

# Lecture 2: The file system

Hands-on Unix System Administration DeCal

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## Review

❖ Basic programs

❖ Basic commands

File hierarchy

Filesystems

File types

# Review

# Basic programs

Review

❖ Basic programs

❖ Basic commands

File hierarchy

Filesystems

File types

- `pwd`
- `cd`
- `ls`
- `cp, mv`
- `less, vi`

# Basic commands

Review

❖ Basic programs

❖ Basic commands

File hierarchy

Filesystems

File types

- RTFM: `man`, `--help` command line option
- **input**: command line options, `stdin`
- **output**: `stdout`, `stderr`
- **manipulate** with pipes (`|`), redirection (`>`, `>>`), and substitution (```)

Review

**File hierarchy**

- ❖ Windows
- ❖ \*nix concept
- ❖ Looking under /
- ❖ Looking under / more

Filesystems

File types

# File hierarchy

# Windows

Review

File hierarchy

❖ **Windows**

❖ \*nix concept

❖ Looking under /

❖ Looking under / more

Filesystems

File types

- each storage device has a drive letter, e.g. `A: \` for floppy, `C: \` for hard disk, etc.
- important directories
  - ❖ `C: \Windows`
  - ❖ `"C: \Program Files"`
  - ❖ `C: \Users`

# \*nix concept

Review

File hierarchy

❖ Windows

❖ \*nix concept

❖ Looking under /

❖ Looking under / more

Filesystems

File types

- “simplicity through expression”
- everything starts from the root<sup>1</sup>: /
- excessive (but productive) abbreviation
- case sensitive

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<sup>1</sup>(not to be confused with /root)

# Looking under /

/bin/ core **bin**aries

/dev/ **dev**ice files

/etc/ systemwide *configuration* files

/home/ **home** *directories* (user data)

/lib/ core **lib**raries

/proc/ **proc**fs interface to kernel

# Looking under / more

/root/ **root**'s home directory<sup>2</sup>

/sbin/ to **system binaries**

/tmp/ **temporary** files

/usr/ non-core binaries, libraries, etc.

/var/ **varying** files: logs, user inboxes, running program data, etc.

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<sup>2</sup>(not to be confused with the root / )

Review

File hierarchy

**Filesystems**

- ❖ What is a filesystem?
- ❖ Examples
- ❖ Non-disk/flash filesystems
- ❖ RAID
- ❖ RAID examples
- ❖ Mounting

File types

# Filesystems

# What is a filesystem?

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ Examples

❖ Non-disk/flash filesystems

❖ RAID

❖ RAID examples

❖ Mounting

File types

- Each local hard disk can have one or more partitions which contain files managed by a filesystem
  - ❖ e.g., `/dev/sda`, `/dev/sda1`

# Examples

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ **Examples**

❖ Non-disk/flash filesystems

❖ RAID

❖ RAID examples

❖ Mounting

File types

- Windows (and flash drives) filesystems: FAT32, NTFS
- Linux: ext3, ext4, btrfs
- Other Unix: UFS, XFS, ZFS, ReiserFS

# Non-disk/flash filesystems

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ Examples

❖ Non-disk/flash filesystems

❖ RAID

❖ RAID examples

❖ Mounting

File types

- RAM: tmpfs
- network: NFS, SMB
- FUSE: GmailFS, WikipediaFS

# RAID

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ Examples

❖ Non-disk/flash filesystems

❖ **RAID**

❖ RAID examples

❖ Mounting

File types

- Redundant Array of Independent (Inexpensive) Disks
- combine multiple hard drives for speed (striping), capacity, reliability (mirroring, parity)

# RAID examples

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ Examples

❖ Non-disk/flash filesystems

❖ RAID

❖ RAID examples

❖ Mounting

File types

- common examples: RAID 0 (striping), RAID1 (mirror), RAID5 (parity), RAID 6 (two parity)
- nested, e.g., RAID 10

# Mounting

Review

File hierarchy

Filesystems

❖ What is a filesystem?

❖ Examples

❖ Non-disk/flash filesystems

❖ RAID

❖ RAID examples

❖ Mounting

File types

- file hierarchy crosses filesystem boundaries
- use `mount` to mount local or networked *stuff* on a directory (mount point)
  - ❖ can mount regular files too

Review

File hierarchy

Filesystems

**File types**

❖ Regular files

❖ Other file types

# File types

# Regular files

Review

File hierarchy

Filesystems

File types

❖ Regular files

❖ Other file types

- Windows: filetype extensions

- ❖ `.exe`

- ❖ `.doc`

- Unix: magic tests

- ❖ `man file`

# Other file types

Review

File hierarchy

Filesystems

File types

❖ Regular files

❖ Other file types

- `ls -l`
  - ❖ **directories** (`dir`)
  - ❖ **symbolic links** (`symlink`)
  - ❖ **devices**: **c**haracter, **b**lock
  - ❖ **sockets**, named **p**ipes (FIFOs)