Protocolli e Architetture di Routing
A.A. 2017/2018

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Lecturers

- In-class lectures
  - Fulvio Risso (fulvio.risso[at]polito.it)
- Labs and exercises
  - Ivano Cerrato (ivano.cerrato[at]polito.it)

- Please get in touch with the right person!

Course mission

This course presents the most important algorithms and routing protocols used in modern networks. Additional topics include: (1) the architecture of modern network devices; (2) a brief insight of the problem of processing traffic inside a network device; (3) software defined networks and beyond.

Course outline

- Routing
  - Routing and Forwarding algorithms
  - Distance Vector and Link State
  - Hierarchical and inter-domain routing
  - RIP, IGRP/EIGRP, OSPF, BGP
  - Multicast routing
  - IPv6 routing
- Network processing
  - Architecture of some commercial devices
  - Introduction to the processing issues in network routers
  - Introduction to packet processing libraries and tools
  - Software-Defined Networks and Network Functions Virtualization

Prerequisites

- IP and the most important protocols of the TCP/IP suite
  - ARP, IP, DNS, TCP, UDP
- Packet sniffing with respect to the above protocols
  - A full set of exercises is available on the website
- IP addressing, IP network design
  - A full set of exercises is available on the website
- Static routing on IP networks
  - A full set of exercises is available on the website

The student is required to check that he is OK with those exercises; if not, he has the responsibility to fill his gaps by himself.

Teaching organization

- Some in-class exercises
- Some additional exercises are provided
  - Student should complete them on their own
  - Closed-answer questions available as well
- Lab topics
  - Most important routing protocols (RIP, OSPF, BGP)
  - Packet processing
- Check the schedule of the lab on the calendar

Labs and exercises

- Not compulsory, but definitely needed to pass the exam
- We expect students to complete their duties timely
  - **Not at the end of the semester!**
- Lab logistics
  - We well provide a fully configured VM with all the required tools for all the labs
    - DynNG no longer used
  - The VM can be either copied on a USB stick and used to boot your laptop, or executed in Virtualbox
  - Better if the student comes with his own laptop; in any case, LADISPE machines should be available as well
- The course website provides:
  - The text of each assignment
  - Resources about how to configure Cisco routers

Schedule

- 6+ hours/week
  - (hopefully) some spare hours at the end of the semester
  - No fixed schedule for class/lab
    - Depends on what we have to do
    - Please check the online calendar week after week
  - Some additional lectures during the period
- Lab: LADISPE or classroom
  - We are still evaluating the best option
- Lab Hours = Consultancy Hours
  - Please use those hours for having hints about the course topics, exercises, homework, lab, etc

Exams rules (NEW!): Option 1

- Written exam (max grade = 30)
  - A mixed set of open-answer questions, multiple-choice questions, and exercises
    - To achieve the maximum grade, you need to have studied the subject **and** be able to reach some new results on your own
    - This means, just studying is not enough
  - Oral examination in case few students are present
  - Possibility to ask for an **additional** oral session if mark >=26
    - Usually, only **one** question

Exams rules (NEW!): Option 2

- The same as Option 1 plus a **public** talk about a scientific paper, that counts for 0-4 points, added to the outcome of the exam
  - Topic: a scientific paper of about 12 pages
  - Not available for everyone
  - More in the next slides
- Please don't expect the maximum grade for everybody: it is likely that most people will get less than the 4 points
- To be given at any time, but before 2017, Jan 31st
- Awarded grade will be valid only for the current academic year
- The student can no longer ask for the oral examination

Exams rules (NEW!): Option 3

- Personal project, replacing the exam
  - About 3 weeks full-time
  - Eligible students must have an *average mark* >= 27
  - To be completed within the end of the semester
- List of possible topics available on the course website

More about Option 2

- Why: books are ok for well-known topics; papers are needed if we need to address "cutting-edge" topics
- How: each student chooses a paper from a public list available on the website
  - Assignment in FIFO order (contact Ivano C.)
- Each student should
  - Read and understand the paper
  - Be able to summarize the topic and present the content to a technical audience
  - Be critic with the paper, and be prepared to answer to possible questions from the public
  - Present the paper in 20 minutes + 10 for questions, unless a different timing is agreed between the student and the professor
    - Do not underestimate how difficult this is!

Option 2: some suggestions (1)

- Time is really limited

Your work is excellent not when it is perfect, but when it is the best result you can achieve given the constraints you have

- The "meat" allows you to survive, but the "beauty" makes you feel better
  - Make your presentation appealing!
- **Give the talk to a "friendly" audience before going public**

Option 2: some suggestions (2)

- Suggested outline
  - Background
  - Addressed problem
  - Proposed solution
  - Validation
  - Comments (Was it correct? Any flaws?)
  - Conclusions
- Usually one slide/minute
- Math is important, but results are much more important than math
  - Math may be needed to achieve the result, but it may not be need to understand what has been proposed
  - Focus on what matters, leaving unimportant details out of the presentation

How the talk will be evaluated

- Technical content and organization of the topics
- Presentation
  - Graphical layout, correctness of the text (e.g., no typos)
  - Capability to keep the interest of the audience
  - Capability to explain the topic
  - Capability to stay in the assigned timeslot
- Capability to answer to the questions

Exams schedule

- Two exams sessions in winter
  - End Jan
  - Feb
- One exam in July
- One exam in September

Students who were enrolled in the past

- The general outline is the same over the years
- However, we will put more emphasis on new topics, such as SDN, NFV, network programming

Textbooks (1)

- **J. Doyle, Routing TCP/IP (volume 1)**
  - http://www.amazon.com/Routing-Professional-Development-Certification-Training/dp/1578700418
  - Volume 2 for BGP, IPv6, management, etc
- C. Huitema, Routing in the Internet (2nd edition)
  - http://www.amazon.com/Routing-Internet-2nd-Christian-Huitema/dp/0130226475
- G. Varghese, Network Algoritmics
  - http://www.amazon.com/Network-Algorithmics-Interdisciplinary-Designing-Networking/dp/0120884771

Textbooks (2)

- But...
  - Do not cover all the topics
  - Please take your own notes in class

- The professor strongly suggests to buy a book if you are interested in those topics

Logistic (1)

- Course website
  - http://par.frisso.net
- Day-by-day calendar
- Online slides
  - Available (hopefully) before the class

! Warning !

! Slides are not enough !

! Exercises and labs are very important !

Logistic (2)

- Class live recording (on http://didattica.polito.it/)
  - For who cannot attend to the class
  - Done on “best effort” basis
    - No guarantees, e.g., when the professor’s laptop crashes
    - Online publication may be delayed for some days
  - **Volunteers needed!**
- Prof. hours for consultancy
  - Before/after the class
  - Face-to-face meetings
    - Check for “rules” on the professor’s website:
    - http://fulvio.frisso.net

Logistics (3)

- Almost all the documentation is in English
  - This choice aims to help foreign students who are interested in this subject
- Classes will be in Italian
- The exam will be in Italian

Auto-learning lectures

- Due to budget constraints, we have 12 hours in auto-learning mode
- The advantage is that we have more lab hours
- Available on the “Portale della didattica”, as usual

Questions?