

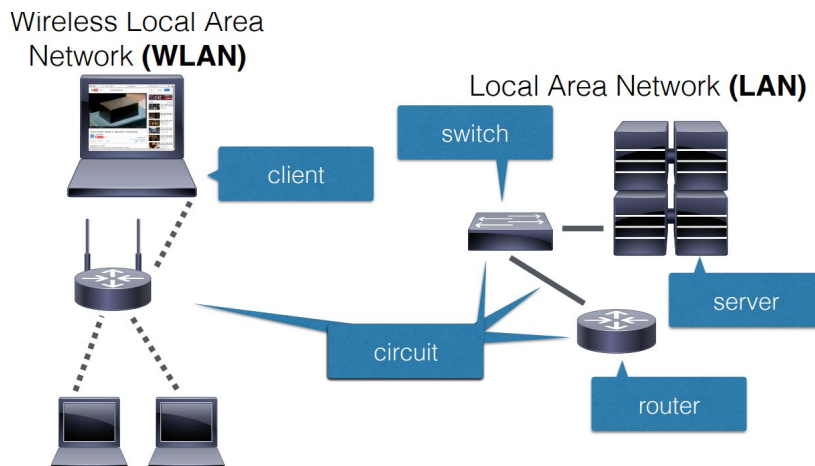
Week 8: TCP/IP Basics and Application Layer

Learning Objectives:

- Name and describe the functions of the different layers of the Internet Model
- Identify different application architectures
- Understand and analyse the HTTP and SMTP application layer protocols

Network Components:

- Client – a device that enables users to access the network
- Server – a device that provides services to clients. E.g. act as a storage, printing server, web server
- Switch – Device that connects multiple clients to form a LAN
- Router – Device to connect different networks



Types of networks:

- LAN (Local Area Network) – A group of clients or servers that share a local circuit, connected through switches and cables. Devices in a LAN can communicate with each other without going through a router. Speed usually 1Gbps (gigabit per second).
- BN (Backbone Network) – A network that connects multiple LAN's using routers. Usually does not contain clients or servers, it is used to transfer network traffic

between LAN's, e.g. connect different floors, or campuses of a building. Speed usually 10 Gbps.

- MAN (Metropolitan Area Network) – Large network that connects LANs and BNs across locations, e.g. across a country. This network is usually leased to a third-party company to handle the network connection.
- WAN (Wide Area Network) – Similar to MAN except that it connect networks across large geographical locations. E.g. country to country.

Network application architectures:

In most cases, a client will communicate with a server, and they together provide an application to the user. There are four main tasks application to perform:

- Presentation logic – application providing user interface
- Application logic – define how application behaves, e.g. what happens when user performs a certain action
- Data access logic – how application manages its data. E.g. updating data whenever user makes changes or retrieving information when user does something
- Data storage – where data is kept.

In a server-based application architecture, almost all processing is done by the server. The client is just a “dumb terminal”.

Client-based server, client does everything besides data storage

In a client-server based architecture, there is a central file storage facility, allowing multiple users to work on the same files together. In this architecture, the client performs the presentation and application logic, while the server performs data access and storage.

A thin-client architecture is where the client performs only presentation logic, while the server performs the rest. This is common in web applications where webpages renders the page to users screens, but any action the user does is handled by the server.

A multi-tier architecture is where multiple servers are used to handle specific tasks of the application.

A peer-to-peer architecture is where no server is used at all. Clients connect to each other with each client implementing all aspects of the application.

Layers and protocols

The Internet Model:

1. Hardware layer - concerns with hardware like cables, plugs sockets, antennas.
Specifies the signals that are transmitted
2. Data link layer - defines the interface between hardware and software. Specifies how devices in a LAN can exchange packets.
3. Network layer – responsible for routing, decides which path a packet takes through the network
4. Transport layer – establishes a logical connection between an application sending a message and receiving application.
5. Application layer – Actual application software that a user interacts with.

Protocol Data Units – A formal language that defines how two applications talk to each other during each layer.

- Hardware layer PDU is a bit
- Data link layer PDU is a frame
- Network layer PDU is a packet
- Transport layer PDU is a segment or a datagram
- Application layer its messages