Universität Stuttgart

Distributed Systems

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Goal

The goal of the course is to enable the student to understand the foundations of distributed systems, fundamental distributed algorithms, and to be able to design and develop such systems.

Build Distributed Systems that are:

- correctly functioning
- performance-oriented
- and reliable

Design principles of distributed systems and their application to the modern networked environment

- Understand fundamental distributed systems theory
- Design for Internet/Web/Pervasive environments

Outline

Tentative

Basics:

- Characterization of Distributed Systems
- System Models

Middleware:

- Interprocess Communication
- Distributed Objects and Remote Invocation
- Distributed File Systems
- Distributed Transactions

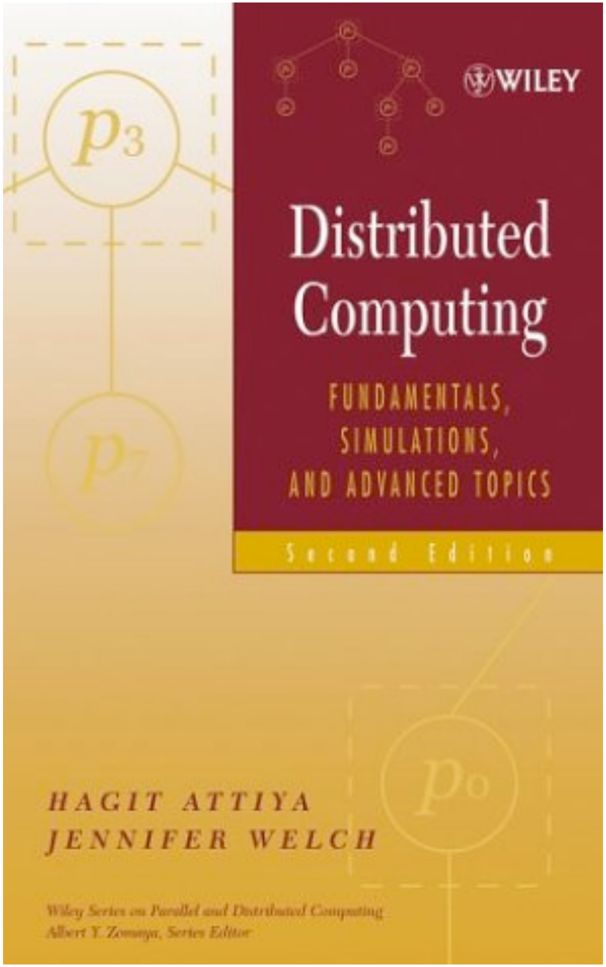
Distributed Algorithms:

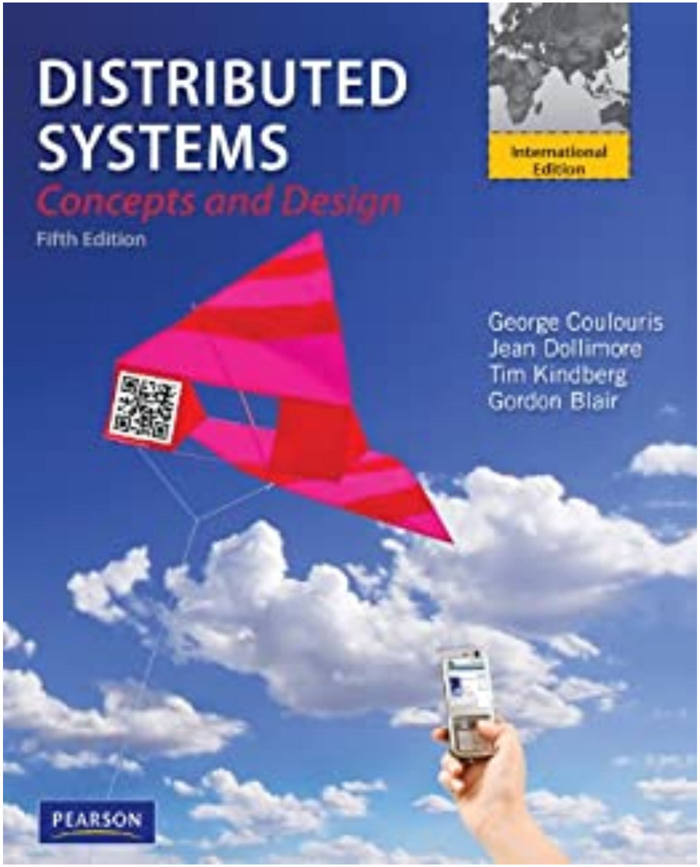
- Time Logical
- Time Physical
- Coordination
- Agreement
- Fault Tolerance

System Infrastructure:

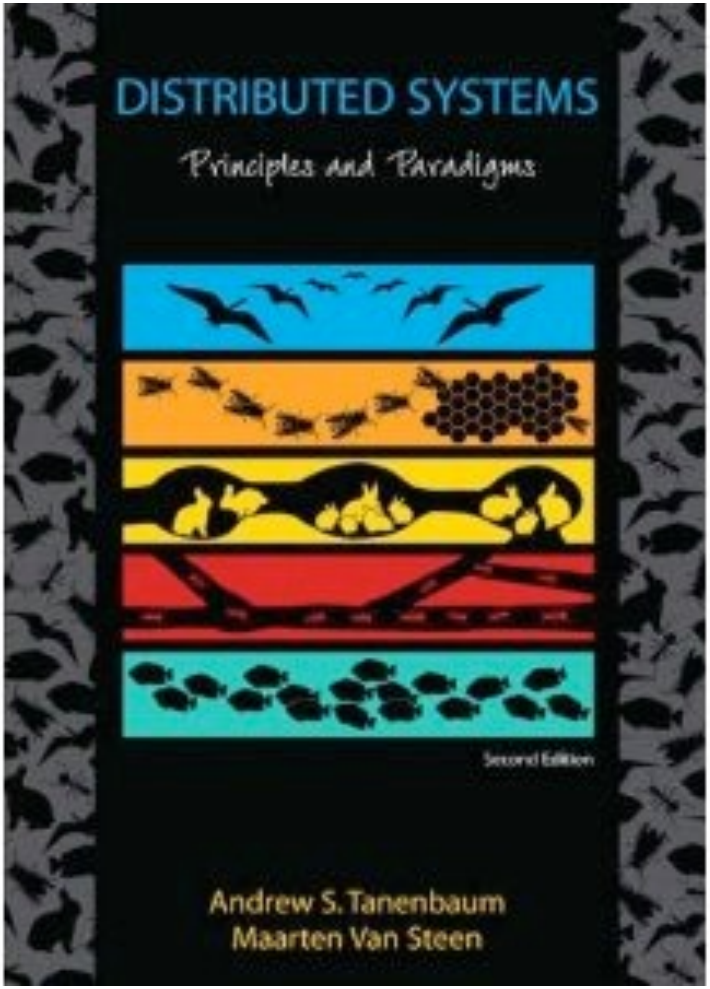
- Replication

Books


WILEY
p3
p7
Distributed Computing
FUNDAMENTALS, SIMULATIONS, AND ADVANCED TOPICS
Second Edition
p0
HAGIT ATTIYA
JENNIFER WELCH
Wiley Series on Parallel and Distributed Computing
Albert Y. Zomaya, Series Editor


DISTRIBUTED SYSTEMS
Concepts and Design
Fifth Edition
International Edition
George Coulouris
Jean Dollimore
Tim Kindberg
Gordon Blair
PEARSON

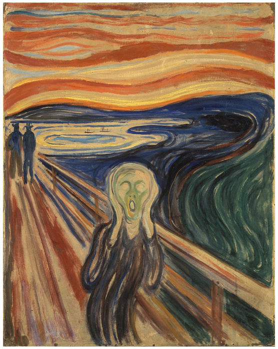
A possible alternative book



Slides are not intended for self-study

- Slides are given as a reference to help you take notes; they are not study material and do **not substitute** books, lecture notes, or other resources.

- Slides formatting reflects the source they come from (so yes, sometimes the formatting of different sets of slides may be different)



Lectures

Tentative

29.04.28	Introduction, DS
	Models and Networking
	Logical Time, RPC, RMI, Interprocess Communication
	Distributed Graph Algorithms, Elections
	Bully algorithm
	Excercise/Project
30.04.24	Multicast
	Fault Tolerance
	Replication
	Excercise/Project
17.06.24	Distributed File Systems and GFS
	Distributed Transactions and 2PC
	Excercise/Project
18.06.24	PAC Theorem
	Physical Time
	PAC Theorem
	Physical Time
	Excercise/Project
05.07.24	Exam tryout
	Demo day
17.07.24	**Written Exam**

Evaluation

- Project report and demo (pass/no pass)
- Written exam (marked)

Project evaluation

Both UniStu and HHZ

- Project Report
  - clarity, context, state of the art, problem statement, evaluation
- Demo
  - clarity, organization, creativity
- Q&A
  - choices presentation, distributed system overall knowledge

Project Requirements

- The Architectural Description is illustrated
- Project requirements:
  - any distributed application, must implement:
    1. Dynamic discovery of hosts
    2. Crash fault tolerance
    3. Voting

Project

How to work

- Work in groups of three
- You are responsible for forming the groups
- All members of the group get the same mark
- We do not intervene in group dynamics
- In Relax only one member of the team submits, not all members need to submit the same document

Reports

- The report is at most 5.000 words (min 2.500), declare number of words at the end of the report
- In the report, discuss how the requirements are satisfied
- Reports are checked for plagiarism (also historically)

On the use of ChatGPT and similar tools

- You can use whatever tool you want for the report, ChatGPT, Grammarly, etc., but you are solely responsible for the content.

- Hallucinations, incorrect statements, and un-existing references are **your** mistakes and can lead to failing the project.

Deadlines

Deadline is midnight CET of the indicated day

When	What	How
10.5.24	One page proposal (500 words max)	Relax
16.5.24	Feedback on the one page proposal	Webex, online
1.7.24	Final report	Relax

Course Evaluation

or
URL: https://evalserv.reutlingen-university.de/evasys/indexstud.php
Kennwort: VZM1S
Open till the day before the final evaluation.