
Exam themes' specification and requirements

Runtimes for concurrency and distribution

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Modality

- **Individual or collaborative** undertaking
 - Max **group size** ≤ 3 individuals
- Topic chosen freely out of the topics enumerated here
- Exam work in **three steps**
 1. Study of the **state of the art** around the chosen topic
 2. Selection of an applicable **real-world scenario** of interest
 3. Implementation of **Proof-of-Concept** based on above scenario to prove the candidates' understanding of the subject matter
- Exam work's output has two parts
 - **Technical report** (TR) on the candidate's findings
 - **Oral presentation**
 - Both **delivered in English**
- Admission to oral presentation upon approval of the TR

Technical Report: main components

■ **Problem statement**

- ❑ Scope (boundary)
- ❑ Purpose (technical and scientific expectations)
- ❑ Aspects to be investigated

■ **Work product**

- ❑ Technical choices made in the realization of the PoC
- ❑ Design of the evaluation experiments
- ❑ Results of the evaluation experiments

■ **Self-assessment**

- ❑ Candidate's own critique of own exam work (achievements, failures)
- ❑ Discussion of the candidate's *learning outcomes*

List of topics

- A. Exploration of **scalability** challenges and solutions in a real-world scenario of choice
- B. Application of **Paxos** or **Raft** algorithms to real-world scenario of choice
- C. Exploration of real-world situations where **eventual consistency** is known to be used soundly
- D. Exploration of **saga** (*distributed transaction*) **pattern** for rationale and challenges of use in real-world applications
- E. Study of how an **orchestration** language (e.g., Ballerina, Jolie) can help implement microservices-based Cloud-native apps
- F. Students' own proposal (subject to instructor's approval)

Examples of excellent outcomes

- **Rafting multiplayer video games**
Gabriele Pozzan, Tullio Vardanega
Software: Practice and Experience, **2021**
<https://doi.org/10.1002/spe.3048>
- **The scalability challenge of Ethereum: An initial quantitative analysis**
Mirko Bez, Giacomo Fornari, Tullio Vardanega
13th Conference on Service Oriented Software Engineering (SOSE), **2019**
<https://doi.org/10.1109/SOSE.2019.00031>
- **Microservice-Based Agile Architectures: An Opportunity for Specialized Niche Technologies**
Stefano Munari, Sebastiano Valle, Tullio Vardanega
23rd Ada-Europe International Conference on Reliable Software Technologies, **2018**
https://doi.org/10.1007/978-3-319-92432-8_10

Schedule

- **No fixed date for the exam (big risk!)**
 - Registration attached to the closest official exam session
- Notification of choice of topic
 - By **12:00 hrs, 17 January 2022**
 - With **explicit declaration of estimated delivery time**
- Bonus applied to early delivery
 - **2 points** if by **18:00 hrs on 15 April 2022**
 - **1 point** if by **18:00 hrs on 10 June 2022**
 - Computed on delivery time, redeemed on passing exam
- Latest submission time
 - By **18:00 on 28 September 2022**