Semester Project Information

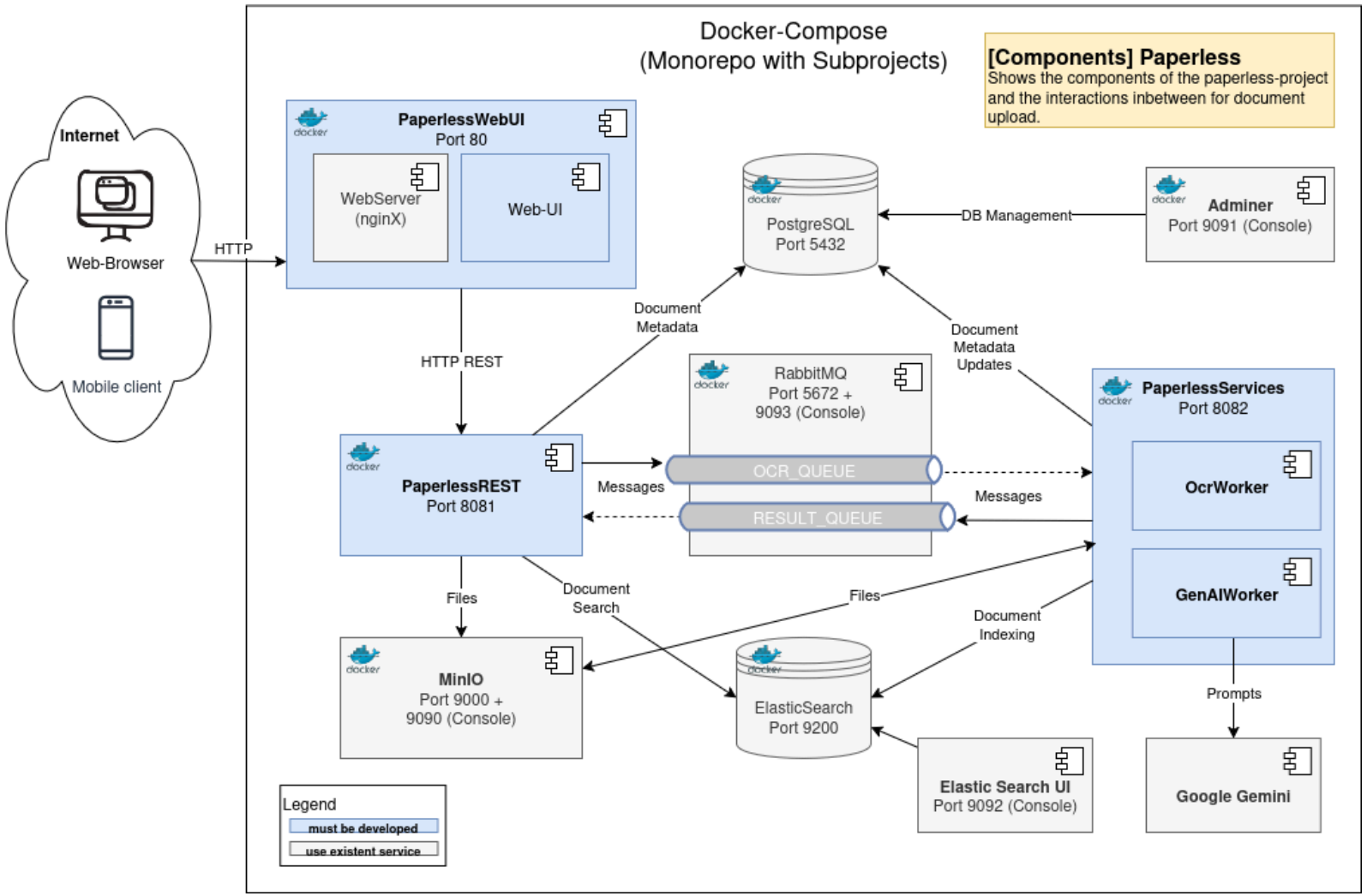
SWEN3 | BIF5

Semester Project:

Document Management System

a Document management system for archiving documents in a FileStore,
with automatic OCR (queue for OC-recognition),
automatic summary generation (using Gen-AI),
tagging and full text search (ElasticSearch).

Semester Project Architecture



Use Cases

1. Upload document
    - Automatically performs OCR
    - Is indexed for full-text search in ElasticSearch
    - a summary is automatically generated
2. Search for a document
    - Full-text and fuzzy search in ElasticSearch
3. Manage documents
    - Update, delete, metadata
4. Your additional individually defined usecase (Sprint 6)
    - Your own choice
    - Must include additional entities!

Technology Stack

Java

- JDK LTS (>=21)
- Spring Boot (>=3)

C#

- .Net >= 8.0
- ASP.Net

Both

- Docker (Desktop)
- RabbitMQ
- PostgreSQL
- ElasticSearch
- GenAI (Google Gemini or similar)

Semester Project Sprints

Sprints

Sprint 1	Sprint 2	Sprint 3	Sprint 4	Sprint 5	Sprint 6	Sprint 7
Project-Setup	(Web-)UI	Queuing	Workers,	GenAI	ELK	Integr.-Test
REST API			MinIO, OCR		Use Cases	Batch-Processing
DAL		**Mid-Term Code Review**				**Final Code Review**

Sprint 1: Project-Setup, REST API, DAL (with Mapping)

1. Java/C# Project Setup
2. Remote Repository setup,
   all team members are able to commit/push
3. REST Server created
   Endopints defined by the team (code-first)
4. ORM is integrated to persist the entities on the PostgreSQL database, use the repository pattern
5. Show correct function with unit-tests, mock out the “production” database
6. Initial docker-compose.yml, used to run the REST-server & database inside containers

Sprint 1: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 1)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error
  - Servers (REST & PostgreSQL) start successfully
  - REST Endpoints functioning, data is persisted in DB

Sprint 2: (Web-)UI

1. Webserver service (e.g. nginx or else) integrated
2. Dashboard and detail-pages are served by the webserver
3. The Webpage communication with the REST server
4. Extend docker-compose.yml to run the UI in an additional container

Sprint 2: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 2)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error (docker compose build)
  - docker compose up successfully starts containers
  - GET http://localhost/ returns the functioning paperless-frontend

Sprint 3: Queues integration (RabbitMQ)

1. Extend docker-compose.yml to run RabbitMQ in a container
2. Integrate Queues into REST Server
3. on document upload the REST-Server should also
    - send a message to the RabbitMQ
    - will be processed by an "empty" OCR-worker
4. Failure/exception-handling (with layer-specific exceptions) implemented
5. Logging in remarkable/critical positions integrated
6. Prepare for the mid-term Code-Review

Sprint 3: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 3)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error (docker compose build)
  - docker compose up starts all containers successfully
  - POST http://localhost/... some PDF-Document
    will lead to a log-entry at the worker-service (for to be processed with OCR)

Sprint 4: Worker Services (OCR, MinIO)

1. Create an additional application for running the OCR service
2. Tesseract for Ghostscript (or the like) integraded and working, show function with unit-tests.
3. Extend REST Server to store PDF document in MinIO
4. Implement the OCR-worker service to
    - retrieve messages from the queue (sent by REST-Server on document-upload),
    - fetch the original PDF-document from MinIO
    - perform the OCR-recognition
    - show functionality with unit-tests
5. Extend docker-compose.yml to run the MinIO and OCR-service in a container

Sprint 4: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 4)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error (docker compose build)
  - docker compose up sucessfully starts all containers
  - POST http://localhost/... some PDF-Document
    - will lead to store the PDF on MinIO
    - will lead to a log-output on the PaperlessService.OcrWorker (stating OCR result)

Sprint 5: Generative AI-Integration

1. Extend docker-compose.yml to include configuration for GenAI service
2. Add a new GenAI-worker service
3. On document upload, after OCR is complete:
    - Send the extracted text to a GenAI API (Google Gemini)
    - Receive a summary as a response
4. Extend REST Server to store the summary in the database
5. Logging in critical positions is integrated
6. Exceptions and API failures are handled properly

Sprint 5: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 5)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error
  - docker compose up starts all required containers including PaperlessServices
  - POST http://localhost:8080/ … some PDF-Document
    - will lead to the summary generated with GenAI
    - will lead to summary stored in the database

Sprint 6: ElasticSearch Integration, additional Use-Case

1. Elasticsearch integraded in worker-service and working
    - Show function with unit-tests.
2. Implement the indexing-worker to
    - Store the text-content (the former OCR-result) in Elasticsearch
    - Show functionallity with unit-tests
3. Implement the use-case „search for documents“ in your project.
4. Implement your additional use-case in your project (this must contain additional entities)

Sprint 6: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 6)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error
  - docker compose up starts all required containers
  - HelloWorld.pdf will be uploaded via Paperless Frontend http://localhost/
  - Search function executed in http://localhost/ for term „Hello“ will result in showing up the HelloWorld.pdf document

Sprint 7: Integration-Test, Batch-Processing, Finalization

1. Show the functionality of use case „document upload“ with an integration-test
2. Create an additional application for running the scheduled service that reads daily XML files from an input folder to process access
   logs from external systems via a batch process.
   - Consider how such a process is best integrated into the existing architecture.
   - Define an appropriate XML format for the access statistics.
   - Extend the PostgreSQL database so that the daily access count is stored per document.
   - Implement the batch service to be scheduled (e.g. daily at 01:00 AM) to retrieve and process the XML files. Ensure the input folder and filename patterns are configurable.
   - Provide a sample XML file to demonstrate the functionality.
   - Ensure that processed XML files are appropriately archived or removed to prevent redundant processing.
3. Project finalization
4. Prepare for the final code-review

Sprint 7: Assignment

- Date of submission: `dd.mm.yyyy`
  (see Moodle Course: „Submission – Sprint 7)
- Submission contents:
  - ZIP-Archive with the full project
- MUST-HAVE Check Criteria:
  - No build error
  - docker compose up starts all required containers
  - Provided integration-test (write an HOWTO in README.md) will be executed and should run successfully to the end.
  - The batch process must successfully read the sample XML file, process the data, and persist it in the database as demonstrated by relevant database queries.

Semester Project Grading

Grading

- 35% Continous Sprint Submissions (code quality + completeness)
  - Incremental Points per Sprint
    - E.g. Sprint 3 = Sprint 1 Today, Sprint 2 Today, Sprint 3 Today
    - Continued option to improve
  - Hand-ins are graded and teams are asked for presentations
- 65% Code Reviews (code quality + knowledge + completeness)
  - 30% Mid-Review
  - 70% End-Review
- All parts have to be positive

Code Review

Code review is systematic examination … of computer source code. It is intended to find and fix mistakes overlooked in the initial development phase, improving both the overall quality of software and the developers' skills.

Code Review Criterias

- Unit Tests, Code Coverage (> 70%)
- REST Service
- Queuing
- Business Layer & Logic
- Data Access Layer
- Entities & Entity Mapping
- Validation
- Exception Handling
- Logging
- Dependency Injection
- Service Agents
- Implementation of Use Cases