


Networks – Lecture 1 (course presentation)

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Welcome
at the first lecture of the
Networks course 2022!

Staff team for this course

Lecturer

Paolo Ciancarini, PhD

Tutorial

Shinnazar Seytnazarov, PhD

Lab

Marat Mingazov (m.mingazov@innopolis.ru)

Sourabh Pal (s.pal@innopolis.university)

Who Am I?

Professor, Innopolis University & University of Bologna (Italy)

Education background

BS, PhD: University of Pisa, Italy

Postdoc: Yale University, USA

Research areas

Distributed systems, Middleware

Software Engineering and Software Development

High Performance Computing

Computer chess & Artificial Intelligence for computer games

Organisation of the course

Seven weeks, from today to March 5

Two lectures per week: Mondays at 9.20-10.50, Fridays at 11-12.30

Lectures, Tutorials and Labs: Same time same place every week

(but some lectures of mine will be online only)

Information available on the Moodle

Active participation

- Do not be afraid to ask questions
- Pay attention to the lectures
- Close your screens (as much as possible)
- Put away your phones
- No “multitasking”

House rules

Rule 1: Be on time

Rule 2: Do not miss the class -
attendance is recorded

Class representation

- Choose five students as class representatives who will be responsible for communication with me and the TAs

Weekly Quizzes (20%)

Labs (35%)

Final written exam (35%)

Attendance (5% for lectures, 5% for tutorials)

Grades breakdown

90 and above: **A**

80 to 89.9: **B**

70 to 79.9: **C**

Less than 70: **D**

Office hours

Monday: 12:00 to 13:00

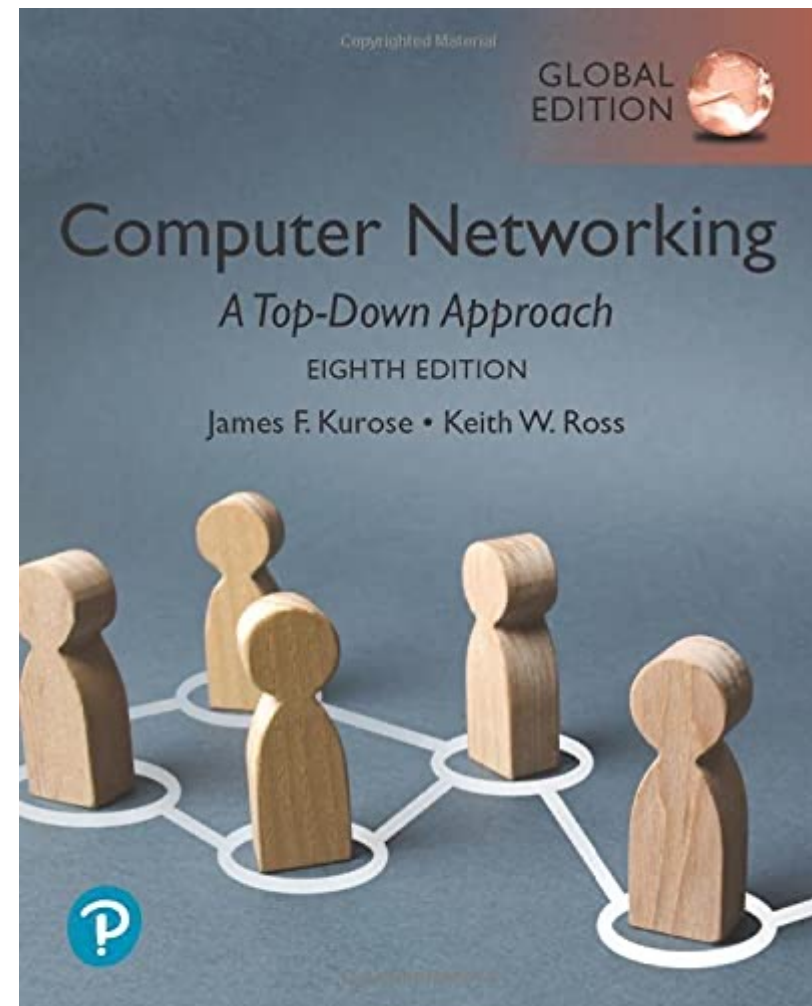
Thursday: 13:30 to 14:30

My telegram id: [@PaLoCaPa](#)

The content of the presentations is taken from the textbook of J.F. Kurose, K.W. Ross, *Computer Networking, a Top-Down Approach*, 8th Edition, Pearson, 2020.

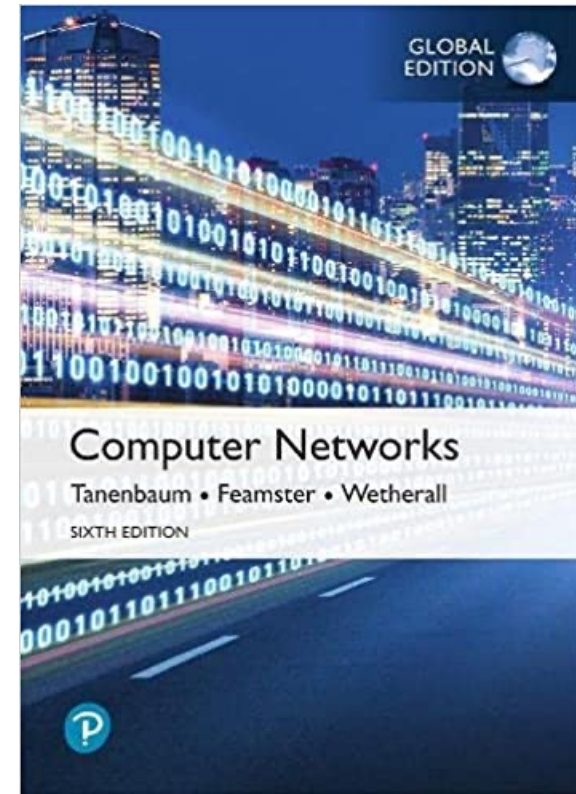
Additional material may be added, and referenced properly when done so.

Thanks to Muhammad Fahim, Giancarlo Succi, Alexander Tormasov.



Other resources

Other book: Tananbaum, Feamster, Wetherell, *Computer Networks*, 6th edition, Pearson 2021



Tables of contents: comparing Kurose vs Tanenbaum

- 1) Computer networks and the Internet
- 2) Application layer
- 3) Transport Layer
- 4) The Network Layer: Data plane
- 5) The Network Layer: Control Plane
- 6) The Link layer and LANs
- 7) Wireless and Mobile Networks
- 8) Security in Computer Networks

Kurose-Ross

1. Introduction
2. The Physical Layer
3. The Data Link Layer
4. The Medium Access Control Sublayer
5. The Network Layer
6. The Transport Layer
7. The Application Layer
8. Network Security

Tanenbaum

The most important resource

The Internet!

e.g.:

[https://en.wikipedia.org/wiki/Request for Comments](https://en.wikipedia.org/wiki/Request_for_Comments)

[https://en.wikipedia.org/wiki/April Fools%27 Day Request for Comments](https://en.wikipedia.org/wiki/April_Fools%27_Day_Request_for_Comments)

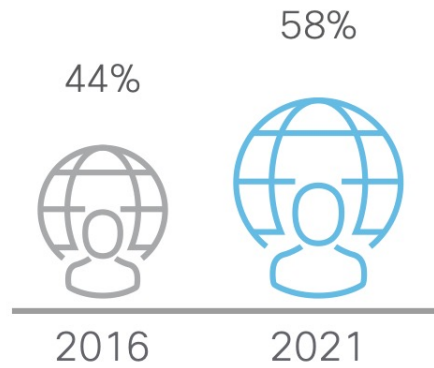
The main topic of the course: the Internet

Today's Internet is the largest engineered system ever created by mankind

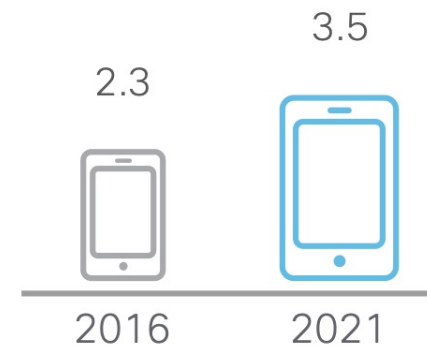
- hundreds of millions of connected computers, communication links, and switches;
- billions of users who connect via laptops, tablets, and smartphones;
- A huge catalog of new Internet-connected “things” including game consoles, surveillance systems, watches, eye glasses, thermostats, TV, and cars

Internet size numbers: forecasts 2016 for 2021

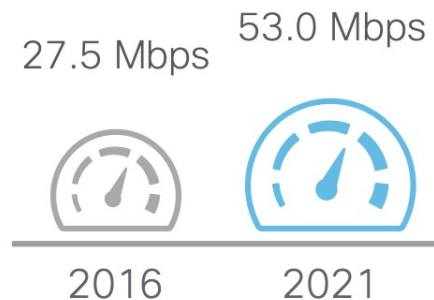
Internet Users: % of Population



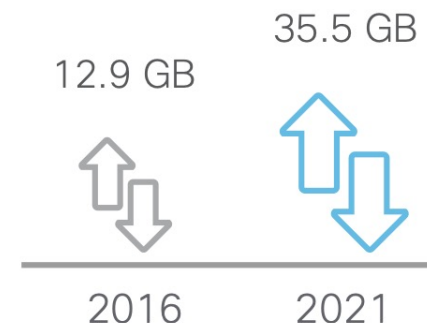
Devices and Connections per Capita



Average Speeds



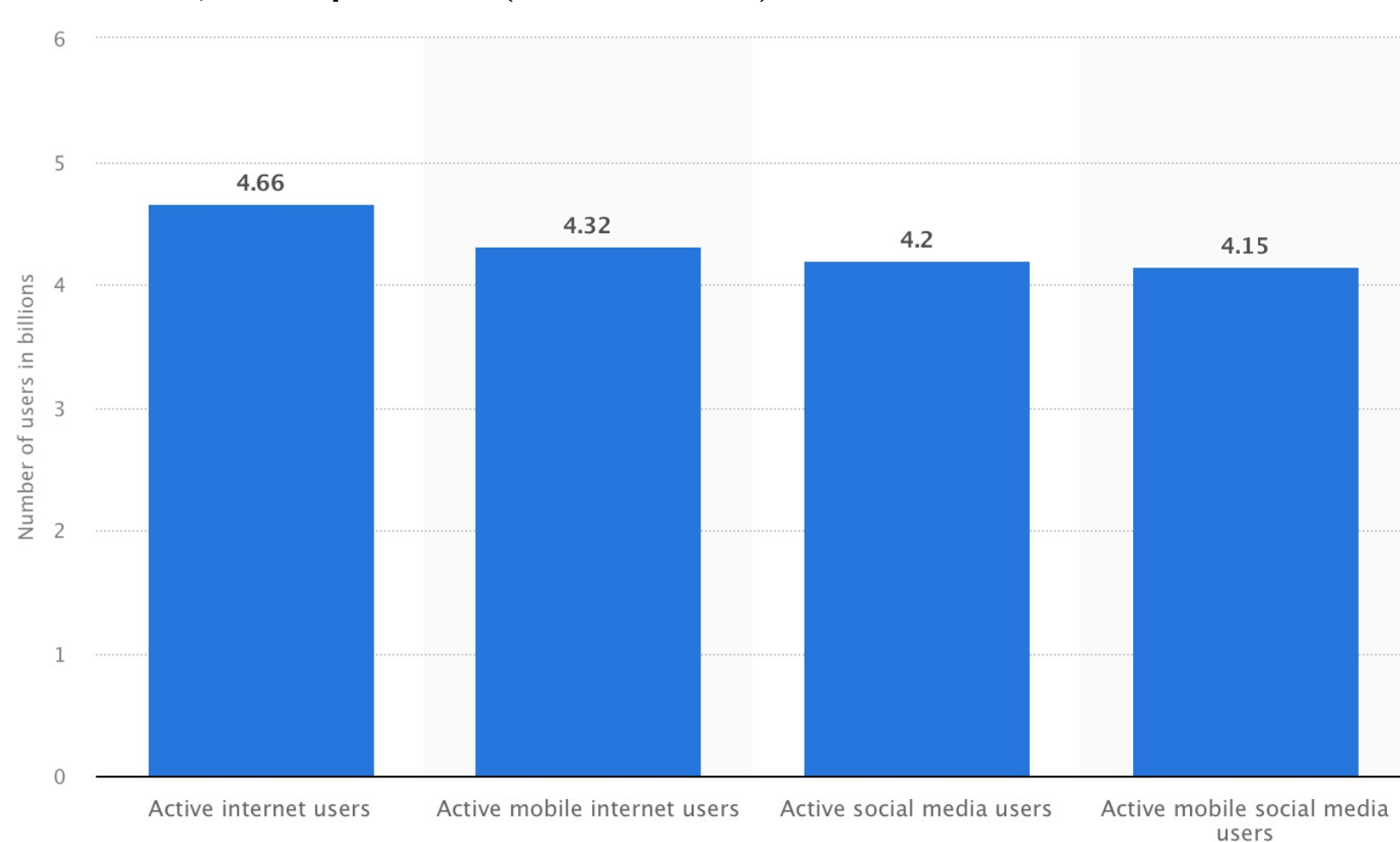
Average Traffic per Capita per Month



Actual Internet size 2021: source Statista

As of January 2021 there were 4.66 billion active internet users worldwide - 59.5 percent of the global population.

Of this total, 92.6 percent (4.32 billion) accessed the internet via mobile



Network jobs

Network Engineers - design computer networks. ...

Network Administrators - install and support the network of an organization

Computer Security Specialists. ...

Telecommunications Specialists. ...

Network solution architects

Wireless network engineer

Network programmer

The main topic of the course: the Internet

- Given that the Internet is so large and has so many diverse components and uses, is there any hope of understanding how it works?
- Are there guiding principles and reference structure that can provide a foundation for understanding such an amazingly large and complex system?
- And if so, is it possible that it actually could be both interesting and fun to learn about computer networks?

The internet: a list of parts (“nuts and bolts”)

- Hardware: the Internet connects about 28.5 billions devices
 - its network is formed by communication links and switches
- Software: Devices, switches, and other hardware pieces of the Internet run programs called **protocols** that control the sending and receiving of messages within the Internet.
 - The Transmission Control Protocol (TCP) and the Internet Protocol (IP) are two of the most important protocols in the Internet

The internet: an infrastructure for **services**

we can describe the Internet from an entirely different viewpoint—namely, as an infrastructure that provides **services** to applications running on devices

How does one program running on one device instruct the Internet to deliver data to another program running on another device?

Devices attached to the Internet provide a **socket** interface that specifies how a program running on one device asks the Internet infrastructure to deliver data to a specific destination program running on another device.

This Internet socket interface is a set of rules that the sending program must follow so that the Internet can deliver the data to the destination program

Two viewpoints to be reconciliated

We have just given two descriptions of the Internet:

- one in terms of its hardware and software components,
- the other in terms of an infrastructure for providing services to distributed applications.

Our goal in this course is to introduce you to both the nuts and bolts of the Internet (its parts and their overall structure) **and** the principles that govern how and why it works (its behavior, and how you can exploit it to program your Internet applications)



Questions?