Reveal to Guide Precision Health: from Demand to Shelf Readiness

Two-Sentence Overview

Reveal is a “young” but widely implemented global good that provides spatial targets and tools to improve quality of field-service delivery. The potential applications for Reveal are vast - from ensuring vaccinations reach the last mile, to supporting delivery of mass drug administration - but the packaging and configurability level of the tool is immature, which bottlenecks adding technical use-cases, geographic context, and partners.

High-Level Budget Summary

The total cost is $200,711 over a 10-month period. The work packages, which all can be executed independently of each other, and their respective budgets are:

Work Package	**Budget (USD)**
Improve user and developer community engagement	48,266
Alignment with OpenHIE product architecture and data exchange requirements	124,429
Execute performance testing	28,01

Executive Summary

Reveal is an open-source digital platform and approved “Global Good” that provides real-time alignment of spatial targets with health service field operations and currently supports malaria and neglected tropical disease interventions in five countries. Reveal combines a web-based tool that facilitates detailed planning by field managers and a mobile tool that guides front-line health workers through highly interactive, self-navigating digital maps down to the household level. In 2018, the Reveal software suite migrated to a new stack to better meet long term goals for sustainability, configurability, and interoperability. However, the focus of 2018 and 2019 was to support new implementations, so less time was spent on sustainability-focused development efforts. (See Appendix A for a one-pager overview of Reveal).

The overarching goal of this project is to lower the barrier of entry to setting up the Reveal system. When evaluating Reveal against the Global Goods Maturity Model (GGMM) and OpenHIE standards for off-the-shelf tools, five thematic gaps emerged. Our specific goals for this investment will be to close these gaps by 1) Broadly engaging the public in roadmapping, 2) Building technical documentation, 3) Achieving OpenHIE architecture for packaging and deployment, 4) Executing load testing, and 5) Demonstrating compliance with OpenHIE interoperability workflows and standards. The activities to achieve these goals involve documentation, code-writing and software development, QA and testing, and community engagement; all of which fall under the role of product management and development, the roles Akros and its development partners play respectively already with this product.

Consortium Team

Akros is a cutting edge organization that establishes data-driven

and technologically-appropriate systems to improve the health and well-being of disadvantaged communities.

Akros is the product manager of Reveal, coordinating the needs of implementing clients with outputs from software development firms. Akros also provides Reveal implementation support to countries and their partner organizations via a translational, capacity-building model. Akros' internal project management system 'Grow' will guide best practices in product and program management, utilizing the Atlassian suite of tools. Subcontractor management will be coordinated through Slack, and tracked by Jira and Confluence.

Akros will partner with Ona Systems, Inspired Testing, and Appstack. Ona is Akros' core development partner and an expert on interoperability frameworks in the development space. Inspired Testing, is a global software testing company with expertise in functional testing, and performance testing, and test automation. Appstack is currently running a Reveal configuration and has a solid understanding of current state and the necessary developer skills. Akros and Ona have worked closely together since 2014, and the two have collaborated with Inspired Testing and Appstack since 2020. Akros will govern the consortium and lead the workflow and functional design, Ona will bring vision for tech innovations and software development -- the Akros TPM will coordinate Ona's work with Appstack who will also be engaged in software development, and Inspired Testing will lead load testing and help set benchmarks for testing processes. Akros also maintains a Reveal steering committee, which will be routinely consulted on architecture and development throughout.

Akros

Akros is based in Lusaka, Zambia, and has been in operation for 12 years since 2008, working in developing country contexts to design data and software solutions to improve the impact of health service delivery. Akros' roots are in epidemiology and behavioral economics, which means Akros is often on the cutting edge of innovation, designing tools and technology geared towards altering people's behaviors in data use towards impact. The breadth of Akros' projects have enabled our teams to establish working relationships in Zambia, Botswana, Ethiopia, Malawi, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Swaziland, Senegal, Thailand, and Zimbabwe. As one of the first organizations to conceptualize the power of geospatial technologies in field-service delivery in the most remote of locations in the development context, Akros has a finger on the pulse of what the issues in the field are, and how technology can realistically be applied to solve them. The below experience list demonstrates this.

Past Experience

Experience and duration	**Description and relevance**
Community Led Total Sanitation Mobile-2-Web (2013 - 2018)	In water, sanitation, and hygiene (WASH) Akros revolutionized the way M&E is done in sub-Saharan Africa by supporting the Zambian Ministry of Water Development, Sanitation and Environmental Protection to design and roll-out a village level surveillance system that captures live, real-time data and drives information back down to key stakeholders and change agents through robust feedback loops. Community volunteers use the mobile-to-web platform to collect village-level data across 69 rural Zambian districts and one urban district in nine out of Zambia's ten provinces. The system provides real-time information on uptake of sanitation behaviors and access to clean water. After just three years, the application of the data collected in this system led to over 3 million new users of sanitation and the first open defecation free districts in sub-Saharan Africa. In 2018, Akros fully transitioned ownership of the digital system to the Ministry of Water Development, Sanitation and Environmental Protection.

mSpray (2014 - 2018)	Akros supported the Zambia National Malaria Elimination Center to improve delivery of one of their key malaria interventions, indoor residual spraying (IRS). The NMEC identified the need for a tool to guide IRS planning, implementation, and monitoring to ensure high spray-coverage at the community level. Akros worked to develop a novel 3-stage approach to map houses across spray areas; use a mobile-based tool (using ODK, OMK, and Ona.io) to guide spray operators to target specific houses; and capture household-level data on achievement of targets. This approach has led to remarkable improvements in the delivery of IRS in Zambia by providing real-time information to inform daily spray campaigns. IRS data between 2013 and 2017 demonstrated a 15% additional decrease in malaria incidence in areas where mSpray was used compared to IRS areas where mSpray was not used. Non-mSpray regions achieved only a 9% reduction in malaria incidence compared to 24% in mSpray regions.
Reveal (2018 - 2020)	In 2018, Akros was awarded a grant to take the solution developed through mSpray, and develop a new open-source application that would amplify the capacity of the tool in supporting field operations and better position the solution for scalability across contexts. Akros and Ona worked to develop Reveal, through a multi-phased but rapid process. The team balanced user stories gathered from countries across the globe with existing mSpray workflows to identify critical features, functions, and business requirements, and build a software architecture that would be sustainable in the long term. Simultaneous to creating a new software, the teams defined development and implementation processes around the software. In 2019, Reveal was implemented in three countries, across upwards of 300 users.

Key Personnel

Dr. Anna Winters is an epidemiologist, and lead of the Reveal team, focused on building infectious disease surveillance and response systems. She currently serves as CEO of Akros, a global public health organization she co-founded. Dr. Winters completed her PhD focused on vector-borne infectious disease and, prior to leading Akros, worked within the US Centers for Disease Control and Prevention Division of Vector-borne Diseases. As the Reveal team lead, Dr. Winters guides strategic direction for Reveal, and thus leads much of the community facing engagement for Reveal and is consulted for any major technical architectural decisions.

Mr. Livashan Soobramoney is a Technical Product Manager with 9 years of experience designing product solutions for a variety of end users and clients. He has worked across a breadth of products and contexts, from corporate banking software solutions to remote monitoring platforms for essential health service delivery in rural settings. He currently is the Technical Product Manager of the Reveal product, where he leads roadmap development, compiles client requirements, and manages development teams to deliver.

Mr. Kyle Hutchinson is the Reveal Coordinator, ensuring quality and consistency across the Reveal project - from product and software development to implementation. His experience traverses both product development and people-management, and has a particular skill-set for adopting big ideas into realization, with awareness of the tools and processes that need to be built to help achieve success.

Kyle acts as a back-up for both the Reveal Lead and Reveal Product Manager. The larger Reveal team has another 10 members across data technical, software technical, implementation, and client relation

teams. The larger team will support the core team both ad-hoc on specific tasks, and fill in as back-ups in full capacity if needed.

Ona

Ona Systems is a development lab based in Nairobi, Kenya, that has been in operation since 2013. Ona is a social enterprise that builds the data infrastructure to drive change; their belief is that technology affords new opportunities for governments and development organizations to be increasingly data driven, collaborative and accountable. Ona operates with the goal never simply to build a great product, but to support great outcomes.

Past Experience

Experience and duration	**Description and relevance**
OpenSRP (2013-2020)	Ona is the technical lead of the OpenSRP platform which it has been developing for the past 6 years. In Zambia, Ona supported PATH and the MoH to develop the Zambian Electronic Immunization Registry (ZEIR) using OpenSRP which has been deployed in Southern Province and has helped deliver over 1M immunizations to date. OpenSRP is also being adopted as one of the platforms used by the MoH as part of it's Boresha Afya which intends to help promote digital health adoption at national scale. Ona is also developing an official ANC module for WHO on OpenSRP and will be supporting UNICEF in deploying OpenSRP in West Africa.
mSpray (2014 - 2018)	Over the four years, Ona worked with Akros as the technical partner to develop mSpray. This included helping develop the spatial mapping methodologies used and worked to help develop OpenMapKit. Ona has also been actively involved in helping inform the design of the geospatial widget and likely will be one of the organizations contributing to its development.
Reveal (2018 - 2020)	Ona is the core development partner for the Reveal platform.

Key Personnel (CVs in Appendix B)

Mr. Matt Berg is the CEO and a co-founder of Ona Systems, and has lead the mSpray and Reveal work with Akros since it began. He guides strategic and technical direction at Ona.

Mr. Craig Appl is the mHealth Technical Lead for Ona Systems Inc. As the mHealth technical Lead, he provides technical leadership for the overall design, development, and implementation of the mHealth platforms managed by Ona systems across multiple country programs and awards.

Mr. Sam Githengi is a Senior Software Engineer at Ona and is the lead developer on the Reveal project. He has nearly ten years of experience in software engineering across a wide variety of tools and languages.

Ona has a team of 10 engineers and 3 project managers who contribute to the Reveal project and thus has the capacity to handle staff outages and back-up situations.

Inspired Testing

Inspired Testing is the specialist testing division of a South African company, Dynamic Technologies Holdings, that was founded in 1999. The company's strength lies in knowing how to structure, execute

and automate testing. Importantly, their ISO 27001 certification and its alignment to the UK/EU GDPR (General Data Protection Regulation) ensures full protection of critical personal data. Inspired Testing uses a unique combination of experience, technique and blended onshore offshore delivery capabilities to provide expert testing across most platforms, devices and environments. Inspired Testing provides performance testing services to many different industries ranging from Banking and Insurance, to Education (universities and schools), logistics, vehicle tracking, social/non-profit institutions, pharma and life sciences companies; with the years of experience Inspired Testing has worked with over 100 different clients in locations across South Africa, Europe, Asia, and the UK; below are just a few examples of relevant projects.

Past Experience

Experience	**Description and relevance**
Performance testing of an insurance pricing system	Our client, one of the largest private insurance company in South Africa, was aiming towards an upgrade of their core insurance pricing system that is the backbone of their insurance book. The performance of the system could not degrade as part of the upgrade. The upgrade was also further complicated by moving from physical hardware to a virtualized environment. Inspired Testing developed the performance testing scripts and provided a managed performance testing service utilizing the Neoload performance testing tools as well as SOAP and Progress tools.
Automated testing of medical referral system	Inspired Testing is helping the innovative team at Vula Mobile to provide quality medical care to rural and remote patients, with a range of software testing and test automation services for a smartphone app, which is used by healthcare workers in rural areas. After an initial consultation that mapped out what Vula Mobile needed, the Inspired Testing team set up automated test scripts for the software in the development environment, and since then, Vula Mobile have been able to quickly and effectively diagnose any performance or functionality issues before they could impact their users.

Key Personnel

Mr. Zaayman is a Director of Inspired Testing UK and Global Head of Performance Testing and has over 15 years of consulting experience in performance testing and automation. He is very analytical and focused which allows architect technical testing solutions for his clients. He has served various international clients in structuring and implementing testing solutions within multi-supplier programme environments.

Mr. Luis is the Performance Team Lead, and is a test professional with more than 3 years relevant QA experience, working across different roles from QA tester to Performance Testing Team Lead. He is an extremely hardworking individual who strives to improve his skills and constantly learn new technologies.

Mr Samaai, Mr Mzonke, and Mr Zawitowski are all dedicated Performance Test Analysts, each with at least 2 years of experience working with Inspired Testing and its parent company.

The scope of the load testing is finite, and this team is expected to manage the work between and across themselves. As the performance team lead, Mr. Luis, can tap into additional Inspired Testing resources if necessary.

Appstack

Appstack is a relatively new development group with leadership and team members well experienced, versed, and highly regarded in the South African development community. With experience primarily in

the Finance Tech space, the team is expanding to other industries. They frequently support groups in transitioning to continuous integration and continuous deployment projects.

Past Experience

Experience and duration	**Description and relevance**
Reveal (2020)	Subcontracted to Akros, AppStack is leading the technical software components of Reveal deployment in a novel implementation of a seasonal malaria chemoprophylaxis in northern Nigeria. This implementation will support 1 district and up to 50 users.

Key Personnel

Mr. Engelbrecht is the CEO of AppStack with decades of experience in software development. As the lead at AppStack he manages and oversees the technical solutions of projects as well as the team members assigned to each project.

Mr. Ramprsad is a Business Analyst with extensive experience in product management and is fully versed in SDLC , Agile Methodologies and Business Analysis. Accredited in Software Testing Analysis, Microsoft Technologies, ITIL, Business Analysis Methodologies and Prototyping tools.

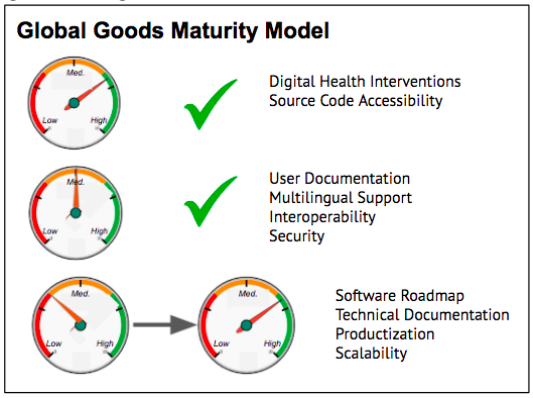
Mr. Fajobi is a Senior Software Developer with a broad skillset and a focus on web development and web based applications. He has over 6 years of experience across a variety of platforms.

Mr. Mngoma and Ms. Chigumo are both Java developers with a cumulative 9 years of experience between them. Mr. Mngoma also has significant database experience, and both have a passion for innovation and creatively thinking through solution design.

Background or Problem Statement

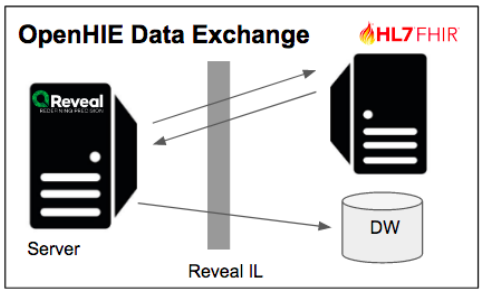
From mid 2018 to date, Akros and Ona built the core Reveal functionality and infrastructure, and designed and implemented product management processes such as prioritization protocols, testing standards, and communication operations. The infrastructure, functionality, and processes were tested in 2019 in three different country-implementations - Namibia, Thailand, and Zambia. In 2020, Reveal will expand into Eswatini, Nigeria, Senegal and others. Throughout the initial development and still today, consecutive rapid implementation timelines continue to require new feature development and resultantly development needed for longer term stabilization and “lighter touch” implementations has been deprioritized. The application therefore, while stable and with a robust feature set, is highly dependent on engineering for deployments, and is not yet in an “off-the-shelf” state. While Reveal development continues to be ongoing, we need to focus discrete time and resources to support the movement of the application to a more accessible state.

While Reveal is well aligned with the GGMM and the OpenHIE guidelines, with scores of “medium” or “high” in many domains, gaps do remain. These gaps fall into five themes: Public Engagement, Technical Documentation, Product Packaging, Scalability, and Data Exchange Testing.



First, per GGMM, Software Roadmap is “low”. Input to the tool’s strategic roadmap (5-year), technology roadmap (6 - 12 month), and access to the release schedule, need to be expanded to increase **public engagement**. The strategic roadmap document is reviewed on a quarterly basis on the Reveal community call, and regular prioritization in Jira produces a release schedule and a product backlog. These processes are limited to a handful of partners and are not sensitive to broader community and unfunded platform needs.

Second, per GGMM, Technical Documentation is “low-medium”. While the Consortium has developed a strong implementation documentation, **technical documentation** is lacking. There are low-level, workflow and functionality-specific business requirements and design documents, basic read-me files for the code, written test plans and processes, but no broader up-to-date system and architectural documentation. Code-level documentation needs to be strengthened.



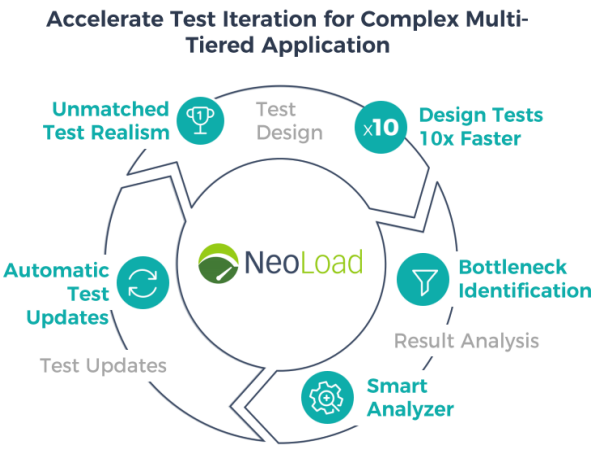
*Third, per GGMM, **Scalability** is “low-medium”*. The Reveal team has a framework for which types of new development and implementations merit load testing, but time and budgets have not yet allowed this to be actualized.

Fourth, per GGMM, Software Productization is “low”, Reveal is not wholly aligned with OpenHIE architecture, standards, and devops. The app is complex to modify for a developer augmenting functionality or an implementer spinning up a quick instance. Reveal has made strides towards OpenHIE deployment architecture - Reveal currently uses gradle for set up of applications, has templates for configuration files, and uses Android Studio to execute testing packages; however, these steps are just the beginning to **product packaging**.

*Fifth, OpenHIE **data exchange** standards are untested.* Reveal has been built using HL7 FHIR standards, and has a tested interoperability layer, but has not yet integrated with another HL7 system.

Digital Health Technologies

Reveal runs on a stack of different platforms including OpenSRP, OpenMRS, Nifi, and Superset. OpenSRP provides the framework for both the server and the mobile client. OpenMRS integrates with OpenSRP, serving as the database for users and the location master list and also as a user interface for user creation. Nifi is an interoperability layer that performs ETL processes on the raw data in the server: polling the OpenSRP server for new entities, enriching data from other API endpoints, and inserting records into the data warehouse; Nifi also generates tasks and plans which are core to the data model. Superset is the reporting data warehouse, where translated data are stored in a user interface that can be interacted with to create reports.



The stack will be directly augmented or supplemented in this work with the following tools and technologies for load testing (NeoLoad), packaging (Docker), and container orchestration.

NeoLoad (Performance/Load Testing Tool)

NeoLoad will be used to deliver the performance testing project. NeoLoad is a Performance Engineering Platform designed to accelerate the performance engineering process across QA, Dev and Ops. NeoLoad offers several attractive advantages over other tool sets including reduced maintenance of scripts for subsequent performance testing projects, integration into DevOps programmes, and fully integrated mobile and web testing.

NeoLoad also provides full API integration enabling teams to pilot other tools or let NeoLoad be piloted by them as the case with different CI tools. Another great benefit of this API exchange is the sharing of data between the tools and having it all associated with specific performance tests.

The Docker platform and Container Orchestration

The Docker platform is the industry-leading container platform for continuous, high-velocity innovation. The Docker platform would enable Akros to separate applications from infrastructure which allows for rapid software delivery. The implementation and utilization of Docker would help bridge the gap between the development and deployment of the Reveal Platform.

Currently, whilst not a direct competitor, Reveal employs the use of Gradle. Gradle is a build tool with a focus on build automation and support for multi-language development. The intention is to transition towards Docker or a containerized solution, to tap into the higher/ more abundant availability of resources au fait with the Docker platform as opposed to Gradle.

Cluster management and orchestration tools automate the creation, deployment, destruction and scaling of application or systems containers. OpenShift is an open source platform as a service (PaaS) offered by Red Hat that allows for the orchestration of Docker containers, and is currently under consideration for use in this work.

This work will also rely on global standards for digital tools and interoperability, most notably, the Global Goods Maturity model and the OpenHIE architecture guidelines, which are the two key resources used to establish guiding standards for this work.

Use Cases and User Stories

The user stories have been organized into stories relevant to implementation, engineering, interoperability, and community.

1. Implementation
    a. I am an implementer or government official on the information systems team for a public health campaign and I want to quickly deploy Reveal for an intervention campaign that is taking place in a few month's time. I don't have technical resources on my team, so I would need some support from a partner, but I would like the work to happen quickly and at a price that fits into my implementation budget.
    b. I am an implementer or government official on the information systems team for a public health campaign and I want to quickly deploy Reveal for an intervention campaign that is

taking place in a few month's time. I have a technical team in-country that can act in a system administrator capacity. I want to set up an instance of Reveal using this team and the documentation resources that are available.

   c. I am an implementer or government official on the information systems team for a public health campaign and I am interested in exploring using Reveal. I want a hands-on, easy to access demo-version (reference app) of the tool that I can download on-the-fly. I need to demo the tool to other stakeholders (government, donors, users) to generate buy-in and assess if it is fit-for-purpose.
   d. I am an implementer or government official on the information systems team for a public health campaign and I would like to understand the benchmarks that Reveal performs best in (# users, network strength, etc.) before I evaluate if it is an appropriate tool.

2. Engineering
   a. I am an engineer from the non-core development team and I would like to contribute to the Reveal project. I have space on virtual machines/servers to set up an environment, and I would like to get a development environment set-up quickly and with ease. I also would like some documentation to help me understand the use cases and system architecture, so I can start off in the right direction. I would also like to understand the principles and guidelines the core team abides by for committing and reviewing code so my work can be added to the code trunk.
   b. I am the Akros Reveal Product Manager, and the demand for Reveal implementations is growing rapidly so that it exceeds the current resources on development teams to support; I want to easily onboard additional developers and engineers to support the tool so the community can continue to expand.
3. Interoperability
   a. I am a government official on the information systems team for a public health campaign and to even consider digital tools to support implementation, they must integrate with DHIS2, so I want to see how Reveal can support data flow into DHIS2 per the data standards required by my country's e-Health (or equivalent) policy.
4. Community
   a. I am a user or implementer of Reveal and I would like to understand what the plans are for platform improvement. There are certain features that I would like to see in future iterations of Reveal, and I'd like a way to request these features and to have visibility into how my request will be processed and prioritized for inclusion.
   b. I support a program that uses Reveal, and I would like to connect with other Reveal users and implementers to understand how they have deployed the tool in specific circumstances.

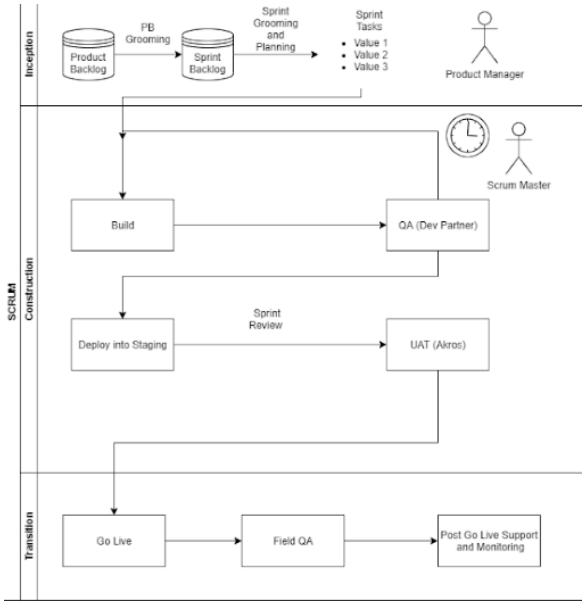
Objectives and Activities

The Reveal Consortium will address the gaps in Reveal via five objective areas that align with the gaps described above and fall into the shelf-readiness framework:

Work Package	**Relevant User Stories**	**Objective**
Improve user and developer community engagement	2a, 2b 4a, 4b	1.1 Expand fora and processes for public engagement 1.2 Define and build a technical documentation library

Alignment with OpenHIE product architecture and data exchange requirements	1a, 1b, 1c 2a, 2b 3a	2.1 Align product packaging with OpenHIE standards 2.2 Build and test a data exchange process
Execute performance testing	1d	3.1 Execute two rounds of load testing

The work packages, objectives, and activities are defined below.



Work package 1: Improve user and developer community and engagement

Objective 1.1: Expand fora and processes for public engagement

Activity 1.1.1: Incorporate community inputs to prioritization processes, including defined fora for collecting inputs and timing for how inputs are processed

- *Owner: Akros*
- *Output: Update and circulate Reveal Software Development Life Cycle (SDLC) and Jira Processes*

Activity 1.1.2: Formalize and publicize service desk protocols

- *Owner: Akros*
- *Output: Developed standard operating procedures, functional linkage of ZenDesk platform with Jira/GitHub repository*

Activity 1.1.3: Extend attendance at quarterly Reveal Forum (roadmap review meetings) to public

- *Owner: Akros*
- *Output: Disseminated agenda, notes and attendee list after each meeting*

Activity 1.1.4: Host annual spatial intelligence workshop - this workshop will feature presentations from community members and collaborators on implementation innovations relevant to spatial intelligence, particularly those that use satellite imagery and/or navigable digital maps. The intent of the workshop is to bring community members of Reveal together with innovation leaders to encourage the ways in which the tool is being used to take advantage of new science to improve use and impact. The 2019 workshop summary is in the appendix.

- *Owner: Akros*
- *Output: Disseminated summary, presentation content, and attendee list after workshop*

Activity 1.1.5: Evaluate long term Confluence needs with community expansion. Reveal currently shares a license with OpenSRP. As usership grows and Reveal becomes more distinct from OpenSRP, it may need its own Confluence cloud-based, community license.

- *Owner: Akros*
- *Output: Migration onto separate, stand-alone, community-license Confluence site.*

Activity 1.1.6: Create Jira securities for community members. Currently Reveal project implementers can add tickets in Jira and view relevant pages. In tandem with the Confluence documentation restructure, we will create user roles for community members that can view the appropriate pages in Confluence as well as have the appropriate view/edit privileges for Jira tickets.

- *Owner: Akros*
- *Output: Jira/Confluence profile access information; to be made public on Akros website.*

Objective 1.2: Define and build a technical documentation library

Activity 1.2.1: Hire technical writer; s/he will sit with Akros part time and be seconded to sit with the core development team part time. A candidate for this position will be contingently hired in the final application stage.

- *Owner: Akros*
- *Output: Writer hired*

Activity 1.2.2: Finalize full list of documents needed. The technical writer will sit with all teams - product management, implementation, core developers, ancillary and support developers, to understand and prioritize the technical documentation needed to inform the two packages that will be delivered.

- *Owner: Akros*
- *Output: Master Documentation List (prioritized and packaged)*

Activity 1.2.3: Restructure and reorganize Confluence wiki page. All documentation will be stored on the wiki, so it needs to be logically organized

- *Owner: Akros*
- *Output: Site Product Map for Wiki*

Activity 1.2.4: Write new documentation including software architecture and design, source code documentation, UX/UI design style guides, API documentation, product maps, and others.

- *Owner: Akros*
- *Output: Documentation Package 1*

Activity 1.2.5: Update testing documents and product or business requirement documents, and write any additional new documentation.

- *Owner: Akros*
- *Output: Documentation Package 2*

Work package 2: Alignment with OpenHIE product architecture and data exchange requirements

Objective 2.1: Align product packaging with OpenHIE standards

Reveal product packaging needs to align with OpenHIE architecture standards. We will improve the server strategy and definition of configuration files for the Reveal reference product, ease the launch of Reveal development environment to enable quick-start development projects with packaging scripts, expand testing strategy to accept contributions from other projects, add code to configuration files to increase what can be turned on/off by a system admin, and design and test (through a third party) a containerized deployment approach.

Activity 2.1.1: Architect and modify the Reveal platform to allow for the development environment and the production platform to be created as containers (packages code and all its dependencies so the application runs quickly and reliably from one computing environment.)

- *Owner: Appstack*

- *Output: Containerized Development Environments and Production Platforms POC*

Activity 2.1.2: Create a container deployment process to be managed within/by Container Cluster Management Software, which will allow for fast access to development environments and a less resource intensive deployment process (in terms of time)

- *Owner: Appstack*
- *Output: Containerized Deployment Pipeline (CI/CD)*

Activity 2.1.3: Iterate on current configurability work to further enhance the scope of configurable levers: Add to configuration files to increase the scope of functionality and look and feel that can be turned off by a system admin

- *Owner: Ona*
- *Output: Increased configuration coverage*

Objective 2.2: Build and test a data exchange process

*We will prove **data exchange** by building an API to create aggregates aligned with IHE ADX Technical Framework, and set up a test server aligned with HL7 FHIR to demonstrate data exchange per relevant workflows in 6.2 Aggregate Reporting, 6.4 Care Services, 6.5 Patient Identity Management Workflows, and 6.6 Shared Health Record.*

Activity 2.2.1: Expand and enhance the existing OpenSRP API to fully satisfy the HL7 FHIR interoperability standard, as well as, align with IHE ADX Technical Framework. Demonstrate the success of the enhancement through a fully functioning Integration POC with a system that employs the same interoperability standards. We envision a integration with an existing DHIS2 instance being the reference POC

- *Owner: Ona*
- *Output: Integration POC (Inclusive of relevant documentation).*

Activity 2.2.2: Create an separate test instance to facilitate the sign off of the Integration POC

- *Owner: Ona*
- *Output: Akros UAT environment*

Work package 3: Execute performance testing to improve tool benchmarking

Objective 3.1: Execute two rounds of performance load testing

*Two rounds of performance testing will set initial benchmarks for performance to better support **scalability**. Load testing could be done in isolation or may piggy-back on existing implementations. Load, stress, soak and scalability testing are some of the test types included when undertaking performance. The primary requirement focus of this work package will be load testing and the benchmarking of transactions that can be used to compare future releases with. Some stress testing will be included to verify system performance at and possibly beyond normal load conditions per projected future business growth.*

Figure 1: Performance Testing Methodology

Activity 3.1.1: Discovery - Create a Performance test plan outlining environment and approach for the overall execution of the tests. Demonstrate the success of the approach through a functioning Performance Testing Proof of Concept (POC)

- *Owner: Inspired Testing*
- *Output: Performance Testing POC (Inclusive of relevant documentation)*

Activity 3.1.2: Script Design and Development is the process of designing test scripts and execution scenarios in a systematic manner. Final script preparation and execution of specific activities aimed at preparing for test execution.

- *Owner: Inspired Testing*
- *Output: Performance Testing Automated Scripts*

Activity 3.1.3: The test execution process involves evaluating or scrutinising the system through the execution of the test scenarios identified and prepared in the previous phases. Execution may include cycles of test execution.

- *Owner: Inspired Testing*
- *Output: Performance Testing Baseline Results*

Activity 3.1.4: The results of the testing, Inspired Testing's finding and recommendations captured in the detailed closeout report. May include a "*lessons learnt"* workshop and formal closeout meeting.

- *Owner: Inspired Testing*
- *Output: Formal Performance Testing Report*

Community Feedback

The Reveal consortium currently runs our own quarterly "Reveal Forum, whose members will be an integral part of the feedback process throughout this grant. We are also already a member of several international digital health communities and will be using these networks to solicit specific feedback at strategic points in the work (Table 1). As most of these communities meet monthly and offer opportunities for presentations, we will seek to present on the specific topics/deliverables on which we would like feedback. Table 1, below, outlines how we plan to engage with each community, listing the specific deliverables we will be sharing with each. The timing of this feedback is expected to fall within the deliverable feedback periods listed on the schedule, below.

Per the Reveal Catalytic Implementation Model, Akros conducts weekly meetings with each of the teams actively implementing Reveal in different countries across the world, and will also use these meetings as an opportunity to solicit ad-hoc feedback on this work. These teams will largely be able to weigh in on the user stories, the community engagement strategies, and the load testing scenarios. Additionally, these implementing teams are invited to Reveal Forum meetings.

We anticipate the Reveal community will be expanding throughout the duration of this work through additional implementations; this means not only having access to additional implementers with more contextual-country knowledge, but also means we will be onboarding new development teams to support these implementations. These teams will receive technical documentation as it is developed so that we can rapidly assess if the documentation is effective and iterate as needed.

Table 1. Communities and resources from which to solicit feedback

Community	**Purpose**	**Meeting Frequency**	**Feedback/Expected inputs**
Reveal Forum	Discussion amongst partners interested in	Quarterly	Present user stories and approach to work for a) clarification or addition to user

	the Reveal platform, for learning across the community, capturing user stories and feedback to inform the Reveal Roadmap.		stores and b) inputs on proposed strategy. Gather inputs and co-design updates to Reveal SDLC Circulate load testing scenarios and benchmarking to implementers to vet applicability.
Digital Solutions for Malaria Elimination (DSME)	"Community of technology organizations, implementers, and subject matter experts who use, develop, or support digital tools in country-led efforts to eliminate malaria"	Monthly (Community Call)	Present initial Master Documentation List, Help Service Desk Protocols and planned technical documentation packaging during community call. Present user stories and approach to work for a) clarification or addition to user stores and b) inputs on proposed strategy.
OpenSRP Community	Community of collaboration for implementers and developers contributing to OpenSRP	Monthly	Present packaging process approach for input and to understand how others have handled the approach with OpenSRP.
NetHope Solutions Center	Resource center and community to collaborate and learn about ICT practices in development.	Monthly (ICT4D Conference Webinar Series)	Present community engagement strategy during webinar for input and suggestions
Digital Impact Alliance (DIAL) (Not a community, but a resource)	Partnership that provides resources, guidance and support to improve digital technology incorporation into development, in accordance with the SDGs.	Ad-hoc	Consult as a resource for technical standards, ad-hoc as need arises
OpenHIE community	Community of practice aimed to "improve health of underserved through...collaborative... health information sharing architectures"	Ad-hoc	Present or consult on planned data exchange and product package, within scheduled time frame, below.
Health Data Collaborative	Aligns technical resources to country owned strategies and plans for collecting, storing, analyzing and using data to improve health outcomes.	Monthly	Present or consult on planned use case support and illicit feedback and direction from donors and country stakeholders.

Schedule

Activity	Team Location Month/ Quarter	August (pre-award)	[Month/Quarter] September	October	November	December	January	February	March	April	May	June
Work planning	All, remote		x									
Work package 1 - Global Good Maturity Model												
Objective 1.1 - Expand Public Engagement												
1.1.1 Incorporate community inputs in SDLC	Akros, Zambia											
Update to incorporate community channels	Akros, Zambia		x	x	x	x						
Present and get feedback from Reveal Forum	Akros, remote						x					
(Deliver) Publicize SDLC, Jira Processes, and overview of Community Engagement Process (section in Reveal Roadmap) on Confluence and revealprecision.com	Akros, Zambia							x				
(Review) Open period for ongoing feedback	All, Reveal Forum, remote							x	x	x		
(Deliver) Publicize revisions based on feedback	Akros, remote										x	
1.1.2 Formalize and publicize service desk protocols	Akros, remote											
(Review) Share and request feedback from live Reveal implementers	Akros, various			x	x	x	x					
Update based on feedback	Akros, Zambia					x	x					
(Deliver) Publicize protocols on Confluence and revealprecision.com	Akros, Zambia							x				
(Review) Open period for ongoing feedback	All, DSME, remote							x	x	x		
(Deliver) Publicize revisions based on feedback	Akros, Zambia										x	
1.1.3 Open Reveal Forum to public	Akros, remote											
Host meetings quarterly	Akros, remote	x				x				x		
1.1.4 Host annual spatial intelligence workshop	Akros, location tbd											
Prepare and solicit collaborators and presenters	Akros, remote		x	x								
Host meeting	Akros, location tbd				x							
(Deliver) Publish meeting summary report on revealprecision.com	Akros, remote					x						
1.1.5 Evaluate Confluence licensing	Akros, Zambia											
Project usership through current and prospective implementations and market research	Akros, Zambia			x	x							
Move to new license (if needed)	Akros, Zambia							x				
1.1.6 Create community Jira securities	Akros, Zambia											
Evaluate types of community user roles	Akros, Zambia				x	x	x					
Create user access roles	Akros, Zambia							x				
(Deliver) Publicize access on revealprecision.com	Akros, Zambia							x				
Objective 1.2 - Technical Documentation Library												
1.2.1 Hire technical writer	Akros, Zambia	x										
1.2.2 Finalize documentation list	Akros, Zambia											
Gather existing documentation	Akros, Zambia		x									
Scope needs with each team	All, various		x									
(Review) Circulate draft documentation list for feedback	All, DSME, various			x								
(Deliver) Publicize Master Documentation List on Confluence	Akros, Zambia			x								
1.2.3 Restructure Confluence wiki	Akros, Zambia											
(Review) Gather feedback from users on ease of use, intuitiveness	All, Zambia		x									
(Deliver) Publicize Wiki Site Product Map on Confluence home page	Akros, Zambia			x								
1.2.4 Write new documentation	Akros, Zambia											
Working sessions with developers	Akros, Ona, Kenya			x								
Draft documents created	Akros, Zambia			x								
Internal developer review	Ona, Kenya				x							
(Review) Draft package shared with stakeholders	Akros, all communities, Zambia				x							
(Deliver) Documentation Package 1 publicized on Confluence	Akros, Zambia					x						
(Review) Open period for ongoing feedback	All, various						x	x	x	x	x	
(Deliver) Finalize changes to Documentation Package 1	Akros, Zambia											x
1.2.5 Update existing documentation and write new	Akros, Zambia											
Working sessions with developers	Akros, Ona, Kenya						x					
Draft documents created	Akros, Zambia						x					
Internal developer review	Ona, Kenya							x				
(Review) Draft package shared with stakeholder	Akros, all communities, Zambia							x				
(Deliver) Documentation Package 2 publicized on Confluence	Akros, Zambia								x			
(Review) Open period for ongoing feedback	All, various									x	x	
(Deliver) Finalize changes to Documentation Package 2	Akros, Zambia											x

Work package 2 - Alignment with OpenHIE												
Objective 2.1 - Product Packaging												
2.1.1 Architect platform to work with docker	AppStack, South											
Scope detail and effort	AppStack, South Africa			x	x							
Execute development, test, and iterate	AppStack, South Africa					x	x	x				
(Deliver) Containerized dev environment and production platforms POC (as measured through meeting of test criteria on tickets)	AppStack, South Africa								x			
2.1.2 Create container deployment process	AppStack, South											
Scope detail and effort	AppStack, South Africa			x	x							
Execute development, test, and iterate	AppStack, South Africa					x	x	x				
(Deliver) Containerized deployment pipeline (as measured through meeting of test criteria on tickets)	AppStack, South Africa								x			
2.1.3 Iterate on configuration files	Ona, Nairobi											
Scope detail and effort	Ona, Nairobi			x	x							
Execute development, test, and iterate	Ona, Nairobi					x	x	x	x			
(Deliver) Increased configuration coverage (as measured through meeting of test criteria on tickets)	Ona, Nairobi								x			
2.1.4 Define server-strategy and test	Ona, Nairobi											
Develop architecture and costing for multi-instance (Test, Build, Prod) support	Ona, Nairobi				x	x						
Build multi-instance POC server	Ona, Nairobi						x	x				
(Deliver) Test containerized deployment on multi-instance server through third party cloud	Ona, Nairobi								x			
Objective 2.2 - Data Exchange												
2.2.1 Enhance OpenSRP API to include Reveal-	Ona, Nairobi											
Scope detailed reports consistent with IHE IDX workflows	Ona, Nairobi		x	x	x							
(Deliver) Mock-ups of incoming and outgoing reports	Ona, Nairobi				x							
Execute development, test, and iterate	Ona, Nairobi					x	x					
(Deliver) Integration POC with documentation	Ona, Nairobi							x				
2.2.2 Create test implementation instance	Ona, Nairobi											
Identify implementation opportunities for testing	Akros, Zambia	x	x	x	x							
Scope integration	Ona, Nairobi					x	x					
Execute development, test, and iterate	Ona, Nairobi							x	x			
(Deliver) Functioning Akros UAT environment	Ona, Nairobi										x	
Work package 3 - Performance testing for benchmarking												
Admin												
Objective 3.1- Performance Load Testing												
3.1.1 Discovery Phase - Create test plan	Inspired Testing, South Africa											
Scope implementation environments to designate necessary tests	Inspired Testing, South Africa		x									
Create a plan outlining the approach for testing	Inspired Testing, South Africa		x									
(Deliver) Build a functioning performance testing POC with documentation	Inspired Testing, South Africa			x								
3.1.2 Script Development	Inspired Testing, South Africa											
(Review) Incorporate any feedback on POC	All, various		x									
Create and refactor auotmated performance testing scripts	Inspired Testing, South Africa		x									
Setup and configure testing tool	Inspired Testing, South Africa			x								
Execute single-user scenarios to validate individual scripts	Inspired Testing, South Africa			x								
Script Maintenance	Inspired Testing, South Africa					x	x	x	x			
3.1.3 Performance Test Execution	Inspired Testing, South Africa											
Execute testing	Inspired Testing, South Africa			x	x	x	x	x	x			
3.1.4 Reporting	Inspired Testing, South Africa											
(Deliver) Performance Testing Baseline Results midline and final reports	Inspired Testing, South Africa						x		x			

Deliverables

No.	Deliverable	Month/Quarter Due
1	Work Package 1, Objective 1.2 ● Publicize Master Documentation List on Confluence ● Publicize Wiki Site Product Map on Confluence home page Work Package 1, Objective 1.3 ● Build a functioning performance testing POC with documentation	October 2020
2	Work Package 1, Objective 1.1 ● Publish spatial intelligence workshop meeting summary report on revealprecision.com Work Package 1, Objective 1.2 ● Documentation Package 1 publicized on Confluence Work Package 2, Objective 2.2 ● Mock-ups of incoming and outgoing reports	December 2020
3	Work Package 3, Objective 3.1 ● Performance Testing Baseline Results midline (round 1) report	January 2021
4	Work Package 1, Objective 1.1 ● Publicize SDLC, Jira Processes, and overview of Community Engagement Process (section in Reveal Roadmap) on Confluence and revealprecision.com ● Publicize help desk protocols on Confluence and revealprecision.com ● Publicize access to community user login to Confluence Work Package 2, Objective 2.2 ● Integration POC with documentation	February 2021
5	Work Package 1, Objective 1.2 ● (Deliver) Documentation Package 2 publicized on Confluence Work Package 3, Objective 3.1 ● Performance Testing Baseline Results final (round 2) reports Work Package 2, Objective 2.1 ● Containerized dev. environment and production platforms POC (as measured through meeting of test criteria on tickets) ● Containerized deployment pipeline (as measured through meeting of test criteria on tickets)	March 2021

	● Increased configuration coverage (as measured through meeting of test criteria on tickets) ● Test containerized deployment on multi-instance server through third party cloud	
6	Work Package 1, Objective 1.1 ● Publicize revisions based on feedback to deliverable 4 Work Package 2, Objective 2.1 ● Functioning Akros UAT environment	May 2021
7	Work Package 1, Objective 1.2 ● Finalize changes to Documentation Packages 1 and 2 based on feedback	June 2021

Global Good Maturity Model Assessment

Reveal specific assessment is here:
https://docs.google.com/spreadsheets/d/1Z4QFCCklGVF7dc4HWGHsU6XzRpKOXq2cR6btC0Ju5fs/edit#gid=0