Server Operating Systems

Lecture 14
Backing Up and Restoring

Backing up and Restoring

- Backup Strategies
- Backup Media
- Accessing Floppy Disks and CD Devices
- Backing up, Compressing, and Restoring Files
- Combining Backup and Compression
- Alternate Backup and Compression Programs

The Importance of Backups

Reasons for data loss or corruption:

- Hard Disk Failure
  - Disk drives have moving parts, so they are the most prone to failing in a computer.
  - RAID 1 or 5 are two ways to prevent this.
- File Corruption
- Malicious Destruction
  - Disgruntled employees, virus attacks, or hackers.

The Importance of Backups

Reasons for data loss or corruption:

- Disasters
  - Fire, flood, tornado, etc…
  - Good backups will help you recover from this provided they are stored offsite.

- Accidental Deletion/Overwrite
  - Mostly from the command line. Copying or moving files to a file that already exists and overwriting it, removing the wrong files on accident, etc.…

Backup Methods

The three main types of backups are: *full*, *incremental*, and *differential* backups.

A typical setup will have 5-7 daily tapes, 4-5 weekly tapes, and 12 monthly tapes.

Factors to consider in your backup plan:

- The criticality of the data.
- The amount of data to be backed up.
- The time window available to do backups.
- Funds available for a backup system.

Backup Methods: Full

All critical data is backed up everyday.

- Whether it has changed since the last backup or not.

Takes the longest and probably requires multiple tapes.

This method can make it easier to find data upon restoration and you know that everything is always up-to-date.

Backup Methods: Incremental

Backup is done in small steps over a period of time (probably a week) where each step only backs up what has changed since the last incremental backup.

Overall time to backup is significantly less than the full backup.

The restoration process is longer and more complicated as it requires the last full backup and all of the incremental backups.

If any one tape during the week goes bad, the whole week's backup is compromised.

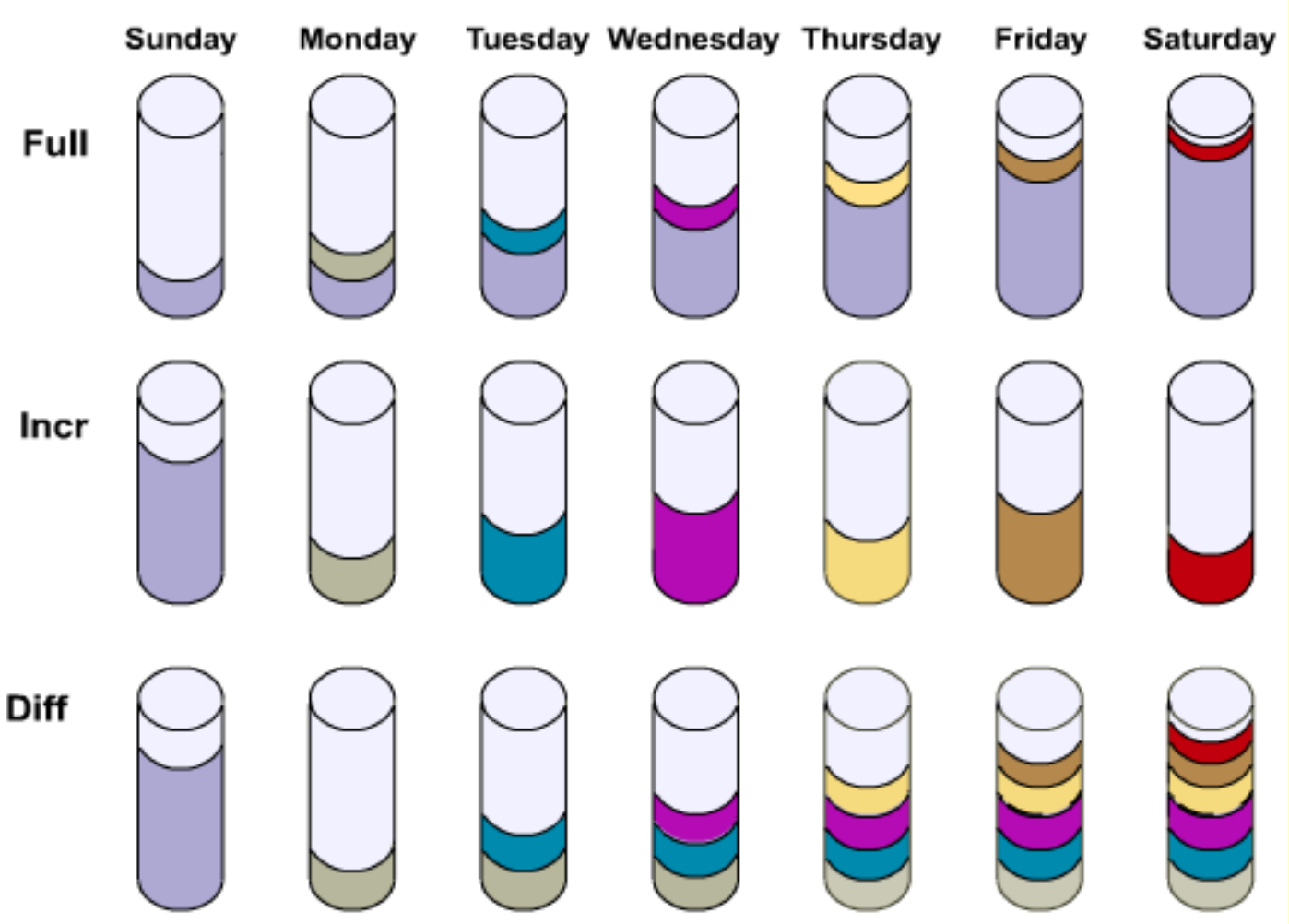
Backup Methods: Differential

The backup is done in steps, but this time it is a copy of everything that has changed since the last full backup.

This type of backup is a compromise between the Full and Incremental backup types.

Only requires two tapes to do a restoration – the last full backup and the last differential backup.

Backup Methods Diagram



Backup Methods

Backup Method	Total Time to backup	Ease of Restore	No of Tapes required to restore if hard drive fails on Friday morning
Full	Longest	Simplest	1
Incremental	Shortest	Most Complicated	5
Differential	Moderate	Moderate	2

Data Restoration Issues

Remember, the restoration process needs to be tested for its effectiveness!

Four restoration tasks need to be completed successfully in order to verify that backups are working correctly.

- Restore a file
- Restore a directory
- Restore a file system
- Restore a hard drive

Magnetic Tape for Backups

There are many types of magnetic media with a wide range of storage capacity.

Streaming magnetic tape is the most popular for backups because it is inexpensive and can hold a large amount of data.

- This type of media reads and writes sequentially.
- Thus, access to arbitrary files is very slow.

Magnetic and Optical Desks for Backups

Media like DVD-R and DVD-RW are becoming more popular, but store much less data than tape.

Hard disk drives are now cheap enough to make them a viable option as backup media.

Backing up Files with `tar`

The **`tar`** ("Tape Archive") command allows the backing up of multiple files in the file system.

`tar` was originally developed to backup files to a tape drive, but it can be used with other types of media (hard disk, floppy drives).

It makes a single archive file out of a set of files.

Files are not compressed as they are archived.

Backing up Files with `tar`

`tar` *`function`* [*`modifier`*] [*`output_file`*] *`filenames`*

- Always use a ".tar" extension on the output file.

`tar` Functions

- One letter characters used to create, view the contents of, or extract files from a tar archive.
- Functions do not have to be proceeded by a '-', but can be.

`tar` Function Modifiers

- One letter characters used with tar functions to modify their behavior.

Backing up Files with `tar`

Function Letter (Lower case)	Meaning	Function Performed
c	Create (or combine)	Create a new tar file
t	Table of Contents	List the table of contents of the tar file
x	EXtract files	Extract the specified files from the tar file

Modifier Letter (lower case)	Meaning	Function Modified
f	File name	Specify the tar file to be created as either a file on the hard disk (/tmp/file.tar), or a device file for an output device (/dev/xxx) like a floppy disk, optical drive or tape drive
v	Verbose	Execute in verbose mode

Compressing Files

```
gzip [options] [files]
gunzip [options] [files]
```

The gzip command is used to compress a file.

`gzip filename.txt` will create a compressed file called:

`filename.txt.gz`

Options:

-d decompress
-h help message
-r recursive - compress all files and directories within a directory.
-v verbose - print name and percentage reduction for each file.

Backing up and Compressing the Home Directory

Create the **`tar`** File

- Move to the home directory (**`cd /home`**)
- **`tar cvf /tmp/studenthome.tar student`**

Display the Table of Contents

- **`tar tvf /tmp/studenthome.tar`**

Compress the tar File

- **`gzip –v /tmp/studenthome.tar`**

Backup the Compressed File to the Default Tape Drive

- **`tar cv /dev/tape /tmp/studenthome.tar.gz`**
- **`or`**
- **`cp /tmp/studenthome.tar.gz /dev/tape`**

Restoring Files

Make a new directory and change to it.

- **`cd ; mkdir newhome ; cd newhome`**

Extract the home directory from tape.

- **`tar xv  /dev/tape  studenthome.tar.gz`**
- **`or`**
- **`cp  /dev/tape  newhome/studenthome.tar.gz`**

Uncompress the compressed tar file.

- **`gzip -d studenthome.tar.gz`**

Extract the tar file.

- **`tar xvf studenthome.tar`**

should create a folder called student, which contains all the files and folders that the original folder contained.

Opensource Command Line Backup and Compression Tools

`zip` and **`unzip`** Commands

- Unix versions of the PKZip and WinZip programs. Gives you the ability to use archives made with these Windows formats.

GUI Backup Tools

Unlike most other GUI versions of command line tools, GUI versions of backup utilities are often much more sophisticated and better suited to “mission-critical” use.

KDE provides graphical tools for archiving, compressing and uncompressing files.