TCP/IP Computer Networks

2014/2015 – 1st Semester (Autumn / Fall)

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See CLIP for archive and course administrative info

Goals for today's lecture

- Presentation of the instructor
- Goals of the course
- Structure of the course
- Students expected work
- Course grading
- Schedule

Presentation of the instructor

https://sites.google.com/site/joselegatheaux

Graduated from FCT/UNL in 1979

From 1980 to 1983 - Teaching assistant at FCT/UNL

From 1984 to 1987 – Researcher and invited professor at INRIA – France (Distributed Systems)

1986 – PhD from Université de Rennes

1988 – 1992 – Assistant professor at Faculdade de Ciências de Lisboa

1991 – 1994 – Project IP-Forum

1993 – now - Professor at FCT/UNL, Head od Department, Vice-Dean

Former research: several distributed systems projects (CSCW, Data Management, Mobile Computing)

Current research project: Simple and effective multi-path routing and map-encap approaches for routing in the global Internet

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Presentation of the course

This is a second course on computer networks, for advanced under-graduated or graduated students, allowing them to gain a deeper comprehension of this subject. It assumes that the student was already exposed to an introduction to networking with practice on network programming interfaces.

The course also takes an hands-on approach with laboratory and project activity.

Research group projects allow students to gain insights in hot and emergent computer networking topics

Goals

Knowledge and understanding goals

- Transmission and packet switching
- Routing
- Quality of service and network management
- Transport protocols
- Emergent topics in computer networking

Know-how goals

- Ability to setup a small TCP/IP Network
- Ability to use tools for network analysis and measurement
- Awareness of representative equipment used in real computer networks
- Research and analyze emergent networking topics

Syllabus (1)

Introduction
- Review of fundamental concepts in networking
- Fundamentals of TCP/IP networks

Direct Link Technologies
- Link layer services
- Shared media protocols
- Addressing and shared media
- What are the important characteristics of links and networks

From Shared Links To Simple Networks
- Bridges and switches
- Shortest-path trees
- Scalability issues and evolution

Syllabus (2)

Routing
- Topology
- IP addresses
- Intradomain, interdomain and multicasting routing protocols
- MPLS

Management, Quality of Service and Transport Protocols
- Quality of Service in IP networks
- Quality of service at the network level
- Evolution of TCP and alternative transport protocols

- **Emergent topics**
  - LISP and Software Defined Networking
  - Transport challenges
  - Content Distribution Networks

Syllabus (3)

Case studies and emergent topics

- Software Defined Networking
- Data Center Networking
- Internet Structure
- Evolution of Transport Protocols
- Traffic Engineering
- MPLS and Virtual Private Networks
- Content Delivery and Network Infrastructures Collaboration
- Network Mobility
- Routing in Multihop Mobile networks

- …

Laboratory sessions

In laboratory sessions groups of students deploy, manage and measure a new network configuration: LANs, VLANs, routers interconnection, WAN with RIP, WAN with OSPF, multimedia transmission, multicasting, QoS, …

Some lab assignments must be reported by the group

Essays and reports

Associated with some topics, written essays must be delivered by students. Most are based on an interesting paper or on a book section (probably 3).

Students are also required to present a report on some of the laboratory sessions (3 or 4).

Projects

Students, organized in groups of 2 (or alone), must complete a research project on an hot or emergent topic

Projects with no implementation (only synthesis or composition work) will be graded up to 14. Projects including an implementation (test, …) will be graded up to 20

Project proposals will be available during the course

Readings

- ## Required textbook
  - Computer Networks: A Systems Approach (5th edition), by Peterson and Davie, 2011
  - Hamed Haddadi and Olivier Bonaventure (editors), "Recent Advances in Networking", Volume 1, ACM SIGCOMM eBook, August 2013
  - Ivan Marsic, "Computer Networks – Performance and Quality of Service," Rutgers University, 2013 (http://www.ece.rutgers.edu/~marsic/books/CN/)

- ## Other books and articles
  - Several other networking text books (ask if you want to know about)
  - Articles
    - I will provide further references during the course (mostly concerning lab and project assignments)

Slides acknowledgements

- Textbooks companion web sites
    - Computer Networks: A Systems Approach by Peterson and Davie
    - Computer Networking: A Top-Down Approach Featuring the Internet by Kurose and Ross

- Slides of other courses
    - Princeton University
    - Brown

Course methods

Lectures are intended to support the instructor's presentation of fundamental issues. Students should, before classes, study the recommended bibliography.

Laboratory sessions take place in a specialized laboratory equipped with hubs, switches, routers; their aim is to perform several network configurations and test their performance. The laboratory is equipped with network gear mostly identical to the one currently used in small to medium networks.

These lab sessions are based on a "hands-on" computer network learning approach.

Grading (assessment components)

1. Two tests (25 + 25 = 50 % of the final grade)

2. Essays and lab assignments and reports (25% of the final grade)

3. Group research project (25% of final grade)

Tests are closed-book ones but students can use a A4 sheet with their study notes

All intermediate grades have resolution of 0.1 grade

Notes on the group research project

Projects with no implementation work are graded at most 14/20

Projects with implementation are graded up to 20/20

Students are responsible for proposing any tests and other implementation activities related to the project subject. The instructor will help students with suggestions

Late delivery of the project deliverables implies grading reduced at the rate of 1.0 grade per day

Written and lab assignments

Late assignments and reports will see their grades reduced at the rate of 1.0 grade per day

Students must deliver all group written assignments and lab assignments reports and be graded with at least the average grade of 10.0

Participation in at least 70% of the lab sessions is mandatory

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Please take note of

- Lab sessions will start next week

- Intermediate tests are already scheduled (look at CLIP)

- Project proposals will be available in the course page:
  https://sites.google.com/site/fctunlptrctcip2015/

- All these rules, scheduling, documents, activity etc. are available from the same site