

Headline: TDA 596 / DIT 240, Distributed Systems, 7.5 ECTS, LP 2

Examiner: Philippas Tsigas

Course responsible: Tomas Olovsson

Course Assistants/supervisors: Deepak Desai

Mikael Gordani

**Lecturer: Aras Atalar,
Philippas Tsigas**

Charalampos Stylianopoulos

**Olaf Landsiedel
(3 guest lectures)**

**Christos Profentzas
Jithinraj Sreekumar**

Course content:

Aim: Why are computing systems becoming increasingly distributed? How can we build reliable and fault-tolerant distributed systems? Why does the Internet scale to billions of users? How are modern distributed systems such as the cloud, the smart grid, or connected cars built? These are a few questions that our course on distributed systems addresses. The goal of the courses is to understand the design of distributed systems and discuss the underlying principles and mechanisms that drive today's distributed systems. Our lectures provide the required fundamentals, and our labs give a hands-on experience in developing distributed systems and exploring their real-world challenges.

Content: We begin the course with an introduction to the basic concepts of distributed systems and the challenges they pose. After that, we revisit the required background in communication systems and operating systems. We continue with the main course content and focus on:

- Naming
- Mutual Exclusion and Election
- Clocks and Time
- Consistency and Replication
- Fault Tolerance in Distributed Systems
- Selected Applications in Distributed Systems

Our lectures provide students with the required fundamentals, and labs give students a hands-on experience in developing distributed systems and exploring their real-world challenges. This course offers learning experiences that involve hands-on experimentation and analysis as they reinforce student understanding of concepts and their application to real-world problems. Overall, this course provides the students the ability to understand fundamental issues in the design of methods for distributed systems.

Learning outcomes:

1. Knowledge and Understanding

In the exam and home assignments, the students are required to show knowledge of basic concepts of distributed systems and their challenges, naming and synchronization of systems,



consistency and replication, and fault tolerance in distributed systems. Moreover, they are required to describe applications of distributed systems and the mechanisms these use to provide their services.

Furthermore, students shall discuss and analyse the challenges and requirements that the different approaches have. They shall be able to compare and summarize the strength and weaknesses associated with the individual mechanisms.

2. Skills and Abilities

During the course, students are required to develop and evaluate small-scale distributed systems using fundamental mechanisms introduced in the lectures. The successful completion of the course requires a skillful and knowledgeable demonstration of these software developments in advanced settings including unreliable links and systems as well as limited bandwidth.

3. Judgement and approach

The student judgment skills should include the ability to describe and analyze existing and new methods for distributed systems design. In particular, the systems ability for scalability and fault tolerance.

4. Communication Skills

The communication skills that are expected to be developed in this course include collaboration in groups as well as oral and written presentation of lab results.

Course structure/course implementation (*Organization, Course distribution*)

The course consists of lectures and labs. Olaf Landsiedel who also acts as examiner and course responsible mainly teaches the lectures. In addition, Philippos Tsigas gives three guest lectures. Commonly, we have three lectures per week.

The course is complemented by four lab tasks. The TAs hold the lab sessions and we commonly have two lab sessions per week.

Examination forms:

Written Exam:

- Means allowed: Nothing except paper, pencil, pen and English - xx dictionary
- Grading: maximum 60 points.
 - GU: G 24p, VG 48p
 - CTH: 3:a 24p, 4:a 36p, 5:a 48p

Labs: 4 labs each 10 points (plus possible bonus tasks), to pass: 31 points, resubmission at (re)-exam dates, deadline extensions cost points.



Course Literature:

Marten van Steen and Andrew S. Tanenbaum, "Distributed Systems", CreateSpace Independent Publishing Platform, ISBN-10: 1543057381, ISBN-13: 978-1543057386, Third edition (!). There might be different ISBN numbers for hard and soft cover etc. Digital copy: On the site of the authors, a digital copy is available (upon request) for free (note that we are using the third edition): <http://www.distributed-systems.net/index.php?id=ds2-copy>

Schedule:

Lectures: Commonly three times per week, please see timedit and course website for details
Labs: Commonly twice a week, commonly, Mondays 15.15 to 17.00 and Thursdays 8:00 to 9:45

See timeedit for details on rooms etc.

