NSS
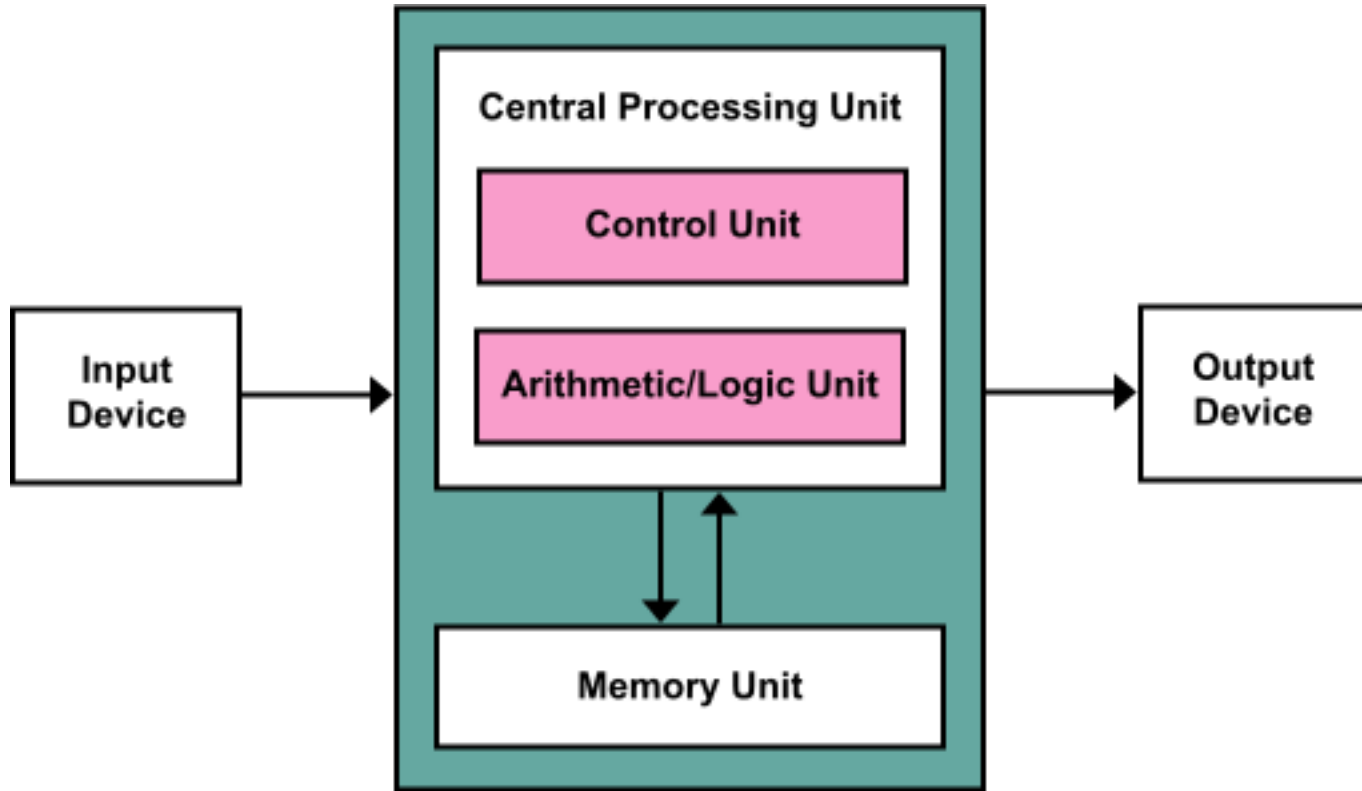
Intro Q/A
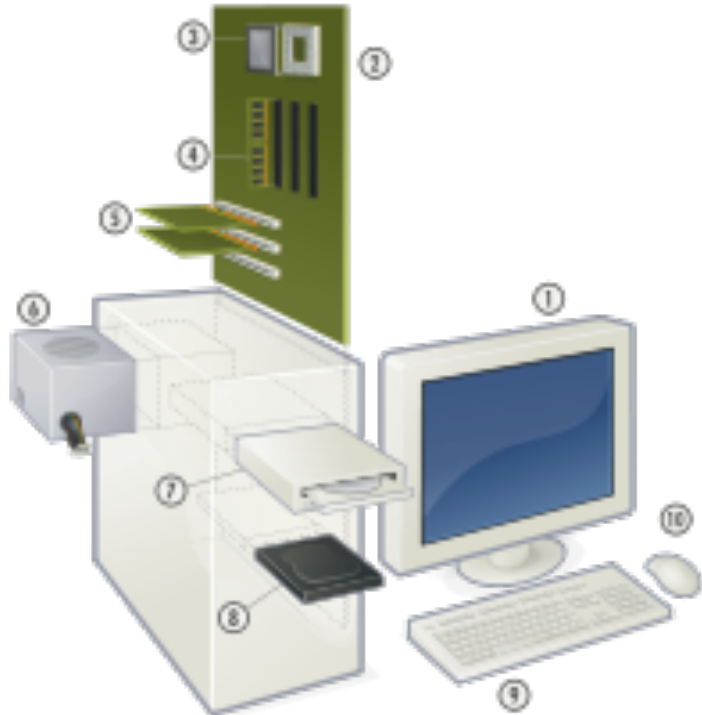
NSS

Von Neumann Architecture

Hardware

Hardware

Motherboard

    Ram

    Processor

    Buses

Storage devices

    Hard drives, DVD/CD, Flash drives

Input

    Mouse/Keyboard

Output

    Printer/Monitor

Ram

Stores the code and data that are actively accessed by the CPU

Processors

The part of the computer which carries out required actions.

Bus

Connects the CPU to the various components

Storage

Various types of memory used by a computer: Ram, Hard drives, Cache.

Networking devices

The devices which allow multiple computers to communicate.

These include local networking devices as well as remote devices used in communication:
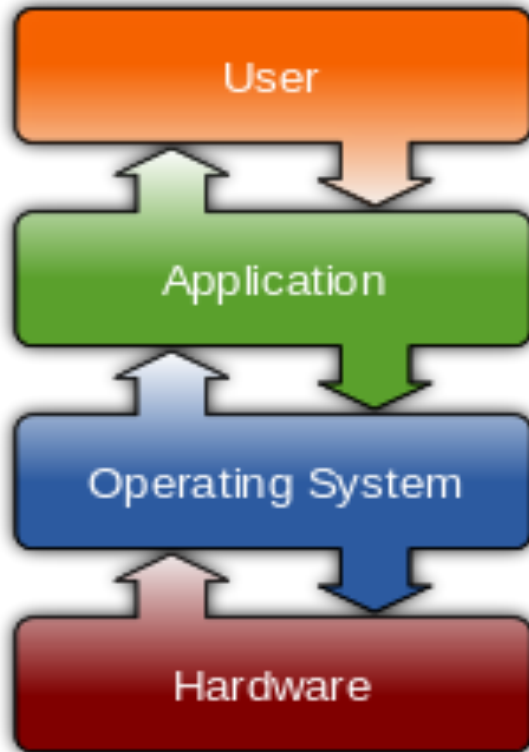
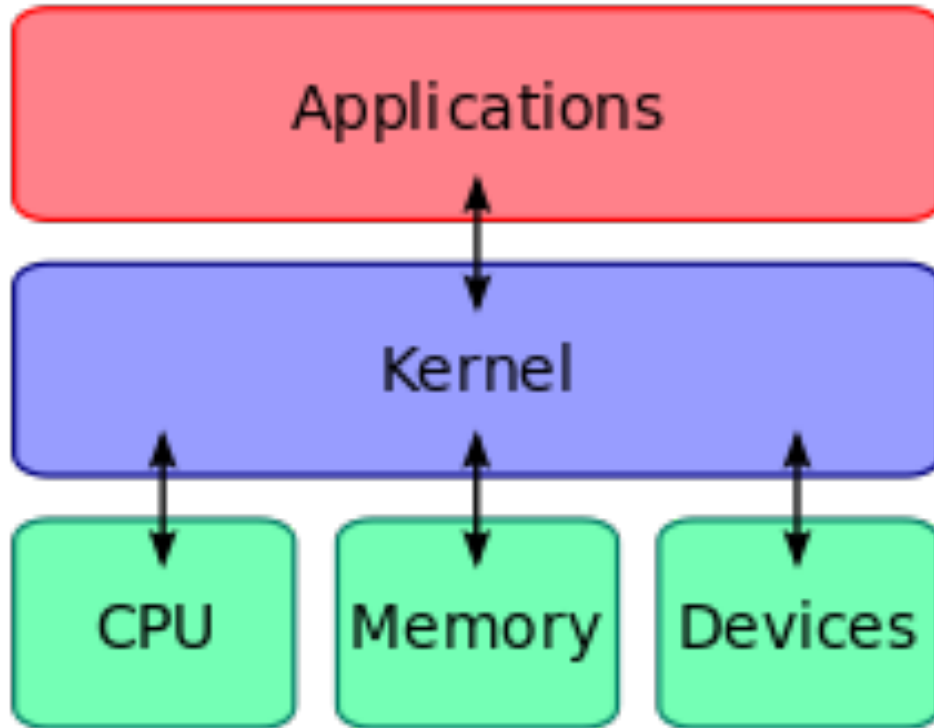Switches, Bridges, Network Cards

Input/Output Devices

Input devices are any devices which allow users to enter data.

Output devices are devices which display data in a human readable format

Operating systems

Parts of an OS

OS Parts

Kernel

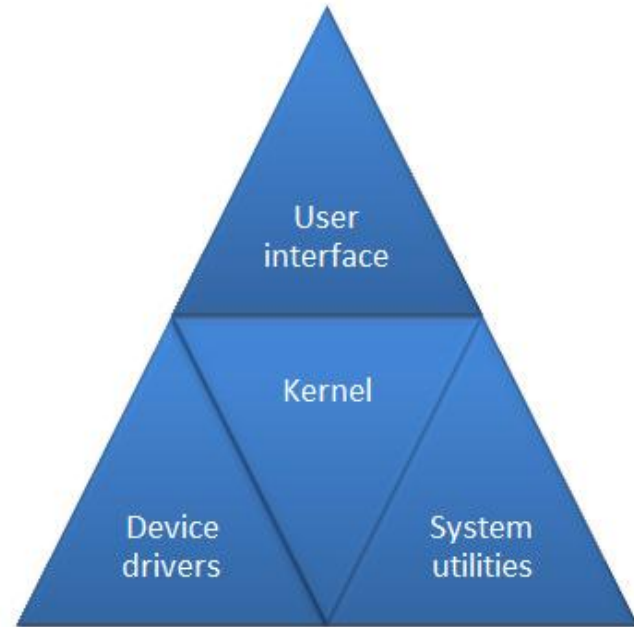Device Drivers

User interface

System Utilities

PARTS OF AN OPERATING SYSTEM

(c) teach-ict.com

Kernel

- Loading / Unloading applications from memory
- Scheduling tasks to run on the CPU
- Memory management
- File management
- Data security

Device Drivers

Every piece of hardware that makes up the computer or connected to it, will have a device driver that allows the operating system to control and communicate with it.

User Interface

This part of the operating system is directing what you see on the screen (via the device driver) and reacting to your key presses and other inputs. The user interface could be a basic command line interface, as you might find on a server, or it might be a full blown Graphical User Interface (GUI) such as the Mac OS X, Windows or perhaps Gnome on Linux.

WIMP (Windows, Icons, Menus, & Pointers)

System Utilities

Part of the Operating System provides all of the basic facilities that run in the background without user interaction.

Print spool services

Crypto password management

File management services

Useful features

Scheduling

Memory Management

Allocation of resources

Utilization tracking
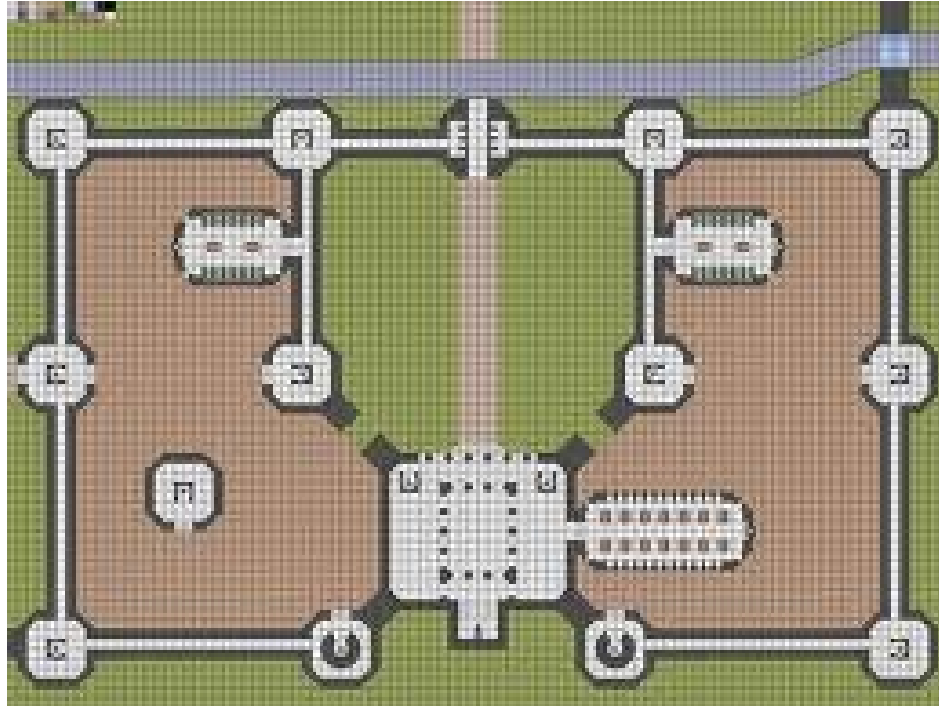
Data/User/Process Security

Network connections

Hierarchical Protection Domains (Trust)
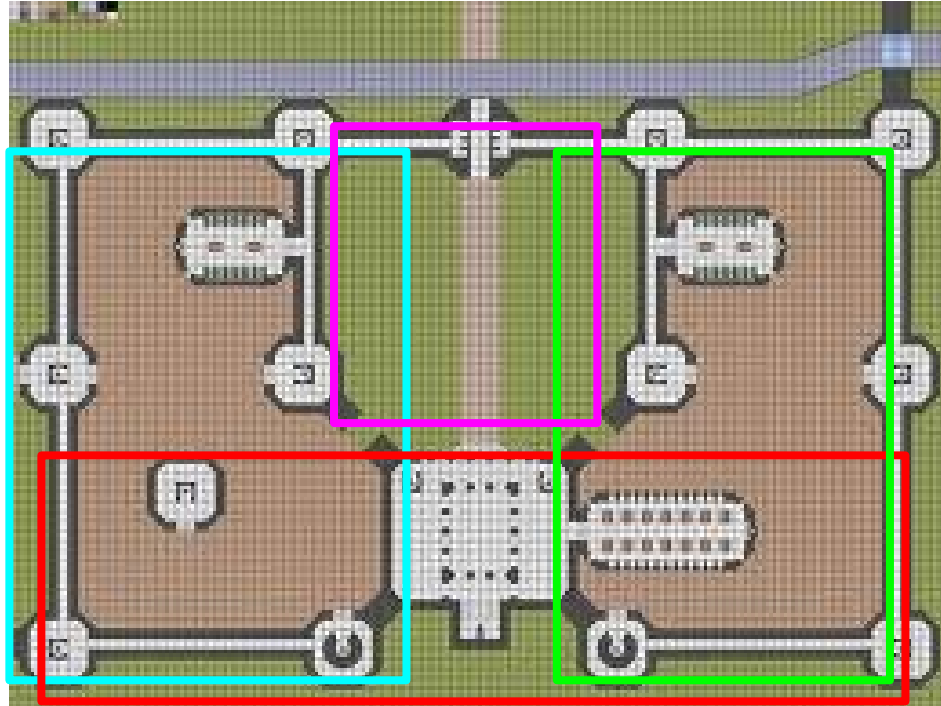
AKA Protection Rings

Are a mechanism to protect data and functionality from faults and malicious behavior.

In other words the operating system has different levels of access to resources.
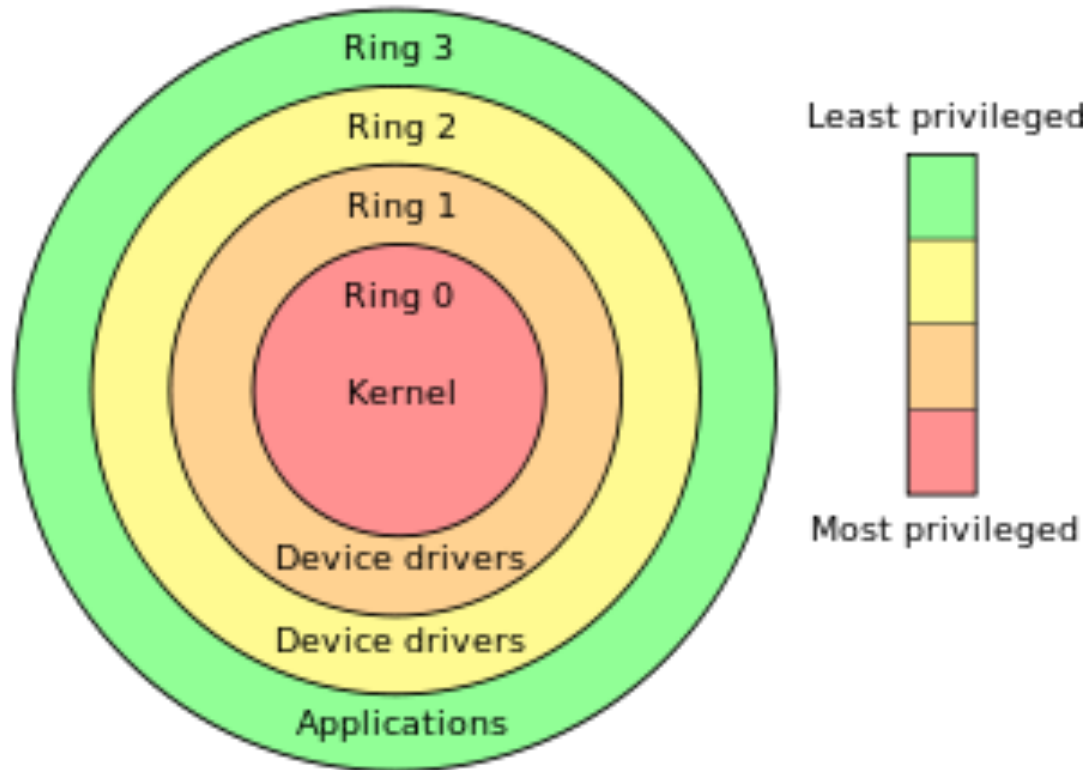
A Useful Analogy

Zones of Privilege (Trust)

Privilege rings

Interacting between rings

Outer rings can interact with inner rings through well constructed gates.

OSI Model
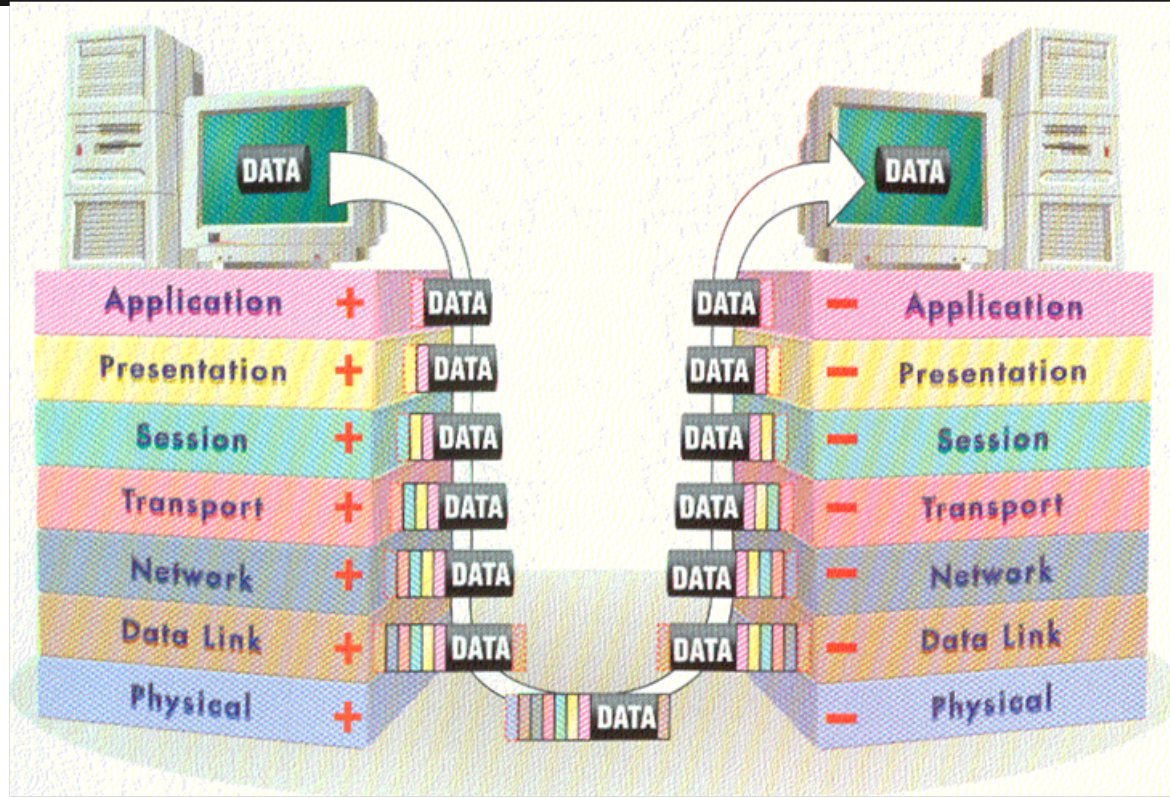
A Wiki definition

The **Open Systems Interconnection (OSI) model** (ISO/IEC 7498-1) is a conceptual model that characterizes and standardizes the internal functions of a communication system by partitioning it into abstraction layers. The model is a product of the Open Systems Interconnection project at the International Organization for Standardization (ISO).

OSI (Open Source Interconnection) 7 Layer Model

Layer	Application/Example	Central Device/Protocols	DOD4 Model
Application (7) — Serves as the window for users and application processes to access the network services.	**End User layer** Program that opens what was sent or creates what is to be sent — Resource sharing • Remote file access • Remote printer access • Directory services • Network management	**User Applications** — SMTP	Process
Presentation (6) — Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	**Syntax layer** encrypt & decrypt (if needed) — Character code translation • Data conversion • Data compression • Data encryption • **Character Set Translation**	JPEG/ASCII EBDIC/TIFF/GIF PICT	Process
Session (5) — Allows session establishment between processes running on different stations.	**Synch & send to ports** (logical ports) — Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.	**Logical Ports** — RPC/SQL/NFS NetBIOS names	Process
Transport (4) — Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.	**TCP** Host to Host, Flow Control — Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing	PACKET FILTERING — TCP/SPX/UDP	Host to Host
Network (3) — Controls the operations of the subnet, deciding which physical path the data takes.	**Packets** ("letter", contains IP address) — Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting	**Routers** — IP/IPX/ICMP	Internet
Data Link (2) — Provides error-free transfer of data frames from one node to another over the Physical layer.	**Frames** ("envelopes", contains MAC address) [NIC card —— Switch —— NIC card] (end to end) — Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control	**Switch Bridge WAP** PPP/SLIP	Network
Physical (1) — Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	**Physical structure** Cables, hubs, etc. — Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts	**Hub**	Network

GATEWAY — Can be used on all layers

Land Based Layers

Application

Supports end user processing (Email, File transfer, Network software)?

Presentation

Translates from application to network formats (encryption)

Session

Establishes and manages connections between applications

Transport

Handles transfer of data between end systems or hosts and is responsible for end-to-end error recovery and flow control.

Network

Handles switching and routing

Data Link

Encodes and Decodes data into bits

Physical

Handles the bit stream through the network