DIPLOMA WALLAH

(Your One Stop Hub For Diploma Resources)

OPERATING SYSTEM AND ADMINISTRATION

Complete Notes Based on Full Syllabus

- Diploma Engineering

4th Semester

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Notes prepared by **Sangam**

Ch-4

Sagar Sangam

~~User Authentication~~

System monitoring

System monitoring is the process of continuously checking a computer or server's performance and health.

It help make sure that all components (CPU, memory, disk, network) are working properly and efficiently.

This like health checkup for our computer.

What is monitored?

* CPU usage - How much processor used?
* Memory (RAM) - How much memory is free and how is being used.
* Disk space - How much storage is available.
* Network traffic - How much data is being sent and received.
* Processes - Which programs are running and how much resources they use.
* System logs - Record the system events or errors.

Why

prevent crashes
Optimize performance
Security
Capacity planning.

Tools
- Linux: top, htop, vmstat, iostat, netstat
- Windows: Task manager, Resource Monitor, performance Monitor.

* Log monitoring

Log monitoring is the process of continuously checking the logs generated by our OS, applications, our network devices to detect errors, security issues, or performance problems.

- Logs = records of events, like user login, errors or system warnings.
- Monitoring = watching these logs in real time to detect issues.

Types of logs:—
- System logs → OS events (Startup, Shutdown, Crashes).
- Application logs — software event (eg. web server errors)
- Security logs → login attempts; failed authentication.
- Network logs → Traffic events, firewall alerts.

Eg
Imagine a bank: every transaction, login attempt, or failed password attempt is recorded in a log.
Log monitoring helps detect suspicious activity like repeated failed logins or unauthorised transaction, ensuring security.

* System Maintenance
System Maintenance is the regular upkeep of a computer / server to ensure it runs efficiently, safely and securely.
Key Maintenance →
1. Disk Cleanup - Remove temporary / unnecessary files.
2. Software updates - Keep OS and application updated.
3. Backup - Regularly save important data
4. Hardware checks - Monitor CPU, memory, disk health.
5. Security checks - Antivirus scan.

System Maintenance keeps your computer / server healthy and prevents failures.

Ex - A web server logs show high CPU usage (log monitoring). Admin then clears unnecessary process, updates software, and restart service (System Maintenance) → System runs smoothly again.

System Information

System information is all the details about our computer our servers, including hardware, s/w and configuration. It help understand how our system works and troubleshoot problems.

Component:-

→ Hardware Information
- CPU → processor type and speed
- RAM → memory size and usage
- Storage → Hard disk / SSD size and free space.

→ Software Information
- OS - windows, Linux, MacOS
- Installed Application - program on our system.
- System Drivers - software that controls hardware devices.

→ Network Information
- IP Address - of our device identify on the network.
- MAC address - unique identifier of n/w hardware.

→ System performance
- CPU usage, memory usage, disk I/O network traffic.

Tools
- Windows: System Information (msinfo 32), Task manager, Command prompt (systeminfo)
- Linux: lshw, uname, -a, df -h, free -m

System Architecture

System architecture is the design and structure of a computer system, showing how hardware and s/w components interact to perform tasks.

→ It shows how everything is connected and work together.

Components

1. Kernel (Core of OS)
   - manage CPU, memory and devices
   - Ex-
     - monolithic Kernel: Linux
     - microkernel: Minix, QNX

2. User space
   - Area where user application run
   - Example: Browser, word processors, games

3. System calls
   - Interface b/w user programs and Kernel.
   Ex - open(), read(), write() in Linux.

4. Memory management
   - OS controls RAM allocation for programs.
   - Ex- Virtual memory allows programs to use more memory than physically available.

5. process management
   - OS Schedules and controls execution of multiple processes.

Ex - Task manager in windows or t

Ex
- CPU (kernel) - OS decides which program get CPU.
- Memory (RAM) - OS assigns memory to apps, keep system stable.
- Storage (DISK) → OS manages file storage & access.
- processes (Apps) - OS schedules multiple program to run efficiently.
- I/O devices - OS manages mouse, keyboards, printer, network.

Ex
- process management: OS decides how much CPU each apps gets.
- Memory management: Allocates RAM to both apps.
- Device management: Send audio o/p to speakers.
- System calls: Apps request files or network data to OS.

Every thing happen seamlessly because of the OS system architecture.

Boot loader

A boot loader is a crucial component in linux boot process that initializes the system by loading the linux kernel and passing necessary boot parameters.

Steps

1. BIOS / UEFI Initialization
- BIOS (Basic I/O System) or UEFI run first.
- performs POST check CPU, memory hardware
- load bootloader from disk.

2. Bootloader Stage
- Bootloader is a small program that loads the linux kernel into m/m.
- GRUB (Grand unified Bootloader), LILO.
- lets we choose which OS to boot if multiple are installed.

3. Kernel loading
- Kernel is loaded into m/m.
- Initialize hardware devices and mounts the root filesystem.
- Start the initial process (init)

4. Init / Systemed Stage
- The first process (init or Systemed) is Started.
- Responsible for starting all user-level services and daemons.

Ex - Networking, GUI, Printing Services.

5. Runlevel / Target Stage
- multiuser.target → CLI
- graphical.target → GUI

6. Login prompt
- Finally user see login prompt or GUI login screen.
- System is ready for use.

Linux boot process = power ON → Hardware check → load Kernel → Start services → Login screen → System ready.

* System Runlevels define the mode in which Linux operates, controlling which services and processes start.

Common system runlevel
0 - Shutdown
1 - Single user mode
2 multi user mode
3 multi users with networking CLI
4 undefined / user-defined
5 multi-user with GUI
6. Reboot

System updats:
A system updats is the process of installing new version of s/w, security patches, bug fixes and kernel updats on our OS.
- updats can be four:
  - OS Components
  - Installed application
  - Security patches.

Thinking of our smartphone: we regularly update apps and system s/w to fix bugs, add features, and improve security.

* Repository:
A repository is a central location where s/w packages are stored and maintained.
- our system downloads updated our new s/w from repositories.

Types
1. official repositories - maintained by OS dev.
2. Third party repo - maintained by independent dev.
3. Local repo - stored on our own server/network.

Sharing/selling not allowed.