

Practical Lab

Distributed Systems Management

(ds-manage)

Course website: <https://github.com/TUM-DSE/sys-manage/>

Kick-off meeting

Chair of Decentralized Systems Engineering

<https://dse.in.tum.de/>



- A lab from the Chair of Decentralized Systems Engineering
 - Website: <https://dse.in.tum.de/>
 - Location: 1st Floor, 7th Finger
- If you are interested for bachelor's or master's thesis, guided research
 - Feel free to contact us
 - Open theses: <https://dse.in.tum.de/theses/>
- Instructors:
 - Charalampos (Babis) Mainas: charalampos.mainas@in.tum.de
 - Prof. Pramod Bhatotia: pramod.bhatotia@in.tum.de

Course Topics

- Distributed Systems
 - Deeper understanding of distributed systems
- Cloud-native systems
 - Building, packaging and maintenance of cloud systems
- Testing
 - Assure the correctness of applications
- Tutoring
 - Interact with other students



RocksDB

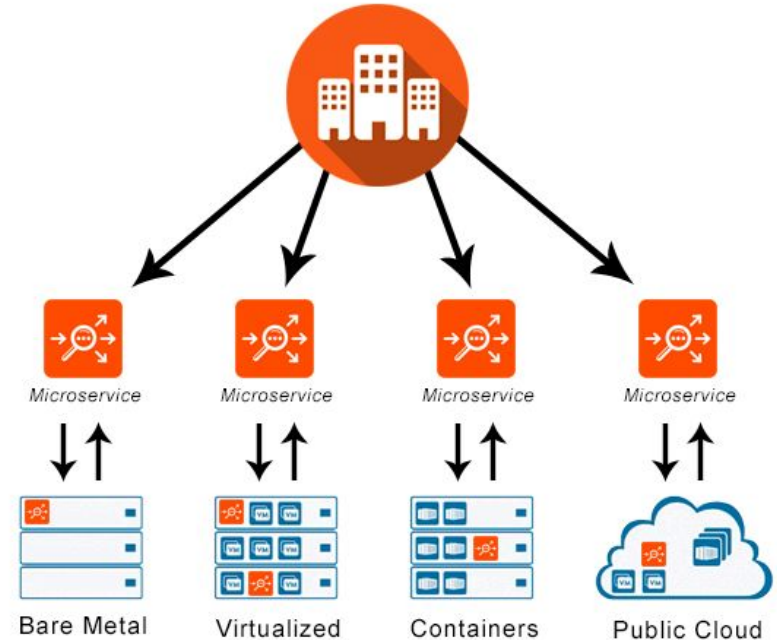
Cloud computing and microservices

- Design
 - Microservices
 - Distributed
- Development
 - Automation
 - Different workflow
- Deployment
 - VMs
 - Containers
 - Functions

Monolithic Architecture



Microservices Architecture



Applications

- Distributed systems should always be:
 - Fault-tolerant
 - Scalable
 - Efficient
- Distributed systems are more complex:
 - Communication between nodes
 - Coordination
 - Asynchrony – packet loss, network fails etc.

Learning goals

- Challenge your knowledge in:
 - Distributed systems
 - Network programming
- Deep understanding of key concepts
- Learn to communicate and resolve issues
- An insight of DevOps
- Tutor experience

How we gonna achieve our goals

- We will experiment on top of an another course from our Chair
 - Cloud Systems Engineering
 - Focus on distributed systems
 - Students will build a distributed storage system in 4 steps
- Learn by facing questions and issues raised from other students

- Cloud-lab consists of 4 programming assignments:
 - Each related to a different aspect of distributed systems
 - Built on top of each other, like a stack
- For each one programming assignment your tasks are:
 - Q&A
 - Plagiarism check
 - Improvement of test cases
 - Improvement of assignments
 - Bonus for automation
 - Help with infrastructure (Optional)

- For every assignment you will be divided in 4 groups:
 - Improvement of test cases
 - Improvement of assignments
 - Q&A
 - Plagiarism check
- The groups change in every assignment:
 - Everyone will participate in each one of the above groups once
 - Change group for every new assignment

Tasks of each group

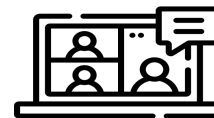
- **Assignment improvements:**
 - Understand the concept of the assignment
 - Propose new exercises
 - Update the existing ones
- **Test cases improvements:**
 - Understand the concept of the assignment
 - Propose new test-cases
 - Resolve issues regarding testing automation

Tasks of each group

- Q&A
 - Interact at slack channel with students from cloud-lab course
 - Participate in the Q&A of each lecture
 - Resolve issues and questions from the students
 - Propose hints - NOT solutions (Be careful!)
- Plagiarism
 - Check for patterns in the submitted solutions
 - Compare with previous years solutions
 - Create and run plagiarism checks
 - Submit report

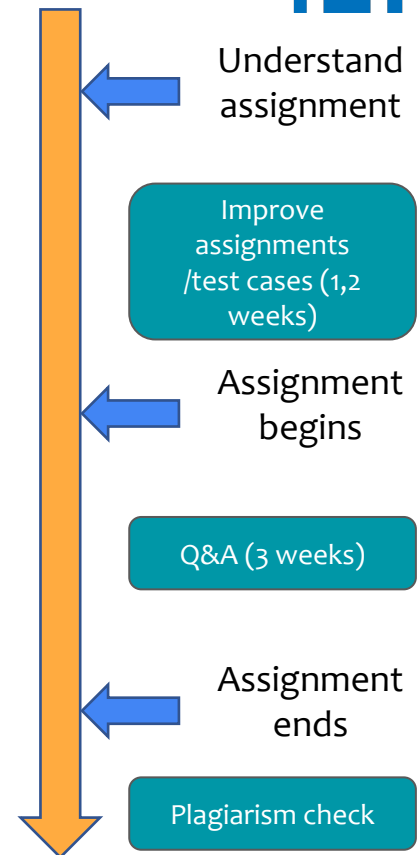
Timeline

- At total 4 assignments
 - 3 weeks between each assignment
- Course assignments:
 - Containers, Orchestrator, single-node KVS + TXs
 - Distributed KVS
 - Replicated Distributed KVS
 - Distributed TXs: w/ and w/o replication
- Slack channel: #ws-22-cloud-lab



Lecture

topic + assignment



- Grades will be assigned according to the contributions.
 - Answer and resolve questions and issues
 - Help setting up the infrastructure
 - Resolve technical problems
 - Improve assignments
 - Add more test cases
- Bonus:
 - Automate the process of a task
 - Help with infrastructure
 - Improve the lab

The important thing is to learn and test your knowledge, a good grade will follow.

Recommended reading



- The Linux Programming Interface - Michael Kerrisk
- Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems - Martin Kleppmann
- Site Reliability Engineering - Betsy Beyer, Chris Jones, Jennifer Petoff and Niall Richard Murphy

- University plagiarism policy
 - <https://www.in.tum.de/en/current-students/administrative-matters/student-code-of-conduct/>
- Decorum
 - Promote freedom of thoughts and open exchange of ideas
 - Cultivate dignity, understanding and mutual respect, and embrace diversity
 - Racism and bullying will not be tolerated

Contacts

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 - charalampos.mainas@in.tum.de
- Prof. Pramod Bhatotia
 - pramod.bhatotia@in.tum.de



Workspace: <http://ls1-courses-tum.slack.com/>

Chair website: <https://dse.in.tum.de/>

Course website: <https://github.com/TUM-DSE/sys-manage/>

Channel: #ws-22-ds-manage

Join us with TUM email address (@tum.de)