

Research Topic:

The research topic I have chosen is "Optimizing Microservice Architecture in the Buzzloop Project." This topic aligns with the first driver for research, which is to gather new knowledge to advance a project. The Buzzloop project involves developing a complex system with multiple microservices, and there is a need to optimize the architecture to ensure scalability, reliability, and efficiency.

Why I Chose This Topic:

The Buzzloop project is currently facing challenges related to the performance and scalability of its microservices architecture. As a member of the development team, I am responsible for ensuring that the system meets project requirements and delivers a seamless user experience. By researching and optimizing the microservices architecture, I aim to address these challenges and improve the overall performance of the Buzzloop platform.

Research Questions:

Main Research Question:

- How can the microservices architecture of the Buzzloop project be optimized to improve performance and scalability?

Sub-Research Questions:

1. What are the current bottlenecks and performance issues in the existing microservices architecture?
2. What are the best practices for designing and implementing microservices architecture in a cloud-native environment?
3. What technologies and tools can be utilized to optimize communication and coordination between microservices?
4. How can containerization and orchestration technologies such as Kubernetes be leveraged to improve scalability and reliability?
5. What monitoring and observability solutions should be implemented to ensure the health and performance of the microservices architecture?

Research Methods:

To address the research questions, I will utilize the following research methods, categorized based on the Research Framework:

Library (Literature Review, Expert Interviews):

- Conducting a comprehensive review of existing literature, research papers, and case studies related to microservices architecture, cloud-native development, containerization, and orchestration technologies.
- Interviewing experts in microservices architecture, cloud computing, and DevOps to gain insights and best practices.

Workshop (Brainstorm, IT Architecture Sketching, Prototyping):

- Brainstorming sessions with the development team to explore optimization strategies and architectural patterns.
- Sketching IT architecture diagrams to visualize proposed changes and optimizations.
- Prototyping solutions to experiment with different architectural approaches.

Lab (Component Test, System Test, Performance Benchmarking):

- Conducting component tests to evaluate the performance and functionality of individual microservices.
- Performing system tests to validate the interaction and integration of microservices within the architecture.
- Benchmarking the performance of optimized microservices architecture against the current implementation.

Deliverables:

The research will result in a comprehensive report outlining findings, insights, and recommendations for optimizing the microservices architecture of the Buzzloop project. Additionally, a presentation will be delivered to the project team to discuss research outcomes and proposed strategies for implementation.

Estimated Time:

- Literature Review: 2 weeks
- Expert Interviews: 1 week
- Brainstorming and Prototyping: 2 weeks
- Experimentation and Benchmarking: 2 weeks
- Report Writing: 2 weeks
- Presentation Preparation: 1 week

Research Framework:

The research plan will be structured based on the Research Framework provided to ensure a systematic and effective approach to the research process. This framework will guide the selection of research methods and justify the strategic approach taken in optimizing the microservices architecture of the Buzzloop project.

Additional Resources:

I will refer to the ICT Research Methods website (<https://ictresearchmethods.nl/>) for guidance on selecting appropriate research methods and tools for each phase of the research process. This resource will provide valuable insights and practical advice to enhance the quality and effectiveness of the research.

Research Topic:

The research topic delves into evaluating the Quarkus and Spring Boot frameworks for building Java-based microservices, focusing on their application in library management systems.

Problem/Opportunity:

Library management systems require robust and efficient microservices architecture to handle various tasks such as cataloging, circulation, and patron management. Selecting the most suitable framework is crucial for ensuring scalability, performance, and maintainability of the system. The opportunity lies in exploring the advantages and disadvantages of Quarkus and Spring Boot in the context of library management systems.

Research Questions:**1. Main Question:**

- How do Quarkus and Spring Boot compare in terms of suitability for developing microservices in a library management system?

2. Sub-Questions:

- What are the best practices and design patterns recommended for building microservices using Quarkus and Spring Boot in a library management system?
- How do the community support and ecosystem for Quarkus and Spring Boot differ, and how do they impact the development process and long-term maintenance?
- What are the strengths, weaknesses, opportunities, and threats (SWOT analysis) associated with using Quarkus versus Spring Boot in a library management system context?
- How do Quarkus and Spring Boot libraries and frameworks perform in terms of domain modeling, exploratory data analysis, and validation techniques in the context of library management systems?
- What are the experiences and insights of experts in the field of microservices architecture and Java frameworks regarding the use of Quarkus and Spring Boot in library management systems?

Research Methods:

1. Literature Study:

- Review academic papers, articles, and documentation comparing Quarkus and Spring Boot.
- Explore user requirements and domain-specific challenges in library management systems.

2. Expert Interviews:

- Interview architects and developers experienced in microservices architecture and Java frameworks to gather insights and recommendations.

3. SWOT Analysis:

- Conduct a SWOT analysis to identify the strengths, weaknesses, opportunities, and threats associated with Quarkus and Spring Boot.

4. Exploratory Data Analysis (EDA):

- Perform exploratory data analysis to understand the performance, scalability, and resource utilization of Quarkus and Spring Boot frameworks.

5. Benchmark Testing:

- Conduct benchmark tests to compare the performance of microservices built with Quarkus and Spring Boot in a library management system scenario.

Deliverables:

1. Comparative analysis report highlighting the advantages and disadvantages of Quarkus and Spring Boot in the context of library management systems.
2. SWOT analysis findings and recommendations for selecting the appropriate framework based on specific project requirements.
3. Expert interview insights and recommendations for best practices and design patterns in microservices architecture.
4. Performance benchmarking results and analysis for Quarkus and Spring Boot frameworks in library management systems.

Estimated Time:

The research and analysis process is expected to take approximately 8-10 weeks, including literature study, expert interviews, SWOT analysis, exploratory data analysis, and benchmark testing. Additional time may be required for synthesizing findings, writing reports, and presenting results.

Additional Resources:

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