Week 1 – Introduction to Networking

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Semester 2, 2021

Outline

- Computer Networks
- Different types of computer networks
- Protocols, Layers and Services

Network vs Computer Network

- **Network**:
  - An intricately connected system of things or people
  - An interconnected or intersecting configuration or system of

- **Computer Network**:
  - A collection of autonomous computers interconnected by a single technology

Terminologies

- **Network device**: e.g. PC, Phone, Router, Switch.
- **Server**: Provider of a service. Accept requests from clients.
- **Client**: A net ting to a server and requesting a service.
- **Packet**: A message sent two network devices.
- **IP address**: A unique number identifying a network device.

What are the Internet and the World Wide Web?

- Is the Internet or WWW a computer network?
- Simple answers:
  - The **Interne**

    network but a **networks**!
  - The **WWW** is a distributed

    system that **runs on top of the Internet**

Uses of Computer Networks

- Business and Personal Applications
  - Resource sharing (e.g., printer, scanner, files)
  - Access to information
  - Interactive entertainment
  - E-commerce
  - Social Interactio
- Internet-of-Thi
  - parking, smart-meter, vending mach

Simple Client-Server Network

- A network with two clients and one server

Simple Client-Server Network

- The client-server model involves requests and replies

Differentiating Factors of Networks

- Types of transmission technology
  - Broadcast link
    - Broadcast networks have a single communication channel s n a network.
    - Packets s received by all others. Intended recipien the packet contents, others simply ig

Differentiating Factors of Networks

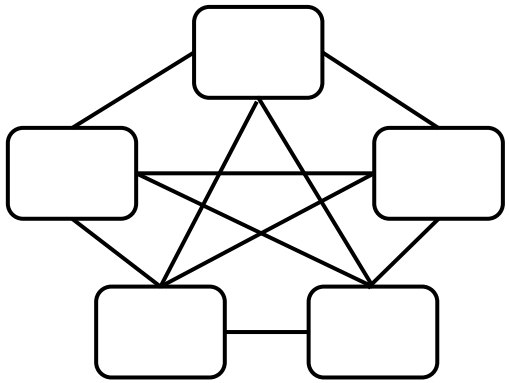
- Types of transmission technology
  - Point-to-point links
    - Data from sender machine is not seen and processed by other machines.
    - Unicasting is o-point networks with a single n exchange data.
    - Point-to-point networks consis nections between individual pairs of machines.
  - Multicasting
    - Transmission to a subset of the machines.

Differentiating Factors of Networks

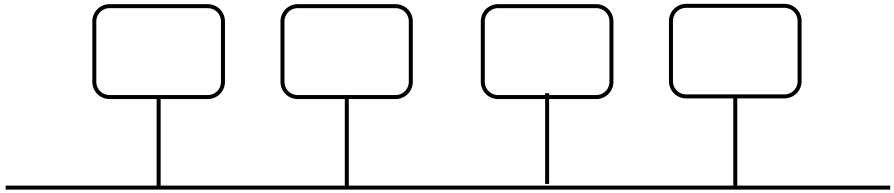
- By Scale

Differentiating Factors of Networks

- By Topology
  - Mesh
    - Fully mesh: each device has a dedicated point-to-point link to every other device.
  - Bus
    - All devices are
    - Only a single d at any point in time. Requires a negotiation mechanism t ission conflicts.
    - e.g. Ethernet is the most common b



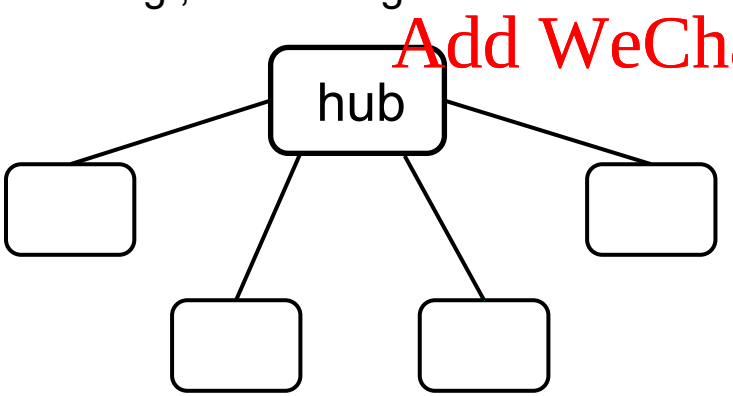
(a) mesh



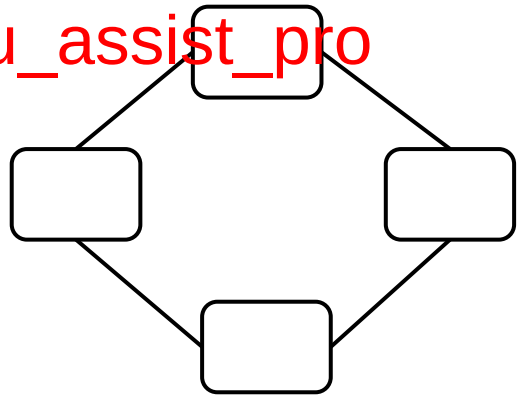
(b) bus

Differentiating Factors of Networks

- By Topology
  - Star
    - All devices are attached to a central device.
  - Ring
    - Each device on the ring receives the data from the previous device and forwards it to t
    - Requires acce euing
    - e.g., Token ring.



(c) star



(d) ring

What Makes the Internet Work

- Protocols, Layers and Services
  - Protocol Hierarchies
  - Design of Layer Models
  - Connection-Oriented and Connectionless Services
  - Services Pri
  - Services and Protocols
- Network Reference Mod
  - Open Systems Interconnect
  - TCP/IP
- Network Standards

The Philosopher-Translator-Secretary Architecture

Network Software: Protocol Hierarchies (1)

- Layers, protocols and interfaces

Consider the network as a stack of **layers**

ach layer offers

ervices to layers above

ough **interface**

tocol is an agreement between the communicating parties on how communication is to proceed

Network Software: Protocol Hierarchies (2)

- Information flow supporting the virtual communication in layer 5

Services

- Choice of service type has a corresponding impact on the reliability and quality of the service

- Connection-Oriented vs. Connectionless
  - Connection-O connect (similar to telephone ser t in connection setup.
  - Connectionless: just send (si al service).

Connection-Oriented and Connectionless

- Six different types of services

Service Primitives

- Primitives are a formal set of operations for services
- The number and type of primitives depends on the nature of service - in general more complex services require more service primitives
- Six service primitives for implementing a simple connection-oriented service

Relationship of Services and Protocols

Relationship of Services and Protocols

- **Service = set of primitives that a layer provides to a layer above it**
  - Provided through the interfaces between layers (service provider vs. service users)
  - Defines what operations the layer is prepared to perform on behalf of its us
  - Abstract: nothi ns are implemented

- **Protocol = a set of rules governing the format and meaning of packets that are exchanged by peers within a layer**
  - Packets sent between peer entities

Next: Reference Models

- The OSI Reference Model
- The TCP/IP Reference Model
- A Comparison of OSI and TCP/IP
- A Critique of ocols
- A Critique of odel