Introduction to the Course

Distributed Systems
Sistemi Distribuiti

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Ingegneria Due
ALMA MATER STUDIORUM—Università di Bologna a Cesena

Academic Year 2011/2012
1. Motivations
   - Toward Distributed Computational Systems

2. The Course
   - Goal & Structure
   - What to Do
Outline

1 Motivations
   - Toward Distributed Computational Systems

2 The Course
   - Goal & Structure
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Computational Systems

What is a computational system?

- any system with computational capabilities
- how many computational systems today in this room?
  - how many a few years ago?

Interactivity & Interoperability

- Almost any computational system of today comes equipped with ICT technologies for interacting with other computational systems
- We live immersed in a sort of computational cloud, where an incredible (and always increasing) number of computations are performed at every instant
  - distributed, concurrent computations
  - either controlled / triggered, or autonomous computations
Pervasiveness of Computational Systems

Nowadays, computational systems...

- ... have become pervasive
- ... are at the core of most artificial systems

The physical nature of artificial systems...

... adds complexity to computational components / systems

- in terms of physical distribution
- in terms of temporal distribution
- in terms of unpredictability of the scenarios
On the Notion of Distribution

What is distributed?
- computational units, communication channels...
- data, information, knowledge
  - as well as their representations
- sensors, actuators, ...
  - the boundaries between the systems and the surrounding environment are topologically sparse

Spatio-temporal unity of systems is lost
- there is no longer a notion of system time, nor a system location
- system components, at different level of abstraction, are only partially related
  - temporally & topologically
Motivations Toward Distributed Computational Systems

What has Changed?

A number of assumptions over systems no longer hold

- system events *no longer* constitute a totally-ordered set
  - generally speaking, partial ordering is the only feature
- admissible interactions among system components *no longer* depend on compresence
  - in space / time
  - within a physical / virtual topology
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Goals of the Course

Students of this course should

- Learn the basics of distributed systems
- Take a look at some of the hottest new trends
- Experiment with distributed technologies
  - object-based as a general trend in moving legacy models & technologies toward distributed systems
  - web-based as the most relevant case of today widespread distributed, knowledge-intensive systems
  - coordination-based as a general-purpose approach to advanced technologies for intelligent & pervasive systems
Structure of the Course: Main Topics

Generality on distributed systems
- Basic problems and definitions
- Software architectures

Issues of distributed systems
- Communication
- Naming
- Synchronisation
- Consistency & replication
- Fault tolerance

Main sorts of distributed systems
- Distributed object-based systems
- Distributed web-based systems
- Distributed coordination-based systems
Material of the Course: Main Book

[Tanenbaum and van Steen, 2007a]
*Distributed Systems. Principles and Paradigms*

[Tanenbaum and van Steen, 2007b]
*Sistemi Distribuiti*
Pearson Education Italia, Torino, Italia, 2ª edizione.

This book represents the main guide throughout the first two parts of the course—Basics & Issues.
The material of the course includes slides available from the course's web site: 

http://apice.unibo.it/xwiki/bin/view/Courses/Sd1112

- Slides will be available from the course's web site.
- Along with any additional information—e.g., related literature.

The last part of the course, on the three main sorts of distributed systems, will:

- contain several references to the Tanenbaum & van Steen book chapters.
- but will mainly evolve according to a different perspective, as reported on the course’s slide.
Laboratory

Where, when, who

- In the VeLa Lab, via Venezia 52
- Tuesday, h. 14–17
- with Professor Enrico Oliva

http://apice.unibo.it/xwiki/bin/view/Courses/Sd1112Lab

- The Lab will be the place where the technologies for distributed systems are presented and experimented
- It will make the theoretical part meaningful
- It will be essential for the exam
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Attitude toward the Course

Attending lessons is important

- The topic is rich of subtleties
- A lot of “implicit knowledge” is transferred orally
- In particular, attending to Lab classes is essential

Material may be enough to pass the exam, anyway...

- ... for those who have problems attending lessons
- ... or, for those who just hate the Professor’s voice / face / slides / attitude / whatever
Registering to the Course

Professors-students lists...
- are provided for free by the Alma Mater Studiorum
- they mostly work
- we will use them here

Please register soon...
- to the list andrea.omicini.SD-1112
- using password 1112SD
- like, say, today.
References

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