

BrightStor® ARCserve® Backup for UNIX

Enterprise Option for Advantage™ Ingres® Guide r11.5



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Chapter 1: Introducing the Option

BrightStor® ARCserve® Backup is a comprehensive, distributed storage solution for applications, databases, distributed servers, and file systems. It provides backup and restore capabilities for databases, business-critical applications, and network clients.

BrightStor ARCserve Backup incorporates cutting edge client/server and manager architectures. The client component lets you issue requests through client software located on your database host, to the BrightStor ARCserve Backup server. Typical requests include calls to browse computer systems and to submit backup and restore jobs. BrightStor ARCserve Backup also treats the computer systems and NAS servers it backs up and restores as clients.

The manager component manages the flow of data and requests between BrightStor ARCserve Backup and the databases you back up or restore. The option portion of the manager component, a separate software component installed on your client machine, initiates or performs specified backup and restore services. Each option is designed to work with a particular database or operating system.

Among the options BrightStor ARCserve Backup offers is the BrightStor® ARCserve® Backup Agent for Advantage™ Ingres®, which provides services to BrightStor ARCserve Backup and the Advantage™ Ingres® database. These services let you:

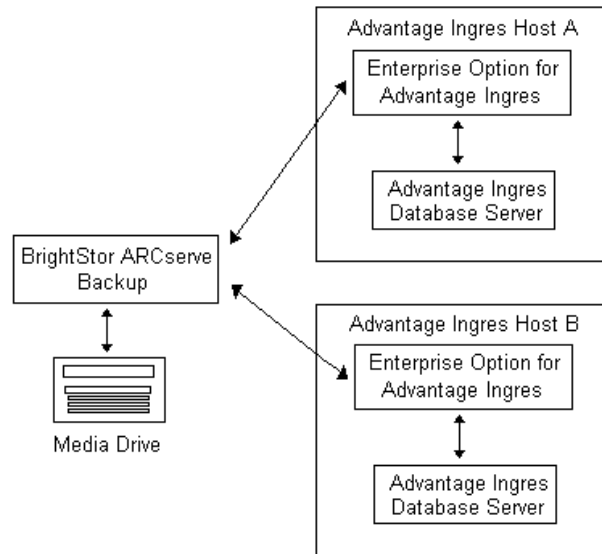
- Backup Advantage Ingres databases and the objects they contain using BrightStor ARCserve Backup without taking your database offline or preventing users from adding new data to it.
- Restore Advantage Ingres databases using BrightStor ARCserve Backup.

The option handles all communications between BrightStor ARCserve Backup and the Advantage Ingres database server during backup and restore jobs, including preparing, retrieving, and processing the data packets sent back and forth across the network. This process lets you perform backup and restore jobs efficiently.

Option Architecture

The option provides services that let you use BrightStor ARCserve Backup to back up and restore Advantage Ingres databases. Using the networking capabilities of BrightStor ARCserve Backup, you can back up an Advantage Ingres database that resides on any host on which the Enterprise Option for Advantage Ingres is also installed. You can perform backups local to BrightStor ARCserve Backup, if the database and the option are all located on the same host. You can also back up databases located on remote hosts. The remote hosts must have the Enterprise Option for Advantage Ingres installed so the databases can communicate with BrightStor ARCserve Backup.

The following diagram shows the relationship between BrightStor ARCserve Backup and Advantage Ingres hosts:



Note: The Enterprise Option for Advantage Ingres can also be installed on the same server as BrightStor ARCserve Backup to back up an Advantage Ingres installation on that server.

Components

The option has the following four components:

- **Browser:** Initiated by BrightStor ARCserve Backup, when you use the Backup and Restore Managers to browse the contents of a host. If the option is installed and enabled on the host, the Browser component is initiated. The Browser is used to retrieve selected information, as part of the user's browsing process, from the Advantage Ingres installations on that host. This information is then displayed on the Backup Manager's Source Panel or the Restore Manager's Destination Panel.
- **Data Movement Agent:** Initiated by BrightStor ARCserve Backup during the execution of a backup or restore execution. This agent contacts the ingres tools such as ckpdb/rollforwarddb/infodb in order to know what must be part of the backup or restore execution, and at what specific moment. The agent is responsible for the data movement that occurs during the backup and restores execution.
- **libing.so:** This library includes various modules that are shared between the Browser and the Data Movement Agent including code that is used to interface with Advantage Ingres.
- **IngDBExtr:** During the backup or restore execution, the IngDBExtr is responsible for synchronizing the work and information between the ingres ckpdb/rollforwarddb and the Data Movement agent.

Online Backup and Restore Strategies

The Advantage Ingres server is organized into databases. The databases are subdivided into database objects, such as data files, config files, and journal files. BrightStor ARCserve Backup uses the option to dynamically backup and restore/recover the entire database, or selected database objects, while the database remains online.

Important! *Planning your backup and restore strategy in advance is critical both for protecting your database against failures and for quick recovery of your Advantage Ingres server in case of disaster. As part of your preparation, be sure to review the planning information in the Administrator Guide for guidelines on creating backup and restore strategies. For additional information on backup and restore strategies, also see Backup Strategies in the chapter Backing up the Database.*

Database Backup Overview

A backup operation copies a database or selected database objects to storage media (for example, a tape volume). BrightStor ARCserve Backup backs up Advantage Ingres databases using the backup features of BrightStor ARCserve Backup, the option, and Advantage Ingres.

Backup jobs are submitted from either the BrightStor ARCserve Backup graphical user interface or command line interface. BrightStor ARCserve Backup adds the job to a job queue. At the appropriate time, the job initiates and prompts the option to issue commands such as ckpdb and infodb to Advantage Ingres. When the data transfer is ready to begin, the option reads the data to be backed up and transfers it through the network to the BrightStor ARCserve Backup server, which reprocesses the data and places it on a storage device.

Depending on the backup job and the properties of the database, BrightStor ARCserve Backup creates appropriate backup sessions on the storage media. If you back up an entire database, BrightStor ARCserve Backup automatically creates at least two sessions:

- The data session containing the actual database information.
- The configuration session containing the database's backup configuration file and the checkpoint's .dmp and .lst files.

If a database is journaled, you can also back up the database's journal files. In journaled databases, the browser displays a JOURNAL OF DATABASE *dbName* object that refers to the journal files associated with that database. Select this object to back up the database's journal files. A separate journal session is added to the storage media for each set of journal files that are backed up and are associated with a particular checkpoint number.

During a simple (no journal files requested) Advantage Ingres database backup, BrightStor ARCserve Backup automatically backs up the following:

- Data files
- The checkpoint's .dmp file
- The checkpoint's .lst file
- The aaaaaaaa.cnf file in the database's dmp directory

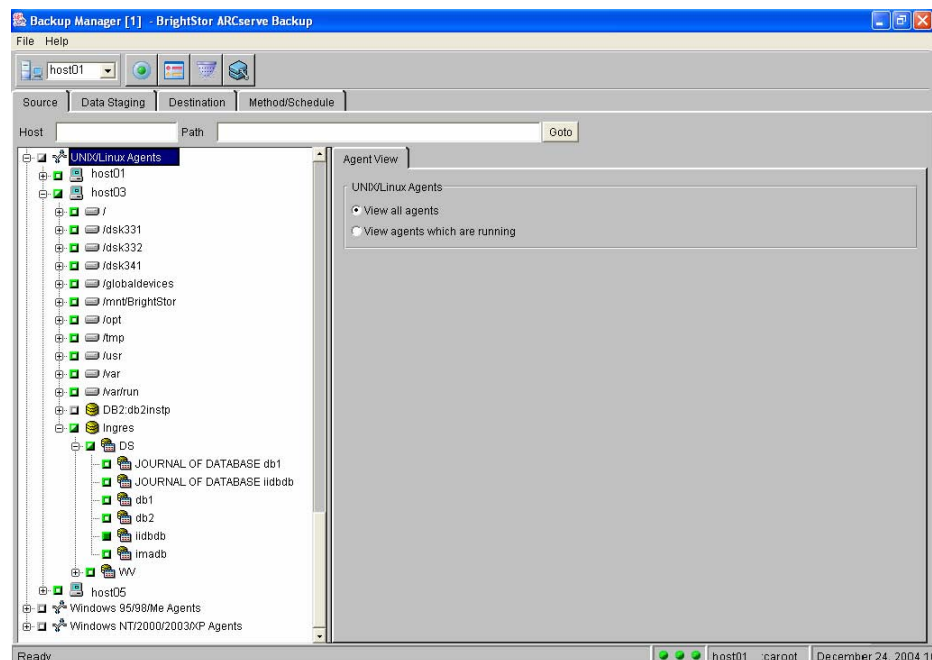
Master Database Backup

The Advantage Ingres master database, iibdadb, contains information that is particular to each installation, such as:

- The list of databases that exist in the installation and where they are located
- The list of locations that exist in the installation
- Authorization information on which users may access which databases

You must include it in your regular backup schedule. If a total system failure occurs, the information in the iibdadb database is required to perform a full database restore.

In the following illustration, the selected item is the Advantage Ingres Master database:



BrightStor ARCserve cadbase Database Backup

Although BrightStor ARCserve's internal database (cadbase) is stored within an Ingres installation, using the Advantage Ingres Option to backup and recover this database is not supported. A special BrightStor ARCserve procedure must be followed for this purpose.

How Transaction Checkpoints Work

A checkpoint is a consistent snapshot of a database's tables at a specific point in time in which all outstanding transactions have been committed. The Enterprise Option for Advantage Ingres uses Advantage Ingres checkpoints to perform online, dynamic backups without locking the database or taking the entire database offline. Checkpoints of the database are created using the Advantage Ingres ckpdb command. During backup, Advantage Ingres logs database transactions to a special dump file to track all of the changes made from the time the database is checkpointed until the backup ends. During a restore operation, after the Enterprise Option for Advantage Ingres has restored the data, the dump file is used to bring the database to the consistent state (recover) that it was in at the time that checkpoint was first created.

If journal files are also selected for backup, the option retrieves journal files from the database journal directory and passes them directly to BrightStor ARCserve Backup, which backs them up to a storage device. When the backup finishes, the option instructs the Advantage Ingres database server to return to normal operation mode. If only journal files have been selected for backup, BrightStor ARCserve Backup backs up only the journal files without creating a database checkpoint. Before backing up journals, however, the database is prompted to close the currently active journal and open a new one. All journals in the database's journal directory are backed up except for the new active journal.

Please refer to the Advantage Ingres documentation set for more information on Transaction Checkpoints.

Note: BrightStor ARCserve Backup will be unaware of checkpoints that are created by manual executions of ckpdb from outside BrightStor ARCserve Backup.

Database Restore Overview

Restore operations retrieve databases or database objects from backup sessions on media and overwrites the information currently in the database with the retrieved information.

Note: This process is also called loading.

Using the Enterprise Option for Advantage Ingres, you can restore data in the following ways:

- By file or by session
- To the most current entry or up to a date and time you specify
- To a remote client
- From past versions of data files

If you restore journaled databases, you can specify whether to use the journal files to restore the database to a later time than the checkpoint time.

Restore jobs use features from BrightStor ARCserve Backup, the option, and Advantage Ingres. To restore data, submit a restore job from the Restore Manager. BrightStor ARCserve Backup processes the restore job in a job queue and starts it at the scheduled time. The restore job communicates with the option, which issues recovery commands such as rollforwarddb to Advantage Ingres. The option initiates communication with Advantage Ingres, performs the restore job with the specified options, and overwrites the current data with the backed up data. Advantage Ingres completes the job by recovering the database.

Disaster Recovery Preparation

After creating your databases, perform an Ingres Installation-wide backup that includes the master database iidbdb. After you have performed this initial installation-wide backup, we recommend that you schedule backup jobs at regular intervals to keep this information current.

Important! *You cannot restore Advantage Ingres data using the Disaster Recovery Option. Use a separate disaster recovery strategy for Advantage Ingres.*

In addition, we recommend that you identify and prepare a standby host, an alternate computer system to which you can recover your Advantage Ingres databases if your database host fails completely. Set up and maintain a standby host so that it is ready to take over from the online host if the online host fails. You can dedicate the standby host to database recovery or use it as a regular production system.

Important! *The standby host and the online database host must use the same operating system. For more information, see "Standby Host Restore Operations"*

We strongly recommend that you maintain your standby host at a high level of preparedness. It takes a significant amount of time to set up, test, and maintain the standby host because the process is involved and requires tailoring to meet your specific needs. You should also recreate the online databases on the standby system and regularly restore/recover the ckp, data, dmp, and jnl directories from the online host to the standby host so you can recover your databases quickly.

Backup Strategy

For the most efficient disaster recovery, we recommend the following backup strategy:

- Perform at least one full offline file system backup of your Advantage Ingres installation before performing your first online backup with the option.

To perform a full offline backup, shut down the Advantage Ingres server and perform a file system backup of all the directories used by your Ingres installation making sure to include all the data locations of any extended databases.

- Perform a full offline checkpoint backup each time there is a major schema change in your database. Although this is not required, it is highly recommended.

Note: See an Advantage Ingres administrator and the Advantage Ingres documentation for information on performing an offline checkpoint backup.

- Perform full online backups regularly (for example, once a week). Between successive online backups, incremental journal backups may be necessary.

Test Environments

After developing backup and recovery strategies, we recommend that you create a test environment in which to practice them. Practicing strategies in separate environments protects your Advantage Ingres files from unnecessary risk. After you have established your backup and restore methods, make any necessary adjustments in the test environment and try your strategies again. When you are satisfied that your backup and recovery strategies have been properly established, move to a production system and perform further tests. By testing your strategies, you can minimize problems before they occur in a real situation.

Restore a Destroyed Database

To restore/recover a specific database checkpoint, the database must already exist in the destination. If the database does not exist (if, for example, it had been destroyed), perform the following procedure:

1. Create the database in the same manner that it existed when the checkpoint was created using the Advantage Ingres utility `createdb`.
2. If appropriate, extend the database to the same data locations as the original database at the time the checkpoint to be restored was created.
3. If the original database was journaled, run the Advantage Ingres `ckpdb` command with the `'+j'` parameter to enable journaling on the newly created database.
`ckpdb +j database name`
4. Restore the config session for the checkpoint to be restored. This will restore the `.dmp` files, `.lst` files, and the database's `aaaaaaaa.cnf` file created by the checkpoint to be restored/recovered.
5. Restore any needed journal files.
6. Copy the restored `aaaaaaaa.cnf.timestamp` file from the database `dmp` directory to the database data directory and rename it to `aaaaaaaa.cnf` to overwrite the existing `aaaaaaaa.cnf` file.
7. You are now ready to restore the data session in order to recover the database from the checkpoint you have selected.
8. After this, your original database will be recovered. You may, however, still need to perform additional tasks such as granting access to the database to particular users, and so on.

How the Option Backs Up Data

When BrightStor ARCserve Backup begins a backup of a database object, it sends a request to the option, prompting it to retrieve database objects from the Advantage Ingres database and relay the data packets to BrightStor ARCserve Backup, which backs them up to a storage device. During the backup, the option reads Advantage Ingres data, dump, and journal files directly from the Advantage Ingres database files and forwards the data to the BrightStor ARCserve Backup server. During this transfer, the data to be backed up does not pass through the Advantage Ingres database server. Control information, however, is exchanged between the option and the server.

1. SQL statements query the Advantage Ingres master database, iidbdb, for a list of databases and the location of their data, dump, and journal directories.
2. The option notifies Advantage Ingres to use the option's cktmpl.def file. This is done using of the II_CKTMPL_FILE environment variable.
3. The ckpdb command is called by the option to perform an online checkpoint of the database to be backed up.
4. The cktmpl.def file instructs ckpdb to initiate the option's IngDBExtr.
5. The ckpdb command notifies IngDBExtr of the next database location to back up.
6. The option's IngDBExtr identifies the files to backup and provides the Data Movement Agent option with each file name. The Data Movement Agent then reads each file and forwards the data to the BrightStor ARCserve Backup server.
7. Repeat step 5 and 6 for each distinct Ingres location that needs to be backed up.
8. Once all the files of the current Ingres location have been backed up, the Data Movement Agent informs the IngDBExtr, which in turn informs ckpdb.
9. Step 4 to 8 will be repeated for each distinct Ingres location that needs to be backed up.
10. Once all location have been backed up, the Ingres ckpdb returns with a success status.
11. The Data Movement Agent will create a new session containing the dump files and config files created during the checkpoint execution.

How the Option Restores Data to Recover a Database

The Enterprise Option for Advantage Ingres uses the following process to restore data and recover a database:

1. The option notifies Advantage Ingres to use the option's cktmpl.def file. This is done using the II_CKTMPLE_FILE environment variable.
2. The option executes the rollforwarddb command to lock the Advantage Ingres database during the restore/recover operation.
3. The cktmpl.def file instructs rollforwarddb to initiate the option's IngDBExtr.
4. The rollforwarddb notifies IngDBExtr of the next database location to restore from tape.
5. The option's IngDBExtr pass the location information to the Data Movement agent. The Data Movement Agent contact the BrightStor ARCserve Backup Server in order to restore the files from the specified locations and checkpoint ID.
6. BrightStor ARCserve Backup writes the data directly to the appropriate location in the Advantage Ingres database.

Note: During this transfer, the restored data does not pass through the Advantage Ingres database server. However, control information is exchanged between the option and the server.
7. Once the data movement completed, that is all the files from the current location restored, the Data Movement Agent informs the IngDBExtr which informs rollforwarddb.
8. Steps 4 to 7 are repeated for each locations that needs to be restored to complete the recovery of the mentioned database.
9. Once all the locations restored, rollforwarddb completes the recovery by applying the checkpoint's .dmp file. If requested, rollforwarddb also rolls forward through available journals, applying those transactions to the database.
10. Rollforwarddb returns with a success status.

Chapter 2: Installing the Option

The Enterprise Option for Advantage Ingres is a client program you install on a BrightStor ARCserve Backup client machine. Use the information in this chapter to install and configure the option. You can find system requirement information in the Readme file and the *Getting Started* guide. Check ca.com for updates to the requirements.

Installation Prerequisites

Before you install the Enterprise Option for Advantage Ingres, we recommend that you verify that your system configuration meets the minimum requirements needed to install the option. For a list of these system requirements, see the Readme file. In addition, verify that the following applications are installed and working properly:

- Advantage Ingres database server
- BrightStor ARCserve Backup

The BrightStor ARCserve Backup host must be a UNIX or Linux machine. You must install the option on the same host as the Advantage Ingres installation that you want to backup. This may or may not be the same host as that where BrightStor ARCserve Backup is installed.

Before beginning the installation, you must have the following permissions and information:

- Super user privileges to log in as root
- The installation ID and II_SYSTEM Environment Variable for each Advantage Ingres server installation on the host machine that you want the option to back up and restore.

Note: Contact an Advantage Ingres administrator to obtain the proper rights and information if you do not have them.

For procedures to install the Enterprise Option for Advantage Ingres, see the *Getting Started* guide.

Post-Installation Tasks

After you have installed the Enterprise Option for Advantage Ingres, you must configure it and add the node on which the option is installed as a remote client to BrightStor ARCserve Backup. The following sections explain how to perform these post-installation tasks.

Configure the Option

To configure the Enterprise Option for Advantage Ingres, follow these steps:

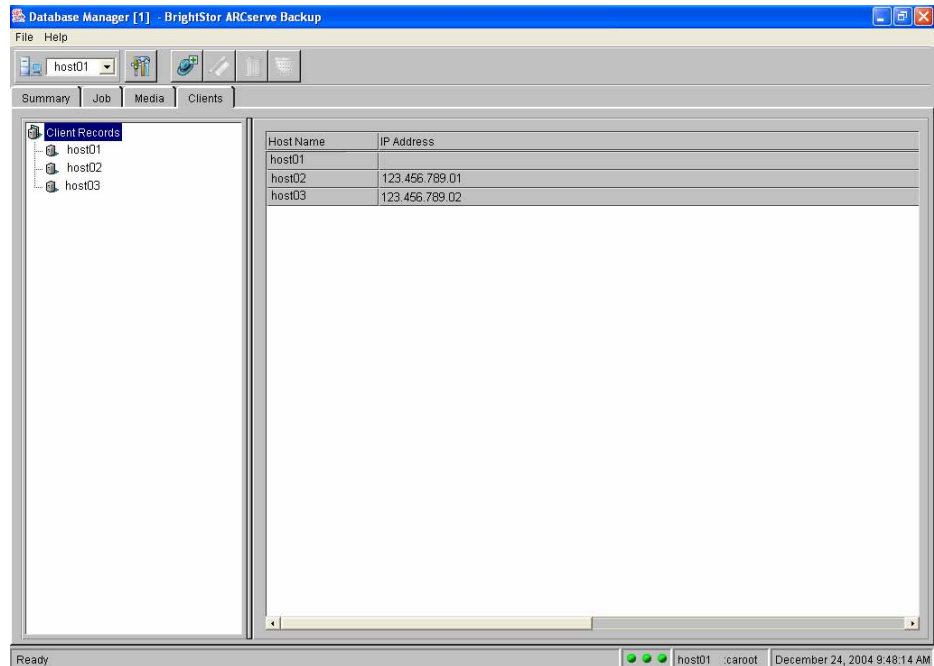
1. Enter **./ingsetup** at the option's installation directory.
2. At the prompt, enter y if you have Advantage Ingres installed.
Note: If Advantage Ingres is not installed, the configuration process stops. Install Advantage Ingres and start the setup script again.
3. When prompted, enter the Installation ID for an Advantage Ingres server installation.
4. When prompted, enter the value of the Advantage Ingres II_SYSTEM Environment Variable for that server.
5. Repeat Steps 3 and 4 until you have configured all the Advantage Ingres server installations you want the option to backup and restore.
6. After configuring the last Advantage Ingres server installation, and when prompted, press Enter.
7. When prompted, enter y to complete the configuration. This will register the option to the BrightStor ARCserve Backup Common Agent.
8. After the configuration finishes, enter y to enable the option.

Define Nodes as Remote Clients

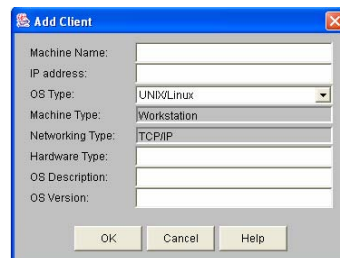
Before backing up an Advantage Ingres database on a remote node to the location in which the BrightStor ARCserve Backup server is installed, you must define that node as a remote client of BrightStor ARCserve Backup. To define a node as a remote client, use the Database Manager in BrightStor ARCserve Backup.

To define a node as a remote client, follow these steps:

1. In the Database Manager, click the Clients tab to display the remote client entries attached to the BrightStor ARCserve Backup host.



2. Click Add Client. The Add Client dialog appears.



3. Enter the machine name and IP address of the remote client.

Note: Select the operating system type (OS Type) and optionally enter the hardware type, operating system description (OS Description), and operating system version (OS Version).

4. Click OK to add the new entry to the BrightStor ARCserve Backup database.

Uninstall the Option

The appropriate system utility should be called to remove the BrightStor ARCserve Backup installation. For example, the following steps describe the uninstallation process for Solaris operating system:

Note: You must have superuser privileges to uninstall the option.

1. At the command line prompt, enter the following command to begin the uninstallation process:

```
pkgrm B ABing
```

2. When asked whether you want to remove this package, enter y for yes.
3. Reconfirm the removal of the Enterprise Option for Advantage Ingres from the machine.
4. The process is finished when the following message appears:

```
Removal of BABing was successful.
```

Chapter 3: Backing Up Databases

The Enterprise Option for Advantage Ingres lets you perform online backups at any time without taking your database offline or preventing users from adding new data to it.

Note: You cannot use the option to perform offline backups. See your Advantage Ingres administrator and the Advantage Ingres documentation for information about performing offline database backups.

This chapter discusses how to plan your installation backup strategy and explains how to prepare for and perform backups of Advantage Ingres database and journal files.

Backup Strategies

The goal of a backup strategy is to prevent the loss of valuable data by ensuring that the data can be recovered from a combination of backup data and online journal files. There are two keys to a successful backup strategy:

- **Perform regular backups:** Although different Advantage Ingres installations and databases often require different backup frequencies, all installations and databases should be backed up at regularly scheduled intervals.
- **Journal critical databases:** Journal all of your critical or heavily used databases so that you can recover them up to the latest committed transaction.

Backup Considerations

The following factors should be considered when planning a backup strategy:

- The importance of each database
- The volatility of each database
- The size of each database
- The time available to perform backups (the backup window)
- The time required to recover the database if a failure occurs

The remainder of this section discusses how each of the considerations affect backup strategy.

Database Importance

The importance of a database is the most crucial factor in determining the direction of your backup strategy. The following actions should be taken for important and critical databases:

- Backup databases regularly
- Enable journaling so that databases can be recovered up to the latest committed transaction
- Backup journals regularly

Note: Backup active journals frequently to reduce the number of transactions potentially lost by a corruption of the active journals.

Database Volatility

The volatility of a database often determines the journaling strategy. Volatile databases should be journaled to reduce the potential for data loss. Perform daily database and journal backups to reduce the size of journal files and the time needed to roll forward through journals during recovery. To further reduce the risk of data loss due to journal location corruption, multiple journal backups can be performed between the execution of database data backups. Because the option does not back up active journals, it prompts Advantage Ingres to close the active journal and open a new one, allowing the previously active journal to be backed up.

Because journal files can become very large, you may need to use the Purge Journal after Journal Backup option. This option automatically reclaims disk space by deleting older, backed up journal files. For more information about the Purge Journal after Journal Backup option, see BackUp Journal Files later in this chapter.

Database Size

The size of a database often affects when and how often you can back it up. For example, very large databases take longer to backup. Because of the long backup time, you may be compelled to backup very large databases only once a week, on weekends.

If the size of a database dictates weekly backups, it is vital that you journal the database and backup the journal files for the database more frequently than the database itself. If the database is mission-critical or very volatile, we recommend that you backup the journal files daily or even more frequently.

Raw Data Locations

When you use raw data locations, the Enterprise Option for Advantage Ingres may need to backup the entire raw area location. Since this area may be quite large it can take a long time to backup and restore. We recommend that you take this into consideration when planning a backup and restore strategy.

Backup Window

The backup window you have available often determines when you can back up a database. For example, a database used heavily during the work-day but little used after 6 p.m. has a twelve or thirteen hour a night backup window. In contrast, a database used heavily twenty-four hours a day, Monday through Friday, but not used on weekends, has a two-day backup window each weekend. In both cases, you can adjust your backup strategy to accommodate the backup window available to you.

Although the option performs online backups (backups run while the database is in use), other constraints can impose particular backup windows. For example, you may not be able to back up the database when it is being updated because of the extra load on the system imposed by the backup operation. In addition, large numbers of updates during backup operations results in larger dump file sizes and longer recovery time because transactions in the dump file must be undone. Therefore, your backup window may be limited to certain times during the day. Other corporate network backups or file transfers can also impose a specific backup window for your database backups, or, if your databases are located remotely from your BrightStor ARCserve Backup Server, network load can also impose a particular backup window.

Length of Recovery Time

To decrease the time needed to recover a database, follow these guidelines:

- Reduce the size of the database before backing it up using Advantage Ingres commands to reorganize indexes or reclaim unused index space.
- Back up the database often. More frequent database backups result in smaller journal files that take less time to roll forward.
- Keep a few journal files available on disk. If you keep journal files on disk, you can recover the database's checkpoint without restoring its journal files.
- Keep a few database checkpoint dmp files available on disk. If you keep dmp files on disk, you can recover the database's data session without having to restore its config session.
- Have a standby system ready to take over from your online system. For example, you can regularly recover the latest database and journal files to the standby system so that it can more quickly replace the online system if it fails.

General Backup Strategies

There are two general backup strategies you can use, alone or together, to implement a successful backup scheme:

- Backup Advantage Ingres completely each time you back up
- Backup selected databases and journal files at different time intervals

A complete backup procedure backs up all Advantage Ingres databases and journal files. A selective backup procedure backs up only those databases and journals you have chosen.

Each general strategy has variations, some of which are discussed in the sections Complete Backup Strategies and Selective Backup Strategies.

Complete Backup Strategies

A complete Advantage Ingres backup strategy is the easier of the two general strategies to implement. It is less complicated, requires the least amount of setup, and is the easiest to maintain. The primary variations of the complete backup strategy are as follows:

- Daily complete Advantage Ingres installation backups.
- Weekly (or less frequent) complete Advantage Ingres backups.
- Weekly (or less frequent) complete backups combined with separate daily or more frequent journal backups.

If you implement a complete backup strategy, the variation you choose depends on a number of factors. These factors include the relative importance of your databases, the volatility of the databases, and the length of time you have available to perform backups.

The remainder of this section discusses the advantages and disadvantages of each variation and how you can choose an appropriate variation.

Daily Backups

Daily complete backups are appropriate if the following conditions are present:

- All of your Advantage Ingres databases are of comparable importance.
- All of your Advantage Ingres databases require backup.

- All the databases are similarly volatile (they are all accessed and updated frequently by users)
- The time it takes to back up fits within your backup window.

Daily backups provide the most comprehensive data protection. However, daily backups may be inappropriate for Advantage Ingres users with extremely active databases and no viable daily backup window.

Weekly or Intermittent Backups

Weekly (or less frequent backups) are appropriate if the following conditions are present:

- All of your Advantage Ingres databases are of comparable importance
- All of your Advantage Ingres databases require backing up
- There is enough disk space to store the journal files, which accumulate data for a week.
- The longer recovery time after a failure, caused by the need to roll forward through larger, weekly journal files, is acceptable.

The primary disadvantage of this variation is a potential disaster recovery drawback. Because the journal files and databases are backed up at the same time, a disaster that corrupts or destroys the active journal files results in the loss of all transactions from the last backup to the most recent transaction.

Combined Backups

Weekly or less frequent backups, combined with daily or more frequent journal backups, are appropriate if the following conditions are present:

- All of your Advantage Ingres databases are of comparable importance
- All of your Advantage Ingres databases require backing up
- There is enough disk space to store the journal files, which accumulate data for a week.
- The longer recovery time after a failure, caused by the need to roll forward through larger, weekly journal files, is acceptable.
- You want better protection against disasters.

Frequent journal backups provide added protection against disasters. If the active journal files are destroyed or corrupted, you can use the most current backed up journal files to recover transactions to a point much closer to the latest actual transactions.

Selective Backup Strategies

Rather than implement an installation-wide backup strategy, you may need to tailor your backup strategy per database or group of databases. Because selective backup strategy variations are more numerous, and because you can apply different variations to different databases, it is more difficult to implement a selective backup strategy. On the other hand, this type of backup strategy gives you greater control over the backup process and lets you match backup frequency and other backup options more precisely to the requirements of each database.

Selective backup strategies include the following procedures:

- Daily database and journal backups
- Daily journal backups with less frequent database backups
- Monthly database and journal backups
- Monthly journal backups with less frequent database backups
- Multiple daily database and journal backups
- Multiple daily journal backups with less frequent database backups

The following sections describe these selective backup strategies.

Daily Database and Journal Backups

The daily database and journal backup strategy is the typical backup strategy and applies to most databases. This strategy provides high levels of data protection.

Daily Journal with Intermittent Database Backups

A common schedule with this strategy is to perform full database backups on the weekend. The following are characteristics of the daily journal with less frequent database backup strategy:

- Lowers system overhead because you only back up journal files on most days
- Increases the time needed to roll forward through journals during recovery
- Uses more disk space for journal files

Weekly Database and Journal Backups

The weekly database and journal backup strategy is appropriate for databases with low levels of volatility.

Weekly Journal with Intermittent Database Backups

The following are characteristics of the weekly journal with less frequent database backup strategy:

- Lowers system overhead associated with database backups because they are performed less frequently
- Increases the time needed to roll forward through journals during recovery
- Uses more disk space for journal files

Monthly Database and Journal Backups

The monthly database and journal backup strategy is appropriate only for databases with little activity.

Monthly Journal with Intermittent Database Backups

The monthly journal with less frequent database backup strategy is appropriate only for databases with little activity.

Multiple Daily Database and Journal Backups

The following are characteristics of the multiple daily database and journal backup strategy:

- It is for very volatile databases.
- It provides higher levels of data protection.
- It reduces the time needed to roll forward through journals during recovery.
- It increases system overhead.

Multiple Daily Journal with Intermittent Database Backups

The following are characteristics of the multiple daily journal with less frequent database backup strategy:

- It is for very volatile databases.
- It provides greater protection against disasters.
- It provides higher levels of data protection.
- It lowers system overhead because the more frequent journal backups take less system resources, such as cpu, than the less frequent database backups.
- It increases the time needed to process journals during recovery, but the increase is often acceptable.

Backup Commands

The following section describes the commands available to use to back up database files and journal files. Sample commands are also provided to illustrate how to perform various backups.

In the following examples, DS and WV represent the ID of Advantage Ingres installations containing the data you want to back up and db1, db2, and db3 represent the names of databases.

Complete Installation Backup

The following is an example of a command to back up a complete Advantage Ingres installation. All the database data, config and journal files of the WV installation will be backed up:

```
$ca_backup -source host01 -ingres_installation_id WV -username root -password root123 -group GROUP1
```

Complete Multiple Installation Backup

The following is an example of a command to back up two complete Advantage Ingres installations. All the database data, config and journal files of the WV and DS installations will be backed up:

```
$ca_backup -source host01 -ingres_installation_id WV DS -username root -password root123 -group GROUP1
```

To completely backup all the Ingres instances running on a host (that have been configured into the option's installation.cfg file), simply do not enter a value for the -ingres_installation_id parameter as in this example:

```
$ca_backup -source host01 -ingres_installation_id -username root -password root123 -group GROUP1
```

Database Only Backup

The following is an example of a command to back up database data files:

```
$ca_backup -source host01 -ingres_installation_id WV -database INGRES db1 db2 -username root -password root123
```

This command backs up only the database data files of databases db1 and db2 from the WV instance. If you want to back up only database items, use the -database INGRES option.

You can specify multiple databases.

Database and Journal Backup

The following is an example of a command to back up databases and their journals:

```
$ca_backup -source host01 -ingres_installation_id WV  
-ingres_databaseandjournals db1 db2 -username root -password root123
```

This command backs up both the database data files and journals of databases db1 and db2 from the WV installation.

You can specify multiple parameters.

Journal Only Backup

The following is an example of a command to back up journals:

```
$ca_backup -source host01 -ingres_installation_id WV -ingres_journals db1 db2 -  
username root -password root123
```

This command backs up only the journals of databases db1 and db2 from the WV installation.

You can specify multiple parameters.

Journal Backup Using the `ingres_purge_journals` Option

The following is an example of a command to back up journals using the `-ingres_purge_journals` parameter option:

```
$ca_backup -source host01 -ingres_installation_id WV -ingres_journals db1 -  
username root -password root123 -ingres_purge_journals
```

This command backs up and purges the journals of database db1 from the WV installation.

Multiple Database and Journal Backup

The following are examples of commands to back up multiple databases and journals.

In the following command, the database files of databases db1, and db3 and only the journals of database db2 will be backed up:

```
$ca_backup -source host01 -ingres_installation_id WV -database INGRES db1 db3 -  
ingres_journals db2 -username root -password root123
```

In the following command, the database files of databases db1 and db2, and the journals of database db2 will be backed up:

```
$ca_backup -source host01 -ingres_installation_id WV -database INGRES db1 -  
ingres_databaseandjournals db2 -username root -password root123
```

In the following command, database files and journals of databases db1, and db2 and only the journals of database db3 will be backed up:

```
$ca_backup -source host01 -ingres_installation_id WV ingres_databaseandjournals  
db1 db2 -ingres_journals db3 -username root -password root123
```

Note: All combinations of database files and their journals can be backed up.

Directory Tree Backups

The Advantage Ingres installation includes various directory trees whose files are not backed up by the Enterprise Option for Advantage Ingres. These files include executable programs and configuration files. To protect these files, use BrightStor ARCserve Backup periodically to back up such Advantage Ingres Installation directory trees. Please note that if your Advantage Ingres installation is spread across various hard disks, the directory trees to backup will also be located on different hard disks. Please refer to your Advantage Ingres documentation set for more information on installations that are spread across various hard disks.

If these file backups include the installation's database data directories, they should be performed only when the Advantage Ingres instance is shut down. This ensures that the database can simply be restarted after a directory tree backup is recovered. If the instance is not shut down, you will likely need to recover a particular checkpoint before you can use the database.

Journal Files Maintenance

When you back up a journaled database, the current, active journal file is closed and a new active journal file is created. The old journal file, however, is not deleted from the disk. As you perform subsequent backups, the old journal files accumulate.

To save disk space, you can delete old journal files using the Purge Journal after Journal Backup option. This option deletes all but the current, active journal file when journals are backed up. Keep in mind, however, that for potentially quicker recovery time, it may be best to keep a few old journals on disk just in case they are needed on a database recovery scenario. In this way, they will not need to be recovered before the database data files.

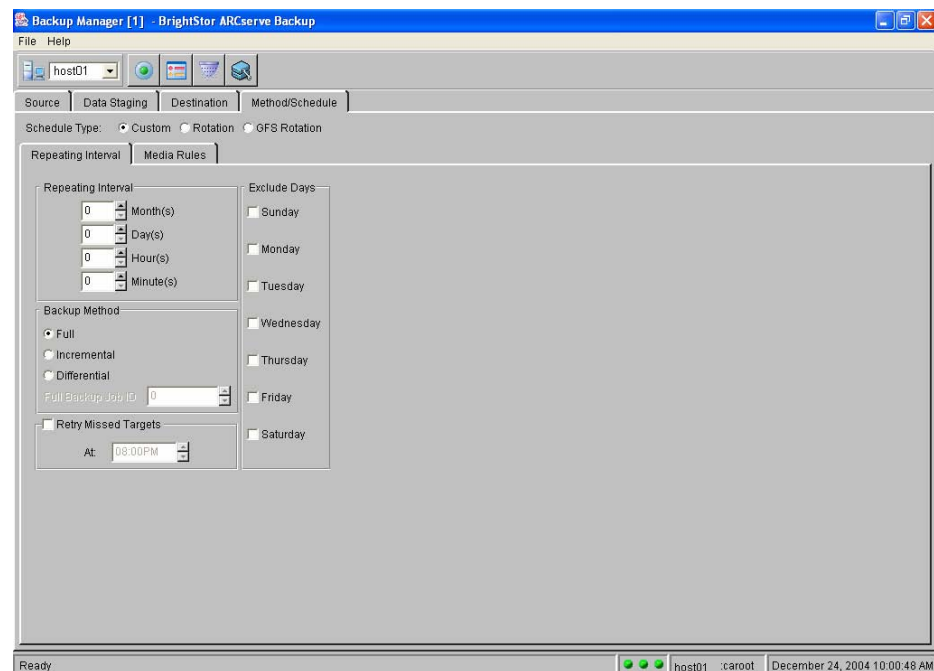
Note: You can use this option to remove old journal files automatically.

Automatic Repeating Backups

You can set BrightStor ARCserve Backup to execute backup jobs automatically by specifying a repeating interval. For example, to run a backup job every Sunday at midnight, you can set the repeating interval to seven days and, when you submit the job, schedule it to run on Sunday at midnight. After the backup finishes, BrightStor ARCserve Backup automatically reschedules the job to execute every Sunday at midnight.

Set the repeating interval on the Repeating Interval tab, on the Method/Schedule tab of the Backup Manager. When you set the repeating interval, set the Backup Method on the Repeating Interval tab to Full.

For Custom, Rotation and GFS Rotation job schedules, the Full backup method generates database data backups while the Incremental and Differential backup methods generate database journal backups.



Schedule Jobs to Optimize Resources

The option uses the Advantage Ingres ckpdb utility to perform online backups of Advantage Ingres databases. The ckpdb utility requires the database to be in a consistent state before it creates a checkpoint of the database and proceeds with a backup. Consequently, all outstanding transactions must be committed or rolled back before a backup job can begin.

If transactions are uncommitted, ckpdb stalls when it initiates the backup job and waits 60 minutes for the transactions to be committed or rolled back before continuing. During this period, messages with the following text are logged to BrightStor ARCserve Backup Activity Log: "Waiting for Db Extractor's response; ckpdb may be stalled due to open transactions (see /tmp/ckpdb_out)." Once all transactions have been committed or rolled back, the backup job continues. When the backup resumes, you can perform database transactions as needed. If open transactions remain after the wait period, the job terminates in error.

Important! *You can configure the option to wait a specified length of time for ckpdb to initiate and continue a backup job. If ckpdb stalls and does not continue within the time you specified, the option terminates the backup job. The default period of time is one hour. For information on setting a different wait period please refer to the "Checkpoint Wait Time" section of Appendix B: Troubleshooting.*

To avoid stalling when a backup job starts, schedule database backups at times when the database is least heavily used.

Backup Preparation

Before you submit a backup job, verify the following:

- The integrity of the data in the database. We strongly recommend that you verify the consistency of the database occasionally. To verify data integrity, use commands such as infodb, verifydb, sysmod, or any procedure that touches all the rows in each table being backed up.

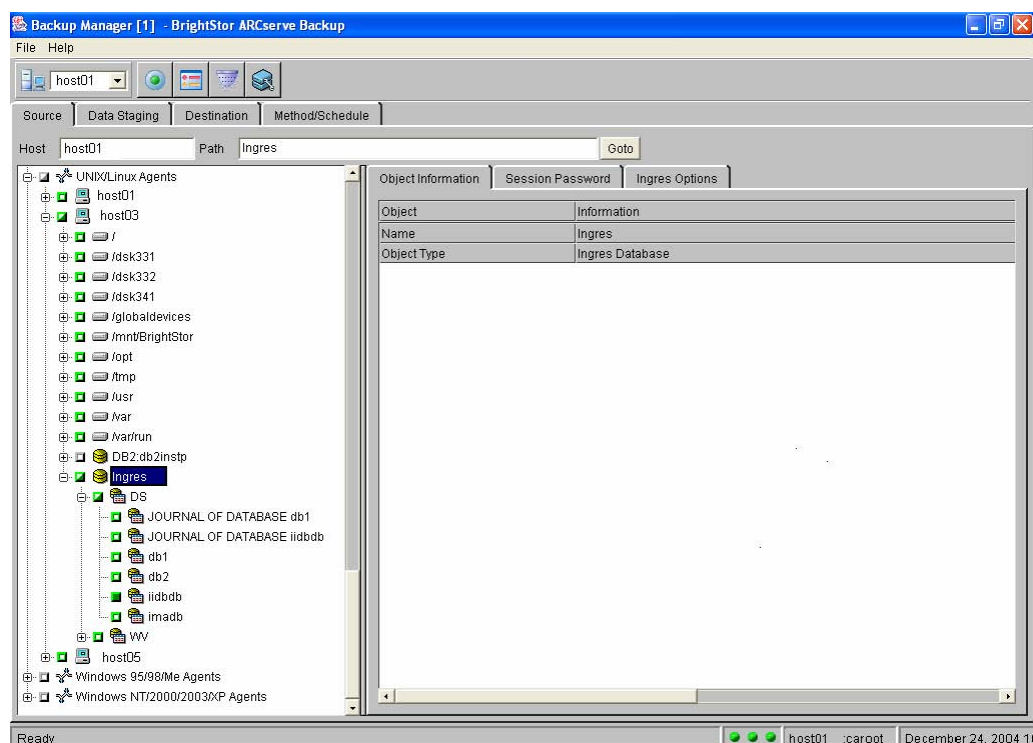
For specific information on the infodb, verifydb, and sysmod commands, see the Advantage Ingres documentation.

- The remote node containing the Advantage Ingres databases to back up is defined to BrightStor ARCserve Backup as remote clients.

For details about defining a node, see Define a Node as a Remote Client in the chapter "Installing the Option."

Backup Manager

The Backup Manager is used to submit your BrightStor ARCserve Backup jobs. It also lets you select the items you want to back up and the location to which you want them backed up.



Each object in the Backup Manager has an icon to its left. Green icons let you control the extent of the backup for an object directly. Click an icon to exclude an object from a backup or to indicate that you want the backup for the object to be full or partial. As you click the icon, it fills or empties of color, indicating the extent of the backup.

A completely filled icon indicates a full backup. A partially filled icon indicates a partial backup. An empty icon indicates that the item will not be backed up.

Gray icons are associated with objects that are not real and that you cannot back up. Typically, these items serve as placeholders under which other objects are grouped and displayed. For example, the "UNIX/Linux Agents" item with a gray icon does not represent a real entity that you can back up. Instead, it serves as a placeholder under which all UNIX/Linux Agents are listed.

As you click the green icons under a gray icon, the fill proportion of the gray icon changes automatically from empty to partial to full depending on the proportion of files you have chosen to back up.

The fill proportion of an icon at a higher level of the directory tree depends on the fill proportions of the icons of the objects at the lower levels. If the icons at the lower levels are a mix of completely filled and partially filled, the icon at the higher level is automatically partially filled. If you click an icon at the higher level, it is automatically completely filled and all of the icons at the lower levels are automatically filled completely.

Advantage Ingres Backup Operations

A backup job must have a data source from which data is extracted and an archive device (storage) in which data is stored. Depending on how you have installed BrightStor ARCserve Backup, the target data can exist on a local volume or on a remote machine.

When a backup job executes, the Enterprise Option for Advantage Ingres automatically calls the Advantage Ingres ckpdb utility to issue a checkpoint of the target database. Before it issues the checkpoint, ckpdb polls the database for open transactions (for example, Update, Insert, or Delete). If ckpdb finds open transactions, it waits for all open transactions to be committed or rolled back before issuing the checkpoint and starting the backup.

Important! *You can specify a maximum length of time the option waits for ckpdb to checkpoint a database. If ckpdb does not checkpoint the database in the time specified, the option terminates and fails the backup job. The default wait period is one hour. For information on setting a different wait period please refer to the "Checkpoint Wait Time" section of Appendix B: Troubleshooting.*

Once the backup starts, you can continue to perform transactions on the database such as database updates, insertions and deletions, and the creation, deletion, or manipulation of global temporary tables. You cannot, however, create, drop, or modify database tables while the database is being backed up.

Back Up Local or Remote Data

To back up data that resides on a local or remote volume, follow these steps:

1. In the Backup Manager, on the Source tab, expand UNIX/Linux Agents.

2. Under UNIX/Linux Agents, expand the host containing the Advantage Ingres installation whose database you want to backup. A pop-up window prompts you for the login account to use while browsing the installation.

Alternately, if you wish to backup the whole host, including using the option to backup all the Advantage Ingres instances for which it has been configured (entered in the option's installation .cfg.file), simply select the host.

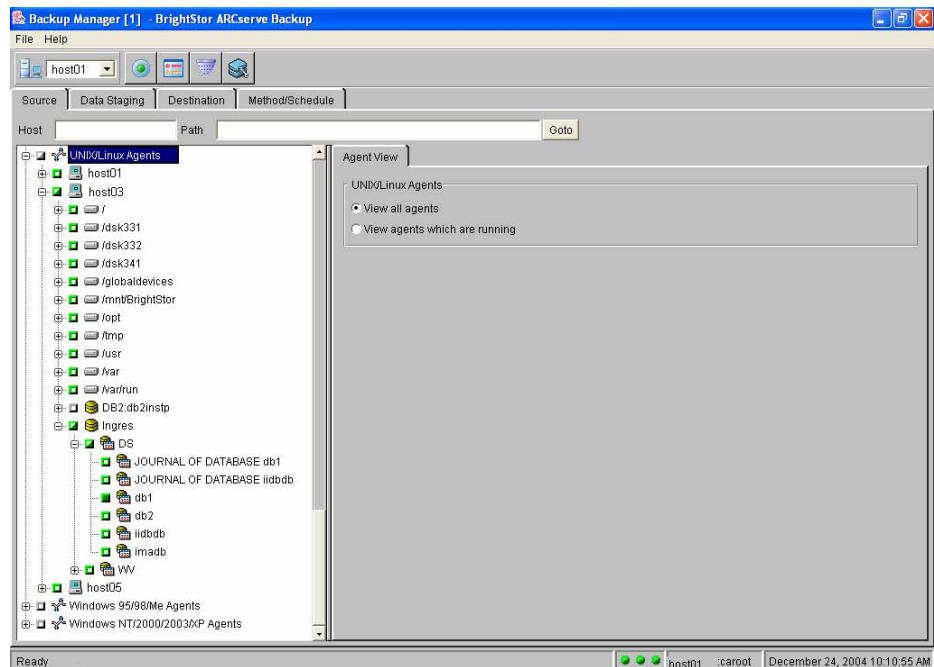
Note: If the host you want to back up is not on the list, use the Database Manager to add that host as a remote client.

3. Enter the user name and password of the login account you want to use while browsing and click OK.

Important! *The login account you use determines the objects that will be backed up. The option performs backups under the name you enter to browse the host. If you enter ingres or root, all the database items you select will be backed up. If you enter a user name who has the Advantage Ingres operator privilege, all the database items you select, except for the iidbdb database (only the root and ingres users can backup iidbdb and its journal files) will be backed up. If you do not enter ingres, root, or a user name with the operator privilege, the option allows you to browse the database, but your backup jobs will not succeed. For more information, see the appendix, How the Login Name Affects Job Execution.*

4. A list of the host file systems and of the BrightStor database agents that are installed on your host appears. If the Ingres Agent has been installed on the host, an entry named "Ingres" will be displayed. To backup every Ingres installation that has been configured into the Ingres Agent's installation.cfg configuration file, select this "Ingres" item for backup. If you choose an Ingres Agent backup option, this option will apply to all the databases that will be backed up.
5. You can expand the Ingres entry to display the list of Advantage Ingres installations on the host.
6. To back up all of the databases and journals of a specific Advantage Ingres installation, select that installation. You can select multiple installations to back up more than one installation in the same job. If you choose an Ingres Agent backup option, this option will apply to all the databases of the Ingres installations you select.

7. To back up individual databases or journals, expand the Advantage Ingres installation containing the database to back up. The Backup Manager displays all the databases and database journals you can select for backup. Select the items that you want to back up by clicking on their respective markers until they are solid green.



Important! If the database is journaled, you must select the journal file item to backup the database's journal. For more information, see *Back Up Journal Files*.

8. Click the Destination tab.
9. Select the Backup Group to which you want to direct the backup data.
10. Customize the backup job. To customize a backup job, click Options in the Backup Manager to display the Options dialog. For specific information about these options, see the *Administrator Guide*.

Note: Many of the options available are not applicable to Advantage Ingres backup jobs.

11. Click Submit to schedule and submit the backup job.

Note: For specific information about backup job schedule options, see the *Administrator Guide*.

You can monitor the progress of your job from the Job Status Manager.

Back Up Journal Files

To back up a database and its journal files, you must select both the database's object and the "JOURNAL OF DATABASE database name" objects. If you select a database and do not select the journal object, only the database is backed up.

Backing up journal files gives you more options when determining a restore strategy. If you do not back up the journals and if they are no longer available on disk, you can recover the database only up to the last backup execution time. We strongly recommend that your backup strategy includes journals. For more information about how journal files are used during the recovery process, see the chapter "Restoring Databases."

To back up journal files, follow these steps:

1. In the Backup Manager, on the Source tab, expand UNIX/Linux Agents.
2. Under UNIX/Linux Agents, expand the host containing the Advantage Ingres Installation whose database you want to back up. A pop-up window prompts you for the login account to use while browsing the installation.

Note: If the host you want to back up is not on the list, use the Database Manager to add that host as a remote client.

3. Enter the user name and password of the login account you want to use while browsing and click OK.

Important! *The login account you use determines the objects that will be backed up. The option performs backups under the name you enter to browse the host. If you enter ingres or root, all the database items you select will be backed up. If you enter a user name who has the Advantage Ingres operator privilege, all the database items you select, except for the iidbdb database (only the root and ingres users can backup iidbdb and its journal files) will be backed up. If you do not enter ingres, root, or a user name with the operator privilege, the option allows you to browse the database, but your backup jobs will not succeed. For more information, see the appendix, How the Login Name Affects Job Execution.*

4. Expand the Advantage Ingres installation entry to display the Advantage Ingres instances on the host.
5. Expand the Advantage Ingres installation containing the journal files you want to back up. The Backup Manager displays all the journals you can select for backup.
6. Select the JOURNAL OF DATABASE *dbName* item, where *dbName* is the name of the database whose journals you want to backup. All the journal files in the selected database's journals directory are backed up.
7. Click the Destination tab.

8. Select the Backup Group to which you want to direct the backup data.

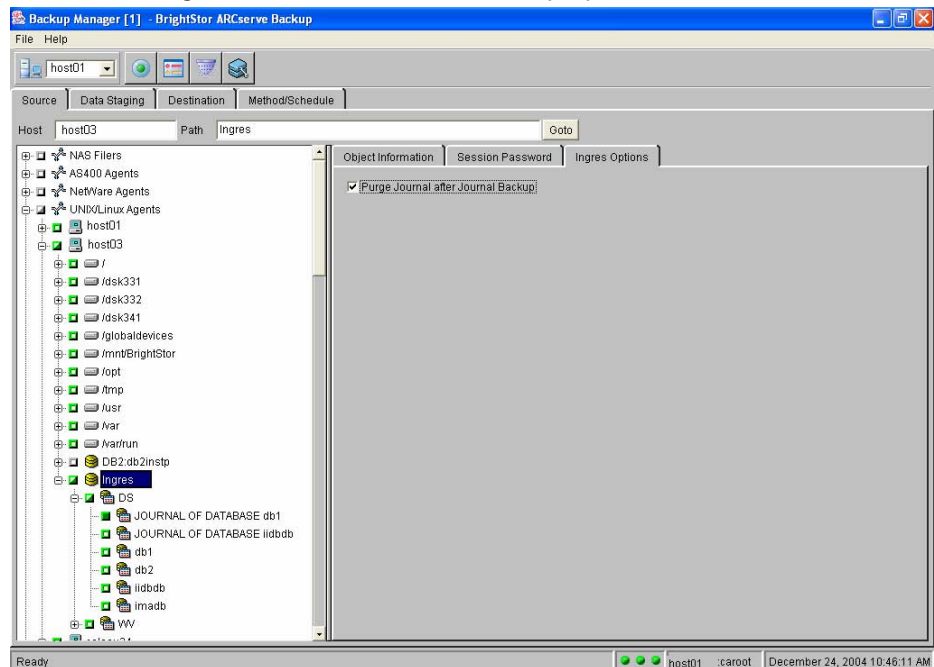
Note: Each backup group represents a specific backup device, such as a tape drive or a file system directory, to which the backup can be directed.

9. Customize the backup job by clicking the Options button in the Backup Manager. For specific information about these options, see the *Administrator Guide*.

Note: Many of the options available are not applicable to Advantage Ingres backup jobs.

10. To purge journal files after they have been backed up, highlight the Advantage Ingres icon, and click the Ingres Options tab on the right pane of the Backup Manager.

11. Select the Purge Journal after Journal Backup option.



12. Click Submit to schedule and submit the backup job.

Note: For specific information about backup job schedule options, see the *Administrator Guide*.

Command Line Interface Backups

BrightStor ARCserve Backup enables you to use commands issued from the system prompt to back up databases and journal files. The following section describes the commands that are available and parameters that you use when issuing these commands. The following command is used to back up data:

```
ca_backup -source hostname [node options] -ingres_installation_id  
ingres_installation_id [-database INGRES [ ingres_dbname... ] ] [-  
ingres_databaseandjournals ingres_dbname...] [-ingres_journals ingres_dbname...] [-  
ingres_purge_journals]
```

Command Parameters for Backup Jobs

The following are the optional parameters available to use when issuing commands to back up data:

-ingres_installation_id *ingres_installation_id*—This parameter specifies the installation ID of the Advantage Ingres database server. A list of installation ids (separated by blank characters) can be provided if you wish to completely backup more than one Advantage Ingres installation using the same backup job. To backup all the Advantage Ingres installations that are configured to the agent on the source host, do not enter a value for this parameter - all the installations that are entered into the agent's installation.cfg configuration file will automatically be selected for backed up.

database INGRES *-ingres_dbname*—This parameter indicates that only the listed databases, not their journals, should be backed up. If you enter this parameter without indicating an Advantage Ingres database name, the parameter is ignored and has no effect.

-ingres_databaseandjournals *-ingres_dbname*—This parameter specifies that both the data and journals of the database should be backed up.

-ingres_journals *-ingres_dbname*—This parameter specifies that only journals of the specified database should be backed up.

-ingres_purge_journals—This parameter specifies that the journals that are backed up should be purged afterwards.

Chapter 4: Restoring Databases

A restore job must have a data source from which backup files are extracted and a destination to which the backup files are restored. Depending on how you have installed BrightStor ARCserve Backup, the backup files can exist on a local volume or on a remote machine.

This chapter explains how to use the Enterprise Option for Advantage Ingres to restore lost or damaged databases or database objects.

Prepare for a Restore

Before you submit a restore job, perform the following actions:

- Make sure the database configuration file, called `aaaaaaaa.cnf`, is in the database data directory. For more information about the configuration file, see *Work with the Database Configuration File* in the chapter “Best Practices.”
- Verify that the dump file for the checkpoint you are recovering exists in the database `dmp` directory.
- Confirm that the journal files you need exist in the database’s `jnl` directory, if you are recovering a database using its journal files.
- Confirm the date and time to use if recovering up to a specific point in time.

Important! *If the database configuration file, the dump files for the checkpoint, or the journal files you need are missing or corrupted, you must restore them before you begin the database restore.*

Database Restore Jobs

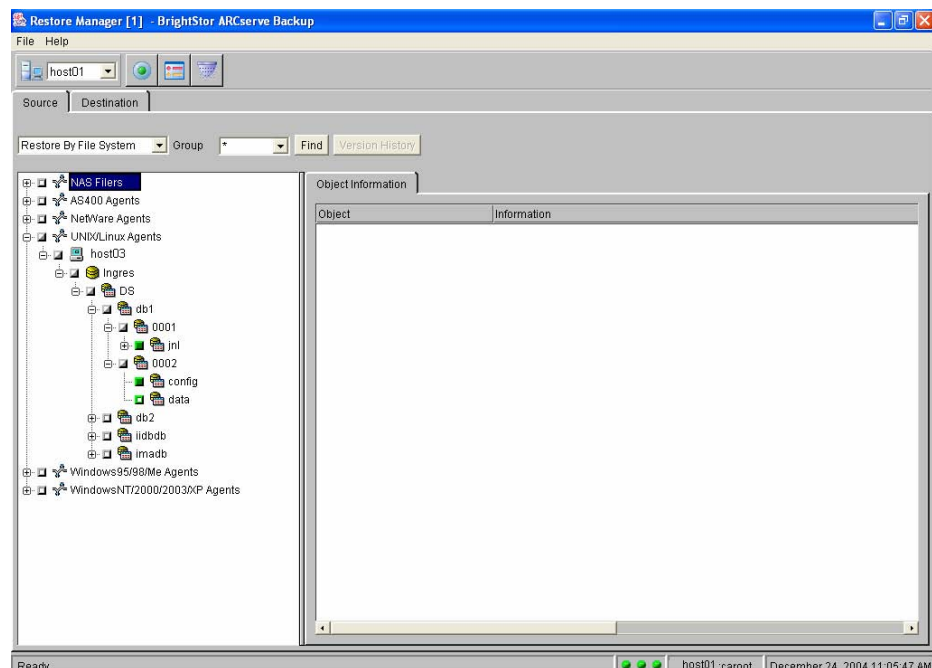
The Enterprise Option for Advantage Ingres cannot restore database files, configuration files, and journal files in a single restore job.

If you need to restore a database file and configuration files, journal files, or both, you must run two restore jobs. You must first run a job to restore the configuration files, the journal files, or both and then run a restore job to restore the database files.

Note: You can restore multiple configuration and journal sessions from different databases in the same restore job. You can also restore data sessions from different databases in the same job. However, you cannot mix configuration and journal session restore operations with data session restore operations in the same restore job.

Restore Manager

The Restore Manager provides detailed information about your BrightStor ARCserve Backup restore job. It also lets you select the items you want to restore and the location to which to restore them.



Each object in the Restore Manager has an icon to its left. Green icons let you control the extent of the restore for an object directly. Click an icon to exclude an object from a restore job or to indicate that you want the restore for the object to be full or partial. As you click the icon, it fills or empties of color, indicating the extent of the restore job.

A completely filled icon indicates a full restore. A partially filled icon indicates a partial restore. An empty icon indicates that the item will not be restored.

Gray icons are associated with objects that are not real and that you cannot restore. Typically, these items serve as placeholders under which other objects are grouped and displayed. For example, the UNIX/Linux Agents item with a gray icon does not represent a real entity that you can restore. Instead, it serves as a placeholder under which all UNIX/Linux Agents are listed.

As you click the green icons under a gray icon, the fill proportion of the gray icon changes automatically from empty to partial to full depending on the proportion of files you have chosen to restore.

The fill proportion of an icon at a higher level of the directory tree depends on the fill proportions of the icons of the objects at the lower levels. If the icons at the lower levels are a mix of completely filled and partially filled, the icon at the higher level is automatically partially filled. If you click an icon at the higher level, it is automatically completely filled and all of the icons at the lower levels are automatically filled completely.

Restore Database Files with the Destination Object Tree

Follow these steps to use the restore manager destination object tree to indicate where database files will be restored:

1. On the Destination tab of the Restore Manager, expand the UNIX/Linux Agents object.
2. Under UNIX/Linux Agents, expand the host containing the Advantage Ingres installation to which you want to restore the data. A pop-up window prompts you for the login account to use to continue browsing.

3. Enter the user name and password of the login account to use and click OK.

Important! *The login account you use determines whether the restore jobs you submit will be completed successfully. The option performs restores under the name you enter. If you enter ingres or root, all your items will be restored. If you enter a user name who has the Advantage Ingres operator privilege as your user name, you can restore all the items selected, except for the iidbdb database's data sessions, config sessions and journal files. If you do not enter ingres, root, or a user name with operator privilege, the option cannot complete your jobs. For more information, see the appendix "How the Login Name Affects Job Execution."*

4. Expand the branches of the Destination tree to find and highlight the Ingres item. You can recover a database only to an Advantage Ingres installation with the same Installation ID as the ID of the source database. The destination database must also be a clone of the original database. Because of these restrictions, to restore a database to another Advantage Ingres installation, that installation must effectively be located on a different host from which it was backed up.

Note: For procedures to restore databases to hosts other than the ones from which they were backed up, see Restore a Database to a Standby Host in the "Best Practices" chapter in this guide.

5. Click the Ingres Options tab. If the Ingres Options tab does not appear, highlight the Advantage Ingres icon.
6. Select the restore options for the job. If you do not select an option, the option rolls forward up to the latest journal file, if journal files exist for the database. For more information about these options, see Restore Options for Advantage Ingres in this chapter.

Important! *Restoring/recovering a journaled database differs at this point from restoring a non-journaled database. For detailed instructions about restoring a journaled database, see How Journaled Database Restores Work in this chapter. When you complete that procedure, return to Step 7 in this section.*

7. Click Submit to submit the job. The Submit dialog appears.
8. In the Submit dialog, enter the time and date you want the restore job to start. Enter a brief description of the job in the appropriate field and click OK.

After you submit a restore job, you can view its progress from the BrightStor ARCserve Backup Home Page by clicking the Job Status icon.

Restore Methods

The Enterprise Option for Advantage Ingres provides these restore methods:

- **Restore By File System method**—This method lets you select objects for restore jobs based on the source machine, and the Advantage Ingres installation from which the data was backed up. It is the default restore method for the Restore Manager. For more information about how to use this method, see *Restore By File System* later in this chapter.
- **Restore By Session method**—This method lets you select objects for restore jobs based on backup sessions. For more information about how to use this method, see *Using the Restore By Session Method* later in this chapter.

Note: The default for all methods is to restore data to the original database.

Restore Options for Advantage Ingres

The Enterprise Option for Advantage Ingres provides the following restore options for Advantage Ingres:

- **Overwrite Journal option:** Use this option to restore a journal file that still exists on disk and overwrite it with the backup file. This option is used only when you are restoring journal files. The data in the overwritten journal files is permanently lost.

If this option is not set and the journal file you are restoring already exists, the restored journal file's file name is appended with an integer value representing the restore time (in seconds) to prevent the existing journal file from being overwritten. To use this restored journal file, rename it appropriately. Remove the `.secondsSinceJan1_1970` from the name for it to be used while recovering the database from the database's data session.

- **Do Not Recover Database from Journal option:** Use this option if you do not want to roll forward through the available journal files; that is, you only want to recover the database to its state at the time of the backup you are recovering. This option is only significant for journaled databases.
- **Restore to Point of Time option:** Use this option to recover a database up to a specific date and time. When you select this option for a restore job, the Advantage Ingres rollforwarddb utility will roll the recovered data session forward through the transactions in the available journals up to the date and time you specify. This option is only significant for journaled databases.

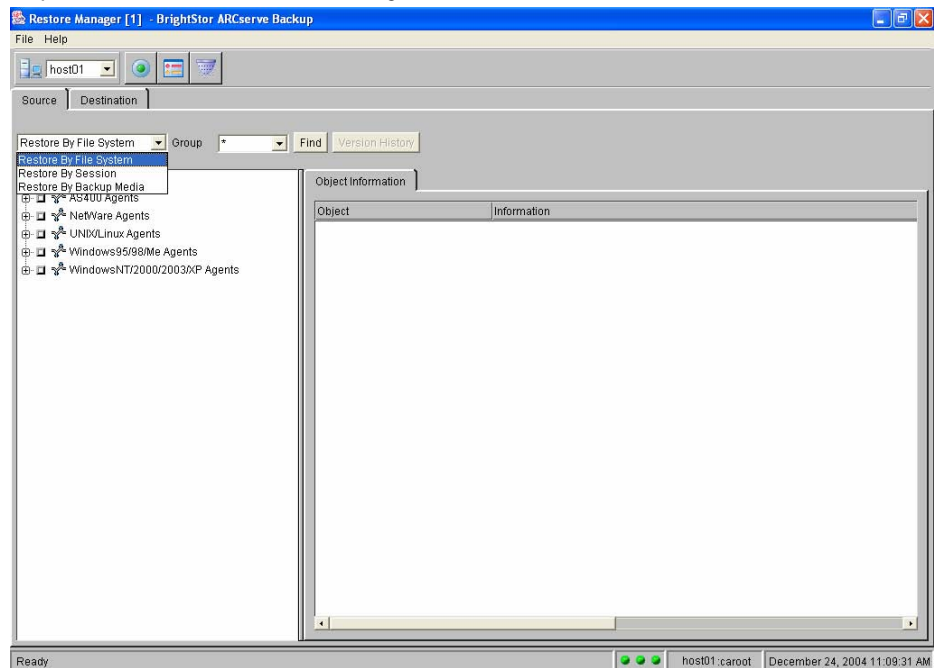
Note: When using the Restore to Point of Time option with a journaled database, verify that the latest journal files associated with the checkpoint to recover are on the local disk. If the latest journal information is not on the local disk, the roll forward operation may not reach the point of time you specify.

These restore options take precedence over the regular BrightStor ARCserve Backup restore filters. Check the *Administrator Guide* before placing any filters on a restore job that are not specific to Advantage Ingres.

Restore Database Files

To start a database restore job, follow these steps:

1. In the Restore Manager, on the Source tab, select a restore method from the drop-down list. The objects displayed in the tree on the Source tab depend on the restore method you have chosen.



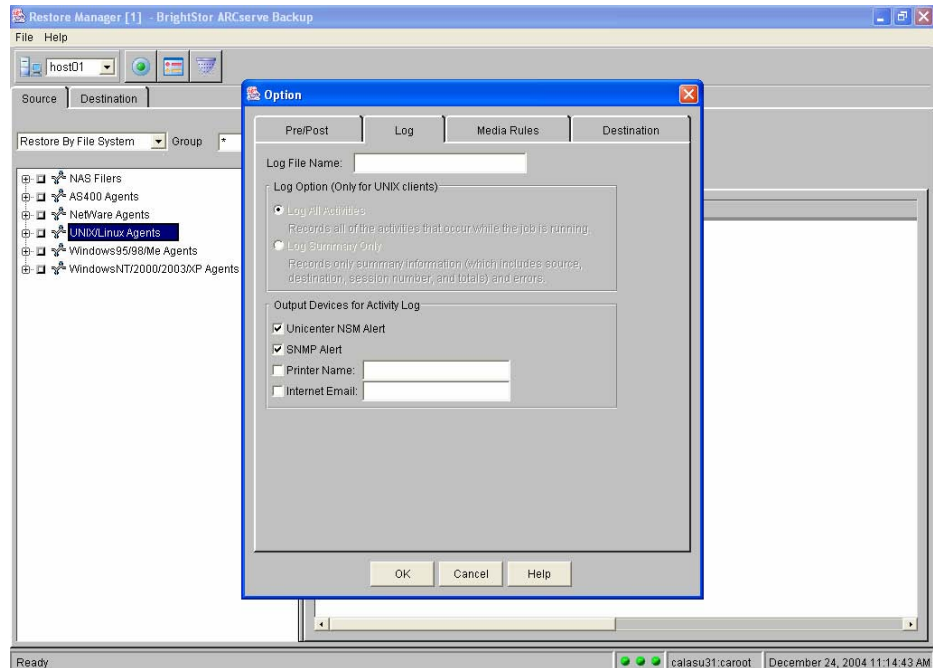
2. Select the objects you want to restore. You must select the appropriate objects for the method that you have chosen.
3. Click Option to open the Option dialog. Use this dialog to set job attributes.

Note: For information on how to select these objects, see Restore By File System Method, or Restore By Session Method later in this chapter.

Note: The options in the Destination tab are not relevant to the Enterprise Option for Advantage Ingres.

- Click the Log tab in the Option dialog. Use this tab to configure job reporting settings.

Note: For detailed descriptions of the log options, see the *Administrator Guide*.



- In the Option dialog, click the Destination tab and select the appropriate destination options for the restore job.

Note: For detailed descriptions of the destination options, see the *Administrator Guide*.

- Click OK to close the Option dialog and return to the Restore Manager.

You can choose one of these methods to complete the database restore job:

- Restore files to their original locations automatically
- Restore files using the destination object tree and the Ingres Option tab

For more information about these methods, see Database Restore Methods later in this chapter.

Restore By File System

The Restore By File System Source Panel method displays an initial directory tree of operating system agent types (for example, UNIX/Linux and Windows NT/2000/2003/XP Agents). When you select an operating system agent type, the machines of that type that have been backed up by BrightStor ARCserve Backup are displayed. When you expand a machine name, the Restore Manager displays both the file systems of this machine that have been backed up and database agent objects for the types of databases on this machine that have been backed up.

Expand the Ingres item, and continue expanding until you reveal a set of folders identified by the checkpoint numbers of each backup. Each numbered folder contains the backup data for the corresponding checkpoint. Select the object types you want to restore.

Note: If the journal files associated to a given checkpoint have not been backed up, only data and configuration objects appear in the tree. Journal objects appear in the tree only if a journal file associated with the particular checkpoint has been backed up.

To select a data session for restore using this method, follow these steps:

1. On the Source tab, expand UNIX/Linux Agents and expand the host on which the Advantage Ingres database you want to restore is located.
2. Expand the Advantage Ingres tree for the host until you reach the folders numbered by checkpoint.
3. Expand the numbered folder of your choice.
4. Click the marker of the data session you want to restore in that folder until it is solid green.

To select a configuration or journal session for restore using this method, follow these steps:

1. On the Source tab, expand UNIX/Linux Agents, and expand the host on which the Advantage Ingres database you want to restore is located.
2. Expand the Ingres tree for the host until you reach the folders numbered by checkpoint.
3. Expand the numbered folders of your choice.
4. Click the markers of the journal and/or configuration session you want to restore in that folder until it is are a solid green. If you wish to recover a specific journal file, expand the journal session object and select the journal you need.

Note: You can select multiple configuration sessions or multiple journal sessions or files, or multiple configuration and multiple journal sessions or files, at the same time.

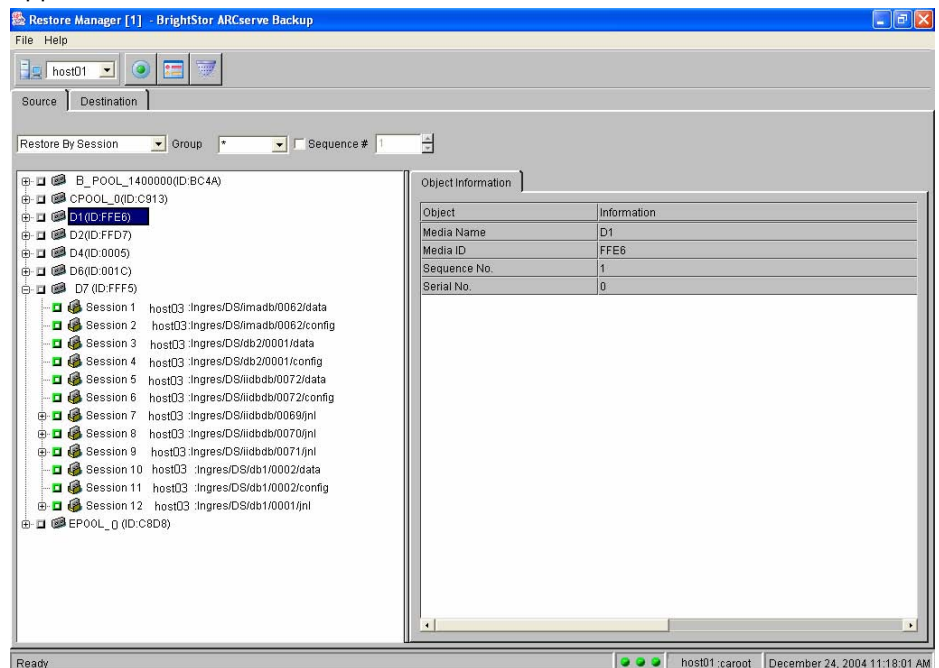
Restore By Session

The Restore By Session method displays a directory tree showing all the media that have been used for backup jobs. When you select a media, all the sessions backed up to that media appear. From this window, select a complete session or particular journals from a specific journal session to restore.

You can restore from only one session per job. If you try to select directories or files from different sessions, BrightStor ARCserve Backup clears your previous selections.

To select data for restore using this method, follow these steps:

1. Select Restore by Session from the Source tab and expand the media containing the files you want to restore. A list of sessions on that media appears.



2. Click the objects that you want to restore from the listed sessions.

Restore By Backup Media

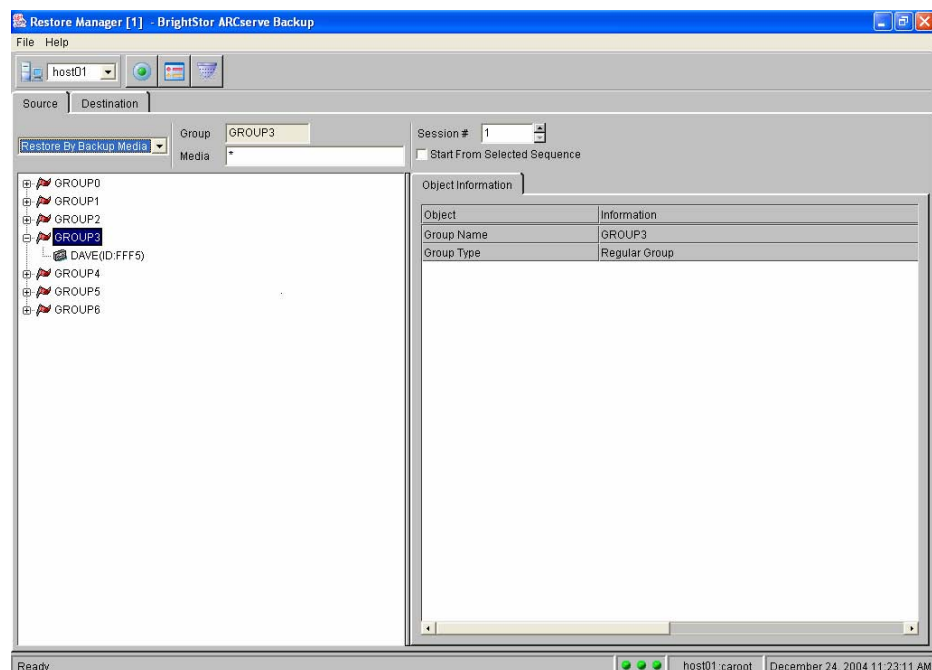
Restore by Backup Media is used to restore individual backup sessions, however, sessions are requested by session number and not by their contents. Session information is not presented. As a result, this restore method has limited application and is complex to use. It is therefore rarely used. If you choose to use this method, the restore job depends entirely on the header and the cataloging information on the media for restore.

Notes:

This method is not supported in this release.

This method is used when the BrightStor ARCserve database is not aware of the contents of the media. An alternative to using the Restore By Backup Media method is to first merge the media into the BrightStor ARCserve Backup database to make the media's contents known to BrightStor ARCserve Backup. You can then perform a more selective restore using the other restore methods explained previously.

The Restore By Backup Media method displays a tree showing all the device groups currently attached to the host. When you select a device group, all the media in the device group appear. When you select a media, the first section will be restored. You can alternatively specify a particular session number for restore.



To select data for restore using this method, follow these steps:

1. Select Restore By Backup Media from the Source tab.
2. Select the media to use for the restore.
3. Specify the session number to restore in the Session # field. The default is to restore the first session. To restore a different session, enter the exact session number in the Session # field.

Important! *The option saves data to media in a particular order but the order in which backup sessions must be restored is reversed.*

Backup sessions are saved to media in the following order on a per database basis:

1. data session
2. config session
3. journal session

Backup sessions, however, must be restored in the following order, also on a per database basis:

1. config/journal sessions
2. data session.

If data and config/jnl sessions must be restored for a particular database, then each session must be restored by a separate restore by media job ensuring that the data session is the last session to be restored to recover the database.

Database Restore Methods

The option provides the following methods for completing database restore jobs:

- Restoring files to their original locations automatically
- Restoring files using the destination object tree and the Ingres Options tab

Use the first method to restore files to their original locations with the fewest number of steps.

Use the second method to perform any of the following actions:

- Restore database files to a different host location
- Apply the options available on the Ingres Options tab, such as the Restore to Point of Time option, to a restore job
- Restore database files to a different host and apply the options available on the Ingres Options tab

Both methods are described in the following sections.

Restore to Original Locations Option

To restore database files to their original locations, follow these steps:

1. On the Destination tab of the Restore Manager, select the Restore Files to Their Original Locations option. If journal files exist for the database, the option, by default, automatically rolls forward to the latest journal file.

Important! *Restoring/recovering a journaled database differs at this point from restoring a non-journaled database. For detailed instructions about restoring a journaled database, see How Journaled Database Restores Work in this chapter. When you complete that procedure, return to Step 3 in this section.*

2. Click Submit to submit the job. A pop-up window prompts you for the UNIX/Linux login account you want used to submit the restore.
3. Enter the user name and password of the UNIX/Linux login account you want to use and click OK. The Submit dialog appears.

Important! *The login account you use determines whether the restore jobs you submit are completed successfully. The option performs restores under the name you enter. If you enter ingres or root, all the database items you select will be restored. If you enter a user name who has the Advantage Ingres operator privilege, the restore job will restore the items you request, except for the iidbdb database's data sessions, config sessions and journal files (only the root and ingres users can recover the iidbdb and restore its journal files). If you do not enter ingres, root, or a user name with operator privilege, the option cannot execute your jobs. For more information, see the appendix "How the Login Name Affects Job Execution."*

4. In the Submit dialog, enter the time and date you want the restore job to start.
5. Enter a brief description of the job in the appropriate field and click OK.

Note: After you submit a restore job, you can view its progress from the BrightStor ARCserve Backup Home Page by clicking Job Status.

Restore Database Files Using the Destination Object Tree

To restore database files using the destination object tree, follow these steps:

1. Click the Destination tab on the Restore Manager.
2. Expand the UNIX/Linux Agents object.
3. Under UNIX/Linux Agents, expand the host containing the Advantage Ingres installation to which you want to restore the data. A pop-up window prompts you for the login account you want used to continue browsing.
4. Enter the user name and password of the login account you want used, and then click OK.

Important! *The login account you use determines whether the restore jobs you submit are completed successfully. The option performs restores under the name you enter. If you enter ingres or root, all the database items you select will be restored. If you enter a user name who has the Advantage Ingres operator privilege, the restore job will restore the items you request, except for the iidbdb database's data sessions, config sessions and journal files (only the root and ingres users can recover the iidbdb and restore its journal files). If you do not enter ingres, root, or a user name with operator privilege, the option cannot execute your jobs. For more information, see the appendix "How the Login Name Affects Job Execution."*

5. Expand the branches of the Destination tree to find and highlight the Ingres item.

Notes:

For the procedures on restoring a database to a host that is different from the one from which it was backed up, see Restoring a Database to a Standby Host in the "Best Practices" chapter in this guide.

You can restore a database only to an Ingres installation with the same Installation ID as the ID of the backup source database. The destination database must also be a clone of the original database as far as database location paths, etc. are concerned. Because of these restrictions, to restore a database to another Ingres installation, that installation must effectively be located at a different host from which it was backed up.

6. Click the Ingres Options tab.

Tip: If the Ingres Options tab does not appear, highlight the Ingres icon.

7. Select the restore options for the job. If you do not select an option, the option will roll forward up to the latest journal file, if journal files exist for the database. For more information about these options, see Restore Options for Advantage Ingres in this chapter.

Important! Restoring/recovering a journaled database differs at this point from restoring a non-journaled database. For detailed instructions about restoring a journaled database, see Restoring a Journaled Database in this chapter. When you complete that procedure, return to Step 7 in this section.

8. Click Submit to submit the job. The Submit dialog appears.
9. On the Submit dialog, enter the time and date when you want the restore job to start.
10. Enter a brief description of the job in the appropriate field, and then click OK.

Tip: After you submit a restore job, you can view its progress from the BrightStor ARCserve Backup Home Page by clicking the Job Status icon.

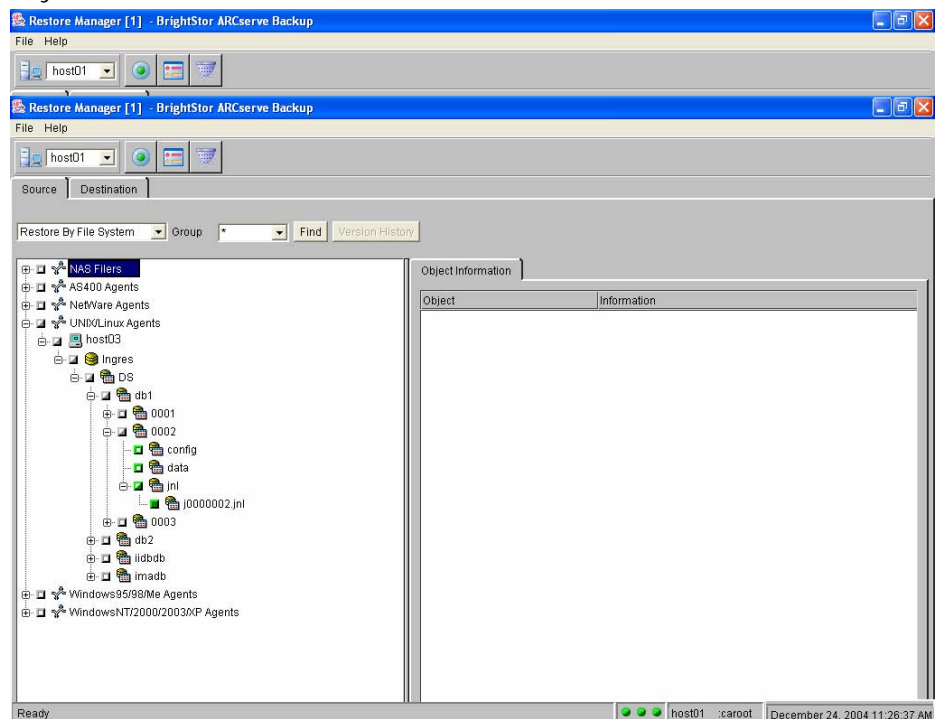
Restore Journal Files

If a database has been journaled and the journal files are corrupt or missing, restore the journal files before restoring the rest of the database. To restore journal files, follow these steps:

1. In the Restore Manager, select Restore by File System from the drop-down list on the Source tab.

Note: To view and select Journal files for restore, you must use the Restore by File System method or the Restore By Session method.

2. Expand the tree as necessary and select the journal files you want to restore. Journal files have a .jnl extension. Select journal files as you would any other file.



3. Click Options to open the Option dialog. Use this dialog to set the attributes for your restore job.

4. Click the Log tab in the Option dialog. Use this tab to configure job reporting settings. For detailed descriptions of the log options, see the *Administrator Guide*.
5. In the Option dialog, click the Destination tab and select the appropriate destination options for the restore job. For detailed descriptions of the destination options, see the *Administrator Guide*.
6. Click OK to close the Options dialog and return to the Restore Manager.

You are now ready to complete the database restore job.

Journal Restore Jobs

The option provides the following methods to complete journal restore jobs:

- Restore files to their original locations automatically
- Restore files using the destination object tree and the Ingres Options tab

Use the first method to restore files to their original locations with the fewest number of steps.

Use the second method if you want to:

- Restore journal files to a different host
- Apply the options available on the Ingres Options tab, such as the Overwrite Journal option, to a restore job
- Restore journal files to a different host and apply the options available on the Ingres Options tab

Both methods are described in the following sections.

Restore Journal Files to Original Locations

To restore journal files to their original locations, follow these steps:

1. Click the Destination tab on the Restore Manager.
2. Click the Restore Files to Their Original Locations option at the top of the Restore Manager.
3. Click Submit to submit the job. A pop-up window prompts you for the login account you want used to Submit the restore.

4. Enter the user name and password of the login account you want to use, and click OK. The Submit dialog appears.

Important! *The login account you use determines whether the restore jobs you submit are completed successfully. The option performs restores under the name you enter. If you enter ingres or root, all the database items you select will be restored. If you enter a user name who has the Advantage Ingres operator privilege, the restore job will restore the items you request, except for the iidbdb database's data sessions, config sessions and journal files (only the root and ingres users can recover the iidbdb and restore its journal files). If you do not enter ingres, root, or a user name with operator privilege, the option cannot execute your jobs. For more information, see the appendix "How the Login Name Affects Job Execution."*

5. On the Submit dialog, enter the time and date when you want the restore job to start.
6. Enter a brief description of the job in the appropriate field and click OK.

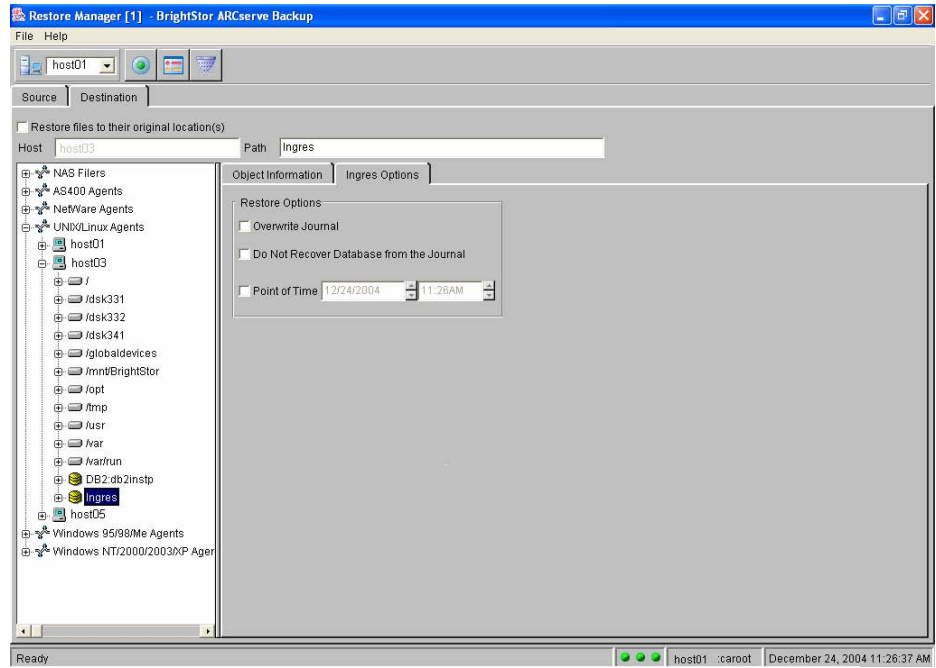
After submitting a restore job, you can view its progress from the BrightStor ARCserve Backup Home Page by clicking the Job Status icon.

Restore Journal Files with the Destination Object Tree

The destination object tree can be used to specify an alternate destination host for the restore or to specify restore options. To restore journal files using the destination object tree, follow these steps:

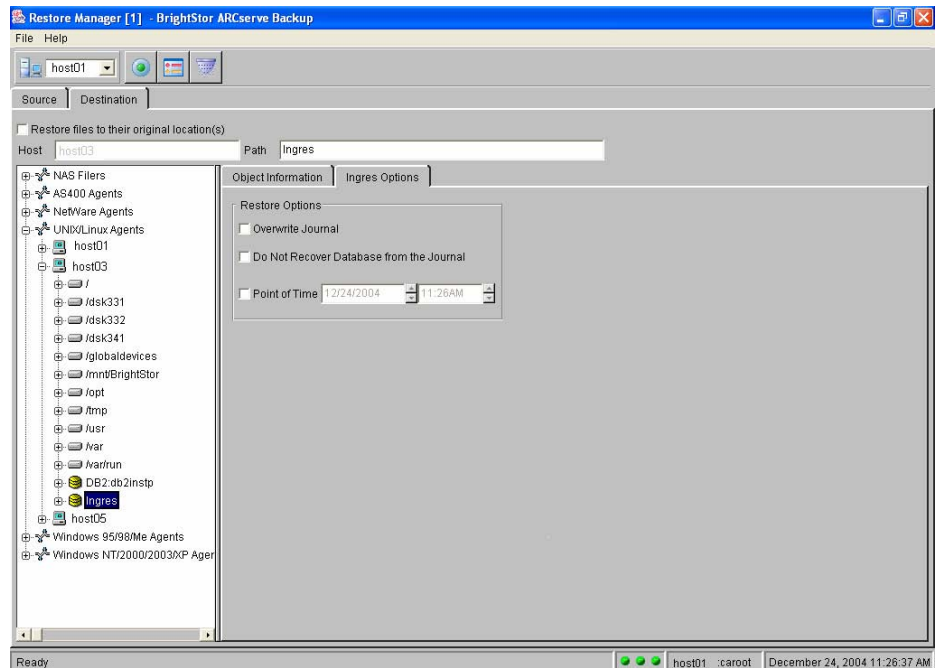
1. Click the Destination tab on the Restore Manager.
2. Expand the UNIX/Linux Agents object.
3. Under UNIX/Linux Agents, expand the host containing the installation to which you want to restore the journal files. A pop-up window appears prompting you for the login account, you want to use to continue browsing.
4. Enter the user name and password of the login account you want to use and click OK.

5. Expand the branches of the Destination tree to find and highlight the Ingres item. You can restore a database only to an Advantage Ingres installation with the same Installation ID as the ID of the database from which it was backed up.



Note: For the procedures on restoring a database to a host other than the one from which it was backed up, see *Restore a Database to a Standby Host* in the “Best Practices” chapter in this guide.

- Click the Ingres Options tab. If the Ingres Options tab does not appear, highlight an Ingres item.

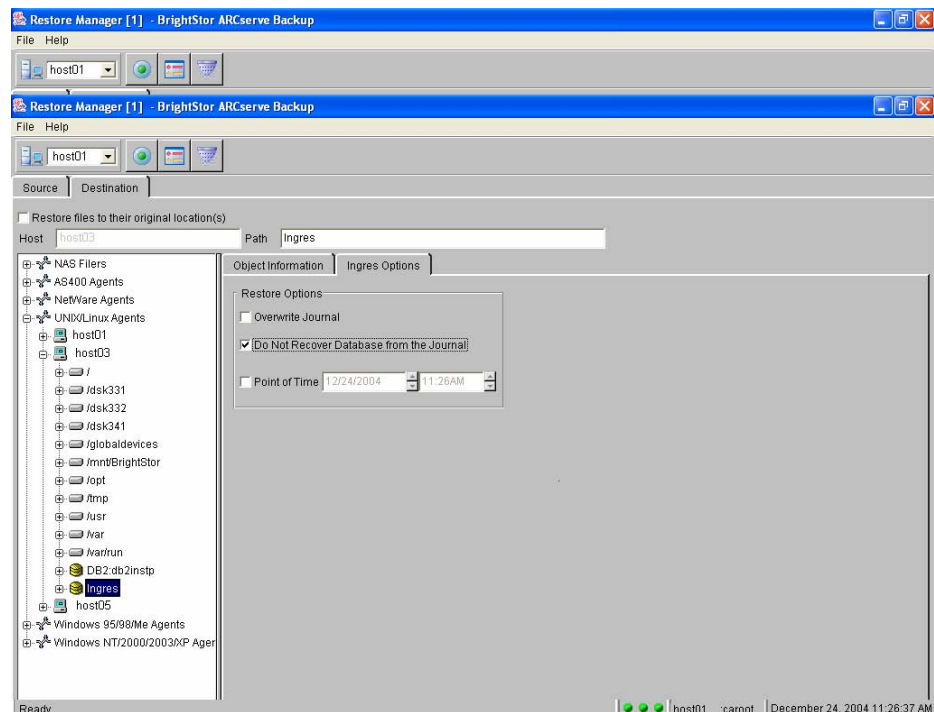


- Select the restore options for the job. For more information about these options, see Restore Options for Advantage Ingres earlier in this chapter.
- Click Submit to submit the job.
- On the Submit dialog, enter the time and date when you want the restore job to start.
- Enter a brief description of the job in the appropriate field and click OK.

After submitting a restore job, you can view its progress from the BrightStor ARCserve Backup Home Page by clicking the Job Status icon.

Journaled Database Restore Jobs

The process of restoring a journaled database is identical to that of restoring a non-journaled database, with one exception: you can select whether to roll forward through the available journals. To roll forward through the available journals, do **not** check the Do Not Recover Database from Journal option. If you do not want to roll forward through the available journals, select the Do Not Recover Database from Journal option on the Ingres Options tab of the Restore Manager's Destination tab.



If you are restoring journal files, you can select the Overwrite Journal option. This option is applicable only when restoring journal files. If it is selected, the option writes the restored journal file over the existing journal. If a journaled database data session is being restored/recovered, then the Restore to Point of Time option can be applied, but not with the Do Not Recover Database from Journal option. For more information on the Restore to Point of Time option, see Restore Options for Advantage Ingres earlier in this chapter.

Important! *Be careful when using the Overwrite Journal option. All data in the overwritten files is permanently lost.*

Set the Do Not Recover Database from Journal option if you are restoring a journaled database's data session and do not want to apply the journals.

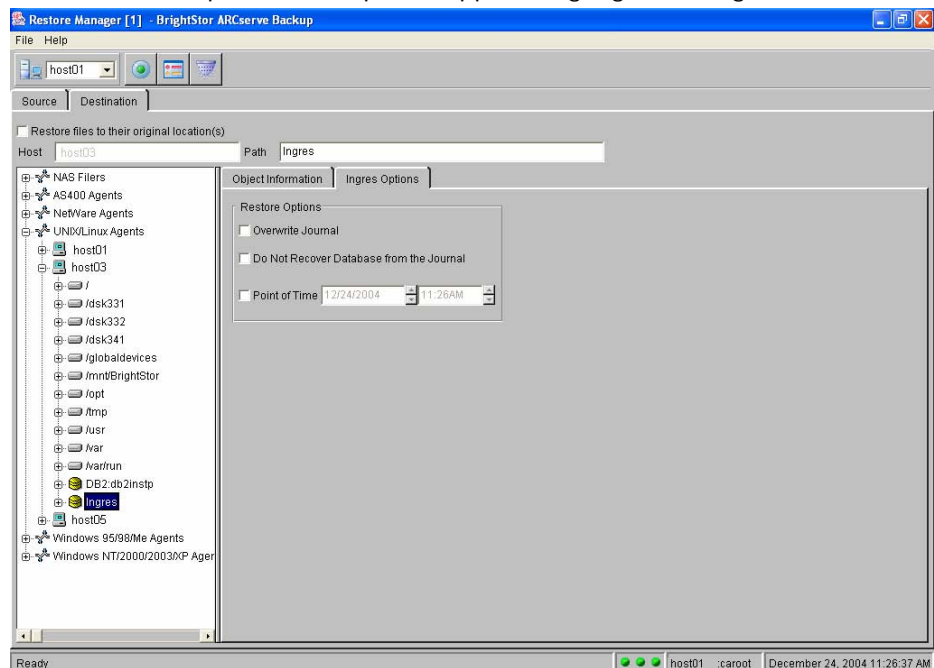
In all other cases, especially when you are recovering a database's data session and want to apply the journals, you can leave this option unchecked.

Restore Data to Remote Clients

You can restore data to a remote client machine using the Destination tab on the Restore Manager. To restore to a remote client, the client must first be defined as a remote node within the option. For more information about restoring to a remote client, see Define a Node as a Remote Client in the chapter “Installing the Option.”

To restore data to a remote client machine, follow these steps:

1. Select the files you want to restore. For instructions, see Restore Database Files, Steps 1 through 7, earlier in this chapter.
2. Click the Destination tab in the Resource Manager window.
3. Expand UNIX/Linux Agents in the tree and expand the client you want to receive the recovered database.
4. Enter the user name and password for the client when prompted.
5. After the list of files at the client’s root directory and the list of BrightStor ARCserve Backup database options appear, highlight the Ingres item.



Typically, you restore data to the same host and Advantage Ingres server from which the data originated.

For the procedures on restoring a database to a host other than the one from which it was backed up, see Restore a Database to a Standby Host in the “Best Practices” chapter in this guide.

You can only restore a database to an Advantage Ingres installation with the same Installation ID as the ID of the database from which it was backed up. The destination database must also be a clone of the original database as far as database location paths, etc. are concerned. Because of these restrictions, to restore a database to another Advantage Ingres instance that instance must effectively be located at a different host from which it was backed up.

You cannot restore a database's data session and its journal file using a single restore job.

Always restore the journal file before restoring the data files.

See Advantage Ingres Database Restore Overview in the chapter "Introducing the Option" for more information about how BrightStor ARCserve Backup uses journal files during the restore process.

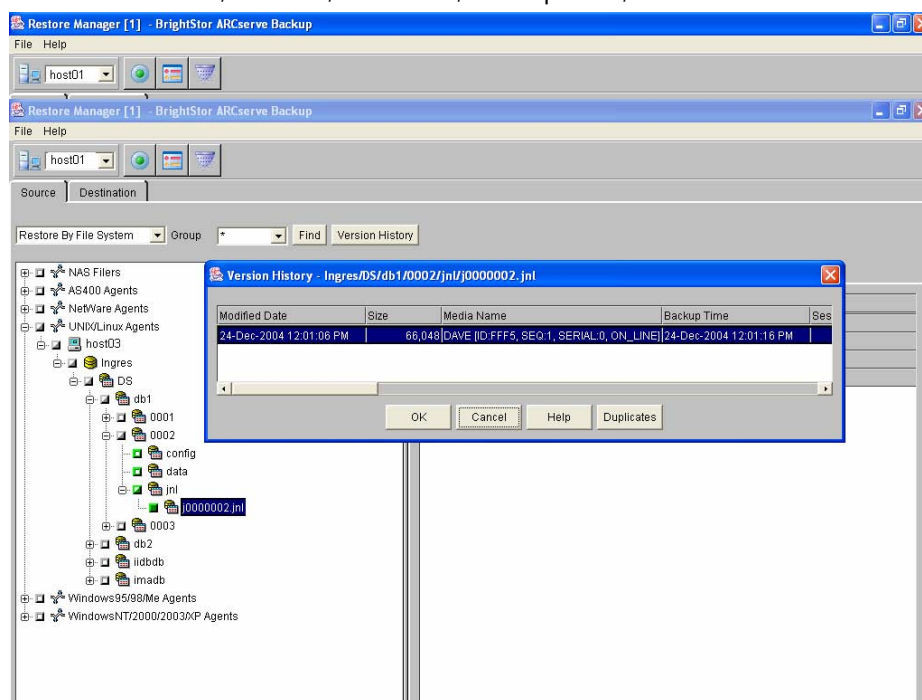
Restore Data from Previous Versions

When you have backed up journal files multiple times, you can restore any of these past versions using the Version History feature in BrightStor ARCserve Backup. Version History lets you view all the versions you have backed up and select the one you want to restore.

Note: You can only use the Version History feature with the Restore by File System method.

To use the Version History feature, follow these steps:

1. From the Source tab in the Restore Manager, select one of these items:
 - The Ingres item
 - An installation
 - A specific database or a journal for which you want to view a version history.
2. Click Version History to open the Version History dialog. The Version History dialog identifies each version of the item you selected by modification date, file size, file name, backup time, and session number.



3. Select the version you want to restore and click OK.
4. Continue with the restore job, as you would for a typical restore using the Restore by File System method.

Command Line Interface Restore Jobs

BrightStor ARCserve Backup enables you to use commands issued from the system prompt to restore databases and journal files. The following section describes the available commands and parameters you can use when issuing these commands. The following command is used to restore data:

```
$ca_restore -source hostname absolute path of the ingres file [data, config, jnl  
or [jnl/file.jnl] ... -dest hostname [-username username -password password] -  
database INGRES dbase name [dbase options]
```

Command Parameters for Restore Jobs

The following are the optional parameters available to use when issuing commands to restore data:

```
ca_restore [-ingres_overwrite_journal]
```

```
ca_restore [-rollforward endoflogs | mm/dd/yyyy[:hh:mm]]
```

Restore Commands

The following section describes the commands available to use to restore database files and journal files. Sample commands are also provided that illustrate how you can perform various restores.

Database File Restoration

Database data files must be restored as a separate job once the database's config files and journal files have been restored. Database config and journal files can be restored by a single restore job.

The following are examples of commands to restore/recover a particular database's data files, config files, and journals files:

```
root@/$ca_restore -source host01 Ingres/WV/db01/123/config Ingres/WV/db01/123/jnl  
-dest host01 -database INGRES db01 -username root -password root123
```

```
root@/$ca_restore -source host01 Ingres/WV/db01/123/data -dest host01-database  
INGRES db01 -username root -password root123
```

In these examples, the commands restore the db01 database's data, config and journal files to the same instance on host01. The first command restores the database's config and journal files associated with checkpoint 123. The second command restores/recovers the database's data files for that checkpoint.

The parameters `-rollforward`, and `-ingres_overwrite_journal` can also be used with these commands.

The following are the requirements for restoring Advantage Ingres files:

- The host must be running the same operating system as the original location
- Files can only be restored to an Advantage Ingres instance with the same installation ID
- Files can be restored only to a database with the same database name as the original on any machine

Specific Database Restore Jobs

The following is an example of command to restore/recover the data files of a particular database:

```
root@/$ca_restore -source host01 Ingres/WV/db01/0001/data -dest host01-database  
INGRES db01 -username root -password root123
```

In this command, 0001 represents the checkpoint number within the database. This command restores the data files in the 0001 checkpoint of the db01 database.

You can also request the restore of data sessions from multiple databases by a single job.

```
root@/$ca_restore -source host01 Ingres/WV/db01/0011/data  
Ingres/WV/testdb/0032/data -dest host01 -database INGRES db01 -username root -  
password root123
```

In this example, the data sessions of checkpoint 11 of the db01 database and checkpoint 32 of the testdb database will be restored and the db01 and testdb databases recovered. Please note that either database or both could have been entered for the `-database INGRES <dbName>` parameter

Multiple Database Config File Restore Jobs

The following is an example of a command to restore the config sessions of multiple databases:

```
root@/$ca_restore -source host01 Ingres/WV/cadbase/0001/config  
Ingres/WV/iidbdb/0002/config... -dest host01 -database INGRES cadbase iidbdb root -  
password root123
```

This command restores the config files of cadbase's checkpoint 0001 and iidbdb's checkpoint 0002. You can restore multiple config files in a single restore job.

Specific Database Journal Restore Jobs

The following is an example of a command to restore a particular database's journals:

```
root@/$ca_restore -source host-01 Ingres/WV/db01/0001/jnl Ingres/WV/db01/0002/jnl  
-dest host-01 -database INGRES db01 -username root -password root123
```

This command restores the journal files associated with checkpoints 0001 and 0002 of the db01 database. You can restore multiple journal files in a single restore job.

Specific Journal File Restore Jobs

The following is an example of a command to restore specific journal files of a database:

```
root@/$ca_restore -source host01 Ingres/WV/db01/0001/jnl/00001.jnl  
Ingres/WV/db01/0002/jnl/00003.jnl -dest host01
```

```
-database INGRES db01 -username root -password root123
```

This command restores the specified journal files. The database parameters [-ingres_overwrite_journal] can be used with these restore procedures.

Chapter 5: Best Practices

This chapter provides recommendations for backup and recovery operations using Advantage Ingres, BrightStor ARCserve Backup, and the Enterprise Option for Advantage Ingres.

Backup and Restore Strategy Tests

After you have developed backup and restore strategies, you must test them to ensure that they work satisfactorily. You can perform backup tests on a production system; however, you should perform recovery tests on a test system that closely mimics the production system before you apply your backup and restore strategies to the production system.

Database Configuration

This section provides recommendations for configuring the Advantage Ingres.

Database Journal Set Up Considerations

You should journal your databases to ensure that you can recover them up to the last recorded transaction before a failure. If you do not journal your databases, you can restore only from the last database backup you performed. Any updates from the backup time to the time of failure are lost and must be reentered.

Advantage Ingres uses the `$II_JOURNAL` environment variable to define the location of the journal files. When you configure your journaled databases, ensure that `$II_JOURNAL` resolves to a file system large enough to accommodate at least one journal for each journaled database.

When determining the size of your file system, take into consideration your expected backup frequency and the size of the journal files. Remember that the lower the database backup frequency, the greater the journal file size. You should also provide room for more than one journal file for each database because the recovery of a database may require a roll forward through multiple journal files.

Database Checkpoint Dump File Considerations

The checkpoint dump file contains records of changes to the databases that occur during checkpoint execution. The size of the dump file depends on the number of updates that occur during a backup.

Advantage Ingres uses the \$II_DUMP environment variable to define the location of the dump file. When you configure Advantage Ingres, ensure that \$II_DUMP resolves to a file system large enough to accommodate the dump file, given the number of updates you expect during the execution of backups. Since a checkpoint's dump file is needed when recovering a database data session, consider keeping a few dump files available on disk for each database.

Multiple Physical Disks

For optimal security against failures, and to improve performance, you should set up your Advantage Ingres instance so that it uses at least five or six physical disks. This allows you to locate the data, checkpoint, journal, dmp, work, log, dual log, and system directories on different physical disks. For more information about DBMS server disk configurations, see the *Advantage Ingres Enterprise Relational Database Getting Started*.

Advantage Ingres Configuration File

The Advantage Ingres configuration file, called config.dat, located in the \$II_SYSTEM/ingres/files directory, contains configuration parameters for your Advantage Ingres instance. You should keep a copy of this configuration file in a safe location since it will come in handy if ever you need to reinstall and reconfigure your Advantage Ingres instance.

Database Object Recreation Scripts

You should maintain scripts to recreate database objects such as users, groups, roles, and database locations. If you must recreate a database, these scripts may help bring the database environment back to an operational level faster.

Backup Recommendations

The following sections provide information regarding items you should consider when backing up Advantage Ingres databases, such as:

- Vault storage for backup media
- File selection
- Database backup frequency
- Database backup scheduling
- Database verification before backup
- Checkpoint resolution
- Directory cleaning

Vault Storage

To protect against major catastrophes, consider storing backup media in a vault at a remote location. Balance this decision against the time it takes to retrieve the tapes for a recovery. One strategy is to create a copy of the backup media for archiving at an off-site vault while retaining the original on site for a number of days.

File Selection

You should back up every database at appropriate, regularly scheduled time intervals. We strongly recommend that you back up the iidbdb and imadb Advantage Ingres databases regularly.

The iidbdb database saves installation-level information such as users, locations, databases, and database extensions. Whenever this information changes, back up iidbdb as soon as possible.

If a database is journaled, back up the journals. Journal files are frequently deleted from disk to save disk space. Backing up your journal files gives you added security against data loss.

We recommend that you back up other components of the Advantage Ingres installation such as the II_SYSTEM directory tree, using the file system backup method.

Database Backup Frequency

If a database is volatile or contains critical data, you may consider backing it up a few times a day. This strategy offers the greatest protection against a failure that can damage both the data files and the currently active journal.

Typically, one backup each day is sufficient, especially if the journals and databases reside on separate disk drives. In case of failure, you can recover the database from the latest backup. A roll forward operation can add the transactions recorded in the journal that occurred after the backup.

If your databases are journaled and are not volatile, consider performing database backups less frequently (for example, weekly). If one of these databases fails, however, the time needed to recover the database is longer because the roll forward operation through the database's journal file has more transactions to apply than if the database backups were done daily. In addition, the size taken by the journal file can grow beyond an acceptable size because the journal files will have recorded a larger number of transactions.

If you do back up journaled databases once a week or less often, you should perform journal backups more frequently. For example, if you back up your databases once a week, consider backing up your journal files once a day. These journal backups are a form of incremental backup from the most recent checkpoint.

Database Backup Schedule Considerations

Because of the following considerations, schedule backups for a time when your database is least used to ensure efficiency:

- The execution of online backups creates extra overhead
- BrightStor ARCserve Backup delays starting a backup until all open transactions are either committed or rolled back

Special Scheduling

After you create a new database, change the structure of an existing database, add or remove users, or change user attributes, you should schedule a backup of that database and the iidbdb database.

You may also schedule a database backup whenever the contents of a database have changed significantly.

Checkpoints

The Enterprise Option for Advantage Ingres uses the ckpdb utility to perform backups. During these backups, the ckpdb utility creates checkpoints that the option records. You can also run the ckpdb utility manually, outside of the option. However, because the option is not running when you run ckpdb manually, the option does not record these checkpoints.

During a restore operation, the Restore Manager displays a list of all checkpoints the option has recorded. Checkpoints generated outside the option do not appear. Therefore, if you have performed a manual ckpdb execution more recently than an option-directed backup, the Restore Manager does not display the most current checkpoint. For this reason, you should avoid manual ckpdb executions.

If you have run ckpdb manually, run an infodb *dbName* command to help you select the checkpoint from which to recover. The infodb command lists the checkpoints recorded by the database. You can compare them to the checkpoints recorded by the option, and select the most appropriate checkpoint from which to recover.

File System Backups

We recommend that you perform occasional file system backups of all the directories used by an Advantage Ingres instance. Perform file system backups while the Advantage Ingres instance is shut down. Shutting down the system ensures that the files contain a consistent view of the databases.

File system backups are important. If a disk failure results in the loss of Advantage Ingres files, such as the database server executables in the bin/directory or the configuration files in the files/directory, your database could be unusable, even if your database data files are untouched by the failure.

Note: The Enterprise Option for Advantage Ingres backs up only database data files, .dmp directory files, and journal files.

If you have the system backup files, you can use the file system backups to return the Advantage Ingres installation, to operational status. However, if you have lost the Advantage Ingres files and do not have a file system backup of the Advantage Ingres instance, you may need to reinstall and reconfigure a new Advantage Ingres instance, recreate the databases (manually or using the unloaddb utility), and recover the databases from the latest option backups to return the databases to their most recent state.

Database Verification Before Backup

You may verify databases before performing a backup with Advantage Ingres commands. To verify the database, run the `verifydb` command. You can also run the `infodb` command to check database configurations. For more information about verifying a database, see the *Advantage Ingres Database Administrators Guide*.

Unloaddb Utility

We recommend that you use the `unloaddb` utility as part of your backup strategy. In a process called unloading, the `unloaddb` utility works through all the tables in a database and creates script files that can recreate the database objects. You can then run the script files created by the `unloaddb` utility, in a process called loading, to rebuild a database or build a copy of it. You can also edit the script files so that they rebuild only the data tables you have selected.

Note: You can back up the script files and the directory in which they reside using the file system method.

The `unloaddb` utility script files are especially useful if you need to reinstall Advantage Ingres. After you have reinstalled Advantage Ingres, run the script files to recreate the databases.

To create script files that let you load a database onto another platform type, you must run `unloaddb` in ASCII mode. After a recovery in which you have run script files created by `unloaddb` in ASCII mode, you can run other scripts to recreate users, groups, roles, and so on, depending on what has been recovered. For more information about scripts, see *Using Scripts to Recreate Database Objects* in this chapter.

Advantage Ingres saves some database information, such as the list of known database users, in the `iidbdb` database. It saves other database information, such as user permissions, in each database.

Directory Cleaning

Because BrightStor ARCserve Backup does not automatically clean `dmp` directories as part of a backup, you should clean these directories periodically.

If you typically start backups without selecting the `Purge Journal after Journal Backup` option, you should periodically clean the database journal directories also. The `Purge Journal after Journal Backup` option automatically cleans the database's journal directory as part of a backup job. Use it when you want to automate the clearing of database journal directories.

Recovery Recommendations

Typically, database, configuration, data, and journal sessions are restored to their original host and database. For information about restoring to another host, see *Restore a Database to a Standby Host* in this chapter.

The following sections contain recommendations for recovering Advantage Ingres databases and files.

Database Configuration File

The database configuration file, `aaaaaaaa.cnf`, is critical to the operation of the Advantage Ingres database. When you run a checkpoint operation, the checkpoint program, `ckpdb` copies the current `aaaaaaaa.cnf` file to the database's `dmp` directory.

Checkpoint Recovery Prerequisites

To recover a particular database checkpoint, you must satisfy the following prerequisites:

- The database must already exist in the destination. If the database does not exist (if, for example, it had been destroyed), the database must be recreated.
- The checkpoint must be listed in the database's `aaaaaaaa.cnf` configuration file. This prerequisite is discussed in the *Backup Configuration File Recovery*.
- The checkpoint's `dmp` and `lst` files must exist in the database's `dmp` directory. This prerequisite is discussed in the *Checkpoint Configuration Session Restore* section.
- The journal files through which the database is to be rolled forward through must exist in the database's `jnl` directory. This prerequisite is discussed in the *Journal File Restore* section.

Backup Configuration File Recovery

You can use the backup copy of a database's `aaaaaaaa.cnf` that is saved in the database's `dmp` directory, to resolve the following situations:

- The database's `aaaaaaaa.cnf` file becomes corrupted.
- A data session must be recovered and the `aaaaaaaa.cnf` file is either unavailable or corrupted.
- A data session must be recovered and the database's `aaaaaaaa.cnf` file does not contain information about the checkpoint to be recovered.

In either of the first two situations, copy the backup `aaaaaaaa.cnf` file, to the database's data directory. If this backup copy becomes lost or corrupted and cannot be used, restore a previous version of this file using the option. The backup `aaaaaaaa.cnf` is backed up with every database backup and is saved in the checkpoint's config session. Restore the appropriate config session to restore a backup `aaaaaaaa.cnf` file. Because the option consults the database's `aaaaaaaa.cnf` file for authentication purposes, if this file is corrupted or unavailable when attempting to restore the database's config session, this restore job must be run as the `ingres` user.

To copy the backup `aaaaaaaa.cnf` file, to the database's data directory, issue the following file system copy command from the installation's `$II_SYSTEM/ingres` directory:

```
cp dmp/default/dbName/aaaaaaaa.cnf data/default/dbName
```

Note: Do not remove the backup `aaaaaaaa.cnf` file from the `dmp` directory. You may need the backup copy in the future.

In the third situation is, if the backup `aaaaaaaa.cnf` file does not have a record of the checkpoint you wish to recover from. A checkpoint cannot be recovered if it is not listed in the database's `aaaaaaaa.cnf` file. Ordinarily this situation should never arise; however, there are two ways in which this may occur. The `aaaaaaaa.cnf` configuration file contains information on a database's last 99 checkpoints. To recover a checkpoint older than those on the current `aaaaaaaa.cnf` file, you must perform the following procedure before recovering the database checkpoint's data session:

1. Restore the config session of the checkpoint you need to restore.

To restore a previous version of the `aaaaaaaa.cnf` file, choose a previous checkpoint, select its configuration session for restore, and submit the job. The restore job restores a previous `aaaaaaaa.cnf` file to the database's `dmp` directory (along with that checkpoint's dump and list files).
2. Copy the restored `aaaaaaaa.cnf` file to the database's data directory.

If an aaaaaaaa.cnf file was previously located in the database's dmp directory(usually the case), the restored aaaaaaaa.cnf file will be named aaaaaaaa.cnf.*timestamp*, where *timestamp* represents the file's restored time in seconds since January 1, 1970. To copy the restored aaaaaaaa.cnf file to the database's data directory, issue the following file system copy command from the installation's

\$II_SYSTEM/ingres directory:

```
cp dmp/default/dbName/aaaaaaa.cnf.timestamp data/default/dbName/aaaaaaa.cnf
```

Note: Because aaaaaaaa.cnf files track checkpoints, restoring an older aaaaaaaa.cnf and copying it to the database's data directory will mean that the database loses the records of its latest checkpoints. Hence, you may want to keep a safe copy of the database's current aaaaaaaa.cnf file just in case you decide that you need to replace it later.

The other way that your aaaaaaaa.cnf may not hold the information on a checkpoint you wish to recover from is if you recover an older version of the database and then decide that you need to recover a more recent version. The problem is that the newly restored aaaaaaaa.cnf file no longer has information on the checkpoints that were performed after it was originally backed up. To correct this problem, you will need to replace the current aaaaaaaa.cnf file with a more recent version. You may start by copying the aaaaaaaa.cnf file in the database's dmp directory (or another backup copy you may have saved) to the database's data directory. You should then run an infodb dbName command to determine if the copied aaaaaaaa.cnf file is aware of the checkpoint you need to recover. If not, then you will need to restore a more recent database config session and copy the restored aaaaaaaa.cnf from the database's dmp directory to its data directory.

Checkpoint Configuration Session Recovery

All Enterprise Option for Advantage Ingres backups are online backups. These backups create a dump file that must be on disk before the option can recover the backup's data session. If the dump file for the checkpoint you are recovering no longer exists in the database's dmp directory, you must restore a database checkpoint's configuration session before you recover the database's data session.

Journal File Recovery

When you recover a data session, the database is restored/recovered to the state it was in at the time that the backup session was created. If the database is journaled, all updates to the database performed from the time that the backup session was created are logged in the database's journal files.

When you initiate a recovery job for a journaled database, by default, the option rolls forward through the existing journal files to automatically bring the database to a more recent state. If you choose to roll forward, the journal files must exist in the database's jnl directory before you initiate the recovery of the database's data session. If these journal files are not in the jnl directory, you must use the option to restore the journals first. For more information on recovering journal files, see Restore Journal Files in the chapter "Restoring Databases."

Non-Journaled Database Recovery

To restore/recover a non-journaled database, select the database backup that corresponds to the checkpoint you want to recover (typically, the latest backup).

Journaled Database Recovery Considerations

This section contains recommendations for recovering journaled databases.

Recover to Specific Checkpoints

To recover a database to the state it was in when you created a particular checkpoint, perform the following procedure:

1. Select the backup data session corresponding to the checkpoint you created.
2. Select the option, Do Not Recover Database from Journal, from the Ingres Options tab.

The option recovers the database from the backup data session only. The option does not use the journal files.

Because this procedure recovers journaled databases without using their journal files, you can use it when the journal files are unavailable. You can also use it when functions that require journal files to achieve a recovery (for example, rollforwarddb), fail.

Latest Transactions Recovery

To recover a database so that it contains the latest transactions in the active journal file, select the database session corresponding to the most current checkpoint but do not select any options on the Ingres Options tab. The option recovers the data session corresponding to the most current checkpoint and rolls forward through the active journal file automatically, recovering the latest transactions.

Remove Incorrect Updates

If you find incorrect data updates in a database starting at a certain time, you can remove the incorrect updates by submitting a recovery job from a checkpoint that rolls forward to just before that point in time.

To run this recovery job, perform the following steps:

1. Select a database backup that corresponds to the appropriate checkpoint.
2. Select the Point of Time option on the Ingres Options tab.
3. Enter a date and time that corresponds to the time just before the incorrect updates began to occur.

How Incorrect Updates are Corrected

If incorrect database updates have occurred in a journaled database after a certain time, but you do not know exactly when, use the Advantage Ingres auditdb utility to produce an audit trail of database transactions to help you find the exact time.

After you have found the time when the incorrect database updates began, use the Enterprise Option for Advantage Ingres to restore/recover the database from the most recent backup made before that time. To ensure a successful restore, set the Point of Time option on the Ingres Options tab to a date and time that corresponds to a time just before the erroneous updates began to occur.

New Installation on Original Hosts

The standard recovery process restores databases to the Advantage Ingres instances from which they were backed up. In this situation, the instance is in good working order, you know the checkpoint from which to recover, and you have restored the required backup sessions (config, journal, data) in the appropriate order.

You may encounter situations in which you need to restore a database to a new Advantage Ingres installation on the original host from which it was backed up. You might perform this type of restoration if, for example, a hard disk fails and corrupts Advantage Ingres or if some type of failure corrupts the operating system and you must reinstall both the operating system and Advantage Ingres.

We recommend that you adhere to the following process when you restore/recover a database to a new Advantage Ingres instance on the original host:

1. Reinstall the operating system (if necessary)
2. Recover system files
3. Reinstall a new Advantage Ingres instance

The following sections describe these procedures in detail.

Operating System Reinstallation

If the operating system is corrupted, you must reinstall the operating system and apply all the relevant patches. If the system disk configuration changed, you must ensure that your directory paths match those that were used by the original Advantage Ingres instance including the paths of any extended database locations. If your original Advantage Ingres instance was installed on /dsk100/Ingresii, for example, it must be possible to create a /dsk100 directory entry with enough room to hold the new Advantage Ingres instance. This is a requirement for database recovery using Advantage Ingres database checkpoints.

The Enterprise Option for Advantage Ingres must be installed on the system.

If you can salvage the original Advantage Ingres database journal files that were on disk, set these files aside for use at the recovery of the databases. These files are typically located in the following directory:

IngresInstallationDirectory/ingres/jnl/default/DatabaseName/

File System Recovery

If you did not need to reinstall the operating system, and if a recent file system backup of the Advantage Ingres directory tree and database extended locations exists, you can recover the data from that backup. A recent file system backup is one that includes all of the extended locations of all databases to be recovered. You can use BrightStor ARCserve Backup to create such backups.

Restore the Advantage Ingres directory tree and all database extended locations to recreate the Advantage Ingres instance as it was at the time of the backup. If you performed the backup while Advantage Ingres was shutdown, then your instance should now be in working order; however, your databases' contents will be what they were at the time of the backup. If you wish to bring your databases to a more recent state, you will have to use the option to recover more recent checkpoints. Be aware, however, that you may need to restore their latest config sessions and copy the restored `aaaaaaaa.cnf[.Timestamp]` files to their respective database data directories so that the checkpoints you want to recover are known. You may also need to restore database journal files. These restore tasks need to be performed before you recover your databases' data sessions.

If you performed the backup while Advantage Ingres was up and running, the recovered databases may not be consistent or the databases may not be at their most recent state. Use the option to restore the most recent config and jnl sessions of all databases, including `iidbdb` and `imadb`. You may need to copy the restored `aaaaaaaa.cnf[.Timestamp]` configuration files from database `dmp` directories to their respective data directories if those in the data directories are unaware of the checkpoints you intend to recover. You may also need to recovery any journal files that were backed up after the checkpoints you will be recovering. You can copy any salvaged journal files to the journal directories of their respective databases in the new Advantage Ingres instance so that the database recovery process can roll forward through the transactions they contain.

Use the option to recover each database in the Advantage Ingres instance, beginning with the Advantage Ingres `iidbdb` and `imadb` databases and followed by all other user databases. Run these recovery jobs as the `ingres` user.

Note: When you recover the `imadb` database, the Advantage Ingres process `rmcmd` can prevent the `rollforwarddb` utility, called during database recovery, from taking an exclusive lock on the database. This prevents the database recovery from proceeding. If this occurs, use the `rmcmdstp` utility to stop the `rmcmd` process before you recover the `imadb` database.

Advantage Ingres Reinstallation

If you do not have a recent file system backup of Advantage Ingres, you must reinstall your Advantage Ingres instance(s) once the operating system is stable. The new instance must have the same installation ID as that of the original instance. The new Advantage Ingres instance's data locations and dmp and jnl directories must have identical directory paths as those of the original instance. Apply all relevant Advantage Ingres patches to bring the new Advantage Ingres instances to the same revision level that existed when the backups from which you want to recover were made.

In addition, the Advantage Ingres configuration file, called config.dat, located in the \$II_SYSTEM/ingres/files directory, contains the configuration parameters for your Advantage Ingres instance. These parameters should be mirrored on the new Advantage Ingres instance. We recommend that you keep a copy of the config.dat file for each Advantage Ingres instance in a safe location in case you must apply it after reinstalling an instance.

You can use either of the following methods to reinstall Advantage Ingres. The first method requires fewer tasks on your part; the second can be used if the first is not proceeding properly. For both methods, your recovery jobs should run as the ingres or root users.

Method #1

This method requires fewer tasks. In addition, with this method, you do not recreate the databases in your instance. You will first use the option to recover your iidbdb database.

1. Determine which journal files are associated with the checkpoint you will recover – you will need to recover these before the database's data session.
2. You will also need to restore the database's latest config session; you can restore the config session and the needed journals using a single job.
3. Copy the restored aaaaaaaa.cnf[.TimeStamp] file to the database's data directory as aaaaaaaa.cnf.

Database dmp directories are typically located at

```
$II_SYSTEM/ingres/dmp/default/dbName
```

You can use this Advantage Ingres command to determine under which directory tree database dmp directories located

```
ingprenv II_DUMP
```

Database data directories are typically located at

```
$II_SYSTEM/ingres/data/default/dbName
```

You can use this Advantage Ingres command to determine under which directory tree database data directories are located

```
ingprenv II_DATABASE
```

4. Recover the database's data session.

Your instance will now be aware of all the databases, locations, and so on that will exist at the end of the instance's complete recovery. You will now need to follow the steps above for each database in your instance. Begin with the imadb database keeping in mind that you may need to run the rmcmdstp command to stop the rmcmd process. Continue with every other database in your original instance. When copying a restored aaaaaaaa.cnf file from its database's dmp directory to its data directory (step #3), you may first need to recreate the database's data directory.

Method #2

With this method, you use Advantage Ingres utilities to recreate and extend every database in your instance before recovering their recent backups using the option. Use the `createdb` command to recreate the databases that existed on the original instance. It's important to maintain a list of the databases on an instance. In absence of such a list, you may start the BrightStor ARCserve Backup Restore Manager to consult which databases were backed up from your original instance. The databases to be recovered must occupy the same locations as they did originally. If these databases were extended to other locations, add these extended locations to the Advantage Ingres instance. These extended locations must be the same type (for example, OCFS or RAW) as the original. Use the Advantage Ingres `accessdb` utility to add these locations to your instance and to extend your databases to use them.

Once all the databases are ready, you can use the option to recover each database in the Advantage Ingres installation. To do this, perform the following procedure:

1. As the `ingres` user, use the option to restore the config and journal sessions of each database that is associated with the checkpoints you want to recover (typically, the latest checkpoints will be recovered). A single restore job can be used for this step.
2. For each database, copy the restored `aaaaaaaa.cnf` file from its database's respective `dmp` directory to its data directory.

Note: The restored `aaaaaaaa.cnf` file may have been restored as `aaaaaaaa.cnf.timestamp`.

Database `dmp` directories are typically located at

`$II_SYSTEM/ingres/dmp/default/dbName`

You can use this Advantage Ingres command to determine under which directory tree database `dmp` directories are located

```
ingprenv II_DUMP
```

Database root data directories are typically located at

`$II_SYSTEM/ingres/data/default/dbName`

You can use this Advantage Ingres command to determine under which directory tree database data directories are located

```
ingprenv II_DATABASE
```

3. Use the option to recover each database's respective checkpoint data session. A single restore job can be used for this step.

Note: You may need to stop the Advantage Ingres `rmcmd` process, using the `rmcmdstp` command, before you recover the `imadb` data sessions.

4. Verify access to the recovered databases.

Standby Host Restore Operations

If your database host fails completely, you may have to recover your Advantage Ingres database to an alternate computer system. Since the time it takes to prepare an alternate computer system for such a recovery can be significant, we encourage Advantage Ingres administrators perform these preparatory tasks before the need for such a recovery is faced. In the sections that follow, we designate the computer system to which an online Advantage Ingres instance's databases will be recovered as the standby host. To restore/recover your database to a standby host, use one of the following methods:

- Recover using checkpoints
- Recover using file system backups
- Replication
- Unload and load using the unloaddb utility

Standby Hosts

To recover your online instance's databases to a standby host using checkpoints, you should set up and maintain the standby host to be ready to take over from the online host in case of failure as described in the following sections.

Standby Host Prerequisites

To recover an Advantage Ingres database using checkpoints, you must meet the following prerequisites:

- The standby system must have the same operating system as the online host, with the same revision level.
- The standby system should have a comparable performance level to that of the online system, if a similar level of responsiveness is needed.
- The hardware and software configuration and the underlying physical disk layouts of the standby host must be very similar (identical if possible) to those of the online host. Keep in mind that Advantage Ingres and its database must reside on the same paths on the standby host as on the online host.
- The standby system may be assigned the same host name as the online system. With this type of setup, if the online system fails, DNS entries for that host name must be reset so that connections by users and applications to the database using the host name can be redirected to the standby system.
- Advantage Ingres must be installed on the standby host and must have the same release and patch level as the online host.

- The Advantage Ingres installation ID of the online and standby Advantage Ingres instances must be the same.
- Advantage Ingres should be installed at the same directory path on the standby system, as on the online system and the default database data location and extended data location directory paths must be identical on both systems. The same is true for database dmp and jnl directories.
- The Enterprise Option for Advantage Ingres and the Common Agent must be installed on the standby host.
- The standby host must have been added as a BrightStor ARCserve Backup client.

Note: If the same host name is used for both the online and standby systems, the standby system must be identified as a BrightStor ARCserve Backup client with a different host name. For example, if both hosts are named abcde, the standby system should be defined as a BrightStor ARCserve Backup client with a host name such as abcde_stdby.

- The same users and groups that access Advantage Ingres on the online system must have access to Advantage Ingres on the standby system, with the same login accounts, passwords, and security levels.
- The local applications that use Advantage Ingres on the online host must also be installed and configured on the standby host.
- Any remote applications that use Advantage Ingres on the online host, or that interface with applications on the online host that connect to Advantage Ingres, must be able to reconnect easily to their counterparts on the standby host.

Set Up Standby Hosts

To set up the standby host, follow these steps:

1. Select a computer as similar to the online host as possible to use as the standby host. This computer must conform to the standby host prerequisites.
2. Install Advantage Ingres on the standby host, and apply the patches needed to bring it to the same revision level as the Advantage Ingres instance on the online host.

Note: The standby host should be a clone of the Advantage Ingres instance on the online system. It must have the same installation ID as that of the original instance. The new Advantage Ingres instance's data locations and dmp and jnl directories must have identical directory paths as those of the online instance. Generally, you should install the new instance on the same directory path as the online instance.

In addition, the Advantage Ingres configuration file, called config.dat, located in the \$II_SYSTEM/ingres/files directory, contains the configuration parameters for your Advantage Ingres instance. These parameters should be mirrored on the new Advantage Ingres instance.

3. At this point you may create the databases that exist on the online instance. The databases on the standby host must occupy the same locations as they do on the online host. If the original databases are extended to other locations, these extended locations must be added to the standby host's Advantage Ingres installation. In addition, they must be of the same type (for example, OCFS or RAW). Use the Advantage Ingres accessdb utility to add these locations and to extend databases to use them.
4. As the ingres user, use the option to restore the config and journal sessions of each database that is associated with the checkpoints you want to recover (typically, the latest checkpoints will be recovered) to the standby host. A single restore job can be used for this step. Ensure that on the Restore Manager's Destination Tab, you select the Ingres item of the standby host for the sessions to be recovered to that system.
5. For each database, copy the restored aaaaaaaa.cnf file from the iidbdb database's respective dmp directory to its data directory.

Note: The restored aaaaaaaa.cnf file may have been renamed as aaaaaaaa.cnf.*timestamp*.

Database dmp directories are typically located at

`$II_SYSTEM/ingres/dmp/default/dbName`

Database root data directories are typically located at

`$II_SYSTEM/ingres/data/default/dbName`

6. Use the option to recover each database's respective checkpoint's data session to the standby host. A single restore job can be used for this step. Don't forget that at the Restore Manager's Destination Tab you must select the Ingres item of the standby host for the sessions to be recovered to that system.

Note: You may need to stop the Advantage Ingres rmcmd process, using the rmcmdstp command, before you recover the imadb data sessions.

7. Verify access to the standby host databases.

Maintain the Standby Host

To maintain the standby host at a high level of preparedness, perform the following procedures:

- Follow the backup schedule for the online system.
- Restore the config and jnl sessions to the standby system each time you back them up on the online host for speedier recovery.
- Keep the standby host identical to the online host. Replicate any significant changes made to the production system on the standby host.
- Test the disaster recovery plan regularly to ensure that it is working well.

Restore to Standby Hosts

If the online host fails, follow these steps to restore your databases to the standby host:

1. Use BrightStor ARCserve Backup to restore the latest config and jnl backup sessions to the Advantage Ingres standby host, if they are not already there. You can restore the config and jnl sessions of all the databases in a single job.
2. If the any database is unaware of the checkpoint from which it will be recovered, copy the aaaaaaaaa.cnf files from that database's dmp directory to its data directory. You can only recover checkpoints of which your database is aware.

Run the Advantage Ingres command infodb (as the Ingres user) on the standby host to generate a list of all of the checkpoints known to all of the databases in your Advantage Ingres installation.

Note: Ensure that you copy the correct version of the aaaaaaaaa.cnf file. If an aaaaaaaaa.cnf file previously existed, restored configuration files are named aaaaaaaaa.cnf.*timestamp*.

3. If you can salvage the previously active journal files of the online databases from the online system, copy them to the standby database's journals directory.

Journal files contain the most recent updates to the database and can be used to bring the standby system to a more current state in relation to the online system. Losing the journal files of the online hosts that have not yet been backed up by the option means that the updates they contained will also be lost.

4. The actions you should take at this point depend upon the ready state of your standby host.
 - If you have not maintained your standby host in a ready state, you will need to:
 - If you have not done so already, restore the latest config and jnl backups of your online databases to the standby host. You can retrieve multiple config and jnl sessions with a single restore job.
 - If you have not done so already, copy any salvaged online journal files to their respective database directories of the standby host.
 - Recover the latest database checkpoints of your online databases to the standby host. You can retrieve the data sessions of multiple databases with a single restore job.
 - Your standby instance will now be ready to take over from your online instance. Be aware, however, that any updates to online databases that have not been either reflected in a recovered checkpoint or in an applied journal file will be lost.
 - If you have previously recovered your latest online database checkpoints to the standby host.
 - If your online databases have not been updated since this time or your online databases are not journaled, then your standby instance will be ready to take over from your online instance. Be aware however that if your databases are not journaled and updates have been made to your online databases since the last checkpoint, these updates will be lost.
 - If some or all of your databases are journaled and updates have occurred since their last checkpoints, then if you have not already done so, copy any salvaged journals to their respective database journal directories on the standby instance. You must then execute the following command for each database to apply the latest journals to their previously recovered checkpoints: `rollforwarddb -c database name`. Your standby instance will then be ready to take over from the online instance.
5. Before switching production processing to the standby system, perform any special actions needed. For example, if the online and standby hosts had the same host name, reset the DNS entries for the standby system so that external entities can continue to connect to the standby system using that host name.
6. Back up the standby instance at the first opportunity.

How File System Backups Work

To restore to a standby host using file system backups, you must install Advantage Ingres on the standby host with the same database disk directories as the online host. With this type of setup, you can use the BrightStor ARCserve Backup file system backups of the online database \$II_SYSTEM directory and all its locations to restore to the standby system.

Shut down Advantage Ingres during the backup and restore operation. The operating systems must be of the same type and should be at the same version level. When recovering in this manner, journal files cannot be used to roll the database forward from the database backup time. Database updates applied to the database from the backup time must be reentered.

Database Replication to Standby Hosts

To replicate a database to a standby host, set up a live, standby Advantage Ingres system that mirrors your production system. Use the Advantage Ingres Replicator to copy automatically each database update of your production system to the standby system as it occurs.

The following are some of the advantages of replicating databases:

- The risk of losing database updates is small because the production system and the backup system both record all updates.
- If a failure occurs, downtime is minimal because the standby system can immediately take over from the production system.
- The standby system can be running on a different operating system.

The one disadvantage of replicating a database is that throughput may suffer because the replication process increases network traffic and general overhead.

Unload and Load Process

In a process called *unloading*, the unloaddb utility creates script files that can recreate databases. You can use the script files to build a copy of a database on a standby host in a process called *loading*. You can also edit the script files so that they build only the data tables you have selected.

Note: To create script files that let you load a database onto a host of another operating system type, you must run unloaddb in ASCII mode.

The advantages of the unloading and loading processes are:

- There is no additional overhead imposed on your online systems during the normal processing period. You can run unloaddb only when the database is not being actively updated.
- The standby system can be running on a different operating system.

The disadvantages of unloading and loading are:

- The database must be locked when you run unloaddb and must be used exclusively by unloaddb.
- You lose transactions that occur after you run unloaddb because journals from the production system cannot be applied to the recovered system.
- The unload and load procedures are time consuming.

Post-Restore Back Up

After you restore database data, you should schedule a new backup of the database, especially if the database was not recovered to the latest journal transactions. If a subsequent restore is needed, you can restore from the new backup.

Appendix A: Frequently Asked Questions

This appendix presents frequently asked questions and answers concerning the operation of the Enterprise Option for Advantage Ingres. You can find additional information in the appendix "Troubleshooting."

Question

What can I back up using the Enterprise Option for Advantage Ingres?

Answer

You can use the Enterprise Option for Advantage Ingres to back up Advantage Ingres databases and their respective journal files. A complete Advantage Ingres instance can be selected to back up all the databases and journal files available for that instance. Only selected databases and their respective journal directories can be backed up by a single backup job. Whenever you back up a database, you automatically backup the checkpoint's .dmp and .lst files along with the database's backup aaaaaaaa.cnf file from its dump directory.

The Enterprise Option for Advantage Ingres backs up only database data locations, database journal directories and database dump directories. You cannot use the option to back up Advantage Ingres configuration files, log files, checkpoint directories or executable programs.

Question

I cannot see the Ingres item or its databases from the Backup Manager Source or Restore Manager Destination tabs. Why?

Answer

The following list provides a number reasons why Advantage Ingres information cannot be found:

- Advantage Ingres may not be up and running.
- The Common Agent may not be up and running. To check the status of the Common Agent, use the `caagent status` command.
- The Enterprise Option for Advantage Ingres may not be enabled. To see a list of the registered and enabled options, use the `caagent list` command.
- The Advantage Ingres instance may not be properly identified to the option. Each Advantage Ingres instance on the host to be backed up and restored must be properly identified in this file. To see the contents of the `installation.cfg` file, use the `"more installation.cfg"` command from the option's installation directory.

For more information, see the "Troubleshooting" appendix in this guide.

Question

Can the Enterprise Option for Advantage Ingres back up Raw database locations?

Answer

Yes, the option can back up Raw database locations.

Question

Can the option perform table level backups?

Answer

No, the option cannot perform table level backups.

Question

Why does the option back up the Advantage Ingres database dump directory automatically whenever it backs up a database?

Answer

Whenever the option performs an online backup of an Advantage Ingres database, database updates that occur during the backup are saved by the Advantage Ingres database server to a dump file in the dump directory. This information is critical to the successful recovery of the database. If it is lost, the database cannot be safely recovered. The option always backs up the .dmp and .lst files of the created checkpoint and the database's backup aaaaaaaa.cnf file found in this directory to ensure that this information is available for use on recovery.

Question

Can I use Advantage Ingres while the option is backing it up?

Answer

Yes. The option can only back up databases in a running Advantage Ingres instance; that is, the option does not perform offline checkpoints. Databases can be updated while they are being backed up.

Question

Can the Enterprise Option for Advantage Ingres be used to create checkpoints to the database's checkpoint disk directory?

Answer

No, the option can only back up to the BrightStor ARCserve Backup server host's configured backup devices.

Question

Can I back up to a remote tape drive?

Answer

The option sends backup data to a BrightStor ARCserve Backup server. If that server is on a different host than the database being backed up, the option sends the backup data to a device on that remote host.

Question

Can I back up to a local disk?

Answer

The option can only back up to a disk or tape at the same host as the BrightStor ARCserve Backup server whether it is located on the same host or a remote host to the database being backed up. If the BrightStor ARCserve Backup server and the database being backed up are on the same host, then your backups can be backed up to a local disk.

Question

Does the Enterprise Option for Advantage Ingres use Advantage Ingres database checkpoints?

Answer

Yes, the option initiates checkpoints on the databases being backed up. When a database must be recovered, the data associated with a particular checkpoint number is selected for a restore.

Question

The option uses the Advantage Ingres ckpdb utility. Can I use the option to request other ckpdb options such as setting a database offline or enabling journaling on a database requesting offline checkpoints?

Answer

No, the option only uses ckpdb to initiate and control online database backups.

Question

Does the Enterprise Option for Advantage Ingres use Advantage Ingres database journal files?

Answer

Yes. You can back up and restore Advantage Ingres database journal files. When a database's data is recovered, the option can control whether the database is rolled forward through the database's available journal files. You can also specify that the roll forward operation stops at a particular point in time.

Question

If a job backs up more than one database and an error is experienced with a particular database, does the backup job terminate upon encountering the error?

Answer

If there are more databases to back up, the job continues.

Question

Can I recover my data to another Advantage Ingres instance or another computer?

Answer

Yes, it is possible, however, the instance to which you want the database to be recovered must be a clone of the original; it must reside on identical file system locations (directory trees) and it must have the same installation ID. Practically, since each Advantage Ingres instance on a host must have a unique installation ID, the instance to which you want the data to be recovered must reside on another computer.

Question

When I submit a job to my remote BrightStor ARCserve Backup server, why does it stay in a ready state for a certain period of time?

Answer

One possible cause is that the time scheduled for the job to run has not arrived. You can reschedule the job with the Job Status Manager or use the Run Now option when you submit your next job. You may also want to check the time on your BrightStor ARCserve Backup host to ensure it accurately represents the current date and time.

Appendix B: Troubleshooting

This appendix contains troubleshooting tips for the Enterprise Option for Advantage Ingres.

Log and Configuration Files

To troubleshoot properly, you must understand the nature of the problem and its source. Start by looking at the log and configuration files. The option maintains these supporting files in various directories.

Log Files

If you are having problems with a job or are have browsing difficulties, you can usually find detailed information about the reason for these problems in the log files.

The following is a list of log files used by the option and their locations.

- Option Logs:
 - /opt/CA/BABingagt directory/logs/ingresbr.log*
 - /opt/CA/BABingagt directory/logs/ingresd.log*
- Advantage Ingres Installation Error Log:
 - Advantage Ingres Installation Directory/ingres/files/errlog.log*
- BrightStor ARCserve Backup Activity Log:
 - /opt/CA/BrightStorARCserve/logs/BrightStor.log*
- BrightStor ARCserve Backup Media Server Log:
 - /opt/BrightStorARCserve/logs/camediad.log*
- Common Agent Log:
 - /opt/CA/BABcmagt/logs/caagentd.log*

Enterprise Option for Advantage Ingres Log Files

There are two Enterprise Option for Advantage Ingres log files, `ingresbr.log` and `ingresd.log`. The GUI browsing option, `ingresbr`, writes to `ingresbr.log`. The backup and restore option, `ingresd`, writes to `ingresd.log`.

The browsing option interfaces with Advantage Ingres when you use the Backup Manager or the Restore Manager to examine the databases serviced by Advantage Ingres. The Backup and Restore Managers interface with Advantage Ingres when you execute backup and restore jobs.

Examine `ingresbr.log` for browsing difficulties and `ingresd.log` for backup or restore job execution difficulties. The log files are located in the logs directory of the option's installation directory. The following are the locations:

```
/opt/CA/BABingagt directory/logs/ingresbr.log  
/opt/CA/BABingagt directory/logs/ingresd.log
```

Advantage Ingres Error Log

Occasionally, you may experience problems with Advantage Ingres. Examining the Advantage Ingres error log file, `errlog.log`, should reveal any difficulties that Advantage Ingres has encountered. The Advantage Ingres Error log file is in the following directory:

```
Advantage Ingres Installation Directory/ingres/files/errlog.log
```

Common Agent Log File

The Common Agent is the software component that initiates `ingresbr` and `ingresd`. If their log files do not display a browsing attempt or a backup or restore job execution, the Common Agent could be experiencing a problem initiating `ingresbr` or `ingresd`. Check the Common Agent log file, `caagentd.log`, for a possible reason for the problem. The path for the Common Agent log file is:

```
/opt/CA/BABcmagt/logs/caagentd.log
```

BrightStor ARCserve Backup Log Files

Each BrightStor ARCserve Backup server component logs its activities to its own log file.

If you suspect a problem with the BrightStor ARCserve Backup server is preventing the option from functioning properly, check the *BrightStor ARCserve Backup Installation Dir*/logs. The logs in this directory record problems with the server.

Configuration Files

The following are the configuration files used by the option:

- Advantage Ingres installation configuration file:
/opt/CA/BABingagt/installation.cfg
- Common Agent configuration file:
/opt/CA/BABcmagt/agent.cfg

Note: If you edit the installation.cfg file manually, you must run the caagent update command. This will ensure that the configuration change you made, is incorporated.

Installation and Setup Problems

You can often resolve installation or setup problems by running ingsetup, the Advantage Ingres setup script. You can rerun ingsetup at any time.

Note: During setup, when you are prompted for the installation ID and II_SYSTEM value for each instance, the values you enter are appended to the installation.cfg file located in the option's installation directory. If you enter nothing, the file does not change. You may need to edit the installation.cfg file manually to remove or add entries as needed.

Browsing Problems

If you expand the host from the Backup Manager Source tab or the Restore Manager Destination tab and you do not see the Advantage Ingres object at the bottom of the top-level directories list, try the following actions:

- Verify that the Common Agent is running by using the `caagent status` command. If the Common Agent is not running, issue the `caagent start` command.
- Verify that the Enterprise Option for Advantage Ingres has been installed on the host you expanded. If the option has not been installed, install the option and register it by running `ingsetup` from the option's home directory on the client machine.
- Verify that the Enterprise Option for Advantage Ingres and Common Agent are properly configured. Issue the `caagent list` command and verify that the option is enabled. If the option is not enabled, issue the `caagent enable 19` command.

To verify that the Common Agent has been configured to manage the option, issue the `caagent list` command and search for an entry that begins with the following code:

```
19      Ingres      11.5.0 ENABLED
```

If you do not see a line with this code, run `ingsetup`.

If DISABLED is displayed instead ENABLED, run `caagent enable 19`.

Expanding an Advantage Ingres instance should display all the databases and database journals in that instance. If they do not appear, verify that the Advantage Ingres Database server is running.

If a particular Advantage Ingres instance appears repeatedly after you expand the Advantage Ingres object, the *Advantage Ingres Installation Directory/installation.cfg* file has duplicate installation entries that must be deleted.

After you expand the Advantage Ingres object, the next level displays the installation IDs of all the Advantage Ingres instances the option is to back up and restore on that particular host. If you do not see the Advantage Ingres instance you want, edit the *Advantage Ingres Installation Directory/installation.cfg* file to add the installation ID and `II_SYSTEM` values of the missing instance.

Backup and Restore Error Messages

If you experience problems with backup or restore jobs, examine the logs noted in Log and Configuration Files earlier in this chapter. Pay particular attention to these log files:

- `/opt/CA/BABingagt Directory/logs/ingresd.log`
- `/opt/CA/BABingagt Directory/ingres/files/errlog.log`
- `/opt/CA/BABcmagt/logs/caagentd.log`

For persistent problems, uncomment the `CA_ENV_DEBUG_LEVEL=4` line in the Enterprise Option for Advantage Ingres section of the Common Agent `agent.cfg` file by removing the leading character (`#`) and run `caagent update`. The output directed to the `ingresbr.log` and `ingresd.log` files becomes more detailed.

The size of option's log files (`ingresbr.log`, and `ingresd.log`) are maintained, by default, at 20 megs for normal logging and 200 megs for debug logging. When their size exceeds these maximums, the files are renamed by appending `".old"` to their names and creating new files to replace them. The default maximums can be overridden by defining the following environment variables in the "Ingres Agent" section of Common Agent's `agent.cfg` file:

`CA_ENV_LOG_MAX_SIZE=<value>`

This is the maximum log size when writing normal execution messages.

`<value>` is an integer value representing the maximum number of bytes to write to the file.

`CA_ENV_DBGLOG_MAX_SIZE=<value>`

This is the maximum log size when writing debug messages.

`<value>` is an integer value representing the maximum number of bytes to write to the file.

Cannot Back Up Paths with \$ in the Path

Do **not** put `$` in file or directory names. The option cannot back up database locations with the `$` character in their path.

Backup or Restore Job Hangs

If a backup or restore job hangs, verify that all open database transactions are either committed or rolled back. See the Messages Issued if ckpdb Stalls section in this appendix for more information.

Problems Restoring from a Checkpoint

If you encounter a problem recovering from a particular checkpoint, try to recover from an earlier checkpoint. Before recovering from the earlier checkpoint, restore all the journals associated to that checkpoint and onwards so that the transactions in those journals are applied automatically after the checkpoint is recovered.

Backup of Journalized Database Unsuccessful

If the backup of a journalized database is unsuccessful, verify that the journal files for the database exist and are valid. Use the infodb command to verify checkpoints and the journal files. In addition, verify that the database is journalized.

Restore of Database Unsuccessful

If the restore/recover of a database is unsuccessful, confirm that the database is online. Validate the integrity and the association of the journal files (for example, gaps and sequence). If necessary, restore the journal files first in a separate job.

Advantage Ingres Has Not Started

The Advantage Ingres server may not be started if the following message appears in *Advantage Ingres Installation Directory/logs/ingresd.log*:
E_DM00AB_CANT_MAP_SHARED_MEM Could not map the server's shared memory

Check the errlog.log for the following message:
E_DM1051_JSP_NO_INSTALL The installation is not currently running.

If this message appears, restart the Advantage Ingres server.

Advantage Ingres Errors

If you encounter problems connecting to an Advantage Ingres database, check the `errlog.log` file for the following message:

`E_DM012A` The database configuration file was not found.

If this message appears, the `aaaaaaaa.cnf` file for this database is not present in the database data directory. You must copy it from the database's `dmp` directory.

Note: Before you copy the `aaaaaaaa.cnf` file from the database `dmp` directory, you may need to use the Enterprise Option for Advantage Ingres to restore the correct version of the file. For more information, see *Work with the Database Configuration File* in the chapter, “Best Practices.”

Checkpoint Wait Time

To prevent indefinite suspensions of backup jobs, you can set the option to wait a specified amount of time for `ckpdb` to checkpoint a database. If `ckpdb` does not checkpoint the database within the specified time, the option terminates and the backup job fails. The default waiting period is one hour.

To modify the checkpoint wait time, open the `/opt/CA/BABcmagt/agent.cfg` file and add the following as a separate line in the Enterprise Option for Advantage Ingres section:

```
ENV CA_ENV_MAX_SEMOP_WAKE_TIME=mins
```

where *mins* is the number of minutes the option waits for `ckpdb` to checkpoint the database and start the backup. Add this line where the other `ENV` lines for the Enterprise Option for Advantage Ingres appear then run the `caagent` update command.

Note: You should not set the wait time to less than five minutes.

Stall Messages

If `ckpdb` stalls, the following messages appear in the Job Status Manager, Activity log, and the option log files:

Waiting for Db Extractor's response; `ckpdb` may be stalled due to open database transactions (see `/tmp/ckpdb_out`)

Still waiting for Db Extractor's response; `ckpdb` may be stalled due to open database transactions (see `/tmp/ckpdb_out`)

If ckpdb stalls on open transactions, the following messages appear in the /tmp/ckpdb_out.log file:

```
Preparing to checkpoint database: database name
Preparing stall of database, active xact cnt: open transactions
List of active transactions...
Username: user name Tran_id: 00003E153EF99892
Process: 0001001C Session: 019C3680
```

Note: The log message of ckpdb or rollforward tool are redirected to the /opt/CA/BABingagt/logs/ckpdb.log.<PID>

This is the temporary file. At the end of the job execution, the content of this file is extracted and appended to the <ingresd.log>

The following are definitions of the variables displayed in the stall messages:

- **Database name:** The name of the database being backed up
- **Active xact cnt:** The number of open transactions ckpdb is waiting for
- **Username:** The user holding the open transaction
- **Tran_id:** The Advantage Ingres transaction ID
- **Process:** The internal Advantage Ingres server ID
- **Session:** The Advantage Ingres Server Session ID

The information from the /tmp/ckpdb_out.log can indicate which user or application has open transactions you must commit or roll back before the backup can continue. The username field, combined with the ps -ef command, can indicate which process has open transactions. You must commit or roll back the open transactions or terminate the process before the backup can continue.

Appendix C: Login Name Privileges

This appendix describes how the login name you enter when you access the Backup Manager or Restore Manager affects the execution of your jobs.

When you expand a host on the Source tab of the Backup Manager or the Destination tab of the Restore Manager, you are prompted to enter a login user name and password. If you enter an appropriate user name and password, the Backup and Restore Managers let you expand the host. If the name you enter is `ingres` or `root`, the option executes all the backup and restore jobs, you submit. If you enter another name, then the backup and restore jobs you submit will be subject to security checks by the Ingres server that may prevent them from backing up or recovering the items you selected.

The following sections provide detailed information regarding the effect that the `ingres`, `root` accounts, the Ingres operator privilege, and "`iihost.privileges.userusername`" config.dat entries has on the execution of backup and restore jobs.

Database Backup Jobs

If your login name is `ingres` or `root`, database backup jobs will be able to backup all the database items you select.

If your login name is that of a user with the Advantage Ingres operator privilege, database backup jobs will be able to backup all the database items you select except for the `iidbdb` database and its journal files.

To backup the `iidbdb` database and its journal files, a non-`ingres` or non-`root` login user must have a corresponding "`ii.host.privileges.user.username`" entry with at least `SERVER_CONTROL` specified in the installation's `config.dat` configuration file; as in this example,

```
ii.host01.privileges.user.user01: SERVER_CONTROL
```

This line should be grouped with other such lines in the `config.dat` file. When this file is modified, the Ingres installation must be shutdown and restarted for the change to take effect.

If as a user that does not have such an entry in the installation's `config.dat` file, you try to backup the `iidbdb` database, the following messages will be written to the BrightStor ARCserve Backup Activity Log:

```
E_DM1037_JSP_NO_PRIV_UNAME Insufficient privilege to issue the -u (username) flag  
Error Backing Up Database [iidbdb]; Continuing...
```

If as such a user you try to backup the `iidbdb` database's journal files, the following messages will be written to the BrightStor ARCserve Backup Activity Log:

```
Error from Ingres' infodb utility  
Error Backing Up Journal [JOURNAL OF DATABASE database name]; Continuing...
```

If the login name you used is not `ingres` nor `root`, and you do not have the operator privilege, the backup of non-`iidbdb` databases and journals will not succeed. If this occurs, the messages detailed as follows will be written to the BrightStor ARCserver Backup Activity Log.

For each database you try to backup (except for the `iidbdb` database as described previously), you will receive these messages:

```
E_DM100B_JSP_NOT_USER You are not a valid DBMS user  
Error Backing Up Database [database name]; Continuing...
```

For each database's journals you try to backup, you will receive these messages:

```
Error from Ingres' infodb utility
```

```
Error Backing Up Journal [JOURNAL OF DATABASE database name]; Continuing...
```

```
Login Name Privileges 111
```

```
E_DM1014_JSP_DB_NOT_DB_OWNER You do not own the database specified
```

Database Data Restore Jobs

If your login name is `ingres` or `root`, database restore jobs will be able to recover all the database items you select.

If your login name is that of a user with the Advantage Ingres operator privilege, database restore jobs will be able to restore/recover all the database items you select except for those belonging to the `iidbdb` database.

To restore or recover `iidbdb` database data, config, or `jnl` sessions or files, a non-`ingres` or non-`root` login user must have a corresponding "`ii.host.privileges.user.username`" entry with at least `SERVER_CONTROL` specified in the installation's `config.dat` configuration file; as in this example,

```
ii.host01.privileges.user.user01: SERVER_CONTROL
```

This line should be grouped with other such lines in the `config.dat` file. When this file is modified, the Ingres installation must be shutdown and restarted for the change to take effect.

If as a non-`ingres`, non-`root` user that does not have such an entry in the installation's `config.dat` file, you try to recover `iidbdb` database items, the following messages will be written to the BrightStor ARCserve Backup Activity Log:

```
Error, user is not privileged to run this operation
```

```
Error initiating restore.
```

If the login name you used is not `ingres` nor `root`, nor do you have the operator privilege, and you select non-`iidbdb` items, the items you select for restore cannot be recovered. The following messages will be written to the BrightStor ARCserve Backup Activity Log:

```
Error, user is not privileged to run this operation
```

```
Error initiating restore.
```


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