Advanced SUSE Linux Enterprise Server Administration (Course 3038)

Chapter 5
Manage Backup and Recovery
Objectives

• Develop a Backup Strategy
• Create Backup Files with tar
• Work with Magnetic Tapes
• Copy Data with the dd Command
Objectives (continued)

• Mirror Directories with the rsync Command
• Automate Data Backups with the cron Service
• Troubleshoot the Boot Process of a SLES 9 System
• Configure and Install the GRUB Boot Loader
Develop a Backup Strategy

• Objectives
  – Choose a Backup Method
  – Choose the Right Backup Media
Choose a Backup Method

• Full backup
  – Best possible method of data backup
  – All system data is copied to a backup media once a day
  – To restore data
    • Most current backup media is copied back to the system’s hard disk
  – Disadvantage
    • Time frame available to perform backups (Backup window)

• Perform backups when the system is not used
Choose a Backup Method (continued)

• Perform an incremental backup
  – Perform a full backup once a week
  – Then you perform a backup every day
    • That copies only files that have changed since the backup the day before
  – Advantage
    • Backup window can be much smaller
  – Disadvantage
    • Recovery time is longer
Choose a Backup Method (continued)

• Perform a differential backup
  – Perform a full backup once a week
  – Then you perform backups every day
    • To record files that have changed since the last full backup
  – Advantage
    • To restore data from a differential backup, you need just two backup media
  – Disadvantage
    • Amount of data to be backed up grows every day
Choose a Backup Method (continued)

Figure 5-1
Choose the Right Backup Media

• Tape drives are used most often
  – They still have the best price-to-capacity ratio
  – Normally these are SCSI drives
• Other media for data backup include
  – Writable CDs or DVDs, removable hard drives, and magnetic-optical (MO) drives
• Storage Area Networks (SANs) are also used
  – SAN often uses magnetic tapes to store the data
• Store backup media separately from backed up systems
• Store sensitive backup media offsite
Create Backup Files with `tar`

**Objectives**
- Create tar Archives
- Unpack tar Archives
- Exclude Files from Backup
- Perform Incremental and Differential Backup
- Use `tar` Command-Line Options
Create tar Archives

- **tar format**
  - Container format for files and directory structures
  - Extension of the archive files end in .tar
- Normally data in the archive files is not compressed
  - You can use additional compression commands
- Directories are typically backed up with
  - `tar -cvf /backup/etc.tar /etc`
  - `tar -cvf /dev/st0 /home`
- View the contents of an archive by entering
  - `tar -tvf /backup/etc.tar`
Unpack tar Archives

• Unpack files from an archive
  – tar -xvf /dev/st0

• Extract just one file
  – tar -xvf /test1/backup.tar -C /home/user1/.bashrc
Exclude Files from Backup

• List of these files must be written in an exclude file
  – Line by line
• List is then passed to tar with the option -X
  – tar -cvf /dev/st0 /home -X exclude.files
Perform Incremental and Differential Backups

• Use a snapshot for incremental backups
  – Make a full backup with a tar command
    • tar -cz -g /backup/snapshot_file -f /backup/backup_full.tar.gz /home
  – Perform an incremental backup
    • tar -cz -g /backup/snapshot_file -f /backup/backup_mon.tar.gz /home

• Use the find command to search for files to back up
  – Make a full backup
    • tar -czf /backup/backup_full.tar.gz /home
  – Back up all files that are newer than the full backup
    • find /home -type f -newer /backup/backup_full.tar.gz -print0 | tar --null -cvf /backup/backup_mon.tar.gz -T -
Use tar Command-Line Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-c</td>
<td>Creates an archive.</td>
</tr>
<tr>
<td>-C</td>
<td>Changes to the specified directory.</td>
</tr>
<tr>
<td>-d</td>
<td>Compares files in the archive with those in the file system.</td>
</tr>
<tr>
<td>-f</td>
<td>Uses the specified archive file or device.</td>
</tr>
<tr>
<td>-j</td>
<td>Directly compresses or decompresses the tar archive using bzip2, a modern efficient compression program.</td>
</tr>
<tr>
<td>-r</td>
<td>Appends files to an archive.</td>
</tr>
<tr>
<td>-u</td>
<td>Only includes files in an archive that are newer than the version in the archive (update).</td>
</tr>
<tr>
<td>-v</td>
<td>Displays the files, which are being processed (verbose mode).</td>
</tr>
<tr>
<td>-x</td>
<td>Extracts files from an archive.</td>
</tr>
<tr>
<td>-X</td>
<td>Excludes files listed in a file.</td>
</tr>
<tr>
<td>-z</td>
<td>Directly compresses or decompresses the tar archive using gzip.</td>
</tr>
</tbody>
</table>
Exercise 5-1 Create Backup Files with tar

• In this exercise, you will do the following:
  – Part I: Create a Full Backup
  – Part II: Create an Incremental Backup
Work with Magnetic Tapes

• Command `mt`
  – Positions tapes
  – Switches compression on or off
  – Queries the tape status

• Magnetic tape drives are always SCSI devices
  – `/dev/st0`
  – `/dev/nst0`

• Query status of the tape
  – `mt -f /dev/st0 status`
Work with Magnetic Tapes (continued)

• Position the tape at the beginning of the next file
  – `mt -f /dev/nst0 fsf 1`

• Spool the tape back to the beginning
  – `mt -f /dev/nst0 rewind`

• Eject the tape from the drive
  – `mt -f /dev/nst0 offline`

• Check whether data compression is switched on or off
  – `mt -f /dev/st0 datcompression`
Copy Data with the dd Command

• Command dd
  – Converts and copies files byte-wise
  – Can copy all kinds of data
    • Including entire hard disk partitions

• Copy a file
  – dd if=/etc/protocols of=protocols.org

• Copy a complete partition
  – dd if=/dev/sda1 of=boot.partition

• Create a backup copy of the MBR
  – dd if=/dev/sda of=/tmp/mbr_copy bs=512 count=1
Exercise 5-2 Create Drive Images with dd

• In this exercise, you use dd to create a drive image
Mirror Directories with the rsync Command

• Objectives
  – Perform Local Copying with rsync
  – Perform Remote Copying with rsync
Perform Local Copying with rsync

- Mirror all home directories
  - rsync -a /home /shadow
- Mirror the content of a directory and not the directory itself
  - rsync -a /home/. /shadow
- Exclude files from backup
  - rsync -a --exclude-from=/home/exclude /home/. /shadow/home
Perform Local Copying with rsync (continued)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-a</td>
<td>Puts rsync into the archive mode.</td>
</tr>
<tr>
<td>-x</td>
<td>Saves files on one file system only, which means that rsync does not follow symbolic links to other file systems.</td>
</tr>
<tr>
<td>-v</td>
<td>Enables the verbose mode. Use verbose mode to output information about the transferred files and the progress of the copying process.</td>
</tr>
<tr>
<td>-z</td>
<td>Compresses the data during the transfer. This is especially useful for remote synchronization.</td>
</tr>
<tr>
<td>--delete</td>
<td>Deletes files that no longer exist in the original directory from the mirrored directory.</td>
</tr>
<tr>
<td>--exclude-from</td>
<td>Does not back up files listed in an exclude file.</td>
</tr>
</tbody>
</table>
Perform Remote Copying with rsync

• With rsync and SSH
  – Log in to other systems
  – Perform data synchronization remotely over the network
• Copy home directory of the user tux to a backup server
  – rsync -ave ssh root@DA1:/home/tux /backup/home/
• Backup of the home directory is copied back to the DA1 system
  – rsync -ave ssh /backup/home/tux root@DA1:/home/
Exercise 5-3 Create a Backup of a Home Directory with rsync

• In this exercise, you will do the following
  – Part I: Perform a Local Backup with rsync
  – Part II: Perform a Remote Backup with rsync
Automate Data Backups with the cron Service

- Automate backups in Linux with the cron service
- System jobs are controlled with the file `/etc/crontab`
  - And the files in the directory `/etc/cron.d`
- System jobs are defined using scripts in directories
  - `/etc/cron.(hourly, daily, weekly, and monthly)`
- Specify which users can create cron jobs with
  - `/var/spool/cron/allow` and `/var/spool/cron/deny`
- Jobs of individual users
  - Stored in files in the directory `/var/spool/cron/tabs`
  - Processed with the command `crontab`
Exercise 5-4 Configure a cron Job for Data Backup

• In this exercise, you use cron for data backup
Troubleshoot the Boot Process of a SLES 9 System

• Objectives
  – System Boot Process Issues
  – How to Boot a Corrupted System Directly into a Shell
  – How to Boot a Corrupted System with the Installation Media
  – How to Start and Use the SLES9 Rescue System
System Boot Process Issues

• Most common problems:
  – The system cannot boot due to a misconfigured boot loader
  – The system cannot boot because of file system corruption
  – An init script has malfunctioned and is blocking the boot process
  – The system does not start correctly because of hardware changes

• Access the file system of the corrupted system
  – To detect and fix the problem
How to Boot a Corrupted System Directly into a Shell

• Boot screen of the GRUB boot loader
  – Lets you pass parameters that modify the Linux kernel
    • Before the kernel is actually loaded
• Use the Boot Options field
  – At the bottom of the GRUB boot screen
• Boot parameter init=new_init_program
  – Changes the first program loaded by the kernel
  – To boot to a shell use init=/bin/bash
How to Boot a Corrupted System with the Installation Media

• Steps
  – Insert the SLES 9 DVD and reboot the system
  – Select Installation; then press Enter
  – When YaST displays the language selection dialog box, select Accept
  – Select Boot installed system; then select OK
  – Select the root partition of the system you would like to boot; then select Boot
How to Start and Use the SLES 9 Rescue System

• Steps
  – Insert the SLES 9 DVD and reboot the system
  – From the boot menu, select Rescue System; then press Enter
  – From the language selection dialog box, select your language; then press Enter
  – At the prompt Rescue login, enter root
  – Press the Enter key
  – You are now logged into the Rescue System as root

• Mount the corresponding partition
  – mount -t reiserfs /dev/hda6 /mnt
Configure and Install the GRUB Boot Loader

• Objectives
  – The Basic Functionality of a Boot Loader
  – The Basics of GRUB
  – How to Configure the GRUB Boot Loader
The Basic Functionality of a Boot Loader

• Basic tasks of a boot loader:
  – Boot various operating systems
  – Pass boot parameters to the Linux kernel

• Stages
  – Stage 1
    • Program code for stage 1 is installed in the master boot record (MBR) of the hard disk
  – Stage 2
    • Usually contains the actual boot loader
    • Files of boot loader are located in the directory /boot
The Basics of GRUB

• GRUB is the standard boot loader of SLES 9
• Features
  – Stage 2 File System Drivers
    • Includes file system drivers for
      – ReiserFS, ext2, ext3, Minix, JFS, XFS, FAT, and FFS (BSD)
  – GRUB Shell
    • Enables interactive control of the boot manager
How to Configure the GRUB Boot Loader

• Edit the file /boot/grub/menu.lst

• Structure of the file
  – General options are listed
  – Options for the various operating systems
    • That can be booted with the boot manager

• Example

```
default 0
timeout 8
title linux
kernel (hd0,0)/boot/vmlinuz
root=/dev/hda1
initrd (hd0,0)/boot/initrd
```
Exercise 5-5 Boot to a Shell and Configure the GRUB Boot Loader

• In this exercise, you will do the following:
  – Part I: Boot the Rescue System
  – Part II: Edit and Test the GRUB Configuration File
Summary

• You should carefully develop a backup strategy
• Full backups take a great deal of time to perform
  – They are typically combined with incremental and differential backups
• Use the tar command to create full, incremental, and differential backups
• Manage tape media with the mt command
• Use the cron service
  – To schedule tasks to occur repetitively in the future
Summary (continued)

- You may temporarily boot your Linux system using a GRUB boot parameter
  - Or by booting from your SLES DVD and choosing the appropriate options
- GRUB is the default boot loader in SLES
  - It is configured using the /boot/grub/menu.lst file