

# Packaging OpenSRP for Scale and Community-driven National Adoption

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## Executive Summary

OpenSRP ( [Open Smart Register Platform](#) ) is an open-source mobile health platform to empower frontline health workers and simultaneously provide program managers and policy makers with current data for decision and policy-making. A committed community of technology, research and implementation partners has evolved the software to a point of early maturity characterized by multiple deployments, high performing technology at scale, and emerging documentation around specific use cases for RMNCAH, TB, HIV, Malaria and Early Childhood Development.

The platform has been under active development since 2014 and deployed in six countries at different levels of scale. Controlled trials and systematic assessments of OpenSRP have shown improvements in coverage and quality of care. OpenSRP is at a critical juncture where improved community governance and product management, along with technical enhancements focusing on interoperability and software architecture, are needed to catalyze scaled improvements to facilitate use in pending national level implementations and make it a global good. GGF would help OpenSRP overcome identified constraints associated with establishing a multi-vendor community and ensuring community-driven, national-scale deployments. On behalf of the consortium, Ona will serve as the lead of OpenSRP as a global good project.

## Open Smart Register Platform

Due to its functionally modular and technologically adaptable architecture, OpenSRP has been used to build localized applications for reproductive, maternal, neonatal, child, and adolescent health (RMNCAH), immunization, early childhood development, and tuberculosis (TB) treatment management. OpenSRP supports the tasks associated with the diversity of health cadres responsible for care provision across multiple program areas. Its unique cross-cadre data sharing feature and client identification facilitate coordination across multiple cadres to create teams of FHWs providing personalized precision care for each client. Functionally, it facilitates real-time feedback loops and enables data-driven decision making at all levels of the health system, from point-of-care to micro-planning and national-level planning; delivering immediate service delivery improvements as well as long-term, system-wide improvements. OpenSRP also interoperates with RapidPro to support demand-creation features through SMS messaging directly to clients, complementing FHWs' efforts on the supply-side. This combined supply-and-demand approach to stimulating timely care provision and seeking is based on an evidence base from testing OpenSRP in Bangladesh.

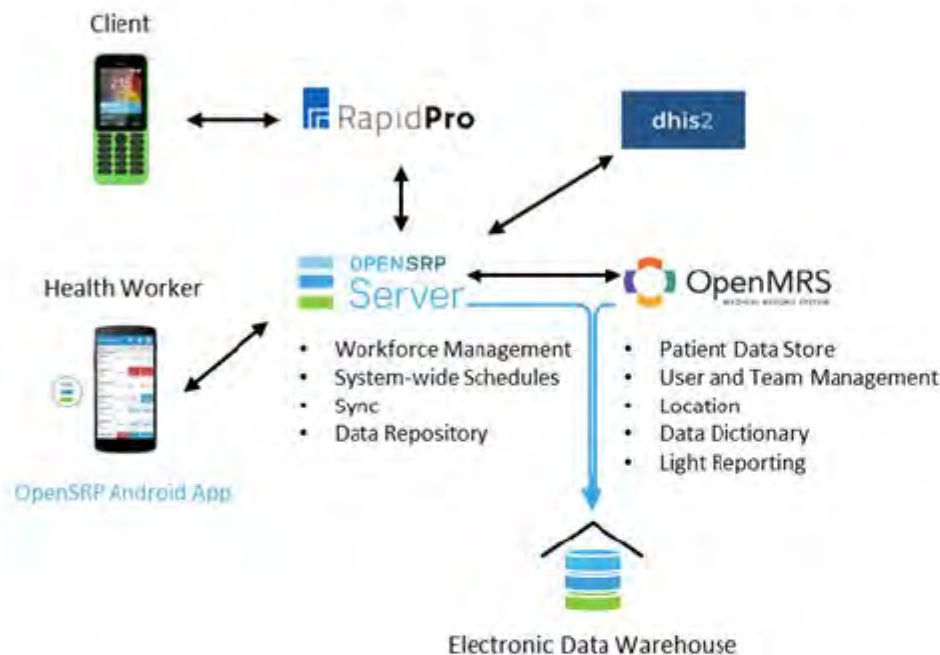
OpenSRP is being used in six countries (Bangladesh, Pakistan, Indonesia, Zambia, Kenya, and Tanzania) with new deployments planned for 2018-2019 (e.g., Uganda, Malawi and countries in West Africa). The MoH of Zambia has adopted OpenSRP as their national electronic immunization registry and the MoH in Tanzania has selected OpenSRP to be part a core component of their national eHealth system. In Indonesia, an OpenSRP deployment created coordinated groups of midwives, nutrition workers and vaccinators in 112 villages serving ~600,000 persons; and this led to significant increases in coverage of antenatal care and post-natal care by 24%, improved completeness of required services by 20%, and enhanced data quality by 21%, along with trends of improved birthweight and reductions in maternal anemia, and better vaccine coverage. Improvements in indicators of care coverage and quality with respect to RMNCAH services, vaccination and TB were also observed in Bangladesh, Pakistan, and Zambia. These findings and maturation of the OpenSRP community and product have fueled a rapid increase in demand from organizations and countries seeking OpenSRP deployments.

Development is currently supported by a dedicated group of technology partners, implementation partners, and research institutions, which grew out of a joint research effort supported by the World Health Organization and coordinated technologically by Ona under a non-binding software collaborative. Financial support from WHO, UBS Optimus Foundation, Johnson and Johnson and Qualcomm Wireless Reach has contributed to the development of specific feature sets, training protocols and monitoring tools. As mentioned above, demand and interest in OpenSRP has begun to outpace these current mechanisms.

OpenSRP has strived to adhere to the best practices identified by the global Digital Health community - enshrined as the Principles for Digital Development. From re-using available open-source technologies, to intensive user-centered design and development from scale at the outset, the community of developers and implementers adheres to these principles to the maximum extent possible.

## Technical Overview

OpenSRP provides a best in class user experience for frontline workers using tablet and smartphone Android based devices, pushes that data to a deployment management system (OpenSRP Server) and integrates with an Electronic Medical Record System (OpenMRS) to provide scalable data management across large geographic areas. OpenSRP can also integrate with third party systems like DHIS2 for automated reporting, RapidPro for direct-to-client messaging and Electronic Data Warehouses (EDW) for robust data analytics. Each component of the platform provides a function that supports: the health workers in the clinic or community, centralized management of the deployment, and a robust data repository that follows industry best practices. Below is a diagram of the full platform with data linkages defined.



*OpenSRP synchronizes data across all systems, ensuring everything is always up to date. To put it another way, any data point added in the OpenSRP App, RapidPro, the OpenSRP Server or the OpenMRS Server will get synchronized across the system every time the user connects to the internet.*

### OpenSRP App (Android Mobile Device)

The OpenSRP App can be deployed on an Android mobile device or tablet. The OpenSRP app functions offline, and synchronizes data with the centralized server when an internet connection is available. The app is the core interface for data collection. It is a secure mobile application that allows FHWs to collect data on their patient population. The OpenSRP app is able to use a barcode scanner app to read QR codes to quickly pull up patient records. Client identification is also facilitated by APIs with third party fingerprint scanners and facial recognition software. The user interface focuses on replacing and improving the current paper register-based workflow with digital client registration, data collection, decision-support, client management, automated reporting, and stock management. The device can be connected to the internet through WiFi or a SIM card, so the data can be exchanged with the OpenSRP Server.

### OpenSRP Server

The OpenSRP server is the system that manages the mobile deployment. It contains technology that synchronizes data across all mobile devices, tracks changes in forms, provides updates on a regular schedule, manages schedules, and integrates with OpenMRS. Additionally,

OpenSRP Server is able to directly connect with third party systems as defined above.

## **OpenMRS Server**

OpenMRS is the centralized data repository that provides role-based access controls, audits and reporting to other systems. It utilizes the transactional data model that has been proven at scale in numerous applications across the globe. This system manages the user access controls in both the centralized server and mobile deployment. It also allows for the separation of data by FHW, clinic site and team; and facilitates standardized data representation through a common data dictionary. The OpenMRS server allows end users to perform patient de-duplication, aggregation and reporting. The OpenMRS server is able to aggregate data locally and push data to DHIS2 using an Extract Transform Load (ETL) process.

## **RapidPro and the Aleena Health Assistant Bot (SMS/Facebook Messenger/Telegram)**

OpenSRP has the ability to intelligently connect with patients and frontline health workers who do not have a device running the OpenSRP Android App. This connection utilizes RapidPro, which is an open source platform that allows implementers to create direct-to-patient messaging interactions through SMS, Facebook Messenger, and Telegram media. The current integration includes the ability to create and update contacts in RapidPro from clients in OpenSRP, contribute updates to the client's health record, and kick off messaging campaigns.

## **DHIS2**

OpenSRP can connect to DHIS2 in two ways, directly through OpenSRP server or through OpenMRS. OpenSRP server can integrate with DHIS2's data sets as well as individual data in DHIS2 Tracker. OpenSRP also utilizes the tools developed by the OpenMRS community; connections to DHIS2 for aggregate reporting and synchronization of facility metadata across the OpenSRP platform. Additionally, OpenSRP can leverage the organizational hierarchies and mapping of catchment areas, to establish roles and data access permissions in OpenSRP.

## **Data Analytics (Electronic Data Warehouse/Tableau)**

Numerous data storage and reporting systems are supported by OpenSRP, including a scalable Electronic Data Warehouse (EDW), a custom reporting interface, and Superset for business intelligence. These systems are utilized to support cross system reporting, AI-based deep learning and real-time dashboards. Superset allows end users to directly query the data in the EDW and create robust visualizations. More generally, it's possible for any third-party reporting or statistical system to connect to both the OpenSRP and OpenMRS servers using an ETL process including Pentaho and Jasper Reports. These ETL processes are already defined for our implementations and available under open source licenses. The big data foundations needed for machine learning are also represented in the OpenSRP stack.

## **Global Good Maturity Model Assessment**

Our Global Good Maturity Model self assessment is below in the appendix and available [here](#) . The consortium ranks OpenSRP as: "Medium" in most sub-indicators; with a "Low" ranking in Software Productization; and "High" in Digital Health Interventions, Source Code Accessibility and Community Engagement. We believe OpenSRP is a budding global good that is well positioned to gain community traction, and scale to many more countries over the coming 18 months. This proposal focuses on six objectives that will support the growth of OpenSRP into a more mature and capable community, platform, and consortium.

## **Global Good Project Proposal**

OpenSRP has now reached a critical inflection point requiring funds to manage the growing number of Ministries of Health, implementing partners and technical organizations who want to use OpenSRP. We have identified six objectives that can improve the maturity of OpenSRP as a community, platform and consortium. The proposed objectives would help the OpenSRP community to overcome challenges associated with establishing a robust multi-vendor community for open source tools.

### **Objective 1 - Establish and formalize community governance:**

With Global Goods funding (GGF), we would seek to establish a clear, well-documented, and public-facing community governance structure to oversee the continued development of the platform. This governance structure will include stakeholders representing the diverse needs of the community, from high level strategic decision makers to technical implementers. We will follow the model championed by other open source communities like OpenHIE, OpenMRS and OpenLMIS by developing governance, product, and technical committees that each address the needs of key areas of the OpenSRP community.

Governance processes and mechanisms to date have been informal and centered on collective research-based governance. In addition to ensuring these new governance approaches are public facing and codified through standard operating procedures, we will establish a legal trademark and certification process to ensure quality of the OpenSRP brand without compromising openness and accessibility to the software; and a mechanism supported by WHO to review and credential content for health domain specific reference versions. We would also seek to enhance the OpenSRP website and continually improve online presence to showcase the platform's capabilities, and how OpenSRP can lead to health system improvements, increased accountability, and impact. Lastly, WHO will establish a community of practice (COP) among Ministries of Health who are digitizing community information systems, and the tools and processes to facilitate collaborative knowledge sharing and growth of the platform through regional mechanisms including AEHIN and the African Alliance.

*Objective 1: Link toward Maturity:* This cross-cutting objective directly supports numerous sub-indicators in the Global Good Maturity Model that we ranked as "Medium". A clear governance structure will facilitate our ability to scale as a global utility, with community engagement. We anticipate that investment in this formalized community governance structure will support increased adoption of OpenSRP at national scale and trend toward increased adoption in national strategic planning, sustainable core funding, and country utilization.

#### **Objective 2 - Formalize a public software development roadmap:**

GGF would help support a technical product manager for OpenSRP who would be responsible for establishing and maintaining a public product roadmap for OpenSRP, with input solicited from OpenSRP community members. In addition, this person would drive better coordination among technical partners to ensure development efforts are streamlined, and that evolving requirements are prioritized and weighed against available finances. The value proposition of OpenSRP as a community information system complementary to other systems will need to evolve to reflect different stakeholders as users, investors, and technical partners. Formalizing the processes for prioritizing feature milestones and standardized releases will be critical for building trust across these important communities.

*Objective 2: Link toward Maturity:* This objective supports unified community engagement and governance during the software development process and improves the coordination of software development activities across a truly global workforce. Furthermore, a unified roadmap that is consistently managed supports the increased communication of features that could lead to improved implementer engagement and adoption.

#### **Objective 3 - Improve documentation for end users and trainers, and technical documentation to facilitate onboarding:**

OpenSRP implementation partners have created considerable end-user and training resources to facilitate successful implementation of OpenSRP. The community manager would focus effort on cataloging and consolidate the existing content into a refined and standardized version for the OpenSRP wiki. This activity would significantly reduce the costs required to develop a training and roll-out approach for new deployments. The technical product manager for OpenSRP would oversee the effort to improve the technical documentation for OpenSRP to facilitate technology teams to set up and deploy OpenSRP without significant support from existing technology partners. Emphasis would be placed on producing documentation, including video tutorials and training tools, to quickly onboard new development teams. This would include documentation on integration with other common digital systems including OpenMRS, DHIS2, OpenLMIS, and RapidPro. This documentation would form the basis of an eventual OpenSRP training and certification program that would enable developers to successfully achieve the skills required to develop and implement OpenSRP.

Technical manuals to onboard new FHWs and supervisors have been developed and will be refined across multiple geographies and be harmonized for easy access for new country partners. Currently, procedures around basic and advanced training, competency evaluation and field monitoring have been developed and form the basis for field implementation manuals and other resources (slide decks, videos). These

would be formalized into curricula for FHW certifications in OpenSRP use.

*Objective 3: Link toward Maturity:*

This objective supports multiple sub-indicators in the Global Good Maturity Model and will shift them from “Medium” to high over the coming 18 months. These investments will improve the experience of frontline workers, implementers and developers with a better software product package, multilingual user interface for implementation- and user-documentation, and technical documentation.

**Objective 4 - Refine software productization for faster adaptation and deployment, including developing “reference” versions for specific health domains:**

OpenSRP technology partners have continued to make parts of the OpenSRP platform user-configurable. This helps speed up the process to adapt OpenSRP to a specific setting without significant re-engineering. GGF would allow partners to continue this effort and focus on the packaging of OpenSRP for easier installation and set up. This would include consolidation of health content into “reference” versions for priority health domains (e.g., immunization, child health, family planning, antenatal care, early childhood development, tuberculosis, HIV, etc.) - a process WHO will lead and coordinate through a community of practice and content review mechanisms through complementary funding. The content for reference versions will include minimum data elements, standard concept dictionary, and decision-support algorithms in line with WHO guidelines linked to essential health interventions.

*Objective 4: Link toward Maturity:* Software Productization is the area where OpenSRP was assessed as “Low.” This objective solely focuses on improving complete packaging of OpenSRP as a unified product that is deployable with minimal core community support.

**Objective 5 - Build a public API considering adherence to HL7/FHIR standards for increasing interoperability and data accessibility:**

GGF would be used to build out a more robust public API for OpenSRP and improve the process for OpenSRP to adhere with global standards, such as HL7/FHIR. This would increase OpenSRP’s technological interoperability with other systems and enhance data accessibility to a wider range of partners, particularly in those countries where health information exchanges (e.g., OpenHIE) and common digital systems (DHIS2, OpenMRS, OpenLMIS, and RapidPro) are nationally deployed.

*Objective 5: Link toward Maturity:* This objective focuses on improving the Interoperability and Data Accessibility sub-indicator with the goal of advancing from “Medium” to “High.”

**Objective 6: Improve system architecture and monitoring tools to enable national rollouts:**

GGF would support improvements to the underlying architecture of the OpenSRP platform that are necessary to ensure OpenSRP can support national-level deployments without compromising performance. This would also cover key technical and functional additions that Ministry of Health partners have prioritized as critical enablers for adoption of the system, including: improved data syncing within and between health workforce cadres; an enterprise data warehouse strategy to support analytics for health worker and health system performance monitoring; and feedback systems for data-driven FHW coaching to enhance performance, learning, and impact.

*Objective 6: Link toward Maturity:* This objective primarily supports the Software Productization sub-indicator with a focus on improving the system architecture, build processes and monitoring tools that allow implementers to more easily manage OpenSRP deployments.

We recognize that the combination of these objectives will have a multiplicative effect on OpenSRP’s maturity as a Global Good. The focused

investment in these objectives will support a global team of technology and implementation partners. We have planned an approach to monitoring and assessing progress at multiple stages to strengthen our work toward these objectives, and ensure these actions contribute to OpenSRP as a platform, community, and significantly shift to a more mature digital community information system.

## Consortium Team

The technology and implementation partners from THRIVE that gave birth to OpenSRP, as well as subsequent partners who have been key to the growth of OpenSRP in new geographic areas, form the consortium of partners for this bid. The success of the OpenSRP platform is dependent upon local partners and communities contributing to a robust, extensible, user-designed, and well-documented technology; validated and relevant health data and content; and partners and tools to ensure high fidelity implementation at scale.

### Technical Partners

The technical partners will be responsible for developing the platform and providing a foundation for local support to Ministries of Health at the country level. Technical partners currently include Ona (technical lead, Kenya, USA), mPower Social (Bangladesh), Interactive Health Solutions (Pakistan, South Africa), Summit Institute of Development (Indonesia), and BlueCode (Zambia).

**Ona** will serve as the lead of this project, and is a design and engineering social enterprise based in the United States & Nairobi, Kenya. Ona has extensive experience designing, developing and implementing health information systems that are used at national scale and integrate with existing government health information systems and open standards. Ona serves as the technical lead for OpenSRP, having co-created the platform with the World Health Organization, and consortium partners, and actively manages the core platform, coordinates with partners on new functionalities, supports the developer community and builds capacity of local technology partners. Ona will lead the community initiatives, coordinate the software development activities among partners and develop features as agreed upon by the community.

**Interactive Health Solutions (IHS)** has core OpenMRS and Android development experience delivering tuberculosis and vaccination programs. For this project, IHS will support the development of the public API and FHIR interface, software architecture strengthening, and community governance.

**mPower** expertise focuses on content related to vaccination, RMNCAH and humanitarian situations. For this project, they will be responsible for development of features that allow handling of continuum of care of beneficiaries serviced by multiple organizations at different points of the continuum of care; and also integration of OpenSRP with other humanitarian response systems such as WHO's EWARS.

**The Summit Institute of Development (SID)**, Mataram, Indonesia, has expertise in Android development, and created and maintains a provincial-level OpenSRP deployment with multiple cadres with: cross-cadre data sharing, facial recognition, medical device integration, nutritional assessment, the RMNCAH continuum, early childhood development, FHW performance, and supervisor dashboards. For this project SID will help create generic RMNCAH modules and interface with universal health care and insurance systems.

**BlueCode** is the operational support and development team for the OpenSRP implementation in Zambia. They manage the day-to-day support activities and will support the development of monitoring and technical support tools required for other operational support implementers.

### Health and Implementation Partners

Health and Implementation partners will be responsible for developing the health and data content, and logic for the “reference” versions of each health module; and conducting field testing to demonstrate the value of features and content that are intended for adoption by Ministries of Health and their implementation partners. The health partners are led by the World Health Organization RHR/HRP and include Johns Hopkins University (USA), Interactive Research and Development (Pakistan, South Africa), Harvard Chan School of Public Health (USA), Summit Institute of Development (Indonesia), and PATH (Zambia, USA).

The **World Health Organization Department of Reproductive Health and Research (WHO-RHR)**, will contribute technical expertise related to health content areas including reviewing forms, data elements, indicators, and algorithms for consistency of OpenSRP

content with WHO guidelines recommendations across health domains, for the purpose of establishing “reference” versions of OpenSRP that Ministries of Health can easily adopt with minimal adaptation. WHO-RHR is a trusted evidence-based agent for Ministries of Health, and brings a wealth of expertise related to Reproductive, Maternal, Newborn, and Child Health (RMNCH) domains implemented within digital health systems including OpenSRP. Within this initiative, WHO will 1) oversee a mechanism for reviewing and credentialing content for reference versions; and 2) facilitate the development of onboarding tools and a community of practice for Ministries of Health engaged in digitizing community information systems with OpenSRP.

**Johns Hopkins University - Global mHealth Initiative** will be responsible for reviewing and compiling evidence-based best practices, synthesizing and recommending best practices based on guidelines and emergent literature across relevant health domains. JHU-GmI will also assist in reviewing the training, monitoring and evaluation capacity embedded within the platform - spanning materials, meta-data, system-generated data and visualizations. As needed, JHU-GmI will assist in the development of tailored monitoring and evaluation plans for country-level deployments, including economic evaluation (costing, cost-effectiveness and budget impact analyses).

**Harvard Chan School of Public Health** will provide expertise in maternal and newborn health and nutrition, early childhood development, data and information systems, and data analysis and visualization, including machine learning. They will publish papers on OpenSRP deployments; identify new features needed; enhance onboarding documentation, manuals and videos for users and trainers and associated feedback mechanisms, conduct onboarding sprints focusing on analytics; define reference version content and health domains, including customized country configuration files; improve monitoring tools for national rollouts, and advanced analytics for performance with emphasis on integration across multiple cadres, and links with universal health care and insurance providers

**The Summit Institute of Development (SID)** has expertise is in large scale research and development closely integrated with government programs, service delivery and data systems, with a focus on RMNCAH, nutrition, and early childhood development. They will contribute to the OpenSRP development roadmap and prioritized features; improve technical documentation for onboarding developers, and onboarding FHWs in diverse settings, and assist with onboarding sprints; review wiki documentation; help develop “reference” versions, and configuration files, contribute to public API with HL7/FHIR standards for data accessibility, enhance inter-cadre syncing and data warehousing, and links with universal health care and insurance systems

## Use Cases, User Stories and Activities

The OpenSRP community includes a diverse range of government officials, donors, scientists, implementers and technologists. The six objectives outlined in this proposal cut across this diverse group of individuals, from high level decision makers who are setting national strategic plans, to the frontline worker who is using OpenSRP to improve the care of patients in their catchment area. This section focuses on describing three user stories who are targeted for this intervention, presenting their use case and linking the objectives to improved outcomes for OpenSRP implementations. Ultimately, investments in achieving these objectives will improve the experience of users in these stories and improve OpenSRP’s maturity.

### Story 1: High Level Strategic Decision Makers (Ministry Officials, Donors, International Organizations)

High level strategic decision makers are a group of individuals, organizations and government officials who are responsible for setting a strategic direction at national or regional scale and deciding on investments. These health system champions provide governance and strategic direction at the policy level and are primarily responsible for developing country strategy, investment roadmaps, and driving country utilization. National strategic plans, eHealth strategies and ICT frameworks are developed to guide a country toward a strategic direction in their health system implementations and this body of individuals is responsible for developing these artefacts, navigating their implementation, and balancing partners and available finances against goals. Core knowledge of the health system needs, global trends in technical implementations and global strategies set by governing bodies is needed to set policies and choose systems to achieve the health system goals. These stakeholders are informed by experiences from other countries, and act when there are formal recommendations, understandable multi-stakeholder processes and a clear stepwise process for investments that minimize risk and demonstrate observable value in line with country health priorities and reporting.

Currently, OpenSRP is deployed at scale in numerous contexts and is gaining traction and a positive reputation. We recognize that this group of users need to have: an understanding of the impact OpenSRP can have in their health context, the technical steps necessary to adopt and integrate OpenSRP into their evolving digital ecosystem; understand the costs associated with adaptation and support of the system; wish to know how the “reference” content compares to their existing community health information system content; and wish to learn about others experience with and approaches for deployment. We have considered decision makers as primary users in our articulation of Objective 1 - establish and formalize community governance.

The improved governance model outlined in Objective 1 includes a governance committee that is responsible for the strategic direction of OpenSRP determined by a consortium of partners. This governance committee will engage with global stakeholders and high level strategic decision makers to support the inclusion of OpenSRP in national level planning, adoption and governance. We will ensure that content in the reference versions of OpenSRP is in-line with WHO guideline recommendations, minimum datasets, and essential interventions; and made available alongside workshops and documentation, for easy adoption. Furthermore, in collaboration with AEHIN and the African Alliance WHO will support the establishment of a community of practice for Ministries of Health who have experience with or are considering digitizing community information systems with OpenSRP and allied systems. Work to consolidate the process of adaptation and integration of OpenSRP into broader investments, and the associated requirements and costs will be documented.

## Story 2: Large Scale Implementers

Large scale implementers are organizations and groups who are responsible for executing health programs - in partnership with, and on behalf of governments - across large geographic regions to improve public health outcomes. They are responsible for linking high level policies to action and regularly evaluate alternatives, decide on an approach and work with partners to successfully implement a solution. This group needs to have a deep understanding of the activities within a health system from the lowest level health worker to the needs of high level strategic decision makers. This group includes technologists and software developers who have the need to understand OpenSRP at a code and operational support level to ensure their implementation can technically deliver a sustainable service for the implementation team. It also includes organizations proactively adopting and refining ICT tools that are subsequently mainstreamed and institutionalized at national scale by government.

Multiple objectives in our proposal cater to the needs of this group. The product committee, as outlined in Objective 1 will support the strategic direction of the OpenSRP software product and will support the needs of large scale implementers by providing them with a seat at the decision making table. Objectives 2, 3, 4, 5 and 6 support multiple individuals within large scale implementing organizations including project managers, monitoring and evaluation specialists, software developers, operational support teams, FHWs and field managers. These objectives focus on increased information, productization and adoption, which are core characteristics that are evaluated by this group, and form the basis of trust, engagement, and necessary tools to act on and support the use of and integration of OpenSRP within the broad ecosystem.

## Story 3: Frontline Health Workers

Frontline health workers (FHWs) are the first point of care for millions of underserved communities in multiple areas across the globe. Many are burdened by archaic paper registers that comprise the community health information systems, which prioritize data collection and indicator reporting over active use of data to enhance service provision and work planning. Despite health system differences across countries and regions, the core needs of these FHWs, and the health systems within which they operate, are remarkably similar. They need tools that improve their ability to deliver high coverage and quality of healthcare to their populations everyday. OpenSRP's primary user is the diversity of FHWs providing health services, and we work tirelessly to improve the functionality, experience and value for these users.

Two objectives support improving the needs of FHWs. Objective 3 focuses on improving and localizing documentation and training materials for FHWs and frontline managers. This will increase the likelihood that OpenSRP is more readily adopted and easily supported at the point of service.

Objective 5 focuses on supporting FHIR based integration with third party systems. This area of work will strengthen the capability of



OpenSRP to integrate with third party systems and data exchange architectures including a client registry, shared health record, terminology service, or civil registration and vital statistics systems. Ultimately, establishing support for the HL7/FHIR standard related to specific domain areas, will improve integration support across systems, and enhance the ability to uniquely identify a client, represent their health in a mutually intelligible way between systems, and support their continued care across multiple care settings. These types of connections will also have tangential benefits in the FHWs primary work activities by providing them with more information at the point of service to make informed decisions; and reduce their potential need to switch between incompatible digital solutions.

## Digital Health Technologies

OpenSRP utilizes a number of freely available open source software systems and all development is done under an Apache 2.0 license. The primary software development activities will happen in Objectives 4, 5 and 6. This section provides an overview of the software that needs to be developed, the operational tools that will be used to improve productization and the activities that will improve the system architecture and monitoring tools.

### Improving Software Productization

OpenSRP continually aims to make the system easier to configure, set-up and deploy. We have recently gone through an assessment that identified core areas of improvement that could speed up the adoption process. The biggest hurdle for new implementers is the technical needs of setting up and configuring a platform that crosses three different technology stacks (Android app, OpenSRP server and OpenMRS). The first priority is to create a “reference version” of OpenSRP that contains a core configuration of features that are available across implementations. In order to do this, we will need to perform a code review and cleanup across all implementations to identify core workflows and features that should be showcased. This system will be published online and made available on the Google Play store for individuals to try and download so they can better understand the technical workings and configuration of the system.

The second priority is to improve the packaging of the complete system (Android App, OpenSRP server and OpenMRS). We will do this by improving our continuous integration and release process so it is easier to stand up a demo instance of OpenSRP for implementers to test. We will utilize a number of technical systems to do this including Ansible and Docker. This will allow OpenSRP to be deployed across multiple operating systems and platforms as well as supporting the ability to run deployments without manual intervention.

### Integration with HIS Infrastructure using HL7/FHIR

OpenSRP is being implemented in areas where there are other investments in health infrastructure. Our existing integrations with RapidPro, OpenMRS and DHIS2 have proven fruitful for direct-to-patient messaging, integration with clinic systems and national level reporting. However, significant investments are being made in national infrastructure systems like a Client Registry, Facility Registry and Shared Health Record. In many countries there is an urgent emerging need for systems to support universal health care (UHC) insurance systems as mandated in Sustainable Development Goal 3. OpenSRP is well positioned as a leading frontline health worker system (Community Information System - CIS - in WHO classification), and we could significantly add value by integrating with national level infrastructure systems such as Open Health Information Exchange (OpenHIE) and Civil Registration and Vital Statistics and national UHC insurance systems.

Current OpenSRP implementations position the system to act as an independent platform that manages all content. While countries have planned for this, OpenSRP is not yet integrated at national scale with health infrastructure systems. We envision a future where OpenSRP seamlessly integrates as a CIS with the national client registry, facility registry and shared health record as well as civil registration and vital statistics systems. This type of integration would allow multiple actors in a health system to share unique patient information and longitudinal health records across physical hospitals, clinics, laboratories and mobile teams. This is critical for the areas where ANC, PNC and child immunization activities are being captured by OpenSRP across multiple FHWs and facilities. We aim to connect OpenSRP Server directly to the OpenHIE interoperability layer using HL/ FHIR standards.

HL7/FHIR is an emerging global standard in the health information space that focuses on providing standardized interfaces that follow industry best practices in information exchange. Many open source information systems in our space have begun the adoption process from HL7 v2 or

v3 to FHIR. We believe OpenSRP could benefit by building a FHIR interface directly in to the OpenSRP server to be able to exchange information with systems like Jembi's HEARTH, Open Health Information Mediator (OpenHIM), Open Immunize (OpenIZ), and Open Civil Registration and Vital Statistics (OpenCRVS).

## Data Extraction API and Interface

OpenSRP uses an ETL process to load data from OpenSRP, OpenMRS and RapidPro into the enterprise data warehouse to power real-time operational reporting dashboards. While these dashboards are useful, we have already recognized the need to use more advanced analytical approaches to help better classify worker performance, identify issues like data fraud and to identify clients that may be at risk. Using this funding, we would leverage the EDW infrastructure to build smart analytics using machine learning and other statistical techniques to help automate and make more accessible data for decision making.

## Improved System Architecture and Operational Support Tooling

The software development teams have identified core issues with OpenSRP that could be improved to to increase the technical scalability of the platform. National scale implementations could benefit by ensuring OpenSRP and OpenMRS perform in a multi-server architecture environment with robust monitoring tools. Currently, OpenSRP is deployed with a single Apache Tomcat application server for each service (OpenSRP Server and OpenMRS). The architecture includes multiple servers for the data storage and electronic data warehouse. This architecture needs to be tested at scale in large countries like India where the systems will require horizontal scaling, load balancing, etc. We would also explore integration with an external shared health record (via FHIR) like HEARTH.

We aim to include demo data generation at scale for the entire OpenSRP platform to identify and test weaknesses in the system architecture. This will inform the system architecture and support our devops processes to monitor such a large scale implementation.

OpenSRP currently utilizes numerous open source operational support and system monitoring tools to ensure the implementations have a 99%+ uptime. These tools are currently distributed across the community with each implementation running their own configuration. We aim to standardize these tools in a unified and deployable package so they can be included in the OpenSRP product and support new implementations.

## Our commitment to the global good ecosystem

OpenSRP consortium members are actively engaged in the global health information system community in numerous areas. OpenSRP technical teams are already involved in numerous communities of practice including OpenHIE, OpenMRS, OpenLMIS and the Digital Solutions for Malaria Elimination. For example, we are engaged with the OpenMRS community as regular support team members, feature developers and thought leaders as well as being committed to OpenSRP an OpenMRS distribution. We will continue to engage with the OpenLMIS community to develop an integration with OpenSRP that links the health and supply chain domains at the national, subnational, facility and patient levels.

### *Improved OpenSRP Community Governance*

The establishment of a publically available governance structure is a critical step to facilitating community engagement and expansion of the OpenSRP multi-vendor community while ensuring the integrity of OpenSRP. By articulating the code governance process and formation of community and product managers, the Consortium can meaningfully absorb new members and transparently involve the community in the architectural decision-making of the software. The mapping of the governance structure and contact details will be posted on the website and provide clear instructions on engaging with members. Our activities are modeled on the innovations driven by long standing Open Source communities in our space (OpenHIE, OpenMRS and OpenLMIS).

Our new community governance model will include three committees, a governance committee, product committee and technical committee that each focus on supporting a subset of the OpenSRP implementation community. Each committee will establish a charter, develop a roadmap and hold regularly scheduled meetings to move the system forward. The OpenSRP public wiki will be the primary source of all community conversations, meeting minutes and up to date information about OpenSRP.

## DEVELOPMENT OF GLOBAL COMMUNITY RESOURCES

WHO will collaborate with its growing community of partners to develop a set of guidance resources to support new adopters and implementers. As part of these resources for community engagement, WHO will release a requirements-gathering training for Ministries of Health who are undergoing the process of digitizing their paper registers, in which OpenSRP would be the reference software. These resources will include an iterative process of development whereby community feedback will be incorporated to enhance the relevance of the training materials. We will also develop a series of webinars for national and district-level health information officers regarding use of the feature set of OpenSRP, and processes for planning OpenSRP rollouts. Finally, for those embarking on active deployments, we will host workshops as onboarding sprints on specific topics such as: practical trainings of FHW, certifications and establishing local institutions of OpenSRP support, supervisors' use of reporting information, establishment and maintenance of systems, benefits and use of interoperable systems, advocacy for financial and human resources. The foundation of these sprints will emphasize the active use of data-for-decision-making. These would potentially be planned in parallel with technical sprints, thereby leading to rapid development of OpenSRP country teams well versed in deployment, use and maintenance of OpenSRP.

### Project Deliverables & Schedule

The GANTT chart of product deliverables is available as an attachment. It includes a detailed list of activities broken out by objectives, timeline, and responsible parties using a RACI matrix. It is worth noting, WHO and other donor partners will be contributing matching funding to amplify activities and catalyze potential for success.

#### **Objective 1 - Establish and formalize community governance deliverables:**

- Establish new governance approaches that are public facing and codified through standard operating procedures;
- Establish a legal trademark and certification process to ensure quality of the OpenSRP brand without compromising openness and accessibility to the software;
- Establish a mechanism to review and credential content for reference versions;
- Enhanced website to showcase the platform's capabilities and value; and
- Establish a community of practice and tools for Ministries of Health who are digitizing community information systems to facilitate adoption.

#### **Objective 2 - Formalize a public software development roadmap deliverables:**

- Establish and maintain a public product roadmap for OpenSRP;
- Formalize procedures for prioritizing features and technical refinement weighed against finances.

#### **Objective 3 - Improve documentation for end users and trainers, and technical documentation to facilitate onboarding deliverables:**

- Catalogue and consolidate existing end-user and training content into a refined and standardized version available from the OpenSRP wiki;
- Release technical documentation that facilitates technology teams to set up and deploy OpenSRP;

**Objective 4 - Refine software productization for faster adaptation and deployment, including developing “reference” versions for specific health domains deliverables:**

- Released version of OpenSRP that is user-configurable;
- Released reference versions of OpenSRP for 3 specific health domain areas;


**Objective 5 - Build a public API considering adherence to HL7/FHIR standards for increasing interoperability and data accessibility deliverables:**

- Release a robust public API for OpenSRP with documentation;
- Release versions of OpenSRP that adhere to HL7/FHIR standard for prioritized health domains

**Objective 6: Improve system architecture and monitoring tools to enable national rollouts deliverables:**

- Release an improved version of OpenSRP supporting improved cross-cadre syncing;
- Potential integration with a shared health record (like HEARTH) for national level scale
- Release a version of OpenSRP that is integrated with Electronic Data Warehouse and Smart Analytics (leverage machine learning)
- Release performance monitoring metrics that function with OpenSRP and integrated systems

**Supporting Documents:**  [OpenSRP Self Assessment - Global Goods Maturity Model](#)

 [opensrp\\_gantt\\_for\\_digital\\_square\\_notice\\_b.pdf](#)

 [opensrp\\_budget\\_narrative.docx](#)