openIMIS Shelf Readiness

Two-Sentence Overview

The goal of this project is to improve the open-source Insurance Management Information System (openIMIS[1]) interoperability layer for easier and more efficient integration with other health-related systems within OpenHIE (Open Health Information Exchange) architecture, and to allow an efficient installation procedure through enhanced packaging and documentation, and thus, to align the solution with the Instant OpenHIE project and initiative. As the project requires total re-architecting and re-development using new open source technologies and frameworks, the team composed by Swiss Tropical and Public Health Institute (Swiss TPH), the designer and developer of the legacy openIMIS version, implemented in five countries, Bluesquare, the designer and developer of the new modular openIMIS version, and SolDevelo, the developer of the openIMIS FHIR (Fast Healthcare Interoperability Resources) module with experience in integrating health systems, will join their expertise to respond to both Instant OpenHIE project requirements and openIMIS Initiative's expectations.

High-Level Budget Summary

	Work Package 1 openIMIS FHIR Module	**Work Package 2** Packaging and Installation	**Work Package 3** Quality Assurance	**Work Package 4** Documentation	**Total Cost (USD)**
Total Project Costs					

Executive Summary

This project aims to improve implementers, administrators and developers' working experience with openIMIS. Digital Square's investment will allow us to undertake the following activities:

- The **openIMIS FHIR module**, currently based on FHIR STU3 version, will be enhanced by integrating FHIR R4 version, allowing openIMIS to support new workflows and integrations, by adding missing FHIR resources which will allow external systems to synchronise metadata satisfying dependencies, by improving authentication and authorisation mechanisms, by proposing extensions based on OpenHIE interoperability workflows, and, finally, by improving FHIR module's documentation and quality.
- The **packaging and installation** mechanisms will be enhanced based on Instant OpenHIE project's requirements to allow a smooth installation procedure of both legacy and modular openIMIS versions.
- **Quality assurance** will be substantially improved allowing for integration and system testing mechanisms.
- The technical **documentation** will be revised and redeveloped, allowing implementers and developers to install and customize openIMIS based on their implementation needs.

[1] https://openimis.org/

Consortium Team

Swiss TPH (Prime Organisation)

Swiss TPH is a leading institute in global health with a particular focus on low and middle-income countries with a staff strength of over 850 from 80 different nations, currently active in 300 projects across 100 countries. Swiss TPH will be responsible for technical project management, the expertise on health financing, openIMIS, drafting of business and technical specifications, supporting the system and architecture design.

Swiss TPH's relevant experience includes involvement in the design and implementation of the Insurance Management Information System (which is the genesis of the openIMIS Initiative) since its inception in Tanzania. Since 2012, Swiss TPH has been and continues to implement two projects at scale for the deployment of insurance schemes through openIMIS, in Tanzania and Cameroon, and two openIMIS pilots in Chad and Democratic Republic of Congo. Additionally, Swiss TPH is actively involved in the development of openIMIS as part of the Implementers and Developers Committees of the openIMIS Initiative.

Qualifications of key members of the proposed project team:

- Dragos Dobre:
    - IT System Architect (PhD. in Automatics and Computer Science, MSc. in System Engineering) at Swiss TPH
    - Management of software life cycle (from specification to development and deployment)
    - Design, development, and maintenance of open-source applications
    - openIMIS design, development and implementation experience since 2018 in implementation sites of openIMIS - Tanzania, DRC, and Chad
    - Project Coordinator experience across international teams for GIZ openIMIS mandate
    - OMG-Certified Systems Modeling Professional™
- Patrick Delcroix:
    - Product manager (MBA and MSc. Electronics) at Swiss Tropical and Public Health Institute (Swiss TPH)
    - 6 years of experience managing ICT projects
    - 1.5 years of experience managing services
    - PMP and Prince2 Certified Project Manager
    - Other certifications: ITILv3, Six Sigma, Scrum master

SolDevelo

SolDevelo is a dynamic Polish IT company (+80 staff) focused on delivering high-quality software and innovative solutions. SolDevelo is currently involved in several openIMIS projects, including the 'maintenance and support project', openIMIS FHIR module development, openIMIS integration with OpenMRS and enhancing the security of the legacy system. SolDevelo has been involved in many opportunities that required skill sets relevant to this particular project, for example OpenMRS (core contributors), Health Level Seven International (HL7) FHIR (OpenMRS Sync 2.0 module), nationwide micro-service based implementations (OpenLMIS), nationwide OpenHIE architecture based implementations (National Health Infrastructure project with such components like OpenELIS, DHIS2, OpenMRS and many other HIE compatible applications, health standards-based workflows for the Client Registry, Facility Registry, Health Management Information System, Shared Health Record, and Interoperability Layer).

Qualifications of key members of the proposed project team:

- Kamil Madej
    - Senior-level Java Developer/Team Leader (BSc. Engineering) at SolDevelo
    - Working in international teams for various projects/clients, like:
        - openIMIS

        - OpenMRS
        - MOTECH
        - Terre des hommes
        - Connect for Life
    - Performing code review
    - Creating high-level designs using tools for wireframing
    - Leading several frontend and backend development teams

Bluesquare

Bluesquare with their headquarters in Belgium (+40 staff), specializes in data systems and technologies in the health sector. They have gathered a unique blend of expertise in the fields of information technology, software development, data science and modelling, and public health. They work in over 30 countries developing tools and data systems for program M&E, health financing and logistics. Their central focus is to support health program teams to develop and adopt innovative solutions that support improved performance of the health systems they serve.

Bluesquare has supported the openIMIS community since late 2018 as the partner managing the "Modular Transformation of Source Code". They bring to this project their rich experience in digital health financing tools in support of Result Based Financing (RBF) - they manage the data systems for several of the largest RBF programs in sub-saharan Africa - including the DRC and Nigeria and a senior team of software developers.

Qualifications of key members of the proposed project team:

- Xavier Gillmann
    - full stack software developer with over 20 years experience in project management and software development.
    - deep knowledge of open source languages and frameworks.
    - worked for over 10 years in the health insurance sector in Europe.
    - a Master's Degree in Information Technology
    - experience in data warehousing, mobile data collection, computation and visualization.
    - At Bluesquare, Xavier currently shares his time between openIMIS and D2d, a data and meta-data synchronization tool for DHIS2 platforms.
- Eric Darchis
    - full stack software developer with over 20 years experience in very diverse domains ranging from real-time data dispatching to mobile data collection.
    - Bachelor in Computer Science
    - extensive experience in numerous open source technologies.
    - At Bluesquare, Eric currently shares his time between openIMIS and Trypelim, a mobile data collection and micro planning tool for the elimination of the sleeping sickness disease in DRC.

Xavier and Eric were deeply involved in the first phase of openIMIS modular transformation: the conception and setup of the new architecture and the rewriting of the claims and locations modules.

Background and Problem Statement

Developed from 2012, openIMIS was built by Swiss TPH as a monolithic system using Microsoft technologies (the legacy openIMIS version). Overtime, additional features were added, making it difficult to maintain and customize. Since 2018, the solution has been redesigned and redeveloped by Bluesquare using open source technologies (Python/Django and Javascript/ReactJS) to compose a modular architecture of the solution (the modular openIMIS version). Because the migration from the legacy to the modular version is a long process, openIMIS Initiative, the group behind openIMIS, has

decided to migrate the solution module-by-module, requiring to install and use both versions simultaneously, making the installation cumbersome.

Nevertheless, the new modular architecture has permitted SolDevelo to develop the FHIR module, allowing the integration of three open source health systems (OpenMRS, Bahmni and DHIS2), a first step for shelf readiness and integration into the OpenHIE architecture. The development of the FHIR module focused on the claim submission process that limits the coverage of other health financing related workflows such as enrolment.

Further, openIMIS offers a reliable User Documentation Manual but it is limited in technical documentation. Unit tests are part of the modular openIMIS developments and this, as part of quality assurance, is highly recommended to be enhanced with integration and systems testing.

Digital Health Technologies

The aim of this project is to improve the interoperability layer, packaging, technical quality and documentation of the open-source Insurance Management Information System (openIMIS) digital tool.

openIMIS is a comprehensive system for managing a health insurance scheme (enrollment, renewal, claims management, feedback, reporting). It is redeveloped from Microsoft technologies to a new modular architecture developed in Python with the Django framework for the backend and Javascript with the React framework for the frontend. Under this new architecture, the FHIR module has been developed and integrated with other systems: OpenMRS, Bahmni and DHIS2.

Fast Healthcare Interoperability Resources (FHIR) is a draft standard describing data formats and elements (known as "resources") and an application programming interface (API) for exchanging electronic health records. The standard was created by the Health Level Seven International (HL7) health-care standards organization. We will use this standard for the API communication protocol and as the internal data structure, thus developing an interoperable solution ready to be integrated into standardized health architectures (e.g. OpenHIE).

The quality assurance is currently checked by static code analysis with Code Climate and LGTM, and unit tests. Packaging of openIMIS is realized using Docker. Documentation is managed through Atlassian Confluence platform (wiki pages for the installation of openIMIS) and ReadTheDocs (for user documentation).

Use Cases and User Stories

This project is aiming to improve the adherence and reduce the learning curve of developers, integrators and implementers of openIMIS. The following use cases are covered by the work packages proposed in this project:

- openIMIS can be integrated and exchange Claim and Patient data (and associated configuration data) with external systems
- openIMIS can easily be installed
- New developments can test their integration with existing openIMIS features
- New developers, implementers and system administrators can easily develop, extend and integrate new modules, activate/deactivate modules, and administer the openIMIS modules.

Objectives and Activities

The technical activities will be grouped into four work packages (WP).

WP1. openIMIS FHIR Module

Objective 1.1: FHIR R4 integration

Activity 1.1.1: FHIR R4 module development

Integration of the FHIR R4 version with additional resources required by openIMIS (e.g. InsurancePlan). This activity will allow us to finalize and validate current FHIR R4 developments. Moreover, it will allow the identification and development of missing or limited openIMIS registries (e.g. medical products data, diagnosis data) into the FHIR module, required by external systems for metadata synchronization.

Objective 1.2: FHIR R4 extensions development

Activity 1.2.1: FHIR R4 extensions development

Previous and current openIMIS integration projects have already identified fields in the FHIR resources that are required for a complete and fully functional integration. FHIR extensions to cover openIMIS structure (e.g. family relations, patient-location link, claim attachments) will be proposed and developed.

Activity 1.2.1: openIMIS extensions development

During openIMIS FHIR module development, improvements to openIMIS data structure have been identified (e.g. claim state, medication form and amount). Such improvements will be proposed and implemented into openIMIS.

Objective 1.3: FHIR Authentication and Authorisation

Activity 1.3.1: FHIR module authentication and authorisation improvement

openIMIS authentication and authorisation is based on users and authorities (grouped in users roles). We want openIMIS FHIR module to use the same authentication and authorisation, thus reusing the openIMIS modules business rules and behaviour (don't repeat yourself principle). This activity will allow us to make the necessary links with the migrated openIMIS modules and prohibit the access to the database directly.

Objective 1.4: openIMIS FHIR Quality Assurance

Activity 1.4.1: FHIR module Quality Assurance

Tests will be developed and integrated in an API testing tool and applied on the openIMIS FHIR module's API.

Objective 1.5: openIMIS FHIR module documentation

Activity 1.5.1: FHIR module documentation improvement

Current openIMIS FHIR module documentation is covering the mapping between openIMIS and FHIR. This documentation will be improved by developing integration documentation and by defining the FHIR openIMIS profile.

WP2. Packaging and Installation

Objective 2.1: Docker package improvement

Activity 2.1.1: Docker package improvement

Docker packages for Legacy and Modular versions will be improved to simplify the containers, to integrate advanced health-check for all containers and to comply with Instant OpenHIE's packaging/deployment strategy.

Objective 2.2: Developer initialisation script

Activity 2.2.1: Developer initialisation script development

From our experience, initializing the development environment is a time consuming task. To solve this issue, scripts will be developed to allow the modular openIMIS version to be installed and easily integrated into Windows environments, but also to facilitate the initialization of a ready to start openIMIS development environment.

WP3. Quality Assurance

Objective 3.1: System testing

Activity 3.1.1: System testing

Currently, only Unit Tests are available for openIMIS modular version. During the release process, the most time consuming activity is the manual system testing to check for regression issues and to validate new functionality. This activity will develop automatic System Tests of openIMIS backend via API calls.

WP4. Documentation

Objective 4.1: Developer documentation

Activity 4.1.1: Backend documentation development

openIMIS backend is built with Python and Django framework. The backend developer documentation will cover new module development, extension of an existing module, event-based triggering, etc.

Activity 4.1.2: Frontend documentation development

openIMIS frontend is built with Javascript and ReactJS library. The frontend developer documentation will cover new module development, extension of an existing module, contribution to the main menu and to other modules, etc.

Objective 4.2: Implementer documentation

Activity 4.2.1: Implementer documentation development

The implementer documentation will cover the openIMIS modules presentations, links between modules, backend and frontend modules selection and installation, addition and removal of modules, etc.

Objective 4.3: Administrator documentation

Activity 4.3.1: Administrator documentation development

Each openIMIS module has a configuration that can be changed through the Django admin interface. The administrator documentation will define the different configuration items.

Community Feedback

We are very engaged within the openIMIS community and we participate in weekly and monthly calls. During these meetings, we get the feedback from other openIMIS developers and from developers from other open source solutions interested in openIMIS.

Moreover, we are participating in OpenHIE Health Financing community meetings where openIMIS is considered as a study case.

Schedule

The following is a high-level work plan.

Activity	Lead Team	Month							
		1	2	3	4	5	6	7	8
FHIR R4 module development	SolDevelo								
FHIR R4 extensions development	SolDevelo								
openIMIS extensions development	SolDevelo								
FHIR module authentication and authorisation improvement	SolDevelo								
FHIR module Quality Assurance	SolDevelo								
FHIR module documentation improvement	Swiss TPH								
Docker package improvement	Swiss TPH								

Developer initialisation script development	Swiss TPH								
System testing	Swiss TPH								
Backend documentation development	BlueSquare								
Frontend documentation development	BlueSquare								
Implementer documentation development	Swiss TPH								
Administrator documentation development	Swiss TPH								

Deliverables

Work Package	Deliverable	Schedule
1. FHIR module	FHIR R4 integration	March 2021
	FHIR new resources and extensions	April 2021
	Authentication and Authorisation	February 2021
	FHIR module documentation	May 2021
2. Packaging and installation	Docker package	February 2021
	Scripts	February 2021
3. Quality Assurance	Integration/System automatic testing	May 2021
4. Documentation	Developer documentation	February 2021
	Implementer documentation	March 2021
	Administrator documentation	June 2021

Global Good Maturity Model Assessment

Please review “Attachments” on the open application platform.