System Integration 2021 Exam Project

Objectives

The objective of this project is to enable you to demonstrate knowledge and skills acquired in the System Integration course, in collaboration with the Development of Large Systems.

The project involves design, implementation, and documenting of integrated software system with a business context.

The project solution, as well as short video-presentation of it must be submitted on-line before the exam and discussed at the exam.

The development of the project is a teamwork, while the examination on it is individual. Every team member is expected to be able to provide argumentation regarding the whole project and its parts, as well as to highlight their own individual contribution to the solution.

Problem Definition

A large virtual IT company DevOrgs (http://devorgs.dk) provides software and services to enterprises of various size and branches. During the recent years the company has developed expertise in digitalisation of business processes and modernization of enterprise applications by means of automation, integration and interoperability of disparate components.

The list of company's current customers includes, but doesn't end with

- a 4* hotel with a restaurant, bar, and SPA
- a 1st division football club
- online pizza delivery shop
- a book and vinyl subscription services provider
- a car-driving school
- a small cooperative bank
- a big insurance agency

Your team is responsible for one of DevOrgs integration projects, which serves a particular business customer.

Your group is free to decide on a customer, use cases and implementation scenarios, development environments and integration platforms, within the scope of the requirements listed below.

Task

Your task is to design, develop and implement modern integrated software system, which provides business services and automates business processes, related to your customer's domain of activities. To fulfill the task, your team needs to:

1) Analyze the domain and identify potential problems in the existing legacy digital systems at the customer, such as lack of functionality, performance issues, operation difficulties, data storage and transformation issues, customer dissatisfaction, etc.;
2) Select business cases and scenarios, where you can help solving the problems by applying integration and modernization techniques;
3) Design the architecture of your integrated solution applying DDD approach;
4) Develop and deploy the solution on a local server and/or a cloud platform, while considering readiness for scaling and load-balancing;
5) Advertise the final product in a short video clip.

Requirements

As it is a project with particular learning objectives, it refers to the content you have learned and the assignments you have developed during the semester. Therefore, you must consider the following mandatory requirements and limitations of your exam project solution:

1. **System Components**
    Subject of integration are several disparate applications, application components, and data sources of three types:
    a. a monolithic or legacy object-oriented application – for ex. file or large DB based system, Client-Server or MVC architecture, any black-box or hidden application
    b. SOAP/REST web services or SOA implementation – either locally built or exposed as free resources in Internet
    c. microservices architecture application or modules of application, including selected discovery, orchestration, or choreography methods and technologies

2. **Business Context**
    The integration architecture design reflects on the business context:
    a. applies domain-driven design approach
    b. includes BPMN models and rules
    c. follows enterprise integration patterns, EIP
    d. enables sharing, integration and transformation of data between system components, data structures and file formats

3. **Integration Technologies**
    The development implements variety of integration and communication techniques (the technologies in the parentheses are examples)
    a. both RESTful and gRPC APIs
    b. MOM – either brokerless (Apache Camel) or broker-based (ActiveMQ, RabbitMQ)
    c. event streaming – (Apache Kafka)
    d. business process automation – (Camunda)
    e. microservices composition, discovery, and management – (Docker, Docker Compose, Eureka, Netflix tools, Kubernetes)

4. **Development Environments and QA**
    The product also illustrates use of
    a. decoupling, configuration, choreography and orchestration of components
    b. synchronous and asynchronous interaction styles
    c. logging and monitoring the system or its components
    d. producing error messages in human-readable format
    e. implementing variety of programming languages or development platforms
    You can consider the Twelve-Factor App recommendations.

5. **Client Applications**
    The product integration channels must be tested for both success and failure

    a. there is no requirement for developing a GUI-based client application
    b. publicly available means, such as Postman, curl, console CLI and web browsers, which provide a simple interface for illustrating the functionality of the integrated system can be used instead

Documentation

There is no requirement for writing report. Instead the team is expected to add project description in a .md file in the GitHub repository, in which the integration development process and considerations are explained and visualized by diagrams.

Including an architectural diagram of the whole system and its components is a must.

In addition to the document, the team prepares a 10-minute video, presenting the project, where the business cases, problems and solutions can be further discussed, demonstrated, and evaluated.

Notes

1) This is a group project. The recommended group size is 4-5 students.
2) The scope of the project should enable fulfilment of the requirements stated above. In focus is the system integration.
3) You are encouraged to reuse the code from your assignments solutions as much as appropriate.
4) Second semester students are encouraged to contribute with implementation of various (ML) algorithms, data structures, and database stores.
5) The project is delivered to Wiseflow, in terms defined by the administration.
6) Improvements on the project quality can be made between the delivery date and the exam date, but there shouldn't be major changes and the changes must be reported at the start of the exam.

Exam

The exam is individual, oral and graded. The examination commission consists the course instructors and an external censor.

The exam begins with 5-minute presentation highlighting the student's personal interest and contribution to the group project, followed by 15-minute dialogue between the student and the examiner on topics related to the project and the presentation, as well as on other topics related to the course content. The exam ends with 5-minute grading.

Important Dates

Hand-in: TBD, December 2021
Exam: 6th and 7th January 2022