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| VILNIUS UNIVERSITY  FACULTY OF MATHEMATICS AND INFORMATICS  DEPARTMENT OF COMPUTER SCIENCE  Project name “DocHR”  Architecture Description  By: Ilja Jurcenko (parašas)  Vilnius 2021 |

**Version History**

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| Version | Date | Author | Comments |
| 1 | 2021-11-16 | Ilja Jurcenko | Initial version, context viewpoint |

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1. Part
2. Introduction and Management Summary
   1. Objectives of AD

The main purpose of this document is to align with stakeholders’ requirements to the system, ensure that all discussed demands are fulfilled in the form of architectural description. Provide correctness and completeness to the overall target of the system.

* 1. Goals of system
* The system must automatically verify COVID-19 passes of employees.
* The system must provide a digital profile for each employee containing personal information.
* The system must automate storage, review and validation for the pdf documents.
* The system must block or allow employees identification cards to facilities based on status.
  1. Scope
* Ability for the HR to review the submitted employee’s case.
* Provide an ability for the employee to upload document for review.
* To notify the employee by the email the status change of his documents.
* For COVID-19 pass document provide separate automated verification.
* Provide automated response to the internal systems regarding the status.

Scope Exclusions:

* The system is designed to be used only in companies’ scope.
* The automatic verification for COVID passes services a higher priority.
* It is confirmed that scope of the system will increase in the future, supporting more functionality for future business needs.
  1. Requirements

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| Functional | |
| Reference | Requirement Description |
| R1 | An employee uploads document to the system |
| R2 | An employee previews the uploaded document |
| R3 | An employee submits document requests for review for the HR |
| R4 | An employee has a separate field to upload COVID-19 passport |
| R5 | An employee gets notified when the document is declined or approved |
| R6 | HR manager sees assigned employees for review (cases). |
| R7 | HR manager opens employee’s documents for review. |
| R8 | HR manager accepts or approves the request (case). |
| R9 | System verifies COVID-19 passport |
| R10 | System notifies latest status to internal security service |

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| Nonfunctional | |
| Reference | Requirement Description |
| NR1 | System is stable and accessible. (Uses cloud-based solutions) |
| NR2 | System uses encryption for private information |
| NR3 | System must be responsive, file uploads within 5-10 sec time period |

* 1. Scenarios

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| Overview | Employee file upload success |
| System State | Normal |
| System Environment | Employee Profile Page |
| External Stimulus | User drags and drops file to the Documents to review area |
| Required System Response | After the file validation success, file uploads to the system and user sees a green snack bar stating. “File upload successful, waiting for HR approval” |

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| --- | --- |
| Overview | Employee file upload failure |
| System State | Normal |
| System Environment | Employee Profile Page |
| External Stimulus | User drags and drops file to the Documents to review area |
| Required System Response | After the file validation check fails, file is not uploaded to the system and user sees a red snack bar stating. “File upload failed, something wrong with a file” |

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| Overview | Employee COVID-19 check success |
| System State | Normal |
| System Environment | Employee Profile Page |
| External Stimulus | User drags and drops file to the COVID-19 pass review area |
| Required System Response | After the initial file check passes, it is uploaded to the system and the system validates the QR code specified in uploaded file successfully. A green snack bar appears, “Your certificate is valid, you can access companies’ facilities.” |

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| Overview | Employee COVID-19 check failure |
| System State | Normal |
| System Environment | Employee Profile Page |
| External Stimulus | User drags and drops file to the COVID-19 pass review area |
| Required System Response | After the initial file check passes, it is uploaded to the system and the system validates the QR code specified in uploaded file unsuccessfully. A red snack bar appears, “Your certificate is not valid.” |

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| Overview | HR case selection |
| System State | Normal |
| System Environment | HR Profile Page |
| External Stimulus | HR navigates to list of assigned employees (located in a left tile) and presses on the employee ID. |
| Required System Response | A selected employee’s profile is loaded in a second tile located on the right. |

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| Overview | HR case document review |
| System State | Normal |
| System Environment | HR Profile Page |
| External Stimulus | HR navigates inside the second tile, scrolling through the uploaded document icons and presses on the icon |
| Required System Response | A selected employees document is opened inside the browser |

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| Overview | HR case document approval |
| System State | Normal |
| System Environment | HR Profile Page |
| External Stimulus | HR presses Approve button next to the document |
| Required System Response | A selected employees document is approved, and notification is sent to the mail. |

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| Overview | HR case document decline |
| System State | Normal |
| System Environment | HR Profile Page |
| External Stimulus | HR presses Decline button next to the document |
| Required System Response | A selected employees document is declined, and notification is sent to his mailbox. A snack bar appears. “An employee has been notified” |

* 1. High level overview

The high-level overview is based on specified requirements and scope of the problem. Regarding the information specified the suggested solution is to *create a separate web service* which communicates with internal and external services accordingly. In addition, file storage and database for employee’s information should be considered (see context view).

* 1. Benefits, Risk and Mitigation Strategies

The primary risk is the dependency on verification of COVID-19 passes, which is outside of company’s scope as well as acquiring the wrong status for the document. In addition, there is always a human factor, when incorrectly assessing the document.

Benefits of such solution is the development time and scalability towards new requirements from the stakeholders.

Mitigation strategies are to provide two factor validation strategy or in the future provide automated verification using ML solutions for parsing dates in licenses, but it is outside of scope.

* 1. Key decisions

Key decision is to use a three-tier architecture for corresponding services. The reason that shaped the architecture is the support for verification for COVID-19 passes as well as support for users with different roles, finally the *document automated and manual verification.*

* 1. Outstanding issues

There could be lack of documentation on external COVID-19 service. Gather documentation regarding the external service for the COVID-19 passes.

1. Stakeholders

* CEO
* HR manager
* HR project owners
* Developer
* Tester
* Employees
* Administrators
  1. Stakeholder groups
* ***Acquires***

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| Role | CEO |
| Interest | Provide financial support for the system |
| Concerns | * System time for development * System development cost * System administration cost |
| Needs | * Automate COVID-19 employees check * Gather private information inside automated system * Digital Storage and history |

* ***Developers***

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| Role | Programmer |
| Interest | Development of the system |
| Concerns | * Bad/No documentation * Time in development can increase the complexity of the project |
| Needs | * Documentation * Automated CI & CD pipeline * Development tools |

* ***Communicators***

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| Role | HR Project Owner |
| Interest | Explaining the usage to stakeholders. Bridging communication between developers and users. |
| Concerns | * System may not completely cover stakeholders needs |
| Needs | - |

* ***Testers***

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| Role | Quality control |
| Interest | Control of overall quality, stability and correct functionality of the system |
| Concerns | * Inability to assess quality control due to complexity or absence of test environment * Developers |
| Needs | * Test environment * Documentation (for better understanding the flow of the system) * Ability to create incidents to developers |

* ***Users***

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| Role | Employee |
| Interest | Employee uses one centralized company’s system for on-boarding, document renewal processes. |
| Concerns | An employee’s not receiving latest status change. |
| Needs | * An employee needs an ability to upload document to the system * An employee needs an ability to preview the uploaded document * An employee needs to submit documents for review for the HR * An employee needs a separate field to upload COVID-19 passport * An employee needs to be notified when the document is declined or approved |

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| Role | HR Manager |
| Interest | HR Manager is interested to review employee’s digital documents. |
| Concerns | HR manager missing contact information of the employee. |
| Needs | * HR manager needs an ability to see assigned employees for review. * HR manager needs an ability to open employee’s documents for review. * HR manager needs to view the corresponding employee’s document request for denial or approval. * HR manager needs an ability to accept or approve the request. |

* ***System administrators***

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| Role | System administrator |
| Interest | Launch and maintain the system |
| Concerns | Complexity of maintenance, support and launch. |
| Needs | Automated CI & CD pipeline |

1. Part
2. General architectural principles

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| Principle | SOLID principles |
| Rationale | To develop a readable, maintainable and scalable system with sufficient delivery pace. |
| Implications | The development time should not drastically increase the complexity of maintenance and development lowering overall cost of the project. |

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| Principle | Domain Driven |
| Rationale | To protect domain specific logic from incorrect usage, and external services |
| Implications | Separation of concerns, less complexity and ability to scale the domain logic. |

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| Principle | Testing (Inversion of Control) |
| Rationale | To lower the number of inconsistences between the services by providing integration/unit tests and mocking the internal and external services. The passing tests should help to reveal problems on our end. |
| Implications | Easier support. Faster bug trace. Code logic protection from incorrect features. As a result, faster development time. |

1. Architectural design decision

The architectural design will be specified and described in future viewpoints. Main architectural design is to separate the dependencies inside separate services and use three-tier architecture for implementation.

1. Architectural views
   1. Context View

Diagram

Description automatically generatedIn order to describe the context, view the external dependencies for the system should be defined.

*Employees-Accounts-System* – an external dependency located in company’s scope, *which provides private information* (name, surname, email, contact information, employee id and roles) and provides customer authentication and authorization.

*Company-Security-System* – an external dependency located in company’s scope, which provides control access to company’s facilities by employee id.

*OutlookMail* – a mail server used to notify status change for employee

*GpEsveikata*.lt – an external service outside of company’s domain, which services for verification of the COVID-19 document pass.

* 1. Functional View

Diagram

Description automatically generated

* + 1. Functional Elements

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| **Element Name** | HR-DOC-Service |
| **Responsibilities** | Manage employee case creation for HR, validation of documents, notification |
| **Interfaces – Inbound** | * Employee-Service * HR-Manager-Service |
| **Interfaces – Outbound** | * Pass-Proxy-Service * Company-Security-Service * Outlook Mail Service |

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| **Element Name** | Employee-Service |
| **Responsibilities** | A service that enables employee to view personal data, upload document, and see verification status |
| **Interfaces – Inbound** | * Employee-Web-Interface |
| **Interfaces – Outbound** | * HR-DOC-Service * Employees-Accounts-System |

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| **Element Name** | HR-Manager-Service |
| **Responsibilities** | A service that enables to view employee’s cases for HR manager, view/validate documents |
| **Interfaces – Inbound** | * HR-Manager-Web-Interface |
| **Interfaces – Outbound** | * HR-DOC-Service * Employees-Accounts-System |

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| **Element Name** | Employees-Accounts-System |
| **Responsibilities** | Used for authentication and authorization of company users. |
| **Interfaces – Inbound** | * HR-Manager-Service * Employee-Service |
| **Interfaces – Outbound** | - |

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| **Element Name** | Company-Security-Service |
| **Responsibilities** | Used to provide or restrict access to company’s facilities. |
| **Interfaces – Inbound** | * HR-DOC-Service |
| **Interfaces – Outbound** | - |

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| **Element Name** | Outlook-Mail-Service |
| **Responsibilities** | Company’s email service |
| **Interfaces – Inbound** | * HR-DOC-Service |
| **Interfaces – Outbound** | - |

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| **Element Name** | Pass-Proxy-Service |
| **Responsibilities** | Used to wrap around the interface provided by the *gp.sveikata.lt* service |
| **Interfaces – Inbound** | * HR-DOC-Service |
| **Interfaces – Outbound** | * gp.sveikata.lt |

* 1. Information View
     1. Data Structure

Diagram

Description automatically generated

* + 1. Data Flow

Diagram

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Diagram

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* + 1. Data ownership

|  |  |  |
| --- | --- | --- |
| System | Cases | Files |
| Employee-Service | creator | creator |
| HR-Manager-Service | updater | updater |
| HR-DOC-Service | owner | owner |

* + 1. Information Lifecycles

Case lifecycle

Diagram

Description automatically generated

File lifecycleDiagram

Description automatically generated

* 1. Development view

Graphical user interface

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* + 1. Common Design
* Common design is to use three-tier architecture for services.
* Presentation layer will consist of separate *Angular* projects that will show information provided from corresponding backend services.
* In application layer services will use *.NET CORE* for manipulation and retrieval from data layer
* Persistence layer will be wrapped using *.NET Entity framework* in order to simplify data management.
* *Azure file storage* will be used for storing actual pdf files of the user.
* All projects must contain Unit tests for testing general modules. The external dependencies must be wrapped using mocking framework *WireMock.*
* Logging must be done using .NET tracing middleware and stored in inside *DataDog* server.
  + 1. Code standards.
* SOLID ( <https://en.wikipedia.org/wiki/SOLID>)
* KISS (Keep it short and simple)
* DRY (Don’t repeat yourself)
* YAGNI (You aint gonna need it)
* Arrange/Act/Assert (<https://wiki.c2.com/?ArrangeActAssert>)
* GoF Design Patterns ( <https://refactoring.guru/> )
  + 1. Coding organization
* All backend projects must protect the Domain layer. In other words, providing a folder structure API/Application/Domain/Infrastructure/Persistence. Each folder is a separate .net class library. Each is protected by the interface.
* Persistence layer uses a Repository pattern for data access of entities.
* Extension methods must be used to support data flow from persistence to application layer.
* Unit ant Integration tests pass status must indicate that the project functionality is valid.
* Source code is stored inside Azure Repos.
* Source code is submitted by pull requests. Every pull request creates its own verification build with unit test pass.
* Every pull request must contain its description and link to JIRA tasks.
* Deployment is supported by the Azure DevOps provided services.
* When running builds, each build is deployed into release pipeline which automatically deploy to DEV, TEST, STAGE. As well as manual toggle release towards PROD.