EtherCIS: Enterprise Clinical Data Repository - built to world leading openEHR standard http://ethercis.org

Submitted by Tony Shannon (Ripple Foundation) on January 18, 2018 - 2:17pm
Last revised by Web Producer on June 21, 2018 - 3:09pm.

Proposal Status: Review Complete

Executive Summary

Healthcare IT at present is simply not good enough and the challenge of building Guideline Based, Workflow Integration, Electronic Health Records at scale is one of the grand challenges of our time. The current state of disconnected siloed proprietary healthIT systems is perhaps the key issue facing the sector, adversely impacting clinicians at the frontline and impacting the care process.

EtherCIS is an open source Enterprise Grade Clinical Data Repository, built to comply with the leading international Electronic Health Record standard known as openEHR. This world leading open source reference implementation of openEHR in action has been supported by the non profit Ripple Foundation, England, that is promoting and supporting the adoption of an open health and care platform to transform 21st Century health care. Designed with the complexity of healthcare in mind, it aims to support the challenge of persisting structured clinical data to the vendor and technology neutral openEHR standard, while also supporting unstructured data. In particular a key aim of the EtherCIS development is to grow the international community that wish to work towards a vendor and technology neutral platform in healthcare. bit.ly/openplf

The Ripple Foundation wish to offer the open source openEHR compliant EtherCIS framework to the Global Goods Digital Health Initiative on the basis that it is the leading open source reference implementation of openEHR, internationally. The openEHR architectural standard for Electronic Health Records offers Digital Square the world's leading open standard for the specification and development of Electronic Health Records that is vendor and technology neutral, as the essential basis for Guideline Based, Workflow Integrated, Digital Healthcare.

While we understand and expect the Global Goods initiative could/should will offer a broad range of tools, given the adverse impact that diverse proprietary data formats   have at the frontline of healthcare, we advocate that the world's leading open standard for Electronic Health Record development, i.e. openEHR is a key element needed in the transformation of the global health IT sector to a vendor and technology neutral open platform, so we now wish to share EtherCIS with the wider world as a Global Good. The primary outcome we seek is the broader adoption of an open EHR platform that bridges the current gap between clinical innovators and the health IT development community and the wider health IT industry. The secondary outcome we seek is a library of easily shareable library of interoperable EHR components (ie openEHR archetypes and templated) that can be widely shared around the world.

Consortium Team

The team behind the EtherCIS is based with the Ripple Foundation, London, England. The Ripple Foundation   was born in Leeds, England in 2015 out of lessons from the multi-billion £ NHS National Programme for IT as well as lessons from the frontline in the busy Leeds Teaching Hospitals NHS Trust & Leeds City area. The Ripple Foundation was established as a non profit foundation Community Interest Company (C.I.C.) in 2016 to further the mission towards an open platform in healthcare. The EtherCIS framework is one of 3 key open source tool sets that the Ripple Foundation is supporting as part of its mission towards an open platform in healthcare. bit.ly/openplf

The makeup of the team that is supporting EtherCIS and would lead on this project is as follows.

- Dr Tony Shannon, Director/Architect, Ripple Foundation

  - Emergency physician by background and Clinical Lead behind the EtherCIS framework, with an interest in healthcare reform, improvement and an open platform to support the clinical frontline. Main point of contact

- Phil Barrett, Head of Development, Ripple Foundation

  - Co Director of the Ripple Foundation and passionate advocate for change in the health IT market. Oversees those projects that Ripple Foundation support.

- Christian Chevalley, Technical Architect & Lead Developer EtherCIS

  - Many years of experience in healthcare IT across the Europe and Asia, with many years working with enterprise grade database technologies. Lead Developer and Technical Architect on the EtherCIS Clinical Data Repository

- Seref Arikan, Quality Assurance Lead, EtherCIS

  - Oversees the test coverage and continuous integration technologies that underpin EtherCIS

- Dr Ian McNicoll, Clinical Information Models Lead/CoChair, openEHR Foundation

As the development of an open platform to transform 21st Century Healthcare is key to the Ripple Foundations mission, we are actively seeking collaborators with us during this project.

Project Description

The openEHR standard   http://openehr.org/   and the open source EtherCIS   http://ethercis.org/   implementation offers a powerful approach to the complex challenge of information modelling and data persistence in healthcare, which may be explained as follows.

- To address the huge problem of diverse clinical applications that have been built in healthcare that are not interoperable with one another, the openEHR specification outline an approach to the key kernel of healthcare applications that is vendor and technology neutral, known as openEHR archetypes

- openEHR archetypes are best understood as clinical information models, i.e. data sets crafted and curated by clinical authors, using a maximum (not minimum) dataset approach. This approach allows clinical leaders to coral clinical opinion together around common clinical concepts such as Diagnosis, Medications, Allergies, Blood Pressure etc, where clinical needs vary but all will input into the maximum dataset

- openEHR templates then reuse these archetypes for a particular purpose, for instance an Emergency Department checklist, or an Operation Note or particular clinical setting (eg Cardiology Clinic Template). They do so by combining reusable archetypes while constraining the datapoints that are not needed for that particular purpose.

- openEHR archetypes and templates work very well with other key standards such as terminologies (eg SNOMED CT) and classification systems (eg ICD 10) as well as messaging/interchange standards such as HL7 FHIR/CDA etc

- These clinical information models are built to be independent of both the applications that may leverage all these helpful

models, as well as the database technology used to persist them (eg SQL/NoSQL) with an Archetype Query Language (AQL). In that sense the openEHR ecosystem is a bit like the Android ecosystem, independent of the hardware as well as allowing freedom of the software that can be built on top

- Adaptable to different countries and contexts - at this time a clinical team has overseen the input of over 1800 individuals from over 90 different countries in the international openEHR Clinical Knowledge Management effort run online at http://openehr.org/ckm/, while openEHR already powers EHR solutions from Brazil to Moscow

- EtherCIS as the leading open source openEHR implementation bridges the gap between clinically authored openEHR content and technical developers comfortable working with approaches such as web/REST APIs

- Open sourced, publicly and freely available online, all openEHR content is licensed under a Creative Commons Attribution-ShareAlike 3.0 licence, while EtherCIS is licensed under the leading Apache 2.0 license

Our proposal is a focused one on introducing the leading work of the openEHR community into the Digital Square Global Goods/Digital Health mix with the introduction of EtherCIS. In particular we would like to explore its potential in the context of the thought leading Standards Based/Implementable/Interchangeable openHIE Architectural Strategy, which we see as a very good fit with our work https://ohie.org/architecture/#strategy . We propose ;

- Focused review of core international archetypes against global health needs

- Focused test of integrating EtherCIS into the openHIE Interoperability Layer and exploring its utility as a candidate Shared Health Record component.

- Identification of areas for improvement/any gaps that would need to be addressed to ensure EtherCIS ease of use as a powerful vendor neutral data repository.

- Once these improvements have been identified to work with Digital Square to grow the open source community and market of suppliers who are willing and able to address those improvements and gaps and thereby grow the capacity/capability in the challenging area of vendor-neutral and interoperable health record development.

We welcome support on our proposal and look forward to sharing EtherCIS with the wider world as a Global Good.

Proposal in Detail

Introduction

Ripple Foundation is a clinically led not for profit organisation working towards and supporting the move to an open platform fit for 21st century health and care. Supporting open source, open standards and an open architecture that can be used worldwide. Born out of the National Health Service in England and building upon 10+ years expertise (both clinical, business and technical) the team have broad experience with both national, regional and local based healthcare IT implementations.

We are supporting those people who are working to change 21st century health and care. They include clinical, business and technical leaders who have a need and/ or want to service that need.

We are supporting the process of building the community who want to collaborate around this open platform mission. We want to challenge the limitations of the current limited health and care IT market, positively disrupt and move health and care towards a services oriented marketplace.

We are supporting those key technologies that we believe should be open sourced to benefit the health and care world. Ripple Foundation is actively supporting key open platform projects in order to further this mission.

We operate on a free code, free knowledge but paid for support model to help healthcare systems with their move towards implementing an open platform approach. As a non profit foundation, aligned to Digital Square, we recognise the need to encourage and foster organisations (both for and non profit) to provide quality, cost effective services based on an open platform. Our services include:

- Leadership, Strategy & Design

- PMO support

- Education & Training

- Quality Assurance

- Contractual & Communication

We are fully signed up to the Digital Square principles of the need for Global Goods that will transform internationally. We have enjoyed and benefited from this open proposal approach and learned a lot about the current state of healthcare IT across the globe.

With due respect to all those other leaders in this field and their important work, we strongly believe that our carefully considered technologies are ideally placed to enhance this Global Goods mission and are already align well with the thought leading openHIE architectural principles.

We feel there is a real need to mature and further the health IT market, with a set of improvements to existing technologies in the LMIC setting, as well as improvements to those technologies such as our own that have emerged within an HIC setting. Therefore it is our considered opinion that a focused and action orientated set of proposals that aims to compare,contrast, combine and showcase these approaches is in the best short, medium and long term best interests of this Global Goods initiative from Digital Square.

We therefore offer one of three interrelated proposals that would each add value individually and of course when combined would be most beneficial. The specific outcome of this piece of work is a demonstrable showcase of an open platform, that combines the best of LMIC derived and HIC open source technologies. In doing so we believe this can help set solid foundations to which further investment to the global good initiative should be pursued to improve care healthcare across the globe.

In advance of the detail of this application we wish to address one particular point head-on, which is; why invest in new and unproven technology rather than invest in a set of tried and tested set of technologies proven in the LMIC setting? To this important point we politely point out that though we have been advocating open source as a route to healthcare transformation in an HIC setting over the last 10+ years, we have been unable to get support for some of those existing LMIC based technologies in a HIC setting to due to one of three key reasons

1. Usability

2. Integration and interoperability

3. Robust records architecture

All challenges compounded by the vendor lock-in mentality that pervades the HIC health IT landscape.

Therefore, it is our view that any global goods initiative should openly and directly focus on addressing these issues to ensure existing LMIC technologies are continuously improved as well as ensuring a bridge is build between LMIC and HIC innovation in this field towards realising one truly excellent and compelling set of global goods.

This proposal aims towards helping Digital Square realise its Global Goods ambition.

User Stories

1# Medical Officer in LMIC setting

Medical Officer (MO) in a small district hospital in Africa who is responsible for a series of clinics, wards and an operating list, with minimal resources. He/She has an existing internet connection some of the time and is keen to run a more efficient service with an easy to use electronic patient record solution. Most of his/her needs are generic and can be summarised in three areas:

- Running basic business analysis on the patients involved and their outcomes
- The essential running of the clinics, wards and operating lists where groups of patients need to be managed on a daily basis to ensure the smooth running of the service
- Easy to use and navigate patient record system including on mobile devices

While the needs of the service are mostly generic, in order to stay in touch with good medical practice as it evolves at a regional/ national/ international level, the MO involved is keen to ensure the health system application is continually improved and stays in touch with this good medical practice.

There may be insufficient time to develop pathway design at a district hospital level, the MO is keen to obtain weekly/monthly updates and avail of modules of new or improved modules as they become available, from an open platform via their internet connection.

2# Chief Medical Information Officer in HIC setting

A Chief Medical Information Officer (CMIO) based in a medium sized city/region in Europe who is responsible for supporting a wide range of city wide clinics and hospital based wards and surgical operating environments, with reasonable resources, in their publicly funded healthcare system. He/She has a variety of existing health IT suppliers, yet is frustrated by the level of service support and clinical colleagues are frustrated by the poor usability of the systems He/She has been tasked with supporting a much more efficient, patient centred, service with an move towards an easy to use electronic patient record open platform approach in the region Despite the complexity of the size and scale of the

healthcare setting and associated integration challenges, most of the city/regional health IT needs are generic and can be summarised in three areas:

- Running clinical/business analysis on the patients involved and their outcomes

- The essential running of the clinics, wards and operating lists where groups of patients need to be managed on a daily basis to ensure the smooth running of the service

- Easy to use and navigate patient record system including on mobile devices

While the needs of the service are mostly generic, in order to stay in touch with good medical practice as it evolves at a regional/ national/ international level, the CMIO involved is responsible for ensuring that the health system application is continually improved and stays in touch with this good medical practice and makes best use of the public funding.

It is understood that there are a wide variety of disconnected patient pathways across primary, secondary, tertiary care across the city/region, the CMIO officer is keen to work towards an open platform that can be improved with weekly/monthly updates and avail of modules of new or improved modules as they become available, from a global open platform commons via chosen solution.

Use case

These contrasting user stories are outlined to highlight the pressing need for better IT tools across the planet, regardless of the LMIC and HIC setting. Most healthcare systems seek an easy to use platform, integrated and robust data for global reporting

While we appreciate the roots of the Digital Square initiative may be LMIC based, this call is after all, a call for Global Goods, so we are pursuing a goal of an open platform that can be used by all.

- Primary use case of this proposal is to work towards supporting both the health worker in the LMIC setting who has insufficient healthcare IT to meet their needs as well as the health worker in the HIC setting who is frustrated with the poor state of their healthcare IT. In both cases there is a clear and present need for global goods, based on an open platform across the world, leveraging smart principles such as the standards based, interchangeable components approach outlined by OHIE.

- The focus of this related proposal is to progress one of three open source tools that has emerged from a HIC setting and work towards their integration into an LMIC setting so they are aligned with the OHIE effort and leveraged as Global Goods. The tools are based on three key needs at the frontline:

  - Great usability: healthIT that frontline health workers and patients want to use.

  - Easy integration: with existing systems as well as future applications

  - Robust clinical records architecture:to unite clinical efforts around the world

Digital Health Technologies

EtherCIS

EtherCIS as the leading open source openEHR implementation bridges the gap the world leading and comprehensive openEHR standard with a robust open source implementation of this standard , to get it into the hands of healthIT developers around the globe.

openEHR offers the internationally leading open specification for an Electronic Health Record architecture, with a two level information modelling approach that addresses the wicked challenge of national/international standardisation of clinical content (eg measuring Blood Pressure in multiple diverse clinical settings) with the real need for localisation of that content at an organisational/team/user level (eg measuring Blood Pressure in a LMIC Emergency Room setting)

openEHR as a standard and EtherCIS as the leading open source implementation of that standard offers very powerful tools to any one faced with the challenge of building a healthcare IT application. Built with scalability, reusability and maintainability in mind its primary purpose is to offer an EHR architecture to support healthcare workers at the frontline, as a byproduct of this very robust record architecture it greatly aids the challenge of semantic interoperability be that via FHIR/ openEHR APIs or other means.

EtherCIS, as the leading open source implementation of openEHR offers a unique opportunity for the Digital Square to move their Global Goods initiative to learn from and leverage the world leading openEHR architecture for healthcare. We know that the very valuable open source health IT initiatives that have emerged from the LMIC setting are based on a variety of fixed information models, which will limit their utility and adoption outside of this setting. Therefore to combine the learning of the open source and openEHR communities, EtherCIS is the perfect means to combine/contrast between LMIC and HIC learning, methods and tooling in this field and offers a solid means to improve all Global Goods.

The EtherCIS codebase and the openEHR specification are both comprehensively documented and are closely aligned in terms of thought leading technical strategy. That is openEHR benefits from an open source implementation to explore and prove the standard in an open reference implementation, while EtherCIS benefits from the years of international research and development that have gone into developing the openEHR specification.

EtherCIS is open sourced and publicly/freely available online via github and licensed under the Apache 2.0 license.

openEHR content (archetypes , templates etc) are also openly available on github and licensed under a Creative Commons Attribution-ShareAlike 3.0 licence,

Community Feedback on EtherCIS

Amanda BenDor

Could you provide some more information/link to the CDA templates and FHIR resources that are already supported/mapped against the archetypes?

Has there been any interest expressed for EtherCIS in Low and Middle Income Countries (LMICs)? What about adoption of openEHR?

DHIS2 Scott Russpatrick

Ripple Foundation are working on the   OpenEHR   system and architecture which has been developed for hospital EHR in developed settings. They have a wealth of experience and ideas regarding open standards that DHIS2 could utilize for a more patient-centric, interoperable model.

Self-Assessment of the Global Good Maturity Model

see attached

Activities/ Action for this proposal:

The Ripple Foundation team delivering this work, operate on a user centred, Agile development, sprint based methodology. As part of this approach, the team will undertake more detailed preparatory work at the beginning of a project and ahead of each of the 2 week development sprints. Whilst the team are comfortable undertaking back to back development sprints, we have found when working with multiple partners and organisations, that undertaking 1 sprint per month ensures sufficient evaluation and preparatory work to maximise the time in development.

The detail of each of the items highlighted in the sprints below, would be further elaborated and agreed ahead of the commencement of the associated development to ensure user needs and outcomes are clearly defined. Whilst the team would undertake daily standups, sprint retrospectives etc. we would also look to align with broader reporting measures defined by Digital Square in an open and transparent manner.

Title	Activities
Project Startup	Project initiation
	Connection with the oHIE team & technologies
	Clinical Knowledge Manager review kickoff
Sprint 1	Integration with JEMBI
Sprint 2	Online Demo of
	PulseTile & QEWD & EtherCIS connected to
	JEMBI
	With test data

Project closure / knowledge transfer	Online Training Materials	
	Technical overviews of the tools used to aid knowledge share	
	Project closure report	

NB Dependency: On cooperation from openHIE (JEMBI) technical team to provide a test environment with access to their APIs

Workplan - Project deliverables

Upon completion of project, the team will have delivered the following:

- An online demonstrator of Global Goods in action, based on the oHIE model utilising PulseTile/QEWD/EtherCIS
- Showcase test environment integrations with the following existing Global Goods:
  - JEMBI
- Open Source code - released under an Apache 2.0 license
- Free and openly available documentation and learning materials
- Knowledge transfer to any interested within the Digital Square ecosystem
- Project report of work undertaken, lessons learned and proposed next steps

Workplan - Schedules of Milestones

#	Milestone	Example timings
Month 1	Project initiation	e.g. May 31st 2018
Month 2	Sprint 1 (as per Sprint plan above)	e.g. June 30th 2018
Month 3	Sprint 2 (as per Sprint plan above)	e.g. July 31st 2018
Month 4	Project Close, Report & Knowledge Transfer	e.g. August 31st 2018

NB This proposal is one of three related proposals , all related to the 3 key tiers of the Ripple showcase stack, towards an open platform.

Those 3 proposals are for;

PulseTile: Transforming Usability in Healthcare: http://www.pulsetile.com

QEWDjs: Quick/Quality Easy/Enterprise Development & Integration for Healthcare: http://qewdjs.com/

EtherCIS: Enterprise Clinical Data Repository - built to world leading openEHR standard http://ethercis.org

On its own this proposal offers a unique yet valuable asset to the Global Goods initiative.

When combined with another/all three, these offer a major contribution to the Global Goods initiative, in particular these offer a way to combine the efforts and expertise of the open source health IT community from both LMIC and HIC backgrounds towards truly groundbreaking global goods.

Budget Narrative for EtherCIS proposal

Key support	Days
Strategy and Clinical leadership- Dr Tony Shannon -	8
Programme Management and oversight - Phil Barrett -	6
QEWDjs Integration - M/Gateway Ltd -Rob Tweed	15
EtherCIS development - Adoc Software Development -Christian Chevalley	17
Clinical modelling - FreshEHR ltd- Dr Ian McNicholl	10

Total Budget	USD $ 69,872

See attached budget narrative for more information, the detailed project budget has been submitted to Digital Square

NB This budget has been prepared as a standalone project , while 1 of 3 proposals. It can be expected that significant savings could be achieved across the 3 projects if these platform components could be funded together

Supporting Documents: ethercis_digital_health_software_global_good_maturity_model_-_selfassessment2018march_v2.xlsx
EtherCIS Budget Narrative