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Proposal to fund interoperability across 3 open source health projects under LibreHealth to improve user experience, support training and scale digital health solutions.

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Executive summary

LibreHealth is an umbrella organization of open source health information systems projects under the fiscal sponsorship of the Software Freedom Conservancy (SFC). LibreHealth was formed in 2016 so that individual digital projects may get equal visibility to the community members as well as to evolve as a single destination that showcases best open source practices
for the health IT needs of low-resource settings and to help reduce the cost of healthcare over all.

LibreHealth currently has 3 projects – LibreHealth Toolkit (which is adopted from OpenMRS) to provide a base platform for digital innovations, LibreHealth Electronic Health Record (LibreHealth EHR) and LibreHealth Radiology Information System (LibreHealth RIS). Core to LibreHealth is a shared infrastructure for all projects, education and training support and diversity for community support.

Our mission to serve as a common home for open source digital health products eliminates waste and redundancy that occurs when end users are forced to adopt multiple end products. Particularly in low-resource settings, this silo approach has caused severe hardships such as the dependence on foreign actors, lack of actionable information and poor health outcomes due to
lack of continuity of care.

Despite the benefits reaped from LibreHealth, we have firsthand experience that distributing multiple digital health products is not enough. We need to seamlessly transition and integrate between our projects. This would shield the user from the burden of maintaining complex health systems and frees their time to focus on improving patient care.

All code will be open source, made available under the appropriate licences for the component projects, ie: Mozilla Public License, Gnu Public License v2+ and Apache License v2.

Three proposals follow, each would go a long way to reaching our interoperability and sustainability goals.

Proposal Priority and Funds distribution

The next pages contain three separate proposals, prioritized as requested. Should any of the following be funded all grant money should be paid to Software Freedom Conservancy on our behalf and attributed to the LibreHealth project for this purpose.

Proposal Priority #1

Natural Language Processing for Clinical Progress Notes

The LibreHealth Project seeks to strengthen our projects ability to serve the clinical and educational user base by adding interfaces to cTakes, a well known, open source, Natural Language Processing service for clinical data. This project will be further improved by using ActiveMQ asynchronous communication (also open source) as one of the protocols for sending and receiving secure progress notes and the cTakes resulting coded data.

NLP support will allow clinical users to improve the ability to report and track quality, outcomes and issues, while (ideally) letting the clinician enter progress notes in a more textual and comfortable format. The educational users can use de-identified progress notes data from real providers to do research and classroom simulations in conjunction with the NHANES based clinical data we are currently using.

cTakes interface NLM area of focus

- Collect and De-Identify a large number of Progress notes from several provider's existing EHR. These will be used both for testing and as a basis for the educational use cases. We have agreements in hand for this data.
- Develop export interfaces from LibreHealth EHR, RIS and Toolkit to send freeform notes to a cTakes instance, which then uses NLMS to map terms and temporal relationships.
- Map cTakes results to discrete data elements in the EHR, RIS and Toolkit data structures.
- Create services for managing the import/export data using best practices for scalability with ActiveMQ and cTakes projects.
- QA, Testing and Documentation.

Budget and high level Plans

Using existing volunteer and vendor resources the funds will allow a spike in development to accomplish the above focus areas in the next 2-3 months.

Success will be demonstrated when the project can show that freeform/text based progress notes from the EHR, RIS and toolkit in real time and receive, map and import the discrete data into their databases such that they information is available in "normal" views from the user's perspective.

Side benefits to this project include core infrastructure to use ActiveMQ for other information communication needs, such as peer-to-peer and doctor-patient data sharing.

Project Priority #2

Containerization of the LibreHealth EHR Platform

The EHR platform is a large application that is used and frequently distributed as a full web stack installation. Installation and setup typically requires a technically savvy user to install all the dependencies, ie: OS, mySQL server, web server, PHP, etc. While there have been both prebuilt VM distributions as well as Windows XAMPP style bundles, these are not typically easy to secure, resilient and scalable.

This project proposes to rework core structure of the EHR so that it can be deployed as a series of containers using common container management standards, such as Kubernetes.

Containerization Key Areas of Focus

- Cleanly separate PHP/HTML/Javascript Application code from backend services
- Modify document storage to use server (file or database) outside of the application container.
- Modify all configuration data to be stored outside of the application container
- Create containers and container deployment models
- Create Kubernetes, Puppet, Chef or similar management tools to allow easy creation, scaling and deployment
- Document the model and deploy the EHR demo and test sites using the new model

This new model will allow the project to grow by taking advantage of current industry trends in scaling and deployment. Other projects that support one-click installations of services could then adopt the EHR and help spread the use more broadly to more users.

Budget and high level Plans

Using existing volunteer and vendor resources the funds can will allow a spike in development to accomplish the above focus areas in the next 2-3 months.

Success will be demonstrated by the project's ability to deploy a fully containerized version of the EHR and subsequently take the lessons learned and apply them to the other Librehealth project code bases.

Project Priority #3

Implement the core FHIR resources as a service for all current Projects

1. Adopt FHIR, an open standard for health data exchange, across all our current projects
2. Implement FHIR's RESTful services and use its information model across projects
3. Build web components against FHIR endpoints that are shareable between all projects.

Once successful with the grant phase, we would then be able to embark on phase II of the project to build a single marketplace where we can package and distribute products to meet end user needs. By improving the pipeline of distribution we hope we can reduce the burden of bringing on new projects to LibreHealth as well as impact the end user by improving the flexibility and user interfaces. In the past we have worked on such projects using Google Summer of Code students and also graduate students conducting independent study. We hope that we can meet our first two objectives before the next Google Summer of Code for 2018, and hence provide a base for new students to work on for phase II of the Project.

Proposed Budget and high level plan

We already have a volunteer team of core developers across all 3 projects. By using the funding, we will do a code spike for Interoperability that implements FHIR and provides basic developer toolkit that allows for development of web components using JavaScript and mobile responsive languages.

We plan to extend the developer toolkit to include training modules for new developers

Success

Our primary output measures include

1. Major FHIR based release of LibreHealth Toolkit, LibreHealth RIS and LibreHealth EHR
2. Software Development Kit for building web components against FHIR
3. Number of web components developed

A later goal is to assess successful integration of the phase I component with Google Summer of Code student projects to provide a single marketplace of LibreHealth digital tools for end users.