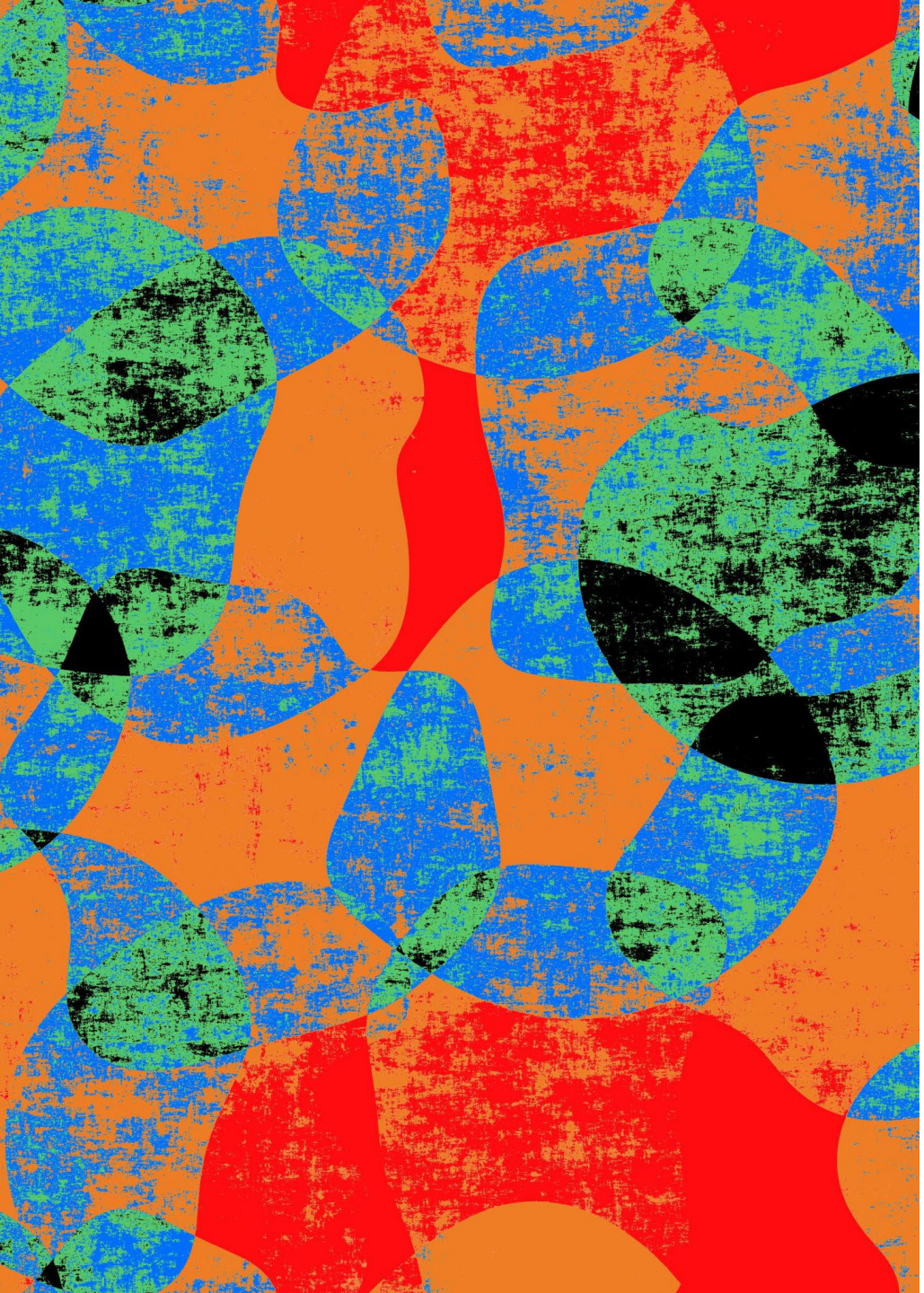


COMPLEMENTI DI RETI

Michele Garetto, Gianluca Rizzo

LECTURERS

- Prof. Michele Garetto
  michele.garetto@unito.it

- Prof. Gianluca Rizzo
  gianluca.rizzo@unito.it

- Lab tutor: Luca Berra

SUMMARY

WHAT IS THE COURSE ABOUT?

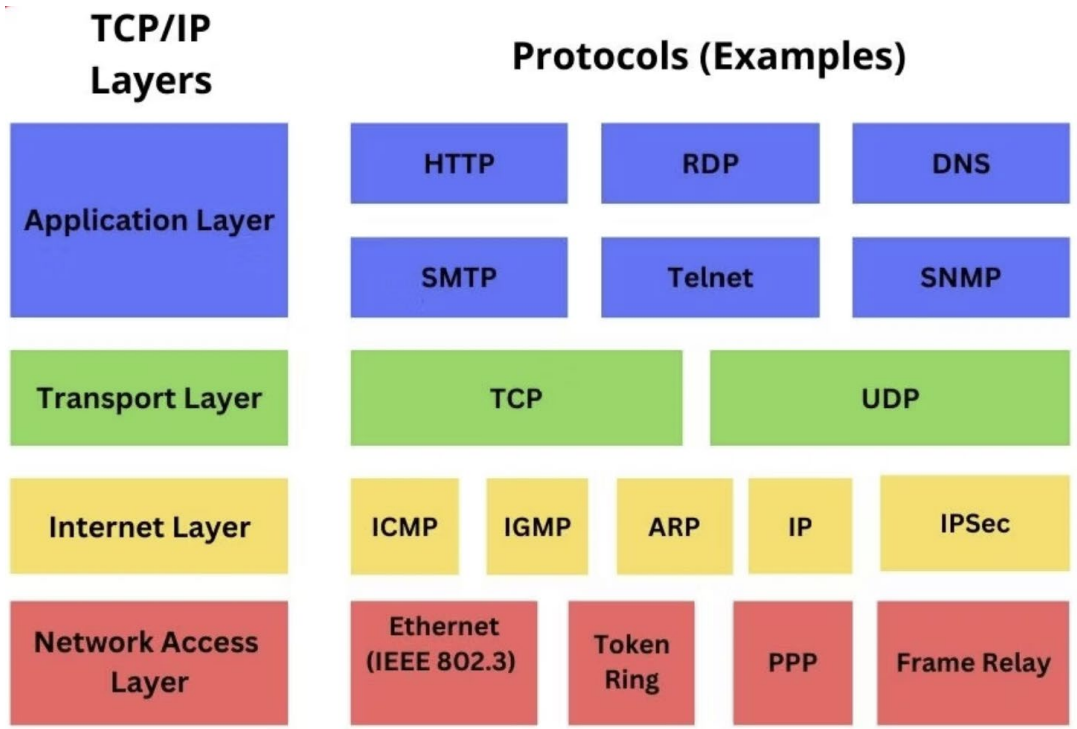
This course is about **computer networks**

That is to say, a set of devices with computing capabilities

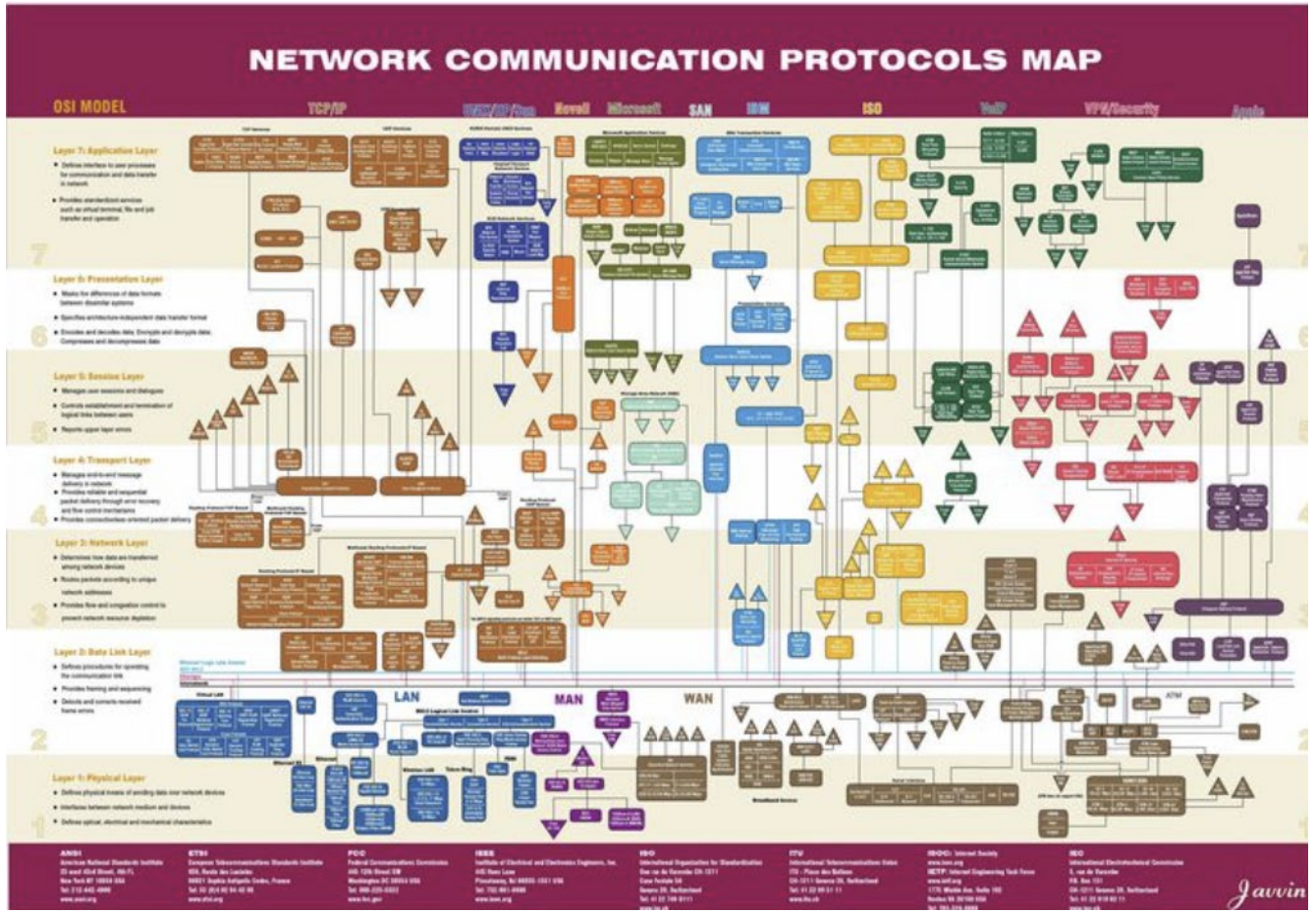
exchanging information with each other

WHY THIS COURSE?

- In theory, there is no difference between theory and practice (or better: reality)…



- But reality is a mess!



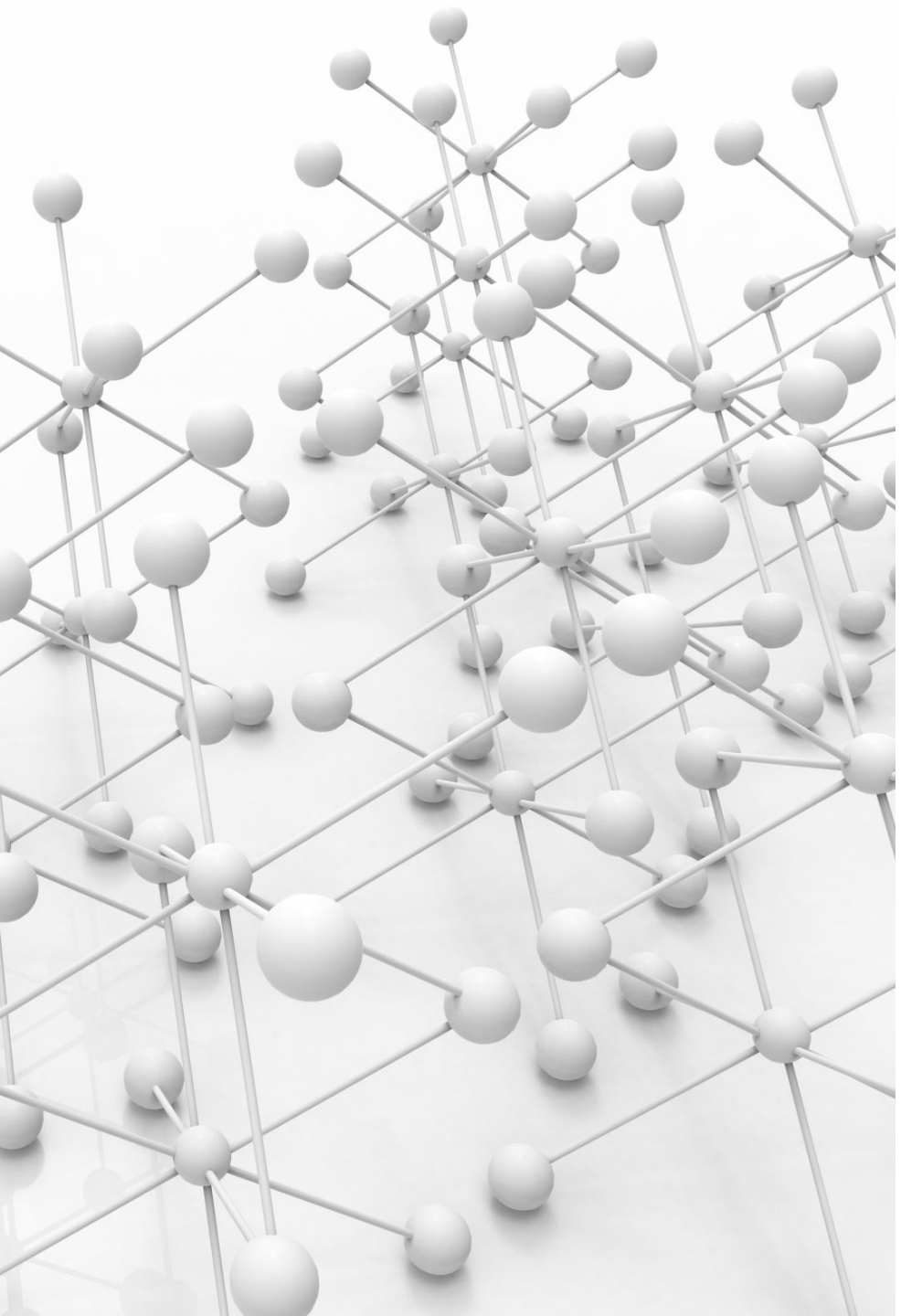
- Theory course gave you the tools to navigate this complexity…

  - …But did you try to actually sail and navigate it?
  - This is a wholly different skill!

- **This course is about acquiring that skill**:

1. **Deepen, broaden and reinforce** your knowledge of the foundations of computer networks
2. **Learn to use your knowledge** of CN to solve simple problems in real networks

Learn to cope with the complexity of networks "in the wild"



WHY IS IT IMPORTANT?

In any context you will deal with networks, you will deal with the **real one**, not with the nicely behaved, idealized one

- With all its mess!

A network is a complex system made of a multitude of interacting parts:

- Some parts are unknown
- **Emerging behavior!**

Experimental skills are key to understand (and start mastering) this complexity

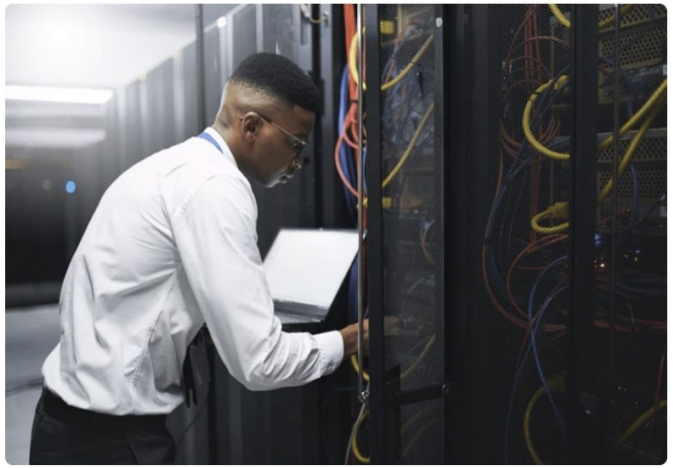
GOAL OF THIS COURSE

- To provide students with practical experience in modern network architecture, protocols, and administration…
- …through **hands-on, virtual** laboratories
- Students will work with **emulated network scenarios**

WHAT WILL YOU LEARN?

By the end of this course, students will be able to:

- Configure and troubleshoot network topologies
- Utilize network monitoring tools to analyze traffic
- Implement both intradomain and interdomain routing protocols
- Configure BGP for data center routing
- Implement and test web load balancing solutions
- Set up and troubleshoot DNS infrastructures
- ...and more



EXAMPLES:

You will acquire:

- Knowledge of different virtualization techniques (virtual machines, containers)
- Ability to design the topology of simple networks
- Ability to operate Docker containers
- Ability to design the IP addressing plan and to implement different routing strategies
- Ability to use network emulators (e.g., kathara.org)
- Ability to use Linux commands for advanced network configuration

TOPICS COVERED BY THE COURSE

- Introduction to the virtual laboratory environment based on the Kathará framework
- Basic network administration tools and techniques
- Network monitoring fundamentals
- OSPF configuration and optimization
- BGP fundamentals and neighbor relationships
- BGP in data centers
- Load balancing algorithms and techniques
- DNS hierarchy and record types

PLAN FOR LABORATORIES

Labs will draw from the open Kathara' labs database, with some key modifications to fit the goals and the scope of the course:

- Basic Topics
- Intradomain Routing
- Interdomain Routing
- Data Center Routing
- Application Level
- Labs Integrating Several Technologies

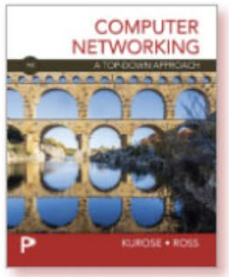
ORGANIZATION OF THE COURSE

- This course is taught in **English**
- **Theory**
  - **When and where:** Monday, 14:00-16.00, Room F
  - **Recall of concepts fron CN course**
  - **Introduction to new topics in CN**
  - **Intro to network emulation tools**
- **Labs**
  - **When and where: Thursday**, 11:00-13.00, Room Dijkstra
  - **Solution of practical exercises and problems on network emulator**
  - **BYOD or on the PCs of the lab: your choice**
- **On some weeks, we might have more theory (or more labs)**

COURSE MATERIAL

- Slides of theory part: on Moodle (GitHub)
- Lab exercises text and code: on GitHub (links on Moodle)

- **Please update your local copy before each lab/theory lesson!**
- Reference text: Computer Networking: a top down approach (Kurose, Ross)



Computer Networking: A Top-Down Approach
9th edition
Jim Kurose, Keith Ross
Authors' website

- Links to additional material will be provided on Moodle

EVALUATION

Oral exam (only)

Mix of theory questions, question on lab exercises, and solutions of pen-and-paper exercises

In front of a PC

(show you are able to implement and interpret network scenarios on network emulator)

QUESTIONS?

- **Office hours**: drop an email to lecturers, and arrange an online/in person meeting