Medical Imaging SaaS Platform

LEI Project Class – 2023/2024

Mentors

- Carlos Costa (carlos.costa@ua.pt)
- Luís Bastião Silva (bastiao@ua.pt)

Team

4-5 Students

Introduction

In the last decade, cloud computing providers have created huge opportunities for several industries, allowing them to reduce the burden of maintenance and purchasing hardware and software licenses for core backbones. The healthcare industry is not an exception and slowly benefited from the Cloud. For instance, the production of medical digital imaging has increased and generates a heavy burden of data daily. Digital medical imaging has brought many benefits, but it also presents new challenges for storing and sharing data and dealing with IT infrastructure is not a mission for the healthcare industry, mainly the small and medium imaging centers. More recently, Google Cloud and AWS have created transparent services to store them using the current standards.

With cloud computing technology, it is possible to build Software-as-a-Service applications that allow the creation of IT facilities without investing in infrastructure, training personnel, or licensing software. It is also an economical solution following on-demand pay-per-use scalability and does not require maintenance over time or initial investments. The driving idea of this project will be the outsourcing of VNA-PACS (Vendor Neutral Archive – Medical Imaging Repository) components to a SaaS, using a defined concept of "PACS-as-a-service" paradigm, allowing small clinics to create their medical imaging repository without the need to have a large number of storage servers.

To support the idea, open-source software will be used, such as Dicoogle [1] (www.dicoogle.com) and VolView (https://kitware.github.io/VolView). Dicoogle is an open-source Medical Imaging VNA/PACS largely used by industry, academia, and research labs. In the industry, numerous projects are using it in distinct use cases. For instance, the biggest installation receives more than 1 million object images daily. It also has a set of resources aggregated as a Learning Pack (https://bioinformatics-ua.github.io/dicoogle-learning-pack/).

[1] Lebre R, Pinho E, Jesus R, Bastião L, Costa C., "Dicoogle Open Source: The Establishment of a New Paradigm in Medical Imaging". J Med Syst. 2022. https://link.springer.com/article/10.1007/s10916-022-01867-3

Objectives

The main objective of this project is to develop a Medical Imaging SaaS (Software as a Service) platform to allow end-users (e.g., radiologists) to use the system as a common utility. However, since cloud infrastructures (servers, disk, network, etc.) have costs, it is necessary to develop an e-commerce broker that could moderate the usage of the service and apply costs to users according to users' profiles (e.g., free, basic, premium).

The information system must include logic to handle the following functional requirements:

- Account Management (registration, users, actions, and service profile)
- Manage archive size per account according to the eviction policy (e.g. using Dicoogle Service API)
- Payment/Billing Management (integration of an open service broker)
- Integration of a Web and Open-Source viewer like, for instance, VolView (https://kitware.github.io/VolView)
- Imaging Source Connectors (Webform Upload | Modality Gateway)
- Audit-trail Module

Tasks:

1. Contextualization with working scenario
2. Research related works
3. Requirements definition (in detail)
4. Planning
5. Development
6. Tests and Evaluation
7. Report writing (Congress Article - optional)