

# Coverage Criteria for Integration Testing of Microservice Systems

Master's Thesis

**Supervisor:** Prof. Dr. Alexander Pretschner

**Advisor:** Lena Gregor

**Email:** {alexander.pretschner, lena.gregor}@tum.de

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Fakultät für Informatik  
Lehrstuhl 4  
Software & Systems Engineering  
Prof. Dr. Alexander Pretschner

Boltzmannstraße 3  
85748 Garching bei München

Tel: +49 (89) 289 - 17362  
<https://www4.in.tum.de>

## Context

Microservices, a widely adopted software architecture style, bring a new way of building flexible and scalable systems [1]. The distributed nature of microservices, coupled with their diverse technology stack, introduces inherent complexities in testing, surpassing those encountered in monolithic systems. However, good tests are crucial for ensuring good quality software. Traditional test adequacy criteria like branch coverage can be used to evaluate tests focusing on implementation details within single services. However, when it comes to the quality of higher-level tests that focus on the interactions between microservices, new adequacy criteria are needed, as traditional approaches are too fine-grained and fail to capture the dependencies across system boundaries.

We consider integration tests as tests that focus on the interaction of multiple microservices - in practice often referred to as gateway integration tests.

## Goal

Previous to this thesis, a literature review was performed to identify relevant coverage criteria already published in the literature. This thesis aims to adapt suitable, existing coverage criteria to the context of microservice integration testing. The resulting coverage criteria should be implemented into a tool where the coverage of test cases is tracked, and the coverage metric is calculated for an existing test suite.

## Research Questions

**RQ1:** Which coverage criteria are most suited to be adapted to our context?

**RQ2:** How can we adapt those coverage criteria for integration testing of microservice systems?

**RQ3:** Which existing approaches/implementations can be used to track the coverage of test case executions over service boundaries?

## Working Plan

1. Go through the results of the previous literature review and identify the most suitable existing coverage criteria for adaptation.
2. Adapt those criteria to the context of microservice integration testing.
3. Implement the calculation of those coverage criteria.
4. Evaluate the coverage criteria.
5. Write the thesis report.

## Deliverables

- Implementation of the coverage calculator.
- Final thesis written in conformance with TUM guidelines.
- Presentation of the work at the chair after the submission.

## References

- [1] Lewis, J., Fowler, M.: Microservices (Mar 2014), <https://martinfowler.com/articles/microservices.html>