Computer Networks (CN)
EE-353

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Lectures 1 - 3 (Chapter 1)

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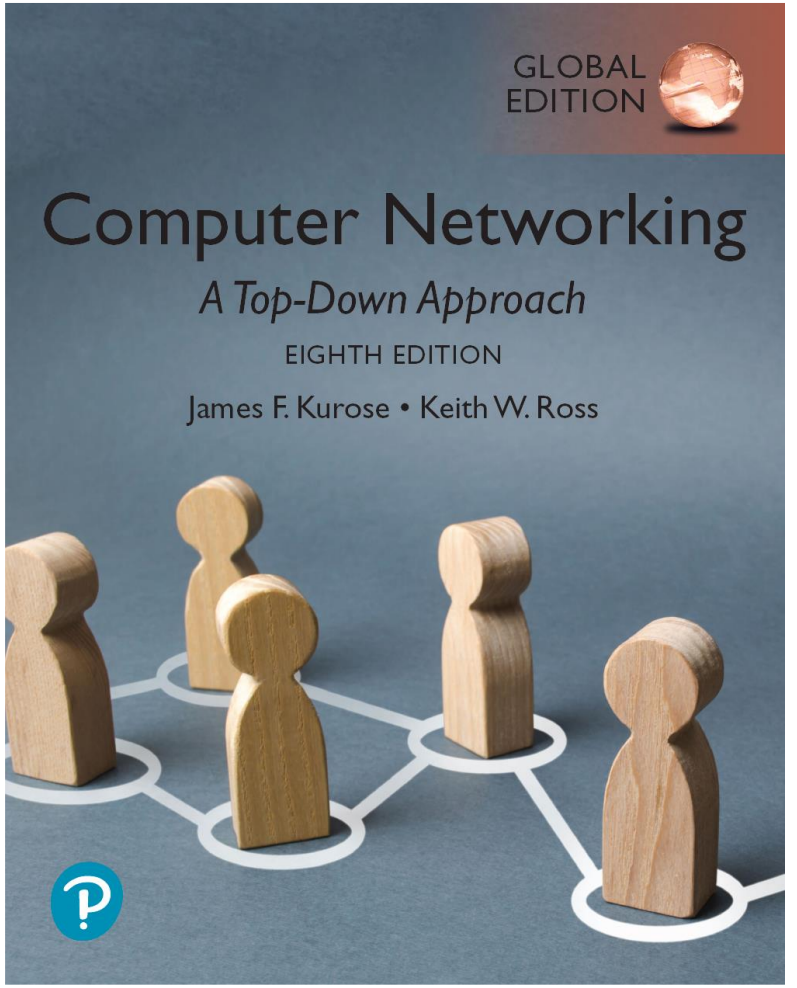
Text Books

- Computer Networking A Top-Down Approach, 8th Edition by Kurose and Ross.



Reference Books:

- Computer Networks and Internets, 6th Edition by Douglas E. Comer
- Computer Networks a systems approach, 5th Edition by Peterson and Davie

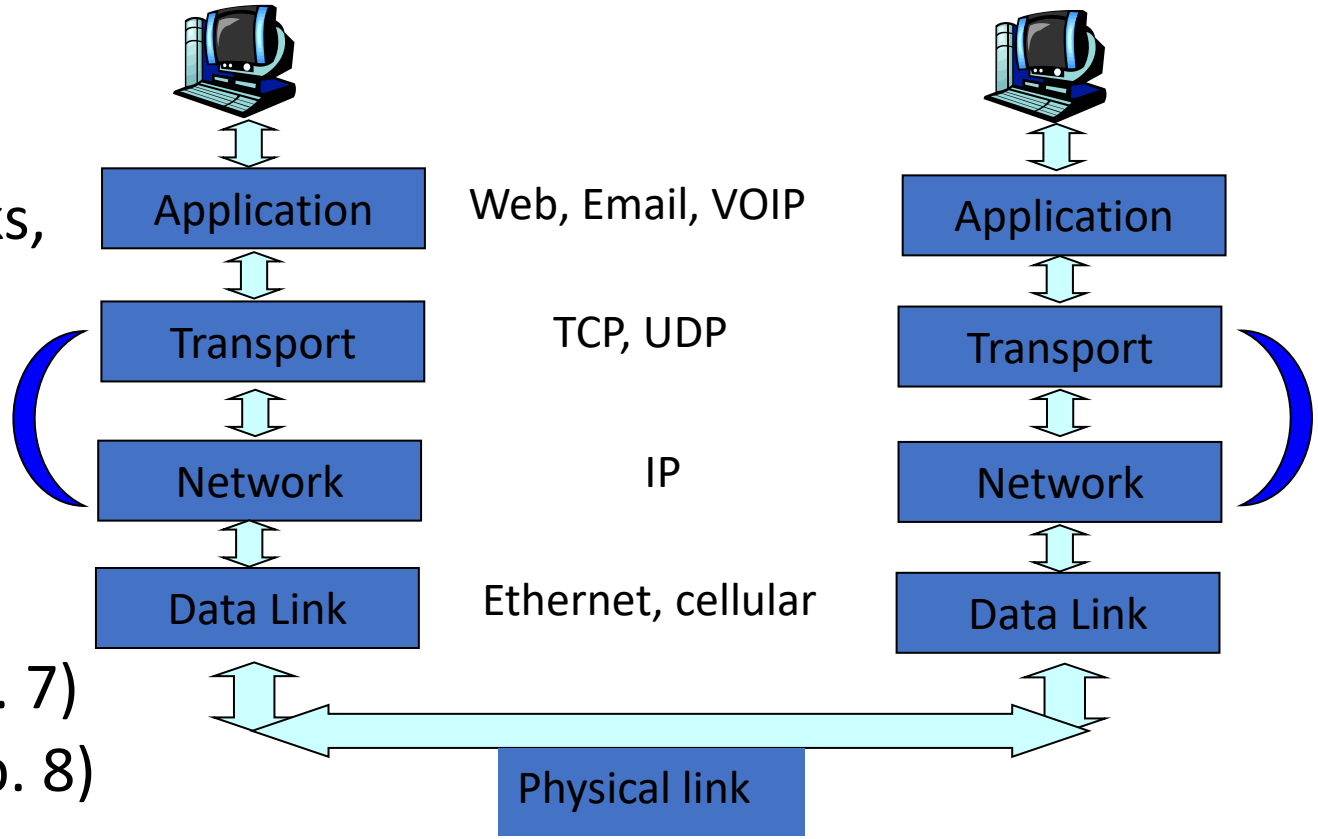
Weightages

- **Quizzes:** 10%(Theory part of 75%) (6-8)
  - Announced/unannounced
  - No-best-of policy
- **Class Activity:** 5%(Theory part of 75%)
  - Punctuality / Participation
- **Assignments:** 15%(Theory part of 75%) (3-5 Assignments)
- **MSE:** 30%(Theory part of 75%)
- **Final Exam:** 40%(Theory part of 75%)
- **Lab Work:** 25% (Lab Work, Lab Quizzes and Lab Exam/Project)
  - **Project:** 30% (Lab part of 25%)

Course Overview:

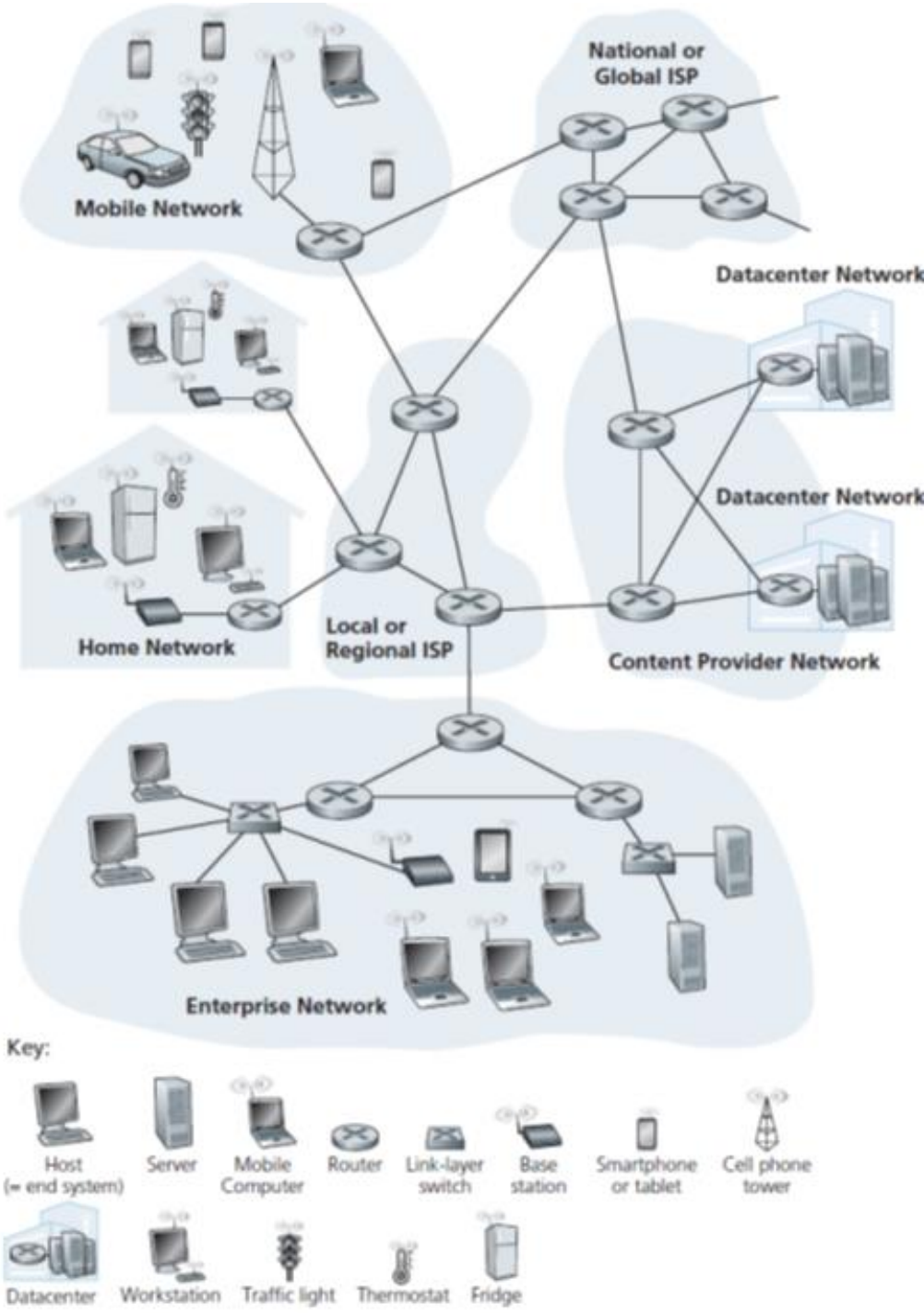
- Computer Networks and the Internet (Chap. 1)
- The Link Layer: Links, Access Networks, and LANs (Chap. 6)
- The Network Layer (Chap. 4,5)
- Transport Layer (Chap. 3)
- Application Layer (Chap. 2)

- Wireless and Mobile Networks (Chap. 7)
- Security in Computer Networks (Chap. 8)



Overview:

- What is the Internet?
- The Network Edge
- The Network Core
- Delay, loss, and throughput in Packet-Switched Networks
- Protocol Layers and their Service Models
- Networks under attacks (Security)



1. What is the Internet?

- Two ways to answer this question:
  - The basic hardware and software components that make up the internet (the nuts-and-bolts description).
  - A networking infrastructure that provides services to distributed applications.

1.1. What is the Internet? (The Nuts-and-Bolts view):

- Largest engineered system ever created by mankind,
  - With hundreds of millions of **connected computers**, **communication links**, and **switches**;
  - With billions of users who connect via laptops, tablets, and smartphones;
  - With an array of new Internet-connected things such as Web cams, game consoles, surveillance systems, watches, eye glasses, thermostats, cars, picture frames, and even washing machines.
- A computer network that interconnects billions of computing devices throughout the world.
- A network of networks.

1.1.1. Hosts or End Systems:

traditional

- desktop PCs,
- Linux workstations,
- Servers,
- laptops,
- smartphones,
- tablets,
- Web cams,

Non-traditional

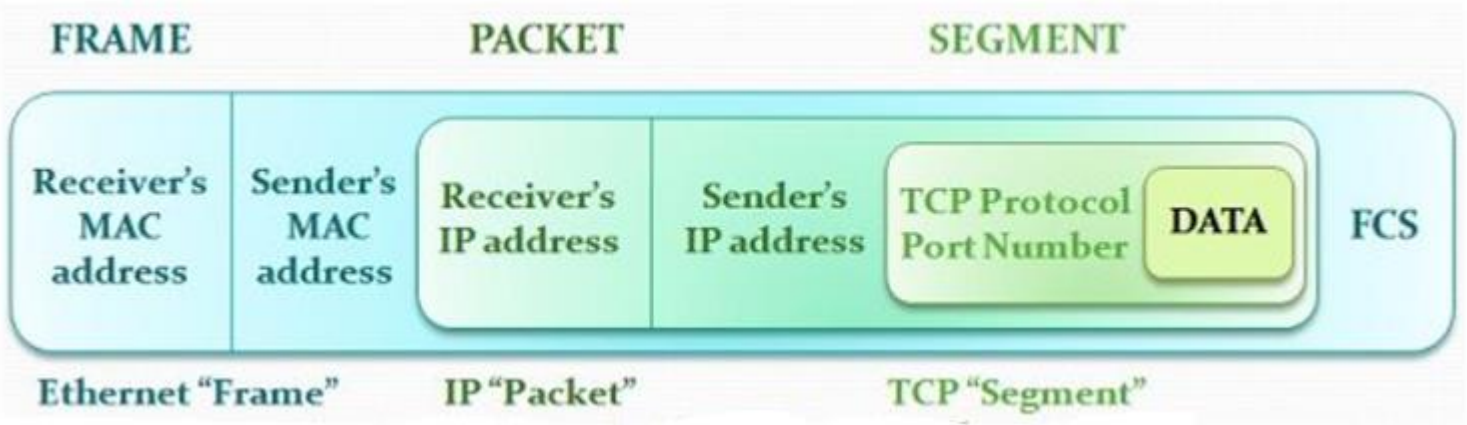
- TVs,
- Eye glasses,
- gaming consoles,
- Cars,
- Traffic control systems,
- Thermostats,
- home appliances,
- watches,
- home security systems, and more are being connected

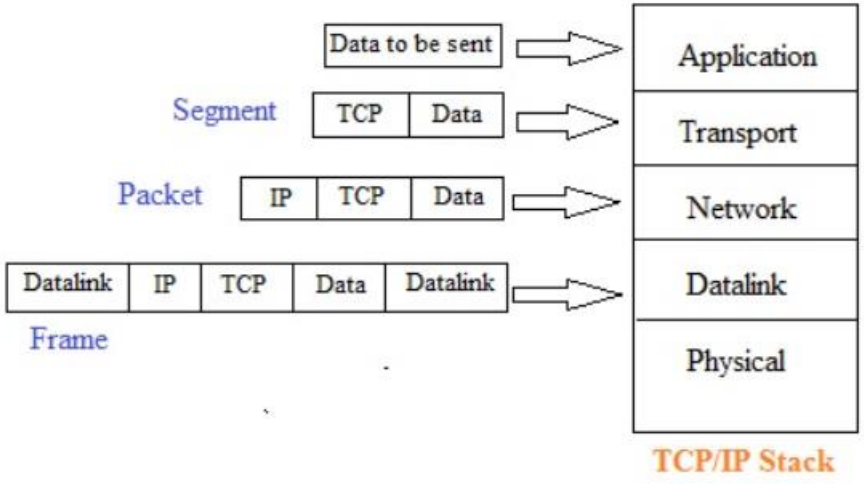
In Internet jargon, these devices are knows as hosts or end systems.

By some estimates, there were about 18 billion devices connected to the Internet in 2017, and the number will reach 28.5 billion by 2022 [Cisco VNI 2020].

1.1.2. Communication Links:

- End systems are connected together by a network of **communication links** and **packet switches**.
- Different links can transmit data at different rates, with the **transmission rate** of a link measured in bits/second.
- When one end system has data to send to another end system, the sending end system **segments** the data and adds **header** bytes to each segment.

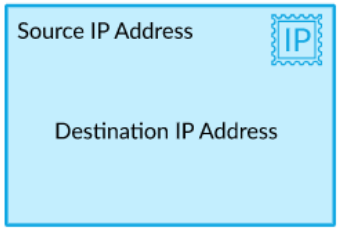


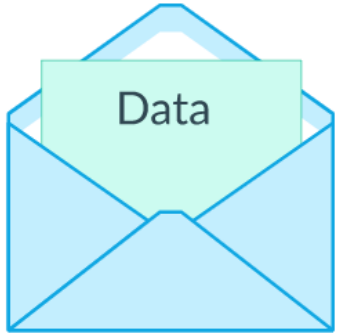


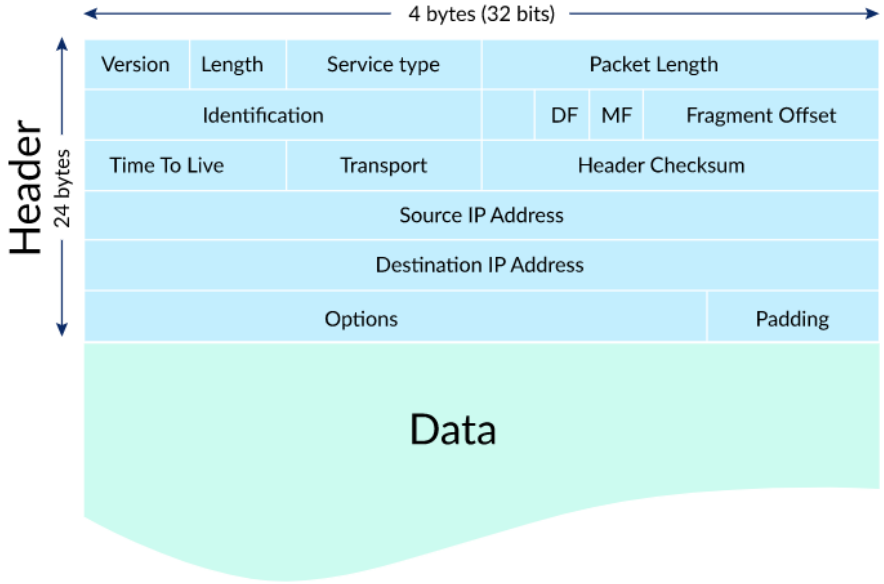
Source: Internet

1.1.2. Packets:

- The resulting packages of information, known as **packets** in the jargon of computer networks, are then sent through the network to the destination end system, where they are reassembled into the original data.

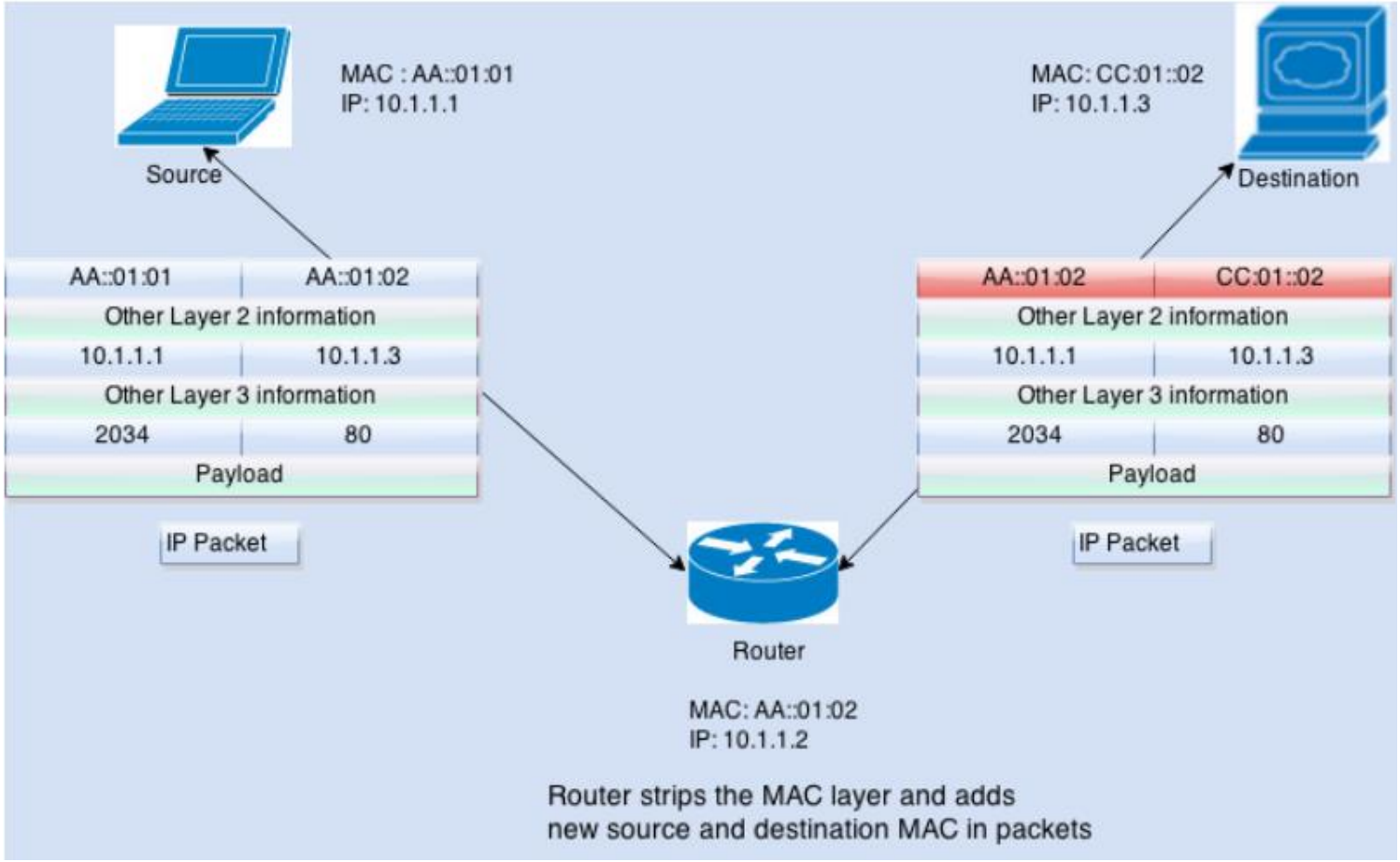






1.1.3. Packet Switch:

- A **packet switch** takes a packet arriving on one of its incoming communication links and forwards that packet on one of its outgoing communication links.
- Packet switches come in many shapes and flavors, but the two most prominent types in today's Internet are **routers** and **link-layer switches**.
- Both types of switches forward packets toward their ultimate destinations.
- Link-layer switches (connects devices within the network) are typically used in **access networks**, while routers (connects between different networks) are typically used in the **network core**.



Source: Internet