

Distributed Systems Programming (DSP)

Course Introduction

Teacher: Prof. Riccardo Sisto

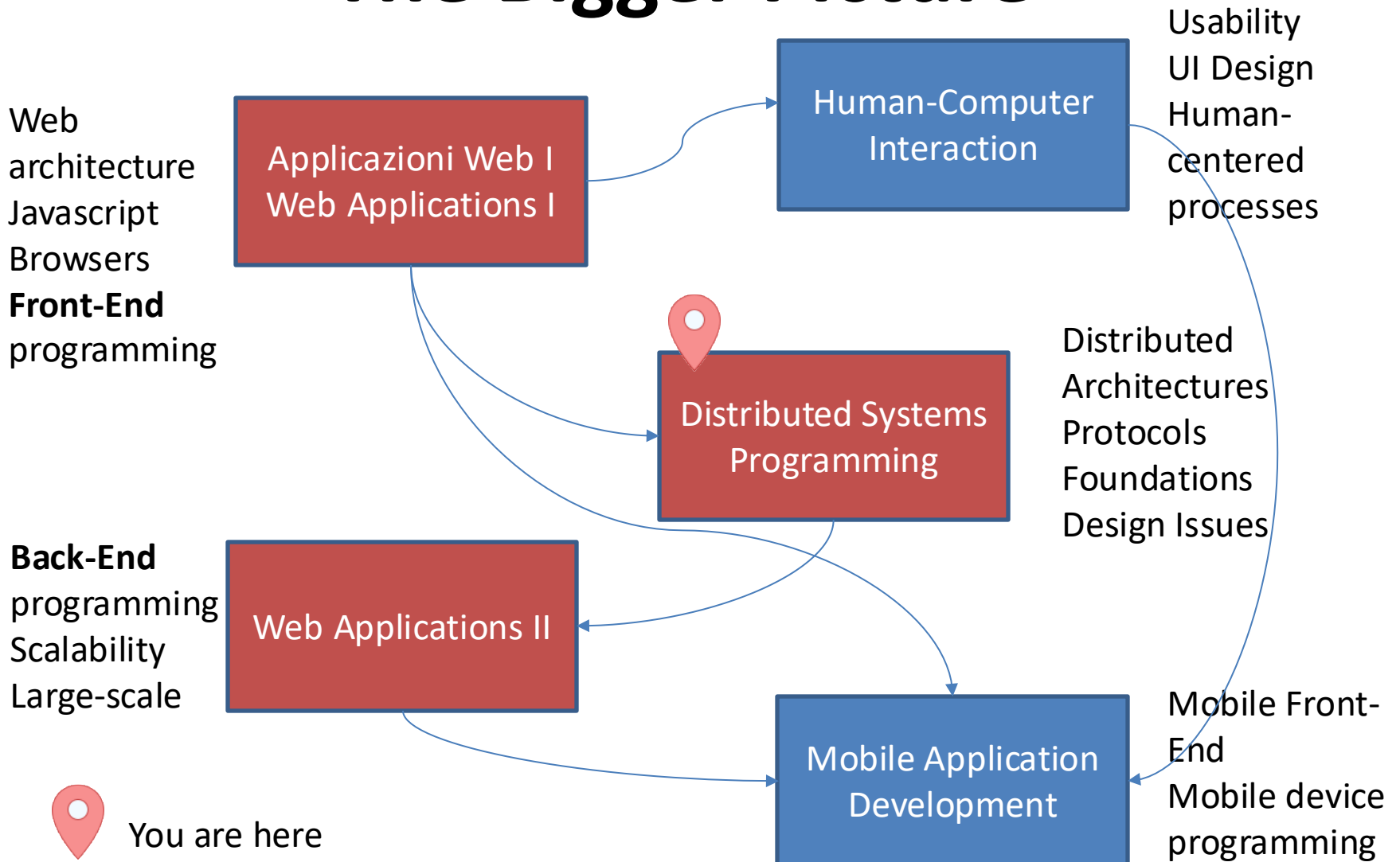
Teacher Assistants: Daniele Bringhenti

Francesco Pizzato

Course Introduction

- Goals and Program
- Organization
- Textbooks and Teaching Material
- Exam Rules

The Bigger Picture

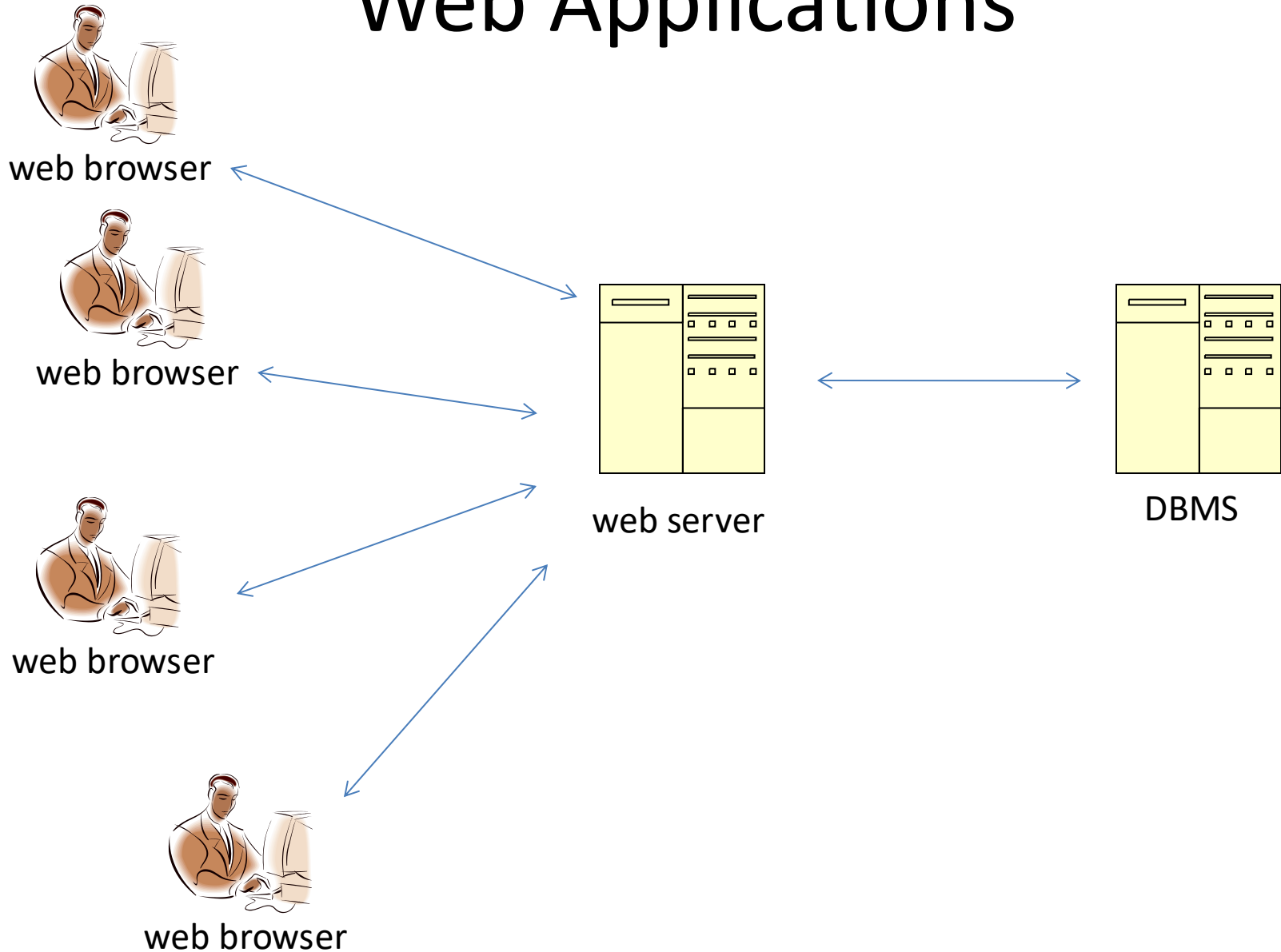


Main Goals

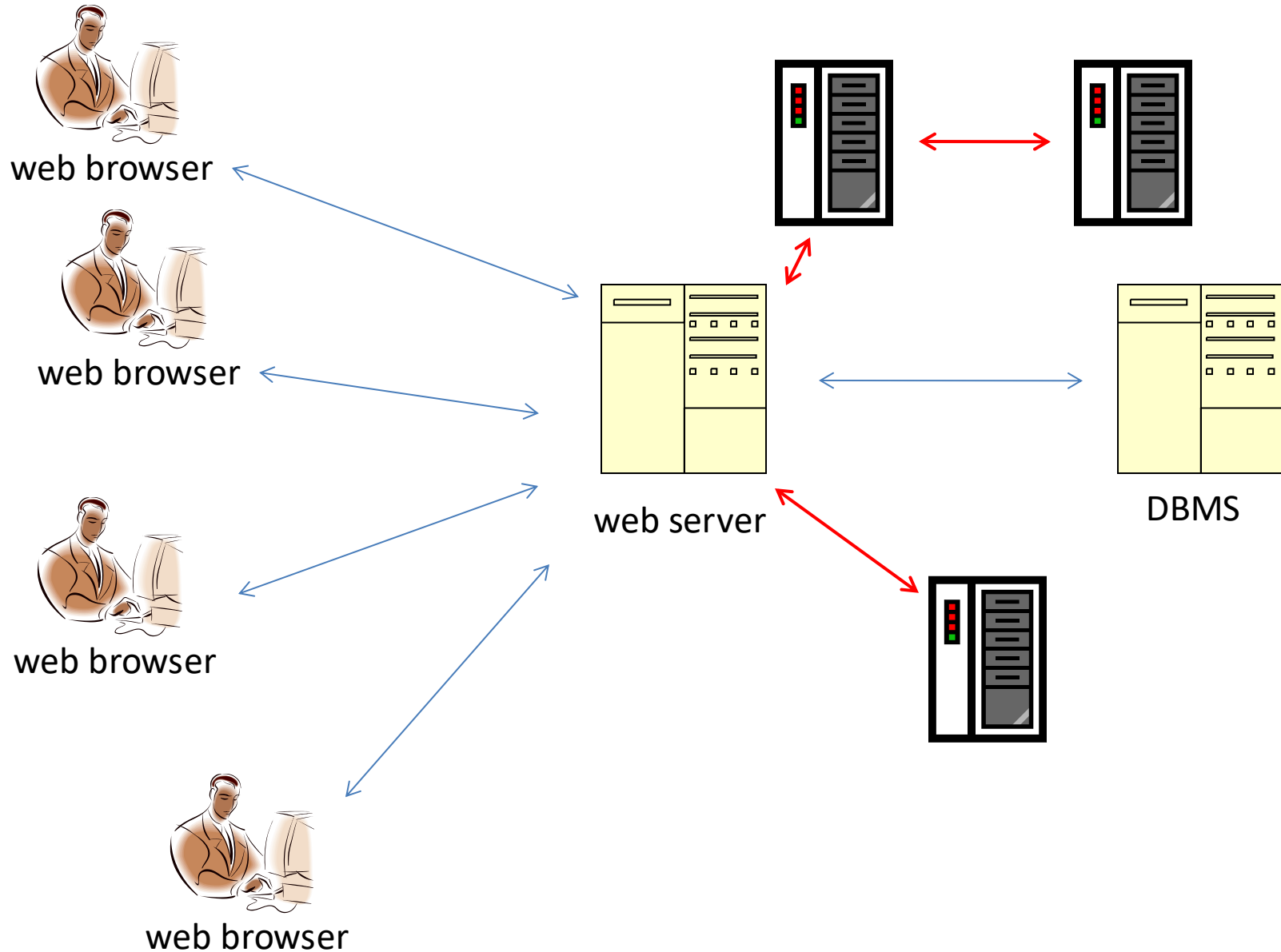


- Learn the main theoretical and practical foundations of distributed systems programming
- Know/understand the most widely used (web and non-web) distributed systems architectures
- Get skilled in designing distributed service interfaces (special emphasis on REST and micro-services)
- Get skilled in the application of the theoretical concepts using different technologies (gRPC, websockets, TCP/IP sockets, MQTT)

Web Applications



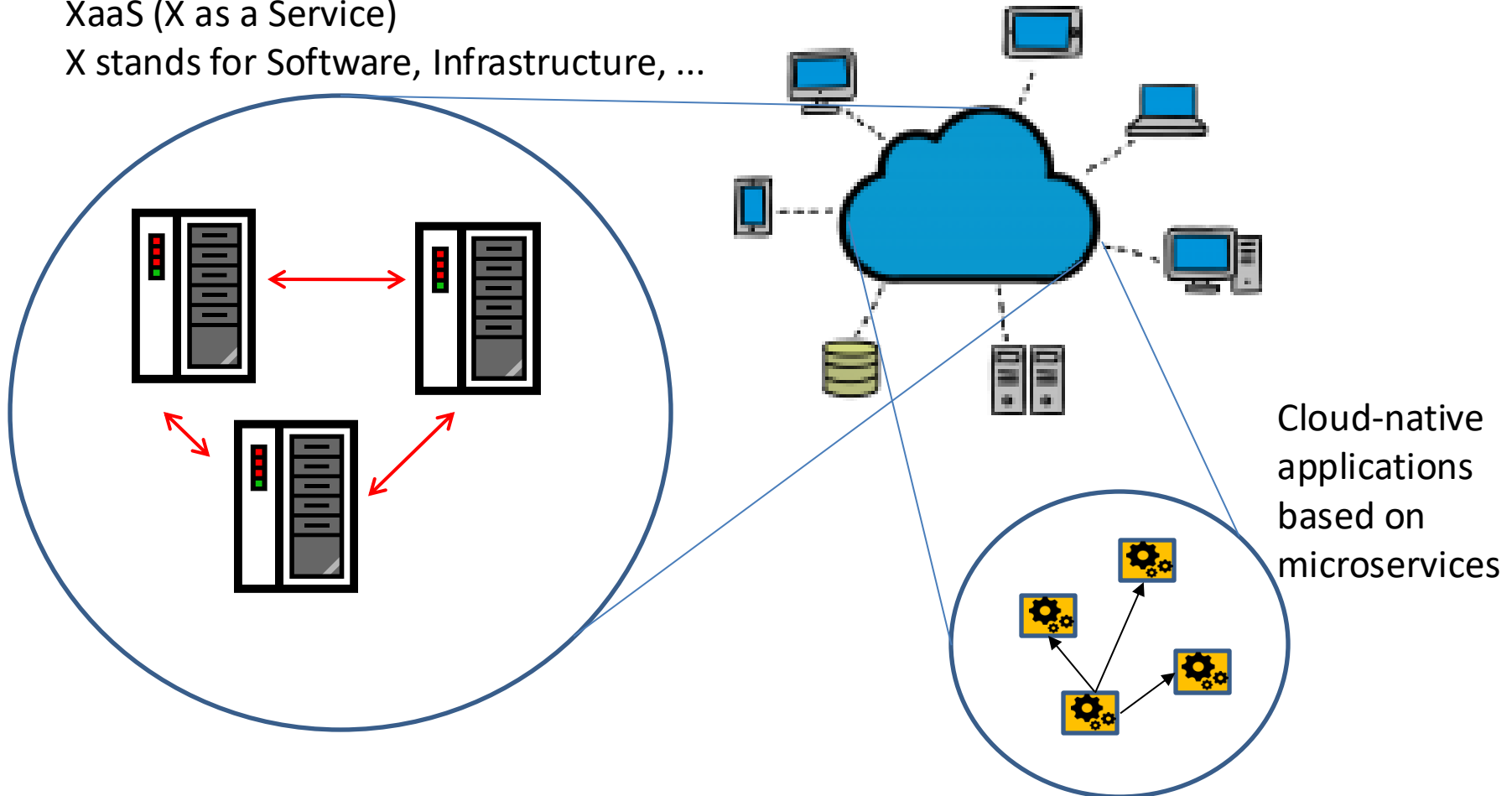
Web services used in **Web applications** for B2B interactions



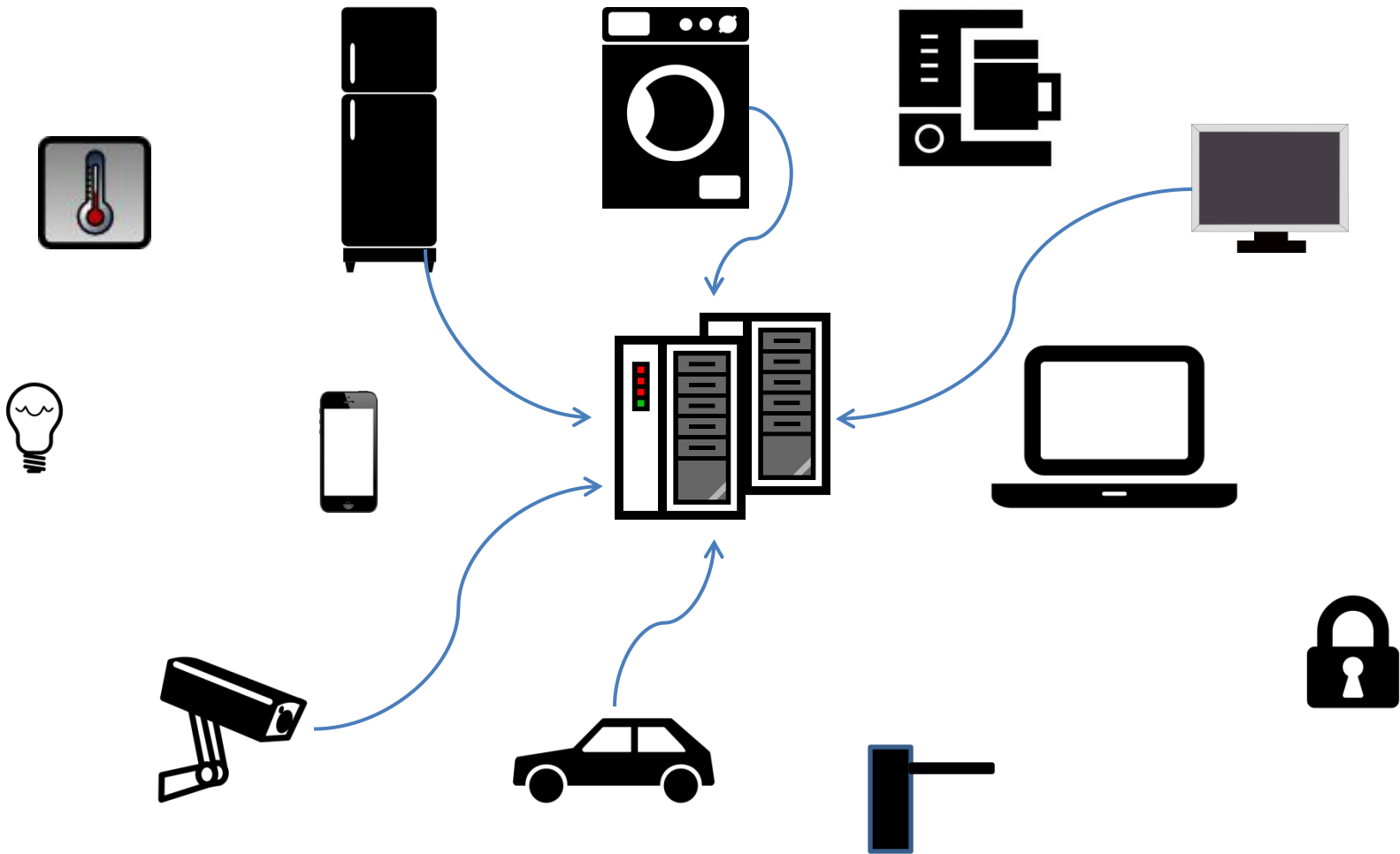
B2B Interactions in Cloud Computing

XaaS (X as a Service)

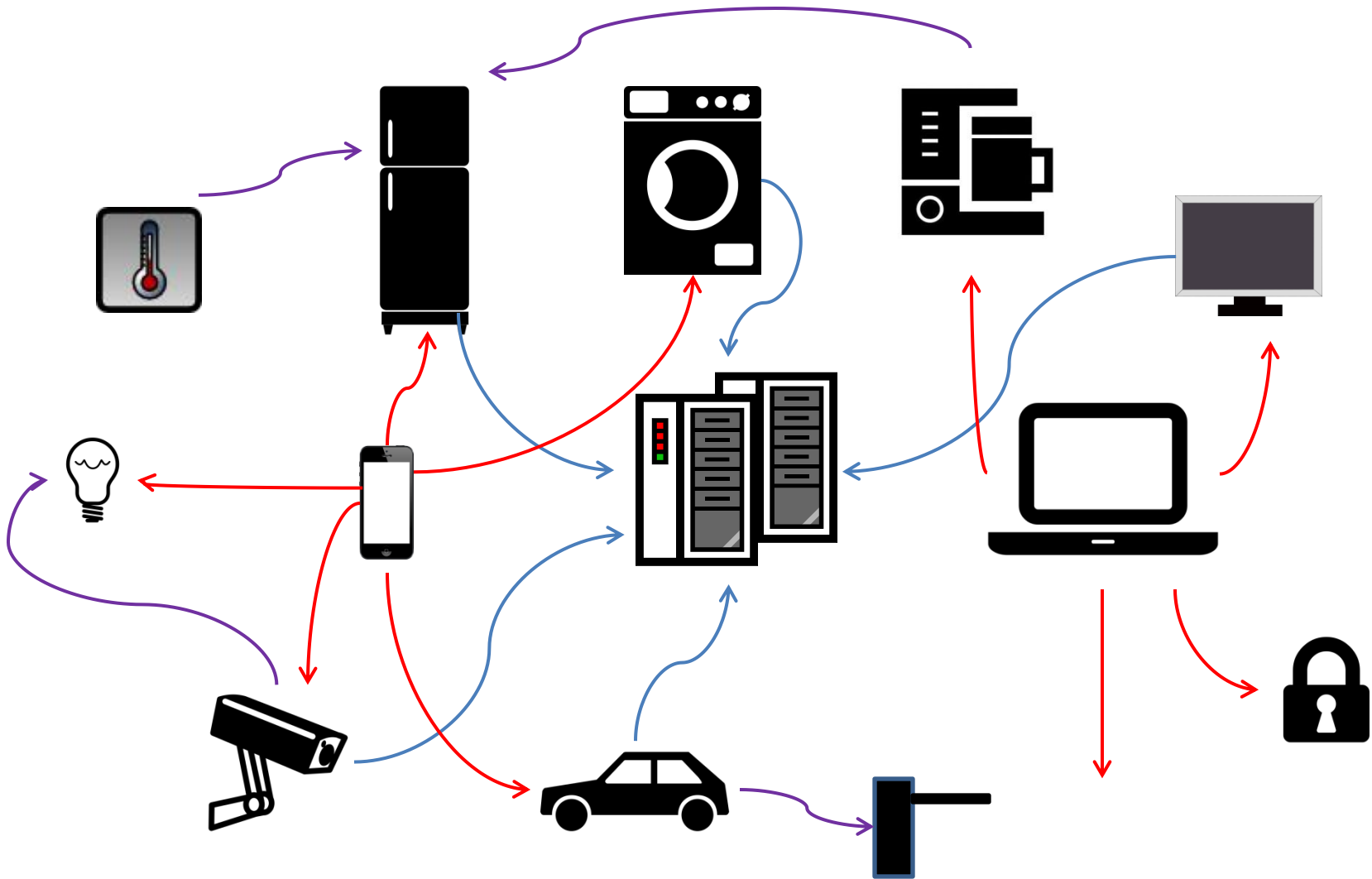
X stands for Software, Infrastructure, ...



Internet of Things (IoT)



M2M Interactions in IoT



Course Pre-requirements

- Computer Networks
 - in particular, TCP/IP, and HTTP
- System Programming
- Web Applications I
 - Programming of web applications using javascript
- Object Oriented Programming in Java

Course Topics



- Distributed Systems Programming Foundations:
 - Distributed systems properties and architectures
 - Distributed algorithms and error management techniques
 - Techniques for data serialization/deserialization/validation
- Web and non-web architectures
 - REST, HTTP/2/3, gRPC, protocol buffers, websockets
 - Main alternatives to the web: TCP/IP sockets, MQTT
- Design aspects
 - Guidelines for designing distributed services and their interfaces (with special emphasis on REST)

Exercises and Laboratories

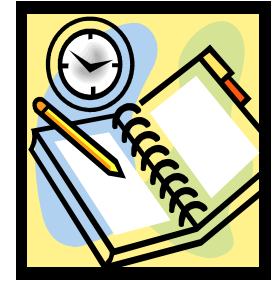


- Exercises in classroom:
 - Examples and exercises on the explained techniques
- Laboratories:
 - Total of 7 labs at LABINF (3 hours each)

Course Organization

- All lectures and laboratories are **in-person**
- **Video recording** of lectures and lab general explanations provided as a *best-effort* service

Timetable



- Lectures

Wednesdays 11.30-14.30 room 2T

Thursdays 08.30-10.00 room 7T

- Laboratories (LABINF) :

Group 1 Mondays 16.00-19.00

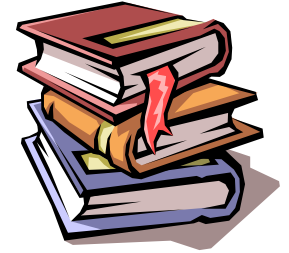
Group 2 Tuesdays 08.30-11.30

You will be invited to fill a form useful for
defining groups

LABORATORIES WILL START ON OCTOBER 21!

The exact Labs schedule will be published asap

Textbooks and Teaching Material



- Material available in electronic form:
 - Copy of the slides used for lectures
 - Teaching material / tutorials / readings
 - Reference documents/ standards
 - Video-recording of lectures
- ⇒ Course Web Portal: <https://didattica.polito.it>

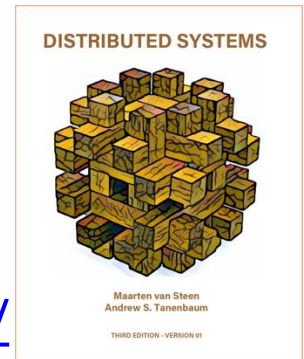
Textbooks and Teaching Material

- Textbooks:

Foundations of Distributed Systems:

- M. van Steen, A. S. Tanenbaum, "**Distributed Systems**", 3rd Edition, 2017-2018

<https://www.distributed-systems.net/index.php/books/ds3/>



REST principles and RESTful web services design:

- L. Richardson, S. Ruby, "**RESTful Web Services**" O'Reilly 2007, now freely available at

http://restfulwebapis.org/RESTful_Web_Services.pdf



Exam Rules



- Exam goal: verify the expected knowledge and skills have been acquired
- Exam organization:

Check design and
development
skills

Check knowledge
of foundations

Check knowledge
of project/design
choices

- individual project + mandatory oral exam

How the Exam Works



- Project
 - Variation or extension of Lab exercise
 - individual work
 - Developed at home in the days before the exam call (number of days usually 15, depends on complexity)
 - Deadline: 1 working day before exam call
 - Submitted on GitHub Classroom

How the Exam Works



- Mandatory oral discussion
 - Discussion of the project + questions about the theoretical foundations discussed in the course
 - Evaluation of project (50%) and knowledge (50%)

Exemptions

- Students who complete a special project or related thesis can substitute the normal exam with an oral discussion of the special project or thesis
 - A (limited) number of these projects/theses will be made available
 - Selection based on merit (CV)

Asking for Questions



- Prof. Riccardo Sisto
 - Phone: 011 090 7073,
 - e-mail: riccardo.sisto@polito.it
 - Daniele Bringhenti
 - Phone: 011 090 7098
 - e-mail: daniele.bringhenti@polito.it
 - Francesco Pizzato
 - Phone: 011 090 7098
 - e-mail: francesco.pizzato@polito.it
- We receive by appointment**

A slack workspace is available for the course, in order to facilitate/share interactions (see invitation link available on didattica.polito.it)