BRU Server

BRU Server Admin Guide
TOLIS Group, Inc., et al
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1 – Installation and Getting Started

BRU Server installation involves up to three separate component packages:

BRU Server Server– The main server software package. The BRU Server Server is the component that performs all I/O management for the disk Stage and any tape drives or libraries. As such, it is installed on the system that backs up the other systems and where the disk stage and/or tape drive(s)/Libraries are physically attached. It also manages the authentication and communication between the server and client systems.

BRU Server Agent – The client-side software package. This is installed on any systems that will be backed up by the server. Multiple servers may actually service an installed agent. Since there are agents for many different operating systems, be certain to install the agent package that is correct for your operating system.

BRU Server Console – The Management Console software package. This should be installed on any systems that you wish to use to manage the BRU Server environment. Since there are consoles for many different operating systems, be certain to install the console package that is correct for your operating system. There is no limit to the number of systems on which you can install the BRU Server Console.

System Requirements:

Server on Mac OS X:
Mac OS X 10.4.11 or later (Server or Desktop)
G4 500MHz or faster Processor (G4 1GHz Recommended)
512MB RAM 1GB Recommended)
Compatible SCSI, SAS or Fibre-Channel HBA (if using tape)
4GB Disk Space (installation and Catalog growth)
Admin defines required disk space for Staged (D2D) Backups

Server on Linux:
Major Linux Distribution[1] Using GLIBC 2.3 or better and 2.6.24+ kernel
x86 1GHz or better Processor
x86_64 (AMD Athlon/Sempron 2800+ or better)
(Intel Core 2 or i series processor 1.6GHz or better)
512MB RAM (1GB Recommended)
Compatible SCSI, SAS, or Fibre-Channel HBA (if using tape)
4GB Disk Space (installation and Catalog growth)
Admin defines required disk space for Staged (D2D) Backups

Server on Solaris:
Solaris 10
Any SPARC CPU - UltraSPARC III or better processor recommended
512MB RAM (1GB Recommended)
4GB Disk Space (installation and Catalog growth)
Admin defines required disk space for Staged (D2D) Backups

Server on IRIX:
IRIX 6.5
256MB RAM
4GB Disk Space (installation and Catalog growth)
Admin defines required disk space for Staged (D2D) Backups

Agent on Mac OS X:
Mac OS X 10.4 or later (Server or Desktop)
G4 500MHz or faster Processor
128MB RAM
20MB Disk Space

Agent on Linux or Unix:
No special requirements in that if your hardware supports your OS installation, the BRU Server Agent should run fine.

Agent on Windows:
Windows 2000 (Professional and Advanced Server),
Windows XP (Home, Professional, Media Center) SP2 Required,
Windows Server 2003, Windows Server 2008
Vista, Windows 7
20MB Disk Space
PIII 600MHz minimum recommended if using compression or encryption

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[1] While BRU Server and other BRU products are compatible with most major Linux distributions, some distributions are still shipping installation kernels that are known to exhibit both SCSI and Networking problems. Please check your distribution for one of the kernels listed above before attempting to install and run BRU Server under Linux.

Console on Mac OS X:
    Mac OS X 10.4 or later (Server or Desktop)

Console on Linux or Unix:
    The BRU Server Linux Console is a x86 32-bit application, therefore, it will run on any modern 32-bit x86 Linux or an EM64T/x86_64 Linux system with the 32-bit compatibility libraries installed.

Console on Windows:
    The BRU Server Windows Console is a 32-bit application, therefore, it will run on any Windows version newer than Windows 2000. Windows XP must be updated to at least Service Pack 2.

General Installation Considerations

The BRU Server components are currently provided via download as either zip files (Windows, Mac OS X), or tar.gz files (all other platforms). To install the components, extract the files into a folder on your system and execute the associated applications as outlined in the following pages.

Linux KDE Note: If you use Dolphin or Ark to extract the BRU Server components, the executable bit will be cleared on the extracted files. We recommend either using "Archive Manager" or manually extracting the files via the command line.

The packages are named appropriately. If you will be installing all three packages on the same system, they must be installed in the order of:

> **BRU Server**
> **BRU Server Agent**
> **BRU Server Console**

On Mac OS X systems, you will be required to authenticate as the system administrator when installing the Server and Agent components since both packages require root level access to your system. The user account installing the Server and Agent ***MUST*** have a password; this is required for security reasons. If you attempt to authenticate as a user with no password, the authentication will fail. This is not a bug nor an error.

For Linux and other Unix systems, you must run the Server and Agent packages as root vi either sudo, gksudo, or kdesu. Once installed, the Agent UI on Linux is executable by any user, but configuration can only be executed by the root user.

On Windows, as with most Windows packages, the Agent must be installed by an Administrator level user.

The Console package may be installed by any user and does not require root level access for operation.

If you are updating from a previous version of BRU Server, the update process will retain all of your existing configuration, jobs, schedules, and other settings during the installation process. You don't need to uninstall a previous version unless directed specifically to do so by TOLIS Group technical support.

If you do wish to be doubly sure that your existing BRU Server information is safe, you may refer to the information in Appendix C - "**Backing Up the BRU Server Server**".

A Quick Word About BRU Server's Architecture
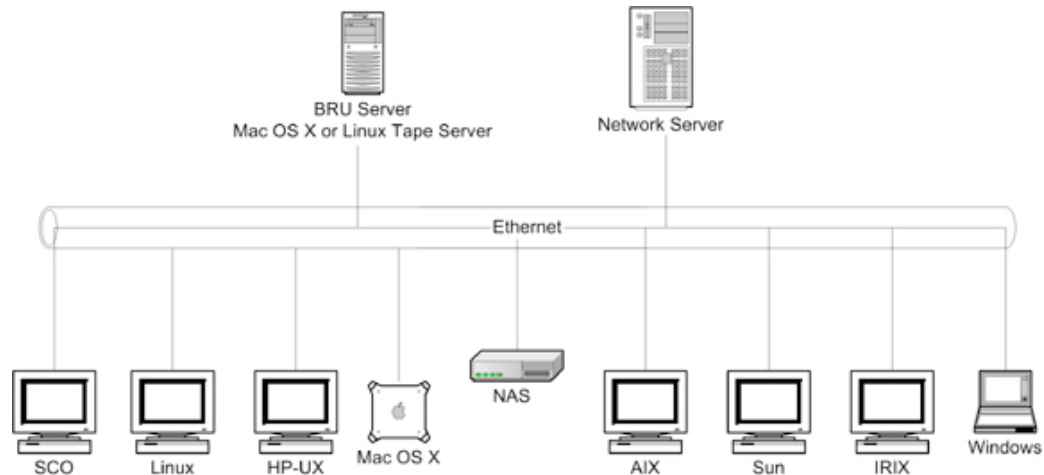
BRU Server Client Server Architecture

BRU Server uses a true client/server architecture for all operations. It consists of three components as previously described in the installation section – the server, agents, and consoles. Any client system may be accessed by the server system through the agent daemon that is installed on that client system. Also because the agent daemon runs continuously and with the permissions of the client system's admin user ("root" for Unix and OS X, and "Local System" under Windows), users do not need to be logged into the client system for backups to occur.

When accessing the server via the Console application, you are simply looking into and potentially modifying the state of the server environment. Therefore, the Console component may be installed and run from any compatible system that has network access to the server system. Such a system does not need to be part of your BRU Server backup environment and you are not limited in location nor number of systems as to where the Console component is installed.

Because BRU Server is true client/server, when you are running the console applications on a system, you are "viewing" the state of the server system. Since your console is simply a view into the server environment, the system running the console does not need to be the same OS type or have the server or agent daemons running. Additionally, from within a single console login, you may monitor and control multiple jobs simultaneously without interfering with the actual job processes. This asynchronous nature also means that multiple consoles may be monitoring the state of a job simultaneously.

Server Installation – OS X

💬 *If you are using a tape library, please ensure that there is at least one data tape available in slot 1 of the library before starting the installation.*

You may configure the BRU Server components graphically or via command line. In either case, you must configure the server component prior to configuring any agent components.

💬 *Because the BRU Server daemons (server and agent) MUST have full root authorization while running, you must perform the configuration steps as a user with an assigned password and administration rights on the machine where the configuration is being performed.*

Installation Prerequisites

- Mac OS X 10.4.11 or later (OS X Server or OS X Client)
- G4 500MHz or faster Processor (G4 1GHz or faster Recommended)
- 512MB RAM (1GB Recommended)
- Compatible SCSI, SAS or Fibre-Channel HBA (if using tape)
  (TOLIS Group Recommends ATTO Technologies or ACard HBAs)
- 4GB Disk Space (installation and Catalog growth)
  (Admin defines required disk space for Staged (D2D) Backups)
- TCP ports 14441-14450 for client / server communications
- Installing user must have admin rights and must have a password assigned
- If you are using a tape library, at least 1 data cartridge must be inserted into the first tape slot in the library.

Graphical Server Configuration

- Locate the **BRU Server Config** application
- If you have a Tape Library, ensure at least one normal tape is installed.
- Start the "**BRU Server Config**" application
- Authenticate as your system administrator (not the same as the BRU Server "admin" account)

Server Configuration - OS X Authentication

Initially, the config tool will scan your system for compatible tape drives and libraries. If you are using a tape library, you MUST have at least one non-cleaning cartridge tape in the library. Once this scan completes, you will be asked to assign a BRU Server "admin" user password. ***This password should not be the same as your system administration password***. The BRU Server "admin" user is a self-contained user that does not equate to any other user on your system. Do not confuse our use of the term "admin" with your system's Administrator.

Server Configuration - Password Entry

Once the password is assigned, the server daemon will be started and the BRU Server boot time startup operation will be added to the system startup folder.

Server Configuration - Initial Hardware Scan

After you have set the BRU Server admin password, BRU Server Config will run a hardware scan. If you are using a tape drive or library, the device(s) should be turned on an prepared as mention above before running the tool. Once the scan completes, your BRU Server server will have all of the basic information that it needs to use your tape devices.

Server Configuration - Main Admin Window

At this point, the server daemon is running in demo mode and your server system is ready to use. If you have a license, the next step is to enter the license information.
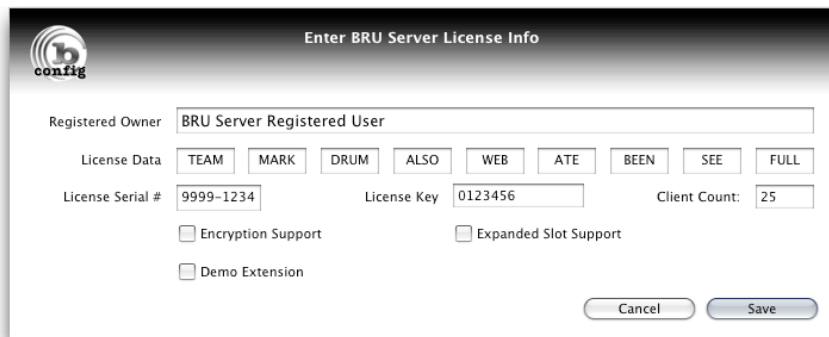
Server Configuration - License Entry

If you do not wish to have the BRU Server server daemon started at boot, simply click the "**Server daemon starts at system boot**" checkbox to remove the daemon from the Startup Items and set server daemon startup to manual.

Server Configuration - Configuration Complete

Once the Password and License information have been properly added, you are now ready to configure any client systems.

Tape Hardware Change

Server Configuration - Tape Hardware Scan

In the event that you change your tape hardware configuration, BRU Server will require that you rescan your system before you can return to backup operations (this is to prevent device assignment changes from affecting your destinations). To rescan the hardware, select the "**Hardware Scan**" tab and click the "**Scan**" button.

Command Line OS X Server Configuration

Connect to your server system via ssh or open the Terminal.
Execute the following commands and respond to the prompts:

```
sudo -s
cd /usr/local/bru-server
./server --kill
./server --password
        (Enter your new BRU Server "admin" Password – will not be echoed)
./server
```

The BRU Server server daemon will start as a background process. To check the status, you may monitor the server log file using the "tail" command:

```
tail -f /var/log/bru_server.log
```

Your output should look something like:

```
Oct 13 08:47:55 Configuration signature same as saved configuration
Oct 13 08:47:55 Listening on port 14441
Oct 13 08:47:55 Bound socket
Oct 13 08:48:05 Starting system housekeeping
Oct 13 08:48:05 Cleaning catalog directory
Oct 13 08:48:05 Stage directory '/Applications/BRU Server Config Tool.app/
Contents/MacOS/stage' not found
Oct 13 08:49:34 Accepted new connection from 192.168.1.7:60524
Oct 13 08:49:34 Authenticated user admin from 192.168.1.7:60524
```

To exit the tail function, type CTRL-C.

Server Installation – Linux

If you are using a tape library, please ensure that there is at least one data tape available in slot 1 of the library before starting the installation.

You may configure the BRU Server components graphically or via command line. In either case, you must configure the server component prior to configuring any agent components.

Because the BRU Server daemons (server and agent) MUST have full root authorization while running, you must perform the configuration steps logged into the system as root or by using sudo, gksudo, or kdesu to execute the BRU Server Config.

Installation Prerequisites

- Major Linux distribution using GLIBC 2.3 or better and 2.6.24+ kernel
- x86 1GHz or better Processor
- x86_64 (AMD Athlon/Sempron 2800+ or better or Intel Core 2 or i series processor 1.6GHz or better)
- 512MB RAM (1GB Recommended)
- Compatible SCSI, SAS, or Fibre-Channel HBA (if using tape)
- 4GB Disk Space (installation and Catalog growth)
  Admin defines required disk space for Staged (D2D) Backups
- TCP ports 14441-14450 for client / server communications
- Installing user must log in as root or be able to run the sudo, gksudo, or kdesu utilities
- If you are using a tape library, at least 1 data cartridge must be inserted into the first tape slot in the library.

Graphical Server Configuration
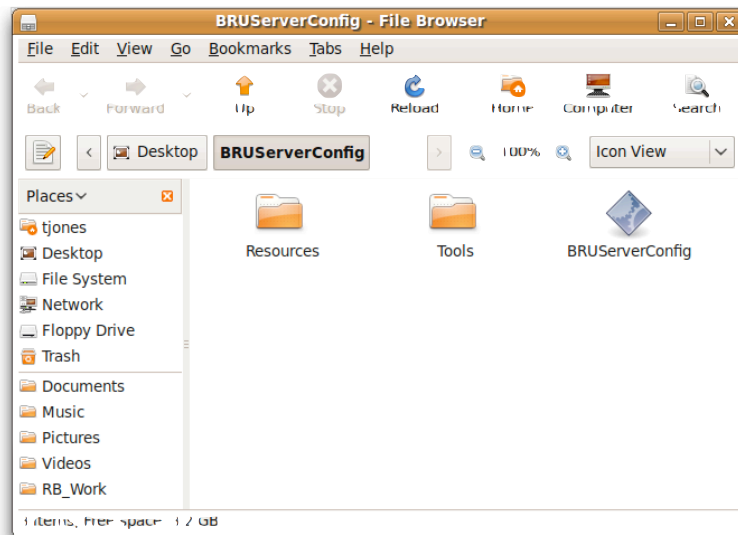
Server Configuration - Linux Application Executable
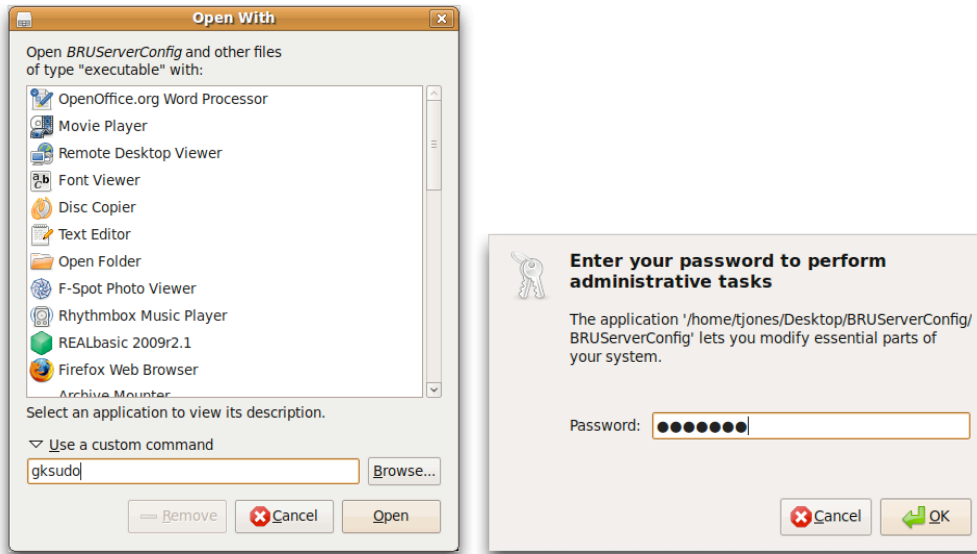
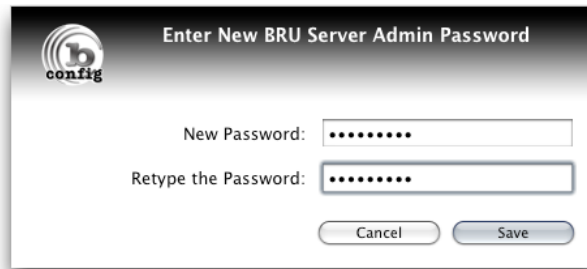**Server Configuration - Using gksu To Execute The BRU Server Config Application**

- Locate the **BRU Server Config** application
- If you have a Tape Library, ensure at least one normal tape is installed.
- Start the "**BRU Server Config**" application using a root-enabled account
- Authenticate as your system administrator (not the same as the BRU Server "admin" account)

Initially, the config tool will scan your system for compatible tape drives and libraries. If you are using a tape library, you MUST have at least one non-cleaning cartridge tape in the library. Once this scan completes, you will be asked to assign a BRU Server "admin" user password. ***This password should not be the same as your system administration password***. The BRU Server "admin" user is a self-contained user that does not equate to any other user on your system. Do not confuse our use of the term "admin" with your system's Administrator.
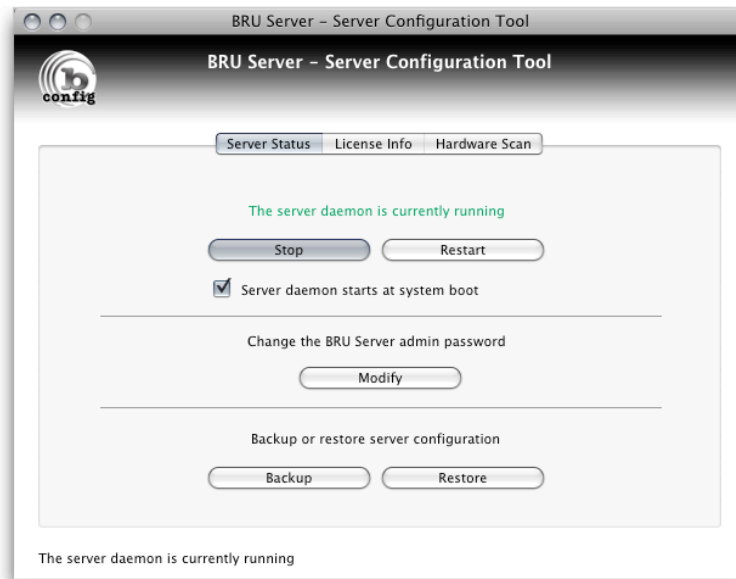

Server Configuration - Password Entry

Once the password is assigned, the server daemon will be started and the BRU Server boot time startup operation will be added to the system startup folder.

Server Configuration - Initial Hardware Scan

After you have set the BRU Server admin password, BRU Server Config will run a hardware scan. If you are using a tape drive or library, the device(s) should be turned on an prepared as mention above before running the tool. Once the scan completes, your BRU Server server will have all of the basic information that it needs to use your tape devices.
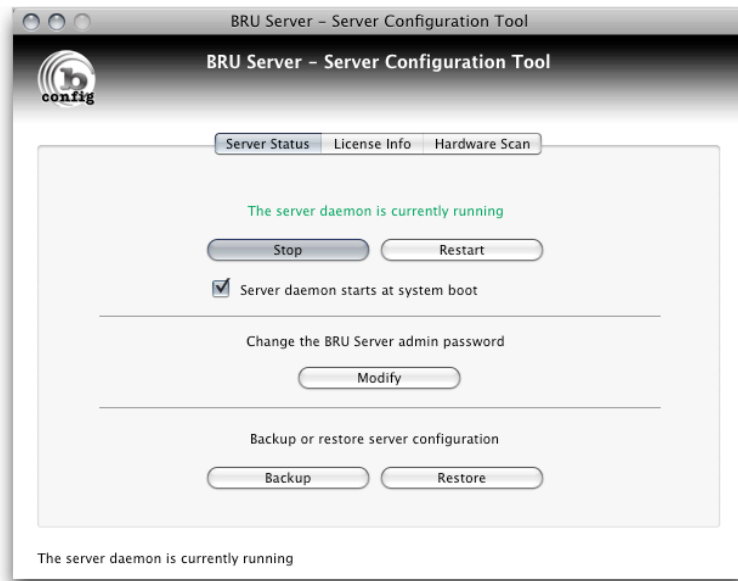

Server Configuration - Main Admin Window

At this point, the server daemon is running in demo mode and your server system is ready to use.

Server Configuration - License Entry

If you have a license, the next step is to enter the license information.

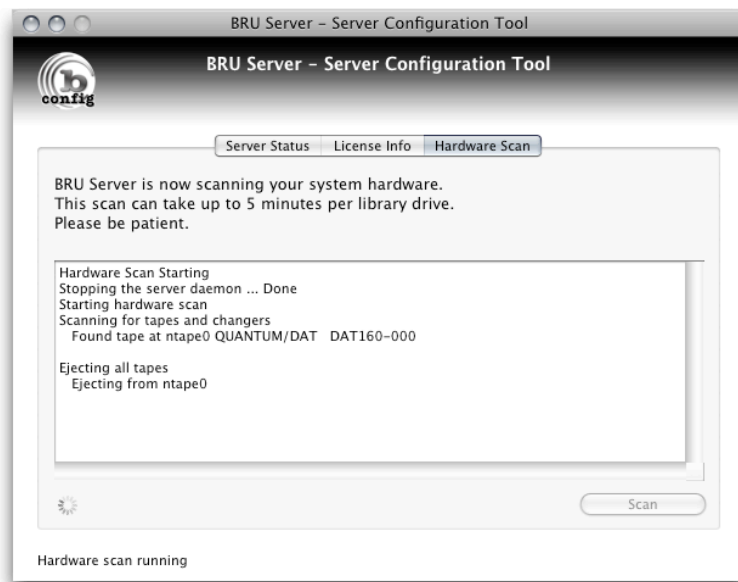If you do not wish to have the BRU Server server daemon started at boot, simply click the "**Server daemon starts at system boot**" checkbox to remove the daemon from the Startup Items and set server daemon startup to manual.

Server Configuration - Configuration Complete

Once the Password and License information have been properly added, you are now ready to configure any client systems.

Tape Hardware Change

Server Configuration - Tape Hardware Scan

In the event that you change your tape hardware configuration, BRU Server will require that you rescan your system before you can return to backup operations (this is to prevent device assignment changes from affecting your destinations). To rescan the hardware, select the "**Hardware Scan**" tab and click the "**Scan**" button.

Command Line Linux Server Configuration

Connect to your server system via ssh or open a terminal.
Execute the following commands and respond to the prompts:

```
sudo -s
cd /usr/local/bru-server
./server --kill
./server --password
```
        (Enter your new BRU Server "admin" Password – will not be echoed)
```
./server
```

The BRU Server server daemon will start as a background process. To check the status, you may monitor the server log file using the "tail" command:

```
tail -f /var/log/bru_server.log
```

Your output should look something like:

```
Oct 13 08:47:55 Configuration signature same as saved configuration
Oct 13 08:47:55 Listening on port 14441
Oct 13 08:47:55 Bound socket
Oct 13 08:48:05 Starting system housekeeping
Oct 13 08:48:05 Cleaning catalog directory
Oct 13 08:48:05 Stage directory '/Applications/BRU Server Config Tool.app/
Contents/MacOS/stage' not found
Oct 13 08:49:34 Accepted new connection from 192.168.1.7:60524
Oct 13 08:49:34 Authenticated user admin from 192.168.1.7:60524
```

To exit the tail function, type CTRL-C.

Server Installation – Unix

Installation Prerequisites

- Processor type depends on your platform
- 256MB RAM (512MB Recommended)
- 4GB Disk Space (installation and Catalog growth)
  (Admin defines required disk space for Staged (D2D) Backups)
- TCP ports 14441-14450 for client / server communications

The server installation on Unix systems is text based. To begin the installation, after extracting the tarball, cd into the unix directory and execute the install script:

```
cd unix
./install
```

After agreeing to the license, the first menu presented allows you to choose which options you will install:

```
            BRU Server Installation

Toggle  Install     Component
-----------------------------------------
S:      [ Yes ]     Server - Drives tapes/libraries
A:      [ Yes ]     Agent - Backup/Restore services for this machine
C:      [ Yes ]     Console user interface
G:      [ Yes ]     Graphical (X11) user interface

D: Installation directory [/usr/local/bru-server]
I: Install (or upgrade) selected components
U: Uninstall BRU Server
Q: Quit


Enter command:
```

Selecting any of the top four letters will toggle the installation state of the associated component. For the primary server installation, we recommend that you accept the defaults and install all of the components.

Also, while it is possible to modify the installation directory, we recommend that you accept the default of **/usr/local/bru-server**. Select the I option to begin the installation.

```
Beginning installation.  Looking for a prior installation
Prior installation not found

Installing console interface
Copied console files

Create a symbolic link in /usr/bin to "bru-server.console" executable? (y/n) y
Installing gui interface
Copied gui files

Create a symbolic link in /usr/bin to "bru-server" executable? (y/n) y
Installing server
Copied server files
```

By answering Yes to the symbolic link questions, entries will be placed into **/usr/bin** to allow easier access by system users to the console tools. The tools will be accessed as **bru-server** (GUI), **bru-**

server.console (Curses), and **bru-server.cmd** (command line). If you answer no to these questions, you will either need to add /usr/local/bru-server to your path, or call out the tools by their full paths.

During this phase, the installer will check for any existing BRU Server installations. If a previous installation is found, you have the option of retaining the existing database elements for the updated install.

The next phase will ask if you wish to add the server to the startup environment and whether you wish to start the server once the installation completes. We recommend that you answer yes to both of these questions.

The next step will scan your system hardware to locate any tape drives and libraries. If you are using a tape library, there MUST be at least one non-cleaning cartridge tape in the library. This process can take up to 5 minutes per tape drive, so please be patient.

After the server is installed, the agent will be installed. For more information on the agent installation, refer to the following section.

Licensing the Unix server

Applying a license to the Unix server currently requires the manual editing of the license file. While the Server Config Tool GUI allows you to enter your license under OS X, you may also manually edit the license file with these same instructions if you prefer to use the Terminal on OS X. This file exists as **/usr/local/bru-server/license**.

If you are adding the primary license, your entry line should look like this (all on one line):

```
MEET-BAR-DEMO-CAR-TAP-ATE-CARE-SAY-TEST:0123456:0000-0000:BSRV1:darwin:
150ES::Registered User or Company Name
```

This line breaks down into the following elements separated by colons ":"

```
License Data
License Key Verifier
Serial Number
Product
Platform
Client Count with special keys
Name of the registered user or company
```

Note that you should only have a single line in your license file. Any other line in the file will cause the license to be read as invalid.

Command Line Daemon Management

Manually start or stop the server daemon

Please note that it can take up to 90 seconds between the stopping of a server and the primary communications socket being completely closed and available. If you are restarting the server after manually stopping it, please wait at least 90 seconds before attempting to connect to the server via the Console. Otherwise, the connection will be refused since the socket has not been reopened.

Start:

```
sudo /usr/local/bru-server/server
```

Stop:

```
sudo /usr/local/bru-server/server --kill
```

Manually re-run the Unix Agent configuration steps

If you need to re-run the Unix Agent configuration steps, you may execute the daemon process passing the **--config** argument (as root):

```
sudo /usr/local/bru-server/agent --config
```

Manually update the admin password on the Unix server

To change the Unix BRU Server server admin password, you may execute the server daemon process passing the **--password** argument (as root):

```
sudo /usr/local/bru-server/server --password
```

Manually stop a running BRU Server server under Unix

To stop a running server without using the GUI, you may execute the server daemon process passing the **--kill** argument (as root):

```
sudo /usr/local/bru-server/server --kill
```

Manually re-run a Hardware Scan

To re-run the BRU Server Hardware Scan, you must first stop the BRU Server server daemon. Once the daemon is stopped, you may execute the scan process passing the **--scan** argument (as root):

```
sudo /usr/local/bru-server/server --scan
```

After the hardware scan is complete, the BRU Server server daemon must be restarted.

Mac OS X EMail Considerations

The BRU Server server daemon contains a built in MTA. As such, it doesn't require that you have an email, or SMTP server running on the BRU Server server system. However, it does need information about how to transmit mail messages that are generated during normal operations. This means that the BRU Server server system must know how to find the destination mail server and also be able to identify itself using a standard domain name (DNS) type machine name (i.e.: bruserver1.tolisgroup.com rather than bruserver1.local).

If your network environment uses DNS services, the simplest solution is to ensure the BRU Server server system has a proper DNS entry. If you do not use DNS services internally, you may provide the necessary information via the hosts file (/private/etc/hosts on OS X).

If you don't have DNS available (and can't enable it), you will need to edit the hosts file on both your BRU Server server and your mail server. On the BRU Server server system, you must add entries for both the destination mail server and the system itself:

```
##
# Host Database
#
# localhost is used to configure the loopback interface
# when the system is booting.  Do not change this entry.
##
127.0.0.1        localhost
255.255.255.255 broadcasthost
::1              localhost

 ## This next line is the local system as the mail server will recognize it
192.168.1.37    bruserver1 bruserver1.tolisgroup.com

 ## This next line is the entry for the mail server as the local system should know it
192.168.1.5     mail       mail.tolisgroup.com
```

The "Do not change" message relates to the 127.0.0.1 and ::1 entries. It does not mean that you can't add entries for other systems into the file. In this example, we've added both the IP address for the mail server (192.168.1.5) and the machine itself (192.168.1.37). On an OS X system, we would also need to make a change to the /private/etc/sysconfig file

On the mail server, you only need to include the BRU Server server system:

```
127.0.0.1       localhost
192.168.1.1     gw             gw.tolisgroup.com gw
192.168.1.37    bruserver1     bruserver1.tolilsgroup.com
```

With these changes in place, each server knows the other and your BRU Server mail will be properly delivered.

Agent Installation OS X, Linux, Windows

The new BRU Server 2.0 agents are installed on Linux and OS X by running the Agent application. On Windows systems, the Agent is a standard setup executable.

Linux x86

To install the Agent on Linux, extract the gzipped tarball and copy the entire "BRU Server Agent Config" folder to a location on your system. The first time that you run the application, you must run it as root by either logging in as root or by executing it with sudo, gksudo, kedsu or similar tool. When you execute the application as root, the tool will examine your system for an existing BRU Server agent version and either update that version to 2.0, or create and install the necessary files for operation.

Mac OS X

Installation of the Agent component onto a Mac OS X system is also performed by executing the "BRU Server Agent Config" application. After extracting the aplication bundle, you may place it anywhere on your systems, but we recommend creating a folder within your Applications Folder named "BRU Server". After copying the application bundle, execute it and authenticate when requested. As with the Server component, the user must be an admin user and must have a password assigned.

Windows

For Windows systems (Windows 2000 and newer), the Agent is installed via a Windows setup application. Run the setup application as an administrative user.

The Agent UI Menu Options

Once installed and configured, the BRU Server Agent application does not need to be executed for your system to be recognized by the BRU Server server system to which you have authenticated. However, the Client-side initiated backup and restore operations use the new Agent user interface accessed through either the taskbar tray icon (on Linux and Windows) or the statusbar icon on Mac OS X systems.
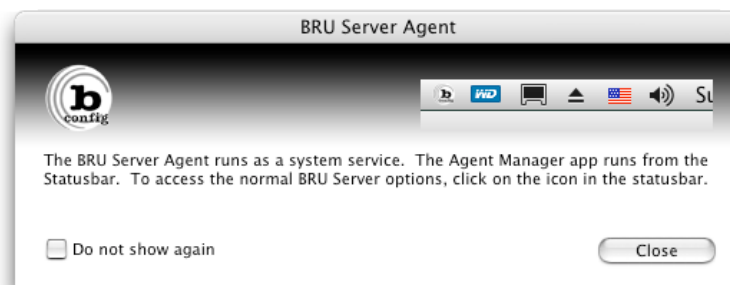
UI Access Reminder Dialog

OS X Statusbar and Windows and Linux Taskbar Agent UI Icons

Under OS X, click on the 'b' icon with your main mouse button. On Windows and Linux systems, use the right mouse button.
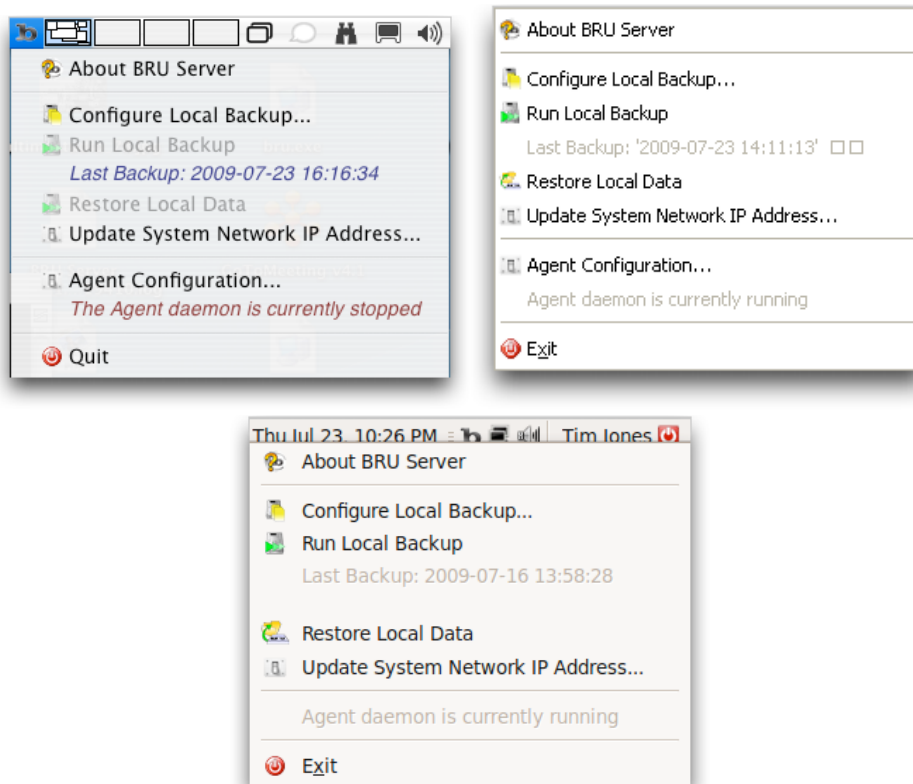
Agent User Menu (OS X, Windows, Linux)

The user Agent menu is basically the same on all three platforms with one exception - the Linux menu does not allow you to access the configuration option as the configuration options must be executed by the Linux system root user.

The menu options are described below

About BRU Server
>   Display the About Dialog

Configure Local Backup
>   Allows you to configure the files and folders to be included within a locally initiated backup. A backup created using this mechanism may also be restored locally without BRU Server admin actions. Entries are automatically saved.

Run Local Backup
>   Executes the backup of the job defined in the "Configure Local Backup" window.

Last Backup
>   Displays the date and time of the last locally executed backup job.

Restore Local Files
>   Allows you to select from locally initiated backup job archives and restore them to the local system.

Update System Network IP Address
>   If you are using a DHCP server for system IP address assignment, this option will alow you to update the IP address for your system on the server.

Agent Configuration - (OS X and Windows Only)

Displays the Agent configuration dialog.

Agent Status

Displays the current run state of the BRU Server Agent daemon / service.

Quit

Exits the User interface. Does not affect the daemon / service.

Using the Agent Interface

To configure the client system to allow local user control, on OS X or Windows, open the statusbar menu and select the "Agent Configuration" option.
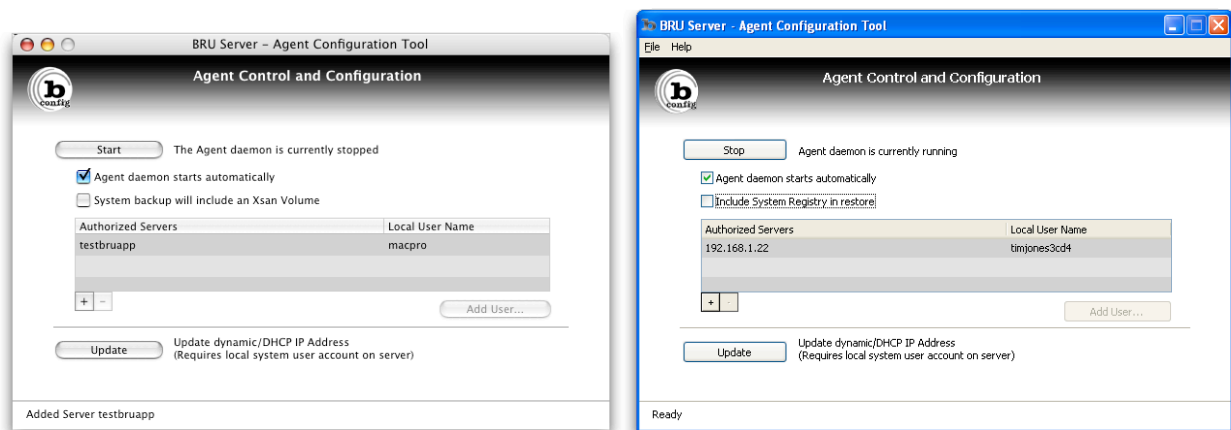
Agent Configuration - Daemon, Servers, and Local user

When you first execute the application, your system will be checked for any existing BRU Server Agent Version. Please note, the 2.0 agent is not compatible wit prior versions of the server and vice versa. You must only use the 2.0 agent with the 2.0 server.

To authorize a new server to perform backup and restore operations on this system, click the "+" button below the "Authorized Servers" listbox.

Agent Configuration - Specifying a New Server

Enter the DNS name or IP address of the server. The password requested is the server's admin password (BRU Server admin, not the OS) - as an administrator, you should not share this password with the client system user as they will have their own password assigned below (if they will be performing client initiated backup and restore operations). If this client system will support client-side initiated backup and restore, check the "Add User" checkbox.
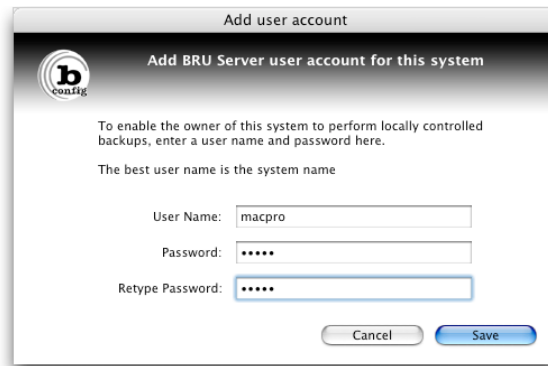
Agent Configuration - Adding the local system user

If you add a user, the default user name will be the machine's hostname. This is done for ease in matching BRU Server user accounts with client system. However, you may assign any, single word, alphanumeric name that you choose (no spaces). The password is the password that the created user will use to log in to the associated BRU Server server for local backup and restore operations.

Once authenticated, the local user will be automatically entered for the client system user for backup and restore operations.

Configuring the Default Local Backup
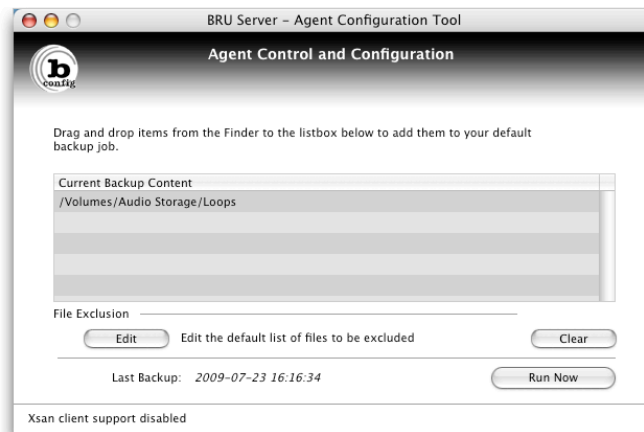
Agent Configuration - Local backup definition

Selecting data for backup is as simple as drag and drop. With the Local Backup window open, simply drag volumes, folders, or files onto the listbox. The list created is automatically saved. If you wish to edit the exclusion table file (bruxpat), click the "Edit" button below the list.
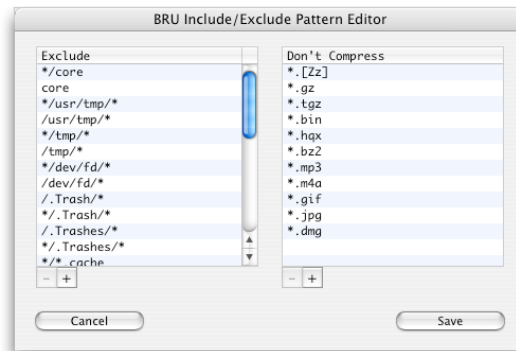
Agent Configuration - Excluded Files List Editor

The bruxpat file is a plain text file that contains a list of patterns to match for exclusion. While the patterns my be defined as either standard shell patterns (**xs**) or regular expressions (**xr**), most users will find the shell patterns easier to work with. A simple exclusion of all MP3, WMA, and AAC files would be:

```
xs   */*.mp3
xs   */*.MP3
xs   */*.wma
xs   */*.WMA
xs   */*.m4a
xs   */*.m4p
```

To accomplish this with a regular expression exclude pattern, you could use:

```
xr   */*.[mM][PpMm4][3aAp]
```

This says in any directory, match any file that has an extension with a first character m or M, a second character P, p, M, m, or 4, and a last character of 3, a, A, or p.

Running a Local Backup Job
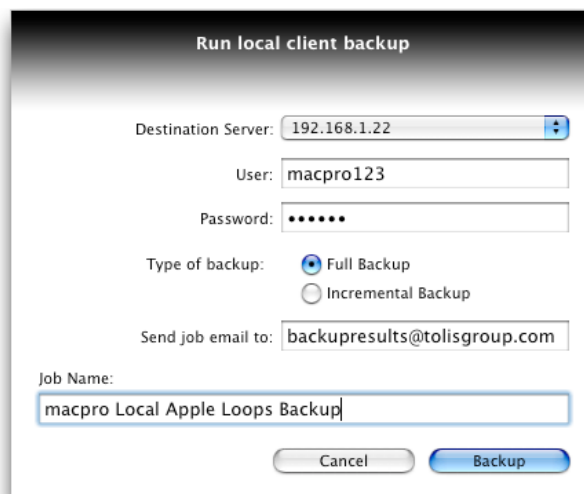
Agent Configuration - Run Local Backup Operation

By either clicking the "**Run Now**" button of the Local Backup Definition window, or by selecting the "Run Local Backup" from the Agent UI menu, you will be asked to log into the specified server system. You may also name the backup job and select whether it is to be a Full backup or an Incremental backup of the data in the Backup Content list. In addition to the name you give the backup, the system will add a "(F)" or "(I)" to the start of the job name to make it easier to recognize (F)ull versus (I)ncremental jobs when you need to restore data.

Once the backup starts, the window is closed and the backup runs until completion or the client user manually aborts the job via the Agent UI menu.

__Local Backups vs. Server Scheduled Backups__ - The locally configured and executed backup and restore options provided in the OS X, Linux, and Windows Agents are intended to be used in conjunction with normal organization-wide backup/archival requirements rather than as a replacement for them. The purpose is to enable desktop users to manage their own small-content backup and restores without the requirement of involving IT administration staff for simple "I didn't mean to delete that file" restore situations.

One method used by many of our customers is to install 2 or more BRU Server server systems - one for desktop users with a large D2D stage volume, and a second for your organization's mandated backup/archive scheduled operations to either disk or tape.

As an administrator, you can control the amount of disk space that each user may use (Stage Quota). and how long their local backups are retained on the server stage disk volume. Refer to the section in Chapter 6 on User administration for more information.

OSX Agent Notes

Configuring The Agent "brutab" file for Xsan Support

If you are using the OS X Agent user interface, there is a checkbox that turns Xsan support for this client on or off. Note that you only need to enable Xsan support on the client system that will specifically be used as the hosting client for the Xsan volumes.

Because of a slight difference in the way the Xsan filesystem works, the HFS+ `btime` (backup time) parameter is not available. This means that a default installation of the Agent on a system that will be the client involved with backing up the Xsan storage pool(s) may not process the appropriate files in the case of an Incremental or Differential backup. To enable proper handling of Incremental or Differential backup operations on the Xsan volumes, add the following line to top of your `/usr/local/bru-server/brutab.agent` file:

`#+IGNOREBTIME=YES`

Note that there are no spaces in that line and the hash (#) is not a mistake. Also, you must use pico, vi, TextWrangler, or some other editor that will preserve Unix line breaks. Using TextEdit or SimpleText will add Mac line breaks and cause errors when the BRU engine reads the contents of the file.

Configuring Agents Using Apple Remote Desktop

You may also send the agent configuration sequence to a group of managed OS X systems using ARD's "Send a Unix shell command to Target Computers". Select the appropriate computers ARD console and select the Manage -> Send UNIX Command... menu option. The command to send is a single line and consists of the command, the server that will be authorized to backup the systems followed by a comma and then (no space) the BRU Server server's admin password:

`/usr/local/bru-server/agent --config2 servername,password`

As an example, to authorize the server "`backup1`" with a BRU Server admin password of "`RemBackup` " to backup the OS X clients, send the command as follows"

`/usr/local/bru-server/agent --config2 backup1,RemBackup`

Agent Installation – Unix

Installation Prerequisites

- TCP ports 14441-14450 for client / server communications

To install the agent under a Unix system, extract the tarball as previously described, cd into the unix directory and execute ./install.

```
                    BRU Server Installation

Toggle  Install    Component
------------------------------------------
A:       [ Yes ]    Agent - Backup/Restore services for this machine

D: Installation directory [/usr/local/bru-server]
I: Install (or upgrade) selected components
U: Uninstall BRU Server
Q: Quit

Enter command:
```

Select *I* to begin the installation. If you are installing as part of a full server install, this will be the next step after the server installation completes. Once the appropriate files are copied, you will be prompted to add a server to the list of authorized servers.

```
Now configuring the agent:
The agent will only accept connections from authorized servers

BRU Server Agent Configuration

Authorized Servers:
None

Enter the number to delete, N to add a new server or RETURN to quit >
```

Select *N* to authorize a new server and enter the server name or IP address and admin password as prompted. This step will contact the server and login using the admin password provided. It will also add this system to the server's client list automatically.

Finally, you may choose to add the agent to the system startup and start the agent.

To manually start or stop the Unix agent, execute:

Start:

```
/usr/local/bru-server/agent
```

Stop:

```
/usr/local/bru-server/agent --kill
```

Windows Notes

Installation Prerequisites

- Any Windows version from Windows 2000 to Windows Server 2008 and Vista
- Windows XP SP2 and Vista SP1 strongly advised
- Administrator level user for installation

The Windows Agent is installed with the standard Windows Installer. An MSI file is available for all versions of Windows. While the installer package is configured to require a restart after installation, some users have reported that this does not occur in all installation instances. **Please be sure that you restart your Windows system after the installation completes**.

The Windows Agent is run as a Service after it is installed. To configure the Agent and authorize servers to access the system, use the BRU Server Agent Config application, in the *Start -> Programs -> TOLIS -> BRU Server Agent Configuration* menu.
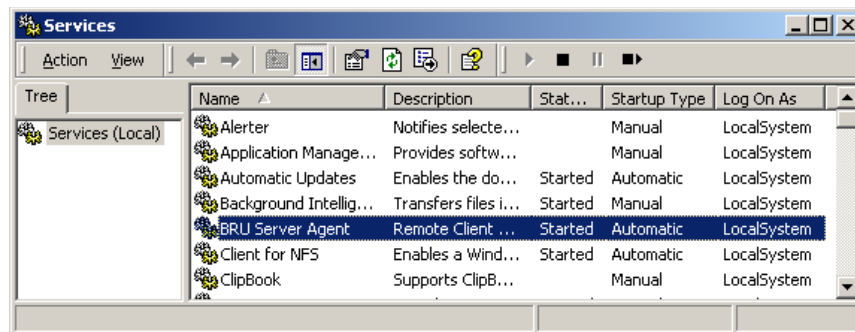
Windows Services Manager

To start or stop the Agent service, or change the default startup setting, you may use the Agent UI, the Windows Service Manager tool, or the Windows "sc.exe" command line tool. The service is "BRU Server Agent".

Windows Open File Support

If you purchased the BRU Open File Access Manager with your BRU Server licenses, it should be installed on the Windows client system along with the agent (install the agent package first). It is not necessary to install a copy on all Windows clients systems, only Windows systems that support platforms such as Exchange Server, SQL Server, Lotus Notes / Domino, Oracle, FileMaker Pro, or other platforms that utilize live file access that would normally prevent the platform data from being properly backed up. For more information on the Open File Access Manager, please refer to the Manual included with the software.

DNS Note (applies to ALL platforms)

In the event that you do not have proper DNS set up for your local networking environment, BRU Server may not be able to properly resolve your network addresses for clients and servers. In this case, we recommend that you add entries to the /etc/hosts or LMHOSTS file on your systems. These additions must be performed as root. An entry would look like this:

```
192.168.1.34   myserver.mydomain.com     myserver
192.168.1.46   myclient.mydomain.com     myclient
…
```

Console Installation

Once the server and agent components are installed and configured, the final installation step is to install the console component. While most users will install a console on the actual server system, this is not required. In fact, the console may be installed on any compatible system that has a network connection to the server.

The BRU Server 2.0 Console does not require special installation steps and can be executed from any location on your system. The only exception is there are a few files that must be installed on a Linux system, therefore, the first time that you execute the Console on Linux, you must execute it as root by either logging in tempoirarily as root, or by using a helper tool such as sudo, gksudo, or kdesu. After that initial run, any logged in user may execute the Console application.

There are two versions of the console available – the graphical console and a character-based console that can be executed over any standard terminal connection to the system on which it's installed.

To start the graphical console, under OS X, double-click the **BRU Server Console** icon.
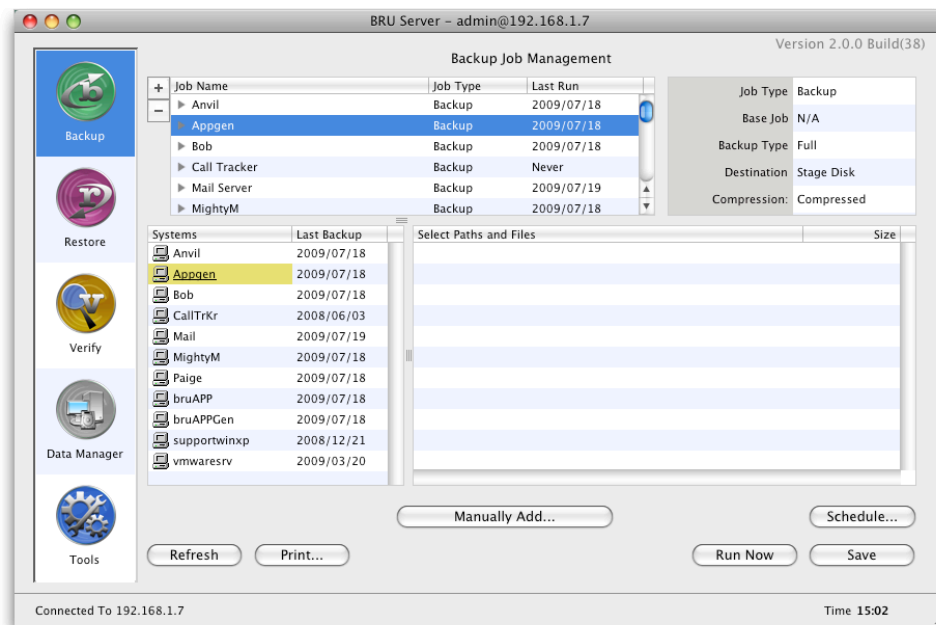
Main Backup Window – GUI Console

The GUI provides a full, mouse driven interface to all BRU Server operations and options.

```
 ● ● ●          root@gw:/home/e-smith/files/primary/html — bru-server.conso — 80x25
Uncached slots [1, 2, 3, 4, 5, 6, 7, 10]
Trying tape in slot 1
Looking for tape in 'ntape1'
Tape is online
Reading header
Found unknown tape 401e7ea16b70:0
Making this tape '777734'
Checking TapeAlert status on ntape1
No TapeAlert messages
label = g4mac
label = (null)
buffer size = 128k bytes
media size = <unknown>
█

  Backup:
Read:           6102 files    300.406 M bytes
Read End Rates:    BRU:            2.870 MB/s  Network:    11.838 MB/s

Write:          4886 files    259.350 M bytes
Write End Rates:   Network:     4.827 MB/s  BRUio:        2.018 MB/s

Verify:            0 files    0 K bytes
-2.3/Mac/OSXResources/app/Resources/English.lproj/Documentation/ide/index.html
 |                                                                          |
```

Main Backup Window – Character Console

The character-based console requires that you type commands, but provides the same capabilities as the GUI console. During installation, the character-based console app is made available from the `/usr/bin` directory. This should place the application – `bru-server.console` – into all default user paths.

In addition to the character based console `bru-server.console`, we also provide a command line tool that simplifies third-party wrapper development called `bru-server.cmd`. Please refer to Chapter 6 for more information on using these tools.

Additional Setup Considerations

Setting the Server's Stage Path

The server Stage path is a volume or folder that disk to disk backups are written. By default, BRU Server uses a path named "stage" within the installed environment - the complete absolute path is /usr/local/bru-server/stage. Once you have completed the installation of the server and configured your other defaults, we recommend that you examine your system configuration and assign a path on a volume that will support your disk to disk backup needs (see Chapter 5 for more information).

Firewall and Routing Considerations

BRU Server uses ports 14441 through 14450. To allow proper communications in an environment where firewalls must be considered, please make sure that these ports are available for bi-directional, TCP and UDP packet traffic.

Executing Tasks Before or After a Job Run

If you have a task that should be performed before or after the BRU Server job is executed, there is a mechanism provided for both agents and the server. Such tasks include stopping and restarting a mail server, exporting a database to a flat file, warning users that a backup is about to occur, and many more. The files may be created using any programming of scripting language supported by your system including shell, python, perl, Applescript, or even compiled C/C++. The only requirement is that the resulting file be executable and return a zero for success or non-zero for any error condition.

On your agents, add executable files named `pre` and `post` to the agent install directory – "`/usr/local/bru-server`" on all OS X and Unix variants, and as `pre.bat` or `pre.cmd`, and `post.bat` or `post.cmd` in "`C:\Program Files\BRU Server Agent Configuration\`" on Windows systems.

Additionally, there is a master pre and post capability on the server system. The file should be placed into the server application directory - "`/usr/local/bru-server/`" - and be named `backup.pre` and `backup.post`. The server sequences will be executed before any client backup operation is begun and after *ALL* client backup operations have completed. The same rules apply for creating the server-specific jobs as for the client system pre and post sequences.

Excluding Specific Files or File Types From Backup

In addition to explicitly specifying excluded paths in the backup job definition, each client system may have a list of parameters that will cause the backup operation to exclude specific files, directories, or file types for any backup. This file is the '`bruxpat`' (BRU eXclusions PATtern) file. It is placed within the actual agent install directory on each client system.

These directories are –

> OS X and Unix variants

> "`/usr/local/bru-server`"

> On Windows Systems

> "`C:\Program Files\TOLIS Group\BRU Server Agent Configuration\`"

There are sample files included within the directories that may be viewed for further details. This is a plain text file that contains a list of patterns to match for exclusion. While the patterns my be defined as either standard shell patterns (**xs**) or regular expressions (**xr**), most users will find the shell patterns easier to work with. A simple exclusion of all MP3, WMA, and AAC files would be:

```
xs  */*.mp3
xs  */*.MP3
xs  */*.wma
xs  */*.WMA
xs  */*.m4a
xs  */*.m4p
```

To accomplish this with a regular expression exclude pattern, you could use:

```
xr  */*.[mM][PpMm4][3aAp]
```

This says in any directory, match any file that has an extension with a first character m or M, a second character P, p, M, m, or 4, and a last character of 3, a, A, or p.

Note: If you receive a message line in your logs that reads:

`bru: [W140] error - unable to read include/exclude pattern file: "/usr/local/bru-server/bruxpat". Archive may contain unexpected files.`

You should create the missing "bruxpat" file on the client system being backed up. The path to where the file is expected to be found is listed in the message. If you are not actively adding files for exclusion, you may simply "touch" the file to eliminate this message.

`sudo touch /usr/local/bru-server/bruxpat`
`sudo chmod 777 /usr/local/bru-server/bruxpat`

Getting Started

A Simple Backup and Restore Tutorial

Note - While the screenshots presented in this guide may be of one particular platform, the operations and layouts are the same for all 3 platforms.

Once you've completed the server and agent setup, the next step is to create a backup job definition, define the data to be included, and set the job schedule.

You may use the graphical interface or either of the command line interfaces to perform these tasks. For this simplified tutorial, we will utilize the BRU Server GUI Console.

Start the GUI Console and you will be greeted with the Login window.

BRU Server Login Dialog

To login to your BRU Server server:

> Enter the BRU Server server system's DNS name or IP address
> Use the TAB key or mouse to move to the BRU User field and enter admin
> Use the TAB key or mouse to move to the Password field and enter the admin user password.

Hit ENTER or click the "Login" button to connect to the BRU Server server and login.

Defining and Performing a Backup

Once the user and password are accepted, the BRU Server Configuration Assistant is displayed. If you wish to continue with the assistant, step through each of the panels and respond as necessary. However, for this tutorial click the "Skip Assistant and Configure Manually" checkbox since this tutorial does not require changes to the installation defaults.

In either case, the main BRU Server console window is displayed next. Please wait while the interface communicates with the server to load information about the server status. This may take a minute, so please be patient. Because BRU Server is a true client-server application, the console is simply a view into the state of the server system and must communicate with the server to update its displayed information from time to time.
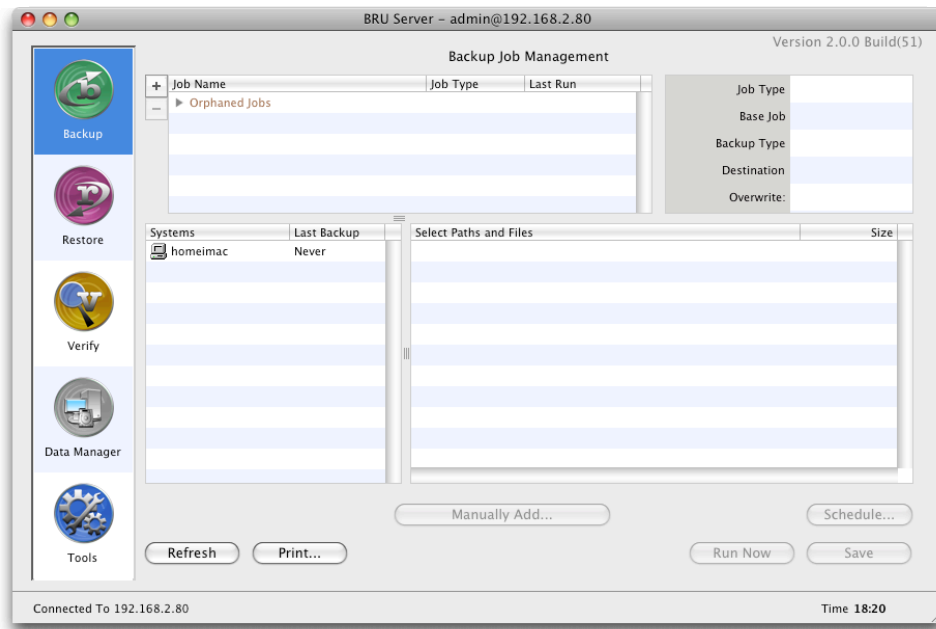
BRU Server Console - Main Window

The first step in creating a backup job is to name the job. Click the "**+**" button next to the Jobs list or select "**New Job**" from the File menu. You will see the New Job Name dialog.

BRU Server Console – New Job Dialog

For the tutorial, we will name the job "QuickStart Demo" and leave the destination set to the "Stage Disk" and Compression should be "Enabled". Click "Ok" or hit the ENTER key to continue.

The next tip dialog informs you of the remaining steps required before you've actually created a job.

BRU Server Console – New Job Tip

If you do not want the console to remind you of these steps each time you create a new job, click the "Do Not Show Again" checkbox.

Click the "Ok" button to continue.

Expand the client system entry for your client by clicking on the disclosure triangle to the left of the system name. To match the steps in this tutorial, you should expand a Mac OS X client system.
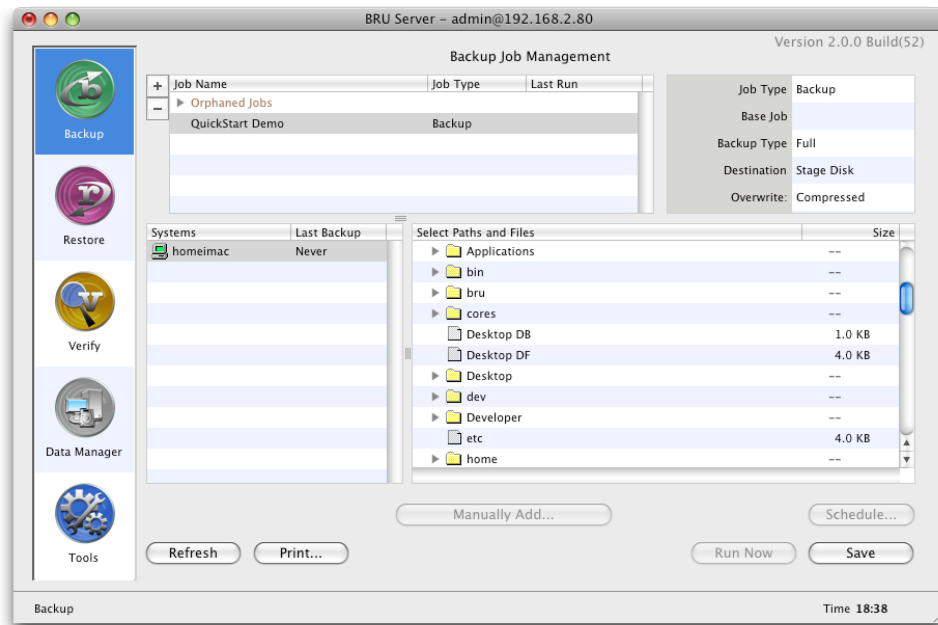
BRU Server Console – Expand the Client System and Root Volume

Next, expand the root volume and scroll down to the "Applications" folder. Expand the "Applications" folder and single click on the entries for "Address Book.app", "Applescript", and a few other applications (we chose around 150MB for this tutorial). Your selection list should look something like the figure below.
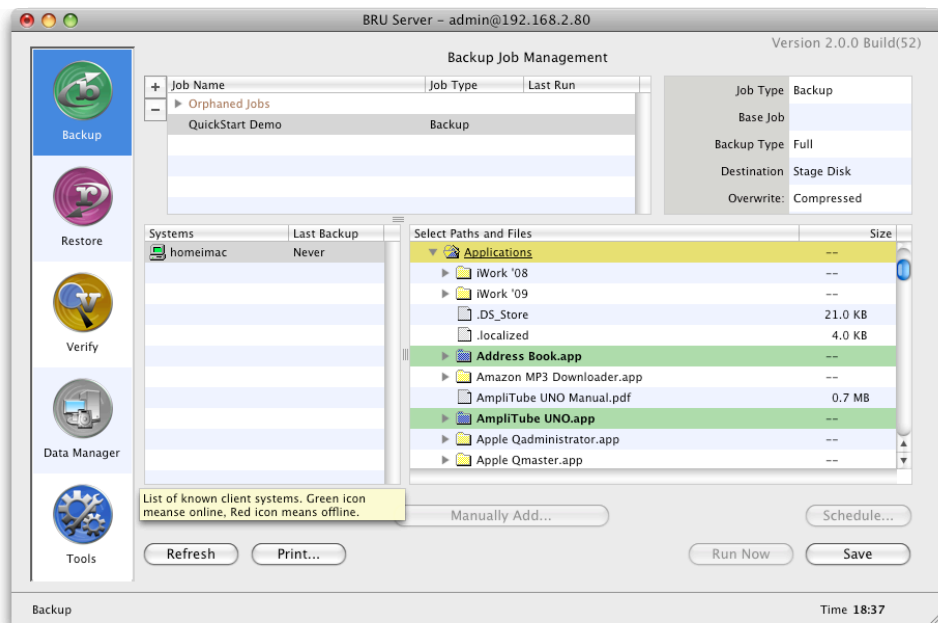
BRU Server Console – Selected Files and Folders

Note: Each color has it's own meaning. The meanings are as follows:

- **GREEN** - When a file is highlighted in green, this means that the file as been selected for backup. If a folder/volume is highlighted in green, then the folder and all of its contents have been selected for backup.
- **YELLOW** - Only folders and volumes are possibly colored yellow. Yellow indicates that a portion of that folder/volume has been selected for backup, but not the complete volume.
- ~~**RED**~~ - When a file/folder/volume has been highlighted in red and struck through, BRU Server in instructed to explicitly exclude the selected item from back up. Use this option to explicitly exclude files from your backup. This setting is handy for when you've selected a top level folder and you need to explicitly exclude one or more items from the folder's contents rather than selecting each of the wanted items in the folder.   It also means that any items added to the top level folder after the backup job is defined will automatically be included without further action or changes to the job definition.
- **NONE** - If the file/folder/volume is not highlighted in any color, then it has not been chosen as part of the backup. Therefore, this file will not be backed up by BRU Server.

Check the Email checkbox and set the appropriate email address in the Email field. The next step is to save these settings. While we could simply run this job now without saving it, we want to save in this case so we may reuse the job later in the tutorial. Click the "Save" button to continue.
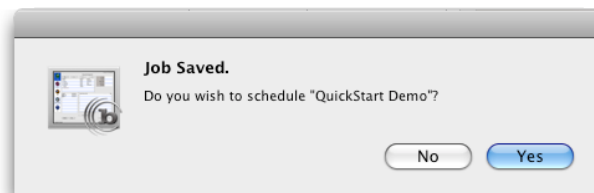
BRU Server Console – Job Was Saved Successfully

Next, we want to schedule the job, so answer Yes or hit the ENTER key to continue.
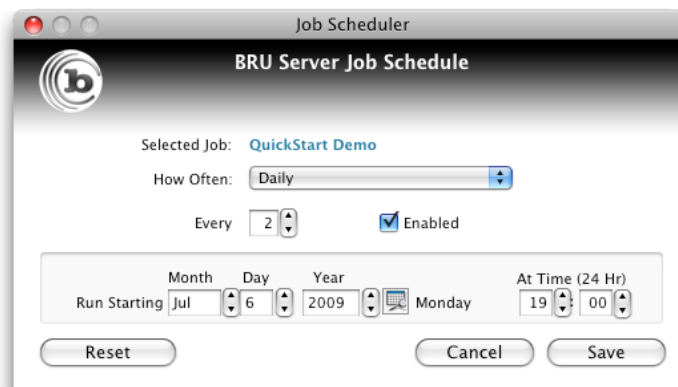
BRU Server Console – Job Schedule Dialog

For our tutorial, select "Daily" from the How Often popup menu and set the "Every" value to "2". This setting means that this job definition is to be run daily, every other day, at the time specified starting on the date specified. The current values assigned to the date and time fields are the current day and time. For now, accept the date and set the time 5 minutes into the future. Click the "Save" button to continue.

To see that the job has been scheduled, click on the "Data Manager" tab and then select "Schedules" from the popup menu.
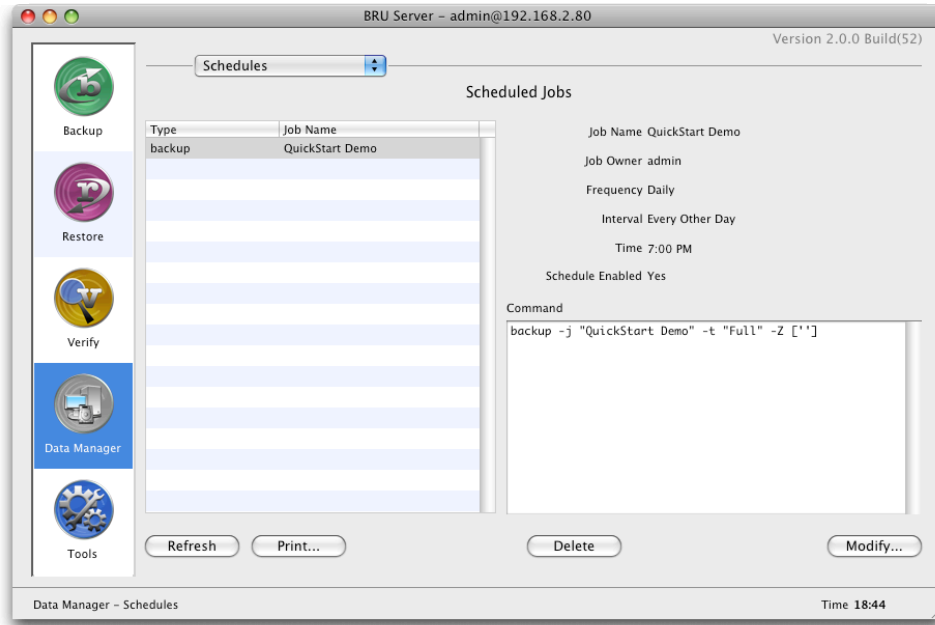
BRU Server Console – Schedule Manager

If you click on the "QuickStart Demo" entry, the Command field will list the actual command that the server daemon will execute to perform the specified job. Wherever possible, the console will disclose the command line that will be executed.

If you wished to remove this job from the scheduler, click the "Delete" button. To Change the schedule, click the "Change" button. For now, leave the job as it is and click the "Tools" tab.

Before the scheduled job has a chance to start, click the "Tools" button in the tab list. The default panel on the Tools tab is the "Job Monitor" panel. This panel displays all active jobs and allows you to monitor them or stop/cancel them.
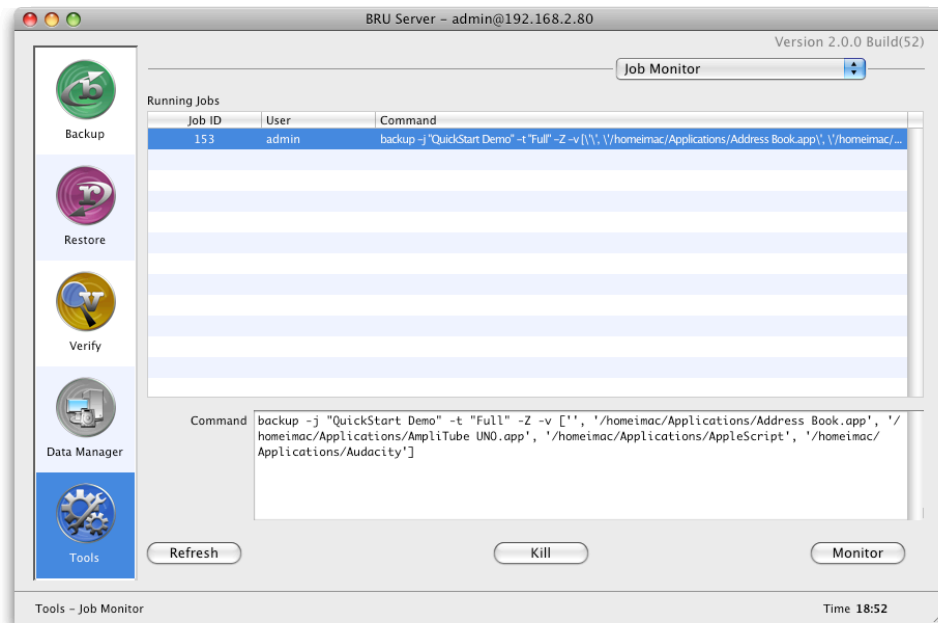
BRU Server Console – Job Monitor Panel

If your scheduled job has not started, wait until the time that you specified and its entry will appear in the upper list box as shown above. Once it appears, click on the entry and then click the "Monitor" button. The Monitor window will open and you will be monitoring the operation of your scheduled backup.
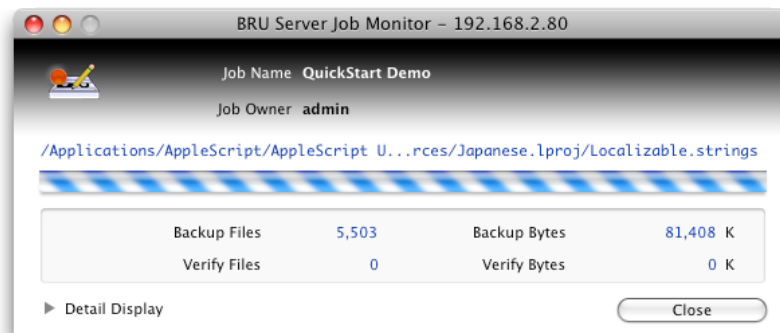
BRU Server Console – Monitor Window (Low Detail Display)

The Monitor window allows you to view the operation, but does not allow you to physically interact with the running job. In fact, you could be monitoring this job for a dozen or more locations within your network and none of the Monitor windows would interfere with the others. The Monitor window displays the current job name, owner, current file being processed, a count of files processed, and the amount of BRU data that has been processed.

If you wish to see more of the behind-the-scenes info, you may check the "Detail Display" check box and the Monitor window will expand to show more information about the job.
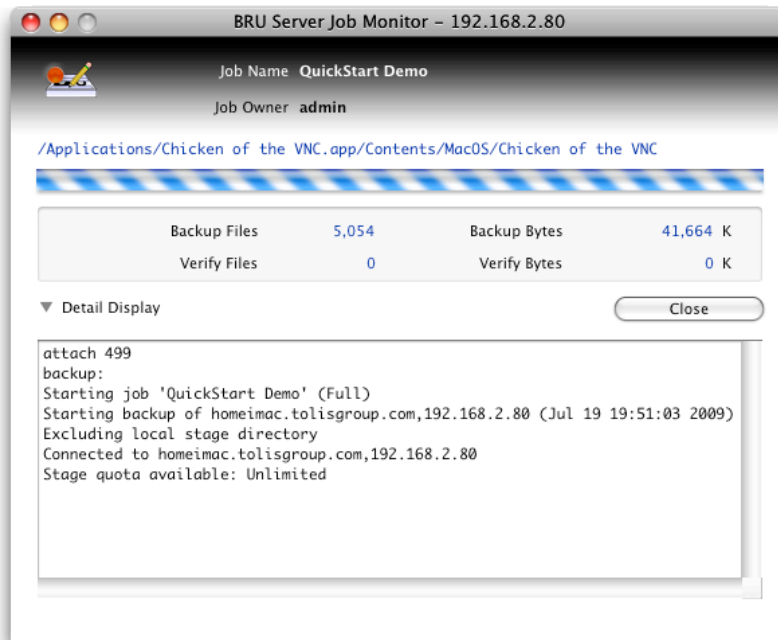
BRU Server Console – Monitor Window (Detailed Display)

The "Detail Display" provides additional information from the server concerning this job. The values displayed in the bottom panel are instantaneous snapshot values and are really only useful for troubleshooting network problems. Do not look at them as representing the actual final throughput of your backup.

If the job has not finished, click the "Close" button and watch the Job Monitor panel in the main window. When the job completes, it will be removed from the list.

Once the backup and verify is completed, you will find information about the job in the History database and the Archives database. In this instance, there will be no entry in the Tapes database since the backup was written to the Stage folder. Also, a summary email will be sent to the address that you entered in the Email field.

To see the history report for this operation, open the Data Manager panel and select the History option from the popup menu.
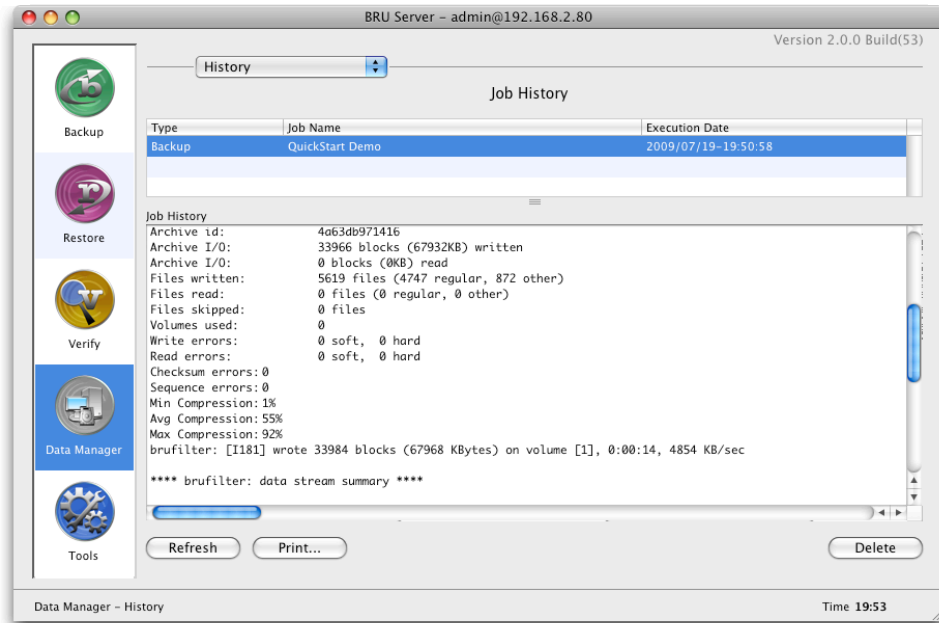
BRU Server Console – Job History Panel

In this case, there is only one entry – the backup and verify that we just ran. By selecting it in the top list, the actual history information will be displayed in the lower list. All pertinent information about each system selected in this job will be listed. At the end of the history report will be a summary for the entire job as shown below.
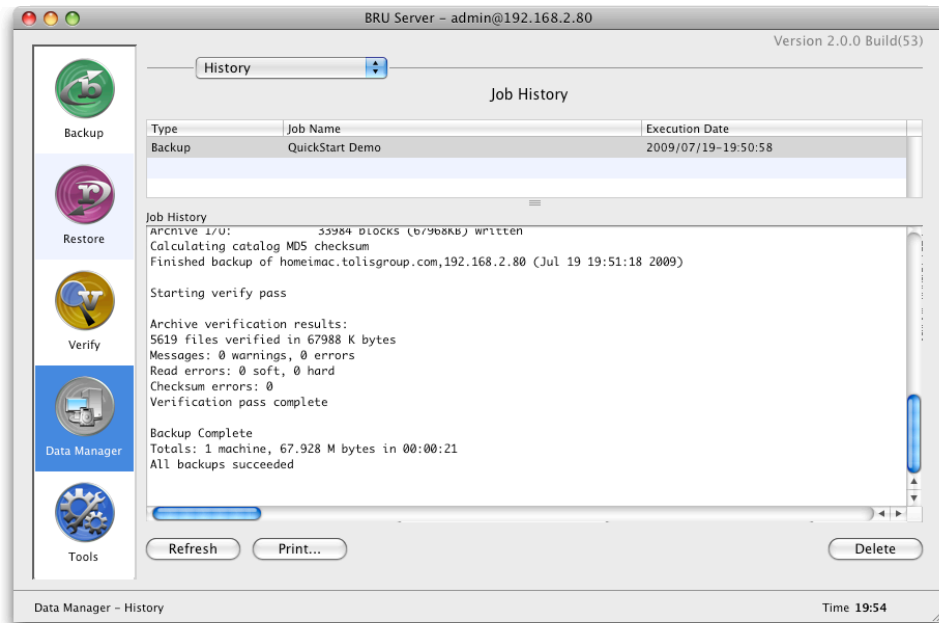
BRU Server Console – Job History Summary

Performing a Restore

The final step in this tutorial is to restore an application. We have chosen to restore the "Address Book" application.

Open a Finder window and go to the Applications folder. Find the "Address Book" and rename it to "Address Book Original" as shown in the next figure.

Finder – Rename "Address Book" to Address Book Original"

Next, select the Restore tab to display the Restore panel. Click the "*Refresh*" button and expand the client system that we just backed up and the expand the archive as shown.
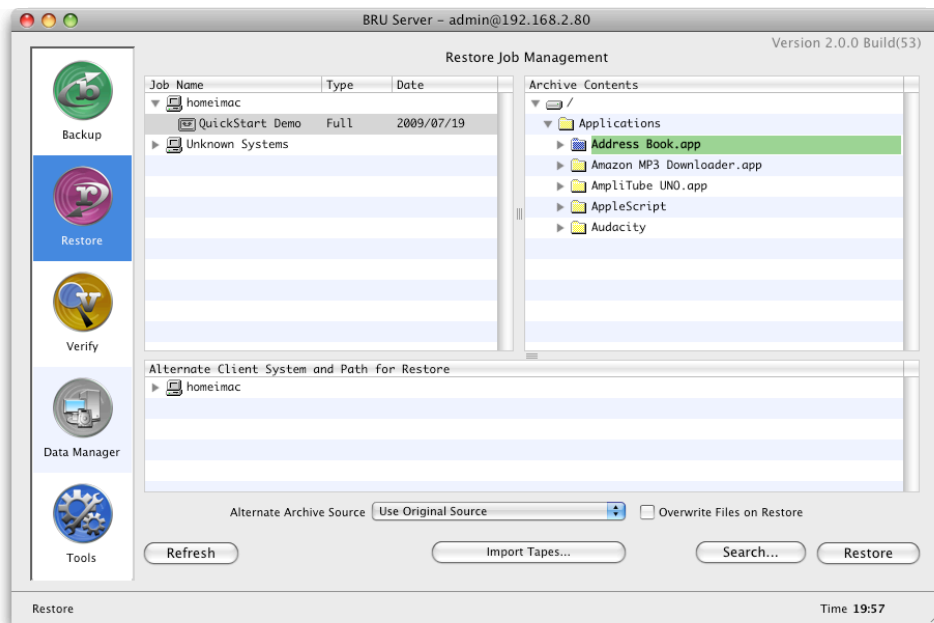
BRU Server Console – Restore Panel

Next, select the "**Address Book.app**" entry

Finally, click the "Restore" button. BRU Server will verify that you wish to restore by displaying a verification dialog. Click the "Yes" button to continue.
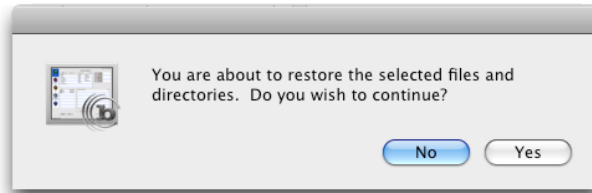
BRU Server Console – Restore Verification

The Monitor window will be displayed and the progress of the restore will be shown. This particular example will not take long.
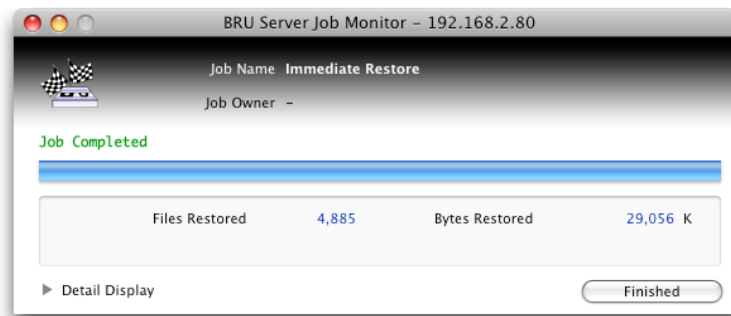
BRU Server Console – Restore Completed

To check the success of the restore, return to the Finder window and you will see your "Address Book Original" along with the restored "Address Book" app.

Finder – Restored "Address Book" application

This concludes the QuickStart tutorial. For more in-depth information on BRU Server management and operation, please refer to the BRU Server Administrators Guide.

2 - Backup Operations
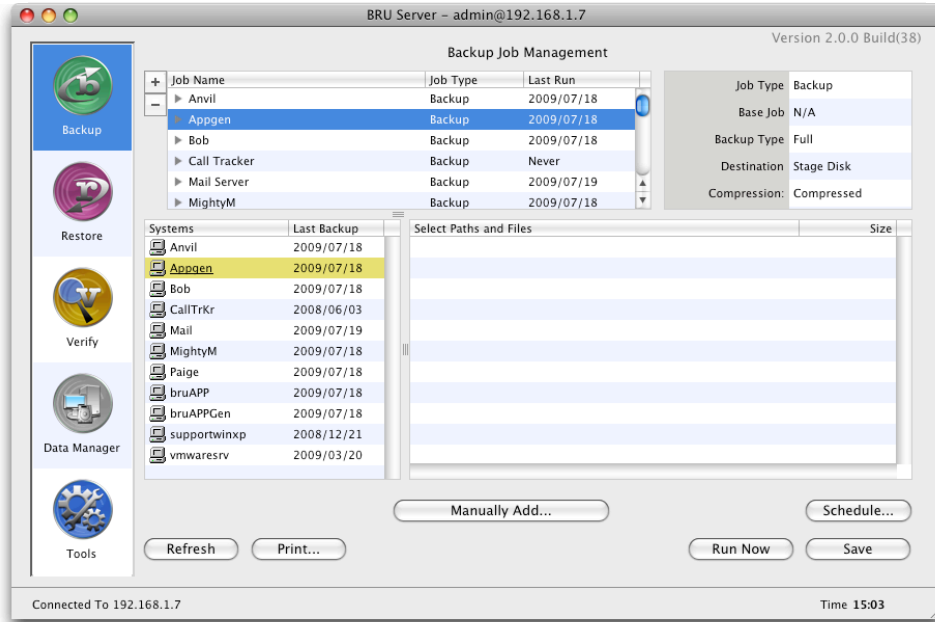
The Main Backup Screen

Interface Elements

New Login Button: Clicking on this button will disconnect your current session and allow you to login to a different BRU Server server system.

Jobs Listbox: The current backup job is selected from this list. To add a new job, click the "New" button, select the "New Job" option in the File menu, or type Command-N (Control-N under Linux). To load a previously saved job, select it from the list. Jobs are displayed in a hierarchical fashion with Full, base jobs displayed at the folder level and dependent Incremental or Differential jobs displayed when the parent Full is expanded
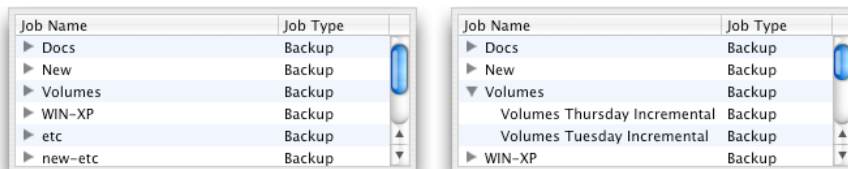
Full and Dependent Incremental or Differential Job Relationship

If you are defining a backup strategy that includes full and incremental or differential backups, create a new full backup definition by selecting the systems that you wish to be included in the backup, set the type to "Full", and save it. Next, select the saved job from the Job listbox, and click the "Duplicate..." button to copy it. Rename the new job to indicate its purpose - for example "Engineering Full" could become "Engineering Inc" - change the type to "Incremental" and set the "Base Job" to the previously saved "Engineering Full" job, and click OK to save the new "Engineering Inc" job. When the "Engineering Inc" job is executed, it's file selection will be based upon the machine and file selection and the date of the last time any job based on the "Engineering Full" job was executed.

When selecting a job, the basic details of the job are displayed in the box to the right of the Jobs listbox. These details include:

> ***Job Type***:   Backup or UpStage
> ***Base Job***:   The name of the job this job is based on or N/A for a Full job
> ***Backup Type***:   Full, Incremental, or Differential (N/A if the job is an UpStage)
> ***Destination***:   Where the archive(s) will be written
> ***Overwrite***:   Default, Overwrite, or Append for Tape-based jobs
> ***Compression***: Compressed or Uncompressed for Staged jobs

New Button: This button starts the process of creating a new job definition and opens the job defaults dialog. If you have a job selected in the Jobs listbox, this button is labeled "Modify..." and clicking it allows you to modify the existing job rather than create a new job.

Delete Button: This button is only enabled if you have a job selected in the Jobs listbox. Pressing Delete will delete the selected job. If you are deleting a Full job, any Incremental or Differential dependent jobs will also be deleted. Any saved schedules will also be deleted.

Duplicate, Modify, Rename options: If you have a job selected in the Jobs listbox, you may duplicate, modify, or rename the selected job by issuing a Control-Click (Right-Click) on the selected job row. Duplication of exiting jobs allows easier creation of incremental or differential jobs based on a previously defined base job. Note that you can't modify a Backup job and turn it into an UpStage job or vice versa.

All backup operations require a name. This name can be any normal text string and should provide a clue about what the particular job is for. For Example, "Daily Engineering Backup" is more explanatory than "Eng1". You must save the job, even if you wish to run it immediately. Once saved, the job can be used as a base job against which future incremental or differential jobs can be run.

Email Entry: Normally, the default administrator will receive email notices from the system when a job is run. This email will contain any interaction notices and the job result report. You may enter any valid email address in this field. A comma followed by one space should be used to separate multiple addresses. This email address is in addition to the BRU Server administration email address set in preferences.

Machines and Directories Listbox: All systems that are currently known by this server will be displayed within this listbox. To see the available systems' contents, click the disclosure triangle if under Mac OS X, or the plus sign under other platforms to expand the selected system's contents.

When making selections within this listbox, the following color coding applies:

- White - Volume, File or Folder Not Selected
- Green - Volume, File or Folder Fully Selected
- Red w/Strikethrough - Volume, File or Folder Explicitly Excluded
- Yellow w/Underline - Volume or Folder Contents Partially Selected (does not apply to files)

Verify Backup Checkbox: This either enables or disables the verify pass for backup jobs. We strongly recommend that you always verify your backups for the highest level of confidence in your archives. Since BRU Server runs the verify pass as an out-of-band service, the verify operation does not interfere with users' ability to access the system or their data.

Eject Tape Afterwards Checkbox: This is for standalone tape drives only and if checked, BRU Server will eject the tape from the tape drive following the backup operation. This only applies to standalone tape drives as we always return tapes to their slots when using a tape library.

Save Button: This saves the current job as defined by your selections and settings when you press the button.

Run Now Button: This button allows you to manually run a backup or UpStage job. It will be disabled unless you have named the current job.

Estimate Button: This will run an estimate pass on the data selection to provide information on how much media will be used when the backup is performed.

Schedule Button: This button opens the Scheduler dialog and allows you to schedule the currently selected backup or UpStage job.

Defining a Backup Job Definition
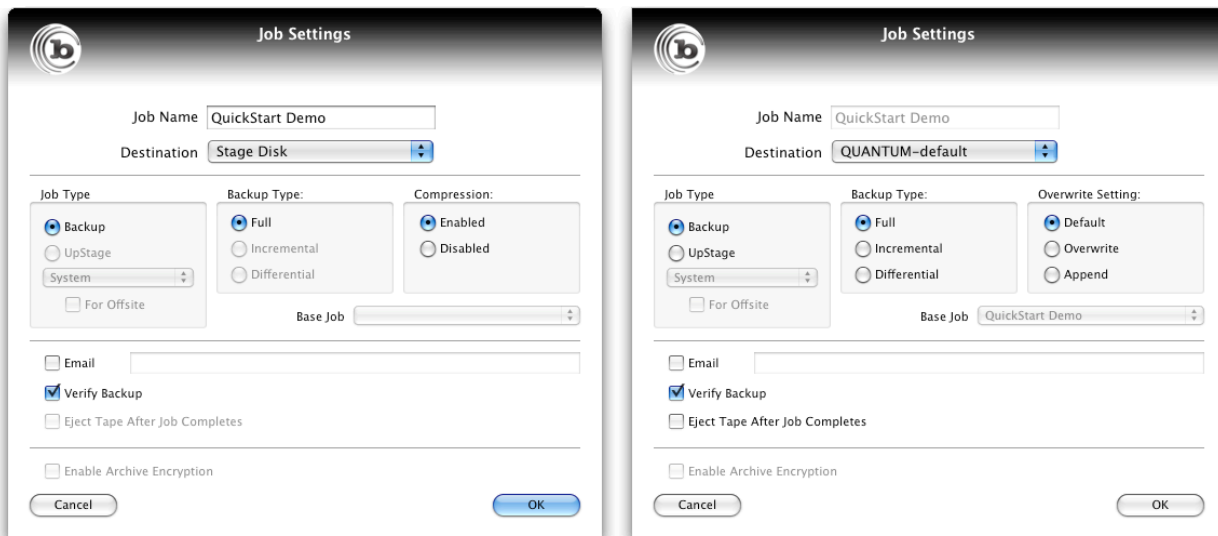
Job Settings Dialog - Stage Destination (Left) and Tape Destination (Right)

When you click on the **New.../Modify...** or **Duplicate...** button, the Job Settings dialog will be displayed. This is where you name the job, set its destination, backup type, job type, compression or overwrite mode, and base job if the job is not a Full job or an UpStage.

Job Name Entry Field: Enter the human readable name for the job. As mentioned previously, this should be a descriptive name for the job.

Destination Popup Menu: This menu is used to select the destination for the current job. Defaults are the disk stage and the default "-default" destination that is created for a drive or library during installation. To define additional destinations, click the Tools tab and select the Device Configuration option. More information about destination planning is presented below in "*Defining Destinations*".

Overwrite Radio Buttons (Tape Destination): This allows you to set the method used when writing to a tape destination. The options are:

> **Default** – use the setting in the Device Configuration for this destination
> **Overwrite** – Overwrite the data on the selected destination
> **Append** – append the current job data to the end of the current data on the selected destination.

Compression Radio Buttons (Disk Stage Destination): If you are writing to the Disk Stage, you may choose to compress the archives written to the Stage path. When writing to Tape, you do not control the compression mode as it is defined by the tape device and is usually enabled by default. The disk compression options are:

> **Enabled** - The archives are written in compressed mode
> **Disabled** - The archives are written without being compressed

Base Job Popup Menu: The Base Job popup menu is only enabled if the **Job Type** is **Backup** and the **Backup Type** is **Incremental** or **Differential**. This menu allows you to select the appropriate Full job to use as the comparison base job for the Incremental or Differential dependent job.

Full and Incremental or Differential jobs do not necessarily need to be assigned to the same destination. For example, you could write your Full backups directly to tape and then write and store your Incremental or Differential backups to the disk Stage. BRU Server knows whether a requested file for restore is on tape or Stage and requires no additional steps for restore of the required data regardless of the location.

BRU Server allows you to create a job definition that has no selection or exclusion entries. This type of Backup job is referred to as a "Complete Client List" backup operation. It is designed to allow administrators of large environments (100's of client systems) to create a full job for all of the client systems without the need to manually select the filesystems on each defined client system. The UI will warn you if you are creating such a backup job definition.

Determining Selected and Excluded Machines, Paths, and Files

The first and most familiar method for determining selected machines and directories is to select the job from the **Jobs** listbox and the view the selection state in the lower **Selected Systems** listbox. However, because a job can contain selections from multiple client systems, easily comparing the selections from one machine to another can become complicated as the depth of the paths increase. on each client. The BRU Server GUI provides an easier and more direct mechanism. To easily determine a saved job's included and excluded data, select the job in the Job Listbox and then either CTRL-Click (or Right-Click if you have a multi-button mouse) and select the "Show Selections" option from the contextual menu presented.
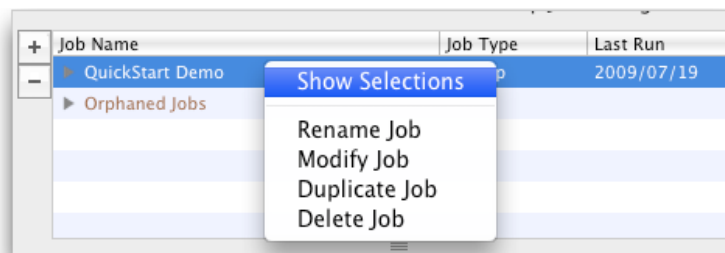
Show Selections Contextual Menu

The **Current Selections** dialog will be displayed. You may then remove entries from the presented selections by clicking the appropriate checkbox and the clicking the "Delete Selected" button (selected in this instance meaning the checked entries in the listboxes). Additionally, you may sort the entries by either Client system (the default) or by the Selected or Excluded file/path by clicking on the header.
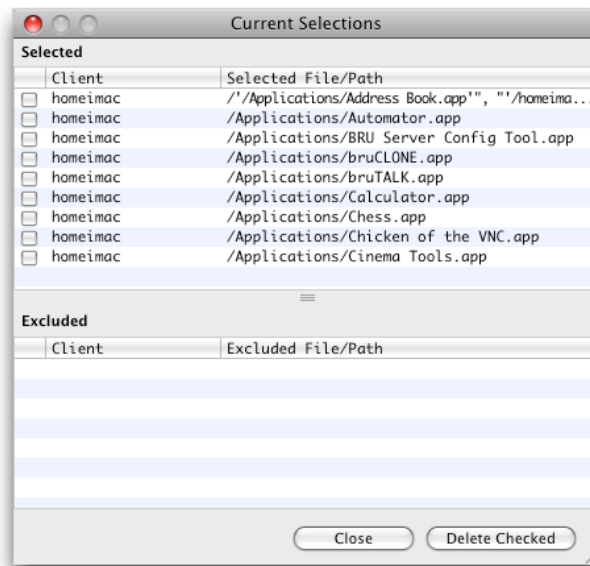
Current Selections Dialog

The actual changes are not saved in the job until you click the Save button on the Backup window. If you wish to make your changes permanent, you must click the Save button. If you decide that you did not wish to save the changes and you haven't clicked the Save button, you may cancel the changes by simply deselecting the current job and then reselecting it. The previous entries will be reloaded and are visible in the Current Selections dialog.

Defining Destinations

Unlike most other backup applications, BRU Server does not use the concept of a single tape. Instead, backups are written to a destination. A destination may consist of zero or more assigned tape slots if you are using a tape library, while a standalone tape drive will only have one destination. While a standalone drive only offers one destination, the tapes used for a multi-tape archive would still be considered a single destination

Destinations are defined on the "Data Manager" panel of the main interface.
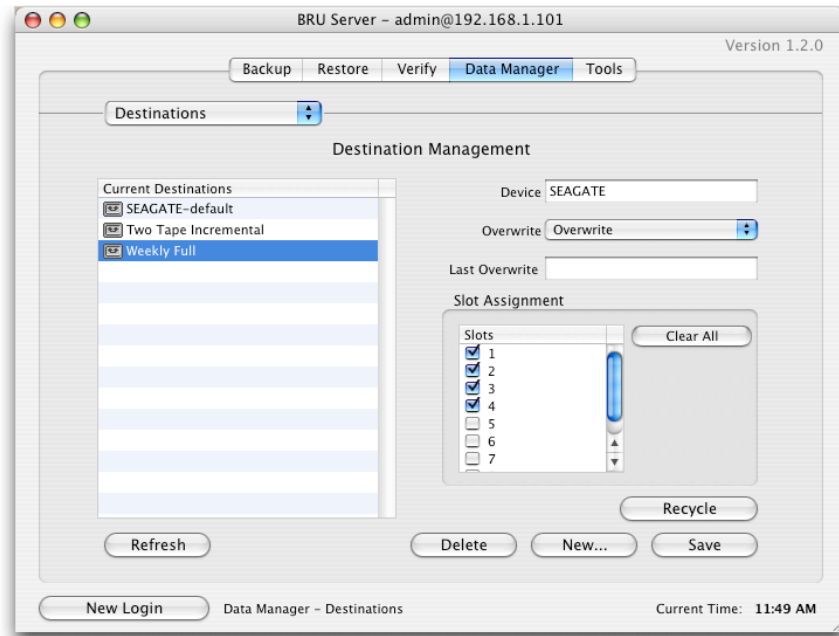
Destinations Manager

For library users, there can be multiple destinations defined. In fact, as a minimum we recommend one destination for each physical tape drive in the library. By defining multiple destinations, you will be able to execute simultaneous job operations – backup, UpStage, or restore – allowing you to reduce wait times for defined jobs.

By Default, a library will have one destination defined when it is initially scanned – "***BRAND*-default**" – where **BRAND** is the manufacturer of the library such as *Exabyte*, *ADIC*, *Sony*, or others. This destination will consist of no assigned slots and all slots will be placed into the "***Free Pool***".

If you only have one tape drive in your library, this default destination may be satisfactory. However, if you have multiple drives available within the library we recommend that you rename this default destination and add an additional destination for each additional tape drive. For example, in an Exabyte 221L with 2 drives, you could create two destinations: **EXABYTE-1** and **EXABYTE-2**. Here we have chosen to keep the brand name as part of the destination name but this is not required. You could have called them **ACCOUNTING** and **ENGINEERING**, or **103-99-3ENG** and **103-99-3ACC**.

It is important to realize that these destinations do not imply that a particular drive within the library will be used and there is no way for you to assign a destination to a specific drive. In a multi-drive library, the BRU Server software will determine which drive should be used based upon the amount of time each drive has currently been in use. This feature is called Autobalancing™ and is designed to lessen the potential of overusing a single drive within your library and thereby increasing the life expectancy of all drives.

Tape Usage and Handling

In addition to BRU Server's Autobalancing™ of the drive selection being automated, BRU Server also handles tape media differently than most backup applications to provide the longest possible life for your media. With most backup applications, when a backup operation is set to overwrite a series of tapes, the backup will automatically reset the first tape for use to the first slot in the assigned tape pool. This can result in some tapes in a pool being used excessively while others may never be used.

BRU Server's tape use algorithm is designed to ensure that tapes within a defined destination are used equally. Therefore, overwrite jobs will always start with the least used tape in a destination. For example, if you have a destination with 8 defined slots and the first backup used tapes 1-4, when you next run an overwrite job to that destination, the backup will start on the tape in slot 5 rather than restart with the tape in slot 1.

This means that when handling the media for removal and rotation, you should always remove ALL tapes assigned to a destination, not just the ones that you think were written to in the last backup operation.

When a job is set to append, please be aware that the append operation only applies to the first tape used if the appended archive uses more than one tape. If you are using a standalone tape device, please be certain that the additional tapes provided can be safely overwritten as no checks will be made to prevent their full use. When using a library, the append method will always start the append from the last used tape in a destination, so the following tapes will not be part of the previous backups sent to that destination. However, to be safe, please be sure that any rotation methods remove and replace ALL tapes in a destination as outlined above.

Additionally, if you have tapes that you wish to protect from future overwriting, you can mark the tape as "Unwritable" in the Tapes panel of the Data Manager tab. Refer to chapter 6 - "Data Manager" for specific information.

How Does BRU Server Track Tapes?

BRU Server tracks tapes by an assigned tape ID. This ID logic uses the following assignment scheme (in order of precedence):

- If the tape has a barcode label, the tape's ID is the barcode ID.
- If the tape doesn't have a barcode, the tape is assigned an internal value starting with 100000 and incrementing by one for each new tape added to the tapes datatable.
- If the tape has a barcode that duplicates a previous barcode (i.e.: you've received a tape from another BRU Server system that has the same barcode as one of your known tapes), BRU Server will the assign the 100000 numbering scheme to this new tape.

There is an exception to the assignment of the 100000 ID values. If a barcoded tape is checked, but the tape never comes online or doesn't become ready within the "Online Timeout" period, BRU Server can only assume that this is a foreign tape and will use the logic applied to a tape with a duplicate barcode. This is because BRU Server always double checks the first archive's ID against the known tape's first archive ID. In the case of the tape not becoming ready in the specified time, BRU Server must assume that this is a blank tape or a tape with a non-BRU archive. To prevent this, please make sure that you assign an appropriate value for the "Online Timeout" setting in the Preference dialog. For up to date values for various tape drive types, please visit the TOLIS Group support knowledge base:

```
http://knowledgebase.tolisgroup.com/
```

Scheduling Jobs

There are three ways to access the job Schedule dialog - answering "Yes" to the scheduling question after saving a job definition, by selecting a previously saved job and clicking the "Schedule" button, or by accessing the Schedules database from the Data Manager panel.
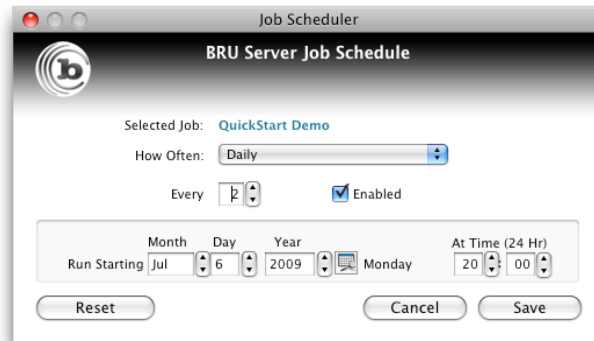
Job Scheduler Dialog

The scheduling interface consists of the following controls:

How Often Popup Menu: Selects one of –
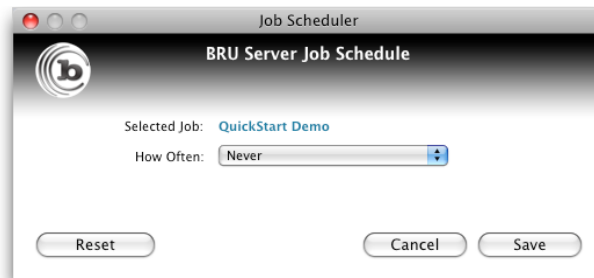
Never – Do not schedule, or cancel previously assigned schedules for the selected Job definition.
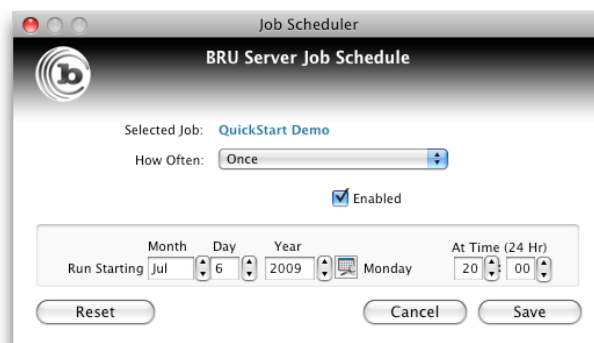
Once – Run the selected Job definition one time on the date and time specified.
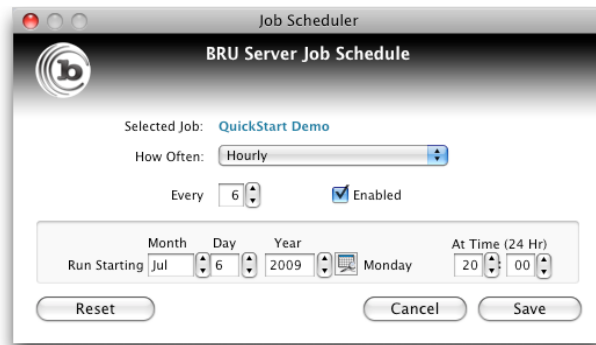
Hourly – Run the selected Job definition hourly starting on the date and time specified. May be modified to skip the number of hours specified in the Skip counter (see below).
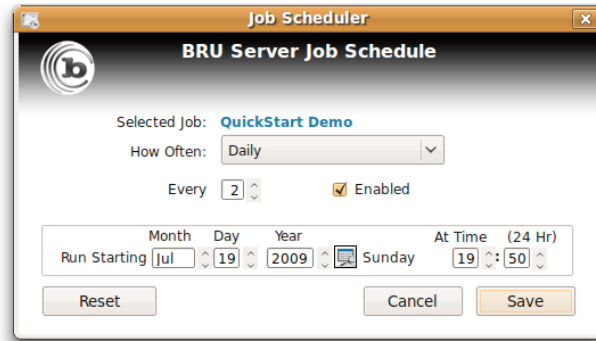
Daily – Run the selected Job definition every day starting on the date and time specified. May be modified to skip the number of days specified in the Skip counter (see below).

Weekly – Run the selected Job definition once a week on the day specified starting on the date selected. May be modified to skip the number of Weeks specified in the Skip counter (see below).
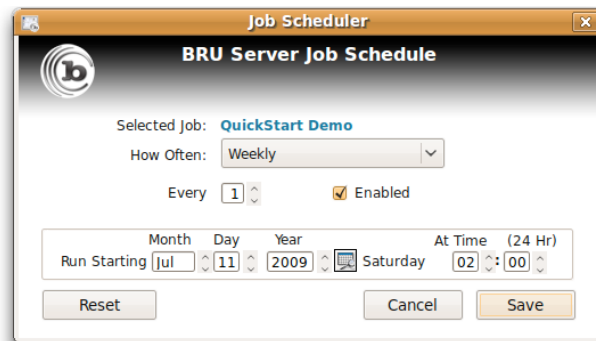
Monthly – Run the selected Job definition on the day(s) of the month and in the weeks(s) of the month specified beginning on the date specified. May be modified to skip the number of Months specified in the Skip counter (see below).
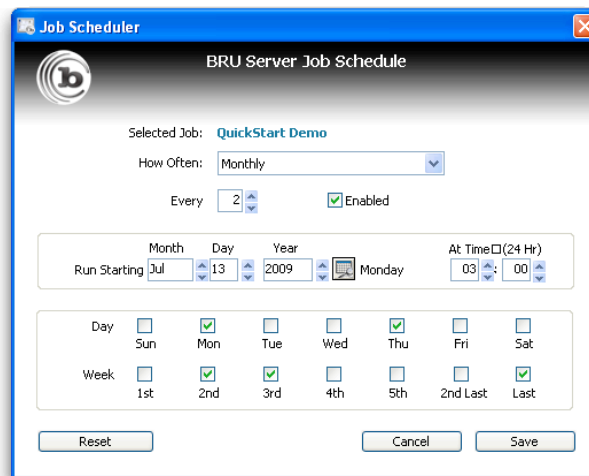
In addition to the obvious "Monthly" use of this setting, the Monthly setting can also be used for creating Weekday or Weekend type schedules. For example, by selecting the *Mon* - *Thu* **Day** check boxes and the *1st* - *5th* **Week** check boxes, you can effectively create a schedule for an incremental or differential backup that runs only on the weekdays and the schedule the full backup to run on the Friday setting.

> For more information on the Monthly Scheduling option, visit our Knowledge Base at http://knowledgebase.tolisgroup.com/?View=entry&EntryID=104.

Every Counter: Used to specify the period to skip between scheduled Job runs. 1 = every, 2 = every other, and so on. If you have selected Daily with a Skip Counter setting of 3, your job will run every third day.

Month, Day, Year, and Time Counters: Used to specify the date and time that the selected Job definition should start running. Change the setting using your mouse and the Up/Down arrows attached to the counter.

Calendar Icon Button : Clicking this button will popup a separate calendar window which provides simplified selection and setting of the schedule start date.

Now Button: The Now button sets the Date and Time counters to the current date and time. It doesn't cause the job to actually be executed as this moment. If you wish to run a job immediately, select the job from the main **Backup** panel and click the "**Run Now**" button.

Save Button: This button saves the current schedule in the Schedules database, assigning it to the selected Job definition.

Cancel Button: Closes the Scheduler dialog without making any changes to the selected Job definition's schedule.

Enabled Checkbox: YOu may disable any scheduled operation without interfering with it's normal schedule or without needing to delete and recreate the schedule by clearing this checkbox. This allows you to easily suspend a scheduled backup for a system that may be offline for maintenance or other reason during its normal scheduled access times. One the system is back online, simply check this checkbox and the schedule will continue as before.

*Schedule Activation Note: If you do not wish to use the "**Run Now**" option on the main* **Backup** *panel, there are two factors that you should keep in mind when scheduling an operation that you want to run while you are watching - You should schedule the job at least 3 minutes into the future, and the time on the server (where the job is controlled) may not be the same as the time on the system where the Console is running. If a job is scheduled to run, but doesn't seem to start when you expect, please verify the time on the server system before assuming that the job has failed to run as scheduled.*

Backup Planning And Considerations

Unlike many backup solution, BRU Server provides the flexibility to define backup operations that meet your system recovery requirements in a manner that works best for your environment. However, because of this flexibility, it is easy to become overwhelmed by the number of options that are available. This section will discuss basic backup concepts and some specific considerations that you may use as guidelines for developing your BRU Server backup strategies.

D2T, D2D, and D2D2T - What's with all of these acronyms?

In its simplest computing-oriented definition, a backup is a copy of data that is made to prevent the loss of the data in the event that the original copy is damaged or deleted. In making copies of the original data it's always best to store the copies remotely from the original data and tape offers a very straight forward and secure manner for doing this.

However, we also understand that as disk capacity has increased with disk prices decreasing, disk becomes an attractive storage mechanism. Plus, with disk's high performance, backup and restore times can be greatly reduced when compared to tape backup operations.

To offer the widest range of data backup operations, BRU Server supports writing archives to both disk and tape. A normal tape operation would be considered a Disk to Tape copy (D2T), while a backup to disk would be considered a Disk to Disk copy (D2D). However, to provide a "best of both worlds" situation, modern backup applications provide the ability to perform D2D for performance and the D2T for the security and archival nature of tape in a hybrid copy operation called Disk to Disk to Tape (D2D2T) in which the middle disk is provided as a halfway point between the original data and the archival tape media. Adding this middle layer allows for client backups that can occur asynchronously instead of sequentially, bringing shorter backup windows into play. The data is then moved from the mid disk layer to the tape media after the backup of the client data is completed.

In BRU Server's language, any backup operation that involves disk is called a Stage operation, whether the disk Stage is the final destination for the backup or the midpoint for a tape based storage mechanism. Once the client data is completely written to the disk Stage, the movement of that data onto tape media is called an UpStage. Because of the manner in which BRU Server manages the data in both locations - on disk or tape, the administration for restoring data is totally transparent to the admin regardless of the data's position on disk Stage or tape.

With BRU Server, D2T, D2D, and D2D2T are all part of your default configuration. There are no additional components to install and there are no additional licensing considerations to use these features. Additionally, BRU Server disk Stage may be assigned to any type of disk media locally available to the BRU Server server system - including RAID, Xsan, or other filesystem type. And, because the mechanisms used to write to disk don't require special virtual tape library software, the only limit to the number of backup streams that may be processed simultaneously is based on your available network bandwidth.

For more information on Disk Stage setup and use, please refer to chapter 5 below.

Important Backup Data Selection Concepts

Differential Rotation Scheme
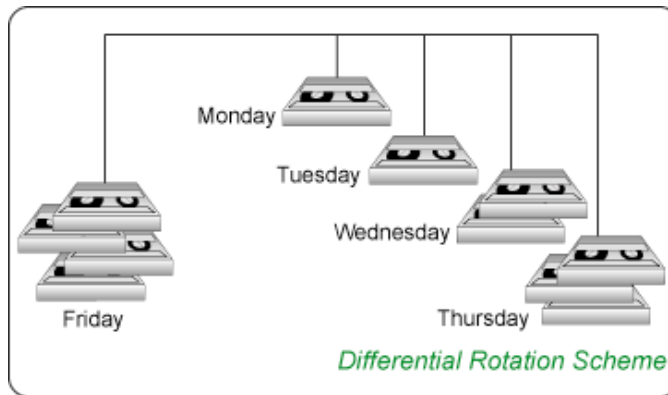
A differential backup is a backup that includes any files that have either a modification or creation date that is newer than the last FULL backup. We stress the word full because the date-stamp of the last FULL backup marker will be used for each differential backup. This means that each differential backup will be slightly larger than the last, so keep this in mind when defining the tape media used for the differential backups.

Incremental Rotation Scheme
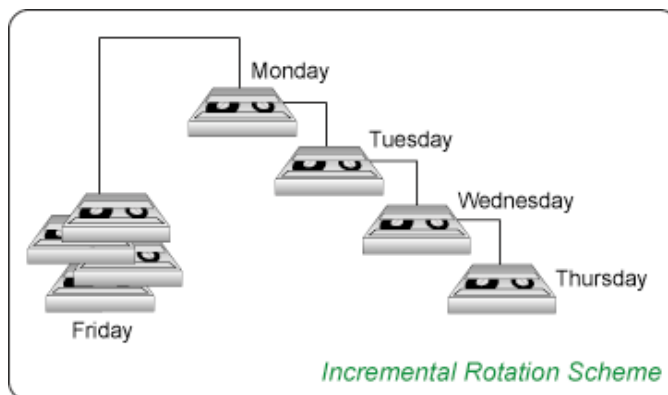
An incremental backup is defined as a backup that includes files with a modification or creation date newer than the date-stamp of the last backup of its type, rather than the last full backup of its type. This means that the contents of a given incremental backup will probably remain relatively consistent from backup to backup.

When deciding on an incremental or differential backup process, examine the amount of work that will be required to recover a given dataset. When using an incremental backup scheme, the restore process will require access to the most recent full backup and all of the incremental backups that have occurred since that full backup. For a differential schedule, the restore will require access to the last full backup and the most recent differential backup.

With that in mind, if you are using a tape library or disk stage for backup, the incremental process will be a very easy to implement strategy since archive maintenance and tracking is relatively automated. However, if you are using a standalone tape device, while the differential strategy may utilize more media, it will simplify the restore process.

Special Client-Side Backup Configuration Options

In addition to the settings on the server, each client system may have specific tasks to run prior to and after the backup process. This functionality is provided vi two commands – PRE and POST – that are placed into the Agent directory on the client system.

These files may be any type of executable file – Python, PERL, Shell, C, C++, TCL – as long as they are executable and return a 0 (zero) for successful completion and non-zero for failure. On Windows systems, these files should use the .bat (PRE.bat) or .cmd (PRE.cmd) extensions to inform the Windows executive that they are executable. From within these batch or command files, you may call any executable file and perform any type of operation that should be performed to either prepare a system for the backup operation (i.e.: disable remote logins, close unnecessary applications, dump the netinfo database, etc.) or to return it to full operation upon the completion of the backup operation.

You may also provide a list of files or file types to exclude from the backup process. To do this, the agent looks for a file called 'bruxpat' located in the agent directory. This is a plain text file that contains a list of patterns to match for exclusion. While the patterns my be defined as either standard shell patterns (xs) or regular expressions (xr), most users will find the shell patterns easier to work with. For example, to exclude any MP3 file and all files in any temp directory found within the paths selected for backup you could use:

```
xs   *.mp3
xs   *.MP3
xs   */temp/*
```

If you are familiar with regular expressions, the two mp3 entries could be combined into a single 'xr' line:

```
xr   *.[Mm][Pp]3
```

Backing Up the Backup Server

Details for providing an easy to recover backup of the BRU Server server environment are provided in Appendix C.

Backup Destination and Job Configuration Examples

Example 1 - Small Office, 500GB, VXA Tape Technology, No Disk Stage

Exabyte VXA-320 Packetloader 1x10
- Single Tape Drive with 10 Tape Slots and barcode reader
- 160GB/tape Native per Tape Capacity (X23 tapes) (1.6TB Total Native Capacity)

Environmental Data Requirements
- 500GB Total Data on 15 Client Systems In Full Backup
- 8GB/day average change for Incremental Backups
- 4 Weeks of Rotation (24 VXA X23 Tapes Total)

Create 3 destinations (Data Manager -> Destinations):
- Weekly Full   Slots 1-4
- Daily Inc   Slots 5-6
- Emergency Access   Slot 10

Place the remaining 3 tapes into the Free Pool (Tools -> Device Configuration):
- Free Pool   Slots 7-9

Create the Backup Definitions and Set the Schedules:

- Create a "***New...***" backup job definition
- Set the ***Destination*** to "**Weekly Full**"
- Set the ***Backup Type*** to **Full**
- Set the ***Job Type*** to **Backup**
- Set the ***Overwrite Setting*** to **Overwrite**
- Click "***OK***"
- Select the clients systems and data
- Click "**Save**"
- Answer "**Yes**" to the ***Schedule*** question

- Set ***How Often*** to **Weekly**
- Set the ***Every*** value to **1**
- ***Run Starting*** day should be a **Friday**
- ***At Time*** should be set for some time after the normal workday ends.

- Select the Full backup definition and click the "***Duplicate...***" button.
- Change the ***Job Name*** to "**Daily Inc 1**"
- Set the ***Destination*** to "**Daily Inc**"
- Change the ***Backup Type*** to **Incremental**
- Change the ***Overwrite Setting*** to **Append**
- Set the ***Base Job*** to the saved Full backup job
- Click "***OK***"
- Repeat this for Incremental jobs 2-4 (Tuesday through Thursday)
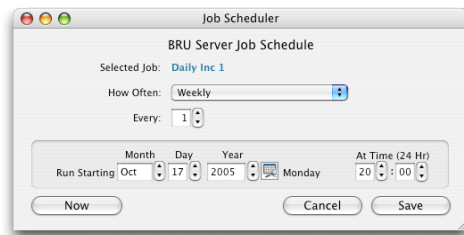
- Set the schedule for each job (1-4)
- Set *How Often* to **Weekly**
- Set the *Every* value to **1**
- *Run Starting* day should be set appropriately
- *At Time* Should be after normal working hours

The results of this setup will be a complete backup of the selected system(s) occurring every Friday and over the weekend as time requires to the tapes in the first four slots of the library overwriting any existing data. Starting on Monday, and running each weekday evening, an incremental backup of the same systems and paths specified in the Full backup job definition will be run with the resulting archive (s) being written in appended mode to the tapes in slots 5 and 6. Because the Incremental data average change rate of 8GB/day is far less than the 160GB native capacity of the VXA X23 tapes, we will write multiple Incremental jobs to the tapes in slots 5 and 6. This means that the Incremental backups for each week will be on the tapes in these 2 slots appended one after the other.

In the event that either the full or incremental jobs require more tape than currently assigned, BRU Server will select an unused tape from the **Free Pool** (slots 7-9) and automatically extend the destination. The job using the tape from the **Free Pool** will include this information in its summary email and job history report so that you may track which tape was added to the destination for rotation purposes.

At the end of each week (Friday Morning in this rotation scheme), the tapes in slots 1-6 are removed and replaced with fresh tapes with the full backups ("**Weekly Full**" - tapes from slots 1-4) sent for offsite storage; the "**Daily Inc**" tapes (slots 5 and 6) can be kept onsite, or sent offsite as well.

After the fourth week of rotation, the first week's tapes are brought back onsite, the "**Daily Inc**" destination is Recycled (See the "**Tools**" -> "**Server Commands**" panel) and the four week rotation starts over.

As an additional safety precaution, an out of sequence full backup (a manual "**Run Now**" of the Full job definition) could be run and saved offsite, allowing the normal full tapes to remain onsite for an extra week. Also, this "master" backup could be used for things like security audits on the client systems by using BRU Server's Verify Comparison mode.

Finally, in the event that a special backup or restore operation was required, you can use the Emergency Access destination defined above so that you don't need to remove and replace the normal rotation media and potentially interfere with your normal backup scheduling.

Example 2 - Small Office, 200GB, Standalone LTO-2, Dlsk Stage

HP LTO-2 StorageWorks Ultrium 448 Tape Drive
- Standalone LTO-2 Tape Drive
- 200GB/tape Native Capacity
- 150GB Assigned Disk Stage

Environmental Data Requirements
- 200GB Total Data on 30 Client Systems in Full Backup
- 5GB/day Average change for Incremental Backups
- Full Backup Every 2 Weeks
- 8 Weeks of Full backups (4 LTO-2 Tapes)
- 2 weeks of Incremental Data Saved on the Disk Stage

No New Destination Definitions Required
    Uses the Default Standalone Destination and the Stage Disk

Open the Preferences and set the default Max Stage Age to 21 days

Create the Backup Definitions and Set the Schedules:

- Create a "*New...*" backup job definition
- Set the *Destination* to "**HP-default**" (This is a tape destination)
- Set the *Backup Type* to **Full**
- Set the *Job Type* to **Backup**
- Set the *Overwrite Setting* to **Overwrite**
- Click "*OK*"
- Select the client systems and data
- Click "*Save*"
- Answer "*Yes*" to the **Schedule** question

- Set *How Often* to **Weekly**
- Set the *Every* value to **2** (every other Friday)
- *Run Starting* day should be a **Friday**
- *At Time* should be set for the end of the business day (so the tape admin can ensure a tape is ready)

- Select the Full backup definition and click the "*Duplicate...*" button
- Change the *Job Name* to "**Daily Inc**"
- Set the *Destination* to "**Stage Disk**"
- Change the *Backup Type* to **Incremental**
- Change the *Compression Setting* to **Enabled**
- Set the *Base Job* to the saved Full backup job
- Click "*OK*"
- Answer "*Yes*" to the **Schedule** question

• Set **How Often** to **Monthly**
• Set the **Every** value to **1**
• **Run Starting** day should be the **Monday** following the Full job's first Friday
• **At Time** should be after normal working hours
• Check the **Day** checkboxes **Mon - Fri**
• Check all **Week** checkboxes

The results of this setup will be a complete backup of the client systems occurring every other Friday to what should be a single LTO-2 tape. Then, every weekday, an incremental backup of the client systems will be written to the server's Disk Stage path. The Staged archives will remain on the Disk Stage for 14 days. Once the Incremental backups reach 22 days old (3 weeks +1 day), they will be automatically aged out of the system and deleted from the Stage. At this point, a fresh full backup of the client systems will have been completed and the previous incremental data should no longer be required. We keep the incremental archive an extra week for that inevitable "Just In Case" situation.

Each Monday, the tape administrator should remove the current LTO-2 tape and store if safely offsite. At the end of four full backups (8 weeks), when the fourth full tape is taken offsite, the first is brought back onsite to start the full rotation again. As each following week's tape is taken offsite, the oldest offsite tape is brought back onsite for the next full backup.

Optional UpStage Operation

Instead of Aging the Incremental backups out and simply deleting them, additional tapes can be added to the rotation and the Incremental Stage backups could be UpStaged to tape for long term retention and offsite storage. This UpStage would be executed once a month after the latest Friday full operation is completed.

Example 3 - Larger consulting office, 2TB total storage, HP StorageWorks 1/8 G2 Tape Autoloader, 7TB iSCSI DIsk Stage

HP StorageWorks 1/8 G2 Tape Autoloader
- 1 Ultrium 1760 LTO-4 tape drives
- 8 tape slots
- 800GB / tape native capacity
- 6.4TB total native tape capacity
- 3TB assigned iSCSI disk stage

Environmental Data Requirements
- 2TB Total Data on 175 Client Systems in Full Backup
- 70GB/day Average change for Incremental Backups
- Full Backup Every 2 Weeks
- 8 Weeks of Full backups (16 LTO-4 Tapes)
- 8 weeks of Incremental Data Saved on the Disk Stage for versioning

Create 2 Destinations of 4 slots each
- Weekly 1 Full
- Weekly 2 Full

Open Preferences and set the default Max Stage Age to 56 days

Create the Backup Definitions and Set the Schedules:

Full backups run every 2 weeks:
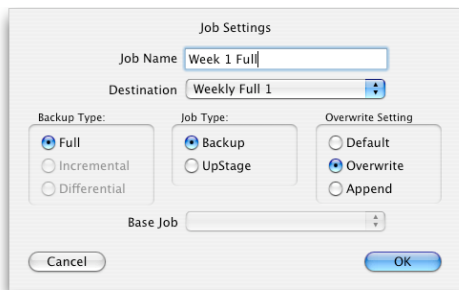
•Create a "*New...*" backup job definition
•Set the *Destination* to "**Weekly Full 1**"
•Set the *Backup Type* to **Full**
•Set the *Job Type* to **Backup**
•Set the *Overwrite Setting* to **Overwrite**
•Click "*OK*"
•Select the client systems and data
•Click "*Save*"
•Answer "*Yes*" to the **Schedule** question
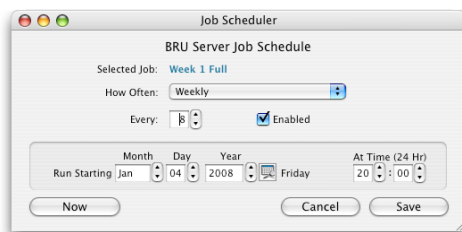
•Set *How Often* to **Weekly**
•Set the *Every* value to **4** (every 4th Friday)
•*Run Starting* day should be a **Friday**
•*At Time* should be set for the end of the business day (so the tape admin can ensure a tape is ready)

Repeat this setup for "Week 2 Full" assuring that the starting date is 2 weeks after the previous. In the above example, the dates would be Jan 4th and 18th.

Incremental backups will run daily on weekdays and weekends except for the weekend of the full backups

• Create a "***New...***" backup job definition
• Change the ***Job Name*** to "**Incremental 1-1**"
• Set the ***Destination*** to "**Stage Disk**"
• Change the ***Backup Type*** to **Incremental**
• Change the ***Compression Setting*** to **Enabled**
• Set the ***Base Job*** to the saved Full backup job
• Click "***OK***"
• Answer "***Yes***" to the **Schedule** question

• Set ***How Often*** to **Daily**
• Set the ***Every*** value to **14** (every 14th day)
• ***Run Starting*** day should be the **Monday** following the base full (**Week 1 Full** in this case)
• ***At Time*** should be set for the end of the business day (so the tape admin can ensure a tape is ready)

Once saved, select expand the "**Week 1 Full**" job and select the "**Incremental 1-1**" job and click "***Duplicate...***". Rename the job to "**Incremental 1-2**" and click "***OK***". Set the scheduled start day to the **Tuesday** and the every value to **14**. Repeat this for Incremental jobs 3-12 (taking the schedule through the Friday of the next Full backup).

Finally, duplicate "**Week 1 Full**", changing its name to "**Week 2 Full**" and changing the schedule start date to 2 weeks after the "**Week 1 Full**" start date (in this case, Jan 18th). Next, duplicate each of the incremental jobs changing their start dates to 14 days after their "**Incremental 1-X**" counterparts.

The result will be a full backup and 12 related incremental backups run every two weeks.

3– Restore Operations
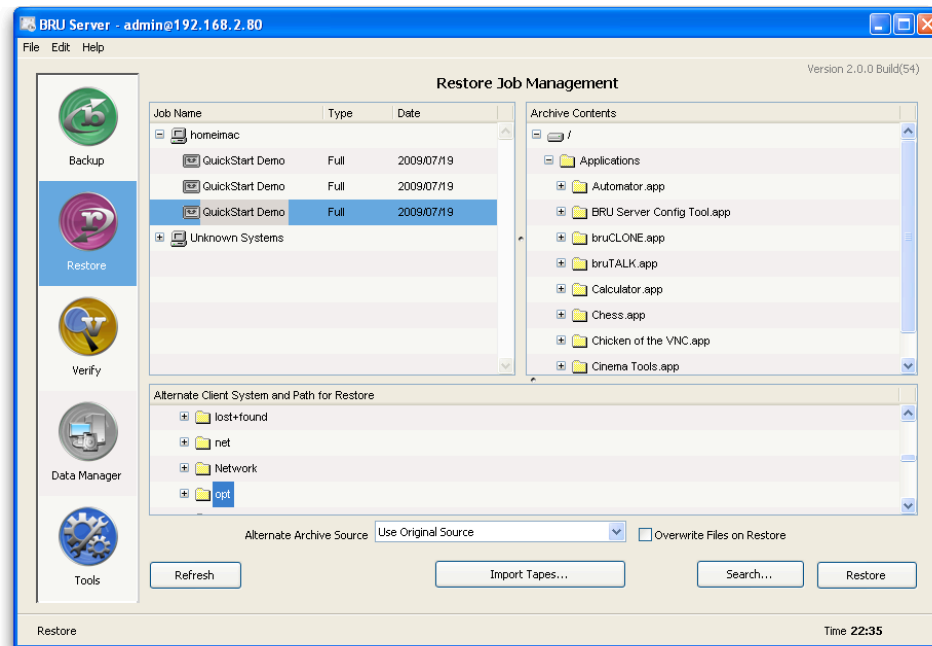
Main Restore Panel

The main Restore panel allows you to select from available backups and restore all or some of the files stored in the backup. By default, a restore operation will return the files to their original system and path, but you can select a different path, or even a different system to restore the selected files.

The elements of the Restore panel are:

Available Archives Listbox: This listbox displays all known clients systems and their associated archives known on the current server. Use the disclosure triangle to expand or collapse the available entries. The archives are displayed by client system and are sorted by backup date. The jobs may be re-sorted by clicking on the headers of the columns displayed.

Archive Contents Listbox: Once a specific archive is selected in the ***Available Archives Listbox***, the contents can be browsed and selected in this listbox.

Alternate Restore Location Listbox: This listbox allows you to select any authorized client system and path if you wish to restore the select archive data to a different location or system.

Alternate Device Popup Menu: This popup menu allows you to select an alternate device – such as a standalone tape drive – from which to read the archive. This can be used to restore from tapes that have been exported from the library without disturbing the library's current load-out.

Overwrite Checkbox: If this is selected, the restore will overwrite any existing files in the location to which the restore is directed. By default, BRU Server will only overwrite a file on disk if the file in the archive is newer than the file on the disk.

Search Button: Clicking the "***Search***" button displays the search dialog and allows you to search the selected archive(s) for files by path or name.
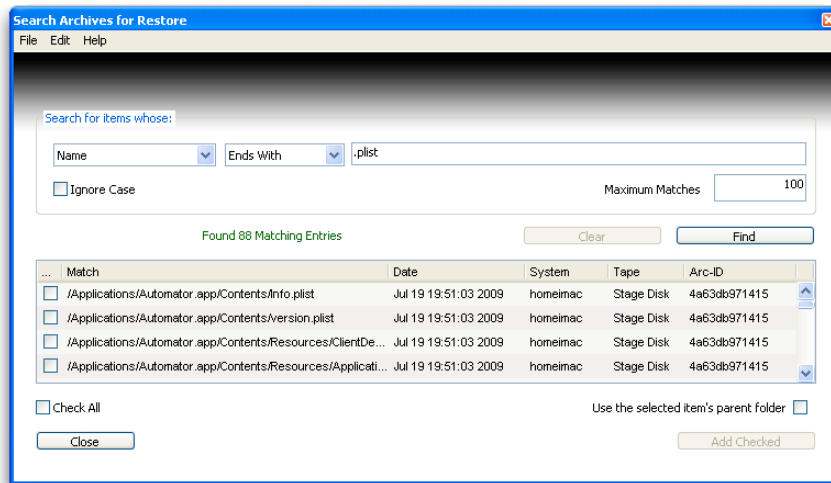
Search Dialog with Selected Files

Fill in the search term, set the "***Ignore Case***" checkbox (searches are case sensitive by default), limit the number of returned matches (100 is the default if not set), and click the "***Find***" button. Check the checkbox of any files that you wish to restore and click "***Add Checked***". These files will be added to the list of items to be restored.

To clear these results and execute a fresh search on the same archive(s), click the "***New Search***" button. Click the "***Close***" button to return to the Restore panel.
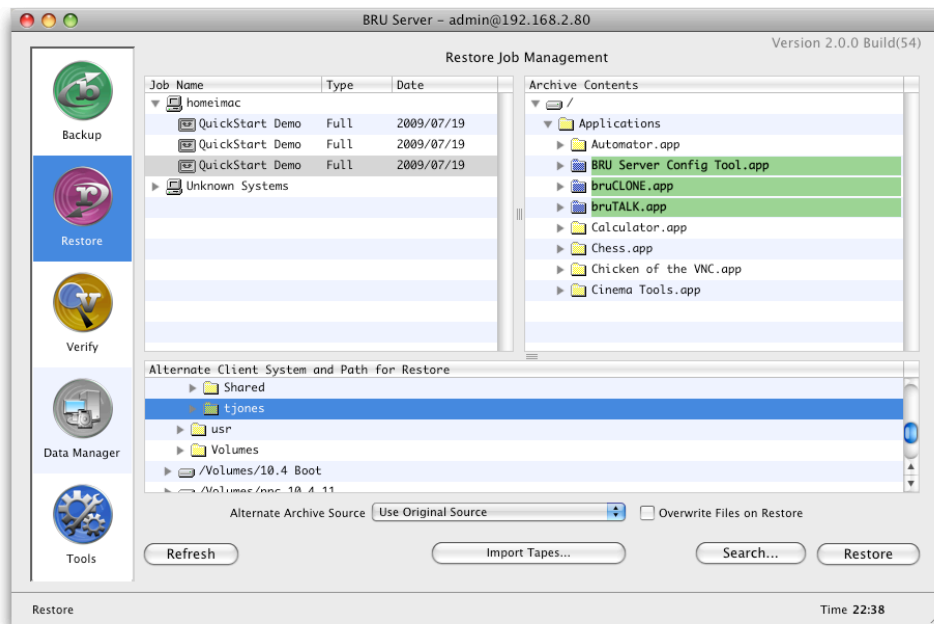
Main Restore Panel With Alternate Location Selected

The figure above shows a restore selection with an alternate restore location selected. When the files are restored, the selected hierarchy will be recreated within the selected destination. As shown, the selected folders will be restored on the Mac system known as "homeimac" under the "/Users/tjones/" hierarchy.
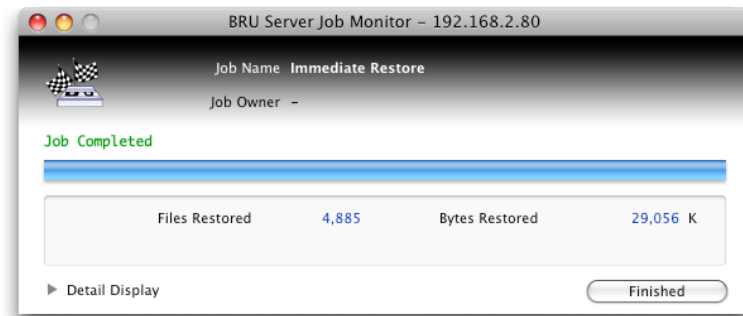
Restore Progress Window

During a restore operation, the Restore Progress will be displayed within the Job Monitor window. As with a backup, you may close the Monitor window without affecting the actual restore operation.

Import Tapes... Button: Clicking the "***Import Tapes...***" button will bring up the Import window and allow you to add tapes that have either been removed from your existing tapes datatable, or import tapes from outside of your working BRU Server environment - such as from another BRU Server system, or a BRU LE or BRU Workstation backup from a different platform.
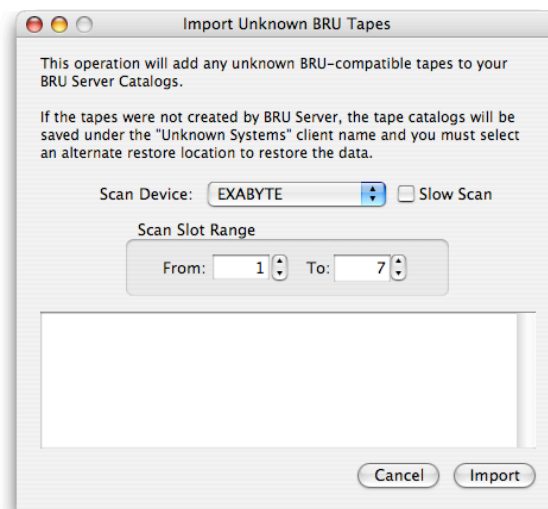
Import Tapes Dialog

When importing tapes from a BRU Server environment, there are three scenarios that should be considered when choosing the slots to scan:

- If the tapes to be imported consist of a single archive that crosses multiple tapes, only select the last tape's slot for scanning. This allows the import pass to read that tape, locating the catalog that is stored at the end of the backup archive. This is the fastest way to import a multi--tape archive.

- If there are multiple archives on a single tape or multiple tapes, select all of the slots. The import scan will match the stored catalogs with the appropriate archives and the scan will be very quick.

- If the tapes are unknown, the import scan will start by trying to locate catalog sets on the tapes. If archives are found, but no matching catalog sets are found, the scan will convert to a slow

scan and the entire archive(s) will be read to generate a new catalog for the archive(s) located on the tapes specified.

4 - Verify Operations
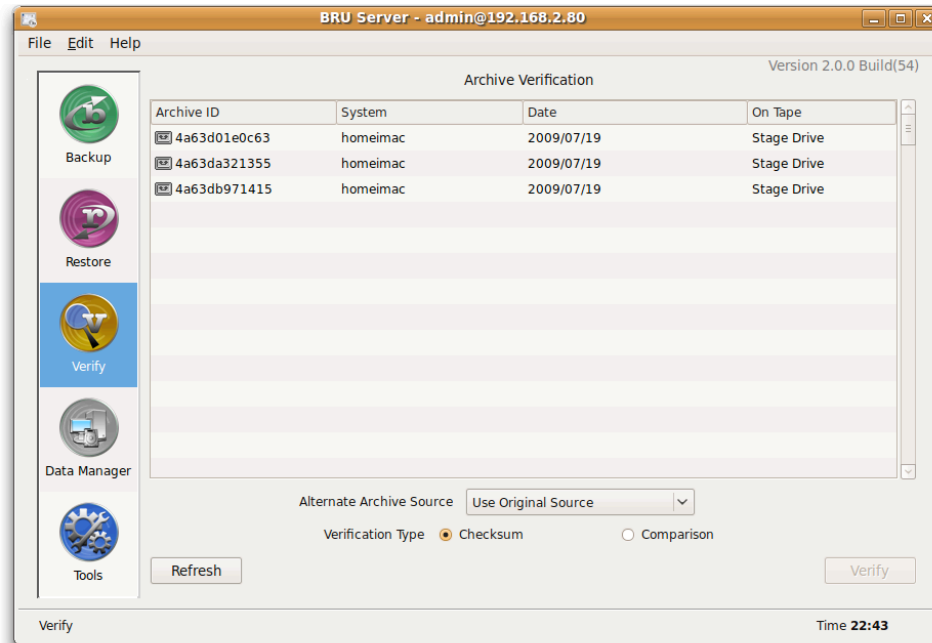
BRU Server Verify Panel

Normally, BRU Server backup operations include a verify pass to ensure the successful completion of the backup of each client system. However, there are times when running a manual verify may be required. BRU Server provides 2 methods for verifying the contents of an archive (on tape or staged)

Checksum (Inspect) Verify

During a backup operation, the BRU format generates a 32 bit checksum for every 2K of data read off of the filesystem being backed up. The checksum is then written into the header for each data block in the archive. This checksum generation changes the way that backups are verified by allowing the verification pass to only involve the system running BRU and the archive (tape or disk) with no dependency on the original filesystem included in the backup. This means that you may verify a BRU archive at any time and place no burden on the network or the client systems. Additionally, the archive can even be verified on a different OS and platform.

When you run an Inspect verify pass (the default), BRU uses the checksums in each BRU data block on the tape to validate that the data matches what was originally read from the client's filesystem. This process is totally out of band and does not involve communicating with the client or its filesystem.

Comparison (Differences) Verify

A Comparison verify will compare the data in the selected archive against the original data on the client syste. Since you can select any valid client system, this verify pass may be executed against the original client system's filesystem, or against a different client system's filesystem. If you choose a different, or alternate, client, the comparison will only be as successful as the two systems' (the original and the alternate) filesystems are similar. This is primarily useful for comparing mirrored systems or validating filesystem states in the event of a potential security breech.

In addition to selecting an alternate system to compare against, you may also choose to perform the verification pass using a different device than the one used for the primary backup. This can be useful in environments where you have a separate standalone tape drive and wish to validate a tape's contents without reloading it into the library.

To verify a tape in an alternate device, select the new device from the "Alternate Device" drop down list. If your device isn't listed, you may add a new device to the BRU Server environment via the "Tools" panel.

5 - Disk Staging

What is Disk Staging?

Disk Staging is a common name for writing archives to a disk location rather than to a tape drive before rewriting the archives to tape. While Staging was originally conceived to allow faster client backup by allowing the clients' archive to be written to disk before being sent to tape (D2D2T) for safe keeping, Staging has come into its own as a legitimate backup mechanism (D2D). BRU Server's Staging involves the use of disk space on the BRU Server server system to store the client archives. Backups assigned to the stage disk can be written asynchronously - in comparison with tape backups, which must run synchronously and sequentially - so the backup of multiple client systems may occur at the same time; the number of simultaneous connections limited only by your available network bandwidth. Also, because BRU Server is a true Unix tool in the backup sense, it does not require an added tape emulation layer as it can write directly to the disk.

However, BRU Server's Disk Staging is NOT simply disk-based backup. Most other backup applications allow you to backup to a file on disk – and this means that you must keep track of the disk file created by the backup - or they use a virtual tape technology that pretends that the disk space assigned is a make-believe tape library. BRU Server's Disk Staging is not simply backing up to a file, but rather a complete mechanism for providing improved client backup scheduling and near-line storage of client data until the Staged data is aged out or an UpStage process moves the staged data off of your Stage disk onto your tape volumes.

*While BRU Server's Stage process does not use a virtual tape library (VTL), the normal BRU Server tape operations are fully compatible with virtual tape devices from companies such as ATTO Technologies, Overland Data, FalconStor, and many others. The main differentiator is that BRU Server does not **REQUIRE** a VTL to allow the use of disk for D2D backup operations.*

Designating the Disk Stage Environment

The **Preferences** panel is accessed by either using the Application's "**Preferences...**" menu or by pressing ⌘**, (command-comma) or CTRL+, (control-comma)** on Linux.

Preferences Panel - Setting the Disk Stage Destination

Enter the POSIX path (forward slash delimited instead of colon delimited) for the actual stage disk location in the "Stage Path" field. This path MUST be located on the server system and should be a locally attached volume for best performance. Keep in mind that the volume on which the selected path exists should provide enough space for the backup tasks that will be assigned. You can limit the stage space by assigning a quota to the admin system user account (see the User Manager in in the next chapter). This quota will be checked before each Stage backup and warnings and errors will be issued if the assigned quota is approached or exceeded. You may also assign a limit to the number of days that backups assigned to the stage are retained. If you are wish to retain the staged backups permanently, be sure to schedule an upstage job to allow for the staged data to be copied into your tape environment.

Backup versus UpStage - What's the difference?

When you utilize the Stage disk as a D2D solution with no use of tape, backing up to the Stage is a single step process and the only thing that will modify the availability of your archive are the Max Stage Age and manual removal of the archives.

However, when you use BRU Server's Stage as part of a D2D2T solution, the archives are first written onto the Stage disk and then an UpStage process is run that rewrites the archives in native format onto the tape(s) and then - and this is an important consideration - deletes the archive(s) from the Stage disk once a proper verification of the tape rewrite is completed successfully. Performing D2D2T operations are designed to provide the asynchronous capabilities of multiple clients to disk while keeping the Stage disk cleaned as the disk archives are moved to tape. A properly operating D2D2T archive plan will never require maintenance of your Stage disk and, short of actually trying to write too much data to the Stage disk between UpStage operations, should never fill your Stage disk.

What happens if BRU Server fills the Stage disk?

There are situations that can occur that can cause BRU Server to actually fill the Stage disk unexpectedly. When this occurs, BRU Server will remove the archive that it was writing to ensure that the disk is not left in a full state. On Unix-based systems, leaving a mounted disk in a 100% full state can prevent it's proper mount or unmount or, even worse, prevent the system from booting if the disk filled was the root volume. We looked at other options, including user intervention to decide whether the archive should be left or older archives should be removed instead, but there was no safe way to ensure the full disk state did not cause a problem far worse than a failed backup.

If you use Staging, be sure to monitor your result emails or the job history on a regular basis to make sure that you've not run into this situation. If this has happened during your backup, the history file will contain a message that looks like the following:

```
Error writing to stage file: [Errno 28] No space left on device
brufilter: [I109] attention - assuming end of volume 1 (unknown size)
```

In this case, the backup has failed and you should examine your backup jobs and Max Stage Age to determine the cause.

Relocating an Existing Stage Environment

While it is always best to define your Stage path on a volume large enough to handle your archive storage requirements, it may become necessary to relocate your Stage directory. To relocate your Stage directory and its contents, follow these steps:

    Stop the server daemon
    Decide on the new Stage location
    Copy the entire directory structure from your current Stage directory to the new volume

From either the GUI or the Command line BRU Server Console, reassign your Stage Directory

From the GUI
- ⌘**, (command-comma) or CTRL+, (control-comma)** on Linux.
- Change the "Stage Directory" parameter to the new path
- Save

From the Command Line (see Chapter 7 for detailed explanations)
- Start either `bru-server.console` or `bru-server.cmd` and login
- Enter `set -m parm stage_directory /new/stage/path` at the "**BRU Server >**" prompt

Restart the server as described in Chapter 1.

Using Removable or External Disks With Disk Staging

While BRU Server's staging feature is designed to provide a non-sequential backup capability for larger environments that then moves those disk based archives to tape, for many smaller shops, the use of a disk-based operation and interchangeable external Firewire disks may provide an easy to manage backup procedure that is cost effective and still provides the ability for off-site storage of the backup archives.

When you mount a Firewire (or USB) drive, a mountpoint is created under the /Volumes directory on your system. While there is an alias to the mounted volume on your desktop, the actual mountpoint for the device is under /Volumes for use as a stage directory for BRU Server. Therefore, if your external volume is named "FireWire 1", the actual POSIX path on the system required by BRU Server will be "/ Volumes/FireWire 1/". To keep the BRU Server stage archive files in a neat and orderly fashion, we recommend the use of a subdirectory such as "backups" or "stage" to provide an easy to recognize path when viewed under the Finder.

The main consideration when using interchangeable media is the naming of the actual volumes. If all of the disk volumes are given the same name in the Finder when you initialize them, you may leave the stage path setting alone between disk changes. However, if your disks have different volume names, you must modify the settings for the stage volume to take into account the new volume name when you exchange disks.

Retain Staged Archives After UpStage
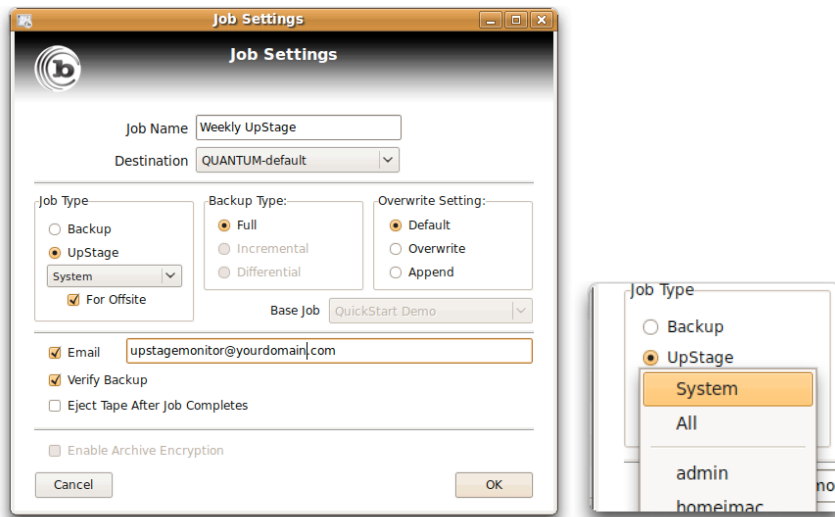
Extended UpStage Operation Options

New in BRU Server 2.0 is the option to leave the archives on the stage disk after they have been copied onto tape. This mode is called "UpStage for Offsite" and it is designed to allow you to keep offsite tapes while retaining a local copy of the same data onsite. To use this option, check the "" checkbox on the job definition panel.

Additionally, you may select to upstage just the system (admin) jobs, a specific user's jobs, or the entire stage volume contents (the default in BRU Server 2.0.0).

6 – Data Manager and Tools

In addition to the normal Backup, Restore, and Verify operations, there are two additional tab panels – Database Maintenance and Tools. These panels are used for maintaining and administering the BRU Server environment.

On all panels where printing is supported, the Print button will either print the selected record, or all records if no specific record is selected. All standard printing features are supported, including printing to PDF.

Data Manager - Users
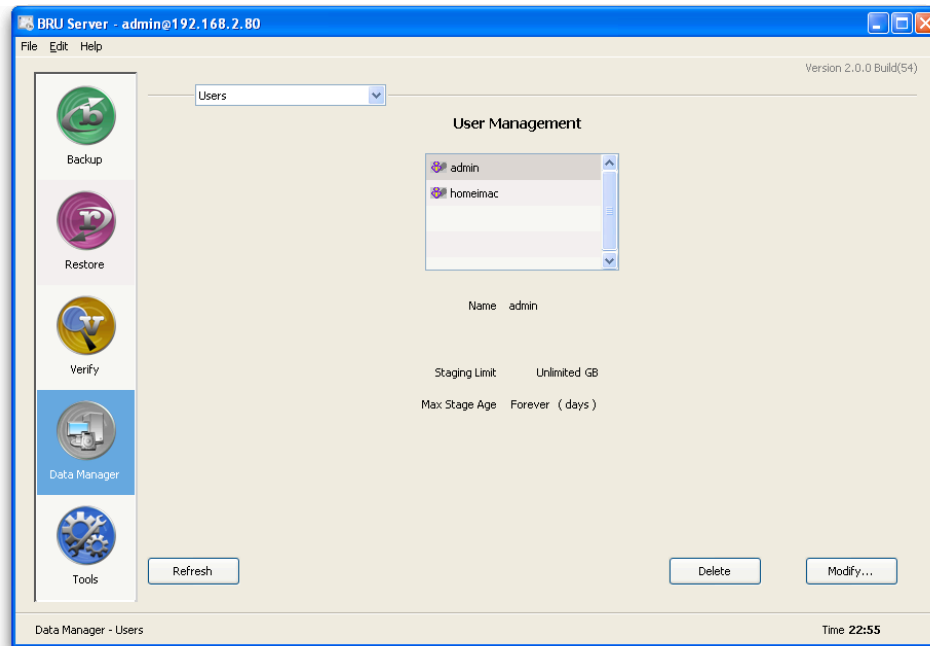
User Management

To manage, add, or remove authorized users, select *Users* from the *Data Manager* popup menu. You may select an existing user with the listbox, or create a new user by clicking the "*New...*" button typing the new user's name into the text portion of the *User* listbox. When a user is selected, you may change the parameters by clicking on the "*Modify...*" button and save the changes or delete the account by clicking the "*Delete*" button. Note that the **admin** user cannot be deleted.

The user name provided does not need to match a user's system login name as the name assigned is specific to BRU Server and has no tie to the system user accounts.

Setting a value besides '-1' for the Stage Quota will limit this user to that amount of disk space (in gigabytes) on your defined stage volume. Setting the Max stage file age to something greater than zero will result in any staged archives being removed when they exceed that number of days in age.

Data Manager - Clients

All systems backed up by BRU Server are considered client machines, including the server itself. This means that the Agent component must be installed on the physical machine.
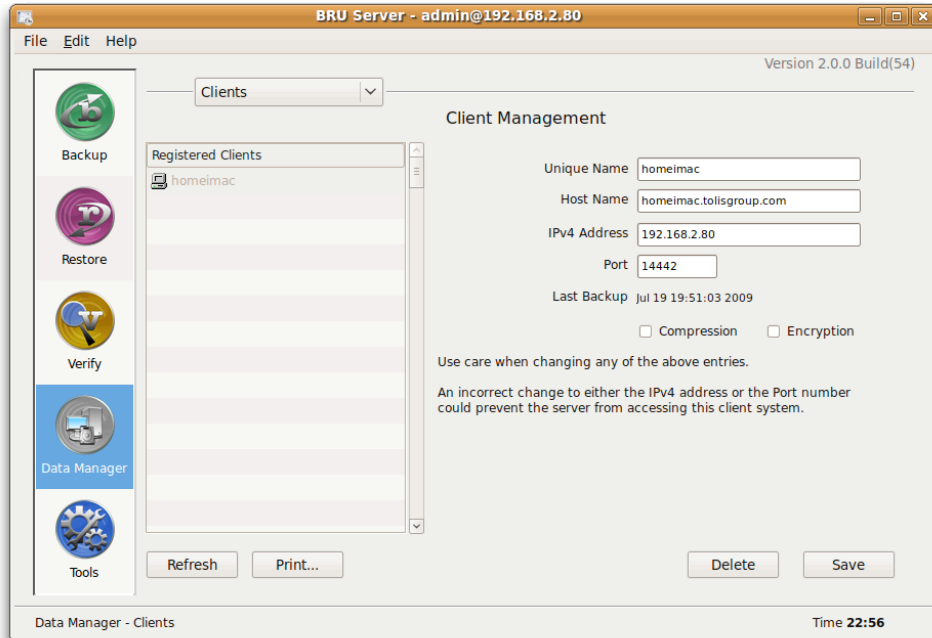
Client Machine Manager

While the ***Host Name***, ***IPv4 Address***, ***Port***, and ***Last Backup*** fields may be manually modified, doing so may make a client system unavailable for backup operations.

The ***Displayed Name*** field may be safely modified, but keep in mind that name this is the name by which jobs are assigned to the client. In the above example, the machine now listed as "**Support 2**" was originally called "**pc-00095**". "**Support 2**" is a much more easily remembered client name. Please keep in mind that if you change the ***Displayed Name*** after the client has been assigned to a backup job, the system will no longer be included in that job until the job is modified as the old displayed name is what is saved within the saved job definition.

If you have a fast system and wish to compress the data being transmitted between the client and the server or if you are in an environment where data transmission security is a requirement encrypt (256bit AES) the data stream between the client and the server, check the appropriate checkbox and save the changes for the client system. Note that both compression and encryption will ƒdramatically increase BRU's loading of the client system, so we only recommend these options for systems that are backed up in non-work timeframes or for systems that are not regularly used directly by users (mail servers, DNS servers, etc.). Also, neither setting applies to the archive written to your backup media - compression for Staged backups is part of the Stage backup job definition and compression for tape drives is controlled by the drive and is automatically enabled by the device.

If you have two ethernet cards on one system and would like BRU Server to use a specific one, visit our Knowledge Base at http://knowledgebase.tolisgroup.com/?View=entry&EntryID=26.

Data Manager - Tapes

The Tape Database Manager allows you to get statistics for tapes that have been used and are currently known to the BRU Server system. BRU Server uses a numbering scheme to internally identify tapes. Looking up a given tape will provide you with a given tape's barcode (if so equipped), the primary archive on the tape, how many times it has been used, which library and slot or drive (if standalone) it was last accessed from, the dates of the first and last use, whether the tape is full, and how much data has been written during its lifetime.
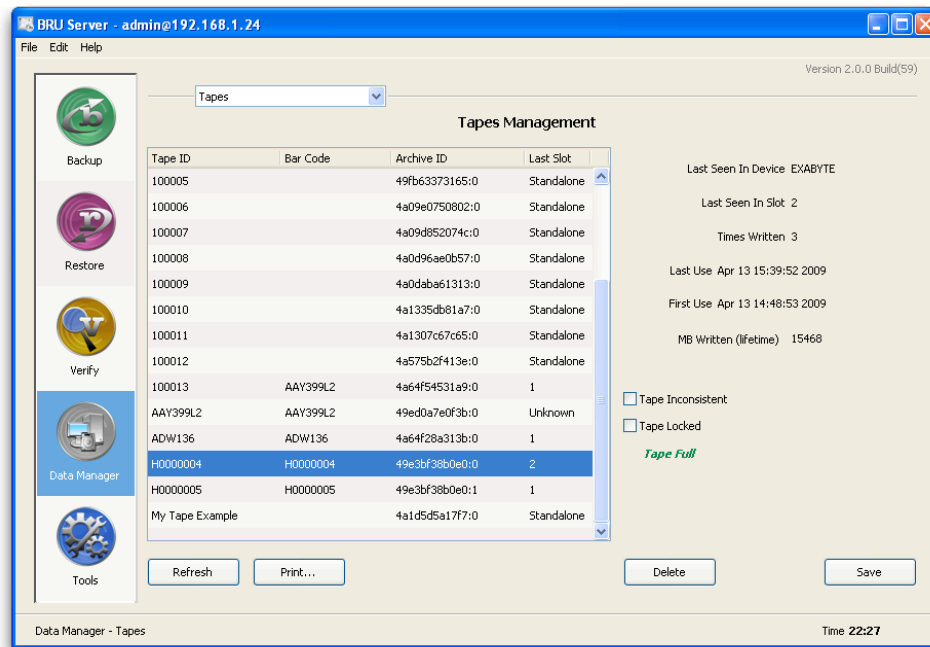
Tape Database Manager

In addition, indicators inform you if the contents are inconsistent – usually meaning that a backup operation failed because of some unexpected error, and if the tape is unwritable. This last condition could be related to the tape being write protected or because the tape had an unrecoverable error during the last write attempt.

While it is possible to modify or manually set any of the values shown, we recommend that you do not make manual modifications as changes could interfere with the usefulness of the selected tape in future backup operations.

If you wish to force a tape to be overwritten regardless of its status, you may select it and delete it from the database using the Delete button. In this event, the tape will be seen as an unknown tape and any future writes to this tape will overwrite the contents. To access the data on the tape after it's been deleted from the database, you should use the Import feature discussed below in the Tools section.

Data Manager - Archives
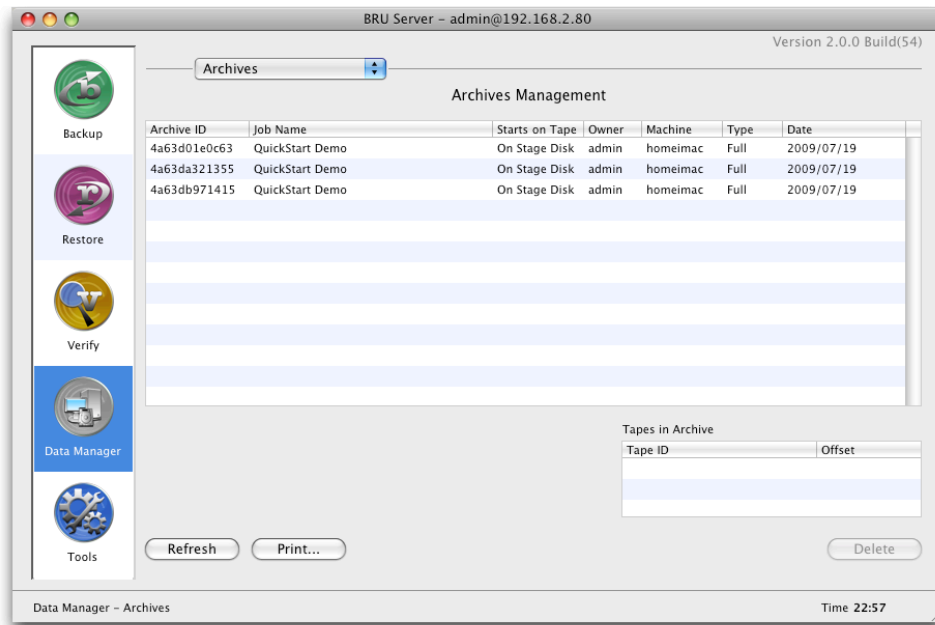
Archive Database Manager

The Archive Database Manager allows you to access the details for all known archives on a given BRU Server server system. To view an archive's details, select the archive from the listbox. The information presented will include the client machine the archive includes (each system is saved as a separate archive), the tape or tapes used, the Job Name, type, and owner (none of these fields is editable). If you delete an archive entry here, you must re-import the tape that includes the data in order to use the system's automated restore features. As with *ALL* BRU products, any tape may be restored via the command line – even if the catalog is not available.

Data Manager – Job History
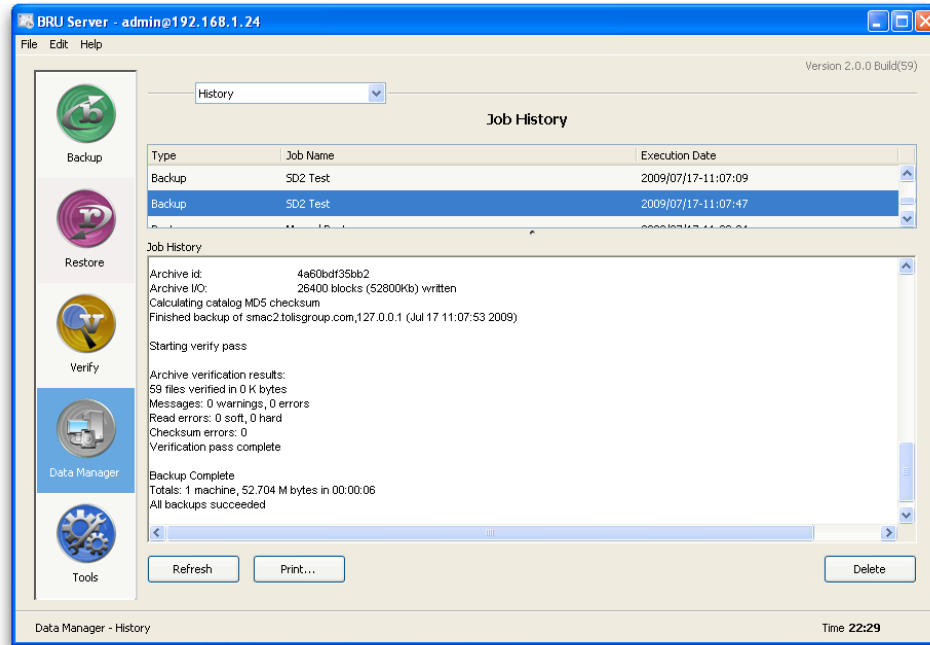
Job History

The Job History panel allows you to retrieve information about all jobs that have been executed on this BRU Server system. The available entries are selected via the upper Job Listbox. The entries may be sorted according to Job Name, Execution Date, or Type by clicking the listbox header for the appropriate column.

Data Manager - Destinations
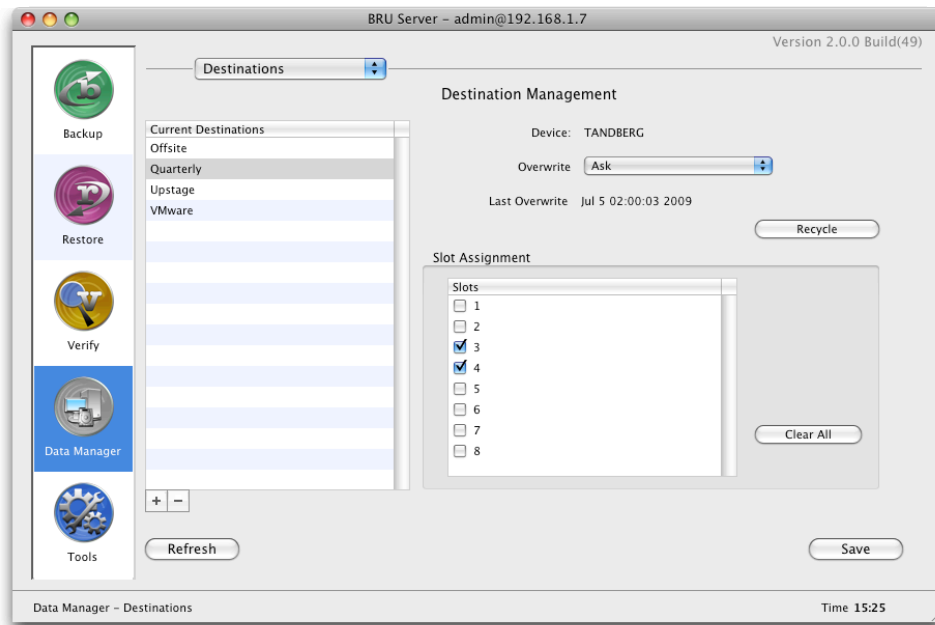
Destination Manager

As mentioned previously, BRU Server does not manage backup jobs by tapes or slots but by destinations. A destination is either the disk Stage, a single tape (in the case of a standalone drive), or a selection of slots within a library.

By default, BRU Server creates an entry named for your recognized library manufacturer – Sony in the example above – with '-all' appended to indicate the given library with all slots. The default destination includes all of the available slots in the library at the time of the BRU Server installation. The only exception is in libraries with barcode support that include a cleaning cartridge when the original scan is performed. In that event, the slot containing a cleaning cartridge will be excluded from the '-all' destination that is created. To manually exclude a cleaning cartridge slot in libraries that do not include a barcode reader, or where your cleaning cartridge is not labeled as such, see the "Tools" section of this chapter on "Device Configuration."

The Destination Manager is where you define subsets of tapes within a library for a specific backup operation. From the Destinations panel, you may create a new destination, modify an existing destination, Delete a destination, or recycle a destination for overwrite on its next use.

To create a new destination, Click the **+** button at the bottom of the Destinations listbox. Enter the name in the entry field and select the destination device on the New Destination Dialog. Click **OK** and select the overwrite setting and then click the appropriate slot checkboxes. To modify an existing destination, select from the available entries, change the settings displayed and click the Save button.

New Destination Dialog

Destinations may be configured consisting of one or more slots. The slots need not be contiguous, however for ease of removal and media management, we recommend that they are. If a destination is defined, but slots are unassigned, the unassigned slots can be allocated to a free pool. The free pool will be used in the event that a backup exceeds the capacity of the tapes permanently assigned to the destination. Any tapes added from the free pool will be assigned to this destination until such time as the destination is reset via an overwrite operation or a manual reassignment of the slots to the free pool.

Destination Caution

While it is possible to assign the same slots to more than one destination, we recommend that you refrain from this in practice. The GUI will automatically remove slots from the free pool when added to a destination and warn you if you select slots that are currently assigned to other destination. You may override this warning, but the use of this type of slot configuration can result in unexpected overwriting of important archives and must be managed very closely to prevent unexpected results.

"Slot in Use" Warning Dialog

When working with the default single destination created during system installation and configuration, it is possible to create a situation where data will be unexpectedly overwritten. Because BRU Server works withe destinations instead of physical tapes, any overwrite of a destination will result in the tapes assigned to that destination becoming fair game for any future write - including appended backups.

Therefore, we recommend that you examine your backup requirements and plan your destination definitions properly to ensure that data is not unexpectedly overwritten during future backup operations.

Please refer to the example section in chapter 2 for more information on destination configuration and backup planning.

Loading New Media

When you replace the media in a library destination, you must replace ALL of the tapes, not just the ones used in previous backup jobs. Once you have replaced the media, you must tell BRU Server that new media is available in the assigned slots. You do this by selecting the destination and clicking the "Recycle" button. The server will examine each new tape and update the state within the datatables and cache.

Data Manager - Schedules
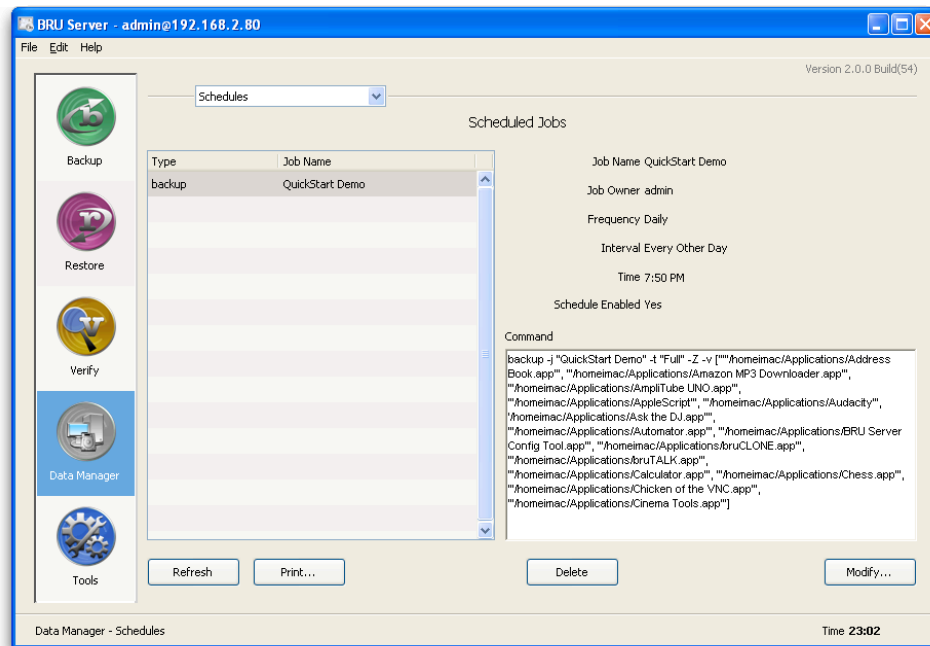
Schedules Manager

Scheduled jobs may be managed on the main Backup panel by selecting the job in the job listbox and clicking the ***Schedule...*** button or from the Schedules Data Manager panel.

The data displayed includes the job's name, the owners, its frequency and interval, the date and time of the next run and the actual command that will be executed. This command is the command that you would enter at the prompt if you were running the job manually in one of the command line tools or if you were building your own controlling wrapper application and wished to execute the command.

None of these fields are editable. To edit a schedule entry, select the entry and click the ***Modify...*** button. The normal Job Scheduler dialog will be displayed and changes may be made to the selected schedule.
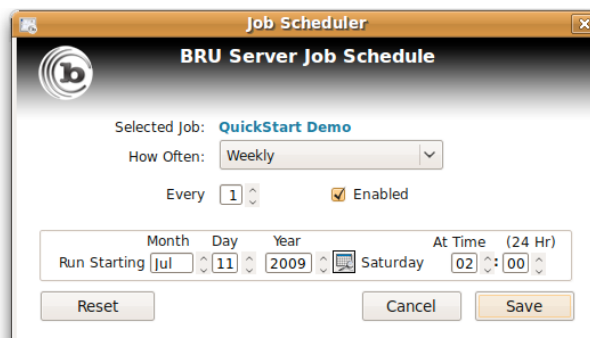
Job Scheduler Dialog

Tools - Job Monitor
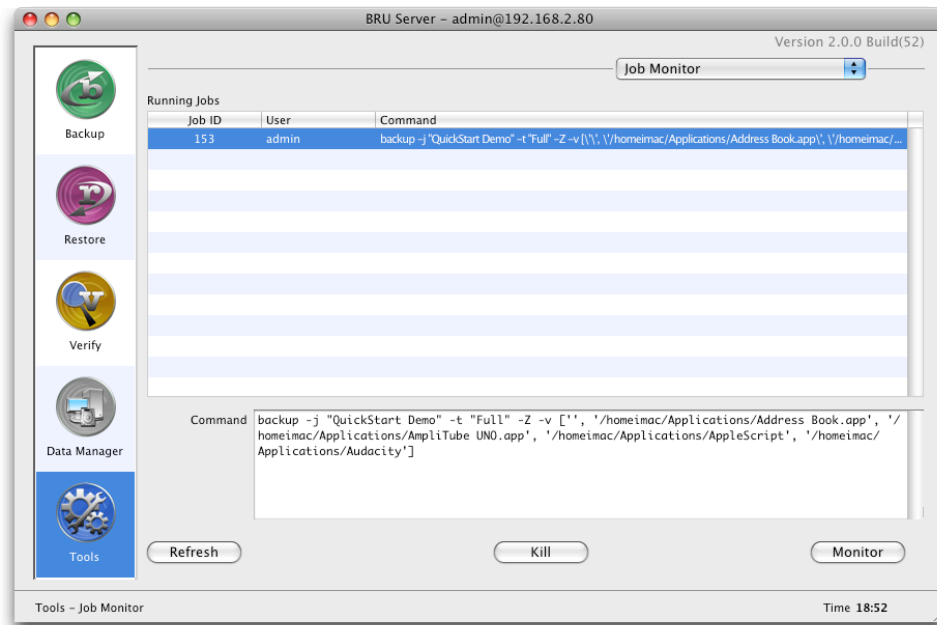
Job Monitor

The Job Monitor is the primary Tools panel and will most likely become a familiar site to the manager of a larger BRU Server environment. Since staging allows many backup operations to occur at the same time, you can monitor the status of any job by selecting it from the listbox and clicking the "Monitor" button.

In fact, you may monitor multiple jobs at the same time or monitor the same job from Consoles on different systems. For each job that you select to monitor, a new Job Monitor window will open. Any of these Monitor windows may be closed without affecting the monitored job.

Using Stop/Kill When Writing to Tape: Using the Stop/Kill option will cause the job to end immediately. If you are using the Stop/Kill option for a backup job that is currently writing to tape, the tape will be marked inconsistent by BRU Server. If you are using a tape library, the tape will not be ejected from the drive. The tape will remain in the drive until it is manually unloaded and put back into the originating slot. This is because BRU Server can only work under the assumption that the job has been forcefully killed due to a critical error. Once a backup job is killed, it is not possible for the backup operation to resume where it left off; it must be restarted from the beginning.

Using the Stop/Kill When Writing to Disk: Upon performing the Stop/Kill option on a backup operation that is writing to stage disk, the backup operation will stop immediately. This will cause the archive to close on the current file being backed up. This will then cause the archive to become abandoned and the next time that the Housekeeping process is run the archive will be imported as an abandoned stage archive. Once the import is complete, it will he listed under the "Lost + Found" section in the Restore panel. Once a backup job is killed, it is not possible for the backup operation to resume where it left off; it must be restarted from the beginning.

Tools – Device Configuration
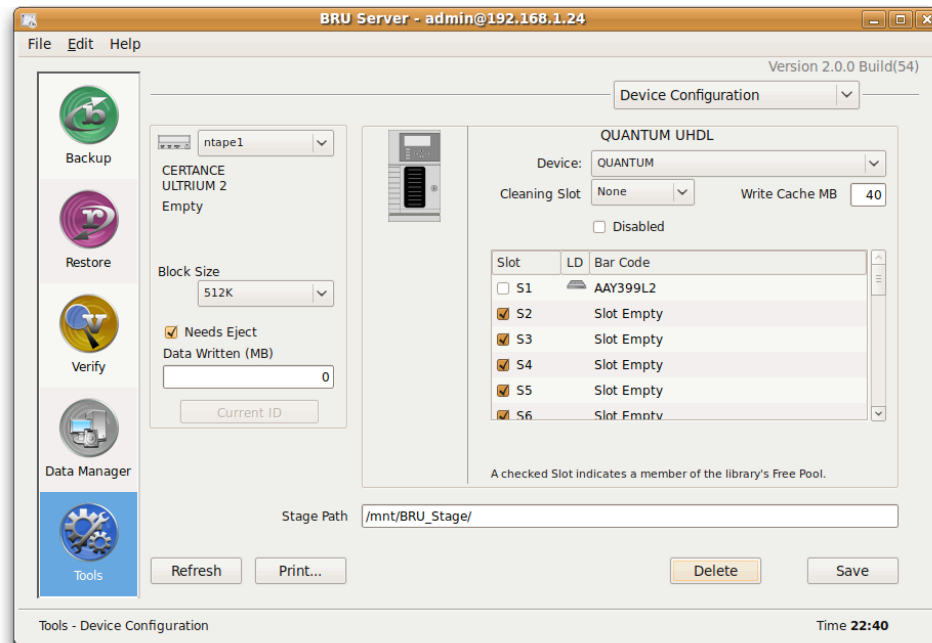
Device Configuration

The Device Configuration tool allows you to both query a device setting and make changes to its settings. Settings such as the ***Block Size*** can dramatically affect the performance of a tape device. You can also use this to disable a device that will be temporarily removed from a system such that the configuration settings are retained and no errors are reported during operations. The setting of the drive Block Size and the BRU Server "Write Cache" are highly dependent on your system's connectivity and the types of data included in a given backup/archival operation. While increasing the Write Cache will almost always improve throughput to high speed devices such as LTO-4 or LTO-5 and is only limited by the amount of system RAM you wish to dedicate, the Block Size setting is more dependent on the type of data being backed up. The only way to determine the best value for your environment is to perform backups of a representative selection of data using the various Block Sizes and compare the performance information returned.

If you have a cleaning cartridge that is not recognized as such by your barcode reader (As in the above figure), or you don't have a barcode reader, you can assign a permanent slot as a cleaning cartridge and the tape in that slot will not be included in any backup and restore operations.

The checkboxes in the lower right portion of the screen represent all of the available slots in the selected library. By default, they should all be checked indicating that all of your currently available slots are assigned to the Free Pool.

The Free Pool consists of tapes that are not permanently assigned to any Destination. In the event that a Destination with physically assigned slots fills all of its assigned tapes, an available tape from the Free Pool will be added to extend the Destination's capacity. Once assigned, the Free Pool tape becomes a member of that Destination's assigned slots.

> *A Note for experienced BRU users: The "Block Size" referred to here is the same as BRU's bufsize setting. The write cache is a memory pool on the server that is used to cache the network stream and help improve the to-tape performance on the server when operating in Disk to Tape (D2T) mode.*

Tools - Library Manager
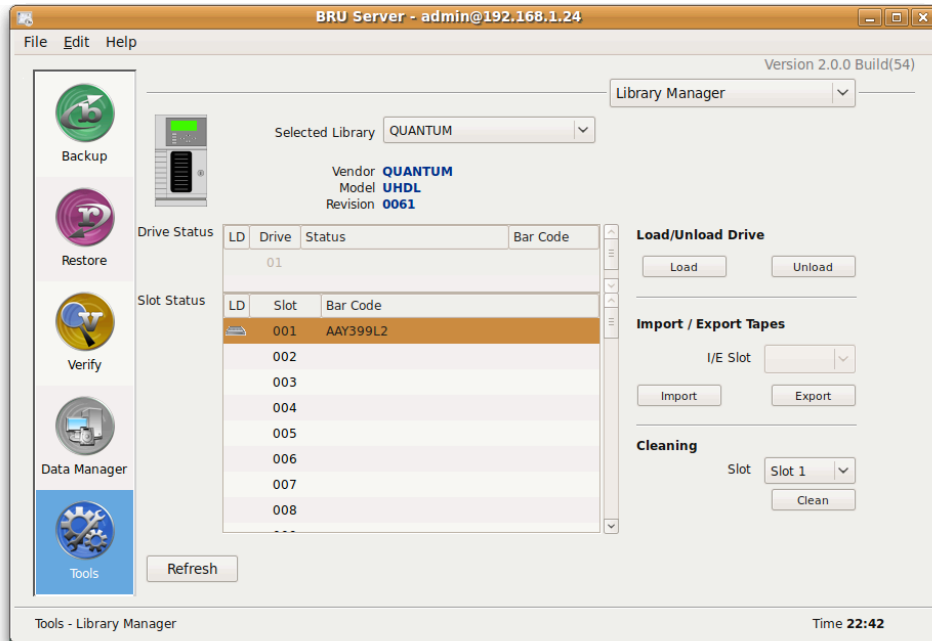
Library Manager

The Library Manager panel allows you to perform manual operations with the tapes in your library.

Load/Unload Drive - To load a tape into the drive or unload a tape from the drive back to its slot, select the drive in the upper list box and the select the tape slot in the lower list box. Once both are selected, the Load and Unload buttons will be enabled.

Import/Export Tapes - If your library has an Import/Export Slot (sometimes referred to as a mailslot or a Cartridge Access Port - CAP), you can move tapes from a internal slot to an I/E slot or from an I/E slot to an internal slot without opening the library. Most smaller libraries (usually less than 10 slots) don't offer this feature. To remove or add a tape, select the slot in the lower list box and then select the appropriate I/E slot from the I/E Slot popup menu. The Import and Export buttons will become enabled.

This feature is very important in larger libraries as any time you physically open the library and access the media directly, the library must re-inventory all of the slots once you close the library and bring it back online. In some larger libraries this re-inventory can take hours to complete. By using the I/E slots, the library keeps track of any media changes that you make and is ready to resume operation as soon as the I/E slot is emptied and locked.

Cleaning - To manually clean a drive, select the drive in the upper list box and the select the appropriate slot from the Cleaning Slot popup menu. The clean button will be enabled. We recommend that you refrain from over cleaning the drive as damage can be done to the head assembly and tape guides from cleaning too often. Refer to your drive manufacturer's documentation for the best cleaning schedule and procedure.

Tools – Lock Manager
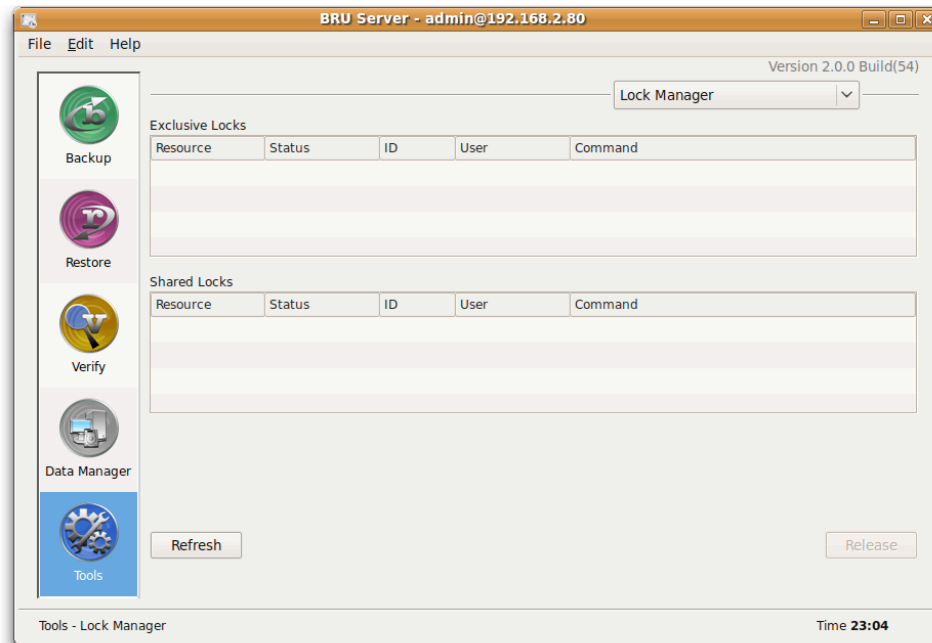
Lock Manager

The Lock Manager allows you to manually monitor locks that are placed on devices by the BRU Server software. There are two types of locks – ***Exclusive*** and ***Shared***. Exclusive locks are assigned to a single task such as a backup or restore from a tape drive or the movement of a tape from a slot to a drive. A Shared lock would normally be assigned for read access to a database record.

To Unlock a lock, select the lock in the listbox and click the Unlock button. Do not use this feature for experimentation as improperly released locks can thoroughly confuse the BRU Server operations.

Tools – Server Commands
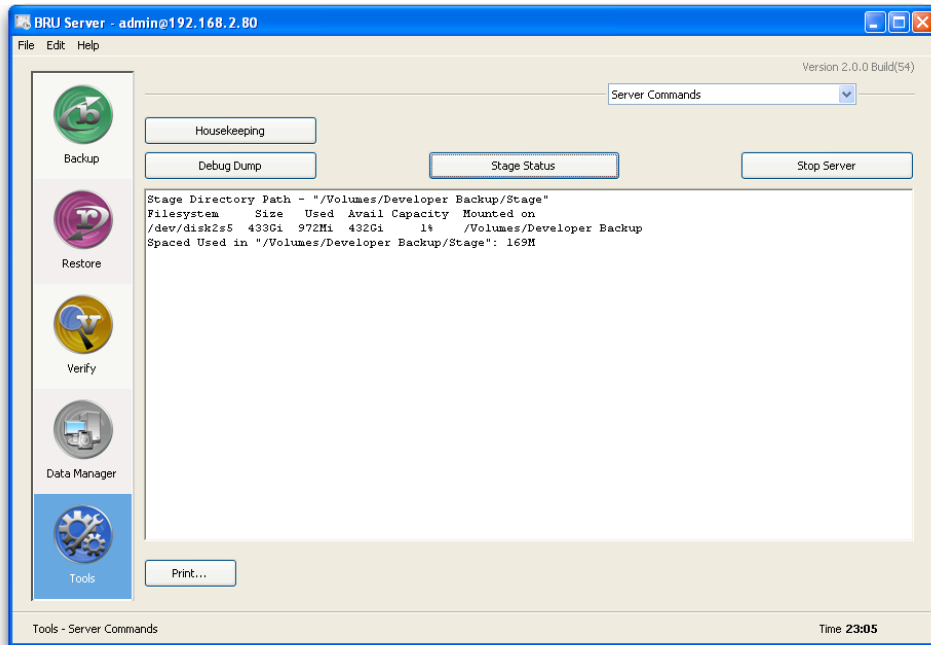
Server Commands Panel

The Server Commands panel allows you to manually perform housekeeping – the cleaning of logs, the history database, and the stage files, shut the server down, dump the server debug log, check the Stage directory status, and import foreign BRU-compatible tapes. If you use the interface to stop the server daemon to which you are connected, you will be disconnected and must login to that physical system outside of the BRU Server Console to restart the server.

Server Commands – Debug Dump
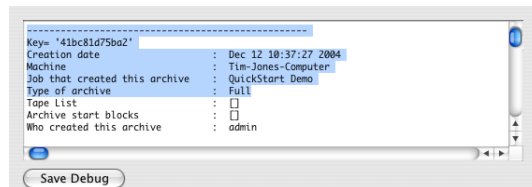
Debug Dump

The Debug Dump option is provided to provide system status back to the TOLIS Group Support and Engineering teams. When you load a debug dump into the interface, you may select and copy sections with your mouse (as shown above) or save the dump to your desktop as "BRU Server Debug.log" by using the "Save Debug Log" button. If TOLIS Group Support requests your server debug dump, this is the file to send in for examination.

Other Settings – System Preferences

System Preferences

The Preferences panel is accessed via the "⌘-," (command-comma) key sequence or by selecting "BRU Server Console" from the menu bar and choosing "Preferences..." from the list. The Preferences panel allows you to configure settings that are sometimes better defined by a human for a given system instead of through an automatic process.

Stage Path: The disk location on the local system assigned for writing staged backups. This may be any location including external Firewire or USB drives (look in /Volumes or use Disk Utility for the proper pathname/mount point).

Max Stage Age: The maximum number of days a staged backup is left on the stage disk. This setting overrides a user's age setting.

Job History Retention: The number of days that a job's completion report is kept in the database.

Administrator Email: The default email address to which all reports are sent.

SCSI Timeout: How many seconds to wait for a SCSI bus command to be returned before declaring a SCSI error.

Online Timeout: How many seconds to wait for a tape to become ready after loading before declaring a load error.

Eject Timeout: How many seconds to allow for a tape to be ejected from a tape drive before checking the status of the eject.

Eject Timeout Needed: How many seconds to wait after checking the status of the eject before declaring an unload error.

Enable Debug Checkbox: This checkbox will turn on the runtime debug window and display much information about what is going on in the interface during operation. As this feature will seriously impact the interface performance, you should only enable this feature when directed by TOLIS Group support personnel.

A Note On BRU Server Tape Management

With many other tape backup applications, maintaining the rotation and overwrite scheme was left to the backup administrator. With BRU Server, this is handled differently.

When dealing with backup jobs and definitions,

Additionally, BRU Server keeps track of tapes that have "aged out" of the catalogs. If a tape set is reloaded into a destination and its contents are no longer active, BRU Server will properly overwrite the existing archives with the new backups, even if the next backup job is set to append.

This means that erasing the media is not required. Each time you erase a tape, you reduce its life expectancy. Since an overwrite operation will make any existing data irretrievable, there really is no need to erase a tape. Since BRU's reason for existence is to restore data, it won't perform operations that will reduce the potential the data can't be restored unless the user overrides its defaults.

In fact, ***you should only manually erase media if it is being disposed of and may have contained sensitive data***. And then, we recommend that you physically destroy it in addition to erasing it.

7 - Command Line Operations

In addition to the graphical interfaces, BRU Server provides command line tools to enable non-GUI access and management – bru-server.cmd and bru-server.console for the management console, and the agent and server daemons themselves.

Agent Command Line Options

If you enter `agent --help` in a terminal, you will see the following:

```
BRU Server Agent version 2.0.0 (C) 2003-2009, TOLIS Group, Inc.
Built 16:09:38 07/15/2009 on macpro.tolisgroup.com
Options:
   -f, --foreground    Remain in the foreground
   -p, --port=         Port to listen on for connections
   -v, --version       Print version and exit
   -k, --kill          Kill a running agent
       --config        Configure authorized servers
   -h, --help          Print this list and exit
```

If you run the agent daemon with the `--foreground` option, the daemon will remain attached to the terminal in which it was started and all output that is normally written to the bru_agent.log file will also be displayed on the screen. This mode is useful for debugging an agent daemon startup issue. During startup, you will see lines that look like this:

```
20090719 18:33:05 BRU Server Agent starting (version 2.0.0)
20090719 18:33:05 Built 16:09:38 07/15/2009 on macpro.tolisgroup.com
20090719 18:33:05 Bound socket
```

To exit this mode, use `CTRL-C`. This will abort the current agent, so you will need to restart it without the `--foreground` option for normal use:

```
^C
20090719 09:04:53 Going down on signal 2
```

The `--port=` option is useful if you are not able to use the agent's default port of 14442. You may set a different port with this command. You should use port numbers above 1024. If you change an agent's port assignment, you must also change the port assignment in that client system's record on the server. This can be achieved in the GUI on the "Data Manager" -> "Clients" panel.

The `--config` option can only be used by the root user and is discussed in detail in Chapter 1.

The remaining options should be self explanatory.

Server Command Line Options

If you enter `server --help` in a terminal, you will see the following:

```
BRU Server 2.0.0 (C) 2002-2009, TOLIS Group Inc.
Built 16:09:38 07/15/2009 on macpro.tolisgroup.com
Options:
 -P, --password     Set the administrator password and exit
 -p, --port=        TCP port BRU Server will accept connections on.
 -f, --foreground   Do not fork, send log output to standard out,
                    Used for debugging.
 -q, --quick        Do not initialize hardware (faster)
 -d, --directory=   Set top level directory for BRU Server.
                    If omitted, current directory is assumed.
 -k  --kill         Kill a currently running BRU Server
 -v, --version      Print version number and exit.
 -l, --license      Display the license info.
 -h, --help         Print this list.
```

The `--password` option can only be executed if your are running the daemon as root. It will allow you to reset the BRU Server admin password for that system. Non-root attempts to use this option will fail.

If you execute the server daemon with the `--foreground` option, the daemon will remain attached to the terminal in which it was started and all output that is normally written to the `bru_server.log` file will also be displayed on the screen. This mode is useful for debugging a server daemon startup issue. During startup, you will see lines that look like this:

```
20090721 09:42:14 BRU Server starting
20090721 09:42:14 BRU Server 2.0.0 (C) 2002-2009, TOLIS Group Inc.
20090721 09:42:14 Built 16:09:21 07/15/2009 on quicksilver.tolisgroup.com
20090721 09:42:14 Reading license
20090721 09:42:14    Error opening license file 'license':
                       [Errno 2] No such file or directory: 'license'
20090721 09:42:14 Scanning for tapes and changers
20090721 09:42:14    Found tape at ntape0 IBM/ULTRIUM-TD2
20090721 09:42:14    Found tape at ntape1 CERTANCE/ULTRIUM 2
20090721 09:42:14    Found tape at ntape2 HP/C1537A
20090721 09:42:14    Found autoloader at changer0 EXABYTE/LTO 1x7 2U
20090721 09:42:14    Found autoloader at changer1 QUANTUM/UHDL
20090721 09:42:14 Configuration signature same as saved configuration
20090721 09:42:14 Listening on port 14441
20090721 09:42:14 Bound socket
20090721 09:43:04 Starting system housekeeping
20090721 09:43:04 Cleaning catalog directory
```

To exit this mode, use `CTRL-C`. This will abort the current agent, so you will need to restart it without the `--foreground` option for normal use:

```
^C
20060425 10:18:53 Going down on signal 2
```

While the server daemon has an option to assign a non-standard port (`--port=`) and will accept different port assignments than the default of 14441, it will not work as the agent is currently limited to connecting to port 14441 for authentication. This will be changed in a future release of the agent software so that the server daemon may also be started on a non-standard port.

Use the `--quick` option if you want to skip performing an initialization of your tape drives and libraries. If you know that your configuration has not changed, it is safe to use the `--quick` to speed up the startup sequence of the daemon when using a larger library.

To read the BRU Server server's license and display it, use the --license command. It will display your license information based on your license file.

```
Reading license
   Demo expiration on 2009/7/31
   Encryption enabled
   Licensed to Beta User for 50 clients
```

There is one additional line displayed that contains your key and license information. We have omitted it here to prevent confusion.

If you have changed you license and use of this command reports a different number of clients than the server currently shows as licensed, you need to restart the server to recognize the new license info.

An important note about the server daemon and the `--kill` option - you will *not* be warned or asked to confirm the kill command. The server daemon will be stopped immediately and any running jobs will be aborted.

Command Line Consoles

The bru-server.cmd tool allows you to manipulate the server processes directly, via shell script redirection, or even create your own user interface. It requires no special terminal considerations and uses the stdin, stdout, and stderr mechanisms for input and output.

The bru-server.console tool is a curses-based tool that uses special terminal control capabilities to provide an interface that includes command history (using the up and down cursor keys) and a split screen to display job info in addition to the normal command sequences. This tool does require a minimally intelligent terminal such as the default OS X Terminal application or (as a minimum) VT-100 compatibility.

To login with bru-server.cmd, you must pass the proper arguments on the command line. By simply typing bru-server.cmd and hitting enter, you will be reminded of the usage:

```
xserve1 # bru-server.cmd
BRU Server simple command line client 2.0.0
Copyright (C) 2002-2009, TOLIS Group, Inc
Built 16:09:38 07/15/2009 on macpro.tolisgroup.com
Usage:

/Users/tjones/Developer/RB_Work/Server_GUI/Agent/Tools/Mac/bru-server.cmd [ -v ]
[ --port=<port number> ] <user> <host>
   -v      Verbose output
   -s      Simple line control
   --help  Print this list
```

When you enter the proper command, you will not receive a prompt and you should enter the BRU Server admin user password on the next line after you hit ENTER:

```
bru-server.cmd admin server
<adminpassword>[ENTER]
connected
BRU Server >
```

Once you see the "`BRU Server >` " prompt, you are logged in and ready to execute commands. One important option is the "`-v`" option to enable additional verbosity. When you log in using this option, the command prompt will change to "`input:`" instead of the default. Also, you will now see much more information displayed during job "attach" operations.

```
bru-server.cmd -v admin server
<adminpassword>[ENTER]
connected
input:
```
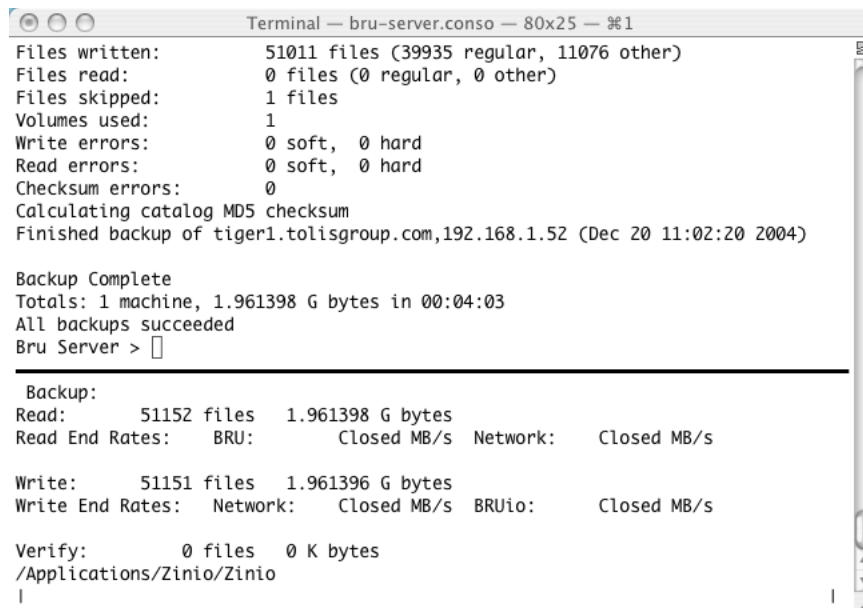
An example of controlling the `bru-server.cmd` tool via a shell script would use a bit of shell redirection:

```
PASSWORD="mysecret"
SERVER="bruserver.domain.com"
RESULT=`(echo ${PASSWD}
sleep 5
echo show backup
sleep 5
exit) | bru-server.cmd admin $SERVER`
```

The `$RESULT` variable would then contain a list of your current backup job definition names.
If you have a normal terminal session available and you are not trying to script the command line, you should use the bru-server.console tool. The login with this tool is interactive and will prompt you for the login parameters.

```
tiger1:~ tjones$ bru-server.console
Remote hostname >tiger1
 Connecting to tiger1:14441... Connected
User name > admin
Password:
```

The main difference is in the way the information is displayed. The bru-server.console tool will actually provide a split screen layout when you are monitoring a job. The current data will be displayed in the lower pane while you are able to continue executing commands in the upper panel. If you wish to close a monitor session, press the TAB key. Pressing the TAB key again will reopen the session.

bru-server.console Character Interface – Both Panes

bru-server.console Character Interface – Top Pane Only

The command sequences are the same for both command line tools and are covered below. Entering exit at the prompt will close the console session. However, any job that may have been running will continue to run.

BRU Server Command Line Access Commands

A list of the general commands available and their short descriptions in both the bru-server.cmd and bru-server.console tools:

```
archivelist     List files in a catalog
archivesmachine    List archives by machine
archivesowner   List archives by ownwer
attach          Attach to a running process
backup          Run a backup job
backupowner     List backups by owner
cattest         Test catalog integrity
debug           Dump debug information
delay           Delay command
estimate        Estimate backup size
exec            Run an external command (admin only)
exit            Exits this session
header          Show the tape header
help            Get help
hinv            Scan for tapes and loaders
housekeeping    Perform regularly scheduled maintenance
inspect         Inspect an archive
kill            Terminate a process or session
lastrc          Last return code
license         Reread and show license information
lock            Acquire a lock on a resource
ls              List directory on a client
mounts          List filesystems on a client
mt              Manipulate tape drives
mtx             Manipulate tape loaders
password        Change password
platform        Get platform info from a client
recycle         Recycle tapes in a destination
remote          Remote access to server
restore         Restore an archive
scan            Scan a tape for archives
search          Search archives
set             Set (create, modify, delete) database record variables
setc            Set database component variable
show            Show variables
shutdown        Shut the server down
test            Catalog dump
unlock          Unlock a resource
upstage         Move a staged backup to tape
verify          Verify archive
version         Print the server version
what            Show what is going on
who             Show who is logged in
```

You can get additional help on any command by typing "help command" at the prompt:

```
BRU Server > help archivelist
archivelist [-m] <archive> <directory>
```

A note about arguments described as lists below - all lists are include in '[' ']' characters with each list element separated by a comma and a space.

  ["/machine/path", "/machine2/path"] or [1, 3, 4, 17]

Python users will recognize this format as a standard list assignment.

Detailed Command Descriptions

`archivesmachine [-m] <machine> -- List archives from <machine>`

This command will list all of the archives created from a specified system `<machine>`.

`archivesowner [-m] <owner> -- Display archives belonging to <owner>`

This command will list all archives belonging to a user `<owner>`.

`attach`

Attach the current Console session to a BRU Server command that is already running. Requires the session number as an argument. Use the 'what' command to see a list of running processes.

Example:

```
attach 423
```

`backup [ options ] <machine-directory list>`

Run a backup job to a <destination>. The machine-directory list is a list consisting of machine and pathnames to back up. A null string means that a full network backup of all machines was selected. If you do not specify a destination (-D), the job is written to the Stage disk.

Options are:

```
-D <destination>  Write backup to <destination> instead of disk
-b <bru_arg>      An argument to be passed on to the remote bru
-e <n>            Override encryption default.   0=off 1=on
-z <n>            Override compression default.  0=off 1=on
-j <name>         Name of this job or base job for partial backups
-t <type>         Type of job (Full, Incremental, Differential)
-v                Run archive verification pass
-r                Eject tape after backup (standalone drives only)
-m <email>        Mail results to <email>
-i                Intermittent style backup
-o <mode>         Overwrite mode-- 'overwrite' or 'append'
-Z                Compress files within archives.  Slows backups a lot
```

Example:

```
backup -j "Sample Job" -v -m "bruadmin@bru.com" ["/tiger1/Users/",
"/g4mac/Users/"]
```

Notice that multiple systems and paths may be included in the machine-directory list. Each separate entry must be enclosed within double quotes. A single entry consists of at least the machine name as it is declared in the machines database. The example above includes the machines "`tiger1`" and "`g4mac`" and backs up the "`/Users/`" folder/directory on each of the systems. The format is similar to an entry in a netinfo database - the root of the BRU Server environment ("/") followed by the machine ("`tiger1`") followed by the path on that machine ("/" at least). Because this job includes 2 systems, there will be 2 physical archives created on your archive media (in the example, the Stage directory).

If we were writing to tape instead of the disk Stage, we would pass a destination using the -D option as follows (enter as a single line):

```
backup -j "Sample Job" -D "EXABYTE-default" -v -m "bruadmin@bru.com"
     ["/tiger1/Users/", "/g4mac/Users/"]
```

This would result in the above job being written to the destination defined as "`EXABYTE-default`" rather than the disk Stage as in the first example.

In addition to specifying path elements that are to be included in the backup job, you may also pass paths that are to be explicitly excluded from the backup operation in the machine-directory list. To specify directories to be excluded from the backup, add all entries that are to be included and then specify an empty path (""). Any machine-directory entries that follow this empty path will be processed on the client as elements that are to be explicitly excluded from the backup operation. This is in addition to any client-specific bruxpat entries that may exist on the given client system. An example that would exclude the "`/Users/Shared`" folder on "`tiger1`" would be created as follows:

```
["/tiger1/Users/", "/g4mac/Users/". "", "/tiger1/Users/Shared"]
```

Keep in mind that you must specify such exclusions for each machine as a separate entry in the list. While the above example will exclude "`/Users/Shared`" from the machine "`tiger1`", it would not exclude it from the machine "`g4mac`".

During the backup process, if you are using the bru-server.console, you may view the progress display by pressing the TAB key. If you are using the bru-server.cmd and did not start the session with the -v option, you will not see any progress detail and the standard "BRU Server > " prompt will return once the restore process is completed.

`backupowner [-m] <owner> -- Display jobs belong to <owner>`

This command will display all backup jobs belonging to the user `<owner>`. UpStage jobs can only belong to the admin account, therefore they are not considered for this command.

`cattest [ catalog file ]`

Tests integrity of catalog files named or all catalogs if no catalogs are specified. This is useful to check for corruption in the catalogs on the disk.

`debug`

Dumps the server state to aid the BRU Server maintainers

Options are:

```
-q     Do not echo the output; only saves the debug file to /tmp directory
       on the server system named bru_server.debug
-m     Mail the result back to TOLIS Group
```

Note – only use this command if instructed by TOLIS Group support personnel.

`delay [ secs ]`

Delay command. Takes a single argument, the number of seconds to delay. The default is one second.

```
estimate [ options ] <machine/directory list>
```

Estimate the size of a backup job.

```
    -j <name>        Name of this job, or base job for partial backups
    -t <type>        Type of job (Full, Incremental, Differential)
```

Example:
```
    estimate –j "Engineering Full" –t "Full" ["/tiger1/Users/"]
```

```
exec <command> [ <arguments> ]
```

Run a command on the server system. This command is only available to the admin user.

```
exit
```

exits this session closing the connection to the server and exiting the local console app.

```
header <drive name>
```

Determine which tape is currently loaded in the specified drive.

Example:
```
    header ntape0
    header /dev/nst0
```

```
hinv [ -d <device> ... ]
```

Scan for tape drives and loaders
```
    -d <device>        Disable <device> to prevent it from being used
    -q                 Do not initialize hardware (faster)
    -e                 Force drive eject before robot tape pick
```

```
housekeeping
```

Perform regularly scheduled maintenance

```
inspect <device>
```

Inspect/test an archive. This is the equivalent to BRU's checksum verify pass. To perform a bit-for-bit comparison against the original client system's data, use the "verify" command (see below).

```
kill <BRU Server process-id>
```

Stop a process. The process-id is found with the 'what' command.

Example:

```
    kill 423
```

```
lastrc
```

Print the return code of the last operation. Zero is success, -1 usually means that a command crashed and other nonzero numbers indicate various kinds of failure. This command is primarily used in scripted operations such as interface wrappers.

```
license [ -r ]
```

With no arguments, shows current licensing information.
With -r, re-reads license information from the license file without restarting the server

Example:

```
BRU Server > license -r
Reading license
   Demo expiration on 2009/7/31
   Encryption enabled
   Licensed to Beta User for 50 clients
```

```
lock <shared|exclusive> <resource> <timeout>
```

Acquire an exclusive or shared use of a resource where <timeout> is in seconds.
Run with no arguments to see what locks are currently held and pending.

```
ls <machine> <directory>
```

List directories on a client machine

Example:
```
ls tiger1 "/Users"
-rw-r--r--    root     wheel              0 Sep 12 2003 20:20 .localized
drwxrwxrwx    root     wheel            204 Dec 01 2004 15:33 Shared
drwxr-xr-x    501      501             1156 Dec 20 2004 09:36 tjones
drwxr-xr-x    502      502             1156 Dec 20 2004 09:36 andy
```

```
mounts <machine>
```

List mount points on a machine. The agent will only process filesystems that are remarked as "local".

Example:
```
mounts tiger1
  local    /                       /dev/disk0s3
  ignore   /dev                    devfs
  remote   /dev                    fdesc
  local    /Volumes/RAID 1         /dev/disk3s3
  local    /Volumes/RAID 2         /dev/disk4s3
  local    /Volumes/Stage Home     /dev/disk1s3
  remote   /Network                automount -nsl [332]
  remote   /automount/Servers      automount -fstab [336]
  remote   /automount/static       automount -static [336]
  remote   /Volumes/Music          //@APPGEN/MUSIC
```

In this example, the agent would not process the filesystems marked as "ignore" or "remote". If you are building a custom wrapper for users, you should not display these filesystem types to prevent confusion caused by a user selecting a filesystem for inclusion in a backup that will not actually be processed.

```
mt <tape device> <mt subcommand> [ arguments ]
```

Manipulation of tape drives. Run "mt" for subcommands

Subcommands are:
```
rewind          Rewind the tape
fsf [n]         fsf the tape n times
bsf [n]         bsf the tape n times
fsfm [n]        fsfm the tape n times
bsfm [n]        bsfm the tape n times
reten           Retension the tape
read n          Read n bytes from the tape
eod             Seek to end of data
setblk n        Set the block size to n
tell            Show current block position
seek n          Seek to block position n
eject           Eject the tape
status          Show tape status
```

Examples:

Get the current drive status

```
mt ntape0 status
Status bits:   BOT ONLINE
Block size:    1024
```

```
Eject the tape from the drive
```

```
mt /dev/nst0 eject
```

```
Get the current block offset on the tape
```

```
mt /dev/nst0 tell
23837
```

```
mtx <scsi loader device> <mtx command> [ arguments ]
```

Used to manipulate tape loaders.

Commands are:

```
move <source-address> <dest-address>        Move a cartridge
status                                       Status of changer
inventory                                    Force a cartridge inventory
inquiry                                      Inquire about vendor/model
load                                         Load a cartridge into a
drive
unload                                       Eject a cartridge
```

Examples:

Get the Library Status

```
mtx changer0 status
Changer changer0

Drive 1 Empty

Slot 1 Full "H0000001"    Slot 2 Full "H0000002"    Slot 3 Full "H0000003"
Slot 4 Full "H0000004"    Slot 5 Full "H0000005"    Slot 6 Full "H0000006"
Slot 7 Empty              Slot 8 Empty              Slot 9 Empty
Slot 10 Full "CLNA0002"
```

Move a tape from a slot to the first drive

```
mtx /dev/sg0 move s5 d1
```

Move a tape from a slot to the first Import/Export slot

```
mtx changer0 move s3 i1
```

```
password [ user ] <password>
```

Change the user's password. This is an admin only command.

```
platform <machine>  -- Get platform-specific info from a client
```

```
recycle <destination>
```

Examine all tapes within a destination, deleting all associated archive records and marking them as empty. Recycling known tapes will erase the tape to insure that they are ready for use in an overwrite job.

```
remote <host> <port>
```

Connect to a remote host at a particular port and then relay data between it and the server. This command should only be used under the direction of TOLIS Group support and is only available to the admin user.

host may be a DNS-resolvable machine name or an IPv4 address
port should be an unprivileged TCP port value

```
restore [ -d directory ] [ -m machine ] [ -D device ] <archive> [ file list ]
```

Restore files from <archive>.

```
-m          Specifies a different machine than the one originally backed up
-d          Specifies restoring to a different directory
-D          Specifies a different device than the backup device
-o          Unconditionally overwrite existing files
-e <n>      Override encryption default.   0=off 1=on
-z <n>      Override compression default.  0=off 1=on
[ files ]   Specifies files/directories to restore, the default is all
            files.
```

An example of restoring the /Users/tjones/Documents directory from an archive labeled 412eef560ec1 to the original location, only overwriting older files on the disk:

```
restore 412eef560ec1 ["/Users/tjones/Documents/"]
```

Restoring that same data to the "**g4mac**" machine's "**/private/tmp/**" directory adds both the **-m** and **-d** arguments:

```
restore -d "/private/tmp/" -m "g4mac" 412eef560ec1
    ["/Users/tjones/Documents/"]
```

(that should be a single command line).

During the restore process, if you are using the bru-server.console, you may view the progress display by pressing the TAB key. If you are using the bru-server.cmd and did not start the session with the -v option, you will not see any progress detail and the standard "BRU Server > " prompt will return once the restore process is completed.

```
scan [ -s ] <device> [ start end ]
```

Scan tape(s) in a device, adding or updating any BRU archives located to the catalog database. This is referred to as an "Import" operation in the BRU GUI.

```
start end           Start and ending slots, required for loaders.
-s                  Slow scan mode
```

```
search [options] <target string> [ archive ... ]
```

Search for elements within the BRU Server catalog database

```
-c       Case insensitive comparison
-r       Regular expression search
-h <n>   Maximum number of hits, default 100
-m       Machine readable output
```

If no archives are listed all known archives will be searched.

```
set [ -m ] <database> <key> [ <value> ... ]
```

Set a key in database <database> to <value>. If <value> is not present, the key is deleted from the database. When using the set command, you must provide values for all values in a given database entry. You use the set command for creating new records, modifying existing records, or deleting records. To delete a record, pass it's key value with no further values.

Example to Create a new machine entry:

```
set machines "Lab's G4" 'pc-00101,192.168.1.101', 14442,
    'Oct 21 13:30:38 2005', 0, 0
```

Example to modify the "Labs's G4" machine's communication port and encryption settings (you could also set each new value using the setc command):

```
set machines "Lab's G4" 'pc-00101,192.168.1.101', 6435,
    'Oct 21 13:30:38 2005', 0, 1
```

Example to delete a job known as "Monday Incremental":

```
set backup "Monday Incremental"
```

Note that there are no further values passed beyond the database record's key value in this deletion example. Specifying a key with no associated value will result in that key being deleted from the datatable.

See Appendix A for a complete list of datatable set command expected formats.

setc <database> <key> <field> <value>

Sets the value of a component. The key object must already exist. The setc command allows to to change a specific value within a database record for a given key.

Example to change the slots assigned to an existing destination called "Weekly Full":

```
setc -m dest "Weekly Full" slots ["1, 2, 3, 24, 25"]
OK
```

Example to change the port value for a known machine:

```
setc machines "Lab's G4" port 6435
```

(note that the OK response is not returned without the -m option on the command)

See Appendix B for a detailed list of the various setc fields associated with each datatable.

show [-m] [<database> [<key>]]

With no arguments, show the database names.

```
BRU Server > show
archives
backup
dest
devices
drives
history
machines
parm
schedule
tapes
upstage
user
```

With a database, show the keys present in the database:

```
BRU Server > show archives
40db3af301bf
40eacdf80e35
411a8c5e0716
4182b2db02f2
41b5f1dc0adf
41c2fdc9033d
41c712ba0dd0
```

With a database and key, show the value of the key:

```
BRU Server > show archives 40db3af301bf
Creation date              :  Dec 10 13:31:08 2004
Machine                    :  tiger1
Job that created this archive :  QuickStart Demo
Type of archive            :  Full
Tape List                  :  ['100004']
Archive start blocks       :  [0]
Who created this archive   :  admin
```

If the -m option is passed with the command, the response will look like:

```
BRU Server > show -m archives 40db3af301bf
('Dec 10 13:31:08 2004', 'tiger1', 'QuickStart Demo', 'Full', ['10004'],
    [0], 'admin')
```

shutdown

Stop the server daemon on the currently connected server. Any running jobs will be irretrievably aborted.

test <archive-id>

Validates a specified archive catalog. The archive-id can be determined by examining the archives database.

unlock

Releases a resource. Usage: unlock <resource>. Use the lock command with no arguments to get a list of current locks.

upstage [options] <destination>

Write a staged backup to a destination, deleting the stage file on successful transfer to tape. The destination must be specified.

```
-v            Run archive verification
-r            Eject tape after backup (standalone drives only)
-m <address>  Mail transcript of output to <address>
-u <user>     User to upstage files, default is all staged archives
-o <mode>     Overwrite mode-- 'overwrite' or 'append'
```

To UpSptage to the "**ADIC-default**" destination, verifying the operations, send email to the **bruserver-admin@bru.com** user, and overwriting any existing data:

```
upstage -v -m "bruserver-admin@bru.com" -o "overwrite" "ADIC-default"
```

```
verify [ -D device ] [ -m machine ] <archive>
```

Verify the integrity of the archive by reading it. If a machine is specified, the files in the archive are compared against the files on the machine. Changes to the files on disk since the archive was made will be reported.

```
-D          Specifies a different device than the backup device
-m          Specifies a machine to compare files against
-e <n>      Override encryption default.   0=off 1=on
-z <n>      Override compression default.  0=off 1=on
```

To perform a comparison verification of the archive against its original client system:

```
verify 40db3af301bf
```

version

Display the version of the server

what

Displays a list of current processes with BRU Server process ID's. You can monitor a process using the attach command or kill a running process with the kill command.

who

Displays a list of who is logged into the BRU Server daemon

Machine Parsing of Output

In all instances, adding a –m to the command options will modify the output to be oriented towards machine manipulation rather than being read by humans. For example, the output of the normal mounts command would look like:

```
BRU Server > mounts tiger1
  local    /                          /dev/disk0s3
  ignore   /dev                       devfs
  remote   /dev                       fdesc
  local    /Volumes/Tiger Server      /dev/disk1s3
  local    /Volumes/Data Volume       /dev/disk1s5
  remote   /Network                   automount -nsl [383]
  remote   /automount/Servers         automount -fstab [404]
  remote   /automount/static          automount -static [404]
  local    /Volumes/iDisk             /dev/disk2s2
  remote   /Volumes/tolistim          idisk.mac.com/tolistim/
  remote   /Volumes/Music             //@APPGEN/MUSIC
```

While the machine readable (-m) version would look like (actually returned as a single line):

```
BRU Server > mounts —m tiger1
[('/dev/disk0s3', '/', 'local'), ('devfs', '/dev', 'ignore'), ('fdesc', '/dev',
'remote'), ('/dev/disk1s3', '/Volumes/Tiger Server', 'local'), ('/dev/disk1s5',
'/Volumes/Data Volume', 'local'), ('automount -nsl [383]', '/Network',
'remote'), ('automount -fstab [404]', '/automount/Servers', 'remote'),
('automount -static [404]', '/automount/static', 'remote'), ('/dev/disk2s2', '/
Volumes/iDisk', 'local'), ('idisk.mac.com/tolistim/', '/Volumes/tolistim',
'remote'), ('//@APPGEN/MUSIC', '/Volumes/Music', 'remote')]
```

The important elements here are that the entire list is enclosed within square brackets - '[' & ']'. Each subsection is enclosed in parenthesis and the elements within those sections are enclosed in single quotes and separated by commas unless the mount point contains a single quote (apostrophe) in which case the entry is enclosed in double quotes.

Each of the parentheses elements above would relate to the separate line output generated without the –m option. For example:

```
('/dev/disk0s3', '/', 'local')
```

equates to:

```
    local    /                              /dev/disk0s3
```

in the standard line based output in the original mounts example.

8 - OS X Support Command Line Utilities

Controlling Tape Drives - tapectl

If you are running BRU Server under Linux, please review the Linux documentation for the mt-st (mt) and mtx commands. The libctl and tapectl tools are provided for Mac OS X systems where native tape and tape library tools are not available.

Tape drives control their media in one of two manners - rewinding mode and non-rewinding mode. In rewinding mode, the media is opened, if the media is not at its beginning, it is rewound, the user operation is performed, and the media is rewound to its beginning. In non-rewinding mode, the media is opened wherever it is positioned, the operation is performed, and the media position remains where the last command left it. The first mode is useful only for writing or reading a single data set from the beginning of the media. The second mode allows much greater flexibility in how a tape is used.

All of the TOLIS Tape Tools utilities use the non-rewinding mode of access.

The tapectl utility provides the following tape operations:

display	- displays information on all available tape devices
inquiry	- displays SCSI inquiry details for the selected drive
status	- display current drive status
fsf x	- forward space filemark (x = count; 1 is default)
bsf x	- back space filemark (like fsf, but backwards)
seod	- space to end of data for appends
erase	- short erase a tape
lerase	- long (secure) erase - takes hours!
rewind	- rewinds a tape
rewoff	- rewind the tape and unload it
reten	- retention a tape (QIC and TRAVAN tapes)
tell	- report current logical tape block
seek x	- seek to logical tape block 'x'
setblk x	- set drive block size to x (x is required, 0 = variable block)
alert	- display Tape Alert information (if supported and available)
unload	- same as rewoff

Example tapectl commands and their results

```
# tapectl -f ntape0 display
Available Tape Devices:
  ntape0: IBM ULTRIUM-TD1 25D4
  ntape1: IBM ULTRIUM-TD1 25D4

# tapectl -f ntape1 inquiry
Vendor = IBM     , Model = ULTRIUM-TD1
Revision Level = 25D4

# tapectl -f ntape1 status
Medium Type: Unknown
Density Code: 0x40 - DLT1 40 GB, or LTO 1
BlockSize: 0
At block 55259
```

Most other tapectl commands perform their operations silently with the return code of the command indicating success or failure.

```
# tapectl -f ntape1 rewind
# echo $?
0
```

This return code (or exit code) of zero indicates that the rewind was successful. Any non-zero return code indicates an error occurred. In most instances, an error will also return text details if the -v (verbosity) option is included in the command:

```
# tapectl -f ntape0 -v erase
Erasing media in drive ... Device Not Ready, No tape inserted
# echo $?
2
```

The return code from this command was 2, and the error message indicates that we attempted to perform a tape operation, but no tape was in the drive.

The following commands can be issued when no tape is in the drive with successful results:

```
display, inquiry, status, setblk, and alert
```

All other tapectl commands will return an error if the tape drive is empty.

tapectl command breakdown

display
> `tapectl display`
>
> The display command searches all busses on your system and reports any type 1 SCSI devices that are located. These devices can be SCSI, Fibre-Channel, Firewire, or USB. We use a naming convention of ntapeX – where X is a number starting at zero. The default tape device for all command is ntape0.

inquiry
> `tapectl inquiry`
>
> The inquiry command issues a SCSI INQUIRY command to the defined device and displays the data returned by the tape drive.

status
> `tapectl status`
>
> The status command gets information from the tape drive and reports the load status, data block size, current block and any SCSI sense messages.

fsf
> `tapectl fsf 4`
>
> The fsf, or Forward Space Filemark command moves the tape forward from its current position to the next filemark. The tape is left positioned on the end of tape (EOT) side of the filemark ready to read or write. You can specify multiple filemarks by providing a number argument after the fsf command.

bsf
> `tapectl bsf 3`
>
> The bsf, or Back Space Filemark command moves the tape backwards from its current position to the previous filemark. The tape is left at the EOT side of the filemark. You can specify multiple filemarks by providing a number argument after the bsf command.

seod
> `tapectl seod`
>
> The seod, or Space to End Of Data command moves the tape forward to the end of currently recorded data. This allows you to position the tape in preparation for writing additional data.

erase
> `tapectl erase`
>
> The erase command uses the SCSI short erase function to clear the contents of the tape. The short erase simply blanks the header on the tape and writes an end of data (EOD) marker at the beginning of the tape. It does not physically erase any data that was previously written on the tape.

lerase
> `tapectl lerase`
>
> The lerase, or Long Erase command actually erase all data on the tape before resetting the EOD marker. While this erase method is more secure than the short erase above, it can take a very long time for a long erase to complete. For example, a 230M SDX3-100 AIT3 tape will take almost 5-1/2 hours to complete the long erase. A DLT VS80 tape will take a little over 2 hours. For most environments, the short erase provides enough security as it takes a specially modified tape drive to read beyond the EOD marker.

rewind
> `tapectl rewind`
>
> The rewind command returns the tape to its beginning.

rewoff
    `tapectl rewoff`
    The rewoff, or Rewind Offline command rewinds the tape and ejects it from the drive.

reten
    `tapectl reten`
    The reten command is only useful for QIC or TRAVAN tape mechanisms. These tapes
    sometimes require retentioning to reset the tape travel path within the cartridge shell. If you are
    having problems reading a known good TRAVAN or QIC tape, running two or three retention
    passes will usually return the tape to readable status. The reten command does nothing if issued
    to other types of tape drives such as DAT, AIT, DLT, or LTO.

tell
    `tapectl tell`
    The tell command reports the current block location on the tape. Tapes write data in blocks.
    Using tell can make it easier to locate a specific file or backup set on the tape.

seek
    `tapectl seek 32452`
    The seek command tells the drive to position the tape to the block specified by the numeric
    argument provided.

setblk
    `tapectl setblk 0`
    The setblk, or set block command sets the physical block size that data is separated into when it
    is written to the tape surface. For SCSI and Fibre-Channel drives, both variable and fixed block
    sizes are supported. For ATAPI based drives (usually found in Firewire and USB versions of a
    drive), only fixed block operation is supported. For most SCSI drives, variable block mode is the
    most efficient operating mode (setblk 0).

alert
    `tapectl alert`
    The alert command returns the Tape Alert™ status from a compatible tape drive. The Tape Alert
    status can provide very specific information concerning the health of your tape drive and your
    media.

unload
    `tapectl unload`
    The unload command is a synonym for rewoff

Controlling a Tape Library - libctl

A tape library allows you to automate the use of multiple tapes and even multiple tape drives without direct user intervention. Tape libraries are often referred to by the names Library, Autoloader, or Changer, but these all refer to the same basic idea – robotic control of loading and unloading of a tape drive within a self contained cabinet. The general distinction is that an Autoloader is usually a smaller unit supporting 10 or fewer tape slots and a single tape drive, while a Library or Changer supports 10s or even 1000s of tape slots and one or more tape drives.

Additionally, it is important to note that many libraries support different access modes. These modes include SCSI – or Random, Console, LCD, and Sequential modes. For proper software operation with libctl, your library should be set to SCSI – or Random mode. For information on the other modes and how you interface with them, please refer to your library's documentation.

The TOLIS Tape Tools libctl utility provides the mechanism to control all of the robotic operations of a library. Commands provided by libctl include:

display	- displays available changer devices
inquiry	- displays the SCSI inquiry info for the selected library
status	- displays info on library queried.
initialize	- (re)initialize elements / read barcodes.
inventory	- Displays load settings for drive(s) and tapes.
load [s] [d]	- Load a tape from slot [s] to drive [d].
unload [d] [s]	- Unload tape from drive [d] to slot [s].
move <fs> <ts>	- Moves tape in slot fs to slot ts. fs and ts are required.
export <fs> [ie]	- Places tape from slot fs into the ie (mailslot) specified.
import [ie] <ts>	- Loads tape in the ie (mailslot) to slot ts.
	export and import default to the first ie slot.
unlock	- Unlocks the i/e port (mailslot) for addition of tape(s).

Example libctl commands and their results

```
# libctl display
Available Tape Changers:
  changer0: SONY LIB-162 01m6

# libctl status
Vendor = SONY     , Model = LIB-162
Revision Level = 01m6
Unit has barcode reader
Robots: 1 (0), Drives: 1 (82), Tape Slots: 16 (1 - 16),
        No Import/Export slots.
  Drive   0: Empty
   Slot    1: Full : Ready : A01JEN
   Slot    2: Full : Ready : A01JEG
   Slot    3: Full : Ready : A01JED
   Slot    4: Full : Ready : ABD123
   Slot    5: Full : Ready : ABD120
   Slot    6: Full : Ready : ABD125
   Slot    7: Full : Ready : ABD126
   Slot    8: Full : Ready : A01JEE
   Slot    9: Full : Ready : A01JG4
   Slot   10: Empty
   Slot   11: Empty
   Slot   12: Empty
   Slot   13: Empty
   Slot   14: Empty
   Slot   15: Empty
   Slot   16: Full : Ready : No Bar Code

# libctl -v load 3 0
Vendor = SONY     , Model = LIB-162
Revision Level = 01m6
Unit has barcode reader
Robots: 1 (0), Drives: 1 (82), Tape Slots: 16 (1 - 16),
        No Import/Export slots.
Move Element Called 0, 3, 82
Move Element Complete.
```

As with tapectl, all libctl commands will provide a return code. A zero indicates complete success while non-zero indicates an error has occurred.

libctl command breakdown

display
> `libctl display`
>
> The display command lists the libraries available according to your OS X. Libraries are type 8 SCSI devices. To provide a standardized naming convention, we refer to the devices as changerX where X is a number starting at zero. The default device for all commands is changer0.

inquiry
> `libctl inquiry`
>
> The inquiry command issues a SCSI INQUIRY command to the defined device and displays the data returned by the tape library.

status
> `libctl status`
>
> The status command returns the current status of the selected tape library. This information includes vendor info, number of drives, tape slots, and import/export slots, as well as the status of each of these elements.

initialize
> `libctl initialize`
>
> The initialize command performs a full INITIALIZE ELEMENT STATUS operation on the entire library. For smaller libraries, this command will finish very quickly, but for a larger library (100+ slots), it can take many minutes to complete.

inventory
> `libctl inventory`
>
> The inventory command is a subset of the status command in that it returns the status of drives, I/E slots, and tape slots.

load
> `libctl load 3 0`
>
> The load command instructs the library to load a tape from the slot listed into a drive. The tape slot is required, but the destination drive may be omitted and the default of the first drive (drive 0) will be assumed.

unload
> `libctl unload 0 3`
>
> The unload command instructs the library to pick the tape from the listed drive and return it to the listed slot. You may omit either the slot and libctl will return the tape to the slot it was originally picked from, or both the drive and the slot and libctl will use drive 0 and the slot the tape was originally picked from.

> **unload NOTE**: *Some libraries require that the tape be physically ejected from the tape drive before being instructed to pick it. Use the 'tapectl unload' command to eject the tape from the drive before issuing the 'libctl unload' command. If you don't do this, the library robot could sit in front of the tape drive for over 10 hours (library dependent) before recognizing that there is no tape to retrieve.*

move
> `libctl move 4 10`
>
> The move command allows you to relocate a tape from one slot to another within the library. The example command moves the tape in slot 4 to slot 10. Not all libraries support this operation, so check the libctl return code if nothing seems to have occurred. Also, an error will occur if the from slot is empty or the to slot is full.

export
```
libctl export 14 1
```
The export command is only useful if your library has a true Import/Export slot (sometimes called a mailslot or an EE slot). It provides a method of exchanging tapes within the library without requiring that the library be physically opened. This is mainly important in larger libraries where opening the library causes a full reinitialization. This command tells the library to pick the tape from the listed slot and place it into the listed I/E slot. The example picks the tape in slot 14 and places it into the first I/E slot.

import
```
libctl import 1 14
```
The import command is the opposite of the export command. It is only useful if your library has a true Import/Export slot. After you've placed a tape into the I/E slot and locked it, this command will pick the tape and place it into the library's inventory.

unlock
```
libctl unlock
```
The unlock command unlocks the I/E slot. It is not supported by all libraries and can actually cause a system hang between the library and the computer. We recommend that you use your library's control panel for locking and unlocking the I/E slots.

9 -Troubleshooting Hardware Problems

If your tape drive or library is not functioning properly, this can cause the BRU interface to report what appear to be odd errors. Since BRU uses OS X's built in SCSI layer for tape and library control, we are very dependent on that layer working properly. Check that you can communicate properly with your tape and/or library.

A good test to check BRU Server's operation is to create and execute a small backup job to your stage disk. Start by checking your stage path either using the Preferences panel in the GUI Console or by executing:

```
show parm stage_directory
```

from either of the command line tools.

If the stage path is correct, open the BRU Server GUI Console and click the "**New..**." button.   Use the following settings:

- Job Name: "***Disk Test***"
- Destination: **Stage Disk**
- Backup Type: **Full**
- Job Type: **Backup**
- Compression: **Enabled**

Select a few files and save the job. Answer No to scheduling and then Click the "**Run Now**" button to kick off the backup test. Once completed, you may delete the "***Disk Test***" job from the job list.

If this backup test completes successfully then BRU is working properly. This suggests that any problems are most likely related to a hardware problem.

Under Linux, check that the devices are properly recognized:

```
# cat /proc/scsi/scsi
Attached devices:
Host: scsi0 Channel: 00 Id: 01 Lun: 00
  Vendor: EXABYTE  Model: EXB-220          Rev: 6.04
  Type:   Medium Changer               ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 02 Lun: 00
  Vendor: EXABYTE  Model: EXB-89008E00012F Rev: V41b
  Type:   Sequential-Access            ANSI SCSI revision: 02
Host: scsi0 Channel: 00 Id: 03 Lun: 00
  Vendor: EXABYTE  Model: EXB-89008E00012F Rev: V41b
  Type:   Sequential-Access            ANSI SCSI revision: 02
```

Check that the devices are seen by your Mac OS X system:

```
$ tapectl display
Available Tape Devices:
ntape0: EXABYTE VXA-2 1005
```

Of course, your drive info may differ, but, if instead of output similar to what you see above, you see simply:

```
$ tapectl display
Available Tape Devices:
```

You definitely have a problem with your system recognizing the tape drive. Normally, BRU will recognize any tape device attached to your Mac via either the SCSI, Fibre-Channel, Firewire, or USB interfaces.
Checking your library is similar:

```
$ libctl display
Available Tape Changers:
changer0: EXABYTE Exabyte EZ17 1.11
```

In either case, If you do not see a device listed, please power down the system and the drive, disconnect the tape drive from the system and double check all of your connections. A bad cable, terminator, or an incorrectly seated SCSI or Fibre-Channel card can result in a communication failure.

NOTE: Under Mac OS X, BRU uses the device names returned by the display commands above as the device names for your tape drive(s) and library. By default device numbering starts at 0 (zero) - the first tape drive would be **ntape0** *while the first library would be* **changer0**. *Also, even though your tape drive(s) may be inside of your library, the tape drive(s) and library robot are different devices.*

If you can see the drive, but BRU Server fails when trying to write or read data, check the cabling as above (look for bent pins on SCSI cables). Also, if you are using OS X 10.2.6+, you may need to look for updated SCSI HBA drivers - Check with your SCSI vendor. On a Linux system, make sure that the "SCSI Generic" kernel driver is loaded (look for 'sg' in the lsmod output). If it is not loaded, BRU Server will not be able to communicate with your devices. To manually load the driver use:

```
sudo /sbin/modprobe sg
```

We strongly recommend that you make this module a permanent part of your Linux system startup. This is usually part of your default `initrd` ramdisk. For information on updating the contents of your default `initrd`, refer to your Linux distribution's documentation and/or the `mkinitrd` manpage.

You may also try modifying your SCSI card settings - on the ATTO UL3 and UL4 cards, you should disable tagged command queuing and set the sync rate for the tape drive (and library) to 40MB/sec (40ST). For Adaptec AIC7XXX HBA's under Linux, you may need to disable Domain Validation.

For Mac OS X, you should also examine your System Profiler output to ensure that your SCSI adapter and attached devices are seen. SCSI and Fibre-Channel Tape drives and libraries should appear as "IOSCSIParallelDevice" entries under 10.2, and as SCSI entries under 10.3 or 10.4. Firewire and USB tape drives will show up as Firewire or USB devices.

Most connectivity problems are corrected by either performing the SCSI HBA changes mentioned or by replacing the cables and/or terminators.

If you can see the drive(s) and libraries using the steps above, but you still get errors in BRU Server when accessing the devices, the following sequence of `tapectl` or `mt` commands will test actual system communication with your drive:

Under Mac OS X:

```
$ tapectl -v -f ntape0 status
Vendor = EXABYTE , Model = VXA-2
Revision Level = 1005
No barcode support
Medium Type: 0x82 (loaded)
Density Code: 0x81 - VXA-2 or DLT 15GB comp
BlockSize: 131072
At block 4000
```

Under Linux:

```
$ mt -f /dev/nst0 status
SCSI 2 tape drive:
File number=0, block number=0, partition=0.
Tape block size 0 bytes. Density code 0x27 (Exabyte Mammoth).
Soft error count since last status=0
General status bits on (41010000):
 BOT ONLINE IM_REP_EN
```

If this looks correct, you may test motion commands:

Under Mac OS X:
```
$ tapectl -f ntape0 rewind
$ echo $?
0
```

Under Linux:
```
$ mt -f /dev/nst0 rewind
$ echo $?
0
```

If the echo command returns anything other than zero, you have an issue with the tape drive and motion commands.

You can test library commands using `libctl` or `mtx`.

Under Mac OS X:

```
$ libctl -v -f changer0 status
Vendor = EXABYTE , Model = Exabyte EZ17
Revision Level = 1.11
No barcode support
Robots: 1 (86), Drives: 1 (82), Tape Slots: 7 (1 - 7), No Import/Export slots.
 Drive    0: Full : Tape From Slot 1
  Slot    1: Empty
  Slot    2: Full : Ready : No Bar Code
  Slot    3: Full : Ready : No Bar Code
  Slot    4: Full : Ready : No Bar Code
  Slot    5: Full : Ready : No Bar Code
  Slot    6: Full : Ready : No Bar Code
  Slot    7: Full : Ready : No Bar Code
```

Under Linux:

```
$ mtx -f /dev/sg0 status
  Storage Changer /dev/sg0:2 Drives, 21 Slots ( 0 Import/Export )
Data Transfer Element 0:Full (Storage Element 17 Loaded):VolumeTag = B0000001
Data Transfer Element 1:Empty
      Storage Element 1:Full
      Storage Element 2:Full :VolumeTag=A0000007
      Storage Element 3:Full :VolumeTag=B0000007
      Storage Element 4:Full :VolumeTag=A0000006
      Storage Element 5:Full :VolumeTag=B0000005
      Storage Element 6:Full :VolumeTag=B0000010
      Storage Element 7:Full :VolumeTag=B0000009
      Storage Element 8:Full :VolumeTag=A0000009
      Storage Element 9:Full :VolumeTag=A0000008
      Storage Element 10:Full :VolumeTag=A0000005
      Storage Element 11:Full :VolumeTag=A0000010
      Storage Element 12:Full :VolumeTag=B0000006
      Storage Element 13:Full :VolumeTag=B0000002
      Storage Element 14:Full :VolumeTag=B0000003
      Storage Element 15:Full :VolumeTag=B0000004
      Storage Element 16:Full
      Storage Element 17:Empty
      Storage Element 18:Empty
      Storage Element 19:Full
      Storage Element 20:Empty
      Storage Element 21:Empty
```

To unload the tape from the drive and return it to the slot, you must first unload it from the tape drive and then instruct the robot to pick the tape and return it to its slot:

Under Mac OS X:

```
$ tapectl -f ntape0 rewoff ; libctl -f changer0 unload
```

Under Linux:

```
$ mt -f /dev/nst0 rewoff ; mtx -f /dev/sg0 unload
```

To see that the unload is successful, use the same status commands from above:

Under Mac OS X:

```
$ libctl -f changer0 status
Vendor = EXABYTE , Model = Exabyte EZ17
Revision Level = 1.11
No barcode support
Robots: 1 (86), Drives: 1 (82), Tape Slots: 7 (1 - 7), No Import/Export
slots.
 Drive     0: Empty
  Slot     1: Full : Ready : No Bar Code
  Slot     2: Full : Ready : No Bar Code
  Slot     3: Full : Ready : No Bar Code
  Slot     4: Full : Ready : No Bar Code
  Slot     5: Full : Ready : No Bar Code
  Slot     6: Full : Ready : No Bar Code
  Slot     7: Full : Ready : No Bar Code
```

Under Linux:

```
# mtx -f /dev/sg0 status
  Storage Changer /dev/sg0:2 Drives, 21 Slots ( 0 Import/Export )
Data Transfer Element 0:Empty
Data Transfer Element 1:Empty
      Storage Element 1:Full
      Storage Element 2:Full :VolumeTag=A0000007
      Storage Element 3:Full :VolumeTag=B0000007
      Storage Element 4:Full :VolumeTag=A0000006
      Storage Element 5:Full :VolumeTag=B0000005
      Storage Element 6:Full :VolumeTag=B0000010
      Storage Element 7:Full :VolumeTag=B0000009
      Storage Element 8:Full :VolumeTag=A0000009
      Storage Element 9:Full :VolumeTag=A0000008
      Storage Element 10:Full :VolumeTag=A0000005
      Storage Element 11:Full :VolumeTag=A0000010
      Storage Element 12:Full :VolumeTag=B0000006
      Storage Element 13:Full :VolumeTag=B0000002
      Storage Element 14:Full :VolumeTag=B0000003
      Storage Element 15:Full :VolumeTag=B0000004
      Storage Element 16:Full
      Storage Element 17:Full :VolumeTag=B0000001
      Storage Element 18:Empty
      Storage Element 19:Full
      Storage Element 20:Empty
      Storage Element 21:Empty
```

If after running these tests you still have problems, but the tests all functioned properly, please contact TOLIS Group support with the following information:

Note: A support agreement is required for support after 30-days from the initial purchase date.

OS X or Linux Version (kernel version if Linux)
Mac or PC System Type (G4, Xserve, Pentium, Opteron et al)
Tape Drive Type and MFG
Library Type and MFG (if appropriate)
BRU or BRU Server Version
BRU or BRU Server Serial Number
Contact Phone Number (access to the system is important)
A thorough description of your issue

Appendix A - Command Syntax for the 'set' Command

This appendix lists the expected syntax for use with the set command. In each case, the -m option can be supplied immediately after the 'set' command to enable the printing of the OK message. You can also call the 'lastrc' command after issuing a 'set' command to determine the last result code. All lists are separated by a comma and a space.

When the term "null" is used below, this means that you should use an empty set of quote marks like so: "".

When the term "empty set" or "empty list" is used below, this means that you used an empty set of square brackets like so: [].

Backup:

The backup datatable stores the job definitions that are executed either from the GUI or from a scheduled operation. While it is possible to execute an ad hoc backup from the command line, we have limited the 1.2 GUI to only allowing for the execution of stored backup job definitions. Saved definitions don't necessarily need to be scheduled once they are saved.

Syntax:

```
set backup name [machines and pathlists], basejob, owner, destination, [email list],
eject flag, verify flag, overwrite mode or compression setting, job type, base date,
schedule frequency, frequency divisor, [sched list 1], [sched list 2], "Private Key"
```

The name is the name of this backup job definition. It is also the datatable key for this definition. The machines and pathnames are in the format of:

```
["/machine/path/subpath", "/machine/path"]
```

If an excluded path is to be included, all included paths are listed and then a null is entered followed by the excluded paths.

```
["/machine/path1", "/machine/path2", "", "/machine/path1/exclude"]
```

If the job definition is not a Full job, the machines and pathlists should be an empty set.

The basejob is either null or the name of a job to base this job upon. Only applies to Incremental or Differential backups. While it is possible via the command line to create a definition that bases one Incremental or Differential job upon another, it is not recommended and is not allowed in the GUI.

The owner is the owner of the job. This will most likely be "admin" unless you define other users within the BRU Server environment.

The destination is either a defined destination ("i.e." EXABYTE-default", or "Daily 1-4") or should be null to indicate the destination is the Stage Disk.

The email list consists of complete email addresses enclosed in quotes.

```
["user1@machine.domain", "user2@machine.domain"]
```

The eject and verify flags are either 1 or 0 when 1 setting the action to true,

If you are writing to a tape destination, the next field is the overwrite mode. This must be exactly one of "default", "overwrite", or "append". If you are writing the backup to the Stage disk, the argument is either "compressed" or "uncompressed"

The job type is either "Full", "Incremental", or "Differential"

The base date should default to the Unix Epoch ("Jan 01 17:00:00 1970") and should not be manipulated directly.

The frequency defaults to "Never" when saving a backup job. It is adjusted as part of a schedule.

The frequency divisor should always be 1.

The final two lists are part of the schedule process and should both be empty lists when saving a backup definition.

Example:

```
set -m backup "Syntax Test" ["/appgen/usr/local/cvs"], "", "admin", "EXABYTE-
default", ["user@email.dom"], 0, 1, "overwrite", "Full", "Jan 01 17:00:00 1970",
"Never", 1, [], [], ""
```

An Incremental job based upon that Full job, but written to the Stage disk would look like:

```
set -m backup "Syntax Test Incremental" [], "Syntax Test", "admin", "",
["user@email.dom"], 0, 1, "compressed", "Incremental", "Jan 01 17:00:00 1970",
"Never", 1, [], [], ""
```

UpStage:

The upstage datatable stores information about UpStage operations. The is the action of moving staged archives from disk onto tape.

Syntax:

```
set upstage name destination, owner, upstage user, [email list], eject flag, verify
flag, overwrite, frequency, base time, frequency divisor, [sched list 1], [sched
list 2], keep
```

The name is the name of this UpStage job definition. It is also the datatable key for this job.

The owner is the owner of the job definition. This should normally default to "admin"

The upstage user is the user whose staged archives are to be upstaged. If you wish to upstage ALL staged archives, this should be null.

The email list consists of complete email addresses enclosed in quotes.

```
["user1@machine.domain", "user2@machine.domain"]
```

The eject and verify flags are either 1 or 0 when 1 setting the action to true,

The next field is the overwrite mode. This must be exactly one of "default", "overwrite", or "append".

The frequency should always be set to "Never".

The base date should default to the Unix Epoch ("Jan 01 17:00:00 1970") and should not be manipulated directly.

The frequency divisor should always be 1.

The final two lists are part of the schedule process and should both be empty lists when saving a backup definition.

Example:

```
set -m upstage "Weekly UpStage" "ADIC-default", "admin", "", ["user@email.dom"], 0,
1, "overwrite", "Never", "Jan 01 17:00:00 1970", 1, [], [], 1
```

Schedule:

The schedule datatable stores all scheduled jobs know by a give BRU Server server. Jobs may be scheduled to run once, on a repeating rotation, and can be disabled while retaining the settings, Repeating rotations may be scheduled hourly, daily, weekly and monthly. Additionally, a divisor is provided that allows you to set the frequency to repeat every, every other, every third, etc. For example, a Daily schedule with a divisor value of 3 would run every third day. A Monthly schedule with a divisor of 2 would run every other month on the days specified. By disabling a schedule, you can postpone its running and then by re-enabling it, the job will run again starting on the next scheduled interval with no further changes required.

Syntax:

```
set schedule type-name frequency, frequency divisor, starting date, [sched list 1],
[sched list 2], command, enabled flag, owner
```

The type-name pair is either backup- or upstage- followed by the job name from the backup or upstage datatable:

"backup-Syntax Test" or "upstage-Weekly UpStage"

The frequency is exactly one of "Never", "Once", "Hourly", "Daily", "Weekly", or "Monthly"

The frequency divisor is a number equal to or greater than 1

The starting date is the first time the scheduled job should be run. The date format is US standard in the form "MMM DD HH:MM:SS YYYY" - i.e.: "Nov 01 20:00:00 2005"

The sched list 1 and sched list 2 lists should be empty lists unless the frequency is "Monthly". If Monthly, sched list 1 is a list of days with Sunday being 0 and Saturday being 6 and sched list 2 is the weeks of the month with 0 being the 1st week, 4 being the 5th week, -1 being the last week, and -2 being the next to last week.

The command is the action backup or upstage command that is to be executed when the schedule is run. This would be a command similar to a command that would be executed from the command line.

```
backup -j "Syntax Test" -t "Full" -D "EXABYTE-default" -o overwrite -v ["/appgen/
usr/local/cvs"]
```

Because this command must be passed as a quoted string, any quote marks should be escaped with a backslash - i.e.: \"Syntax Test\"

The enabled flag is either 1 (enabled) or 0 (disabled). A scheduled job that is disabled will not be run on its next scheduled run time.

The owner is the owner of the job schedule, but not necessarily the original job definition. This should normally default to "admin"

Example:

```
set -m schedule "backup-Syntax Test" "Daily", 1, "Nov 28 20:00:00 2005", [], [],
"backup -j \"Syntax Test\" -t \"Full\" -D \"EXABYTE-default\" -o overwrite -v [\"/
appgen/usr/local/cvs\"]", 1, "admin"
```

User:

The `user` datatable stores the settings for BRU Server users. The admin user is always defined and cannot be deleted. Changes to the user datatable can only be performed by the admin user. While it is possible to create multiple users in the 1.x, versions, there are very few differences between the admin user and a non-admin user. Basically, a non-admin user cannot add, delete, or modify users, and they cannot use the 'exec' command.

Adding a new user actually involves 2 steps - creating the user entry and setting that user's password.

Syntax:

```
set user name ( verifier, salt, stage quota, stage age )
```

The name is the name of the user to add. While it is possible to add user names that contain spaces, we recommend that you adhere to a Unix-like single word user name.

The verifier and salt values should initially be set to the string value '0' (including the single quotes).

The stage quota value is the number of megabytes this user may use on the Stage disk. A value of -1 means unlimited.

The stage age value is the longevity of a stage archive that isn't UpStaged to tape. As soon as the housekeeping operation runs, any staged archives that are 1 day older than this value will be deleted from the Stage directory and cleared from the archives datatable.

Syntax:

```
password name password
```

The name is the user name to apply the password account into.

password is the plain text password to assign to this user.

When the password is assigned, the verifier and salt values in the user's record will be updated. it is very important to maintain these values if you reload and modify a user's settings, otherwise the password will be invalidated.

Also, since the password is not double-checked during this operation, please ensure steps to verify that the password being set is the password that was actually chosen.

The admin user may **ALWAYS** override a user's password with the password command.

Example:

```
set user tjones ('0', '0', -1, 45)
```

This will create a new user named tjones with an unlimited stage quota and a 45 day maximum stage archive life expetency.

```
password tjones my_password
```

This will set the user tjones' password to my_password and update the verifier and salt values in the user record. Once the verifier and salt values are set by the password command, you must read the existing valuse and reassign them any time you save a users table entry for the user or you will invalidate the user's password.

Example:

```
BRU Server > show users tjones
Verifier                 :
0x711CD6F45349C61A8D8E2FACF31AB9D03566492B13A1AF135A75285476090314D57A81CB83CE69180F
9A5EC8DBB3A5131350DA5819731C5977E35FEEC0840994A8026940F7800544504D5B663B69DBCA4222A3
088165C73D40547B09E2417E16331015734FE0C6CEA946C3603095E9B9D40D3622575DED88FDED1BAE25
FFB785L
Salt                     :  0x3421787BC09FBB2E02776FABB27CDD78L
Stage Quota (Megabytes)  :  -1
Max stage file age       :  60
```

Therefore, to reset the Stage Quota value, you must specify both the Salt and Verifier values exactly as reported in the results from the show or show -m command. To simplify this, it recommend that you use the setc command for changing field values.

Dest:

The dest datatable stores the settings for all destinations. As part of the initial hardware scan performed when you first install BRU Server's server daemon, a default destination is created. We strongly recommend that better definitions be defined for daily operations.

Syntax:

set dest name

Appendix B - Datatable Field Names for setc Command

The following entries list the field names for each datatable, it's Displayed name, and its value type. These are for use with the setc command for updating fields within datatable records.

General `setc` Syntax:

```
setc datatable key field value
```

Where datatable is the datatable to operate on, key is the unique record identifier, field is the field name from the tables below, and value is the new value to be assigned to the record.

Examples:

```
setc schedule "backup-Daily Inc" enabled 0

setc -m schedule "backup-Daily Full" action "backup -j \"Appgen\" -t \"Full\" -v
[\"/appgen/usr/appgen\", \"/appgen/usr/local/cvs\"]"
```

Note that any string instance must be surrounded by double quote characters. Because of this, any double quote characters within the string must be escaped using the backslash character (\ ). Unless the double quote is specifically required, you may also change all double quotes within the string to single quotes:

```
setc -m schedule "backup-Daily Full" action "backup -j 'Appgen' -t 'Full' -v
['/appgen/usr/appgen', '/appgen/usr/local/cvs']"
```

As with the other commands, use of the '-m' argument will return "OK" on a successful operation.

The datatables are listed below. In the Type column, S = string, I = integer, IL = a list of Integers within square brackets '[' and ']' separated by commas, SL= a list of quoted strings within square brackets '[' and ']' separated by commas.

Table Name	Displayed Name	Field Name	Type	Example
user:	ID		S	tjones
	Verifier	verifier	S	0x711CD6F45349C61A8D8E2FACF31AB9D03566492B13A1AF135A75285476090314D57A81CB83CE69180F9A5EC8DBB3A5131350DA5819731C5977E35FEEC0840994A8026940F7800544504D5B663B69DBCA4222A3088165C73D40547B09E2417E16331015734FE0C6CEA946C3603095E9B9D40D3622575DED88FDED1BAE25FFB785L
	Salt	salt	S	0x3421787BC09FBB2E02776FABB27CDD78L
	Stage Quota (Megabytes)	stage_quota	I	5000 (-1 = unlimited)
	Max stage file age (days)	stage_age	I	45 (0 = infinite)

destinations:	ID		**S**	My Destination
	Device name	device	**S**	ADIC, HP:2, EXABYTE
	Overwrite/append action	action	**S**	Ask, Overwrite, Append
	Slot list	slots	**IL**	[2, 3, 4, 5, ...]
	Last overwrite time	otime	**S**	Sep 18 23:45:13 2005

drives:	ID		**S**	ntape0, "My Drive", "/dev/nst0"
	Device name	dev_name	**S**	ntape0, /dev/nst0
	SCSI Device name	scsi_name	**S**	ntape0, /dev/sg2
	Vendor	vendor	**S**	CERTANCE
	Product	product	**S**	ULTRIUM 3
	Revision	rev	**S**	1724
	Block Size	block_size	**I**	131072, 262144
	Needs Eject	eject	**I**	0 or 1
	Megabytes written by drive	megs_written	**I**	23412

devices:	ID		**S**	EXABYTE, ADIC, "My Device"
	Drives	drives	**SL**	['ntape0', 'ntape1']
	Number of slots	slots	**I**	21
	Changer device	changer	**S**	changer0, /dev/sg0
	Vendor	vendor	**S**	EXABYTE
	Product	product	**S**	221L
	Revision	rev	**S**	1412
	Write buffer size (Megs)	buffer_size	**I**	128
	Free slot list	free_slots	**IL**	[15, 16, 17, 18, 19, 20]
	Device disabled	disabled	**I**	0 or 1
	Cleaning slot	cleaning_slot	**I**	21

machines:	ID		**S**	Jeremy, bruserver.bru.com
	Fully qualified domain name	fqdn	**S**	pc-00095,192.168.1.95 (This is a combination of the machine name, a comma, and the IPv4 address)
	Port used by BRU Server Agent	port	**I**	14442
	Time of most recent backup	last_backup	**S**	Sep 18 23:45:13 2005
	Use compression	compression	**I**	0 or 1
	Use encryption	encryption	**I**	0 or 1

backups:	ID		**S**	"Weekly Full", "My Inc"
	Machines and directories	md_list	**SL**	["/machine/path"]
	Base job name	base_job	**S**	empty if Full, or the name of a previously defined Full job is incremental or differential.
	Owner of this job	owner	**S**	admin
	Destination of backup	dest	**S**	"HP-default", "My Dest"
	List of email recipients	email	**SL**	["user@domain", "user2@domain"]

	Eject tape after done	eject	I	0 or 1 (only applies to standalone drives)
	Verify backup	verify	I	0 or 1
	Overwrite mode	omode	S	Empty, Overwrite, or Append
	Type of backup	type	S	Full, Incremental, or Differential
	Base time of backup	base_time	S	Sep 18 23:45:13 2005
	Frequency of backups	frequency	I	Never, Once, Hourly, Daily, Weekly, Monthly
	Divisor of main frequency	n	I	1 = Every 2 = Every Other 3 = Every Third ...
	Frequency dependent list 1	list1	IL	[0, ... , 6]
	Frequency dependent list 2	list2	IL	[0, ..., 5, -1, -2]
	Encryption Key	key	S	the private encryption key generated by the keygen application or the Console GUI
upstage:	ID		S	"My Weekly UpStage"
	Owner of this job	owner	S	admin
	Destination of backup	dest	S	"ADIC-default", "US-1"
	User to upstage	user	S	Empty means ALL. Username means only Staged archives owned by the specified user
	List of email recipients	email	SL	["user@domain", "user2@domain"]
	Eject tape after done	eject	I	0 or 1 (only applies to standalone drives)
	Verify backup	verify	I	0 or 1
	Overwrite mode	ov_mode	S	Empty, Overwrite, Append
	Base time of backup	base_time	S	Sep 18 23:45:13 2005
	Frequency of backups	frequency	S	Never
	Divisor of main frequency	n	I	1
	Frequency dependent list 1	list1	IL	Empty Set
	Frequency dependent list 2	list2	IL	Empty Set
	Keep Flag - For retaining archives after an upstage for offsite storage	keep	I	1 = Keep 0 = Delete
history:	ID		S	2005/12/04-18:41:56/ Backup/Appgen
	Date command was run	created_on	S	Sep 18 23:45:13 2005
	Command run by	created_by	S	admin
	Command text	command	S	backup -j "Appgen" -t "Full" -v ["/appgen/usr/appgen", "/appgen/usr/local/cvs"]
	Command output	history	S	(contains non-progress portion of the command results)

schedule:	ID		**S**	backup-Appgen
	Frequency	frequency	**S**	Never, Once, Hourly, Daily, Weekly, Monthly
	Divisor	n	**I**	1 = Every 2 = Every Other 3 = Every Third ...
	Base Time	base_time	**S**	Sep 18 23:45:13 2005
	List 1	list1	**IL**	[0, ... , 6]
	List 2	list2	**IL**	[0, ... , 5, -1, -2]
	Action	action	**S**	backup -j "Appgen" -t "Full" -v ["/appgen/usr/appgen", "/appgen/usr/local/cvs"]
	Enabled	enabled	**I**	0 or 1
	Owner	owner	**S**	admin
tapes:	ID		**S**	100000 series assigned number or barcode if tape has barcode and library supports barcode reader.
	Bar Code	bar_code	**S**	Empty or barcode value reported by library
	Bru ID/volume of first archive	first_archive	**S**	12 character Hex BRU ID: 41e23fa0987e1
	Number of rewrites	rewrites	**I**	5
	Last seen in device	lkp_device	**S**	ADIC, HP:2
	Last seen in slot	lkp_slot	**I**	18
	Date of last use	last_used	**S**	Sep 18 23:45:13 2005
	Date of first use	first_used	**S**	Sep 18 23:45:13 2005
	Tape full flag	full	**I**	0 or 1 (set by software)
	Tape inconsistent flag	inconsistent	**I**	0 or 1 (set by software, resettable after human intervention).
	Megabytes written to tape	megs_used	**I**	123265
	Unwritable tape	unwritable	**I**	0 or 1 (set by software - tape is either bad or write protected)
archives:	ID		**S**	12 character Hex BRU ID: 41e23fa0987e1
	Creation date	created_on	**S**	Sep 18 23:45:13 2005
	Machine	machine	**S**	"tiger1"
	Job that created this archive	job_name	**S**	Appgen
	Type of archive	type	**S**	Full, Incremental, or Differential
	Tape List	tapes	**SL**	100003, 100004 A0034L2, A0035L2
	Archive start blocks	start	**IL**	0, 231442
	Who created this archive	owner	**S**	admin

Appendix C - Backing Up The BRU Server Server

In addition to backing up client systems and even data from the BRU Server server itself, it is also a good idea to backup the BRU Server server environment as a separate data set for ease in recovering the server should it crash.

The server environment consists of the BRU Server binary components, the database table files, and the catalogs directory. Since the binary components will be recovered by a reinstallation of the BRU Server server, the only elements that should be protected specifically are the database tables and the catalogs directory.

Starting with BRU Server release 2.0.0, all platforms provide access to these elements from within the `/usr/local/bru-server` path. The list of files that should be protected with their own backup are:

`archives`	`backup`	`dest`	`devices`	`drives`
`history`	`license`	`machines`	`parm`	`schedule`
`tapes`	`upstage`	`user`		

Also be sure to include the `catalogs` directory and its contents in this backup.

Depending on your server system, there are a number of ways that you can protect these files. If you have a DVD burner (because the catalogs directory can get larger than a CD's capacity), it is possible to write them to a DVD (or two for safety). Because of the static state nature of BRU Server's database files, you can even simply drag-and-drop the files and folder listed above to another disk.

Additionally, you can define a single tape destination and backup these files as a special BRU Server backup job, or even manually load a tape and use the BRU standalone engine and back them up manually with a command line script such as:

```
#!/bin/sh

FILES1="archives backup dest devices drives history license"
FILES2="machines parm schedule tapes upstage user"
DIRS="catalogs"
DEV=/dev/nst0

cd /usr/local/bru-server
sudo tar -czvf ${DEV} ${DIRS} ${FILES1} ${FILES2}
```

This will backup the specified files onto a tape that is loaded in the drive recognized by the system as `/dev/nst0`. For OS X users the device name will be something like ntape0. Of course, this simple script won't control your library, so you will need to manually load and unload the media to perform this backup. You could also change the DEV variable to point to a file on a locally mounted remote filesystem like this:

```
DEV="/Volumes/Remote RAID 1/Helena_HS_Server.bru"
```

This would create a BRU archive on the mounted filesystem "`Remote RAID 1`" called "`Helena_HS_Server.bru`". This file may then be copied to a rebuilt server and restored after the BRU Server software has been reinstalled. The commands to restore such an archive could look like this:

```
cd /usr/local/bru-server
sudo tar -xzvf ${DEV}
```

This would restore all of the previous BRU Server data tables and return your BRU Server server environment to the state it was in at the time this backup was created. The '`-ua`' flag ensures that any existing data table files that were created during the installation will be overwritten by the backup copy.

Mac OS X Path Note: If the `/usr/local/bru-server` path is not found, this is because the BRU Server items may have been installed out of the proper order. On Mac OS X, the `/usr/local/bru-server` path is a symbolic link to the true location, which is `"/Applications/BRU Server Config Tool.app/Contents/MacOS/"` (note the quotes, these are required in the command line).

To simplify the process on Mac OS X and Linux, the Server Config Tool offers an automated method for accomplishing the backup and restore of the server environment.
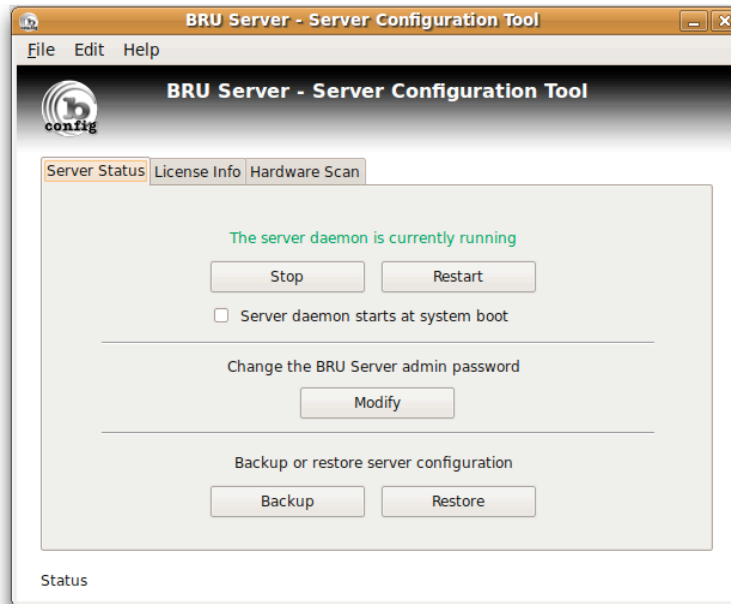
Server Config - Main Display (Linux Shown)

To backup or restore your server environment, click the Backup or Restore button as appropriate. You will be prompted for where to save the file or where to restore the configuration from. If you are restoring, you will be warned about overwriting the existing configuration.

Server Configuration - Restore Configuration Warning

Appendix D - BRU Messages

Overview

All BRU messages are associated with a number. The message number consists of a single letter followed by three digits. The first letter of the message number indicates the type of message (i.e.: **[I181]** is an Informational Message). The messages are listed below:

A - alert message

BRU is alerting the user of a problem. This problem or alert, is not as strong as an error or a warning message but none the less BRU will require a response. This is message is usually followed by a "Q" message

E - error message

BRU has found that the current operation has errors that it cannot overcome. Depending on the **MAXERRORS** setting in your **BRUTAB**, BRU will terminate with an execution summary exit code of 2.

I - informational message

Information regarding the current process. This type of message is echoed to the **/var/log/bruexeclog** file as an "L" message.

L - log message

Entry message to the **/var/log/bruexeclog** regarding the current process. Entry is a copy of what is sent to the screen with the "l" message. All entries are made with a date and time stamp.

Q - query message

BRU is waiting for a response to complete the current process.

W - warning message

BRU has found problems with the current operation. The errors where not serious but BRU was unable to resolve the issue. Depending on your setting for **MAXWARNINGS** in your **BRUTAB** file BRU will terminate the current process.

NOTE: You should investigate all WARNING and ERROR messages reported by BRU. These messages can result in not being able to restore your data.

Many BRU messages are the result of errors returned by the UNIX system. For these types of errors, the UNIX error message is included as part of the BRU message. This portion of the message is described below:

errno = code, description

code is the UNIX error number.
description is a brief text message associated with the error number. These are system values and are not BRU errors. BRU simply reports them as they are defined by the system.

The BRU messages are listed on the following pages. Following each message is an explanation and possible suggestions for corrective action.

BRU Message Code Listing

[E001] specify mode (-cdeghitx)

   The user ran BRU without specifying the mode. The user must specify a valid mode. See Appendix D for a list of BRU modes.

[W002] filename: can't open archive: errno = code, description

   BRU couldn't open the archive file filename for some reason. The reason is indicated by the UNIX error message. Make sure that the device actually exists. Also see if another process (or an old BRU process) still has control of the device.

[W003] filename: warning - close error on archive: errno = code, description

   BRU received an error from the operating system when BRU attempted to close the archive. The reason is indicated by the UNIX error message.

[W004] warning - archive read error at block blocknum: errno = code, description

   BRU received an unrecoverable error when attempting to read an archive. The reason for the error is indicated by the UNIX error message. Whatever data was available at that location in the archive is unrecoverable.

[W005] warning - archive write error at block blocknum: errno = code, description

   BRU received an unrecoverable write error while attempting to write an archive. The reason for the error is indicated by the UNIX error message. Whatever data that was to be written at that location in the archive has been discarded. Proper corrective action depends upon the situation and the specific file within which the error occurred. If this error occurred on the first block of an archive, the archive may be write protected, in which case, the wperr parameter is probably set incorrectly in the brutab file.

   Another possibility is that the I/O buffer size is too large for the given device. Experiment with a smaller buffer size. Set the buffer size with the bufsize parameter in the brutab file or use the -b option to set it on the command line.

[E006] seek error on archive: errno = code, description

   BRU received an unrecoverable seek error from the operating system on an archive file. The reason for the error is indicated by the UNIX error message. Make sure that your archive device actually has the capability to do random seeks to any location. Most tape drives do NOT have this capability. Check the value of the seek parameter in the brutab file. If your device does not have the ability to do random seeks, you must set seek=0.

[E007] media size smaller than I/O buffer size!

   This error was caused when BRU detected a media size that was inconsistent with the I/O buffer size. The media size should be at least as large as the I/O buffer size. It is not possible to write to device if the media size smaller is smaller than the buffer size (i.e. BRU cannot write 1 megabyte of buffer data to a floppy with a media size of 720 kilobytes). Check the brutab file and make sure that the bufsize parameter is less than size.

[W008] warning - buffer size bufsize exceeds maximum maxbufsize allowed for device

   Check the brutab file and make sure that bufsize is less than maxbufsize.

[E009] can't allocate bufsize archive buffer: errno = code, description

   This message was caused when BRU could not allocate an I/O buffer of the size requested. Try reducing the buffer size to a smaller value. This can be done with the **-b** command line option, or the **bufsize** parameter entry in the **brutab** file.

[W010] `filename: warning - block sequence error`

BRU detected an inconsistency in the ordering of blocks returned by the archive device on a read.

For example, BRU asked for blocks "11, 12, 13, 14, 15" and got blocks "11, 12, 14, 15, 16." This error may indicate a hardware problem. If this message occurs at the start of the 2nd volume (when reading a multiple volume archive), it probably means that the last few blocks of the previous volume were missing or were unreadable. This can occur if the media size parameter was set too large in the brutab file (i.e. size=150M for a 60 megabyte tape) during the backup and BRU attempted to write past the end of the previous volume. With some tape drives, it may also occur if the media size was set to zero (unknown). The problem can usually be avoided by setting the media size to a value that is certain to be less than the maximum capacity of the volume (i.e. set size=149MT for a 150 megabyte tape).

To detect and avoid this problem, always verify your archive immediately after the backup is performed. **`AUTOSCAN`** does this automatically for all devices that have an entry in the brutab file (unless **`noautoscan`** is set or you are using a **`norewind`** device).

[W011] `warning - file synchronization error; attempting recovery ...`

BRU was expecting to find a file header block while reading an archive, but instead found another type of block. This warning will occur if you started reading an archive at a volume other than the first, or skipped a volume in the middle of reading an archive. This error message can be suppressed with the **`-QV`** option flag. For more information on the optional flag see Chapter 8. BRU will scan each successive archive block looking for a file header block, and normal processing will resume from the first file header block found.

[W012] `filename: no file: errno = code, description`

The named file does not exist or part of the path name of the named file is not searchable given the current permission settings.

[E013] `filename: can't stat: errno = code, description`

The UNIX stat system call failed. This means that BRU was unable to obtain status information (ownership, access and modification times, link count, etc.) on the file. The reason for the error is indicated by the UNIX error message. Generally, this error is caused because the file is not accessible with the user's current permission settings. On networked systems, it may occur when trying to access remote (NFS-mounted) files. If this is the case, you should check your network permission settings.

[E014] `pathname path too big (1023 max)`

This error was caused when BRU detected a pathname longer than 1023 characters. No known UNIX system allows pathnames longer than 1023 characters, so this message may indicate that the filesystem is potentially corrupted or that something else is seriously wrong.

[E015] `*** OBSOLETE MESSAGE NUMBER ***`

[E016] `filename: can't open: errno = code, description`

BRU could not open filename. The reason is given as part of the UNIX error message. In many cases, this is caused by insufficient file access permissions.

[W017] `filename: warning - file close error: errno = code, description`

BRU received an error when attempting to close the file filename. The reason for the error is given by the UNIX error message.

[E018] `filename: read error: errno = code, description`

BRU received an error while reading a file. The reason is indicated by the UNIX error message. This message means that the file was not backed up properly. It may be an indication of hard disk failure, a corrupted filesystem, a damaged file that is unreadable, or other system problems (like an NFS problem.)

[W019] `filename: warning - file was truncated`

The file filename was truncated while BRU was in the process of reading or writing it. Usually, another program has modified the file that BRU was reading. This can occur if you are attempting to back up database files and the database program is active. If BRU was creating an archive at the time, the archived file is padded with sufficient null characters to bring it back to the size it was originally (the size of the specified file when BRU began to archive it). This is the same size recorded in the file header block. If this message occurs while backing up, the data archived from filename is probably not correct (because the data was changed while BRU was reading it). Even though BRU may restore this file later without any warnings, the data could contain errors. If this message occurs while restoring an archive, it indicates that a problem occurred and that BRU was unable to restore data from the last part of the file.

[W020] `filename: warning - file grew while archiving`

The file filename grew in length while BRU was in the process of reading it. If BRU was creating an archive at the time, the archived file was truncated to it's original size (the size of the file when BRU started to read it). This is the size recorded in the file header block. This warning is commonly seen for log or database files, to which information is constantly being added. It can generally be avoided by backing up the system in single user mode (or by shutting down the database before doing a backup). If the file causing this message is not critical (i.e. log files like **`/var/log/bruexeclog`**) you may wish to exclude these files from the backup. This can be done by specifying a pattern in the **`bruxpat`** file and using the **`-QX`** option.

[W021] `filename: warning - can't set user id: Not owner`

BRU attempted to extract filename which was stored with the **`suid`** bit set and the user running BRU was not the original owner of the file (and did not have superuser privileges).

[W022] `filename: warning - can't set group id: Permission denied`

BRU attempted to extract filename which was stored with the **`sgid`** bit set and the user running BRU was not the original owner of the file (and did not have superuser privileges).

[E023] *`filename`*`: can't exec: errno = code, description`

BRU could not execute the file filename for the reason given as part of the UNIX error message. Generally, this error occurs because filename does not exist, or it was not executable by the user running BRU.

[E024] `can't fork, try again: errno = code, description`

This error was caused when BRU couldn't execute a fork system call. The reason is indicated by the UNIX error message. Generally, this indicates the system is in serious trouble, or the per-user limit on processes has been exceeded.

[E025] `unrecognized wait return statcode`

The wait system call returned a status code of statcode which BRU was not able to understand. If this error occurs it may indicate that there is a problem with your system or that your version of BRU is incompatible with your current version of UNIX. If you have upgraded your operating system, you may also need to upgrade your copy of BRU.

[E026] `child interrupted: errno = code, description`

The child process which BRU was waiting for was interrupted. The reason for the error is indicated by the UNIX error message.

[E027] *`filename`*`: fatal error; stopped by signal sigcode`

The child process, filename, which BRU was waiting for was stopped by a UNIX signal. The reason is indicated by **`sigcode`**.

[E028] *`filename`*`: fatal error; terminated by signal sigcode`

The child process, filename, which BRU was waiting for was terminated by a UNIX signal. The reason is indicated by **sigcode**.

[W029] *filename* **core dumped**

BRU was waiting for a child process, filename, which terminated abnormally and dumped to core.

[E030] inconsistent wait status wait code

BRU received an unexpected return code of wait code from a UNIX wait system call. Usually, the child process which was being run has gone berserk in some manner. This error may indicate that there is a problem with your system or that your version of BRU is incompatible with your current version of UNIX. If you have upgraded your operating system, you may also need to upgrade your copy of BRU.

[E031] can't set uid to userid: errno = code, description

BRU received an error when trying to run the **setuid** system call. The reason is given by the UNIX error message. If this error occurs, it indicates a possible UNIX system bug or an internal bug in BRU.

[E032] can't set gid to groupid: errno = code, description

BRU received an error when trying to run the **setgid** system call. The reason is given by the UNIX error message. If this error occurs, it indicates a possible UNIX system bug or an internal bug in BRU.

[W033] *filename*: **warning - error count block checksum errors**

While reading an archive, BRU detected **errcount** number of checksum errors in the specified file. This message can occur if the archive was originally written with errors-possibly caused by a buffer size setting that is too large. Try setting the buffer size to a smaller value when creating the archive (i.e. set **bufsize=10K** in the **brutab** file or use the **-b 10K** option on the command line). When reading an archive, BRU normally attempts to read the archive with the write buffer size (it obtains the write buffer size from the archive header block stored at the start of the archive). The proper buffer size varies with the system and type of tape drive. In some cases, a tape written on one system (with a large buffer size like 64K) cannot be read properly on another system (which can only handle a small buffer size like 10K). If this is the case, you may be able to force BRU to read the tape by forcing the buffer size to smaller value (i.e. specify **-b 10K** as one of the command line options). Checksum errors may also be caused by hardware or tape problems. Try cleaning the heads on your tape drive. Try to retention the tape. Also, make sure that your tape cartridges are in good shape-tapes do not last forever. They should be rotated frequently and replaced on a regular basis. Make sure that you are using the proper kind of tape with your tape drive. Many tape cartridges look the same (especially 1/4" tapes), but have different densities. For instance, if you have a 150 MB tape drive, you should use 150 MB (DC6150) or 250 MB (DC6250) tape cartridges. You will get errors if you try to write to a 60 MB (DC600A) tape.

[E034] internal bug in routine routinename

BRU detected some sort of internal bug in the routine **routinename**. If this error occurs, it may possibly be a bug in BRU, or a hardware or kernel software problem. If it is not repeatable, it is likely to be a hardware or kernel bug. This message should be reported to TOLIS Group Tech Support.

[E035] can't allocate byte_count more bytes: errno = code, description

BRU ran out of memory for some reason. This error generally occurs when BRU tries to create a tree from a list of filenames read from the standard input, or when memory is very limited on the system due to hardware or CPU constraints.

[E036] internal error in tree; pathname overflow

While building a file tree, BRU created a path which exceeded 1023 characters in length. No known UNIX system allows pathnames longer than 1023 characters, so this message may indicate that the filesystem is corrupted or that something else is seriously wrong.

[E037] * OBSOLETE MESSAGE NUMBER ***

[E038] `filename: seek error: errno = code, description`

BRU received an error when attempting to seek to a certain location in the file that it was reading or writing. The name of the file is indicated by filename. The reason for the error is given by the UNIX error message. This error is rare and usually indicates a hardware problem with the disk drive.

[W039] `warning - info block checksum error`

BRU detected a checksum error while reading the first block of an archive. The info block (archive header block) contains information about the archive which is of use to BRU, but not critical to reading or extracting files from the archive. Make sure that the archive you are attempting to read was actually written by BRU. This error often occurs when attempting to read a tape written by another program (like `tar` or `cpio`). It may also occur if you try to read a tape that is blank. If this is the ONLY warning or error message (and BRU appeared to work normally), it can usually be ignored. In this particular case, it means that BRU had trouble reading the first block of the archive, but was able to skip past the first block and read the rest of the archive normally.

[E040] `filename: write error: errno = code, description`

BRU received an error when attempting to write to the file filename. The reason for the error is shown by the UNIX error message. If this error occurs, it usually indicates a hardware problem with your hard disk. It could also indicate that the filesystem containing filename is out of space, or that the filesystem is write- protected (it may be mounted as "read-only" or you may not have write permission).

[W041] `filename: warning - error setting mode: errno = code, description`

BRU received an error when attempting to set the mode of filename. The error occurred when BRU was executing the system call `chmod`. The reason is indicated by the UNIX error message.

[W042] `filename: warning - error setting owner/group: errno = code, description`

BRU received an error from the operating system when attempting to set the owner id or group id of filename. The error occurred when BRU was executing the system call chown. The reason is indicated by the UNIX error message. On systems which support symbolic links, this error can occur when BRU attempts to set the owner/group id of a symbolic link which points to a file which does not exist. This can occur if the symbolic link filename is restored, but the file the symbolic link points to is not restored.

[W043] `filename: warning - error setting times: errno = code, description`

BRU received an error from the operating system when attempting to set the access and modification times of filename. The error occurred when BRU was executing the system call `utime`. The reason is indicated by the UNIX error message.

[E044] `filename: error making node: errno = code, description`

BRU received an error when attempting to create a special file system node, such as a FIFO, block special file, or character special file. The error occurred when BRU was executing the system call `mknod`. The reason is indicated by the UNIX error message. This message may occur when trying to restore special files and you do not have superuser privileges. On some systems, only the root user has the ability to create special files.

[E045] `filename1: can't link to filename2: errno = code, description`

BRU received an error when attempting to make a hard link between `filename1` and `filename2`. The reason is indicated by the UNIX error message. This message occurs when `filename2` already exists and cannot be overwritten by a link.

[E046] `internal error; inconsistent phys blk addrs`

[W047] `warning - missing archive header block; starting at volume volnum`

BRU couldn't find an archive header block at volume number `volnum`. This warning is normal when BRU is asked to start reading an archive at some other volume than the first volume. For example,

you will see this message if you immediately try to restore files from the 3rd tape of an archive (without reading through the 1st and 2nd tapes). If you want to start from a different tape other then the first tape. You must use the **-QV** option, this will suppress the error message.

[W048] filename: warning - lost linkage: errno = code, description

BRU could not preserve the linkage of two files. The reason is indicated by the UNIX error message. Generally, this error is seen when BRU ran out of memory when it attempted to allocate memory internally to maintain the linkage information of the specified file. In this case, the file would be archived as two separate, distinct files in the archive. Only the linkage information would be lost.

[W049] filename: warning - linknum unresolved link(s)

While archiving the file filename, BRU detected **linknum** number of unresolved links to filename. This error is generated when there is still another pathname which points to filename which does not appear in the archive. Usually, this message occurs when BRU is asked to archive a set of directories that contain files that have hard links to files located in other directories (that are not archived by BRU). This message can be disabled by specifying the **-l** option on the command line.

[W050] ttyname: warning - can't open for interaction: errno = code, description

BRU could not open the **tty** stream **ttyname** to interact with the user. The reason for the error is given by UNIX error message. This message may occur when attempting to run BRU in the background and the **-B** option (background mode) has not been specified. When run in the foreground, BRU attempts to use the **/dev/tty** device to communicate with the user. In background mode, **/dev/tty** is not available. In this case, the interaction pathnames can be specified with the **-Iq,queryfile** and **-Ir,replyfile** options on the BRU command line (this is normally used when running BRU with the **brutalk** program).

[E051] date conversion error: date

The string specified by date is not in the proper format or is not a legal date and time.

[W052] warning - uname failed: errno = code, description

BRU received an error when attempting to execute the **uname** system call. The reason is indicated by the UNIX error message.

[W053] warning - label string too big

BRU has a string length limit of 63 characters for a user specified label (used with the **-L** option). You must shorten the length of your label string.

[E054] error - invalid uid/filename as -o argument: pattern

BRU could not convert a given symbolic user name to the internal numeric form. This error usually occurs when the **-o** option is used and BRU cannot find username in the **/etc/passwd** file.

[E055] error - illegal wildcard pattern: pattern, errmsg

The wildcard matching pattern specified by pattern is not legal. The reason is indicated by **errmsg**.

[E056] *filename*: can't overwrite: errno = code, description

The file filename could not be overwritten during extraction. The reason is indicated by the UNIX error message. In most cases, this message is due to a permissions problem.

[W057] *filename*: can't access for write: errno = code, description

The file filename could not be accessed for write. The reason is indicated by the UNIX error message. In most cases, this message is due to a permissions problem.

[W058] *filename*: can't access for read: errno = code, description

The file filename could not be accessed for read. The reason is indicated by the UNIX error message. In most cases, this message is due to a permissions problem.

[W059] *filename*: warning - will not be contiguous: errno = code, description

BRU was unable to create the file filename as a contiguous file. The reason is indicated by the UNIX error message. This message should only occur on systems that support contiguous files (like **Masscomp** or **HP-UX**).

[W060] *filename*: warning - contiguous files not supported, extracted as a regular file

The file filename cannot be restored as a contiguous file, so BRU will create a regular UNIX file instead.

[E061] can't read both file list and archive from stdin!

BRU was instructed to read both an archive and a list of files from the standard input stream. This error occurs when an illegal BRU command like the following is entered: **bru -x -f - -**

[W062] warning - premature end of volume volnum

When reading/writing an archive device, BRU encountered an end-of-file (or got an I/O error) before reaching the expected end of the archive. This message is often preceded by messages [W004] or [W005]. In this case, it may indicate a problem with the tape drive hardware, old or damaged tapes, or incompatible tape formats (i.e. trying to write to a 60MB tape cartridge on a 150MB tape drive).

[W063] warning - media appears to be unformatted: errno = code, description

When BRU first attempted to read/write to a device it received an error. The reason is indicated by the UNIX error message. If BRU receives an error on the first read or write to an archive device, and the error conditions match the values set in the **brutab** entry for unformatted media in this device, BRU will issue this warning message. When writing, if the format and **fmtcmd=** parameters are set for the device, this warning will be suppressed and BRU will attempt to format the media.

[O064] *** OBSOLETE MESSAGE NUMBER ***

[W065] warning - using internal default device table

BRU could not find the brutab file specified by the BRUTAB environment variable, or the default brutab file located in **/etc/brutab**. In this case, BRU used its internal brutab, which may not be correct for the current archive device.

[I066] *filename*: not restored

This is an informational message. BRU did not restore the file filename because the current file (on the disk) has a modification time that is newer than the file read from the archive. This is BRU's default method of restoring files. If you wish to overwrite all files, regardless of date, you should add the **-ua** option to the BRU command line.

[W067] warning - media appears to be write protected or wrong density

BRU received an error on its first attempt to write to an archive device. BRU has determined that it might be caused by media that is write-protected. The UNIX system may not return the proper error code, so it is not always possible for BRU to determine if the media is actually write-protected. BRU tries to determine the write-protect status by comparing the **errno** code returned by UNIX with the value of **wperr** (as specified for the device in the brutab file). If **wperr=0** (or is not set) then BRU must "guess" at whether the device is truly write-protected. In this case, it assumes that an error on the first write attempt is caused by write-protection, and issues the above message.

[W068] *filename*: warning - not found or not selected

The user specified a file on the command line which BRU did not find. The file filename may not exist or may be spelled incorrectly. If you are attempting to extract (restore) a file, make sure that filename EXACTLY MATCHES with the desired filename on the archive, including any beginning slashes. For example:

> **/myfile DOES NOT MATCH./myfile.**

[W069] warning - may have to use -F option to read archive

BRU encountered an archive which does not appear to have checksum. The archive may have been written with **-F** option (which is not recommended) and must be read with the same option. This message sometimes occurs when BRU attempts to read an archive that was written by another program, like **tar** or **cpio**. It can also occur when BRU has trouble reading a BRU archive due to bad tapes, dirty tape heads, hardware problems, incompatible tape formats, etc.

[E070] interaction needed, aborted by -B option

BRU was run with the **-B** option, indicating that it is running in background mode and that no user interaction is possible. It encountered a condition that required user interaction (like loading a new tape) and terminated. The **-B** option is normally set automatically when BRU is started in the background, so this message may occur even if **-B** was not explicitly specified.

[E071] *filename***: error making directory: errno = code, description**

BRU received an error when attempting to create a directory. The reason is indicated by the UNIX error message. In most cases, this occurs when the user has insufficient permissions.

[E072] *filename***: error reading symbolic link: errno = code, description**

BRU could not read a symbolic link for some reason. The reason is indicated by the UNIX error message.

[E073] *filename***: symbolic links not supported**

While running on a system that does not support symbolic links, BRU encountered a symbolic link while comparing an archive in differences mode (-d option).

[E074] *filename***: could not make symbolic link: errno = code, description**

While extracting the symbolic link filename, BRU was unable to create a symbolic link. The reason is indicated by the UNIX error message. This error will occur if your version of UNIX does not support symbolic links.

[E075] *filename***: could not make fifo**

BRU tried to extract a FIFO (named pipe file) on a system which does not support FIFOs. Normally, BRU tries to create a regular file with the same name. In this case, the attempt to create a regular file was unsuccessful.

[W076] warning - link of filename to dirname, dirname is a directory, no link made

BRU was asked to create a symbolic link from filename to the directory **dirname**, on a system which does not support symbolic links. Since hard links to directories are not allowed by UNIX, this warning is issued and no link is made.

[W077] warning - link of filename1 to filename2, filename2 does not exist

BRU attempted to create a hard link from **filename1** to **filename2** and **filename2** does not exist. Generally, this message occurs when BRU is asked to do a partial restore and **filename2** is not present.

[W078] warning - extracted fifo filename as a regular file

BRU was asked to extract a FIFO named filename on a system which does not support FIFOs. It extracted filename as a regular file. The correctness or desirability of this behavior is subject to debate, which is why the warning is issued.

[W079] *filename***: warning - linkcount additional link(s) added while archiving**

While BRU was archiving a file, there were **linkcount** additional links made to it. These additional links may or may not have been archived.

[W080] * OBSOLETE MESSAGE NUMBER ***

[E081] no default device in brutab file, use -f option

BRU could not find a default device in the **brutab** file. The default device is always the first device entry in the **brutab** file.

[EO82] *** OBSOLETE MESSAGE NUMBER ***

[W083] warning - attempt to change buffer size from oldbufsize to newbufsize ignored (incompatible brutab entries)

BRU detected different default buffer sizes when reading or writing to multiple devices (device cycling). The buffer size is not allowed to change between volumes of an archive. This error usually occurs at the start of the second device, when BRU reads the **bufsize** parameter for that device (from the **brutab** file) and discovers that the buffer size differs from the size used by the first device. To avoid this warning message, use the **-b** option to force a specific buffer size for all devices.

[E084] double buffering I/O error, bytecount bytes read/written: errno = code, description

[E085] problem setting up double buffering, using normal buffering

Both of these errors indicate that BRU encountered a problem setting up the double buffering. Sometimes, reducing the I/O buffer size will remedy the problem.

[E086] *filename*: media ejection failed: errno = code, description

On systems which support ejection of archive media under software control, BRU may be configured to eject each media when it is done with the media. BRU encountered some sort of error while attempting to eject the media.

[I087] *filename*: compressed version was larger, stored uncompressed

When file compression is utilized via the -Z option, BRU will check to ensure that the compressed version of the file uses fewer archive blocks than the uncompressed version. If the compressed version will not result in any savings in archive space (it is larger than the normal file), then the uncompressed version will be archived instead.

[E088] *filename*: decompression failed (errmsg)

BRU received an error from when attempting to decompress a file. The reason is indicated by **errmsg**. The file filename has not been extracted properly and may contain errors.

[W089] warning - estimate mode ignores compression

BRU was told to use both the **-e** and **-z** options simultaneously. Because of the large overhead in compressing files, and because there is no way to determine the compression ratio without actually doing the compression, BRU cannot estimate how much archive space is required for an archive when compression is enabled. Therefore, the **-e** option ignores possible savings due to compression.

[W090] *filename*: warning - not deleted: errno = code, description

BRU received some sort of error while attempting to delete (unlink) filename.

[W091] *filename*: warning - compression failed, stored uncompressed

BRU received an error from UNIX when BRU attempted to compress filename for storage (such as a filesystem temporary space overflow). BRU could not generate the compressed version of the file. Thus, the file was stored uncompressed.

[E092] *** OBSOLETE MESSAGE NUMBER ***

[W093] warning - buffer size bufsize exceeds system imposed limit buflimit with double buffering

While attempting to set up double buffering using System V Style shared memory support, BRU was asked to use an I/O buffer size which resulted in the double buffering buffers exceeding the system imposed shared memory limits. Try setting **shmmax** to a smaller value.

[W094] warning - buffer size automatically adjusted to bufsize

While attempting to set up double buffering using System V Style shared memory support, BRU was asked to use an I/O buffer size which resulted in the double buffering buffers exceeding the system imposed shared memory limits. The I/O buffer size was automatically adjusted downwards to the maximum size which the system could support.

[E095] could not get shared memory segment: kilobytes: errno = code, description

BRU was attempted a system call to **shmget** and was unable to get the requested amount of shared memory. The reason is indicated by the UNIX error message.

[E096] could not attach shared memory segment: errno = code, description

BRU made a system call to **shmget** which failed after BRU had already made a successful **shmget** call. The reason for the error is indicated by UNIX error message.

[E097] could not allocate message queue: errno = code, description

BRU could not allocate the memory needed to perform double buffering (**-D** option). The reason is indicated by the UNIX error message. Your system may not support shared memory, or the shared memory parameters (**shmmax**, **shmseg**, **shmall**) may not be set correctly in the **brutab** file.

[E098] warning - don't understand -I option badargs

The string **badargs** was not recognized as a valid argument for the interaction option **-I**.

[W099] warning - need more than segments shared memory segments

BRU was not able to allocate enough shared memory segments. Try setting the **shmseg** parameter for the device in use to a lower value.

[W100] warning - failed to move break value by {number of bytes} bytes: errno = code, description

BRU made a system call to **sbrk** which failed. BRU was unable to adjust the break value. This message is only caused when BRU was previously able to adjust the break value to the desired place; or should be able to adjust the break value, such as when reducing the amount of memory used.

[W101] warning - compression initialization failed, -Z suppressed

BRU could not acquire sufficient memory to perform the requested file compression. Compression was not performed. Try reducing the number of bits in compression by using the **-N** option with a lower value.

[W102] warning - unknown child died, pid pidnumX(expected pidnum), status statcode

While waiting for a specific child process to exit, the wait system call returned to BRU the pid of another process, **pidnumX**, which exited with the status of **statcode**. This error should never occur. If this error occurs, it is usually indicative of a serious problem with the system.

[E103] double buffer child died, status statcode

The child process used by BRU for double buffering died unexpectedly. The reason is indicated by the UNIX status code **statcode**.

[E104] warning - double buffer child error errcode

The child process used by BRU for double buffering received some sort of fatal error, which the child process was able to recognize as unrecoverable. The reason for the error is indicated by **errcode**.

[W105] warning - no double buffer child to reap: errno = code, description

BRU was waiting for a double buffer child to exit and the wait system call failed for some reason which was unexpected in the parent process.

[W106] warning - archive device may need "shmcopy" flag set in brutab entry

On some systems, the device driver for a given archive device may not be able to do I/O directly to or from shared memory. BRU detects this condition when the first write to, or the first read from, a given device fails with UNIX error code `errno` set to `EFAULT`. BRU issues this warning message and automatically attempts to switch to a mode where the data is copied to or from a local buffer. This automatic switching generally succeeds on writes and fails on reads, which is why the suggested fix is printed as a warning message.

[E107] *filename*`: error - unrecoverable archive write error, some data lost: errno = code, description`

BRU received an unrecoverable write error while creating an archive, and all or part of the data was lost for filename. This message may be an indication of tape hardware problems, dirty tape heads, an improper BRU buffer size, tapes that need retensioning, or tapes that are simply worn out. On high-density tape drives, this message can occur when an attempt is made to write to a low-density tape. Usually this happens with 1/4" tape cartridges, which all look similar. For example, this error will occur when using a 150MB tape drive to write to a DC600A (60MB) or DC300 (30MB) tape cartridge. High-density tape drives can normally read low-density cartridges, but they cannot write to them.

[W108] `warning - media appears to be unformatted or write protected: errno = code, description`

This is a general warning which may appear on the first attempt to read or write an archive volume which is unformatted, or when an attempt is made by BRU to write to an archive which is write-protected. The reason for the warning is indicated by the UNIX error message. This warning may also occur if the backup device does not respond properly when BRU attempts to open the device for writing. BRU is "faked out" and thinks that the device is write-protected. This often occurs with on the first attempt to write to a SCSI device. Try repeating the command. If BRU works successfully, this message can be safely ignored.

[W109] `warning - assuming end of volume volnum (unknown size)`

BRU encountered an unrecoverable read or write error before reaching the end of an archive while reading or writing a volume of unknown size. BRU may have actually reached the end of the volume, or BRU may have simply reached a bad spot on the media, which BRU cannot proceed past. Because BRU does not know the media size, BRU has no way of knowing the difference, hence, the warning message. If no other warnings, or errors, occur, this warning is benign.

[W110] `warning - found volume volnumX, expecting volnum`

BRU was expecting to find volume `volnum` and it encountered a different volume. Remove the volume and replace it with the correct volume.

[O111] `*** OBSOLETE MESSAGE NUMBER ***`

[W112] `warning - volume not part of archive created archivedate`

BRU received the correct volume number, but the date of the volume differs from the current archive. Generally, this warning occurs when the wrong tape is inserted while attempting to extract an archive.

[A113] `alert - all data currently on devicename will be destroyed`

When the brutab entry for a device includes the `qfwrite` boolean value, this message will be issued on the first write to the first volume placed in that device, and BRU will wait for confirmation to continue. In devices which might share both mounted and unmounted media, this prevents inadvertently overwriting media which may have been left in the device by mistake.

[I114] `*** OBSOLETE MESSAGE NUMBER ***`

[A115] `*** OBSOLETE MESSAGE NUMBER ***`

[I116] `*** OBSOLETE MESSAGE NUMBER ***`

[I117] `don't know how to rewind archive device`

BRU doesn't know how to rewind the present archive device.

[A118] `rerun with "-b bufsizek" argument`

Re-run your BRU command with the specified buffer size

[Q119] action filename: please confirm [y/n/g]

BRU is waiting for confirmation of the given action. The **-w** flag was specified on the command line.

[Q120] query options [default: Option] >>

General message used to prompt user with various messages.

[A121] load volume volnum - press ENTER to continue on device device name

[W122] *filename*: warning - too large under current ulimit, not extracted

The size of filename exceeds the current ulimit. Set ulimit to a larger value and try again.

[E123] ulimit call failed to set maximum file size limit to blkcount blocks

BRU was unable to set the ulimit to a larger value.

[W124] warning - no double buffering support included in this version

Your version of BRU does not support double buffering. BRU reverts to normally buffered I/O.

[W125] warning - shared memory does not appear to be working in your kernel

Verify the settings in you kernel. Contact your UNIX provider for help.

[E126] problem sending message to other process

While in double-buffer mode, BRU could not communicate with the child process.

[E127] problem receiving message from other process: errno = code, description

While in double-buffer mode, BRU could not communicate with the child process.

[W128] *filename*: warning - file contents changed while archiving

BRU found that the file it was backing up had been changed. This can happen during live system backups. BRU does not lock files when reading. If a file is modified while BRU is reading it, this message will occur.

[W129] * OBSOLETE MESSSAGE NUMBER ***

[W130] warning - I/O error on first block

BRU cannot read or write the first block of the archive. Verify that the given device has a tape in the drive and that the tape has not been ejected.

[W131] warning - archive device may need "ignoreclose" flag set in brutab entry

We have found that some tape drives require this setting in the brutab file. For additional information on this settings please refer to chapter 4 of this User's Guide

[W132] warning - media size automatically adjusted to size

This message is issued when BRU starts writing to a new volume and has changed the media size to a value which is different than the size originally specified. This can occur if BRU encountered the end-of-tape sooner than expected. For example, the media size was specified as 150M, but BRU hit the end-of-tape (on the first tape) at 120 Mb. BRU will then ask for the next volume and adjust the media size (for the second tape) to a value slightly less than 120 Mb.

[W133] warning - no entry for device devicename in brutabfile

BRU could not locate an entry in your brutab file for the given device.

[E134] internal error errcode - failed self consistency and portability checks

This indicates that the BRU executable file has been damaged or the BRU version is not the correct one for your system. This usually occurs when BRU cannot successfully determine your timezone offset from GMT or receives a bad value for the current date and time from a tzset function call.

[E135] path beginning with filename too large (maxlen characters max)

The specified filename exceeds the system limit.

[W136] filename1: warning - link to filename2 broken, saved as duplicate

The character length of the link name **filename2**, was too large to store in the file header block.

[W137] warning - wait failed: errno = code, description

During double-buffering, an error occurred while waiting for a child process.

[E138] error - unable to format device devicename

BRU could not format the device. It may be write protected, or command specified by **fmtcmd=** failed when attempting to format the device.

[E139] error - timed out during execution of pid pidnum

BRU attempted to execute an external program and the process timed out.

[E140] error - unable to read include/exclude pattern file: filename

The specified include/exclude pattern contains an error. BRU could not read the file.

[W141] warning - bruxpat pattern: pattern, errmsg

The specified include/exclude pattern contains an error. The reason for the error is indicated by **errmsg**. Edit the bruxpat file to correct the problem.

[W142] -E option ignored with -c, -e, -i or -t options

This is an illegal command option for the given modes (**-c -e -i** or **-t**)

[I143] rewinding volume [volnum] to begin autoscan

BRU prints this informational message to let you know it is rewinding volume number **volnum** to begin the **AUTOSCAN**. Rewinding may sometimes take a substantial (several minutes) length of time, it depends on the speed of your tape drive.

[I144] begin autoscan of volume [volnum]

BRU prints this informational message to let you know it has begun the auto-scanning of volume number **volnum**. Auto-scanning may sometimes take a substantial (several minutes to over an hour) amount of time, depending on the speed of your archive device.

[E145] autoscan checksum error at block blocknum (kbsize)

BRU detected a problem while performing a checksum validation during the **AUTOSCAN** phase. It could be an indication of tape hardware problems, dirty tape heads, an improper BRU buffer size, tapes with the wrong density, tapes that need to be retensioned, or tapes that are simply worn out. If this message occurs at the beginning of a tape (**blknum** is less than 10), it may indicate that your tape drive (or device driver) contains a bug and returned control to BRU before it finished rewinding. BRU tried to start the **AUTOSCAN**, but was unable to read the tape (because it was still rewinding). Often this problem can be fixed by setting the **maxrewindtime** parameter for your device in the **/etc/brutab** file. A setting of **maxrewindtime=300** seems to work for most tape drives. Sometimes this message occurs with tape drives that are confused by BRU's overwrite-protect feature. If overwrite-protect is enabled, BRU attempts to read the tape before it tries to write. Some tape drives cannot handle this. If this is the case, edit the **/etc/brutab** file and disable the global brutab parameter "**#+ OVERWRITE PROTECT**" by removing the "**+**" sign or by deleting the line.

[E146] unable to get memory (bytecount bytes) needed for autoscan buffer

BRU is unable to allocate enough memory to create an **AUTOSCAN** buffer. This message usually indicates that the buffer size (the **bufsize** or **asbufsize** parameters in **/etc/brutab**) is too large. It may also be caused by a shortage of memory or by system problems.

[W147] cannot do autoscan - device 'devicename' has "flagname" flag set in brutab

This usually indicates that the **norewind** or **noautoscan** flags are set in the device entry in your **/etc/brutab** file.

[E148] autoscan read error at block blknum (kbsize): errno = code, description

BRU received an error when attempting to read an archive during the **AUTOSCAN** phase. The reason for the error is indicated by the UNIX error message. This message may be an indication of tape hardware problems, dirty tape heads, an improper BRU buffer size, tapes with the wrong density, tapes that need retensioning, or tapes that are simply worn out. Often, this message occurs along with 〔E145〕. Refer to its description for more information.

[W149] autoscan detected errors - media or hardware may be bad

This message indicates that errors or warnings were detected during the **AUTOSCAN** phase.

[I150] autoscan of blkcount blocks on volume [volnum], time, speed Kb/sec

[L151] autoscan of blkcount blocks on volume [volnum], time, speed Kb/sec

These messages are completion messages for the **AUTOSCAN** pass.

[E152] error - timed out trying to open filename

BRU timed out while trying open a device or file.

[E153] error - timed out trying to read

BRU timed out while trying read form a device or file.

[E154] error - timed out trying to write

BRU timed out while trying to write to a device.

[E155] error - memory fault (SIGSEGV)

BRU received a **SIGSEGV** signal from your OS. This is generally indicative of a memory issue in your system.

[E156] error - memory fault (SIGSEGV) in child process

BRU received a **SIGSEGV** signal from UNIX on one of its child processes. This is generally indicative of a memory issue in your system.

[E157] error - received terminate signal (SIGTERM)

BRU received a **SIGTERM** signal from your OS.

[E158] error - received quit signal (SIGQUIT)

BRU received a **SIGQUIT** from your OS.

[E159] error - received interrupt signal (SIGINT)

BRU received a **SIGINT** signal from your OS.

[E160] error - received hangup signal (SIGHUP)

BRU received a **SIGHUP** signal from your OS.

[E161] error - received strange signal (signame)

BRU received an unexpected signal.

For more information on the various signals please refer to your operating systems documentation or contact the OS manufacturer.

[W162] warning - unable to open execution log file 'logfilename': errno = code, description

BRU was not able to open the **bruexeclog** file. This could be due to a permissions problem or the location of the file is not what BRU expected. With every BRU command or operation BRU will attempt to make an entry to the **BRUEXECLOG** file.

[L163] START (info), CMD = 'cmdline'

The entry in you **BRUEXECLOG** and to your screen shows that actual command that was started during your BRU process. It also shows you the release and version of BRU you are running.

[L164] START - child process for double-buffering

[L165] FINISH - warncount warnings, errorcount errors, exit code = exitcode

[L166] starting volume volnum on device "devicename"

[L167] device = devicename, buffer = bufsizeK bytes, media size = size

[E168] * OBSOLETE MESSSAGE NUMBER *****

[E169] error - bad argument for -T option

The user entered BRU options in an illegal combination.

[E170] error - illegal combination of mode options (-cdeghitx)

The user entered BRU options in an illegal combination.

[W171] warning - needs to be owned by root and have suid bit set

[W172] warning - cannot open device 'devicename' to do autoscan

BRU could not open **devicename** to perform **AUTOSCAN** verification.

[E173] error - exceeded warning count limit of maxwarn

BRU exceeded the maximum number of allowed warnings and terminated. The maximum number of warnings can be changed with the **BRUMAXWARNINGS** environment variable.

[E174] error - exceeded error count limit of maxerror

BRU exceeded the maximum number of allowed errors and terminated. The maximum number of errors can be changed with the **BRUMAXERRORS** environment variable or the **BRUMAXERRORS GLOBAL BRUTAB** setting - see Chapter 4.

[E175] error - bad pattern match on: {/etc/bruxpat}, entry

This would and should be superseded by **[W141]**.

[E176] error - bad raw block size = blksize, cannot extract raw file 'filename'

BRU cannot restore or extract the given raw file from the archive. The information specified in the **BRURAW** file has an incorrect block size defined.

[W177] warning - specified size is too large, try setting size to newsize Kbytes

BRU has determined that the size given for the device you are using as an archive deice is to high. BRU has suggested that you use a smaller size as the one specified in this warning message.

[L178] rewinding volume [volnum] to begin autoscan

BRU writes this message to the **bruexeclog** to time stamp when it began to rewind volume **volnum** prior to starting an **AUTOSCAN**. Rewinding may take a substantial (several minutes) amount of time.

[L179] issued reset cmd 'cmdstring'

BRU has reset the device as specified by the reset command you defined in the **BRUTAB** file

[W180] warning - reset cmd error: errno = code, description

BRU received a UNIX error message when attempting to reset the device with the given reset command as specified in the **BRUTAB** file

[I181] read/wrote blkcount blocks on volume [volnum], time, speed Kb/sec

This reports the number of blocks written/read during the current BRU process. This will also indicate the speed at which the process ran by showing you the time and speed in Kb/sec.

[L182] read/wrote blkcount blocks on volume [volnum], time, speed Kb/sec

This reports the number of blocks written/read during the current BRU process. This will also indicate the speed at which the process ran by showing you the time and speed in Kb/sec

[W183] skipped autoscan of volume [volnum]: reason

BRU prints this message to let you know it has skipped the **AUTOSCAN** of volume **volnum**. The reason is indicated as part of the message.

[I184] waiting time seconds to finish rewind

Reports that BRU is waiting a certain amount of seconds before attempting to complete the process

[L185] waiting time seconds to do rewind

Reports that BRU is waiting a certain amount of seconds before attempting to complete the process

[L186] using 'rshname' as remote shell

BRU will use the given file name as it's remote shell

[E187] unable to execute remote shell 'rshname'

BRU is unable to use the given filename as the remote shell. Verify that it exists and that you have the proper permission set.

[E188] cannot find remote shell to execute

BRU can not execute the remote shell. Verify it is in the correct location and that you have proper permissions set.

[A189] filename is not a device

You have attempted to write to a file name. BRU is reporting that this is not a device but a file.

[A190] file filename already exists

BRU is reporting that you are attempting to write to a file that already exists on the system.

[E191] error - compression buffer too large, cannot allocate kbcountk bytes

The given **ZBUFSIZE** in your **BRUTAB** file is too large for your system to support. You should change the **ZBUFSIZE** setting in your **BRUTAB** file to a smaller number then re-attempt your process.

[E192] *filename*: compression error (errmsg), data is corrupted

An error occurred while BRU was compressing filename, the reason for the error is indicated by **errmsg**. The file was not backed up properly and the archived file contains errors. Normally, this error is caused when BRU attempts to back up a file that was changing (like a database file). For information, refer to "Live System Backups" in Chapter 9. In a few rare occurrences, this error has been caused by disk controller hardware failures or by corrupted filesystems.

[E193] *filename*: decompression error (errmsg)

An error occurred during the restore and decompression of a compressed file. The **errmsg** will indicate what the problem is with the file.

[E194] *filename*: warning - file was not backed up: errno = code, {description}

This message is issued when BRU encounters a problem on its first attempt to read filename. Often, this is caused by improper permissions. If filename is part of an NFS-mounted filesystem or the **/etc/export** file (and BRU is running as root), this message can occur if BRU is unable to access the file due to insufficient root permissions. You may need to modify your network security parameters by editing your **/etc/hosts.equiv** or **.rhosts** file. Configuring network security can get complicated (and all networks are different), so refer to your UNIX network documentation for details.

[Q195] enter new device name [default: devicename] >>

BRU is requesting that you enter a new device name or to continue the operation on the default device.

[E196] error - attempt limit exceeded ... BRU terminated

BRU has reached it's maximum numbers of errors given in the **BRUTAB** file.

[E197] error - illegal device name ... BRU terminated

BRU has attempted to write to a device that is not stated in the BRUTAB file. The setting in BRUTAB of **BRUTABONLY=YES** has forced this error. By changing the default value to **NO** for this setting you will be able to write to this device.

[W198] try using a smaller buffer size (like bufsizeK)

BRU is attempting to write to a device that is responding with errors. BRU has determined this write error as having to large of a buffer size setting set for the given device. By using the **-b** option in your command line and change the buffer size to a smaller size BRU might be able to complete the operation.

[A199] OVERWRITE PROTECT: volume is from archive written on date

BRU has found that the date of this archive is within it's overwrite protect setting.

[A200] insert another volume and press ENTER to continue

Query message asking for a different tape.

[E201] user entered Q => QUIT in routine routinename

A user entered Q to quit the operation on one of BRU query to the terminal.

[I202] switching to next device

This is an information message stating that BRU is switching to a different tape drive. This message is sent during a device cycling operation

[I203] device cycling discontinued

BRU has stopped device cycling.

[W204] *filename filename1* too long, changed to *filename2*

This message occurs when BRU restores a file with a name that is longer than 14 characters (the maximum on older UNIX systems). BRU automatically renames the file and shortens it to 14 characters. If your system supports filenames longer than this, this behavior can be suppressed. Simply add the global brutab parameter "**#+ MAXFILENAMELEN=255**" to the beginning of the **/etc/brutab** file.

[I205] *filename* is an existing directory

The given file name in **filename** is a directory

[W206] regular expression error, string

[E207] error - failed MOUNTCMD/UNMOUNTCMD of volume volnum on device device name (exit code = #)

BRU attempted to run the specified **MOUNT** and **UNMOUNT** commands as was not able to complete the operation. The device and volume number is listed in the error message.

[W208] warning - autoscan buffer size adjusted to newbufsizeKb

BRU found that the given buffer size for the **AUTOSCAN** process had to be changed to complete the process. If you see this warning message you should adjust your **BRUTAB** buffer size setting to match the given size for the warning message.

[W209] warning - skipped archive file filename

BRU has skipped the file listed on the warning message.

[W210] warning - could not rewind device

BRU could not rewind the given device.

[E211] unable to write nullcount end nulls

When closing the archive for a specific write, BRU was unable to write the entire closing block of data. This can be caused by low memory, no disk space (of writing to a disk archive), or a write failure on a tape drive.

[E212] BRU terminated, media may be write protected or wrong density

BRU could not continue to write to the device. The reason for this error could be that the configuration of the tape drive size was wrong or that you are using a different size tape on this device.

[W213] could not read password file

BRU could read your password file. This can be caused by a permissions problem. Try running the process again as root and see if that resolves the warning.

[W214] could not read group file

BRU could not read your group file. This can be caused by a permissions problem. Try running the process again as root and see if that resolves the warning.

[I215] translating filename to filename

This is a status message informing you that the filename is being translated to the new filename

[L216] translating filename to filename

This is a log entry you will not see this message echoed to the screen

[W217] warning - filename translates to "null"

BRU is reporting the given filename in your translate file is translating to null

[E218] error - unable to read translate table file: filename

BRU is reporting that it can read your translation file. Make sure that the file is in an ASCII format and is in the given directory stated in your **BRUTAB** file

[E219] translation table error 'ERROR TEXT'

If you have specified a translation table via the -T command line option, BRU is unable to read the contents of the specified file. The '**ERROR TEXT**' will describe the exact error encountered.

[O220] * OBSOLETE MESSAGE NUMBER *****

[E221] *filename* : cannot overwrite directory with file

BRU can not overwrite the directory with a file.

[E222] *filename* : cannot overwrite file with directory

BRU can not overwrite the file with a directory.

[E223] unable to inspect "norewind" device

The given device has the "**norewind**" option set in **BRUTAB**. With this option set BRU can not rewind the device and perform the **AUTOSCAN** option.

[E224] error - invalid -u argument "%s"

Invalid argument with the **-u** option. Valid options are (**a b c d i p r f**)

[E225] error - unable to execute MOUNTCMD="filename"

BRU can not run the given **MOUNTCMD** or it is attempting to run a command that is illegal.

[W226] "device" : device open when UNMOUNTCMD was called (loc=%d)

The device was open with a different request when BRU called the `UNMOUNTCMD`

[W227] "filename": warning - error setting owner/group on symbolic link: errno = number, {description}

BRU could not set the owner/group information for the specified file. The UNIX error number and description, descried the problem.

[E228] error - unable to read raw-partition file: "filename"

BRU could not read the given `BRURAW` file. Make sure that the file has the correct permissions and is in the given directory.

[E229] error - no raw-device description in bruraw table: "filename"

There was no information provided in the `BRURAW` file.

[W230] warning - invalid raw-device specified (& ignored): "filename"

A invalid device was specified in the `BRURAW` file BRU has now ignored that device and is not backing up the given device.

[W231] warning - problem reading label file: "filename"

BRU could not read the given file to create a label from. Make sure that the file exist and that

[W232] *filename*: **warning - file may be locked**

BRU is reporting that the given file name might be a locked file. BRU can not read the file and this might cause BRU to terminate if you have set a low setting for the maximum number of warnings.

[W233] warning - unable to read smart-restore pattern file: filename

BRU is not able to read your given Smart-Restore file. Verify that the file is in the correct ASCII format and has the correct permissions set.

[W234] warning - smart-restore parse error '%s' on line '%s'

An error occurred while parsing your **/etc/smartrestore** file.

[W235] warning - problem creating archive catalog: filename

BRU could create its archive catalog file in the given directory specified in the **GLOBAL BRUTAB BRUTEMP=directory**

[W236] * OBSOLETE MEGSSAGE NUMBER ***

[W237] * OBSOLETE MEGSSAGE NUMBER ***

[E238] error - invalid -Q argument: "%s"

The argument that you passed with the **-Q** option is not valid. Arguments for **-Q** must immediately follow the **-Q** (i.e.: **-QL**) and be separated from the other options on the command line by at least one white space character.

[E239] error - invalid -U argument: "%s"

The only arguments for **-U** are numeric (0, 1, 2, etc).

[E240] error - unable to read, tape may be incompatible

[W241] warning - cannot translate "%s" to "%s"

Attempts to translate filenames during a restore were not allowed. This is probably a permissions problem.

[A242] enter label for volume %d:

[E243] error - previous UNMOUNTCMD on device "%s" failed

[W244] warning - left %d temporary files, check removelog file "%s"

During a restore, BRU ran into a number of open/in use files. These files were copied to a temporary directory and the tape version was restored. You may remove the temporary files by running the shell script displayed.

[I245] "%s": skipped file, %s

The file listed was skipped in this operation because of the reason given.

Appendix E - Support Information

TOLIS Group offers 30 days of free technical support on all BRU Products from the date of your original product purchase. After the initial 30 days, annual support plans are available that will extend your support coverage for an additional twelve months beyond the initial 30 days (for a total of thirteen months of coverage).

During the support period, all updates to the version of BRU or BRU Server that you have currently licensed are included for no additional cost. Additionally, as long as your annual support contract is maintained, updates to your currently licensed product will continue to be made available for no additional cost and cross-grades for the same product (i.e.: OS X to Solaris) or upgrades to a different product (BRU LE to BRU Server) are provided at a discount.

When contacting support, please provide the following info in your email or have it available at the time of your call:

What:	Example:
Product Name and Version	BRU Server 2.0.0
Product Serial Number - **REQUIRED**	8275-9827
OS and Version / kernel	OS X 10.4.11 or Linux 2.6.29
Server System Info	2GHz G5 Dual Xserve or AMD Athlon 64 3500+

Your Phone Number
Best times to call if we are not immediately able to answer your call

Additionally, be sure that you have admin access to the server system, including the tape drive(s) and library.

Our availability and contact information is:

Monday - Friday, 8AM to 5PM MST (Arizona) (GMT -7)
480-505-1814 - Voice
480-505-0492 - Fax
http://support.tolisgroup.com

Additionally, you may also make use of our online Knowledge Base. .

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http://knowledgebase.tolisgroup.com/
```

Support Guidelines

Support Agreement Holders:
Customers that have current Support Agreements are provided support via telephone or email.

DEMO and Evaluation Customers:
Demo and evaluation support is handled through email only as outlined in your welcome email that you received upon downloading the demo version. Telephone support is not available for demo users.

New Customers within 30-Days of Purchase:
If you recently purchased your product, you are given support via telephone, and email. Once your initial 30-days have been reached, any open issues will continue to be supported but by e-mail only. Telephone support will no longer be available. If you would like to continue to receive support via telephone, please purchase a support agreement by contacting BRU Sales.

No Support Agreement/Outside of Initial 30-Days:
For customers that do not have current support agreements or are outside of the initial 30-days of purchase, there is no support available directly from TOLIS Group. Telephone is not permitted. Email support is only available for open issues prior to the expiration the support agreement or initial 30-days after product purchase. If you would like to continue to receive support via telephone, please purchase a support agreement by contacting BRU Sales.

Appendix F - BRU Server End User License Agreement

TOLIS Group, Inc.

LICENSE AGREEMENT

This License Agreement ("Agreement"), provided by TOLIS Group, Inc. ("TOLIS"), governs the use of the object code version of the BRU brand computer software, documentation and materials accompanying this Agreement or otherwise provided in connection herewith (collectively, "Software"), owned by TOLIS, by the person or entity ("Client") that has clicked on the "Agree" button within the installer. For purposes of this Agreement, Software may be the BRU Server server, agent, or console component.

****
IF YOU DO NOT AGREE WITH THE TERMS THAT FOLLOW, YOU MUST SELECT THE "DISAGREE" OPTION IN THE INSTALLER AND YOU MUST NOT USE THE SOFTWARE.
****

1. LICENSE AND USE RESTRICTIONS.

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THE FOREGOING WARRANTY IS THE ONLY WARRANTY GIVEN HEREUNDER. EXCEPT AS OTHERWISE PROVIDED ABOVE, THE SOFTWARE IS PROVIDED ON AN "AS IS" BASIS, WITHOUT ANY WARRANTY WHATSOEVER. ALL EXPRESS, IMPLIED OR STATUTORY CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT, ARE DISCLAIMED. Some states do not allow the disclaimer of implied warranties, so the foregoing limitations may not apply to you.

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4. GENERAL.

Any action related to this Agreement shall be governed by the substantive laws of the State of Arizona, without regard to conflicts of law principles. The State and Federal courts located in Maricopa County, Arizona, shall have sole jurisdiction over any dispute arising hereunder, and the parties hereby consent to the personal jurisdiction of such courts. Neither this Agreement, nor any rights hereunder, may be assigned by operation of law or otherwise, in whole in part, by Client without the prior, written permission of TOLIS. Any sale of more than fifty percent (50%) of the common voting stock of, or other right to control, Client shall be deemed an assignment. Any purported assignment without such permission shall be void. Any waiver of any rights of TOLIS under this Agreement must be in writing, signed by TOLIS, and any such waiver shall not operate as a waiver of any future breach of this Agreement. In the event any portion of this Agreement is found to be illegal or unenforceable, such portion shall be severed from this Agreement, and the remaining terms shall be separately enforced. The parties agree that any breach or threatened breach of this Agreement by Client is likely to cause TOLIS damage that is not fully reparable by payment of damages, and further agree that in such case TOLIS shall be entitled to seek and obtain injunctive or other equitable relief to protect its rights hereunder. Client's performance hereunder and use of the Software shall at all times comply with all applicable laws, rules and regulations, including those governing export of technical information, and Client shall fully indemnify, defend and hold harmless TOLIS against any violation thereof. This Agreement is the entire agreement between the parties with respect to this subject matter, and supersedes any and all prior or contemporaneous, conflicting or additional communications, negotiations or agreements.

Thank you for doing business with TOLIS Group, Inc.!

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