

Chapter 0x00

Presentation & Practical Aspects

Who am I ?

- Prof. Jean-Michel Dricot
- PhD in Engineering (Internet of Things protocols)
- Research / Expertise
 - Cybersecurity
 - Security of network protocols, IoT, privacy
- Co-director of ULB Cybersecurity Research Center
- Founder Erasmus Mundus in Cybersecurity
- Contacts
 - Urgent : Jean-Michel.Dricot@ulb.be
 - Preferred : through student delegate / before lecture

My expectations

- Share my enthusiasm about networks
 - Explain everyday, real-life architectures (network are *everywhere*)
- Foundations of networks
 - From concepts (software and hardware interplay, network performance, reliable transfer, routing algorithms)....
 - ... to the implementation (architectures, technologies)
- Critical thinking
 - What problem do we solve ? What performance/shortcomings ?
 - Links between all parts of the course
- Security and privacy

My (academic) expectations

- Good knowledge of the **concepts and interactions**
 - No need to know everything by heart (i.e. protocol details)
- Autonomy
 - Read the book, external documentation
 - Anticipate the labs (installtion of virtual machines, testing, etc.)
- Collaboration
 - Work as a team, interact, give & take
- Ethics
 - No plagiarism allowed
 - Personal work is different from group work
 - Submit reports on due time

What about you ?

- Large spectrum of students
 - Different backgrounds
 - International students
 - Network geeks ... or not
- Let's discuss
 - Why are you following this class ?
 - What are your expectations ?
 - What technology drives your curiosity ?
 - **What do you want to understand ?**

In practice now....

■ Theory

- 1-2 lectures / week
- Practical infos via Université_Virtuelle and TEAMS channel (with your official ULB or VUB account only)
- Slides are self-content, reference book, Q&A sessions

■ Labs

- Series of 6 labs on a virtual machine environnement deployed on your computer
 - VirtualBox, GNS3, CISCO routers, Wireshark packet capture/analyzer...
- One week to analyze/implement a challenge
- Submit a report (analysis, topology, code, etc...). Graded.
- Q&A / guidance sessions

■ Exam

- Short exam on theory in January (closed book)

Roadmap

- In one sentence

How does the Internet work ?

- Lectures divided in chapters
 - From the Internet-as-a-whole view to the details on a link....
 - Chapter starts with a generic problem statement and solution
 - E.g.: how do we implement a reliable transfer on a complex, lossy, worldwide topology
 - ... and then details an implementation
 - RFC 793 standard: TCP (Transmission control protocol)

Roadmap

■ **Computer Networks and the Internet**

- Topology
- Delay, Loss, and Throughput in Packet-Switched Networks
- Protocol Layers and Their Service Models

■ **Application Layer**

- Developing a network application
- The Web and HTTP
- DNS—The Internet's Directory Service
- Peer-to-Peer Applications
- Video Streaming and Content Distribution Networks

Roadmap

■ Transport Layer

- Multiplexing and Demultiplexing
- Principles of Reliable Data Transfer
- Connection-Oriented Transport: TCP
- Principles of Congestion Control
- TCP Congestion Control

■ The Network Layer: Data Plane

- Routers
- The Internet Protocol (IP): IPv4, Addressing, IPv6
- Generalized Forwarding and SDN
- Middleboxes (yes: your home “wifi router”)

■ The Network Layer: Control Plane

- Routing Algorithms
- Large-domains routing
- ICMP: The Internet Control Message Protocol

Roadmap

■ The Link Layer and LANs

- Multiple Access Links and Protocols
- Switches
- WiFi

■ Security in Computer Networks

- Principles of Cryptography
- Message Integrity and Digital Signatures
- Authentication
- TLS/SSL
- IPsec and Virtual Private Networks
- Firewalls
- Privacy (TOR)

Roadmap

Lets' start !