W3WI_110.2 - Distributed Systems

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Version: 1.0 (WWI23SCA)

Core Topics

- Terminology, concepts, architectures, requirements profiles and architecture models for distributed systems
- Design and implementation approaches
- Comparison of different middleware concepts
- Synchronous and asynchronous communication, remote method calls
- Asynchronous communication and messaging systems
- Security aspects in distributed systems

Previous Knowledge

- Who is familiar with Java?
- Who is familiar with Python?
- Who is familiar with JavaScript/Typescript?
- Who has done any development outside of university projects?
- Who knows what a RESTful API is?

Examination - Portfolio

Background

- the module has 55 lecture hours
- Distributed Systems has 22 lecture hours

  ⇒ Distributed Systems will contribute up to **50** points to the final grade for the module. (Please, don't do the math.)

2 Parts

01	Presentations (10min per student) - max. 15 points
02	Programming Exercise (in teams of 5 students) - max. 35 points

Attention!

Students who present together should not be in the same team for the programming exercise.

Presentations - General Conditions

- The presentations should deal in particular with the core content of the lecture and *be of a conceptual nature*.

  This means that, after briefly presenting the overall purpose of the framework/technology/protocol, the architecture/the details must be presented. That is, how errors are dealt with, which services are offered, which guarantees/security aspects are implemented, how scalability is achieved, etc.

  No promotional presentations!
- The presentations are to be uploaded to Moodle the evening before the agreed date.
- Presentations should be in English.
- The speakers should not rotate several times during the presentation. I.e. the first speaker presents first, then the second, and so on. This is necessary for the grading.

Presentations - Available Topics

Must-have topics

1.	**Byzantine faults** 🔗	1 Person
2.	**LDAP** 🔗	2 - 3 Persons
3.	**Backend Subsetting and connection churn** 🔗	1 Person
4.	**Virtualization**: The goal of this presentation is to give an overview of the different virtualization technologies and to explain the commonalities and differences between them. It is also possible to demonstrate some of the differences using concrete products. Some keywords: Containers (e. g., Docker, Linux), Firecracker, Hypervisors (KVM, Xen, Hyper-V)	3 - 5 Persons
5.	**Real time system monitoring with ebpf** 🔗	2 Persons (One with interest in Linux)
6.	**HTTP/3 and QUIC or HTTP over QUIC** 🔗	2 Persons

Optional topics

7.	**Paxos** 🔗	2 Persons
8.	**Raft Consensus Algorithm** 🔗	2 Persons
9.	**Gossip Protokoll** 🔗	2 Persons
10.	**gRPC** 🔗	2 Persons
11.	**Web and Distributed Application Testing** Client and Server Side testing should be discussed.	4 Persons
12.	**Neo4J** 🔗	2 Persons
13.	**Docker Swarm vs. Kubernetes** 🔗	3 Persons

🏴 *connection churn* ≙ 🏴 *Verbindungsabbruch*

Presentations - Dates

Date	Topic
6. Mar	1. (Byzantine faults), 4. (Virtualization)
19. Mar	2. (LDAP), 5. (Monitoring), 12. (Neo4j)
26. Mar	11. (Testing), 13. (Docker Swarm vs. Kubernetes)
2. Apr	7. (Paxos) , 8. (Raft), 9. (Gossip)
9. Apr	3. (Connection Churn), 6. (HTTP/3), 10. (gRPC)