Introduction to the Course

Prof. Rui Santos Cruz
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Introductions

Administrivia

Class policies

What is this Course About?

Roadmap

Course Assessment
Dr. Rui Santos Cruz is Assistant Professor at Instituto Superior Técnico since 2006, where he teaches Networking and Computer Engineering. He graduated from IST with the Electrical Engineer Degree in 1982, and later with the M.Sc. in Electrical and Computer Engineering and the Ph.D. in Information Systems and Computer Engineering.

He is also researcher at INESC-ID and INESC Inovação, in the field of Next Generation Broadband Networks and Services, with focus on Services Management, Multimedia streaming with quality adaptation, QoS, and QoE.

In more than 30 years of professional career in the industry, Dr. Cruz was involved in electrical power transport and distribution, in the design of high-voltage power plants, in the analysis, design, development, and deployment of computer and communication systems and private and public telecommunications networks, holding positions of senior staff engineer, manager, R&D director, CTO and CEO.

He is the author or co-author of more than 20 papers in international scientific journals, books, and proceedings of scientific conferences.

Dr. Cruz is Senior Member of IEEE, held positions of Vice-Chair and Chair of IEEE Portugal, and also IEEE Legal Representative for Portugal.

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@RUISANTOSCRUZ
Administrivia
- **Class Meetings:**
  - **Lectures (T):** 2 sessions / week, 1.5 hour each
  - **Labs (L):** 1 session / week, 1.5 hour
- **Office Hours:** Tuesdays 15H30-17H15 or by appointment.

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Course Workload:

- This course corresponds to 7.5 ECTS. My expectation is that you will spend approximately twelve hours per week:
  - Three hours in Lecture classes,
  - One and half hour in lab/practice,
  - Four hours doing individual reading, research and hands-on works,
  - Four hours for group discussions to prepare the assignments and/or the ongoing project.
Class Expectations:

- This is a class in which you will learn from one another as well as from me, therefore I expect:

  - That you are willing to share your knowledge, opinions, and ideas in class,

  - That you are open to the ideas and knowledge of your peers,

  - That you will provide one another with clear, honest, concrete, and sensitive feedback on work that is done,

  - That any concept that is unclear or confusing will be explored and examined.
Requisites:

- I assume you have adequate knowledge in Computer Science areas, such as **Networks, Operating Systems, Databases, Distributed Systems** and **Programming**.

- You should bring to class your laptop computer, or tablet, or even a modern smartphone, as some in-class assignments or hands-on work require a web-browser or access to the Internet.
Textbooks

**Primary**


**Secondary**

Class Policies
Class Participation:

- **The Basics:**
  - Come to class prepared
  - Come to class **on time**
  - **Register your participation** in class
  - **Mute your cell phones** and other assorted electronic devices.
  - If you need to leave in the middle of class, do so discreetly. I assume you'll do so discreetly, since there's only one of you.

- **Ask and Answer questions!!**
  - it helps you understand
  - it helps others understand
  - it helps you stay awake
  - it helps me stay awake
  - it’s just more fun for all of us
What is this Course About?
What is IT Infrastructure?

https://www.youtube.com/watch?v=UFQXNiHSXjg
What is IT Infrastructure?

- IT infrastructure *provides services* to applications.
- IT infrastructure is *usually shared* by multiple applications.
- IT infrastructure is *more static and permanent than the applications* running on it.
- The *management of the infrastructure* is separated from the system management of the applications using it.
- The department owning infrastructure components is a different department than the one owning the applications using it.
What is IT Infrastructure?

- Business process
- Information
- Application
- Server
- Building
- Electricity provider

Infrastructure for business analyst
Infrastructure for end user
Infrastructure for system manager
IT Model

Processes / Information

Applications

Application integration

Infrastructure

Systems Management
IT Model - Non Functionals

Processes / Information

Applications

Application integration

Infrastructure

Systems Management

Availability

Performance

Security
IT Model - Applications

Processes / Information

Applications
- Client applications
- Office applications
- Business specific

Application integration

Infrastructure

Introduction to the Course
IT Model - Application Integration

Processes / Information

Applications

Application integration
- Front-end servers
- Application servers
- Connectivity
- Databases

Infrastructure

Availability
Performance
Security
What is this Course About?

IT Model - Infrastructure

Application integration

Infrastructure

End User Devices
Operating Systems
Virtualization
Storage
Networking
Servers
Datacenters

Availability
Performance
Security
IT Model - Systems management

Processes / Information

Applications

Application integration

Infrastructure

Monitoring

Infra management

Infrastructure services

Process management

Systems Management
IT Infrastructure Building Blocks

- End User Devices
- Operating Systems
- Virtualization
- Storage
- Networking
- Servers
- Datacenters
Building Blocks - Networking

- A system of “links” that interconnect “nodes” in order to move “information” between nodes
- Yes, this is very vague
What is this Course About?

Building Blocks - Networking

- A system of “links” that interconnect “nodes” in order to move “information” between nodes

- Yes, this is very vague, but can be defined using other words:

- A structure of “computers and devices” connected by “transmission media”, that allows computer “applications to communicate” with each other
Building Blocks - Networking

- OSI Reference Model
- Network Building Blocks
- Availability
- Performance
- Security

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<th>Layer</th>
<th>Implementation</th>
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<tr>
<td>1</td>
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<td>Cabling &amp; patching</td>
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<td>UTP, Dark fiber</td>
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<td>Data link</td>
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<td>3</td>
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<td>IP (v4, v6, sec), MPLS, ICMP</td>
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<td>4</td>
<td>Transport</td>
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<td>TCP, UDP</td>
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<td>5</td>
<td>Session</td>
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<td>PPTP, L2TP, VPN</td>
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<td>6</td>
<td>Presentation</td>
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<td>TLS, SSL</td>
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<td>7</td>
<td>Application</td>
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<td>BOOTP &amp; DHCP, DNS &amp; DNS-SEC, NTP, SNMP</td>
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Introduction to the Course
Building Blocks - Networking

- Enterprise Networks
- Data Center Networks
Building Blocks - Servers

- Enterprise Systems
- Data Centers
Building Blocks - Storage

- Converged for Ultimate Performance
- SAN for Application Consolidation
- NAS for High Performance Databases and Files
- Tape for Deep Archive
Building Blocks - Data Centers
Building Blocks - Op. Systems and Virtualisation

- Operating System
- Operating System
- Operating System
- Virtual Machine
- Virtual Machine
- Virtual Machine
- Virtualization layer
- Physical machine

Diagram:
- 2G mem
- CPU
- LPAR
- Storage
- NIC
- 2G mem
- CPU
- LPAR
- Storage
- NIC
- 2G mem
- CPU
- LPAR
- Storage
- NIC
- 2G mem
- CPU
- LPAR
- Storage
- NIC
- 2G mem
- CPU
- LPAR
- Storage
- NIC
- Physical machine
What is this Course About?

https://www.youtube.com/watch?v=vBguassbAzo

IT Standards

ITIL®
Explained
Simply & Visually
https://www.youtube.com/watch?v=nYiMZUcBIKo

Managements and Administration
Course Assessment
Assessment:

- **A group Term Project:**
- **Groups of 3 to 4 students** (3 is ideal)
- **Oral presentations are assessed by other selected students**
- **Hands-on works in Lab and in class**

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<th>Weighting</th>
<th>Due Date</th>
<th>Assessment Date</th>
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<td>Project Report *</td>
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<td>6 January</td>
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<td>Bonus: Hands-on works</td>
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<td>During the term</td>
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<td>Bonus: In-class and Participation</td>
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* the grading of this component is capped to 17 points (85% of the maximum) for the Final Grade computation.

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**Normal track students**

**Student-workers and Special Examination Period**

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<td>Project Report *</td>
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<td>Bonus: Hands-on works</td>
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Teamwork:

- Team work is central to functioning of this class (and any modern engineering endeavor)

- Since Projects developed in the real world are a team effort, assignments, presentations, etc. will be done by teams.

- Working Group formation for classes and labs are opened in FenixEdu until the 25th September. A Team leader will be responsible for assigning the other members to the working group.

- Working Groups for Labs should, as possible, be formed by the same members of class Projects
Any Questions?

Introduction to the Course