# FAIR Software as a Service: Combining tools to implement FAIR for clinical data platforms

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**Abstract**

Many DCCs have operational expertise in deploying software services, but lack expertise in deploying and exploiting FAIR services that use Semantic Web technology for machine actionability. Although local deployment is lightweight and non-invasive for institutional infrastructure, engineers are not yet familiar with the underlying web technologies of FAIR services. This poses a risk for delivering the FAIR foundation of a federated health data infrastructure that is ready for federated analytics, AI, and machine learning.
This project is making deployment by institutional DCCs of FAIR services cost-effective, scalable, and sustainable by delivering 'FAIR Software as a Service' (FAIR-SaaS).

**Keywords 1**

FAIR, implementation, architecture, FAIR Data Point, SaaS

## 1. Introduction

Semantic Web (SW) technology is a common implementation choice for software services that help meet the machine actionability requirement of the FAIR principles. An example is the DCAT-based FAIR Data Point (FDP) [1]. Although local deployment is lightweight for SW experts and non-invasive for institutional infrastructure, adoption is hampered if engineers are not yet familiar with the underlying technologies of FAIR services. IT departments and Data Competency Centres (DCCs) usually have operational expertise in deploying software services as such, but lack expertise in using Semantic Web technology. This poses a risk for delivering the FAIR foundation of a federated health data infrastructure that is ready for federated analytics, AI, and machine learning.

We present our first results of a project that aims to make deployment of FAIR services by institutional DCCs cost-effective, scalable, and sustainable by delivering 'FAIR Software as a Service' (FAIR-SaaS). FAIR-SaaS is centrally hosted software that is preconfigured and updated by FAIR specialists for institutional DCCs. The project starts with (i) common FAIR Data Point (FDP)[2] configurations that DCCs can deploy to describe their resources for machines, (ii) grlc-inspired configurations facilitating DCCs to generate common APIs from FAIR metadata.



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[2] FAIR Data Point conform the FAIR Data Point specifications is a service that provides access to machine actionable metadata describing a resource, including pointers to data sets in one or more formats. The metadata is described in terms of the Data Catalogue Vocabulary (DCAT) and extensions thereof. See https://specs.fairdatapoint.org/

An early target is to simplify the processes for DCCs to contribute FDPs for data and compute capacity to the Dutch national health infrastructure, and comply with multiple existing and future common APIs. FAIR SaaS are straightforward to update for FAIR experts (e.g. grlc SaaS requires simple queries on FAIR metadata) who can guarantee convergence to international standards. The hypothesis is that FAIR SaaS provided by SURF, the Dutch national hosting organisation, which requires a minimal number of Semantic Web experts for maintenance, has a significant impact on the applicability, scalability, and sustainability of a health data infrastructure, demonstrating how a critical mass of FAIR (meta)data can be achieved for enhancing health care and life sciences.

## 2. From concept to development

A use-case has been defined with local health data project leaders from the LUMC, UMC Utrecht and Erasmus MC, to develop the overall architecture and concept of the service:

*As a cardiologist I would like to see information on physical fitness (weight, stamina, blood pressure, etc.) for patients planned for thorax surgery across two hospitals, such that I can screen patients based on their physical fitness for surgery and take decisions on timing of surgery and capacity planning. Patients that are not selected must undergo a fitness program.*

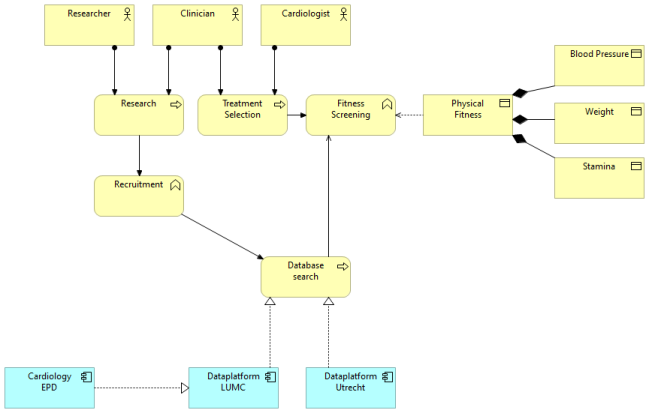


*Figure 1 FAIR-SaaS Business architecture, a conceptual overview of the need by the experts.*

The use-case was used to create the business architecture that has been defined in Figure 1, which resulted in the application architecture defined in Figure 2. From a FAIR mindset, we have defined that these services do not need to be created by us but should be re-used where available and adjusted if necessary.

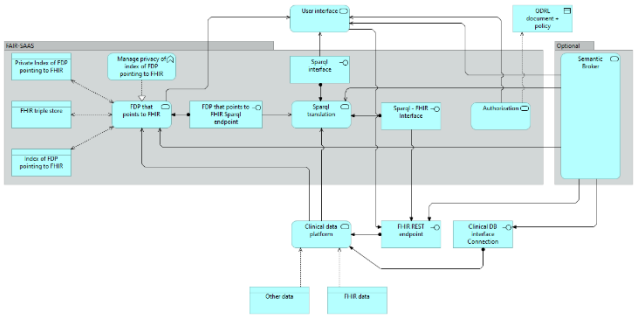


*Figure 2 FAIR-SaaS Application architecture, a conceptual overview of the software services that are needed to address the need of the experts.*

To lower the amount of knowledge about Semantic Web technology needed by IT personnel we concluded that the first services will be delivered in a docker container and that we need to set up a Virtual Machine (VM) image with these dockers pre-installed. The VM is optional if docker knowledge is present at the specific IT department. We are currently combining existing tools to develop these features.

## 3. Acknowledgements

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## 4. References

**[1]** Luiz Olavo Bonino da Silva Santos, Kees Burger, Rajaram Kaliyaperumal, Mark D. Wilkinson; FAIR Data Point: A FAIR-Oriented Approach for Metadata Publication. Data Intelligence 2023; 5 (1): 163–183. doi: https://doi.org/10.1162/dint_a_00160