An open source calculation engine for DHIS2

Two-Sentence Overview

Hesabu allows health programs (M&E, PBF, LMIS and others) that use DHIS2 as a data management tool, to define and execute complex, chained computations (Excel-like) on their data and reload the results directly in DHIS2 to be used as any other data value.

While Bluesquare has been focusing on turning Hesabu into a powerful open source tool to provide easy to manage computations on top of DHIS2, with this investment we would like to improve its shelf-readiness through supporting the users in the set-up, improving modules and documentation.

High-Level Budget Summary

	Work Package 1 : Enhancing the tool usage	**Work Package 2: Improving documentation for a wider access**	**Total Cost (USD)**
Total Project Costs			

Executive Summary

Bluesquare has been developing Hesabu, an advanced computing engine working on top of DHIS2 since 2015, with the goal of replacing custom software by an open source solution connected to a widely used open source data platform. This allows it to continue to leverage the DHIS2 data entry and reporting capabilities, while getting the additional computing power that was needed by many Health Financing projects. Over time, Hesabu's applications have grown and to date it has been used in over 15 countries, including DRC, Cameroon, Burundi, Senegal, Haïti, Madagascar etc... for many different projects in different areas, from logistics to Monitoring and Evaluation.

The time is right to further improve its evolution as a shelf-ready, open source tool in support of the many programs where it is in use. We know that the need for its computation power is something of interest in the broader DHIS2 community, so the key benefit from a shelf readiness investment would be to make its installation and use by other parties much easier, and thus reinforce the tool's use and growth over time for more cases and program management.

To achieve this, Bluesquare, apart from Hesabu's development experience, will not only build on its experience in the health information system but also on the expertise it has acquired in the development of interoperable tools (D2d) and the support for the development of other open source tools (OpenImis).

Consortium Team

Bluesquare is a company specializing in data systems and technologies in the health sector since 2012. We have gathered a unique blend of expertise in the fields of information technology, software development, data science and modeling and public health with a team 40-strong working from Belgium, the DRC, Senegal, Burundi, Zimbabwe, Senegal and the USA. We work in over 30 countries developing tools and data systems for program M&E, health financing and logistics. Our 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 brings a rich experience in digital health financing tools in support of Result Based Financing - we manage the data systems for several of the largest RBF programs in sub saharan Africa - including the DRC and Nigeria and are invested in openIMIS - another open source tool focused on health insurance.

Qualifications of key members of the proposed project team

Stephan Mestach
Stephan Mestach is a civil engineer in computer science and software developer with over 15 years of experience in software development, including in the design and development of applications for healthcare, notarial institutions and banks. At Bluesquare, he has contributed to developing Hesabu and continues to work on its improvements. He has implemented several PBF programs including Cameroon, DRC, and Burundi etc. His technological expertise includes the following tools: Java, J2EE, Android, Sysadmin/ Linux, Puppet, Ruby, Ruby on Rails, CSS, Bootstrap, Javascript, jQuery, web development, code quality, design, performance optimization, continuous integration and system integration.

Martin Van Aken
Martin is the CTO of Bluesquare, with a Matser in computer Science. He is a software developer with over 15 years of experience in the private and public health sector, and insurance (among others). As a CTO, he leads the global architecture of the data platforms developed by Bluesquare. This includes data storage, mobile data collection, system integration, computation and visualization. He also conducts the development of in-house products such as Hesabu, and D2d, a tool that he is used for a better interoperability of information systems. He also advises and leads the implementation of field projects, in particular the analysis and improvement of IT solutions for the collection, aggregation, calculation, analysis, integration and visualization of health data.

Xavier Gillmann

Xavier is a full stack software developer with over 20 years experience in project management and software development. He has a deep knowledge of open source languages and frameworks. He has worked for over 10 years in the health insurance sector in Europe. Xavier has a Master's Degree in Information Technology and experience in data warehousing, mobile data collection, computation and visualization.

At Bluesquare, Xavier works on openIMIS and D2d, a data and meta-data synchronization tool for DHIS2 platforms.

Background or Problem Statement

A lot of DHIS2's users we are working with are looking for a comprehensive calculation engine to be able to use chained, advanced computation on top of the raw data collected - from PBF invoice computations to stockout provision to general service coverage.

Hesabu code is open source, using an MIT licence and hosted on GitHub https://github.com/blsq/orbf2 in use in over 15 countries. While we have invested heavily in the tool powerful computing capacity, we're convinced that the relative complexity of setup and lack of visibility is preventing it from providing its value to a much broader audience. Bluesquare is committed to improve this area, but this is the kind of software that would benefit from a shelf readiness investment program, by making its installation and use by other parties much easier. This would in turn benefit the Digital Square with the addition of a new open source software enhancing the capabilities of the whole environment.

Hesabu is now a mature computing engine having withstanded the test of multiple complex programs in many different contexts

Digital Health Technologies

Hesabu is at its core, a rule engine, able to apply dozens of formulas on a given set of data extracted from DHIS2. It infers the order needed based on their various inputs and outputs. By adding features to DHIS2 like loading data, applying formulas and pushing outputs back as "standard" data values so they can be exploited, it truly enriches the ability for Program Managers in their use of DHIS2. And gives more general users access to new data elements that can be used for subsequent analysis, calculations, or visualizations.
Hesabu can be used by data manager in every health programs from PBF to, M&E and Logistics.

Hesabu is an application coded mostly in Ruby, using the Ruby on Rails framework. Its core engine is written in Go for performance reasons. It stores the data (rules definitions & related info) in a Postgresql database. System requirements

- CPU: 4 cores is the recommended minimum number of cores
- Memory: 8GB RAM is the recommended minimum memory size

- OS: Linux, preferably Ubuntu 18.04 or Debian 10 (but other Linuxes will work as well)
- Postgres: Minimum version 10
- Redis

Architecture

Hesabu consists out of:

- Hesabu-web (A Rails application, ruby 2.5, rails 5.2)
- Hesabu manager (hosted inside DHIS)

These talk to these other services:

- Postgres
- Redis

Hesabu-web is a fairly classic Rails application which stores its data inside Postgres. It uses Sidekiq to run background workers so it can process data without blocking web requests. It will also talk to the DHIS so it can act as both a DHIS-cache and as a DHIS-writer.

Hesabu-web will also use the orbf-rules-engine ruby gem for the calculations. This gem in turn relies on go-hesabu, which is the calculation engine created in golang, and is available for Mac and Linux.

Use Cases and User Stories

While initially developed to tackle Performance-Based Result programs needs, Hesabu responds to various and broader cases for instance:

- Performance-Based Result/Strategic purchasing programs: Calculating accounts payable to a specific facility (health center, school or other services entities), taking into account the amount of service offered, a detailed quality measure, past performance or even comparisons with similar facilities.
- Logistics/supply chain: Predict stock-out risks based on health center activities and inventory movements, even when data are inconsistent over time, due to complex data collection environments.
- Mesure & Evaluation: Taking data availability into consideration when analyzing the trends of indicators, computing complex measurements (thresholds, multi-conditional indicators, scores, etc.), performing advanced data quality and consistency checks, as well as identifying outliers directly in DHIS2.

Objectives and Activities

There is a broad range of levels of independence in its roll-out by program. This project would aim to support its further development as an open source tool supporting public health programs.

We would request support for the following:

Work Package 1: Enhancing the tool usage & Align with OpenHIE architecture

Objectifs 1.1: Support potential users with installing the tool:

Activity 1.1.1 Minimize the time/complexity needed between someone finding Hesabu as their solution of choice and having it up & running and connected to their DHIS2. Supporting this would require:

- It would need to function under docker (webapp + database),
- Options for easy deploy on standard platforms (AWS or others) and
- To improve the system administrator documentation.
- Alignment with OpenHIE:
    - Faciltiing the deployment of a DHIS2/Hesabu combination using proper docker files
    - Align versioning scheme

Objectif 1.2 Set-up Wizard

Activity 1.1.2 Improve the "initial startup" application to help the users quickly set up an initial and functioning use case - ideally in a matter of minutes (for instance a Wizard or other support tool).

Work Package 2: Improving documentation for a wider access

Objectif 2.1 Documentation

Hesabu allows the user to manage powerful computation, but this comes with a significant level of complexity in the tool itself. We want to improve this situation for different kind of stakeholders:

- Administrators: Invest in significant improvements to the documentation for "power users" both in the repository but also in the application itself when possible. This is a request we have specifically received from some of the global users of the tool.
- Developers: Document better how Hesabu manage the computation to allow for easier contributions or proposals to the current engine

Community Feedback

Bluesquare want to engage with the community on the following topics:

- **Main roadblock to installation/setup of digital tools** - we know we can do better, but having feedback from people in similar positions would help a lot focus on the most important points.
- **Specifically with OpenHIE technical community,** see how proper docker compose can help to install the combined tools (for example Hesabu + DHIS2 here), including setting up the integrations in both tools as part as the install. We're also interested in discussing single instances vs multi tenants models in this architecture.
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Schedule

The following is a high-level work plan.

		[Month/Quarter					
		[M]	[M]	[M]	[M]	[M]	[M]
		1	2	3	4	5	6
Enhancing the tool usage & Align with OpenHIE architecture	Bluesquare, Belgium	x	x	x	X		
Improving documentation for a wider access	Bluesquare, Belgium					x	x

Deliverables

Work Package	**Objective**	**Deliverable**	**Schedule (Month/Quarter Due)**
1. Enhancing the tool usage	1.1 Support potential users with installing the tool	Docker installation & guide	M1
		OpenHIE compliance	M2
	1.2 Faster Setup	Initial setup screens	M3
		In app help for setup	M4
2. Improving documentation for a wider access	2.1 Documentation	Write admin doc	M5
		Write developer doc	M6

Global Good Maturity Model Assessment

Please find the Assessment tool for Hesabu here