

# TB141 – ICT System Engineering and Rapid Prototyping

## Formative Assignment 4 - Software and Hardware Architectures

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### Learning Objectives

- Recall the most common hardware architectures
- Identify the proposed hardware architecture from a specific example case
- Recall the most common software architectures
- Identify the proposed software architecture from a specific example case

### Introduction

IT-Formativo, a company specialized in software development, has recently accepted new development projects. However, as all their consultants are overwhelmed with work, they requested some assistance from TUDelft, in order to identify required software and hardware architectures for the problem at hand.

### Project Due

The project is developed in collaboration with a small non-profit association collecting second-hand clothes. The association would like to develop a small application to keep track of the inventory of clothes that have been gifted to them and to have an easy way to visualize its stocks as well as to track the shipping of the clothes to the warehouse. The members of the non-profit are non-tech savvy volunteers, which have provided some specifications for the application during an introductory meeting. Ideally, they would like to have access as soon as possible to the application, but they will be willing to tolerate some delays in the development.

### Architecture

The proposed ICT system will be composed of three elements: an mobile/desktop program, a local server and a database stored on Microsoft Azure.

#### Mobile/desktop program

The program is a responsive web-based inventory management and shipping tracking application. The application is built using a three components architecture to ensure efficient code organization and separation of concerns.

Component A of the application is responsible for managing the data and logic behind the inventory management and shipping tracking functionalities. It handles tasks such as updating inventory levels, tracking shipments, and generating reports.

Component B is responsible for the visual representation of the data and functionality provided by Component A. It includes user interfaces such as forms, tables, and graphs, that allow non-tech savvy volunteers to easily interact with the application.

Component C acts as an intermediary between the Component A and Component B. It handles user input, updates the Component A accordingly, and then refreshes Component B to display the updated data.

To ensure accessibility, the application is designed to be responsive and can adapt to different screen sizes and devices. This means that volunteers can access the application from their desktop computers, laptops, tablets, or smartphones.

The development team will prioritize user experience and design, to ensure the application is intuitive and easy to use for non-tech savvy volunteers. Additionally, the team will perform rigorous testing to ensure the application is reliable and stable before making it available to the non-profit association.

The application is designed to have a responsive user interface that can adapt to both the size of a mobile device (e.g. a smartphone or a tablet) as well as a desktop application. While the frontend might vary, the backend of the application (i.e. the application's main logic and locally stored data) is identical for both the mobile and the desktop version.

### **Local server**

The local server employed by the non-profit association uses a software architecture that enables the server to receive data from multiple sources and apply a series of filtering operations on the data before returning the output to the requester.

The local server is utilized to store and manage all the details about the clothing inventory handled by the association. This includes various attributes of the clothing such as color, size, and the date of donation.

Moreover, the mobile/desktop application utilized by the volunteers to interact with the inventory system can connect with the local server and execute specific filtering operations. The filters allow the volunteers to search for clothes of a particular size or color, or view the oldest clothes in stock.

The filtering process in the local server is carried out through a series of operations, with each operation responsible for a specific task. The filters execute the tasks sequentially, with each filter processing the data and sending the results to the subsequent filter in the pipeline.

Overall, the design of the local server is scalable and flexible, enabling the non-profit association to add new filters and functionalities to the system as needed, without interfering with the existing parts of the application.

### **Cloud storage**

To ensure that the non-profit association's inventory data is secure and available at all times, the local server is connected to a cloud storage solution on Microsoft Azure.

This cloud storage solution utilizes a distributed architecture, where the data is replicated across multiple servers in different geographical locations. This ensures that the inventory data is available even in case of any disruptions in one of the servers or regions.

The cloud storage solution is designed to handle large volumes of data, and provides fast and reliable access to the inventory data. It also provides the non-profit association with flexibility in terms of the amount of storage needed, allowing them to increase or decrease storage capacity as needed.

The cloud storage solution is designed to provide high levels of security for the inventory data. This includes features such as encryption of data at rest and during transfer, access control, and monitoring of access to the data. These security measures ensure that the data is protected against unauthorized access, and is compliant with relevant data protection regulations.



Regular backups of the inventory data on the local server are performed automatically to the cloud storage solution. This ensures that in case of any data loss or corruption on the local server, the data can be restored quickly and easily from the cloud backup.

In addition to providing backup and redundancy capabilities, the cloud storage solution on Microsoft Azure also enables the non-profit association to take advantage of other cloud-based services. These include data analytics, machine learning, and artificial intelligence services that can help improve the efficiency and effectiveness of the inventory management system.

Overall, the integration of the local server with the cloud storage solution on Microsoft Azure provides the non-profit association with a robust, secure, and scalable solution for their inventory management system.

## Assignment

We ask you to analyze both the software and hardware architecture for the problem at hand.

You will be providing your analysis in a form of a short report (maximum 3 pages) composed of the following sections. For your convenience, for every section, we identified some questions/tasks that might help you structuring the report.

You are allowed to use material from the course slides, but we expect you to make the exercise of reformulating the existing content using your own words.

- **Identification of the distributed hardware architecture**

- What distributed hardware architecture is employed here?
- What are the concepts that allowed you to identify the distributed hardware architecture?

- **Discussion of alternative distributed hardware architectures**

- What other distributed hardware architectures do you know?
- Present them using a table summarizing the (distributed hardware) architectures presented during the lectures. The table should contain 2 columns:
  - \* Name
  - \* Description

- **Identification of the software architecture**

- What software architecture is employed here for the mobile application?
- What are the concepts that allowed you to identify the software architecture?

- **Discussion of alternative software architectures**

- What other software architectures do you know?
- Present them using a table summarizing the (software) architectures presented during the lectures. The table should contain 4 columns:
  - \* Name
  - \* Description
  - \* Advantages
  - \* Disadvantages

## Rules for the assignment delivery

*To be read carefully !*

1. The assignment must be developed in groups of 2 students.
2. The assignment must include **your name** and **student id**.
3. The assignment must be submitted in **Brightspace** as a **PDF report**.
4. You have to respect the following conditions:
  - Upload of a file TB141IC\_FA4\_FamilyName1\_StudentID1\_FamilyName2\_StudentID2.pdf on the course Brightspace.
  - Date: **Friday 24 March 2023**
  - Time: **Before 23:59**

After this deadline the assignment will be considered as late and **will not be corrected**.
5. **Knock-off criteria:**
  - Missing names and id on the document/document name.
  - Document exceeding the number of requested pages (3).
  - Wrong submission format

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