THOMAS MORE | UNIVERSITY OF APPLIED SCIENCES

THOMAS MORE | University of Applied Sciences

Computing Fundamentals

LID VAN ASSOCIATIE KU LEUVEN

Planning

Session	Subject	Test – Hand-in
1	Network Models	
2	Internet Protocol Suite	
3	Network segmentation	
4	Network protocols	
5	Operating systems	
6	Command Line	
-- 30/10 – 5/11 --	Autumn break – HERFSTVAKANTIE	
7	Command Line	
8	Mid-term test	**Test**
9	**Scripting**	
10	Virtualization - Cloud computing	

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Learning objectives

- Understanding basics of Network Models and Protocols
- Understanding basics of operating systems
- Understanding basics of Cloud computing
- Check the ECTS fiche …

Ready?

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Monitorate/Monitoraat
ADI/DSPS

- Collin Van der Vorst
  collin.vandervorst@thomasmore.be

- Donderdagen/Thursdays 13:45 - 15:45 C2.14

- Het monitoraat is een vrije ruimte waar de studenten kunnen werken aan hun projecten en terecht kunnen met vragen over moeilijkheden of computerproblemen.
- The monitorate is a free space where students can work on their projects and ask questions about difficulties or computer problems.

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Evaluation

- 1st chance
  - 40% Permanent Evaluation
  - 60% Final exam
- 2nd chance
  - 100% Exam

Network Models

Layered Network Models

- protocol stack

- The network protocols provide the services to upper layer protocols or applications at each layer.
- Network protocols are modular by design and function at specific layers of a hierarchical protocol stack.
- Each layer in the hierarchy provides services to the layer above it and uses the services of the layer beneath it.
- Each layer provides an *abstraction* to the layer just above it.
- This abstraction is desirable, as upper layers need not know how their data is routed across the Internet, or over which network their data will travel.

Protocol families and models

- There are many protocol families and models.

- We will explore the following in this course:

- the **OSI**/ISO 7-layer reference model
- the **TCP/IP** Sun/DoD 5-layer model

- The two models are different in several respects, although both perform the same function, which essentially is to reveal the hierarchical, modular nature of network protocol design and operation. The network models also provide guidance for network protocol designers.

The OSI/ISO 7-Layer Reference Mode

- Layers of the OSI Model

LAYER (NUMBER)	DESCRIBES/DEFINES
Application (7)	Applications and network services
Presentation (6)	The way data is presented
Session (5)	Manages connection terms of a session
Transport (4)	End-to-end messaging between applications
Network (3)	Data addressing and delivery between networks
Datalink (2)	Error detection and packet framing across a physical network
Physical (1)	Network hardware, electrical voltage and current

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OSI

Note that:

- The OSI model was developed by the International Standards Organization (ISO).
- The layers of the OSI model are numbered from the base upward.
- The Physical layer (1) is at the base and the Application layer (7) is at the top.
- The OSI model is a generic networking model.
- The OSI model was designed in the early 1980s and intended for multiple manufacturers and standards.
- The OSI model was originally focused on open systems and interfacing multiple stacks.
- Chronologically, the OSI model was created long after the TCP/IP family of protocols.

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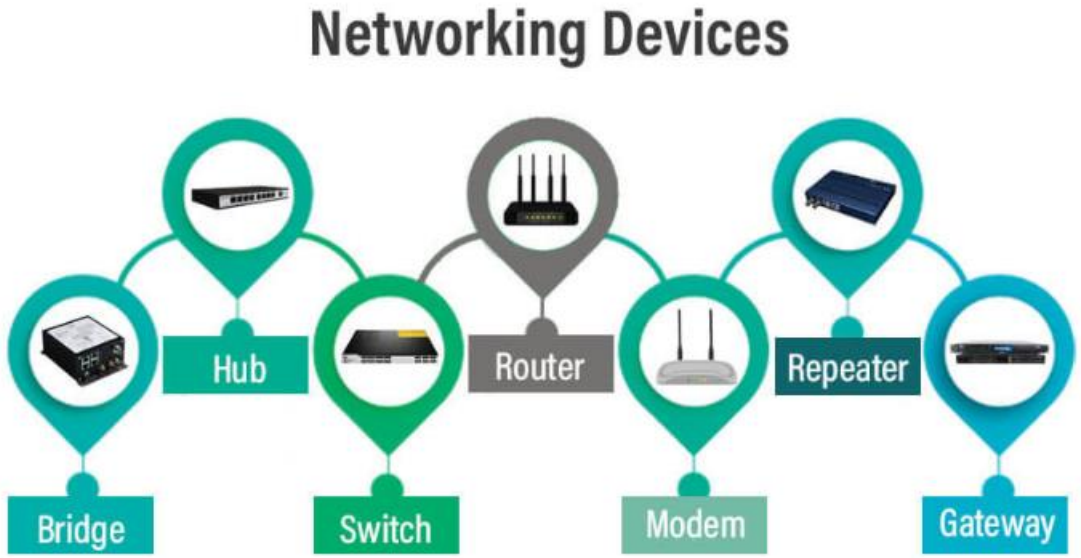
Network devices

- Network devices, also known as networking hardware, are physical devices that allow hardware on a computer network to communicate and interact with one another.



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Repeater

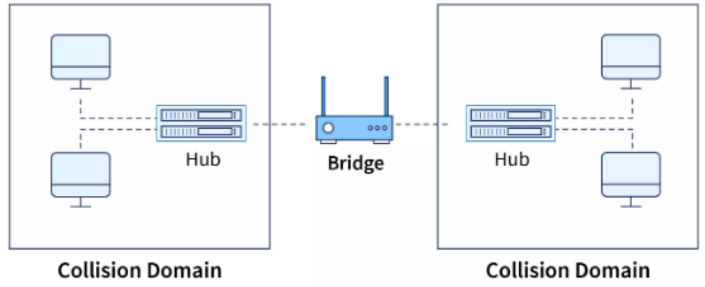
- A repeater operates at the *physical layer*. Its job is to amplifies (i.e., regenerates) the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be transmitted over the same network. When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength. It is a 2-port device.

Hub

- A hub is a basically multi-port repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, the collision domain of all hosts connected through Hub remains one. Also, they do not have the intelligence to find out the best path for data packets which leads to inefficiencies and wastage.
- Hubs broadcast incoming traffic on all ports, whereas bridges and switches only route traffic towards their addressed destinations.
- Hubs operate at *Layer 1* of the OSI model

Bridge

- A bridge operates at the *data link layer*. A bridge is a repeater, with add on the functionality of filtering content by reading the MAC addresses of the source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.
- Bridges broadcast data to every node, just like repeaters and hubs do. However, bridges keep the media access control (MAC) address table up to date as soon as they discover new segments, ensuring that only the desired recipient receives subsequent transmissions.



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Switch

- A switch is a multiport bridge with a buffer and a design that can boost its efficiency(a large number of ports imply less traffic) and performance. A switch is a data link layer device. The switch can perform error checking before forwarding data, which makes it very efficient as it does not forward packets that have errors and forward good packets selectively to the correct port only. In other words, the switch divides the collision domain of hosts, but the broadcast domain remains the same.

Types of Switches

- Unmanaged switches: These switches have a simple plug-and-play design and do not offer advanced configuration options. They are suitable for small networks or for use as an expansion to a larger network.
- Managed switches: These switches offer advanced configuration options such as VLANs, QoS, and link aggregation. They are suitable for larger, more complex networks and allow for centralized management.
- Smart switches: These switches have features similar to managed switches but are typically easier to set up and manage. They are suitable for small- to medium-sized networks.
- Layer 2 switches: These switches operate at the Data Link layer of the OSI model and are responsible for forwarding data between devices on the same network segment.
- Layer 3 switches: These switches operate at the Network layer of the OSI model and can route data between different network segments. They are more advanced than Layer 2 switches and are often used in larger, more complex networks.

Types of Switches

- PoE switches: These switches have Power over Ethernet capabilities, which allows them to supply power to network devices over the same cable that carries data.
- Gigabit switches: These switches support Gigabit Ethernet speeds, which are faster than traditional Ethernet speeds.
- Rack-mounted switches: These switches are designed to be mounted in a server rack and are suitable for use in data centers or other large networks.
- Desktop switches: These switches are designed for use on a desktop or in a small office environment and are typically smaller in size than rack-mounted switches.
- Modular switches: These switches have modular design, which allows for easy expansion or customization. They are suitable for large networks and data centers.

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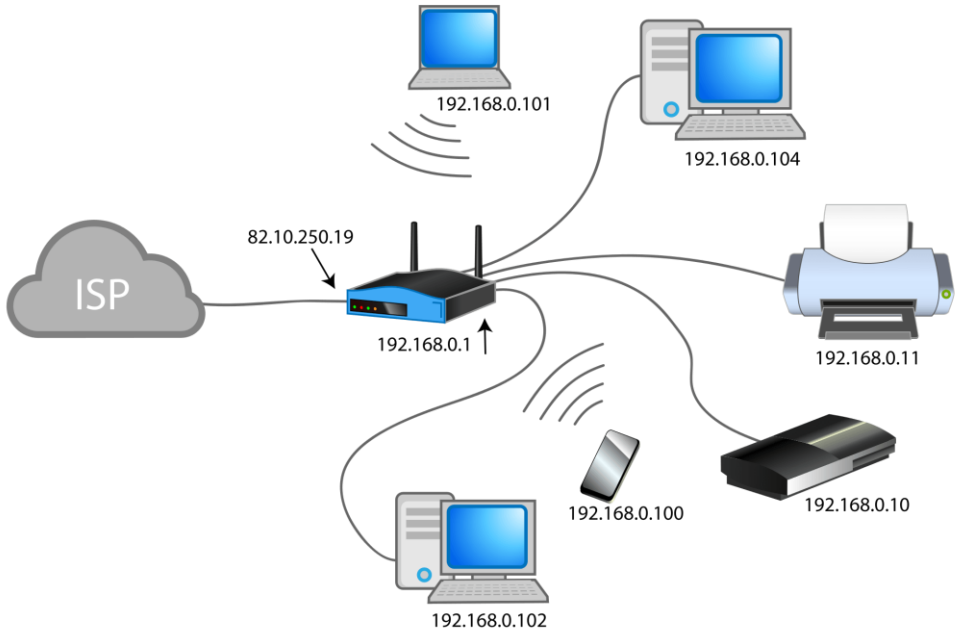
Routers

- A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a *Network Layer* device. Routers normally connect LANs and WANs and have a dynamically updating routing table based on which they make decisions on routing the data packets. The router divides the broadcast domains of hosts connected through it.



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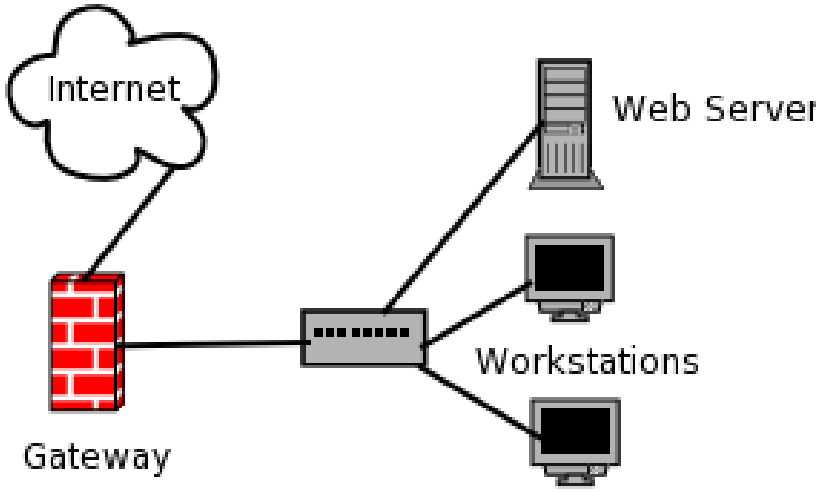
Gateway

- A gateway, as the name suggests, is a passage to connect two networks that may work upon different networking models. They work as messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any *network layer*. Gateways are generally more complex than switches or routers.



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Brouter

- It is also known as the bridging router is a device that combines features of both bridge and router. It can work either at the *data link layer* or a *network layer*. Working as a router, it is capable of routing packets across networks and working as the bridge, it is capable of filtering local area network traffic.

NIC

- NIC or network interface card is a network adapter that is used to connect the computer to the network. It is installed in the computer to establish a LAN. It has a unique id that is written on the chip, and it has a connector to connect the cable to it. The cable acts as an interface between the computer and the router or modem. NIC card is a *layer 2* device which means that it works on both the *physical* and *data link* layers of the network model.