

BRAT: the Bootable Recovery and Admin. Tape
Peter Put
Unit 101, 17971 - 106A Avenue, Edmonton, Alberta, T5S 1V8
(403) 930-3257

Backup and recovery policies are an important part of your system. They can be time consuming, both in planning and resources to make them useful. You can spend considerable time and money preparing for a hardware data loss knowing that there may never be a return on the investment. How much data can you afford to lose and how long will it take to restore the system to its original state?

INTRODUCTION

The BRAT tape is a solution that can be used to restore a system in the event of a catastrophic failure such that the system can no longer be booted. The BRAT tape is designed to restore an unbootable system with very little human intervention. The BRAT tape is created by running a script on the system you are protecting while the system is up and running. The output creates a "snapshot" of the file system and creates a configuration file that can be interpreted by the system install binaries and then creates a backup of the root file system. The tape can also contain the backup/recovery software or an entire backup of the system depending on the amount of disk space used.

The BRAT tape was created to reduce downtime and may make a difference in whether you can restore your system to its original state. The BRAT tape can be created without taking the system down such as the utility COPYUTIL requires.

You may ask yourself when would something like this be required. In the area of disk hardware failures there are four basic categories of disk data and they vary in their range of importance for the system to be able to operate correctly. The BRAT tape addresses the first and most difficult category, but could be modified to address the second category also.

The first type of disk/data loss would be to loose all disk drives on the system. When this type of failure occurs the options for recovery are limited. You have two basic options:

- a. Reload from the Install media, then restore from your backups
- b. Use BRAT and then restore (if required) from your backups, if needed.

The first method (a) requires several steps. The operating system will need to be reloaded first. To do this you would need to know the configuration of the original root volume group. Then you will be ready to start your system restore from your backups.

The second method (b) of recovery would consist of putting the BRAT tape in the tape drive and booting from it. From there the system would boot from the tape with no intervention, restore the LIF file to the root disk, restore the root volume and recover whatever else has been placed onto the BRAT tape and then the system would reboot. All of this happens automatically with no intervention needed. At that point you would recover whatever you might want from your regular backups (if required). This second method does not require the system administrator (or whomever is doing the recovery) to know anything about the original Logical Volume Manager (LVM) or file system and takes much less time. The individual does not even require a working knowledge of LVM.

The second type of disk/data loss would be one that affected the 'root disk' or one with critical OS files such as /usr, /sbin, etc. In that case there are four options for restoring the information after the disks are replaced.

-
1. Reload from the Install media and then restore from your backups.
 2. Use the support CD to assist with recovery
 3. Use COPYUTIL on the support CD
 4. Use the BRAT tape and then restore from backups if needed.

Solution (1) is very involved and might mean unnecessary work and additional downtime.

Solution (2) requires extensive knowledge of how to use the support media and might require input from the HP Support Line. With this method you will need to know the LVM and file system layout and will require the use of the vgcfgrestore command.

Solution (3) uses the COPYUTIL which is a utility on the support media that copies an entire disk including the boot area to tape. The downside of this is that the system needs to be shutdown to execute COPYUTIL and can take an hour or more for each disk.

Solution (4) can be configured to be essentially free of user intervention except to boot the BRAT tape.

The bootable BRAT tape is designed to assist in a timely and accurate system recovery. This solution is designed to allow inexperienced people to confidently recover a system from a non-bootable state.

WHAT IS THIS BRAT?

Bootable Recovery Admin. Tape implements a reliable System Recovery Process for HP-UX across hardware platforms. This process allows the customer to create a customized System Install Image of the existing system either on a DAT tape or a System Install/Recovery Server (NOT IMPLEMENTED YET). Together with a full backup of the system the customer can recover the system in the event of a catastrophic failure of the system disk or root volume group. It also allows for the customer to include the backup utility of choice in the System Recovery Image. This allows the customer to recover user data from regular backups, which could be done using non-standard utilities after the system is functional again.

SYSTEM RECOVERY FROM DAT MEDIA

A new command, "**make_recovery**" is provided to create a System Recovery Tape that is bootable and contains the systems customized HP-UX system along with the "Core OS" files.

The BRAT tape is intended to complement the Support Tape/CD, not replace it. The BRAT tape is only used when the system is unrecoverable, without attempting to salvage any data on the root disk/root volume group. All file systems in the root disk/volume group will be recreated and data recovered from the tape.

The BRAT tape allows a user to recover a failed system by **reinstalling** the "Core OS" portion of the root disk or root volume group from the recovery tape, and getting back the fully customized system rather than having to go through the process of a cold install with all its selections and configurations.

make_recovery also allows the customer to append selected user file systems or files to the recovery tape. This could be the entire root volume group, or part of it. The appended files are also automatically recovered after the system is up and running. This allows a more usable system to be recovered. The remaining file systems can be recovered manually from the standard backup media.

User data appended to the tape is restricted to the root volume group or root disk, as any non-corrupted disks should not be recreated. They can be *vgimported* back after the system is up and running. If any non-root disks are corrupted, these should be recovered from normal backup tapes.

RECOVERY OVER THE LAN (NOT IMPLEMENTED YET)

System recovery over the LAN for a Single System utilizes the client/server of the system install tools. `make_recovery` saves the clients configuration and it "Core OS Archive" on the server. These are used for re-configuring and re-install the client in the event of a fatal corruption of the root disk.

SYSTEM RECOVERY FROM TAPE MEDIA

In this scenario, the user on the client system creates a System Recovery tape by invoking the **make_recovery** command. In the event of a catastrophic failure, the user boots and recovers the system from this tape mounted in a local device. Requirements for the tape media recovery environment:

1. The media must be available on a boot device that is connected to the system.
2. System recovery from the tape media requires little or no user interaction
3. No network Install/Recovery Server is used or required.

The user mounts the recovery media on the boot device. The user then initiates the BRAT System Recovery by first booting the system. The system's boot sequence is to be interrupted.. At this point, the user is presented with a menu of selectable actions. These actions include and are not limited to displaying system information, changing the primary and alternate boot path, searching for potential boot devices (non-lan and lan) and booting from primary, alternate or lan devices. To boot from the local boot device, the user selects the correct device from a list of valid bootable devices.

Customers are already familiar with cold-installs. For a generic system cold install, the user would select the "Install HP-UX" action from the user interface action list. The user is presented with a sequence of menus in the completion of the system install boot. On completing these configuration selections, the system install is executed according to the user selected system configuration.

In the case of the **BRAT System Recovery**, the user boots the system using the bootable BRAT tape. The install user interface (UI) is disabled resulting in no configuration related interaction. The user only needs the System Recovery media to be fully restored. The user can accomplish this task by simply "installing" the system recovery media without any additional recovery interaction. When the system recovery from the media is completed, all the files appended to the recovery tape are automatically restored. The system reboots off of the newly recovered local root disk. Root volume group restoration is then complete.

FEATURES AND USAGE

Below is a list of the features that the Bootable Recovery Admin. Tape provides for HP-UX Release 10.X. The use of these features is also explained for context.

`create_config`

The system administrator will have the capability to run the '`create_config`' command to create a configuration file that reflects the current hardware and software configuration of the system. The configuration can be the whole system, or the root volume group only.

`make_recovery`

The system administrator can use the **make_recovery** command to create a system recovery tape with the customized kernel and 'Core OS' files on it that can be used to recover the system in case of boot disk failure. The system is recovered with all customizations, configurations, etc. intact. The system administrator can also choose to append user data to the tape, so that when a failed system is recovered, the user data is also recovered.

validate_recovery

The system administrator can use the **validate_recovery** command to verify the bootable tape creation.

COMMAND FUNCTIONALITY

create_config

The **create_config** command can be run by the system administrator to create a configuration file that reflects the current hardware and software configuration of the system. This file is created in the format specified by `instl_adm(4)`. The file can be created at a default location or under the name specified on the command line. The configuration can be the whole system or the root volume group only.

```
create_config  [-f filename]  create config file at this location
                                   [-r]      extract configs for the root vg only
                                   [-m]      create remirror script

                                   [-H]      display help information
```

make_recovery

The **make_recovery** command is used to create the System Recovery image on a bootable tape media.

```
make_recovery  [-f filename]  name of file created by create_config
                                   [-r]      root vg only system recovery backup
                                   [-B]      create bootable root vg recovery tape
                                   without backup of data
                                   [-H]      display help information
```

The system administrator can create a system recovery tape with the customized kernel and 'Core OS' files on it. This tape can then be used to recover the root volume group in case of root volume group failure. The system is recovered with all customizations, configurations, sub-systems, etc. intact. Non-root volume groups are not affected. The file systems on other volume groups can be re-imported using `vgimport` using the mapfile info saved under `/etc/vginfo/brat/mapfiles`.

Examples:

```
make_recovery -rf edmsso4.config
```

creates the recovery tape from the config file "edmsso4.config", and backs up the whole root volume group to **ONE** tape. If the file `/etc/exclusion.graph` exists, the user can specify files which are to be also appended to the recovery tape.

LVM CONSIDERATIONS

When the Bootable Recovery Admin. Tape re-creates the root volume group, say vg00, then the /etc/lvmconf/vg00.conf and the /etc/lvmtab files will be re-created.

The .conf files for other volume groups will be created, and /etc/lvmtab will be updated when other volume groups are vgimported back.

BACKUP UTILITIES

The backup utility **fbackup** is used in the creation of the System Recovery Image.

BRAT FILES

/var/opt/check_config	Analyzes and creates system configurations
/var/opt/make_recovery	Creates bootable tape and backup
/etc/vginfo/brat/LVMinfo/lvmcollect.ascii	LVM System information
/etc/vginfo/brat/lvmconf/vg*.conf	vgcfgbackup images
/etc/vginfo/brat/lvmtab/lvmtab*	copy of both ascii and binary "lvmtab"
/etc/vginfo/brat/mapfiles/vg*.mapfile	volume group mapfiles for vgimport
/etc/vginfo/brat/remirror/pv*	pvcreate info
/etc/vginfo/brat/remirror/vg*	vgextend info
/etc/vginfo/brat/remirror/lv*	lvextend info
/etc/vginfo/brat/remirror/remirror.sh	remIRRORing script
/var/adm/brat/index*	time and date stamped fbackup index file

FILE SYSTEM REQUIREMENTS

The directories **/, /bin, /dev, /etc, /opt, /sbin, /stand, /usr, /var...** must be in the root volume group. These are considered "Core OS" filesets, and will be placed on the System Recovery image. They cannot be moved to another volume group.

ADDITIONAL INFORMATION

make_recovery interfaces to the Net Install in the following areas.

The instl_adm(1M) command is used to manage the configuration information in the 3 files:

- 1st 8k of the 700INSTALLFS file
- config
- config.local

The 1st 8k of 700INSTALLFS is immediately available to the system when it boots, and contains the networking information. Once the system has the network up, it will read config and config.local and will concatenate them in the order:

config + config.local + 8k-contents

The config.local file then provides the configuration that is to be used.

instl_adm(1M) is used to verify the system configuration file. The configuration file is then copied out to the (Recovery Server NOT IMPLEMENTED YET), or incorporated into a boot LIF, again using instl_adm(1M) and written out to the System Recovery tape.

BRAT USAGE AND LIMITATIONS

BRAT is not intended as a replacement for your normal backup and recovery procedures.

Creating a root volume BRAT tape requires only a few steps.

- Load the BRAT tool.
- swinstall the proper BRAT files for you OS.
- Select the depot you are using for the BRAT software (i.e. /dev/rmt/0m)
- Drill down one level to the Sub-Product level
- Select the proper OS and platform
- Mark for install, then install (no reboot required)
- Run /opt/brat/create_config -rf [configfilename]
- Run /opt/brat/make_recovery -rf [configfilename]

This step makes a bootable tape, and places an fbackup of the root volume on the same tape.

LIMITATIONS

The HP-UX install process cannot install with a volume group named other than vgXX.

If you have non-standard volume group names follow this procedure.

- Rename the /dev/vgXX directory to a standard volume group name, i.e. vgmain.
- Move the /etc/lvmtab to another filename, i.e. /etc/lvmtab.[today's_date]
- Run vgscan to recreate the /etc/lvmtab with the new volume group names.

BRAT IS NOT A SUPPORTED UTILITY

Hewlett Packard makes no warranty of any kind with regard to this material. Hewlett Packard shall not be liable for errors contained herein. The system manager is responsible for keeping all backups of the computer system and to perform all backup functions.

ADDITIONAL USES FOR BRAT

Expanding the root or primary swap filesystems.

- Run create_config as above.
- Edit the configuration file, changing the filesystem size to the new parameters.

Note: Make sure that you root disk has enough space for the change. You may need to reduce the size of another filesystem.

Note: Filesystems must be in increments of 4K extents. i.e. 150M is not a valid filesystem size, use 148M.

Run make_recovery as above.
Shutdown the system and boot from the BRAT tape.

Note: This will rebuild the system with the new filesystem parameters and then recover the root volume files..

Changing from HFS to JFS

Generate vxfs into the kernel
Run create_config as above.
Edit the configuration file changing the filesystem type from HFS to VXFS.
Run make_recovery as above.
Shutdown the system and boot from the BRAT tape.

Note: This will rebuild the system with the new filesystem parameters and then recover the root volume files.

Cloning systems.

Run create_config on the system you wish to clone.
Edit the configuration file to reflect any differences in the new system.

Example:

Cloning a T520 from a G30 to increase you processing power.

Change the physical_volume disk [52.6.0] to physical_volume disk [0/52.6.0] to reflect the primary path of the T520.
Run make_recovery on the system you wish to clone.
Boot the new system from the BRAT tape.