hill Book Company, 1983)
- *Learning the UNIX Operating System* by G. Todino, J. Strang, and J. Peek (O'Reilly & Associates, 1993)
- *A Practical Guide to the UNIX System* by M. Sobell (Benjamin / Cummings Publishing, 1989)
- *UNIX System V: A Practical Guide* by M. Sobell (Benjamin / Cummings Publishing, 1995)

♦

WIN NT

The following texts provide a good introduction to Windows NT:

- *Using Windows NT Workstation 3.51* by Paul Sanna (Que, 1996)
- *Microsoft Windows NT Resource Kit* by Russ Blake (Microsoft Press, 1995)
- *NT Server Management and Control* by Kenneth L. Spencer (Prentice-Hall, 1995)
- *Windows NT Administration* by Marshall Brain and Shay Woodard (Prentice-Hall, 1994)
- *Windows NT Network Programming* by Ralph Davis (Addison-Wesley, 1994)

♦

Compliance with Industry Standards

The American National Standards Institute (ANSI) has established a set of industry standards for SQL. 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.

Informix Welcomes Your Comments

Please tell us what you like or dislike about our manuals. To help us with future versions of our manuals, we want to know about corrections or clarifications that you would find useful. Include the following information:

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

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Chapter

1

The ON-Bar Backup and Restore System

This chapter explains the following concepts of the ON-Bar backup and restore system for Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options:

- What is ON-Bar?
- What is an ON-Bar backup?
- What is an ON-Bar logical-log backup?
- What is an ON-Bar restore?
- Understanding ON-Bar processes

What Is ON-Bar?

ON-Bar is a *backup and restore system* for Dynamic Server with AD and XP Options on UNIX and Windows NT. Use ON-Bar to make a backup copy of your database server data and logical logs as insurance against lost or corrupted data. Data might be lost or corrupted for reasons that range from a program error to a disk failure to a disaster that damages the facility in which your computer resides.

To recover data, restore the database in two steps:

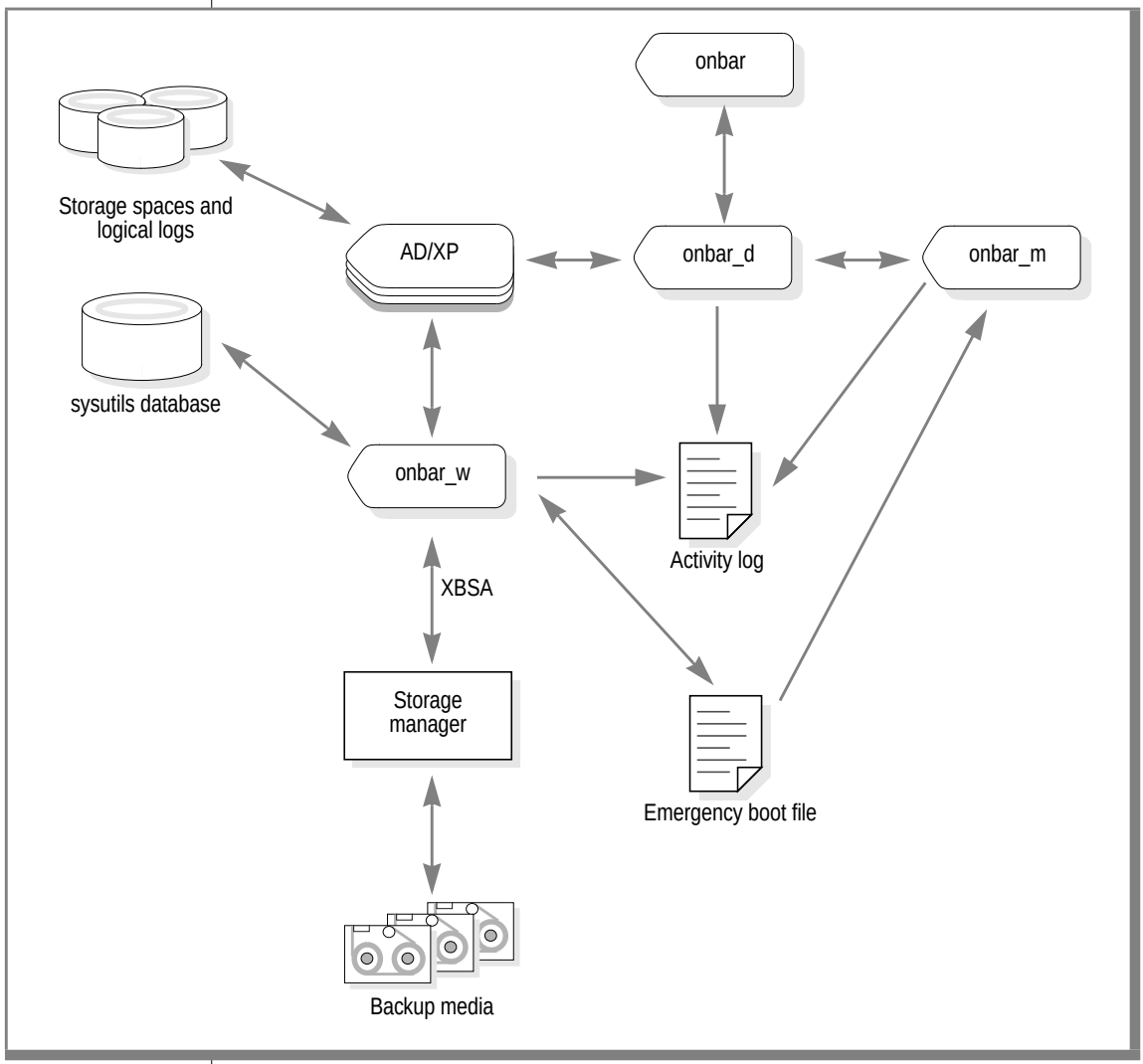
- Restore the backup copy of the data.
- Restore the logical logs to bring data as close as possible to the most recent state.

If you restore noncritical data while the database server is on-line or quiescent, that process is called a *warm restore*. If you restore critical data while the database server is in *microkernel* mode, it is called a *cold restore*. A *mixed restore* is a cold restore followed by a warm restore. (For information on microkernel mode, see your *Administrator's Guide*.)

Figure 1-1 on page 1-5 shows the following components of the ON-Bar backup and restore system:

- Storage spaces (dbspaces) and logical logs to be backed up or restored.
- The ON-Bar catalog tables in the **sysutils** database
- Dynamic Server with AD and XP Options
- The **onbar**, **onbar-driver** (**onbar_d**), **onbar-worker** (**onbar_w**), **start_worker**, and **onbar-merger** (**onbar_m**) utilities
- The XBSA interface shared library for each storage manager that your system uses. You can use either Informix Storage Manager (ISM) or a storage manager that a third-party vendor provides.
- Backup data on storage media
- The ON-Bar activity log
- The ON-Bar emergency boot files

Figure 1-1
ON-Bar Components



The ON-Bar Utility Suite

The ON-Bar utility suite includes the following utilities.

onbar	The **onbar** utility is an editable shell script on UNIX and a batch file on Windows NT that starts the **onbar-driver**. Use the **onbar** script or batch file to check the storage-manager version and customize backup and restore operations.
onbar_d	The **onbar-driver**, which starts and controls backup and restore activities, was renamed **onbar_d**. Use the **onbar** command to start backup and restore operations.
onbar_w	The **onbar_w** utility starts ***onbar-worker*** processes that transfer data between Dynamic Server with AD and XP Options and the storage manager until the backup or restore request is fulfilled.
onbar_m	The **onbar_m** utility starts ***onbar-merger***, which collects and processes the backup and merge emergency boot files from each coserver and creates the restore boot file.

You can call **onbar** and **onbar_d** from the command line, a script, a scheduler such as **cron** (UNIX), or a storage manager process.

Backup Scheduler

The **onbar-driver** communicates backup or restore requests to the Dynamic Server with AD and XP Options Backup Scheduler. The *Backup Scheduler* tracks all active and scheduled backup and restore activities for all the coservers in Dynamic Server with AD and XP Options. The Backup Scheduler creates one or more sessions, each of which contains a list of objects to back up or restore. It then starts **onbar-worker** processes to back up or restore objects in the lists and coordinates the session activity. A *session* is a single backup or restore request. For more information on the Backup Scheduler, see "Understanding ON-Bar Processes" on page 1-26.

Informix Storage Manager

ON-Bar is packaged with Informix Storage Manager (ISM). However, you can purchase a third-party storage manager if you prefer. You must use a storage manager to perform ON-Bar backups and restores. In the ON-Bar backup and restore system, the *storage manager* is an application that manages the storage devices and media that contain backups. The storage manager handles media labeling, mount requests, and storage volumes.

The ISM server resides on the same computer as ON-Bar and the Informix database server; your storage devices are attached to this computer as well. ISM can store data on simple tape drives, optical disk devices, and file systems. ISM also performs the following functions:

- Configures up to four storage devices
- Adds, changes, and deletes administrative users
- Labels and mounts storage volumes on your storage devices
- Manages storage volumes
- Compresses and decompresses data
- Encrypts and decrypts data

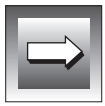
If your Dynamic Server with AD and XP Options is complex and contains many coserver nodes, you might configure more than one storage manager and use different storage managers for different purposes. For best performance, configure one storage manager on each node where a backup device is located. When a storage manager is on each node, the data moves faster because it does not have to travel over the network. For complex examples, see "Examples of ON-Bar and Storage-Manager Configurations" on page 2-13.

For information on how to set up and use ISM, refer to the *Informix Storage Manager Administrator's Guide*.

Third-Party Storage Managers

Some third-party storage managers can manage stackers, robots, and jukeboxes as well as simple tape and disk devices. These storage managers might perform these additional functions:

- Schedule backups
- Support networked and distributed backups and restores



Important: *For information on the third-party storage managers that ON-Bar supports, consult your Informix Sales Representative or the Informix web site at* `http://www.informix.com`*. Make sure that the storage manager has passed the Informix validation process. The validation process is specific to the backup and restore product version, the operating-system version, and the Informix database server version.*

X/O

The XBSA Interface

ON-Bar and the storage manager communicate through the X/Open Backup Services Application Programmer's Interface (XBSA), which enables the storage manager to manage media for the database server. By using an open-system interface to the storage manager, ON-Bar can work with a variety of storage managers that also use XBSA.

Each storage manager develops and distributes a unique version of the XBSA shared library. You must use the version of the XBSA shared library provided with the storage manager. For example, if you use ISM, use the XBSA shared library provided with ISM.

ON-Bar uses XBSA to exchange the following types of information with a storage manager:

- **Control data.** ON-Bar exchanges control data with a storage manager to verify that ON-Bar and XBSA are compatible, to ensure that objects are restored to the proper instance of the database server and in the proper order, and to track the history of backup objects.
- **Backup or restore data.** During backups and restores, ON-Bar and the storage manager use XBSA to exchange data from specified storage spaces or logical-log files.

ON-Bar uses XBSA transactions to ensure data consistency. All operations included in a transaction are treated as a unit. All operations within a transaction must succeed for objects transferred to the storage manager to be restorable.

The ON-Bar Tables

ON-Bar uses the following tables in the **sysutils** database to check the compatibility of component versions, as well as to keep track of backup and restore operations. A list of ON-Bar tables in the **sysutils** database follows:

- The **bar_server** table tracks instances of Dynamic Server with AD and XP Options.
- The **bar_object** table tracks backup objects. A *backup object* can be a dbspace, blobspace, or logical-log file.
- The **bar_action** table tracks all backup and restore attempts against each backup object, except some log salvage and cold restore events.
- The **bar_instance** table describes each object that is backed up during a successful backup attempt.
- The **bar_version** table lists compatible versions of ON-Bar and storage managers.

For a description of the content of these tables, see Chapter 5, "Catalog Tables."

The Emergency Boot Files

The ON-Bar *emergency boot files* contain the information needed to perform a cold restore. The emergency boot file replaces the **sysutils** tables during a cold restore so that ON-Bar can request the correct backup object from the storage manager.

ON-Bar must be able to restore objects from a storage manager even when the tables in the **sysutils** database are not available. During a cold restore, Dynamic Server with AD and XP Options is not available to access **sysutils**, so ON-Bar obtains the information it needs for the cold restore from the emergency boot files.

For information about the location of the emergency boot files, see "The Catalog Tables and the Emergency Boot Files" on page 5-10.

The ON-Bar Activity Log

As ON-Bar backs up and restores data, it periodically writes to the ON-Bar *activity log*. When ON-Bar encounters an error or a warning condition, it writes a message to the activity log. The activity log also documents which storage spaces and logical logs were included in a backup or restore operation and approximately how long the operation took. Use information in the activity log to determine whether a backup or restore operation succeeded. You can specify the location of the activity log in the BAR_ACT_LOG configuration parameter or use the default location, **/tmp/bar_act.log** on UNIX or **%INFORMIXDIR%\bar_<*servername*>.log** on Windows NT. Each coserver, where **onbar-worker** or **onbar-driver** processes are running, has its own activity log if you set BAR_ACT_LOG to a local pathname.

Each **onbar-driver** and **onbar-worker** process writes to the activity log on the node where it runs. Unless your system is configured to have shared directories, and the ON-Bar activity log is specified to be in a shared directory, each node has an activity log that contains its local ON-Bar activity.

For more information about the activity log and a list of ON-Bar informational, warning, and error messages, see Appendix A.

What Is an ON-Bar Backup?

An ON-Bar *backup* is a copy of one or more storage spaces and logical logs that the Informix database server maintains. You can restore the backed up database server data, if necessary. The backup copy is usually written to a *secondary storage* medium such as magnetic tape. We recommend that you store the media off-line and keep a copy off-site if your media and storage manager permit.

Important: *ON-Bar backups do not replace ordinary operating-system backups, which back up all files in directories as specified in the backup command. For a list of files to include in routine system backups, see "What Is Not Backed Up by ON-Bar?" on page 1-11.*

What Storage Spaces Does ON-Bar Back Up?

ON-Bar backs up the following types of data:

- Storage spaces that contain tables and indexes

  For information about storage-space backups and backup levels, see "What Is a Storage-Space Backup?" on page 1-12.

- Logical-log files, which contain a record of each transaction that occurred in the database

  You can either back up logical-log files separately or together with storage spaces.

  You should back up logical logs as soon as they fill so that you can reuse them. For information about logical-log backups, see "What Is a Logical-Log Backup?" on page 1-15.

- If you use ISM, the ISM catalog, which contains information about backed-up data

  The ISM catalog is under **$INFORMIXDIR/ism** on UNIX and **%ISMDIR%** on Windows NT.

What Is Not Backed Up by ON-Bar?

ON-Bar backups safeguard your data. They do not replace normal operating-system backups of important configuration files.

Important: *For use in an emergency, you should have a backup copy of the current version of the following administrative files. You will need to restore these files if you need to replace disks or if you restore to a second computer system:*

- The ONCONFIG file
- The **oncfg** file from each coserver

  The filename is **$INFORMIXDIR/etc/oncfg_*servername.servernum.coserverid*** on UNIX or **%INFORMIXDIR%\etc\oncfg_*servernam.servernum.coserverid*** on Windows NT.

- The **xcfg** file

  The filename is **$INFORMIXDIR/etc/xcfg_*servername.servernum*** on UNIX or **%INFORMIXDIR%\etc\xcfg_*servername.servernum*** on Windows NT.
- The emergency boot files from each coserver

UNIX

- The **sqlhosts** file
- The **sm_versions** file ♦
- Storage-manager configuration and data files

  For more information, see your storage-manager documentation.
- UNIX and Windows NT operating-system and data files

Although ON-Bar does not back up the following files, ON-Bar automatically re-creates them during a restore. You do not need to make backup copies of the following files:

- The *dbspace pages* that are allocated to the database server but that are not yet allocated to a tblspace extent
- Mirror chunks, if the corresponding primary chunks are accessible
- Temporary dbspaces

During a backup, if ON-Bar encounters a storage space that is down, it skips that storage space and writes a message to the activity log.

Warning: *You cannot back up storage spaces that ON-Bar skips. However, you can restore these storage spaces from older backups if they were backed up at least once.*

What Is a Storage-Space Backup?

A *storage-space backup* is a backup of one or more specified storage spaces, or all storage spaces. A storage-space backup copies the tables and indexes in each specified storage space so that they can be restored later to the state they were in at the time that the backup began.

You can specify a physical backup that backs up just the selected storage spaces or both the storage spaces and logical logs. You can perform three different levels of storage-space backups: level 0, level 1, and level 2.

You can specify storage spaces individually or with a dbslice name. Specifying storage spaces with a dbslice name simplifies backups. The dbslice name is translated to the names of its component storage spaces. If you create a new storage space as a member of a dbslice, a backup command that specifies the dbslice automatically backs up the contents of the additional storage space.

What Are Backup Levels?

You do not always have to back up all the tables and indexes all the time. For example, if some tables change daily but others rarely change, it is inefficient to back up the unchanged tables every time that you back up the database server.

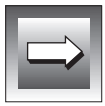
To provide a more flexible backup environment, ON-Bar supports three *backup levels*:

- Level 0 backs up all data in the specified storage spaces.
- Level 1 backs up only data that has changed since the last level-0 backup of the specified storage spaces.
- Level 2 backs up only data that has changed since the last level-1 or level-0 backup of the specified storage spaces.

The following sections explain these three backup levels.

Level-0 Backups

A level-0 backup is a baseline backup. It contains a copy of all pages that contain data for the specified storage spaces. You need all these pages to restore the database to the state that it was in at the time that you made the backup.



Important: *If disks and other media are completely destroyed and need to be replaced, you need a level-0 backup of all storage spaces and relevant logical logs to restore data completely on the replacement computer.*

Level-1 Backups

A level-1 backup contains a copy of every table page that has changed since the last level-0 backup. The data that is copied to the backup reflects the state of the data at the time that the level-1 backup began. A level-1 backup takes less space and might takes less time than a level-0 backup because only data that changed is copied to the storage manager.

Level-0 backups can be time consuming because ON-Bar writes all the disk pages to backup media. Level-1 and level-2 backups might take almost as much time as a level-0 backup because ON-Bar must scan all the data to determine what has changed since the last backup. Performance varies depending on the relative speed of the disk drives used for the database server data and backup media. The major advantage is restore time. It takes less time to restore data from level-0, level-1, and level-2 backups than from level-0 backups and a long series of logical-log backups.

If you create level-0 backups infrequently, the level-1 backup might be large. For example, if you completed the last level-0 backup a day ago, you might not have many changes, and the level-1 backup will be small. However, if the last level-0 backup was a month ago, and many changes have occurred since then, the level-1 backup will be considerably larger.

Level-2 Backups

A level-2 backup contains a copy of every table page in a storage space that has changed since the last level-1 or level-0 backup. All data that is copied to the backup reflects the state of the data at the time that the level-2 backup began.

Tip: *It is good practice to create a backup schedule that keeps level-1 and level-2 backups small and to schedule frequent level-0 backups. With such a backup schedule, you avoid having to restore large level-1 and level-2 backups or many logical-log backups.*

What Is a Logical-Log Backup?

A *logical-log backup* copies all full logical-log files that are not yet backed up to the storage manager. The logical log contains records of all changes (checkpoints) that were performed on a database during the period the log was active. Unless you specify no logging for tables in a database, Dynamic Server with AD and XP Options records all table-update transactions in the logical-log files. Dynamic Server with AD and XP Options continually writes and saves new logical-log records in case you must restore those transactions.

To keep all the logical-log records needed to restore data transactions but let Dynamic Server with AD and XP Options continue to write new logical-log records in a finite amount of space, you free full logical-log files by backing them up. You can reuse the freed logical-log files for recording new transactions.

Why You Need to Back Up Logical-Log Files

You should perform frequent logical-log backups for the following reasons:

- To prevent the logical logs from filling up and hanging the database server.
- If you want to perform a restore in pieces (for example, **onbar -1 -s**, **onbar -r -p**, then **onbar -r -l**).
- If a disk containing logical logs fails.

To illustrate, suppose you perform a level-0 backup on Monday at 10:00 P.M. and then back up the logical logs on Tuesday at midnight. On Wednesday at 11:00 A.M., you suffer a mishap that destroys your databases. However, you can recover all transactions that occurred between 10:00 P.M. Monday and 11:00 A.M. Wednesday because ON-Bar automatically backs up the logical logs during a backup or warm restore. To restore the transactions, replay the logical log, if it is available.

If the disks that contain the storage spaces with the logical logs are destroyed, the transactions after midnight on Tuesday are lost. To restore these transactions from the last logical-log backup, salvage the logical logs (**onbar -l -s**) before repairing or replacing the bad disk, and then perform a cold restore. For information on salvaging logical logs, see "When to Salvage Logical-Log Files" on page 1-19.

Figure 1-2 illustrates this example.

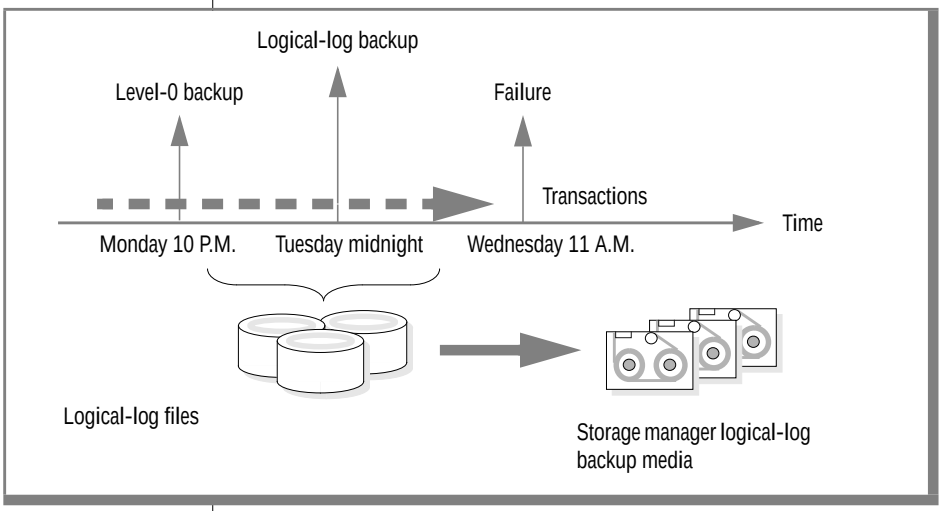


Figure 1-2 *Storage Space and Logical-Log Backups*

Backing Up Logical Logs Even with Logging Turned Off

Although you cannot turn off logging for an entire database, you can turn off logging for specific tables. Even if you do not specify logging for tables, logical logs still contain administrative information such as checkpoint records and additions and deletions of chunks.

Important: *You must back up logical logs even though you are not using logging for your tables, because you must restore logical logs after restoring storage spaces.*

When Should You Back Up Logical-Log Files?

Informix recommends that you back up each logical-log file as soon as it fills. To back up filled logical-log files, enter the backup command manually or configure ON-Bar to back them up automatically. If you do not want to monitor the logical-log files, use *continuous* (automatic) logical-log backups.

The Informix database server reuses logical-log files to minimize the amount of disk space required for logging transactions. After ON-Bar backs up a logical-log file, the database server frees the logical-log file so that it can be overwritten with new transaction information. For a complete description of the logical log, see your *Administrator's Guide*.

Monitoring Logical Logs

To find out if a logical-log file is ready to be backed up, check the flags field of **onstat -l**. When the flags field displays any of the following values, the logical-log file is ready to be backed up:

```
U------
U-----L
U---C-L
```

The value U means that the logical-log file was used. The value L means that the last checkpoint occurred when the indicated logical-log file was current. The value C indicates the current logical log. If B appears in the third column, the logical-log file is already backed up.

```
U-B---L
```

The following example shows the output of **onstat -l** when you use it to monitor logical logs in the logstream of a single coserver:

```
> onstat -l
Informix IDS AD/XP Version 8.20 -- On-Line -- Up 01:35:15 -- 43752 Kbytes

Physical Logging
Buffer bufused  bufsize  numpages numwrits pages/io
  P-2  7        8        115      22       5.23
               phybegin physize  phypos   phyused  %used
             1:00000041 2000     108      7        0.35

Logical Logging
Buffer bufused  bufsize  numrecs  numpages numwrits recs/pages pages/io
  L-3  0        8        20276    994      827      20.4       1.2
address  number   flags    uniqid   begin              size     used    %used
3008faec 1        U-----L  1        1:2065              750      750   100.00
3008fb18 2        U---C--  2        1:2815              750      244    32.53
3008fb44 3        F------  0        1:3565              750        0     0.00
3008fb70 4        F------  0        1:4315              750        0     0.00
```

For information about how to use the **xctl** utility to monitor the status of logical-log files on all coservers, see your *Administrator's Guide*.

Tip: *Use Informix Enterprise Command Center (IECC) to monitor logical logs graphically on all coservers.*

Using Manual or Continuous Logical-Log Backups

You can either back up the logical logs manually or start a continuous logical-log backup. As each logical-log file fills, it is added to a permanent logical-log backup session on each coserver.

To back up all the logical-log files that are full, start a logical-log backup manually. A logical-log backup backs up all the full logical-log files and then stops at the current logical-log file.

If you turn on continuous logical-log backup, **onbar-worker** processes back up the logical logs automatically. If you turn off continuous logical-log backup, the logical-log files accumulate in the log backup session, waiting for a user request for a logical-log backup. Reserve a dedicated storage device for the continuous logical-log backups.

You can use **onstat -g bus** or **onstat -g bus_sm** to monitor logical logs in the current backup session.

Warning: *If you do not turn on continuous logical-log backup, you must monitor your logical logs carefully and start logical-log backups as needed. If the individual logical-log files are not backed up as they fill, the logical log runs out of space to add transactions, and your database server locks up. If the logical-log files run out of space, back them up. The database server will then resume processing transactions.*

For information on how to configure ON-Bar for continuous or manual backups, see "LOG_BACKUP_MODE" on page 4-9.

Why You Need to Save Logical-Log Backups

You must save logical-log backups so that you can use them to restore a database whether or not the most recent storage-space backups are available. If a storage-space backup is inaccessible or unusable, you can restore data from an older backup, if you have one. If any of the logical-log backups are also inaccessible or unusable, however, you cannot roll forward the transactions from those logical-log files or any from any subsequent logical-log files.

Keep logical-log file backups until you are sure that you do not need them to complete a restore from a storage-space backup. At a minimum, keep all logical-log backups from just before the most recent level-0 physical backup to the present.

If your storage manager allows you to copy or clone objects after they are backed up, Informix suggests that you make a second copy of each logical-log backup.

If you mirror the root dbspace and logical-log spaces, you are less likely to have to perform a cold restore after a disk failure because you can recover the critical and logical-log data from the mirrored storage space.

When to Salvage Logical-Log Files

When the database server is in microkernel mode, you can perform a logical-log backup, also called a *log salvage*. It backs up any logical logs that have not yet been backed up and are not corrupted or destroyed. You can then roll these logs forward during restore, resulting in a minimum of lost data.

ON-Bar salvages logical logs automatically before a cold restore unless you specify a physical restore only. ON-Bar salvages the logical logs that are used before it restores the root dbspace. To make sure that no data is lost before you start the cold restore, you should manually salvage the logical logs in the following situations:

- If you must replace the media that contains the logical logs

  If the media that contains the logical logs is no longer available, the log salvage will fail, resulting in data loss.
- If you plan to specify a physical restore only (**onbar -r -p**)

For an example of how to salvage logical logs manually, see page 3-19. For more information on a cold restore, see "The Server Mode for a Cold Restore" on page 1-23.

Warning: *You will lose transactions in logical-log files that are not backed up or salvaged.*

What Is an ON-Bar Restore?

An ON-Bar *restore* operation re-creates Dynamic Server with AD and XP Options data that has become inaccessible because of hardware or software failure, hardware replacement, or user error. For example, any one of the following conditions might require that you restore your database server data:

- You need to replace a disk that contains database server data.
- A logic error in a program has corrupted a database.
- You need to move all of your database server data to a new computer.
- A user accidentally corrupted or destroyed data.

To restore data up to the time of the failure, you must have at least one level-0 backup of each of your database server storage spaces and the logical-log files that contain all transactions since the most recent backups of the storage spaces.

An ON-Bar restore uses backups of storage spaces and logical logs to re-create the database server data in two phases. The first phase is the physical restore, which restores data from backups of the storage spaces. The second phase is the logical restore, which restores transactions from the logical-log file backups. Dynamic Server with AD and XP Options and ON-Bar automatically know which logical logs to restore.

What is a Physical Restore?

During a physical restore, ON-Bar replaces a lost or corrupted storage space with a backup copy from secondary-storage media. Figure 1-3 illustrates a physical restore.

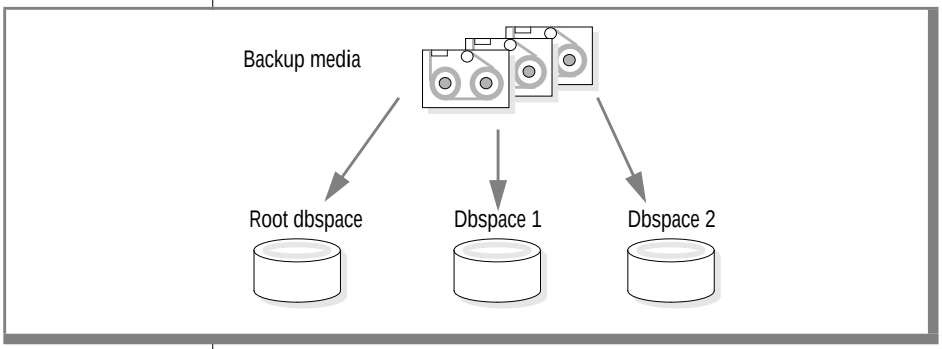


Figure 1-3
Physical Restore

If a critical storage space is damaged because of a disk failure or corrupted data, the database server goes off-line. You need to perform a cold restore to restore at least the critical storage spaces. For more information on cold restore, see "The Server Mode for a Cold Restore" on page 1-23.

If a disk failure or the corruption of data does not cause the database server to go to off-line mode, you can restore any noncritical storage spaces. For example, if one of your disks fails, you can restore to a new disk only those storage spaces with chunks that resided on the failed disk. If the server does go off-line, perform a cold restore.

Importing a Restore to a Different Database Server

Sometimes you might want to transfer all the data from one instance of Dynamic Server with AD and XP Options to another. ON-Bar allows you to restore objects to a different database server instance than the one from which the data was backed up. You must also use compatible versions of XBSA and storage managers for both operations.

Important: *In an imported restore, you do not need to use the same server number on the new computer as was used on the old computer. You can change the server name in an imported restore.*

What is a Logical Restore?

During a logical restore, ON-Bar uses a logical-log backup to reapply and update any database transactions that were applied to a storage space after it was backed up.

Figure 1-4 shows that a logical restore recovers transactions from backed-up logical-log files. The logical-log files recorded transactions that occurred after the last backup. The logical restore applies only to those storage spaces that have just been physically restored.

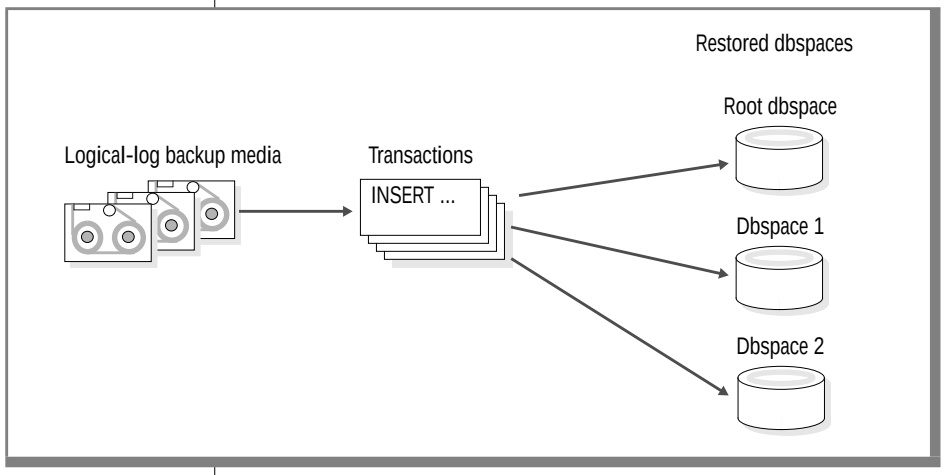


Figure 1-4
Logical Restore

Tip: *When you restore data, ON-Bar chooses the most recent level-0, level-1, and level-2 backups that you should use. You perform a logical restore to bring the system up-to-date. To replay logical-log transactions in parallel, use the ON_RECVRY_THREADS configuration parameter. For information on ON_RECVRY_THREADS, see your "Administrator's Guide."*

During a warm restore, ON-Bar applies backed-up logical-log files to the restored storage spaces. However, because the database server is in on-line mode, users might generate transactions that are being recorded in the logical-log files. To avoid overwriting the current logical log, ON-Bar writes to temporary space the logical-log files that are replayed. For information on how Dynamic Server with AD and XP Options looks for temporary space, see the discussion of DBSPACETEMP in your *Administrator's Guide*.

Warning: *Make sure that you have enough temporary space for the logical-log portion of the restore. The minimum amount of temporary space that the database server needs is equivalent to the total logical-log space for the coservers on which storage spaces are being restored, or the number of log files to be replayed, whichever is smaller).*

Setting the Server Mode for a Restore

When you restore data, you must decide whether to do so while the database server is in microkernel, quiescent, or on-line mode. This decision depends in part on the data that you want to restore. The following sections explain the factors that determine which Dynamic Server with AD and XP Options mode to use when you perform a restore.

The Server Mode for a Warm Restore

A *warm restore* restores noncritical dbspaces while Dynamic Server with AD and XP Options is in on-line or quiescent mode. It consists of one or more physical-restore operations, a logical-log backup, and a logical restore. You can restore a storage space that is down or has at least one chunk that is down, inconsistent, or recovering. Figure 1-5 on page 1-23 shows a warm restore.

Important: *If the storage space to be restored is on-line, use the* ***onbar -r -O*** *option to restore it.*

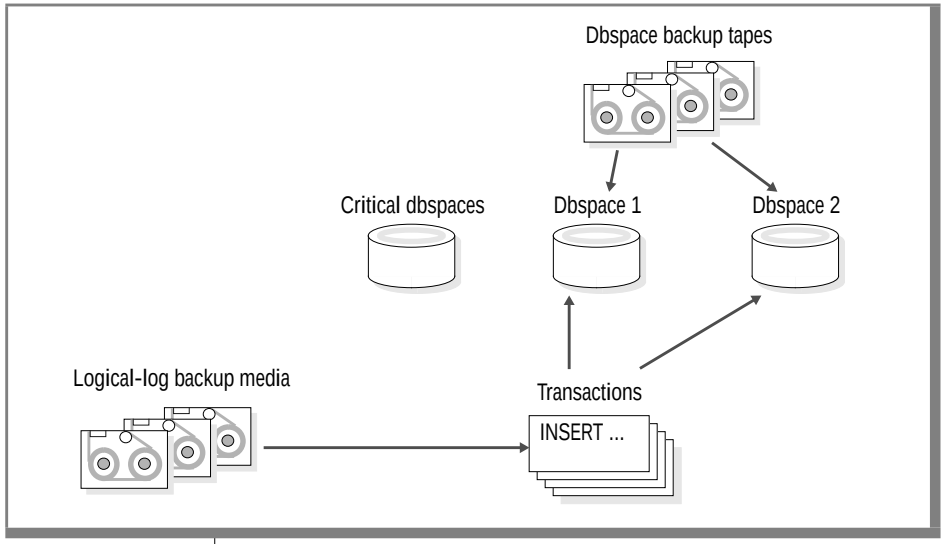


Figure 1-5
Warm Restore

The Server Mode for a Cold Restore

A *cold restore* requires that the database server be in microkernel mode. A cold restore consists of a logical-log file salvage, one or more physical restores, and a logical restore. In a cold restore, you must also restore all the critical dbspaces on all coservers. If a critical dbspace on any of the nodes goes down, you must perform a cold restore on all coservers. The critical dbspaces are as follows:

- The root dbspaces
- The dbspaces that contain the physical log
- Any dbspace that contains a logical-log file

Tip: *If you mirror the critical dbspaces, you can avoid having to perform a cold restore.*

As Figure 1-6 on page 1-24 shows, you can restore all the storage spaces that Dynamic Server with AD and XP Options manages with one physical restore and one logical restore.

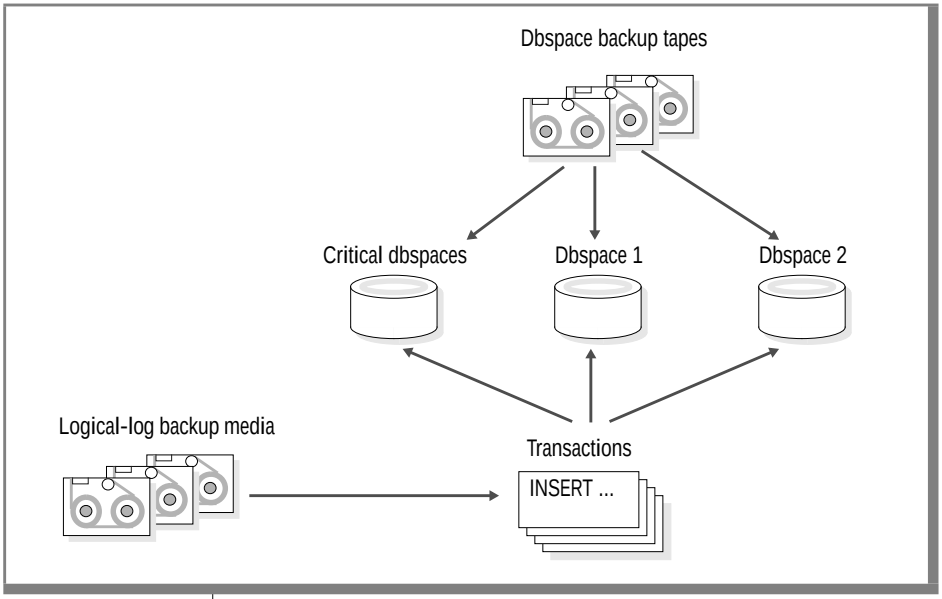


Figure 1-6
Cold Restore

Dynamic Server with AD and XP Options must be in microkernel mode when you begin a cold restore, but it goes into recovery mode after the reserved pages of the root dbspace are restored. After the reserved pages are restored, the database server stays in recovery mode until the logical restore is complete, after which it is in quiescent mode. Use the following command to bring the database server to microkernel mode from off-line mode:

```
xctl -C oninit -m
```

You usually need to salvage the logical logs before starting a cold restore to avoid losing logs that you have not backed up. The logical-log restore that takes place during a cold restore uses the same disk space to sort logical logs that is used for the logical-log files during normal database server processing. For this reason, a physical restore overwrites the data in the logical-log files. For more information, see "When to Salvage Logical-Log Files" on page 1-19.

For information about how ON-Bar uses the emergency boot files in a cold restore, see "The Catalog Tables and the Emergency Boot Files" on page 5-10.

To perform a cold restore

1. If the files in **INFORMIXDIR** were destroyed, re-copy the ONCONFIG, **sqlhosts** (UNIX only), emergency boot files, **oncfg**, and **xcfg** files to their original locations. However, if you are performing the cold restore because a critical dbspace was lost, you do not need to re-copy these files.
2. Start with a logical-log salvage.

   ON-Bar automatically salvages the logical logs unless you plan to specify a physical restore only. You must also salvage the logical logs if the media has been destroyed.
3. Perform a physical restore of each storage space, then a logical restore. (You can perform the physical and logical restore at the same time or sequentially.)

What you need to do after a cold restore

1. Copy the emergency boot files on each coserver to a safe place.
2. Perform a level-0 backup.
3. Copy any files that the storage manager requires.

Handling Off-Line Storage Spaces

If a storage space was never backed up, it cannot be restored and is marked as off-line after the cold restore. Drop the storage space so that you can reuse its disk space.

Warning: *If you have not backed up a storage space and you try a cold restore, its data will be lost.*

Restoring to a Point in Time

A point-in-time restore is a cold restore that you can use to undo mistakes that might otherwise not be fixable, such as dropping a table. A full restore restores the table during the physical restore but drops it again during the logical restore. A point-in-time restore lets you restore *all* data to the moment just before the table was dropped. You cannot restore only a particular storage space to a specific time.

Important: *To determine the appropriate date and time for the point-in-time restore, use the* ***onlog*** *utility that your "Administrator's Guide" describes. The* ***onlog*** *output displays the date and time of the committed transactions. Do not use the coserver time or your watch to determine the point-in-restore time because it would not be accurate.*

When you restore Dynamic Server with AD and XP Options data to a specific time, any transactions that were uncommitted when the failure occurred or at the specified point in time are lost even though they are included in an existing logical-log backup. The transactions are lost because the database server data can only be restored to the last known global point of consistency across all coservers. This point is determined from internal information about global transactions stored in the emergency boot files and information from logical-log files. For information on how to restore a database to a specific time, see "Restoring Data" on page 3-14.

Understanding ON-Bar Processes

This section explains how ON-Bar communicates with the Backup Scheduler and the **onbar-worker** and **onbar-merger** processes. The **onbar-driver** (**onbar_d**) tracks backup or restore requests and waits for Dynamic Server with AD and XP Options and the **onbar-worker** processes to complete them.

You can start the **onbar-worker** processes automatically or manually. Each **onbar-worker** process is associated with a coserver and a storage-manager instance. Once an **onbar-worker** process starts, it might be active after the backup or restore session it was started for is completed. An **onbar-worker** can perform backups or restores from any active session.

To monitor the status of backups, restores, and **onbar-worker** activities, use the **onstat -g bus**, **onstat -g bus_session**, or **onstat -g bus_sm** options. For more information, see "Monitoring Backup Scheduler Status" on page 3-22.

Backup Sequence

In a backup session, ON-Bar backs up both the storage spaces and the logical logs. Figure 1-7 on page 1-28 describes the ON-Bar backup sequence.

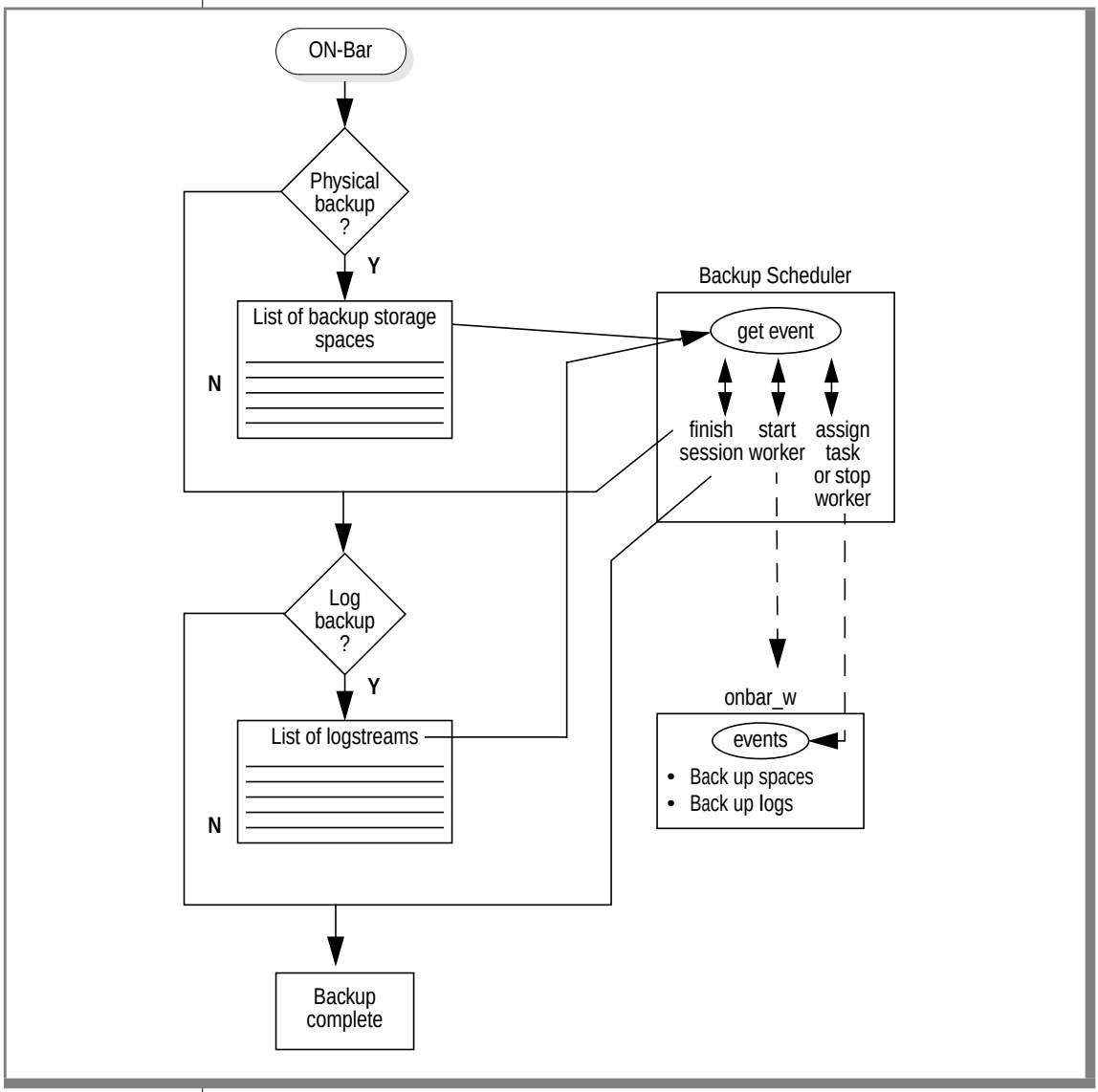
The **onbar-driver** builds and sends a list of storage spaces to the Backup Scheduler. The Backup Scheduler creates a backup session, might start one or more **onbar-worker** processes, and assigns backup tasks to the **onbar-worker** processes. Each **onbar-worker** transfers data between Dynamic Server with AD and XP Options and the storage manager until the backup request is fulfilled.

The **onbar-driver** then sends a list of logstreams (logical-log data) to the Backup Scheduler that assigns the tasks to **onbar-worker** processes. When an **onbar-worker** completes its task, it waits for the next task from the Backup Scheduler. If no new task is assigned in a user-specified amount of time, the **onbar-worker** shuts down. You can set the number of minutes that the **onbar-worker** processes wait in BAR_IDLE_TIMEOUT in the ONCONFIG file.

If the Backup Scheduler has new tasks to assign and not enough **onbar-worker** processes are running to complete the task, it calls the **start_worker** script to start one or more new **onbar-worker** processes. If you have set BAR_WORKER_MAX = 0, you must start a new **onbar-worker** manually. To start **onbar-worker** processes manually, use either the **start_worker.sh** script on UNIX or **start_worker.bat** on Windows NT or call **onbar_w** from the command line.

After each object is backed up, information about it is added to the emergency backup boot file on the local coserver and to the **sysutils** database. The emergency backup boot file is on the coserver of the **onbar-worker** that backed it up.

Figure 1-7
ON-Bar Backup Process



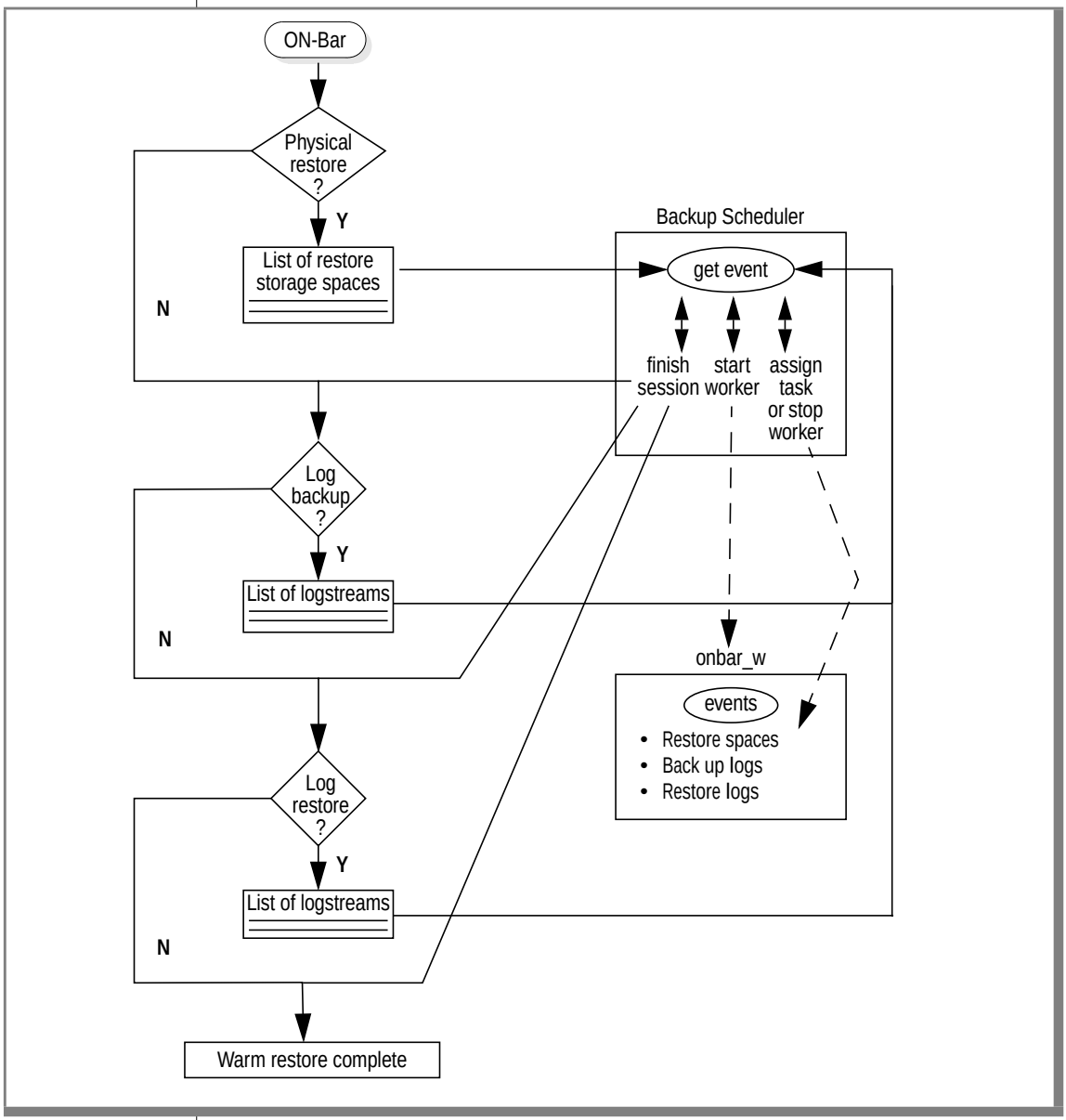
Warm Restore Sequence

If the server is in quiescent mode or is on-line, you can perform a warm restore. ON-Bar gathers data from the **sysutils** database and then requests a restore from the database server. Figure 1-8 on page 1-30 describes the ON-Bar warm restore sequence.

In a warm restore, the **onbar-driver** sends a list of backup objects to the Backup Scheduler. The Backup Scheduler creates one or more sessions that contain lists of backup objects to restore and might start one or more **onbar-worker** processes. The **onbar-worker** transfers data between the storage manager and Dynamic Server with AD and XP Options until the warm restore is complete. For each storage space, ON-Bar restores the last level-0 backup, then the level-1 backup (if it exists), and the level-2 backup (if it exists). Next, ON-Bar backs up the logical logs and restores them.

When the warm restore is complete, information about the logical-log backup is added to the emergency backup boot file on each coserver, and information about the restore and logical-log backup is added to the **sysutils** database.

Figure 1-8
ON-Bar Warm Restore Process



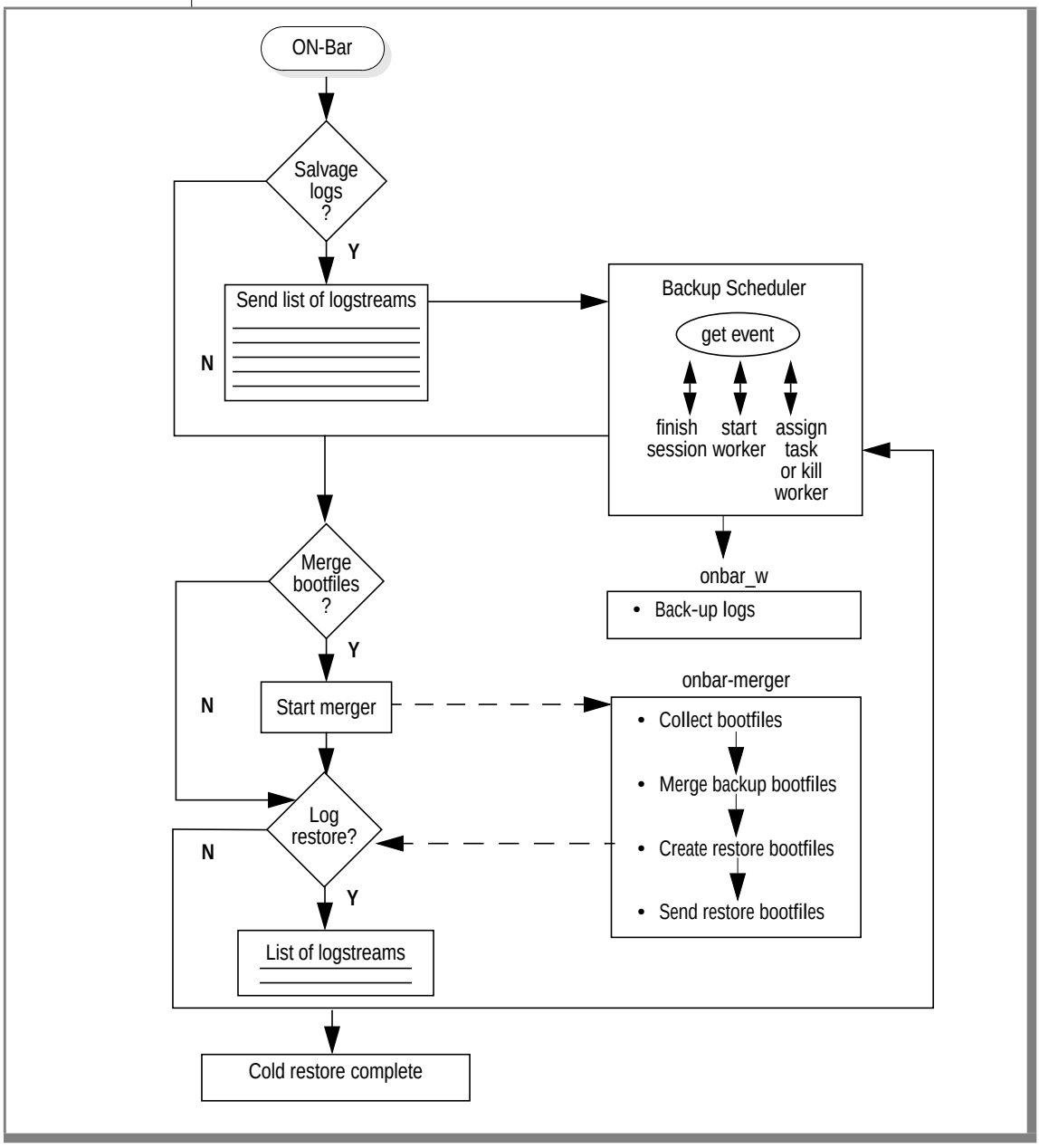
Cold Restore Sequence

If the server is in microkernel mode, you can do a cold restore. Figure 1-9 on page 1-32 describes the ON-Bar cold restore sequence.

In a cold restore, ON-Bar salvages the logical logs, if necessary, and then it starts the **onbar-merger** utility. The **onbar-merger** utility collects and processes the backup emergency boot files from each coserver to determine what backups are required. The **onbar-merger** then creates the restore boot file and copies it to each coserver that contains a backup emergency boot file. (You can specify in the BAR_WORKER_COSERVER configuration parameter which coservers have boot files and run **onbar-worker** processes.)

For each storage space, ON-Bar restores the last level-0 backup, then the level-1 backup (if it exists), and the level-2 backup (if it exists). Finally, it restores the logical logs.

Figure 1-9
ON-Bar Cold Restore Process



Parallel and Serial Backups and Restores

For speed and efficiency, ON-Bar can perform parallel backups and restores. For example, ON-Bar can back up multiple storage spaces at a time. However, you might want to back up or restore data serially. You can back up in serial and restore in parallel, or vice versa.

Specifying a Parallel Backup or Restore

The BAR_WORKER_MAX configuration parameter determines how many storage spaces and logical logs can be backed up or restored in parallel on each storage manager. BAR_WORKER_MAX also specifies how many **onbar-worker** processes you can start on each coserver. The database server automatically starts a new **onbar-worker** to process a request unless the total number of active **onbar-worker** processes on the storage manager has reached the maximum number defined in BAR_WORKER_MAX.

In general, set the BAR_WORKER_MAX value to the number of tape drives available to each coserver. If the database server has multiple storage managers configured, the number of parallel operations is the sum of BAR_WORKER_MAX for each storage manager. For information about how to set storage-manager parameters, see "Setting Local ON-Bar Configuration Parameters" on page 4-10.

Specifying a Serial Backup or Restore

You can specify serial backups and restores with Dynamic Server with AD and XP Options in two ways:

- Set BAR_WORKER_MAX to 0.

  Dynamic Server with AD and XP Options does not automatically start any **onbar-worker** processes. You must start the **onbar-worker** processes manually before you can back up or restore data.

- Set BAR_WORKER_MAX to 1.

  Dynamic Server with AD and XP Options starts one **onbar-worker** and backs up or restores the data serially.

Chapter

2

Setting Up ON-Bar with the Storage Manager

This chapter provides the information that you need to plan and set up ON-Bar with a storage manager in a test environment. The test configuration of ON-Bar and a single instance of Informix Storage Manager (ISM) will provide a simple backup and restore.

The ISM server is installed with the Informix database server on UNIX or Windows NT. The ISM Administrator graphical user interface is installed with Informix Enterprise Command Center on Windows NT or Windows 95.

General background information about how ON-Bar and the storage manager work together appears in Chapter 1, "The ON-Bar Backup and Restore System."

Planning a Backup System for a Production Database Server

To plan for adequate backup protection for your data, analyze your configuration and activity and the types of backup media available at your installation. Also, decide whether to use ISM or a third-party storage manager.

Analyzing Your Database Server System

Evaluate the following database server and hardware configuration elements to determine which storage manager and storage devices to use. Also, determine the number of storage-manager instances that you should configure and the number of storage devices that you need:

- The number of hardware nodes, the number of coservers on those nodes, and how the coservers are distributed across the nodes

  Balance these factors against the number of storage devices and storage-manager instances. The architecture of some platforms limits where you can attach devices, but the number of coservers in your Dynamic Server with AD and XP Options increases processing requirements. The storage-manager sections of the ONCONFIG file should reflect these considerations.

  Although some nodes in a Massively Parallel Processing (MPP) system might not be running coservers, they might be able to run part of the storage manager.

- The number of I/O virtual processors on each coserver, the kind of high-speed interconnect on the MPP system, and the speed of the disks where storage spaces and logical logs are stored

  The Dynamic Server with AD and XP Options subsystem that passes data to ON-Bar uses I/O virtual processors, so ON-Bar throughput depends in part on whether I/O virtual processors are available for it.

- The speed of disks

  Because disks are slower than the high-speed interconnect, it could create a bottleneck in the interconnect. Distributing devices across multiple nodes might reduce the amount of traffic across the interconnect and allow more parallelism.

- The amount of memory available on each node and the distribution of processor activity across nodes

  To calculate the amount of memory that each **onbar-worker** process requires, use the following formula:

  ```
  required_memory = (BAR_XPORT_COUNT * BAR_XFER_BUFSIZE *
  PAGE_SIZE) + 5 MB
  ```

  The ONCONFIG file section for each storage manager specifies the settings for BAR_XPORT_COUNT and BAR_XFER_BUFSIZE. The page size is 4 kilobytes on Windows NT and either 2 or 4 kilobytes on UNIX, depending on the platform.

Analyzing Your Database Server Usage Requirements

The following database server usage requirements also affect your decisions about the storage manager and storage devices:

- The amount and rate of transaction activity that you expect, the size of each logical-log stream, how the transaction activity is distributed across logical-log streams, and when it occurs

  If you are running an OLTP system with many transactions evenly distributed across coservers, your storage manager and storage-device requirements are different from a DSS system, which usually generates few transactions.

  In addition, if logstreams are the same size on each coserver but activity is not evenly distributed, space and resources are wasted. You should adjust them for efficiency.

- The size and number of storage spaces in the database

  When ON-Bar backs up each storage space, it also records the backup event and finds the next storage space to process. Because this processing time is the same for each storage space, many small storage spaces take slightly longer to back up than a few large storage spaces of the same total size.

- Whether storage spaces are mirrored and how easy it is to regenerate data if they are not, as opposed to restoring data from a backup tape

  If storage spaces are mirrored, you usually do not have to restore damaged or corrupted data. Although DSS databases might not be mirrored, they might be easier to re-create from the original external source than to restore from backups if they are corrupted or damaged. For OLTP systems, regenerating data from external sources is rarely possible.

- The number of incremental backups that you want to restore if a disk or system failure requires you to rebuild the database

  All backups take about the same amount of time, although incremental backups use fewer tapes. Restoring storage spaces from incremental backups, however, is much faster than restoring from a level-0 backup and logical-log backups because transactions in the logical logs must be interpreted as they are applied to the physically restored database files.

- The length of time users are interrupted during backups and restores

  You can perform ON-Bar backups and warm restores without shutting down the database server and interrupting end users. Performance in a cold restore is important because it requires shutting down the database server.

- The logging mode of tables

  If storage spaces have many nonlogging tables, logical-log usage is reduced and might require less frequent backups.

- The number and size of logical logs

  If you need to restore data from a database server with very little transaction activity, define many small logical logs. The logical-log restore time is faster with many small logical logs. You are less likely to lose data because of infrequent logical-log backups.

- The type of restores, whether storage space, database, or server

  The way that you structure your database determines what type of restore to use. ON-Bar backs up data in storage-space units. If you isolate tables or databases in a single storage space or in a dbslice across coservers, you can restore single tables or databases.

  When you design your database-server schema, you should isolate critical databases and tables in specific storage spaces and data that users access frequently.

- The backup schedule

  Not all storage spaces need to be included in each backup or restore. You can schedule backups so that you can back up more often the storage spaces that change rapidly than those that change slowly or never change. (ISM does not support backup scheduling.)

Choosing Storage Managers and Storage Devices

The storage manager manages the storage devices to which the backed-up data is written. ISM is included with your database server. For information on how to use ISM, refer to the *Informix Storage Manager Administrator's Guide*.

If you choose a different storage manager, consider whether it has the features that you need to back up your storage spaces and logical logs across all coserver nodes. When you choose storage devices, make sure that they are compatible with the storage manager that you choose. The storage devices should have the speed and capacity that your backups require.

Analyzing Storage-Manager Requirements

ISM fulfills the following storage-manager requirements:

- ISM allows you to back up logical logs and storage spaces to different devices and to specify whether to use encryption or compression for data.
- ISM can write the output of parallel backups to a single device, medium, or volume. Some backup devices can write data faster than the disks used to hold storage spaces can be read.

  If you choose a different storage manager, consider whether it allows multiple data streams to a single storage device.

- ISM can automatically switch from one tape device to another when the volume in the first device fills.

  If you choose a different storage manager, consider whether it supports automatic switching from one device to another.
- ISM allows migration of data from one backup medium to another.

  For speed, you can back up logical logs to disk, but you must move them later to tape or other removable media or your disk will become full.
- ISM uses automatic expiration of data. When all data on a backup device expires, you can reuse that device.
- ISM uses remote procedure calls to transfer data from one process to another across the network.

  Other storage managers might use the high-speed interconnect of the MPP system or shared memory.
- ISM allows you to clone copies of backup data for on-site and off-site storage.
- If you back up to ISM on one coserver node, you can restore it to ISM on a different node.

ISM does not support the following functions:

- Distributing a single data stream across multiple devices simultaneously, which improves throughput if you have several slow devices
- Using different encryption or compression methods for specified storage spaces or databases
- Scheduling backups

Tip: *Some third-party storage managers have environment variables that you must set up so that each* ***onbar-worker*** *process can communicate correctly with the storage manager.*

Analyzing Storage-Device Requirements

Ask the following interrelated questions to determine what storage devices you need. For example, the speed and type of storage devices partly determine the number of storage devices that you need:

- What kind of storage devices do you need?

  The transaction volume and the size of your database are major factors in determining the kind of storage devices that you need.

  ISM supports simple tape devices such as QIC, 4mm, 8mm, DLT, optical devices, and hard-drive backups. ISM does not support tape libraries, jukeboxes, and storage devices that automatically change the backup tapes. If ISM cannot manage the storage devices that you need, you need to purchase a different storage manager. For further information on the storage devices that ISM supports, see the *Informix Storage Manager Administrator's Guide*.

- What is the availability requirement for each device?

  Is it important for your storage devices to allow random as well as sequential access? If so, you cannot use tape storage devices.

- How many storage devices do you need?

  ISM supports up to four devices per host. The number of storage devices that you need depends on the kind of storage devices that you have, how they are distributed across coserver nodes, how much transaction activity occurs on the database server, how fast throughput is, how much time you can allow for backups, and other similar factors.

- How can storage devices be distributed across coserver nodes?

  Configure one ISM server per MPP node where backup devices will be attached. Some hardware platforms limit the number of devices that can be attached to a node.

Installing and Configuring the Storage Manager

Follow the instructions in the storage-manager documentation to install and configure the storage-manager software on at least one node of the database server.

Configuring the Storage Manager

Before you begin using ISM to manage your database server backups, you must perform the following configuration tasks. If you are using a third-party storage manager, perform steps 1, 3, and 4:

1. Set ON-Bar configuration parameters and environment variables.
2. Configure the ISM server properties.
3. Configure your storage devices.
4. Label your storage volumes.
5. Designate a safe place to keep the ISM server bootstrap printouts.

Once you configure the ISM server and storage devices and label volumes for your database server and logical-log backups, you are ready to initiate a backup or restore operation with ON-Bar. For details, see the *Informix Storage Manager Administrator's Guide*.

Configuring a Third-Party Storage Manager

Storage managers have slightly different installation and configuration requirements. Make sure that you follow the manufacturer's instructions carefully. If you have difficulty with the storage-manager installation and configuration, please contact the manufacturer directly.

Important: *Each hardware MPP node that contains a coserver that runs* ***onbar-worker*** *processes must have a local copy of the storage-manager version of the XBSA shared library. The default location of the XBSA shared library is* ***/usr/lib/ibsad001.platform_extension*** *on UNIX. The default location is* ***%ISMDIR%\bin\libbsa.dll*** *on Windows NT. For more information, see "Specify the Location of the XBSA Library" on page 2-19.*

To configure your storage devices, follow the instructions in your storage-manager documentation. The storage manager must know the node and device names of the storage devices that it should use.

Some storage managers let you specify the kind of data to back up to specific storage devices. For example, you might be able to configure the storage manager to back up logical logs to one device and storage spaces to a different device for more efficient backups and restores.

Configuring ON-Bar

ON-Bar is installed with your Dynamic Server with AD and XP Options software. To use ON-Bar with installed storage managers, set specific parameters in the ONCONFIG file. Use the **onconfig.std** file as a template for single coservers. Use the **onconfig.xps** file as a template for multiple coservers. The following section describes the required ON-Bar configuration parameters.

Setting Environment Variables

When you use ISM, you can set certain ON-Bar environment variables that affect the way in which the ISM server handles requests. For information, see "On-Bar Environment Variables for Use With ISM" on page 4-15.

Editing the ONCONFIG File

The ONCONFIG file contains a global parameter section and at least one storage-manager configuration section:

- The global section of the ONCONFIG file contains all parameters that apply to the entire database server or are identical for all coservers, as follows:
  - BAR_RETRY
  - LOG_BACKUP_MODE

- You can include the following ON-Bar parameters in the global section if they are the same for all storage-manager instances. Put these parameters in the storage-manager section between the BAR_SM and END pair if they are different for each storage-manager instance:
  - BAR_ACT_LOG
  - BAR_BOOT_DIR
  - BAR_BSALIB_PATH
  - BAR_IDLE_TIMEOUT
  - BAR_WORKER_MAX
  - BAR_XFER_BUFSIZE
  - BAR_XPORT_COUNT

  Include BAR_BSALIB_PATH in the storage-manager definition sections instead if the libraries are not in the same location on all nodes or if you use storage managers from more than one manufacturer.
- If you use ISM, you can specify the volume pool names for storage spaces and logical logs in the ONCONFIG file. Specify these parameters in either the global or storage-manager definition sections. If you do not set these parameters, ISM uses the default volume pool names ISMData and ISMLogs:
  - ISM_DATA_POOL
  - ISM_LOG_POOL
- You must define each storage manager that you have installed and configured in the storage-manager section, as illustrated in "Defining a Storage Manager on a Five-Coserver AD / XP System" on page 2-14. The following parameters belong in the storage-manager section only:
  - BAR_SM (required; starts the storage-manager section)
  - BAR_WORKER_COSVR (required)
  - BAR_SM_NAME
  - BAR_DBS_COSVR
  - BAR_LOG_COSVR

Important: *ON-Bar does not use the TAPEDEV, TAPEBLK, TAPESIZE, LTAPEDEV, LTAPEBLK, and LTAPESIZE configuration parameters.*

Examples of ON-Bar and Storage-Manager Configurations

This section shows sample configuration parameters for ON-Bar and the storage-manager definition. Use this configuration to test a simple backup and restore. For more information about each configuration parameter, refer to Chapter 4, "Configuring ON-Bar."

UNIX

Sample ON-Bar Parameter Values (UNIX)

```
# Backup/Restore Variables
BAR_ACT_LOG       /tmp/bar_act.log    # Path of activity log
BAR_RETRY           1  # Number of times to retry failures
BAR_XPORT_COUNT    10  # Number of transport buffers per worker
BAR_XFER_BUFSIZE    8 # Size of each transport buffer in pages
LOG_BACKUP_MODE   CONT  # Backup as soon as logical log fills
BAR_IDLE_TIMEOUT    5   # How long onbar-workers wait
BAR_BSALIB_PATH   /usr/lib/ibsad001.so # XBSA shared lib path
```

WIN NT

Sample ON-Bar Parameter Values (Windows NT)

```
# Backup/Restore Variables
BAR_ACT_LOG     %INFORMIXDIR%\bar_myserver.log # Activity log
path
BAR_RETRY           1  # Number of times to retry failures
BAR_XPORT_COUNT    10  # Number of transport buffers per worker
BAR_XFER_BUFSIZE    8 # Size of each transport buffer in pages
LOG_BACKUP_MODE   CONT  # Backup as soon as logical log fills
BAR_IDLE_TIMEOUT    5   # How long onbar-workers wait
BAR_BSALIB_PATH c:\ism\bin\libbsa.dll# XBSA shared lib path
```

Creating a Minimal Storage-Manager Definition

The following configuration example is for a storage manager that can run on coservers 1, 2, 3, 4, and 7. In this configuration, you have to start **onbar-worker** processes manually on coservers 1, 2, 3, 4, and 7. All storage spaces and logical logs are backed up to this storage-manager instance.

```
BAR_SM 1
BAR_WORKER_COSVR 1-4,7
END
```

Defining a Storage Manager on a Five-Coserver AD/XP System

The following example is a simple storage-manager definition that automatically starts a single **onbar-worker** process on coserver 1. Data on coservers 1 through 5 is backed up or restored to the storage manager on coserver 1. If you omit the BAR_WORKER_MAX parameter, you must start **onbar-worker** processes manually. For more information, see "Starting Onbar-Worker Processes Manually" on page 2-18.

```
# Storage Manager instances
BAR_SM           1    # Storage manager ID
    BAR_SM_NAME      A   # Storage manager name
    BAR_WORKER_COSVR 1    # Storage mgr is on coserver 1
    BAR_DBS_COSVR    1-5  # Route dbspaces to this storage mgr
    BAR_LOG_COSVR    1-5  # Route logs to this storage mgr
    BAR_WORKER_MAX   1    # Number of onbar-workers
END
```

Defining the Number of Onbar-Worker Processes on Two Storage Managers

The following example defines different storage managers on two coservers. Because the global BAR_WORKER_MAX value is 3, storage manager **BAKER** on coserver 2 can have three **onbar-worker** processes executing in parallel. For storage manager **ABEL**, the local BAR_WORKER_MAX value overrides the global BAR_WORKER_MAX value. Storage manager **ABEL** can have one **onbar-worker** executing at a time.

```
# Global section
BAR_WORKER_MAX    3  # Global value for no. of onbar-workers

# Storage Manager ABEL
BAR_SM  1
    BAR_WORKER_MAX     1 # only one onbar-worker defined
    BAR_DBS_COSVR      1
    BAR_LOG_COSVR      1
    BAR_WORKER_COSVR   1
END

# Storage Manager BAKER
BAR_SM  2
    BAR_DBS_COSVR      2
    BAR_LOG_COSVR      2
    BAR_WORKER_COSVR   2
END
```

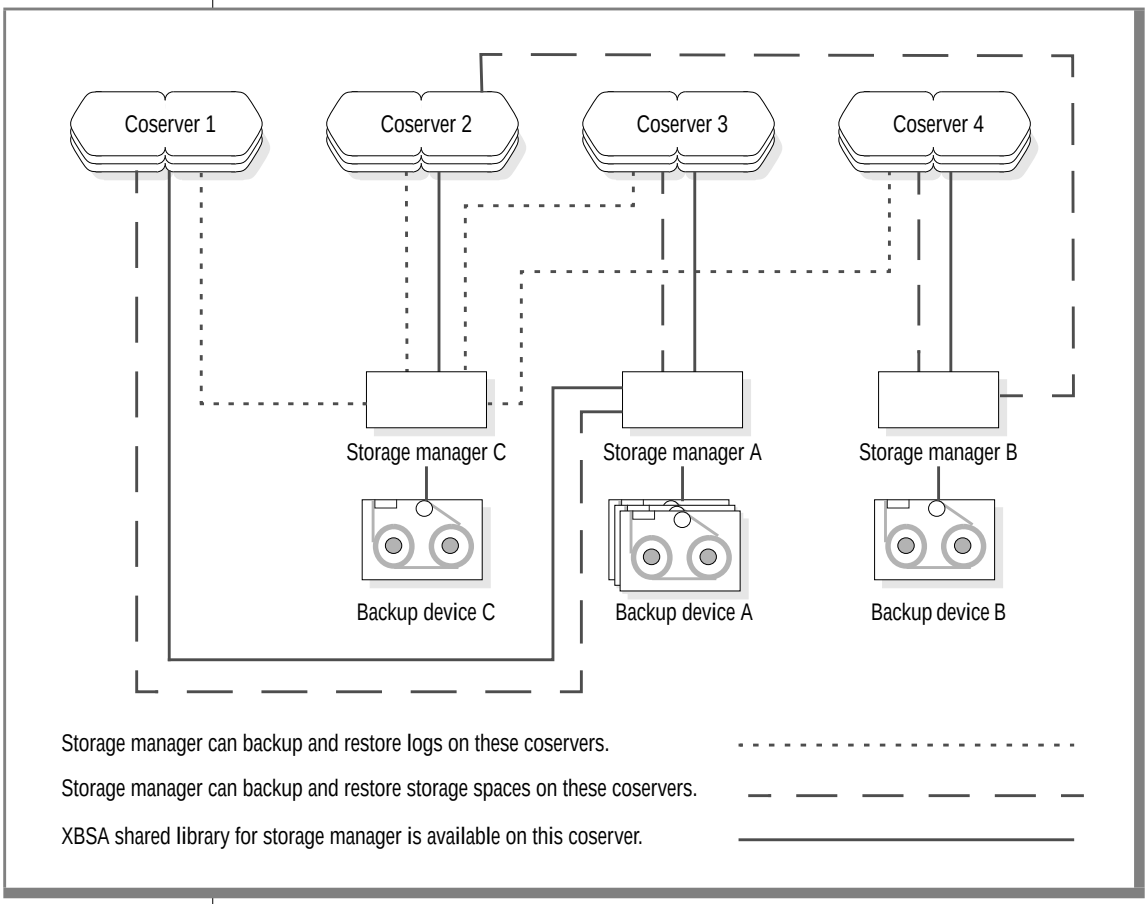
Defining Three Storage Managers and Storage Devices

The configuration in Figure 2-1 on page 2-16 shows how you might set up three storage managers and three backup devices:

- A, a silo with two drives and two connections, one to coserver 1 and the other to coserver 3
- B, a tape autochanger connected to coserver 4
- C, a simple tape drive connected to coserver 2

Storage manager A can back up and restore storage spaces on coservers 1 and 3. Storage manager B can backup and restore storage spaces on coservers 4 and 2. Storage manager C can backup and restore logs on all four coservers.

Figure 2-1
Storage-Manager Configuration



The ONCONFIG definitions for storage managers A, B, and C appear in the following example:

```
# Storage manager section for storage manager A
SM_ID 1
SM_NAME A
BAR_WORKER_COSVR 1,3
BAR_DBS_COSVR 1,3
BAR_LOG_COSVR 0
BAR_WORKER_MAX 2
END
# Storage manager section for storage manager B
SM_ID 2
SM_NAME B
BAR_WORKER_COSVR 4
BAR_DBS_COSVR 2,4
BAR_LOG_COSVR 0
BAR_WORKER_MAX 1
END
# Storage manager section for storage manager C
SM_ID 3
SM_NAME C
BAR_WORKER_COSVR 2
BAR_DBS_COSVR 0
BAR_LOG_COSVR 1 - 4
BAR_WORKER_MAX 1
END
```

Adding Storage-Manager-Specific Information

Skip this section if you use ISM. For each storage-manager instance, make sure that:

- the **onbar-worker** processes are started with the environment variables and other features that the storage manager expects.

  To learn how to start **onbar-worker** processes, read "Starting Onbar-Worker Processes Manually" on page 2-18.

- ON-Bar can find the storage-manager version of the XBSA shared library.

  To find out where ON-Bar expects to find this library, read "Specify the Location of the XBSA Library" on page 2-19.

- the storage manager is compatible with the latest version of ON-Bar.

  To find out where this information is stored, read "Verify Compatibility Information" on page 2-20.

Starting Onbar-Worker Processes Manually

To start **onbar-worker** processes manually, execute the **onbar_w** utility.

UNIX

Use the shell script, **start_worker.sh** in **$INFORMIXDIR/etc**, to start **onbar-workers** manually or to perform additional setup and cleanup tasks when the database server starts the **onbar-worker** processes. The default **start_worker.sh** file contains only one line, which calls **onbar_w** to start an **onbar-worker** process. ♦

WIN NT

On Windows NT, the batch file is called **start_worker.bat**. ♦

If the storage manager does not have special requirements for worker processes that pass data to it, you do not have to change the **start_worker** script or batch file.

If the storage manager has special requirements, edit **start_worker** to include operating-system commands that set up the environment before starting the **onbar-worker** process, or perform other required actions after **onbar-worker** processes start.

The storage-manager documentation should describe any special requirements. If **onbar-worker** processes are not working correctly with a storage manager, check if the storage manager has any special requirements. If they are not listed in the documentation, or if they are not clearly stated so that you can add them to **start_worker**, contact the storage-manager manufacturer directly for more information.

Specify the Location of the XBSA Library

Regardless of how you specify the location of the XBSA library, it must be present on each hardware node where **onbar-worker** processes are started.

UNIX

The default location on UNIX is **/usr/lib/ibsad001.*platform_extension***. For UNIX operating systems, you can make **/usr/lib/ibsad001.*platform_extension*** a symbolic link to the correct library. ♦

If you are using ISM, the default location is **%ISMDIR%\bin\libbsa.dll** on Windows NT and **$INFORMIXDIR/lib/libbsa.*platform_extension*** on UNIX.

Specify the location in the BAR_BSALIB_PATH parameter if you are not using the default XBSA library. If you are using a third-party storage manager, the default location depends on where the storage manager is installed. ON-Bar must use the version of the XBSA library that the storage-manager manufacturer provides.

You can specify BAR_BSALIB_PATH in the global section of the ONCONFIG file if you configure:

- One storage manager.
- Storage managers from one more vendors if each shared XBSA library has the same path on each node, and the paths are not NFS-mounted.

  If each XBSA library uses a different path, you must specify BAR_BSALIB_PATH in each storage-manager-specific section of the ONCONFIG file.

Figure 2-2 on page 2-20 summarizes the rules for specifying the location of the XBSA library. If the extension for your platform is not listed here, refer to the machine notes.

Figure 2-2
Specifying the Location of the XBSA Library

Location	AIX 3.x	AIX 4.x	UNIX (Other)	Windows NT
/usr/lib/ibsad001.o	Yes	No	No	No
/usr/lib/ibsad001.*ext*	None	**.o**	**.sl** or **.so**	**.dll**
Library pathname in BAR_BSALIB_PATH	No (use **$LIBPATH** environment variable instead)	No (use **$LIBPATH** environment variable instead)	Yes	Yes
Symbolic link	Yes	Yes	Yes	No
LIBPATH environment variable in **onbar** or **start_worker** scripts	No	Yes	Depends on the platform	No

Verify Compatibility Information

Before ON-Bar starts a backup or restore process, it calls the currently installed version of the storage-manager-specific XBSA shared library to get its version number. If this version is compatible with the current version of ON-Bar and is defined in the **$INFORMIXDIR/etc/sm_versions** file, ON-Bar begins the requested operation. The information from the **sm_versions** file is in the **bar_version** table in the **sysutils** database.

If you are using a third-party storage manager, the vendor supplies a row for the **bar_version** table that contains the version number. Add this row to the **bar_version** table in the **sysutils** database and to the **sm_versions** file in the **$INFORMIXDIR/etc** directory (UNIX) or **%INFORMIXDIR%\etc** directory (Windows NT) on every coserver node where you can run **onbar-worker** processes. If you update these files, reinitialize the database server for the changes to take effect.

For more information, see "The bar_version Table" on page 5-6.

Before You Make Your First Test Backup

Check the items in this list to make sure that ON-Bar and your storage manager are set up correctly:

- The storage manager is installed and configured to manage specific storage devices.
- If you are using a third-party storage manager, make sure that the XBSA shared library is specified correctly by the ONCONFIG file BAR_BSALIB_PATH parameter or is in the default location.
- The BAR_WORKER_MAX parameter is set to a number greater than 0 in the storage-manager-specific section of the ONCONFIG file.
- The **sm_versions** file in the **$INFORMIXDIR/etc** (UNIX) or **%INFORMIXDIR%\etc** (Windows NT) directory on the database server contains a row that identifies the version number of the storage-manager-specific XBSA shared library.

After you verify that ON-Bar and your storage manager are set up correctly, run ON-Bar on your test database to make sure that you can back up and restore data. For information about performing backups and restores, follow the instructions in Chapter 3, "Using ON-Bar."

Using ON-Bar When You Upgrade the Database Server

Use ON-Bar to perform a level-0 backup of all storage spaces and logical logs before you upgrade your database server. Save these backups so that you can restore the data in case you need to revert to the old database server version. Also, back up the administrative files before you upgrade (see "What Is Not Backed Up by ON-Bar?" on page 1-11).

Do not try to restore these backups to the newer version of the database server. Backups that you make under the older version of the database server are not compatible with the newer version of the database server. After you upgrade the database server, create a new backup of all storage spaces, logical logs, and administrative files.

Also, do not use ON-Bar to migrate the data from one backup storage device to another. Use one of the migration utilities that the *Informix Migration Guide* documents.

Important: *You also need to re-create the* ***sysutils*** *database if you are upgrading to Dynamic Server with AD and XP Options 8.2 from any version of 8.x before 8.11.UF1. If you are upgrading from 8.11.UF1, you do not need to re-create the* ***sysutils*** *database.*

Chapter

3

Using ON-Bar

The first part of this chapter explains the preliminary tasks that you need to complete to perform a successful backup. The rest of this chapter explains how to back up and restore storage spaces (dbspaces) and logical-log files in a production environment.

The **onbar** utility is a wrapper to **onbar_d**, the ON-Bar driver. You can use the same commands with **onbar_d** as with **onbar**. You can use any of the following methods to execute ON-Bar backup and restore commands:

- Issue ON-Bar commands

  To execute the ON-Bar commands that are described in this chapter, you must be user **root** or **informix** on UNIX. On Windows NT, you must be user **informix**.

- Include ON-Bar and ISM commands in a shell script or batch file

  For information, see "Using the Onbar Script to Customize On-Bar and ISM Commands" on page 3-25.

- Use BAR in Informix Enterprise Command Center (IECC) to perform and monitor backup and restore operations

  For information, see the *Informix Enterprise Command Center User Guide*.

- Call ON-Bar from a job-scheduling program

Preparing for a Backup

This section explains the preliminary steps that you must take before you perform storage space and logical-log backups.

Installing and Configuring a Storage Manager

Before you can create a backup with ON-Bar, you must configure ISM (or another storage manager) on one or more coservers. You can install and configure more than one storage manager if you have more than one storage device, such as a single tape drive and a jukebox, and you want to connect the devices on different nodes.

Instructions for a simple ON-Bar and ISM test configuration appear in Chapter 2, "Setting Up ON-Bar with the Storage Manager." For information about ONCONFIG settings for storage managers, see "Setting Local ON-Bar Configuration Parameters" on page 4-10.

Make sure your storage manager is ready to receive data before you begin a backup or restore. Reserve separate storage devices for storage space and logical-log backups. Label and mount all tapes in the storage device. The backup or restore will pause until you mount the requested tape or optical disk.

For information about configuring ISM, see the *Informix Storage Manager Administrator's Guide*. For information about configuring third-party storage managers, see your storage-manager manuals.

Synchronizing Administrative Tasks with Backups

The following administrative changes require a level-0 backup as part of the procedure. Consider waiting to make these changes until your next regularly scheduled level-0 backup.

To ensure that you can restore data, you need to make a level-0 backup of the root dbspace when you:

- add mirroring.
- add a logical-log file.
- change the size or location of the physical log.
- drop a chunk.

To reclaim space or create new dbspaces or logical-log files, make a level-0 backup of all affected dbspaces when you make the following changes:

- After you change your storage-manager configuration
- After you add a dbspace and before you restore
- After you start mirroring for a dbspace that contains logical-log files
- After you add a logical-log file (to make the log file available)
- After you drop a logical-log file
- After you move one or more logical-log files, drop the old logical-log file, and add the new logical-log file
- After you change the size or location of the physical log and reinitialize shared memory
- After you drop a chunk (before you can reuse the dbspace that contains that chunk)

Ensuring Successful Completion of the Backup

Before you create a backup, perform the following tasks to help ensure successful completion of the backup:

- Be sure that you have enough logical-log space to create a backup.
- Print or keep a copy of essential database server configuration information.
- Verify data consistency.

Ensuring That You Have Enough Logical-Log Space

Back up logical logs to free space:

- The database server does not permit new transactions if only one logical-log file is available on the coserver.
- If only one backup device is available, make sure that as many logical-log files as possible are backed up before you start to back up storage spaces. This precaution frees space in your logical-log files.

Copying Database Server Configuration Information

Copy your database server configuration information.

As explained in "What Is Not Backed Up by ON-Bar?" on page 1-11, ON-Bar does not back up important database configuration files. Before you back up dbspaces, make sure that you have a current backup copy of the following database configuration files. These files are stored in **$INFORMIXDIR/etc** on UNIX and in **%INFORMIXDIR%\etc** on Windows NT:

UNIX

- The **sqlhosts** file ♦
- The **oncfg** file for each coserver
- One emergency boot file per coserver that supports an **onbar-worker** process
- The **xcfg** file for the database server
- One **ONCONFIG** file per **INFORMIXDIR**

Tip: *The* ***oncfg*** *and* ***xcfg*** *files are in the* ***$INFORMIXDIR/etc*** *directory on UNIX and* ***%INFORMIXDIR%\etc*** *directory on Windows NT.*

Verifying Database Integrity

Verify consistency before a level-0 backup.

To ensure the integrity of your backups, periodically verify that all database server data is consistent before you create a level-0 backup. You do not need to check for consistency before every level-0 backup. Informix recommends, however, that you do not discard a backup that was verified for consistency until the next time that you verify the consistency of your database. For information on how to check for consistency, see your *Administrator's Guide*.

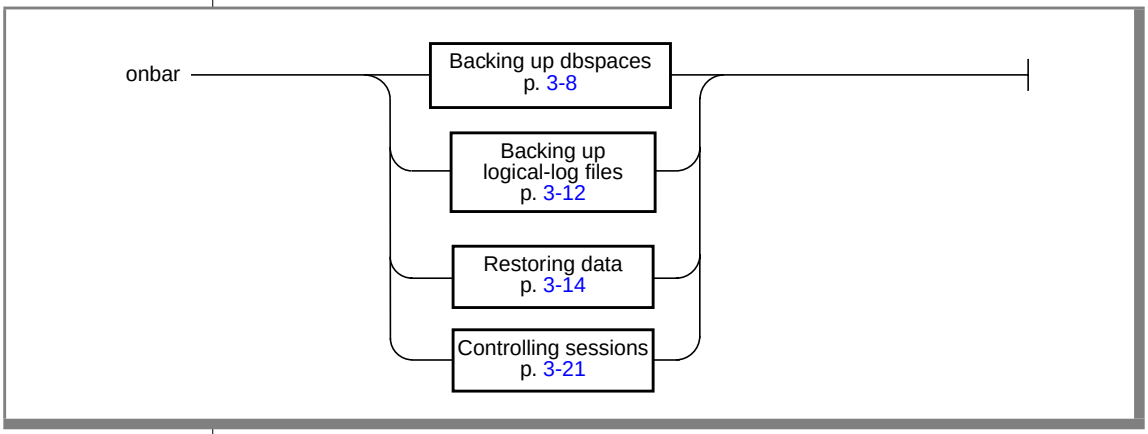
Verifying That the Database Server Is On-Line or Quiescent

You cannot create a backup while Dynamic Server with AD and XP Options is off-line. For information on how to change modes, see your *Administrator's Guide*.

Backing Up Storage Spaces and Logical Logs

The **onbar** utility provides options that enable you to back up storage spaces and logical logs and to restore data from these backups.

Each command-line invocation of the **onbar** utility creates a session that by default is named DBSERVERNAME*process_id*. Use the **onstat** utility to monitor ON-Bar sessions. For information about the **onstat** utility, see your *Administrator's Guide*.



Backing Up Storage Spaces

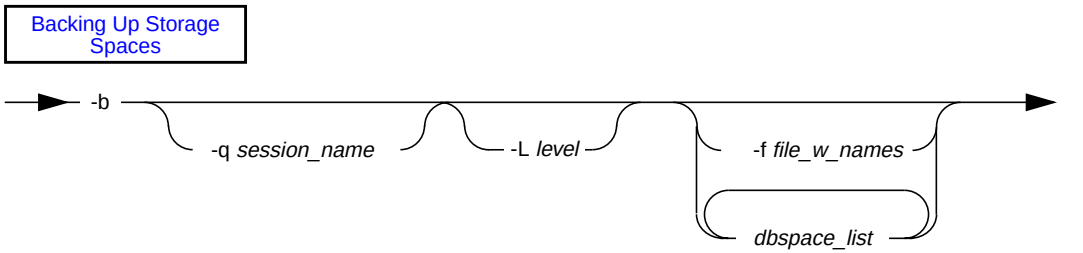
The database server must be in on-line or quiescent mode to perform a backup. Use the **onbar -b** option to automatically back up the storage spaces and logical logs. Only on-line dbspaces are backed up. Use the **-d** option of the **onstat** utility to determine which dbspaces are on-line.

Important: *You cannot back up or restore temporary dbspaces.*

When the ISM server receives a backup request from ON-Bar, it displays label and mount requests in the Devices window of the ISM Administrator program. During a backup, the ISM server automatically routes storage-space data to volumes in the ISMData volume pool and logical-log files to volumes in the ISMLogs volume pool, or whatever pools are specified in the ONCONFIG file.

Always keep the volumes from the ISMLogs pool mounted to ensure that a storage device is always available to accept logical-log data. If the volume is not mounted, the backup will pause.

If you are using ISM, **onbar -b** also backs up the ISM catalog that contains information about the backed up data. During the backup operation, ISM creates *save sets* of the backed up data and enters records in the ISM catalog.



Element	Purpose	Key Considerations
-L *level*	Specifies the level of backup to perform: ■ 0 for a complete backup ■ 1 for changes since the last level-0 backup ■ 2 for changes since the last level-1 backup The default for *level* is 0.	If you request an incremental backup and ON-Bar finds that no previous level backup has been performed for a particular dbspace, ON-Bar performs a backup at the previous level instead. For example, if you request a level-1 backup, and ON-Bar finds no level-0 backup, it makes a level-0 backup instead. It does not create a level-0 and a level-1 backup.
-b	Specifies a backup process.	Backs up the storage spaces, logical logs, and the ISM catalog, if it exists.

(1 of 2)

Element	Purpose	Key Considerations
-f *file_w_names*	Backs up the dbspaces or dbslices that are listed (one per line) in the text file whose pathname *file_w_names* provides.	Use this option to avoid entering a long list of dbspaces or dbslices every time that you backup. The filename can be any valid UNIX or Windows NT filename, including simple (**listfile_1**), relative (**../backup_lists/listfile_2** or **..\backup_lists\listfile**), and absolute (**/usr/informix/backup_lists/listfile3** or **c:\informix\backup_lists\listfile3**) filenames.
-q *session_name*	Allows you to assign a name to the backup session. This name appears in the **onstat** utility so that you can follow the progress of the backup.	This option defaults to DBSERVERNAME*process_ID*.
dbspace_list	Names a dbspace or dbslice to be backed up.	If you do not enter *dbspace_list* or **-f** *file_w_names*, ON-Bar backs up all objects that the database server manages. If you enter a dbslice name, it is translated to the names of all dbspaces in the dbslice. If you enter more than one dbspace or dbslice name, use a space to separate the names.

(2 of 2)

Examples of ON-Bar Backup Commands

The following sections contain examples of ON-Bar syntax for backing up storage spaces.

Performing an Incremental Backup

To perform an incremental (level-1) backup, use the **-L 1** option. If you do not specify any storage-space names, all the storage spaces on the database server are backed up.

```
onbar -b -L 1
```

Performing a Complete Backup of Specified Storage Spaces

To perform a complete backup of specified storage spaces (for example, two dbspaces named **fin_dbspace1** and **fin_dbspace2**), use the **-b** option as the following example shows. You could also specify the **-L 0** option, but it is not necessary.

```
onbar -b fin_dbspace1 fin_dbspace2
```

To back up all dbspaces in a dbslice named **fin_slice**, use the following command:

```
onbar -b fin_slice
```

Backing Up a List of Storage Spaces

To back up a list of storage spaces specified in a file, use the following command:

```
onbar -b -f /usr/informix/backup_list/listfile3
```

Assigning a Name to a Backup Session

To assign a name to a backup session, use the following command:

```
onbar -b -q session1
```

Backing Up the ISM Catalog

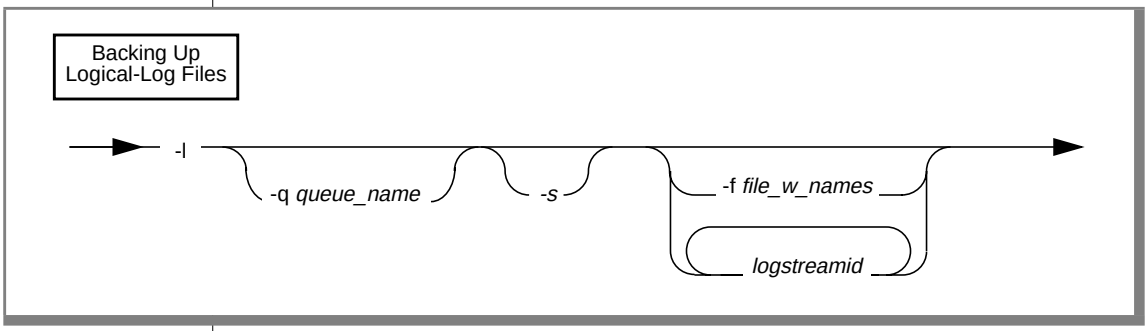
If you are using ISM, use this command to back up the ISM catalog:

```
ism_catalog -create_bootstrap
```

If you use the **onbar** shell script to back up storage spaces and logical logs, it also backs up the ISM catalog automatically. If you call **onbar_d** directly, you must use the **ism_catalog -create_bootstrap** command.

Backing Up Logical-Log Files

If you are unfamiliar with logical-log backups, see "What Is a Logical-Log Backup?" on page 1-15.



Element	Purpose	Key Considerations
-f *file_w_names*	Backs up the *logstreamid*s that are listed (one per line) in the text file whose pathname *file_w_names* provides.	Use this option to avoid entering a long list of *logstreamid*s every time that you use this option. The filename can be any valid UNIX or Windows NT filename, including simple (**listfile_1**), relative (**../backup_lists/listfile_2** or **..\backup_lists\listfile**), and absolute (**/usr/informix/backup_lists/listfile3** or **c:\informix\backup_lists\listfile3**) filenames.
-l	Performs a backup of full logical-log files.	The current logical-log file is not backed up.
-q *queue_name*	Allows you to assign a name to the backup session. This name appears in the **onstat** utility so that you can follow the progress of the backup.	This option defaults to DBSERVERNAME*process_ID*.
-s	Salvages any logical logs that are still on disk after a database server failure.	If possible, use this option before you replace a damaged disk. If you are performing a cold restore on an undamaged disk, ON-Bar automatically performs a log-salvage operation. For information about salvaging logs, see "When to Salvage Logical-Log Files" on page 1-19.
logstreamid	Uniquely identifies a logical-log stream that a given AD/XP coserver generates.	If you supply more than one *logstreamid*, separate each item in the list with a space. A logstream is a coserver ID.

A storage-space backup triggers a logical-log backup.

Performing a Manual Backup of Logical Logs

If you set LOG_BACKUP_MODE to MANUAL, you must initiate a logical-log backup manually. To back up filled logical-log files manually, use the **onbar -l** command, as the following example shows:

```
onbar -l
```

Performing a Continuous Logical-Log Backup

To perform continuous logical-log backups, set the LOG_BACKUP_MODE configuration parameter to CONT in the ONCONFIG file.

Whenever a logical-log file fills, Dynamic Server with AD and XP Options adds it to the system-log backup session that the Backup Scheduler maintains. If LOG_BACKUP_MODE is set to CONT, the Backup Scheduler automatically starts an **onbar-worker** process, if one is not already active, and assigns the log backup to it.

Using Logical-Log Backup Completion Messages

Each time that the database server backs up a logical-log file, it sends the following message to the database server message log:

```
14:13:05 Logical Log 12 - Backup Started
```

When the database server completes the backup, it sends the following message to the message log:

```
14:13:21 Logical Log 12 - Backup Completed
```

The **onbar-worker** process also records the logical-log backup in the ON-Bar activity log in the format
<date> <time> <process_id> <parent_pid><message>:

```
1997-08-19 15:13:20 3663 3182 Begin backup logical log 12:2
1997-08-19 15:13:20 3663 3182 Successfully connected to storage manager
1997-08-19 15:13:20 3663 3182 Completed backup logical log 12:2
```

You can use the **onstat -l** command to verify that the database server has marked the logical-log file as backed up. Once the logical-log file is marked as backed up, it is free for subsequent use when it is needed again. For more information on how to use the **onstat** utility, see your *Administrator's Guide*.

You can also use Informix Enterprise Command Center on a Windows NT workstation to review ON-Bar messages in the Event Monitor log.

Preventing Logical-Log Backups in a Test System

If you set LOG_BACKUP_MODE to NONE, you cannot back up or restore logical logs, and log salvage does not work. Although you can continue to back up storage spaces, you cannot restore them. The only reason to set LOG_BACKUP_MODE to NONE is to test your Dynamic Server with AD and XP Options system. Do not use LOG_BACKUP_MODE = NONE in a production system.

Restoring Data

This section explains how to use ON-Bar to restore data.

When to Perform a Warm or Cold Restore

Unless your database server has failed, you can restore data in a warm restore. See "The Server Mode for a Warm Restore" on page 1-22. You can perform a *warm restore* of data in noncritical dbspaces under the following circumstances:

- The target storage space is off-line or down. (If the dbspace is on-line, the database server automatically shuts down each dbspace just before it starts restoring that dbspace.)

  Taking the storage space off-line ensures that users do not try to update its tables during the restore process.
- The storage space is on-line, but one of its chunks is off-line, recovering, or inconsistent.

  To determine the state of each storage space and its chunks, examine the output of the **xctl onstat -d** utility.

- A table is fragmented across two dbspaces and one of them is down.

  To recover the fragmented table, restore the down dbspace.
- The target storage space is on-line. (Use the **-O** option to restore an on-line storage space.)

You can perform a *cold restore* of dbspaces no matter what state they were in when the database server went down. Also restore (recopy) the administrative files whenever necessary.

If your database server has failed, you must rebuild your database from a cold restore. The database server must be in microkernel mode. For information on how to put the database server in microkernel mode and how to perform a cold restore, see "The Server Mode for a Cold Restore" on page 1-23. An example of a cold restore appears on page 3-19.

Important: *If you reinitialize the database server after a failure, you must perform a cold point-in-time restore to a time before the database server was reinitialized. When you complete the cold restore, verify that you restored the correct instance of the critical dbspaces and storage spaces.*

Specifying a Physical and Logical Restore

You restore data in two steps:

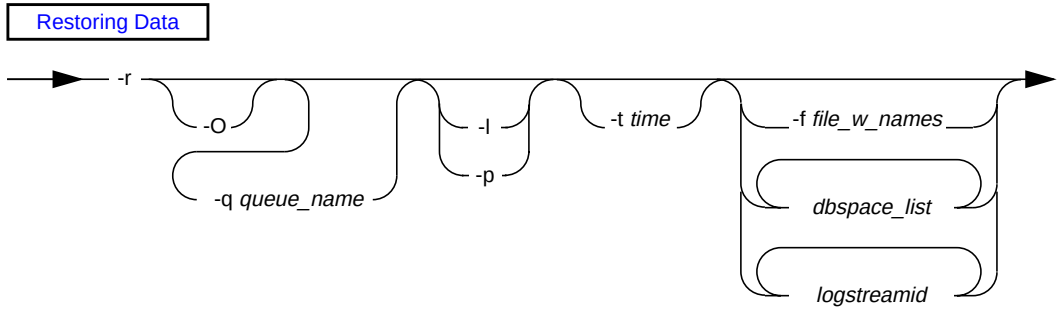
1. Perform a physical restore, which restores dbspaces to their most recent backed-up state.
2. Perform a logical-log backup and logical restore that updates the most recent backed-up version of the dbspaces with later transactions.

The combination of physical and logical restores ensures that tables and indexes are as current as possible. Some transactions made after the most recent logical-log backup might not be recovered if a cold restore is necessary and logical-log files cannot be salvaged.

To perform a physical restore followed automatically by a logical-log backup and restore, use the **onbar -r** command. For finer control, use the **onbar -r -p** command to perform only a physical restore without a logical restore, and then use the **onbar -r -l** command to perform only a logical restore.

You can restore multiple dbspaces separately or concurrently, then perform a single logical restore. Keep in mind, however, that before users can access data, you must perform a physical restore and a logical restore.

Tip: *For faster performance in a restore, assign separate storage devices for backing up storage spaces and logical logs. If physical and logical backups are mixed together on the storage device, it takes longer to scan the tape during a restore.*



Element	Purpose	Key Considerations
-r	Specifies a restore.	None.
-O	Specifies a restore of on-line storage spaces. This option does not re-create missing chunk files.	You can use the **-O** option with the **-q**, **-p**, or **-f** options, or a list of dbspace names. If you specify the **-t**, or **-n** options or *logstreamids* with **-O**, they are ignored.
-f *file_w_names*	Restores the dbspaces or dbslices that are listed (one per line) in the text file whose pathname *file_w_names* provides. For a logical-log restore only, the file contains lists of logstreams instead of dbspaces or dbslices.	Use this option to avoid entering a long list of dbspaces or dbslices every time that you use this option. The filename can be any valid UNIX or Windows NT filename, including simple (**listfile_1**), relative (**../backup_lists/listfile_2**), and absolute (**c:\informix\backup_lists\listfile3**) filenames. You can use dbslice names only for warm restores.
-l	Specifies a logical restore only. Restores and rolls forward the logical logs.	The logical restore applies only to those storage spaces that have already been physically restored.
-p	Specifies a physical restore only.	This option must be followed by a logical restore before data is accessible. This option turns off log salvage during a cold restore.

(1 of 2)

Element	Purpose	Key Considerations
-q *queue_name*	Allows you to assign a name to the restore. This name appears in the **onstat** utility so that you can follow the progress of the backup.	This option defaults to DBSERVERNAME*process_ID*.
-r	Specifies a restore.	None.
-t *time*	Specifies the time of the last transaction to be restored from the logical logs in a cold restore.	Use this option to restore a database to an earlier state. You can use point-in-time restore in a cold restore only. How you enter the time depends on your current GLS locale convention. If the GLS locale is not set, use English-style date format. For more information, see "Restoring to a Point in Time" on page 1-25.
dbspace_list	Names one or more dbspaces or dbslices to be restored.	If you do not enter a *dbspace_list* or **-f** *file_w_names*, all storage spaces are restored. If you enter more than one storage-space name, separate each item in the list with a space.
logstreamid	Uniquely identifies logical-log records that a given AD/XP coserver generates.	If you supply more than one *logstreamid*, separate each item in the list with a space. A logstream is a coserver ID.

(2 of 2)

Examples of ON-Bar Restore Commands

The following sections contain examples of ON-Bar syntax for restoring data.

Restoring all Down Storage Spaces and Logical Logs

To restore completely all storage spaces that Dynamic Server with AD and XP Options has marked as down, use the **-r** option.

```
onbar -r
```

Restoring all Down Storage Spaces

To restore all storage spaces that are down without restoring the logical log, use the **-r** and **-p** options, as the following example shows:

```
onbar -r -p
```

Restoring Logical Logs Only

To restore logical logs after restoring storage spaces, use the **-r** and **-l** options, as the following example shows:

```
onbar -r -l
```

Restoring Specified Storage Spaces or Dbslices

To restore particular storage spaces (for example, two dbspaces named **fin_dbspace1** and **fin_dbspace2**), use the **-r** option, as the following example shows:

```
onbar -r fin_dbspace1 fin_dbspace2
```

To restore all dbspaces in a dbslice named **fin_slice**, use the following command:

```
onbar -r fin_slice
```

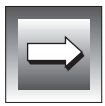
If any storage spaces are on-line, they are skipped in the restore.

Restoring Data to a Point in Time

To restore a database to its state at a specific date and time, enter a command using the date and time format for your GLS locale, as this example shows:

```
onbar -r -t "1997-05-10 12:00:00"
```

For an overview, see "Restoring to a Point in Time" on page 1-25. For an example of using point-in-time restore in a non-English locale, see "Point-in-Time Restore Example" on page B-3.



Important: *To determine the appropriate date and time for the point-in-time restore, use the* ***onlog*** *utility that your "Administrator's Guide" describes. The* ***onlog*** *output displays the date and time of the committed transactions. Do not use the coserver time or your watch to determine the point-in-restore time because it would not be accurate.*

Restoring On-Line Storage Spaces

You can use the following command to restore all the on-line storage spaces or to restore a list of on-line storage spaces:

```
onbar -r -0
```

Salvaging Logical Logs

If a disk fails, you need to replace it before you can perform a cold restore to recover data. You should salvage the logical-log files that are still on the disk, if they are still accessible, by performing the following steps:

1. To salvage logical-log files on the damaged disk, use the following command:

   ```
   onbar -l -s
   ```
2. Replace or repair the disk, if necessary.
3. Restore (copy) the administrative files.
4. To restore all the storage spaces and logical logs, use the following command:

   ```
   onbar -r
   ```

Performing a Cold Restore

If you must perform a cold restore on a database from level-0, level-1, and level-2 backups, follow these steps:

1. Put the database server in microkernel mode with the following command:

   ```
   xctl -C oninit -m
   ```
2. Salvage logs and restore data with the following command:

   ```
   onbar -r
   ```

   The **onbar -r** command automatically salvages the logical logs and restores the critical and noncritical storage spaces.
3. Replace or repair the disk, if necessary.

When the restore is complete, the server is in quiescent mode.

Restoring Save Sets with ISM

If you are using ISM, you can restore data from save sets on the storage volume. Check the save-set status in the Volume Inventory window in the ISM Administrator program. If the retention status of the save set has not expired, you can use ON-Bar to restore it. If it has expired, you must re-create the save set entry in the ISM catalog with the **ism_catalog -recreate_from** command. For details, see the *Informix Storage Manager Administrator's Guide*.

When the ISM server receives a restore request, either the **ism_watch** command or the ISM Administrator program prompts you to mount the required storage volume on the storage device. When you mount the volume, the restore will resume. Check for label and mount requests in the Devices window of the ISM Administrator program.

Restoring Data to ISM on a Different Node

You can back up data to ISM on one coserver node and restore it to ISM on a different node if you follow some additional steps. Because the ISM catalog on the target node does not know about the storage volumes that are on the source node, you need to add the storage volumes to the ISM catalog on the target node before you can restore the data.

To restore the data on a different node

1. Issue the **ism_catalog -recreate_from <*device*>** command.

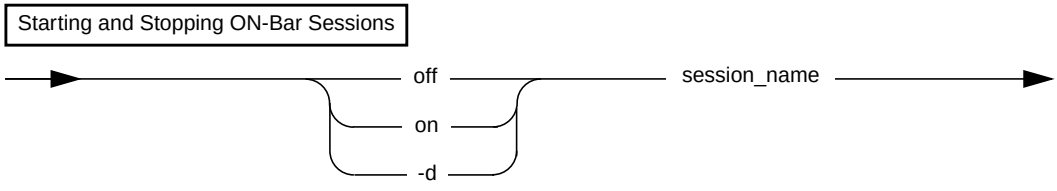
   This command adds the backup volume to the ISM catalog on the target node. For details, see the *Informix Storage Manager Administrator's Guide*.

2. Use the **onbar -r** command to restore the data.

Starting and Stopping ON-Bar Sessions

Session control commands let you stop and restart ON-Bar sessions. You might stop and restart a session to:

- temporarily stop continuous-log backup.
- temporarily stop all ON-Bar sessions while computer traffic is heavy.



Element	Purpose	Key Considerations
off	Suspends a session.	None.
on	Resumes a session.	None.
-d	Destroys a session.	None.
session_name	The name of the session to affect.	The restore session name can be up to 127 characters. If you use a name longer than 127 characters, ON-Bar truncates it to 127 characters in the **onstat -g** output.

Monitoring Backup Scheduler Status

Use the **onstat -g bus**, **onstat -g bus_session**, and **onstat -g bus_sm** options to monitor the status of the Backup Scheduler. The Backup Scheduler tracks scheduled and active ON-Bar sessions.

Using onstat -g bus and onstat -g bus_session Options

The **onstat -g bus** and **onstat -g bus_session** options show the current Backup Scheduler sessions, what work is scheduled for each ON-Bar session, and what work is currently in progress. Both options display identical information.

Sample onstat -g bus Output with no ON-Bar Activity Taking Place

In the following example, two logical-log backup sessions are suspended:

```
onstat -g bus

    Backup scheduler sessions
    -------------------------

    Session "Log backup 2" state SUSPENDED error 0
    Session "Log backup 1" state SUSPENDED error 0
```

Sample onstat -g bus Output During a Dbspace Backup

In the following example, ON-Bar and the Backup Scheduler are working on session **gilism824589**. Currently, dbspace **dbs1.2** is being backed up. Dbspaces **dbs12.1** and **dbs12.2** are waiting to be backed up.

```
onstat -g bus

    Backup scheduler sessions
    -------------------------

    Session "Log backup 2" state SUSPENDED error 0
    Session "Log backup 1" state SUSPENDED error 0
    Session "gilism824589" state WAITING error 0
    DBSPACE(dbs1.2) level 0 BACKUP,RUNNING
    DBSPACE(dbs12.1) level 0 BACKUP,READY
    DBSPACE(dbs12.2) level 0 BACKUP,READY
    DBSPACE(other) level 0 BACKUP,READY
```

Using the onstat -g bus_sm Option

The **onstat -g bus_sm** option shows the current storage-manager configuration, what storage managers are assigned to each coserver, and what work each storage manager is currently performing.

Sample onstat -g bus_sm Output with No ON-Bar Activity Taking Place

The following example shows the storage-manager version, storage-manager name, the number of **onbar-workers**, the number of coservers, the maximum number of **onbar-workers** started, and the ON-Bar idle timeout:

```
onstat -g bus_sm

    Configured storage managers
    ---------------------------

    BAR_SM 1
    BAR_SM_NAME         ism
    BAR_WORKER_COSVR      1
    BAR_DBS_COSVR         1,2
    BAR_LOG_COSVR         1,2
    BAR_WORKER_MAX        1
    BAR_IDLE_TIMEOUT      5
    END
```

Sample onstat -g bus_sm Output During a Dbspace Backup

When a backup or restore session is active, **onstat -g bus_sm** also displays information about the active **onbar-workers**, as the following example shows:

```
onstat -g bus_sm

    Configured storage managers
    ---------------------------

    BAR_SM 1
    BAR_SM_NAME           ism
    BAR_WORKER_COSVR      1
    BAR_DBS_COSVR         1,2
    BAR_LOG_COSVR         1,2
    BAR_WORKER_MAX        1
    BAR_IDLE_TIMEOUT      5
    END

Active workers:

    Worker 2 Coserver 1 Pid 4590 State BUSY "dbsl.2.0"
```

Using the Onbar Script to Customize On-Bar and ISM Commands

Use the **onbar** script on UNIX or the **onbar** batch file on Windows NT to customize backup and restore operations, start ISM, and back up the ISM catalog. The **onbar** script is located in the **$INFORMIXDIR/bin** directory (UNIX) or **%INFORMIXDIR%\bin** directory (Windows NT). The default **onbar** script detects whether the currently installed storage manager is ISM and backs up the ISM catalog. When you issue ON-Bar commands from the command line, the arguments are passed to the **onbar** script and then to **onbar_d**.

The default **onbar** script contains the following sections:

- Add startup processing here

  Use this section to initialize a third-party storage manager, if necessary, and set environment variables.

- End startup processing here

  This section starts the **onbar_d** driver and checks the return code. Use this section for **onbar_d** and storage-manager commands.

- Add cleanup processing here

  The code in this section backs up the ISM catalogs to the ISMData volume pool after the backup or restore operation completes. If you are using a third-party storage manager, you can use this section to clean it up.

- End cleanup processing here

  Use this section to return **onbar_d** error codes.

UNIX

Example: Print the Backup Boot Files

Use the following **onbar** script example to print the backup boot files from all coservers if the backup is successful. Each time that you issue the **onbar -b** command, the backup boot files are printed.

```
onbar_d "$@"    # receives onbar arguments from command line
return_code = $?   # check return code

# if backup (onbar -b) is successful, prints backup bootfiles from all coservers
if [$return_code -eq 0 -a "$1" = "-b"]; then
   servernum=‘awk ’/^DBSERVERNUM/ {print $2}’ $INFORMIXDIR/etc/$ONCONFIG’
   xctl lpr \$INFORMIXDIR/etc/Bixbar_‘hostname‘.$servernum
fi
exit $return_code
```

UNIX

Example: Migrate Backed Up Logical Logs to Tape

You can write a script that automatically migrates the backed-up logical logs to tape for off-site storage. Each time that you issue the following commands, the **onbar** script starts the backup operation and then calls another program to migrate the logical logs to tape:

- **onbar -b**
- **onbar -l**
- **onbar -l -s**
- **onbar -r**
- **onbar -r -l**

If you perform a physical restore (**onbar -r -p**), the following **onbar** script does not migrate the logs:

```
onbar_d “$@”          # starts the backup or restore
EXIT_CODE=$?          # any errors?

PHYS_ONLY=false     #if its a physical-only backup, do nothing
for OPTION in $*; do
    if [$OPTION = -p]; then
        PHYS_ONLY = true
    fi
done
if ! PHYS_ONLY; then   # if logs were backed up, call another
     migrate_logs      # program to move them to tape
fi
```

Chapter

4

Configuring ON-Bar

This chapter describes the ON-Bar configuration tasks. Before you start ON-Bar, read "Setting Global ON-Bar Configuration Parameters." For configuration examples, see "Examples of ON-Bar and Storage-Manager Configurations" on page 2-13. For information about how to set parameters in the ONCONFIG file, see your *Administrator's Guide*.

Be sure to configure your storage manager. Depending on the storage manager that you choose, you might have to configure your storage manager, but you might not have to set the ON-Bar configuration parameters.

Setting Global ON-Bar Configuration Parameters

You can set the following ON-Bar configuration parameters in the ONCONFIG file. The configuration file is organized with a global section and individual sections for each storage manager. The global section includes parameters that apply to all storage managers. The individual storage-manager sections apply only to the specified storage-manager instances. You might need to specify multiple instances of storage managers to back up and restore data to all the coservers in Dynamic Server with AD and XP Options.

Important: *Do not change the BAR_XFER_BUFSIZE or BAR_SM configuration parameters between the backup and restore of data. However, you can change the following parameters between a backup and restore: BAR_ACT_LOG, BAR_RETRY, BAR_WORKER_MAX, BAR_IDLE_TIMEOUT, and BAR_XPORT_COUNT, BAR_BSALIB_PATH.*

The following list describes global configuration parameters. You can set some parameters in the storage-manager sections to override the global parameter settings. For more information on the parameters that you can use in the global section only, the storage-manager section only, or both sections, see "Editing the ONCONFIG File" on page 2-11.

Parameter	Purpose
BAR_ACT_LOG	Specifies the location of the ON-Bar activity log file.
BAR_BSALIB_PATH	Specifies the path of the storage-manager library on UNIX or a **dll** on Windows NT. The BAR_BSALIB_PATH parameter is supported only on some platforms. To determine if BAR_BSALIB_PATH is supported on your platform, check your release or machine notes. Can be a global or local parameter.
BAR_IDLE_TIMEOUT	Specifies the maximum number of minutes that an **onbar-worker** is idle before it is shut down. Can be a global or local parameter.
BAR_RETRY	Specifies how many times a dbspace backup, logical-log backup, or restore operation should be retried if the first attempt fails.
BAR_WORKER_MAX	Specifies the maximum number of **onbar-worker** processes that the Backup Scheduler can start for this storage-manager instance. You can start additional **onbar-worker** processes manually. Can be a global or local parameter.
BAR_XFER_BUFSIZE	Specifies the size in pages of the buffers used between AD/XP and each **onbar-worker**.
BAR_XPORT_COUNT	Specifies the number of shared-memory data buffers for each **onbar-worker**.
LOG_BACKUP_MODE	Specifies how to handle full logical-log files.

BAR_ACT_LOG

default value	UNIX	**/tmp/bar_act.log**
	Windows NT	**%INFORMIXDIR%\bar_act.log**
takes effect	When **onbar** starts or when an **onbar-worker** process starts	

The BAR_ACT_LOG configuration parameter specifies the full pathname of the ON-Bar activity log. Whenever a backup or restore activity or error occurs, the **onbar_w**, **onbar_m**, or **onbar_d** utility writes a brief description to the activity log. The format of the file resembles the format of the Dynamic Server with AD and XP Options message log. You can examine the activity log to determine the results of **onbar** actions.

Warning: *Even if you have set the path of* ***bar_act.log*** *to some other directory, check the* ***tmp*** *directory to see if* ***bar_act.log*** *was placed there. When* ***onbar-merger*** *first starts, it writes messages to* ***bar_act.log*** *until it has a chance to read the ONCONFIG file.*

BAR_BSALIB_PATH

default value	UNIX	**/usr/lib/ibsad001.*platform_extension***
	Windows NT	**%ISMDIR%\bin\libbsa.dll**
takes effect	When the **onbar-worker** process starts	

ON-Bar and the storage manager rely on a shared library to integrate with each other. Configure the BAR_BSALIB_PATH configuration parameter for your storage-manager library. Support for BAR_BSALIB_PATH is platform specific. Check your machine notes or release notes to determine if you can use it with your operating system.

To ensure that this integration takes place, set one of the following options:

- Specify the library pathname.
- Specify a real library in **/usr/lib/ibsad001.*platform_extension***.

  The default pathname of BAR_BSALIB_PATH is **/usr/lib/ibsad001.*platform_extension***, where ***platform_extension*** is the shared-library file extension. For example, the suffix for Solaris is ***so***, so you specify **/usr/lib/ibsad001.so** on a Solaris system.
- Place the storage-manager library in any directory that you choose and create a symbolic link to it from **/usr/lib/ibsad001.*platform_extension***.

If you are using ISM on UNIX, the pathname would be **$INFORMIXDIR/lib/libbsa.*platform_extension***. ♦

If you are using ISM, the default pathname of BAR_BSALIB_PATH is **%ISMDIR%\bin\libbsa.dll**.

The **%ISMDIR%** variable includes a version or release number. For example: **set ISMDIR=C:\program files\informix\ism\1.00**). This directory is set when the database server is installed on Windows NT. This pathname is different if you use a different storage manager. ♦

BAR_IDLE_TIMEOUT

default value	0
units	Minutes
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_IDLE_TIMEOUT *idle_time* configuration parameter determines the maximum amount of time in minutes that an **onbar-worker** process can be idle before it is shut down.

The BAR_IDLE_TIMEOUT configuration parameter is optional. If BAR_IDLE_TIMEOUT is set to zero, the **onbar-worker** processes never time out.

BAR_RETRY

default value None. Does not retry
takes effect When the database server starts

The BAR_RETRY configuration parameter specifies how many times **onbar** should retry a dbspace or logical-log backup or restore operation if the first attempt fails. The setting of the BAR_RETRY parameter determines **onbar** behavior.

If a backup or restore fails, **onbar** attempts to back up or restore the object the specified number of times before it gives up and moves on to the next object.

BAR_WORKER_MAX

default value 0
takes effect When Dynamic Server with AD and XP Options starts

The BAR_WORKER_MAX *max_worker* configuration parameter determines the maximum number of **onbar-worker** processes that the database server automatically starts for this storage-manager instance.

The maximum number of **onbar-worker** processes that run simultaneously depends on the capabilities of the storage manager. In the simplest configuration, set BAR_WORKER_MAX to the number of storage devices physically connected to the nodes that BAR_WORKER_COSVR specifies.

If **onbar-workers** for a specific storage manager have special startup requirements, such as environment variables, you can specify these by editing the **start_worker** script file. For information, see "Starting Onbar-Worker Processes Manually" on page 2-18. If storage managers have dynamic requirements for **onbar-worker** processes, you might have to start them manually.

Important: *BAR_WORKER_MAX is optional. If you set BAR_WORKER_MAX to 0, you must start the* ***onbar-worker*** *processes manually because the database server does not start them automatically.*

BAR_XFER_BUFSIZE

default value	8 pages (which is 32 kilobytes on most Dynamic Server with AD and XP Options platforms)
units	PAGESIZE
range of values	1 to 15 pages
takes effect	When the **onbar-w** utility starts

The BAR_XFER_BUFSIZE configuration parameter specifies the size of each transfer buffer. The actual size of a transfer buffer is BAR_XFER_BUFSIZE * PAGESIZE. For example, if BAR_XFER_BUFSIZE is 15, the transfer buffer should be 61,940 bytes.

For generally good performance, set to 8, although different storage managers might suggest other values. The maximum value that XBSA allows is 64 kilobytes.

You can set this option locally for individual storage managers to override the default or specified global setting.

BAR_XPORT_COUNT

default value	10
units	Buffers
range of values	3 to unlimited
takes effect	When an **onbar-worker** process starts

The BAR_XPORT_COUNT configuration parameter specifies the number of data buffers that each **onbar-worker** process can use to exchange data with Dynamic Server with AD and XP Options. The value of this parameter affects **onbar-worker** performance.

You can set this option locally for individual storage managers to override the default or specified global setting.

LOG_BACKUP_MODE

Use the LOG_BACKUP_MODE configuration parameter to determine how logical-log files are backed up after they fill.

default value MANUAL

range of values NONE

Use the NONE option if you do not want to back up the logs before you reuse them. This option is equivalent to setting LTAPEDEV to **/dev/null** (UNIX) or **nul** (Windows NT). The database server marks the logical logs as backed up as soon as they are full so that ON-Bar cannot restore them. When the database server starts up, it writes a message to the **online.log** if LOG_BACKUP_MODE = NONE.

If you set LOG_BACKUP_MODE to NONE, you cannot also restore logs or storage spaces.

CONT

Use the CONT option if you want to back up logical-log files as they fill. An **onbar-worker** process backs up each logical-log file as soon as it fills.

MANUAL

Use the MANUAL option if you want to queue the logical-log files until you can issue an **onbar -l** command.

takes effect When Dynamic Server with AD and XP Options starts

Warning: *If you set LOG_BACKUP_MODE to NONE, full logs are not backed up to storage media. All transactions in those logs are lost, and you will not be able to restore them.*

Setting Local ON-Bar Configuration Parameters

These configuration parameters allow you to specify several storage-manager instances for Dynamic Server with AD and XP Options. Each storage-manager section must begin with a BAR_SM statement and end with an END statement. If you do not set a parameter, ON-Bar automatically sets it to its default value. Parameters in the storage-manager section override global parameters.

Consider the following factors before you set ONCONFIG options for a storage manager:

- The software requirements and design of the storage manager
- The number, arrangement, and designated use of the storage devices
- The operational requirements of your system

Important: *Each storage-manager brand must have an entry in the* ***bar_version*** *table of the* ***sysutils*** *database. For example, if you are using ISM and a third-party storage manager,* ***bar_version*** *would need two rows, one for ISM and one for the other storage manager. For information about how to create this entry, see* *"The bar_version Table" on page 5-6**.*

The following list describes local parameters that you set in the storage-manager section.

Parameter	Purpose
BAR_SM	Specifies the unique integer identifier for the storage manager. Required.
BAR_DBS_COSVR	Specifies a list of coservers from which the storage manager can accept dbspace backup and restore data.
BAR_LOG_COSVR	Specifies coservers from which the storage manager that BAR_SM specifies accepts log backup and restore data.
BAR_SM_NAME	Specifies the storage-manager name.
BAR_WORKER_COSVR	Specifies a list of coservers that can directly access the storage manager.

BAR_SM

default value	Null string
range of values	Positive integer greater than or equal to one
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_SM *ID* configuration parameter is the unique positive integer that identifies a specific storage-manager instance. The storage manager does not use this value. ON-Bar and the Backup Scheduler use this value.

The number is used internally to track the location of backups. If you change the identification number after you use the storage manager to perform a backup, you invalidate the backups that you have made.

BAR_DBS_COSVR

range of values	A list of unique positive integers greater than or equal to one
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_DBS_COSVR *dbs_cosvr_list* configuration parameter specifies the coservers from which the storage manager that BAR_SM specifies can be sent dbspace backup and restore data.

If BAR_DBS_COSVR is set to 0, the storage manager is not given dbspaces from any coserver. You might specify BAR_DBS_COSVR 0 to reserve a storage manager for logical-log backups only.

To provide flexibility and improved performance, this list of coservers can overlap with values listed for other storage managers. The values are coserver numbers, separated by commas. Hyphens indicate ranges.

BAR_DBS_COSVR is optional. The default is all coservers.

BAR_LOG_COSVR

range of values	A list of unique positive integers greater than or equal to one
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_LOG_COSVR *log_cosvr_list* configuration parameter specifies the coservers from which the storage manager that BAR_SM specifies can be sent logical-log backup and restore data.

If BAR_LOG_COSVR is set to 0, the storage manager is not given logical logs from any coserver. You might specify BAR_LOG_COSVR 0 to reserve a storage manager for dbspace backups only.

The values are coserver numbers, separated by commas. Hyphens indicate ranges. For example, BAR_LOG_COSVR 1-5, 7, 9 specifies a storage manager that backs up logical logs on coservers 1, 2, 3, 4, 5, 7, and 9.

Dynamic Server with AD and XP Options restricts BAR_LOG_COSVR settings to guarantee that no two storage-manager instances can back up logs for the same coserver.

BAR_LOG_COSVR is optional. The default is all coservers.

BAR_SM_NAME

default value	Null string
range of values	Any character except a space and the pound sign (#)
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_SM_NAME *name* configuration parameter is the name of the storage manager. It must be 18 characters or fewer.

BAR_WORKER_COSVR

range of values	A list or range of unique positive integers greater than or equal to one
takes effect	When Dynamic Server with AD and XP Options starts

The BAR_WORKER_COSVR *worker_cosvr_list* configuration parameter specifies which coservers can access the storage manager that BAR_SM identifies. If BAR_SM is specified, BAR_WORKER_COSVR must also be specified. Any coserver on the list can restore data that other coservers on the list back up.

Enter the numbers of the coservers where worker sessions can be started for this storage manager. If you enter only one coserver number, use the number of a coserver on a node with a physically attached storage device so that the storage manager does not have to transfer data across the network.

The list must not overlap with the list of any other storage manager. The values are coserver numbers, separated by commas. Hyphens indicate ranges. For example, BAR_WORKER_COSVR 1-3, 5, 7 specifies a storage manager that can access **onbar-worker** processes running on coservers 1, 2, 3, 5, and 7.

No default exists.

Database Server Configuration Parameters for ISM

The following parameters, when listed in the ONCONFIG configuration file for the database server, affect how the ISM server handles backup and restore requests.

Insert these parameters inside the BAR_SM paragraph in the storage-manager section of the ONCONFIG file if you want them to apply to one storage-manager instance. Insert them in the global section of the ONCONFIG file if you want them to apply to all storage-manager instances.

ONCONFIG Parameter	Effect on ISM Server
ISM_DATA_POOL	If present in the ONCONFIG file, this parameter specifies the volume pool that you use for backing up dbspaces and other storage spaces. The value for this parameter can be any volume pool that ISM recognizes. If this parameter is not present, ISM uses the ISMData volume pool.
ISM_LOG_POOL	If present in the ONCONFIG file, this parameter specifies the volume pool that you use for backing up logical logs. The value for this parameter can be any volume pool that ISM recognizes. If this parameter is not present, ISM uses the ISMLogs volume pool.

On-Bar Environment Variables for Use With ISM

The following environment variables, when set in the ON-Bar environment, determine whether ISM uses compression or encryption when backing up data.

You can set these environment variables in the **onbar_w** utility or **start_worker** script file. Insert the lines that contain the environment variables before the line that invokes the **onbar_w** utility. For example:

```
ISM_COMPRESSION=TRUE; export ISM_COMPRESSION
```

Environment Variable in Effect When ON-Bar Issues a Request	Effect on ISM Server Processing for That Request
ISM_COMPRESSION	If this variable is set to TRUE in the environment of the **onbar** process making a request, the ISM server uses a data-compression algorithm to store or retrieve the data specified in that request. If it is set to FALSE or is not present, the ISM server does not use compression.
ISM_ENCRYPTION	If this variable is set to TRUE or XOR in the environment of the **onbar** process making a request, the ISM server uses encryption to store or retrieve the data specified in that request. If it is set to NONE or is not present, the ISM server does not use encryption.

Chapter

5

Catalog Tables

This chapter describes the ON-Bar catalog tables. You can query the catalog tables for backup and restore data to evaluate performance or identify object instances for a restore.

The bar_action Table

The **bar_action** catalog table lists all backup and restore actions that are attempted against an object, except during a cold restore. Use the information in this table to track backup and restore history.

Column Name	Type	Explanation
act_aid	SERIAL	Action identifier. A unique number within the table. Can be used with **act_oid** to join with the **bar_instance** table.
act_end	DATETIME YEAR TO SECONDS	The date and time when the action finished.
act_oid	INTEGER	Object identifier. Identifies the backup object against which a backup or restore attempt is made. Can be used with **act_aid** to join with **bar_instance.** The **act_oid** column of the **bar_action** table equals the **obj_oid** column of the **bar_object** table.
act_start	DATETIME YEAR TO SECONDS	The date and time when the action began.
act_type	SMALLINT	Identifies the action that is attempted: 1 for backup, 2 for restore, 3 for a foreign or imported restore.
act_status	INTEGER	Identifies the result of the action: 0 if successful, otherwise an error code.

The bar_instance Table

ON-Bar writes a record to the **bar_instance** catalog table for each successful backup. The table describes each object that is backed up. ON-Bar might later use the information for a restore operation. This table tracks backed-up objects.

Column Name	Type	Explanation
ins_aid	INTEGER	Action identifier. Identifies the successful action that created this instance of the backup object. Combined with **ins_oid**, can be used to join with the **bar_action** table.
ins_copyid_hi	INTEGER	The high bits of the instance copy identifier. Combined with **ins_copyid_lo**, it is a unique value that the storage manager assigns to link the ON-Bar object identifier with the storage-manager object identifier.
ins_copyid_lo	INTEGER	The low bits of the instance copy identifier. Combined with **ins_copyid_hi**, it is a unique value that the storage manager assigns to link the ON-Bar object identifier with the storage-manager object identifier.
ins_level	SMALLINT	Level of the backup action: 0 for a complete storage-space or logical-log backup, 1 for a backup of any changes to this object since its last level-0 backup, 2 for a backup of any changes since the last level-1 backup.
rsam_time	INTEGER	The backup checkpoint time stamp. Not a clock time. The database server uses this value when it creates the next level backup.
ins_version	CHAR(18)	ON-Bar version that created this instance. Tracks compatibility among versions of ON-Bar, storage managers, and XBSA. Can be used to join with the **bar_version** table.

(1 of 2)

Column Name	Type	Explanation
ins_oid	INTEGER	Object identifier. Identifies the affected object. Can be used to join with the **bar_object** table. Combined with **ins_aid**, can be used to join with the **bar_action** table.
ins_first_log	INTEGER	In a dbspace backup, identifies the first logical log required to restore from this backup.
ins_sm_id	INTEGER	Storage-manager instance ID. Created from BAR_SM in $ONCONFIG or %ONCONFIG%.
ins_sm_name	CHAR(18)	Storage-manager instance name. Created from BAR_SM_NAME in $ONCONFIG or %ONCONFIG%.
ins_time	INTEGER	Global time stamp from the server. Is a real ANSI-format clock time. Value represents the number of seconds since midnight, January 1, 1970, Greenwich time.
ins_logstream	INTEGER	The coserver ID of the log. For dbspaces, the coserver ID of ins_first_log.
ins_chpt_log	INTEGER	The ID of the log that contains the **rsam_time** checkpoint. Used during backup to verify that logs needed for restore are backed up.
ins_last_log	INTEGER	Log ID of the last log needed during logical restore to ensure that it can be restored if the server fails at the time of the backup.

(2 of 2)

The bar_version Table

The **bar_version** catalog table lists the compatible versions of ON-Bar, XBSA, and storage manager.

The information in this catalog table originates in the **sm_version** file, which is installed in the **etc** subdirectory of **INFORMIXDIR**. Each storage manager should have a single line in this format:

```
1|XBSA_ver|S_M_Name|S_M_ver
```

XBSA_ver is the release version of the XBSA shared library for the storage manager, *S_M_Name* is the name of the storage manager, and *S_M_ver* is the storage-manager version. No field can be longer than 18 characters.

The following example shows the line for ISM:

```
1|1.0.1|ism|1|
```

The **sm_version.std** file is a sample. At least one record in this file must be added to the **bar_version** catalog table in the **sysutils** database. You can use a text editor to update **sm_versions** or use DB-Access to update the **bar_version** table.

Column Name	Type	Explanation
bar_sm	CHAR(18)	The name of the storage manager. Optional. Currently not used.
bar_version	CHAR(18)	The version of ON-Bar. Can be used to join with the **bar_instance** table.
bsa_version	CHAR(18)	The version of XBSA that the storage manager returns.
sm_version	CHAR(18)	The version of the storage manager. Currently not used.

Tip: *After you install ISM, run the **ism_startup -init** script to automatically add the ISM version information to the **bar_version** table. If you have problems running ON-Bar, verify that the **sm_versions** file contains the correct entry for ISM and correct syntax.*

The bar_object Table

The **bar_object** catalog table describes each backup object.

Column Name	Type	Explanation
obj_srv_name	CHAR(18)	The database server name. Used in a multiserver, distributed system to ensure that objects are restored to the correct database server. Used when multiple database servers are on the node to ensure that objects are restored in the database server instance to which the object belongs.
obj_oid	SERIAL	The object identifier. A unique number within the table. This table is a list of all storage spaces and logical logs from each database server for which at least one backup attempt was made. Can be used to join with the **bar_action** and **bar_instance** tables.
obj_type	CHAR(2)	Backup object type: CD = critical dbspace L = logical log ND = noncritical dbspace R = rootdbs
obj_name	CHAR(18)	The user name for the object. For example, **dbs1.1** or **15:3** is the name of (log file 3 on stream 15).

The bar_server Table

The **bar_server** catalog table lists the database servers in an installation. This table is used to ensure that backup objects are returned to their proper places during a restore. This table is built from the **INFORMIXSQLHOSTS** environment variable. If it is not set, ON-Bar uses the **$INFORMIXDIR/etc/sqlhosts** information on UNIX or the **sqlhosts** information in the registry on Windows NT.

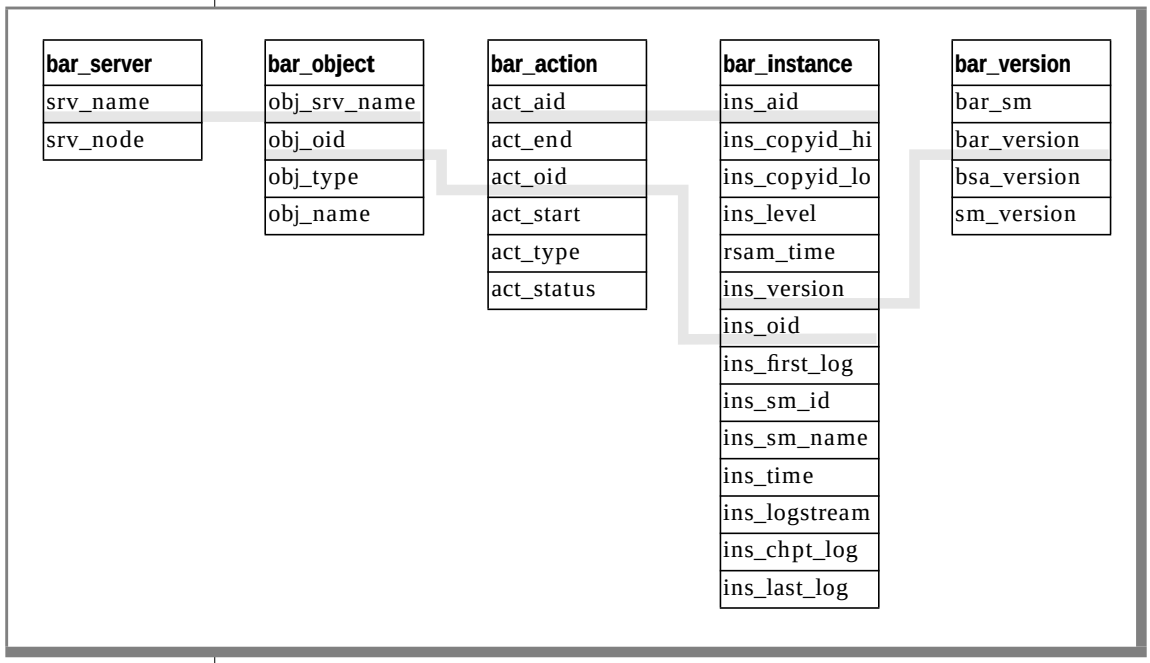
Column Name	Type	Explanation
srv_name	CHAR(18)	Database server name that the **DBSERVERNAME** column in the **sqlhosts** file or registry specifies.
srv_node	CHAR(64)	Name of the node where the database server resides.

ON-Bar Catalog Map

Figure 5-1 maps the ON-Bar catalog tables. The gray lines show the referential constraints between tables.

If you read from right to left, the data needs to be present in the first table before you can insert it in the second table. For example, consider the **bar_object** and **bar_server** tables. Reading from right to left, the **bar_server** table is first, and the **bar_object** table is second. If you try to insert data in the **obj_srv_name** column of the **bar_object** table, a matching name must exist in the **srv_name** column of the **bar_server** table.

Figure 5-1
ON-Bar Catalog Map



The Catalog Tables and the Emergency Boot Files

The emergency boot files reside in the **$INFORMIXDIR/etc** directory on UNIX and **%INFORMIXDIR%\etc** on Windows NT. They contain information similar to that in the ON-Bar catalogs.

The emergency boot files consist of a backup boot file, a restore boot file, and a merge boot file. Each node with a storage manager contains one backup boot file and one restore boot file. If multiple coservers are on a node, they share a backup boot file and a restore boot file. Dynamic Server with AD and XP Options has one merge boot file.

The backup boot files contain backup information and are updated after every backup. The **onbar-merger** re-creates the restore boot files, which the **onbar-worker** processes use during a cold restore. ON-Bar re-creates the merge boot file during a cold restore.

Figure 5-2 lists the types of emergency boot files that Dynamic Server with AD and XP Options uses.

Figure 5-2
Emergency Boot Files

Boot File Type	Boot File Name
Backup	**Bixbar_*hostname.servernum***
Restore	**Rixbar_*hostname.servernum***
Merge	**Mixbar_*hostname.servernum***

During the cold-restore process, ON-Bar follows these steps to create a restore boot file and restore data:

1. It merges the backup boot files from all coservers and creates a boot file for the restore.
2. It distributes the restore boot file to each coserver, overwriting any old restore boot files.
3. It uses the information in the restore boot file and merge boot file instead of the information in the **sysutils** database to determine which backup copy of each storage space and log to use.
4. It re-creates the merge boot file.

Appendix

A

ON-Bar Messages

This appendix describes the ON-Bar activity log file and the ON-Bar messages for Informix Dynamic Server with Advanced Decision Support and Extended Parallel Options. The ON-Bar messages include informational messages, warnings, and error messages.

UNIX

To display error messages on-line, use the **finderr** command. To format error messages for printing, use the **rofferr** command. ♦

WIN NT

To read error messages and corrective actions in Windows NT, use the **Informix Find Error** utility. This utility is available through the Dynamic Server with AD and XP Options program group. ♦

The ON-Bar Activity Log

ON-Bar writes informational messages, warnings, and error messages to the ON-Bar activity log except for messages 43013, 43014, 43016, and 43039, which it might also write to standard error. The ON-Bar activity log helps you determine whether a backup or restore attempt succeeded. The ON-Bar activity log also records approximately how long an operation took and lists the objects that ON-Bar backed up or restored.

The default location and name of the ON-Bar activity log is **/tmp/bar_act.log** on UNIX or **%INFORMIXDIR%\bar_act.log** on Windows NT. To specify a different location and name for the ON-Bar activity log, set the BAR_ACT_LOG configuration parameter. For information on how to set the BAR_ACT_LOG configuration parameter, see “BAR_ACT_LOG” on page 4-5.

About ON-Bar Messages

This section explains how to read and interpret messages in the ON-Bar activity log.

Message Format

A message in the ON-Bar activity log has the following format:

```
timestamp_process_idparent_process_idmessage
```

Figure A-1 describes each field in the message. No error message numbers appear in the activity log.

Figure A-1
ON-Bar Message Format

Message Field	Description
timestamp	Date and time when ON-Bar writes the message
process id	The number that the operating system uses to identify this instance of ON-Bar
parent process id	The number that the operating system uses to identify the process that executed this instance of ON-Bar
message	The ON-Bar message text

The following example illustrates a typical entry in the ON-Bar activity log:

```
1995-01-17 10:09:591217 1259 43046 Unable to open connection to server; Attempt to
get a trusted connection failed.
```

In the following list, messages 43068 through 43098 are storage-manager messages. If you receive a storage-manager error message, consult the storage-manager logs for more details.

ON-Bar Messages

43002 An unexpected error occurred: *text_string text_string*.

43003 An unexpected error occurred: *brief_description*.

Possible causes for this error include operating-system failures, software errors, and missing data. If the versions are compatible, try to stop the backup and restore processes and restart it.

If the error persists, please note all circumstances, save a copy of the ON-Bar and Dynamic Server with AD and XP Options message logs, and contact Informix Technical Support.

43004 Out of memory.

ON-Bar could not allocate more memory. If possible, reduce the number of processes that are running at the same time as ON-Bar or ask your system administrator to either increase your swap space or to install more memory in your system.

43005 ERROR: Attempt to build an SQL WHERE clause for *query* failed.

No data was passed to the **build-where-clause** function, so no SQL WHERE clause can be built. Stop ON-Bar and retry your command.

If the error persists, please note all circumstances, save a copy of the ON-Bar and database server message logs, and contact Informix Technical Support.

43006 ERROR: *where_clause* for *query* exceeds its maximum allowed length of *max_length_allowed* characters.

The SQL statement is longer than its maximum allowed size. Shorten the statement or divide it in multiple statements.

43007 ERROR: No data to insert in *table_name*.

No data was passed to the **insert** function, so no insert in the table was attempted. Stop ON-Bar and retry your command.

If the error persists, please note all circumstances, save a copy of the ON-Bar and database server message logs, and contact Informix Technical Support.

43008 ERROR: Unable to convert datetime to string: *ESQL_return_value*.

Date string is in an invalid format. For the proper date format, consult your Informix manual and retry ON-Bar.

43009 ERROR: *Data* required to insert a row into *table_name*.

An SQL insert in this table cannot occur without the specified data. Stop ON-Bar and retry your command.

If the error persists, please note all circumstances, save a copy of the ON-Bar and database server message logs, and contact Informix Technical Support.

43010 ERROR: Failed to add selected row to linked list for *query*.

The attempt to add the selected row to the linked list failed. Stop ON-Bar and retry your command.

If the error persists, please note all circumstances, save a copy of the ON-Bar and database server message logs, and contact Informix Technical Support.

43011 ERROR: Missing data for *table_name*.

The required data is missing. Stop ON-Bar and retry your command.

If the error persists, please note all circumstances, save a copy of the ON-Bar and database server message logs, and contact Informix Technical Support.

43012 ERROR: Updates to *table_name* primary key are not allowed.

Updating the primary key to a table is not allowed. Delete the row and then attempt to insert a new row with the new primary key.

43013 ERROR: Unable to open connection to database server: *server_name*.

The database server is in an incorrect state.

Bring the database server to the correct state. For a backup, the database server should be in on-line or quiescent mode. For a warm restore, the database server should be in on-line, quiescent, backup, or recovery mode. For a cold restore or log salvage, the database server should be in microkernel mode. You can put the database server in microkernel mode with the **oninit** command or use IECC which runs on an Windows NT workstation.

43014 WARNING: Physical restore complete. Logical restore required before work can continue.

This restore was only a physical restore, or the physical part of the restore succeeded, but the logical restore failed. Perform a logical restore.

43015 ERROR: Unable to read parameters from **$INFORMIXDIR/etc/$ONCONFIG OR %INFORMIXDIR%\etc\%ONCONFIG%**.

The ONCONFIG file is inaccessible. It might be missing or have incorrect permission values.

Verify that an ONCONFIG file exists and that its permissions are correct. For details, see your *Administrator's Guide*.

43016 ERROR: Unable to attach to shared memory.

Unable to initialize a shared-memory connection to the database server. Either the database shared memory was not initialized or the maximum number of users are already using the system.

43017 Shared memory not initialized.

Dynamic Server with AD and XP Options is not running. Start the database server. For instructions, see your *Administrator's Guide*.

43018 Running as Informix for testing.

43019 ERROR: You must be user **root** or **informix** to run ON-Bar.

Only users **informix** and **root** are allowed to execute ON-Bar. Login as **informix** or **root** before you attempt the backup or restore.

43020 ERROR: User is not a member of **Informix-Admin** group.

For Windows NT only: Only users listed in the **Informix-Admin** group are allowed to execute ON-Bar. Ask your system administrator to add your user name to the **Informix-Admin** group.

43022 Unable to open file *filename*.

You cannot create or open the file or its directory because the permissions are incorrect. Verify the permissions on the file and its directory.

43023 ERROR: Invalid serial number. Please consult your Installation Instructions.

An error occurred during installation for ON-Bar. Ask your database system administrator to re-install ON-Bar.

43024 WARNING: Unable to read backup level, defaulting to level-0.

The backup level entered on the command line is not valid. ON-Bar automatically performs a level-0 backup instead.

43025 ERROR: Unable to read logical-log ID.

The logical-log ID entered on the command line is not valid. Verify that the logical-log ID is correct and retry the command.

43027 WARNING: Db / blobspace *spacename* is on-line and does not need to be restored.

The specified storage space is undamaged and does not need to be restored.

43029 WARNING: *dbspace* does not have a level *level_number* backup. Searching for level *level_number* backup.

You cannot perform a level-1 backup unless a previous level-0 backup exists. You cannot perform a level-2 backup unless a previous level-1 backup exists.

For each dbspace, ON-Bar automatically performs a backup at the missing level instead of at the level that the user requested.

43030 ERROR: Unable to register a new **onbar-worker** process: *problem description*.

43031 ERROR: Unable to deregister a new **onbar-worker** process: *problem description*.

43032 ERROR: Unable to get the next event: *problem description*.

43033 ERROR: Received an invalid event from the database server: *event_number.*

Valid events have these numbers: 1: dbspace backup; 2: dbspace restore; 4: log backup; 8: dbspace backup placement; 32: dbspace restore placement; 64: log backup placement; 128: log restore placement; 512: exit.

43034 ERROR: Unable to start the db / blobspace backup: *problem description*.

43035 ERROR: Unable to get backup data from the database server: *problem description*.

43036 ERROR: Unable to close the backup: *problem description*.

43037 ERROR: Unable to commit the backup: *problem description*.

43039 ERROR: Unable to start the logical-log backup: *problem description*.

43040 ERROR: Unable to commit the backup: %1.

43042 ERROR: Version *version_number* of the XBSA shared library is not compatible with version *version_number* of ON-Bar.

Either Informix did not certify the XBSA shared library that the storage-management vendor or an error occurred during installation of ON-Bar.

Verify that ON-Bar was installed properly. Verify that the XBSA library is certified.

43045 ERROR: Db / blobspace *dbspace_name* does not exist.

Verify that the storage space exists in Dynamic Server with AD and XP Options.

43046 ERROR: Unable to start the logical restore: *dbspace_name*.

43047 ERROR: Must restore logical logs from *date_time* or later.

The user wants to stop the restore at a logical log that is too early. A storage-space backup occurred after the log that the user specified. Retry the restore up to the specified logical log or later.

43048 ERROR: Unable to write restore data to the database server: *server_name*.

43049 ERROR: Unable to commit the restore: *dbspace_name*.

43050 ERROR: Unable to start the physical restore: *dbspace_name*.

43051 ERROR: Cannot warm restore critical media: *dbspace_name*.

Critical data (**root** dbspace or any dbspace that contains a logical or physical log) cannot be restored if the database server is on-line. Shut down the database server and retry the restore.

43052 WARNING: *buffer_size* exceeded maximum allowed limit. Changing buffer size to *max_allowed_size*.

The maximum value of BAR_XFER_BUFSIZE has been exceeded. The buffer size has been reset to the maximum allowed value.

43053 Begin cold level *level_number* restore *dbspace_name* (storage manager copy ID: *copyid_number*).

43057 Begin level *level_number* backup *dbspace_name*.

43058 Completed level *level_number* backup *dbspace_name* (storage manager copy ID: *copyid_number*).

43061 Begin warm level *level_number* restore *dbspace_name* (storage manager copy ID: *copyid_number*).

43062 Completed warm level *level_number* restore *dbspace_name*.

43063 Begin backup logical log *logstreamid*.

43064 Completed backup logical log *logstreamid* (storage manager copy ID: *copyid_number*).

43065 Begin restore logical log *logstreamid* (storage manager copy ID: *copyid_number*).

43066 Completed restore logical log <*logstreamid*>.

43067 Successfully connected to storage manager.

43068 Process *process_id* successfully forked.

43069 Process *process_id* completed.

43070 Active object does not exist. Attempt to deactivate it failed.

No active object matched the name that was specified for a **BSADeactivateObject()** call. For information on active and inactive objects, refer to your storage-manager manual.

43071 A system error occurred. Aborting XBSA session.

A system error prevents further processing. For details about the problem, refer to the storage manager activity log (or equivalent).

43072 Attempt to authorize *user_name* failed.

Verify that the user is **informix** or **root**.

43073 Invalid XBSA function call sequence.

The sequence of XBSA function calls is out of order. For details about the problem, refer to the storage manager activity log (or equivalent).

43074 Invalid XBSA session handle *handle_id*.

An XBSA session handle has been previously closed or corrupted. For details about the problem, refer to the storage manager activity log (or equivalent).

43075 XBSA buffer is too small for the object.

For details about the problem, refer to the storage manager activity log (or equivalent).

43076 Description of the object exceeds the maximum allowed value: *maximum_allowed_value*.

Shorten the description of the object and retry.

43077 Dynamic Server with AD and XP Options name exceeds maximum allowed size *maximum_allowed_size*.

Shorten the Dynamic Server with AD and XP Options name and retry.

43078 The new security token name is invalid.

For details about the problem, refer to the storage manager activity log (or equivalent).

43079 Invalid vote value: Must be **BSAVoteCOMMIT** or **BSAVote_ABORT**.

It is unclear whether the transaction should be committed or aborted.

Contact Informix Technical Support.

43080 Invalid environment keyword.

For details about the problem, refer to the storage manager activity log (or equivalent).

43081 That object already exists.

An attempt was made to create an object twice.

For details about the problem, refer to the storage manager activity log (or equivalent).

43082 A new security token must be created.

Create a new security token.

For instructions, refer to the manual for your storage manager.

43083 Backup object does not exist in storage manager.

Unable to find a backup of the object. For details about the problem, refer to the storage manager activity log (or equivalent).

43084 Exceeded available resources.

All backup and restore resources are in use.

Wait until a previous backup or restore session is complete and retry.

43085 A DataBlock pointer is required.

The user attempted to back up or restore with no data. Contact Informix Technical Support.

43086 An object name is required.

The user attempted to back up or restore with no data.

Name the object and retry.

43087 Unable to access NULL pointer.

A required value was set to null. Contact Informix Technical Support.

43088 Rule ID is required.

A required value was set to null.

Create an ID for the rule and retry. For instructions, refer to the manual for your storage manager.

43089 The object is not empty.

43090 This object was not backed up.

The user attempted to restore an object that was not backed up.

43091 Object information data exceeds maximum allowed size *maximum_allowed_size*.

Shorten the information data for the object and retry.

43092 Object name exceeds maximum allowed size *maximum_allowed_size*.

Shorten the name of the object and retry. For instructions, refer to the manual for your storage manager.

43093 Operation is not authorized for *user_id*.

The specified user does not have permission to perform this operation. Ask your system administrator to change your permissions.

43094 A value for the old security token is required.

Fill in the old security token and retry.

43095 The security token has expired. Please create a new one.

The security token is stale. Create a new security token and retry.

For instructions, refer to the manual for your storage manager.

43096 The transaction was aborted.

An error caused the backup or restore transaction to abort.

For details about the problem, refer to the storage manager activity log (or equivalent).

43097 A quote is missing from an environment keyword.

Insert the missing quotation mark and retry.

43098 A username cannot be deleted while it owns objects.

For details about the problem, refer to the storage manager activity log (or equivalent).

43099 An unspecified XBSA error has occurred: *error_number*.

For details about the problem, refer to the storage manager activity log (or equivalent).

43100 ERROR: There are no db / blobspaces or logical logs to backup or restore.

43103 WARNING: Bad option usage: **-f** option requires a *type_of_file*. All will be backed up by default.

User entered **onbar -b -f** but did not specify a filename. By default, ON-Bar backs up all storage spaces if the user does not specify any.

43106 Linked list operation failed *operation_name*.

A linked-list operation failed.

43108 One or more blobspaces are down. Log backup has been aborted.

A blobspace is down. Backing up or salvaging the logical logs would make it impossible to restore this blob in the future.

Bring all blobspaces on-line and retry the logical- log backup or salvage.

43112 Invalid Point In Time value specified: *invalid_time*.

Use the default date and time format for your database server locale.

43114 Db / blobspace *dbspace_name* is down and cannot be backed up.

Only storage spaces that are on-line can be backed up.

Bring the storage space on-line and attempt the backup again.

43115 Attempt to change the Dynamic Server with AD and XP Options operating mode failed: *mode_name*.

An error occurred while the user tried to change the Dynamic Server with AD and XP Options operating mode. Check the message log for errors.

43117 Db / blobspace *dbspace_name* is not down so it will not be restored.

Only storage spaces that are off-line need to be restored. This storage space will not be restored, but ON-Bar will attempt to restore other storage spaces.

43118 ERROR: An attempt to create linked list *list_name* failed with error *error_number*.

Linked-list error messages might be removed in the future.

Linked-list error numbers include 1: memory allocation failed; 2: bad list function input; 3: list node not found; 4: duplicate list node; 5: list is empty; 6: at head of list; 7: at end of list.

43119 ERROR: An attempt to add *specified_information* to a linked list failed with error *error_number*.

43120 ERROR: An attempt to remove *specified_information* from a linked list failed with error *error_number*.

43121 ERROR: An attempt to access the previous node in a linked list failed with error *error_number*.

43122 ERROR: Error *error_number* while reading data from the file *filename*.

43123 WARNING: Db / blobspace *dbspace_name* was not backed up so it cannot be restored.

43127 WARNING: Failed to connect to the **sysmaster** or **sysutils** database. Wait until these databases are created and try again.

Either the **sysmaster** or **sysutils** database has not yet been created.

Monitor the Dynamic Server with AD and XP Options message log until the message `sysmaster database built successfully` appears and retry your command.

43129 ERROR: Unable to create the db / blobspace backup session: *session*.

43130 ERROR: Unable to create the logstream backup session: *session*.

43131 ERROR: Unable to create the logical restore session: *session*.

43132 ERROR: Unable to create the physical restore session: *session*.

43133 No storage-manager instances were defined in the ONCONFIG file.

The user has not defined a list of available storage-manager instances in the ONCONFIG file. Backup and restore operations will be queued until you define a storage manager.

Define storage-manager instances in the ONCONFIG file.

43134 WARNING: Logstream *logstream_id* does not exist.

Verify that the logstream exists in Dynamic Server with AD and XP Options.

43136 ERROR: Unable to create the salvage logs session: *description*.

43137 ERROR: Unable to open logical log placement: *description*.

43138 ERROR: Unable to close logical log placement: *description*.

43139 ERROR: Unable to create a session: *description*.

43140 ERROR: Unable to destroy a session: *description*.

43141 WARNING: *connection_name* in *server_name* has exceeded maximum allowed size and will be truncated to *maximum_allowed_value*.

A database server name and connection name in the **sqlhosts** file must be less than 18 characters long.

43142 ERROR: The wrong version of *dbspace_name or logid* was returned from the storage manager.

43144 ERROR: Error suspending session *session_id*: *description*.

43145 ERROR: Error resuming session *session_id*: *description*.

43146 Completed backup logical log *logstreamid* Global timestamp *number_of_seconds* Complete *Y or N*.

43147 ERROR: No response was received from Dynamic Server with AD and XP Options. Aborting ON-Bar.

Dynamic Server with AD and XP Options did not respond. The database server has probably failed. Find out what is wrong with the database server, correct it, and retry the backup or restore.

43148 Process *process_id* received signal *signal*. Process will exit after cleanup.

A signal was received from another process, the operating system, or a user.

43149 The **onbar_m** should not be called except with a Dynamic Server with AD and XP Options environment.

A call was made to the **onbar_m** utility, which is only appropriate in a Dynamic Server with AD and XP Options environment.

43150 **onbar_m** usage **onbar_m** connection-address.

The connection address is determined by the XCC package. The user entered a command incorrectly, which might indicate an error in ON-Bar. You should use the **onbar** command line to start **onbar_m** and rarely manually.

If you start **onbar_m** manually, use the ON-Bar activity log (BAR_ACT_LOG) to determine the correct value and try again. If ON-Bar issued **onbar_m** automatically, call Informix Technical Support.

43151 ON-Bar failed to initialize the XCC communications mechanism (*error_number*).

43152 The onbar process is waiting for **onbar_m** processes to connect at '*server_address*.'

In a Dynamic Server with AD and XP Options cold restore, the **onbar** process that the user started launches **onbar_m** processes on various nodes of the MPP to collect data required to perform the cold restore. Each **onbar_m** process needs to connect to the **onbar** process with a communications address devised by the **onbar** process. This address is named in this message.

If you are starting **onbar_m** manually, type the address named in the message above on the **onbar_m** command line.

43153 Waiting for **onbar_m** processes to connect...

Several **onbar_m** processes have just been started, and **onbar** is waiting for them all to come up.

43154 All **onbar_m** processes have connected.

43155 The **onbar_m** process started on node *node_name* failed with status *error_number*: *status_number_of_port*.

One of the **onbar_m** processes failed to connect to **onbar**. If this error occurs once, try to start an **onbar_m** process manually on the named node as user **informix**. If the connection fails repeatedly, contact Informix Technical Support with the status information in the error message and with the contents of your ONCONFIG file handy.

43157 The **onbar_m** process on node *node_name* sent an unexpected message (*message_received* instead of *message_expected*).

This message indicates either an error in the ON-Bar software or an improperly started **onbar_m** process. For complete information, contact Informix Technical Support.

43158 The ON-Bar process received a polling error from XCC (*error_number*: *status_number_of_port*).

If this polling error occurs once, try to re-start the cold restore. If it occurs repeatedly, contact Informix Technical Support with the status information in the error message and with the contents of your ONCONFIG file handy.

43159 The ON-Bar process failed to send an XCC message (*error_number*: *status_number_of_port*).

If this error occurs once, try to re-start the cold restore.

If it occurs repeatedly, contact Informix Technical Support with the status information in the error message and with the contents of your ONCONFIG file handy.

43160 The ON-Bar process failed to receive an XCC message (*error_number*: *status_number_of_port*).

If this error occurs once, try to re-start the cold restore.

If it occurs repeatedly, contact Informix Technical Support with the status information in the error message and with the contents of your ONCONFIG file handy.

43161 An ON-Bar process failed to acknowledge an XCC message.

Usually an ON-Bar process exiting prematurely causes this error. If this occurs once, try to re-start the cold restore. If it occurs repeatedly, contact Informix Technical Support with the contents of the activity log and your ONCONFIG file handy.

43162 Session *session_id* complete.

The specified backup or restore session has completed.

43163 Session *session_id* complete with error *numeric_value*.

The specified backup or restore session has completed.

43164 WARNING: Dynamic Server with AD and XP Options has failed or been shut down. Exiting...

Dynamic Server with AD and XP Options has failed or been shut down while one or more **onbar-worker** processes are still running. The **onbar-workers** will be automatically shut down.

43165 ERROR: Unable to determine mode of all coservers.

It was not possible to determine what mode (on-line, quiescent, off-line, microkernel) each coserver is in.

43166 Not all coservers are in a compatible mode.

Not all coservers are in the same mode. Each coserver must be in a mode that is compatible to all the others. For example, all the coservers must be in microkernel mode to perform a cold restore.

The on-line and quiescent modes are compatible, so you can perform a backup or warm restore if all coservers are in one of these two modes. Change all coservers to the same mode.

Appendix

B

ON-Bar GLS Support

Using GLS with ON-Bar

ON-Bar supports Global Language Support (GLS), which allows users to work in their native language. The language that the client application uses is called the *client locale*. The language that the database uses for its server-specific files is called the *server locale*.

ON-Bar must run on the same computer as the database server. However, you can run ON-Bar in any locale for which you have the supporting message and localization files. For example, if the server locale is English and the client locale is French, you can issue ON-Bar commands in French.

The following command performs a level-0 backup of the dbspaces specified in the file, **tombé**:

```
onbar -b -L 0 -f tombé
```

On Windows NT, you cannot use multibyte filenames in backup or restore commands because they are not supported.

The **sysutils** database, the emergency boot file, and the storage manager boot file are created with the **en_us.8859-1** (default English) locale. The ON-Bar catalog tables in the **sysutils** database are in English. Change the client and database locales to **en_us.8859-1** before attempting to connect to **sysutils**.

Identifiers that Support Non-ASCII Characters

The *Informix Guide to GLS Functionality* describes the SQL identifiers that support non-ASCII characters. Non-ASCII characters include both 8-bit and multibyte characters. You can use non-ASCII characters in the database names and filenames with the ON-Bar and **onutil** commands and for filenames in the ONCONFIG file.

For example, you can specify a non-ASCII filename for the ON-Bar activity log in BAR_ACT_LOG and a non-ASCII pathname for the storage-manager library in BAR_BSALIB_PATH.

Identifiers That Require 7-Bit ASCII Characters

You must use 7-bit ASCII characters for the following identifiers:

- Storage space names
- Database server names

Locale of ON-Bar Messages

All ON-Bar messages appear in the activity log in the client locale except the messages that the database server issues. For example, the part of the message that tells you that a database server error occurred appears in the client locale, and the server-generated part appears in the server locale.

Using the GL_DATETIME Environment Variable with ON-Bar

The database server must know how to interpret and convert the end-user formats when they appear in date or time data that the client application sends. You can use the **GL_DATE** and **GL_DATETIME** environment variables to specify alternative date and time formats. If you do not set these environment variables, ON-Bar uses the date and time format of the client locale.

If you perform a point-in-time restore, enter the date and time in the format specified in the **GL_DATETIME** environment variable if it is set.

ANSI

The **-t** option in a point-in-time restore requires the following ANSI date and time:

```
YYYY-MM-DD hh:mm:ss
```

ON-Bar uses the **GL_DATETIME** environment variable, so you can choose which format to use. If **GL_DATETIME** is not set, ON-Bar reverts to the ANSI format. ♦

If the date and time string contains any white space, either put an escape character '\' before this white space or put quotes around the whole string:

```
YYYY-MM-DD\ hh:mm:ss     or       "YYYY-MM-DD hh:mm:ss"
```

Point-in-Time Restore Example

For example, the default date and time format for the French locale, `fr_fr.8859-1` uses the format "`%A %.1d %B %iY %H:%M:%S`." The ON-Bar command for a point-in-time restore is as follows:

```
onbar -r -t "Lundi 9 Juin 1997 11:20:14"
```

You can set **GL_DATETIME** to a different date and time format that uses the date, month, two-digit year, hours, minutes, and seconds.

```
%.1d %B %iy %H:%M:%S
```

The ON-Bar command for a point-in-time restore is as follows:

```
onbar -r -t "9 Juin 97 11:20:14"
```

Tip: *For more information on how to use GLS and the* ***GL_DATE*** *and* ***GL_DATETIME*** *environment variables, refer to the "Informix Guide to GLS Functionality."*

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