

# QEWDjs: Quick/Quality Easy/Enterprise Development & Integration for Healthcare:

## <http://qewdjs.com/>

Submitted by Tony Shannon (Ripple Foundation) on January 18, 2018 - 2:13pm

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**Proposal Status:** [Review Complete](#)

## Executive Summary

Healthcare IT at present is simply not good enough and poor integration/interoperability is one of the key issues facing the sector, adversely impacting clinicians at the frontline and impacting the care process.

QEWDjs is an open source web development and integration framework, grown out of work with the VistA Electronic Health Record programme in the USA, 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 leverages key patterns in healthcare to deliver an integration framework based on ubiquitous web technology (Javascript and NodeJS) and is aimed at being easy to use.

The Ripple Foundation wish to offer the open source QEWDjs derived QEWD-Ripple framework to the Global Goods Digital Health Initiative on the basis that it offers a uniquely useful integration framework for healthcare, that could be the basis of an open online integration commons/store framework that could support healthcare developers around the globe, and has specifically been developed to be;

- Easy to implement and scale- QEWDjs leverages the language of the web, Javascript - can run on a Raspberry Pi microcomputer, while being very capable of supporting the big integration challenges in healthcare across a secure federation of organisations.
- Adaptable to different countries and contexts - by leveraging the ubiquity of Javascript, and its vast international community, along with the powerful Universal DB technology that powers key medical software today ("[MultiDimensional Global Storage](#)") QEWDjs is uniquely placed to simplify and support many healthcare integration challenges today.
- Supports interoperability engine capability with other technologies via standard web based technologies (RESTful APIs, Websockets) plus leverages the multitude of adaptors/connectors available on the world's largest software registry known as NPM
- Open sourced, publicly and freely available online, under the leading Apache 2.0 license

While we understand and expect the Global Goods initiative could/should will offer a broad range of tools, given the critical role that integration plays at the frontline of healthcare, we advocate that a simple, helpful, web development and integration framework to support software developers at frontline of healthcare, such as QEWDjs, is needed to transform the global health sector, so we now wish to share the open source QEWD-Ripple framework with the wider world as a Global Good. The primary outcome we seek is an integration framework in healthcare that healthcare developers want to use. The secondary outcome we seek is a library of easily shareable library of interoperability components that can be widely shared around the world.

## Consortium Team

The team behind the QEWDjs technology and Qewd-Ripple framework 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. QEWDjs and the Qewd-Ripple 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](http://bit.ly/openplf)

The makeup of the team that is supporting QEWDjs/QEWD-Ripple 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 QEWDjs/Qewd-Ripple 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.
- Rob Tweed, Technical Architect & Lead Developer QEWDjs
  - Many years of experience in healthcare IT across the US and the UK, with many years working with integration and database technology in both the web and healthcare. Lead Developer on the QEWDjs technology and the Technical Architect behind the QEWD-Ripple framework used by the Ripple Foundation.
- Alexey Kucherenko, Quality Assurance Lead, QEWDjs
  - Oversees the test coverage and continuous integration of QEWDjs.

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 QEWDjs technology has been developed as a quick and easy/quality enterprise development framework for the modern age, while the related QEWD-Ripple framework simply uses that technology in the context of a modern healthcare application stack, i.e. the Ripple Showcase Stack. QEWDjs and Qewd-Ripple has been developed as a powerful yet lightweight integration technology that can be reused for multiple purposes in healthcare, such as a Person Held Record app, an Electronic Patient Record application or a broad and deep Electronic Health Record that can span a city/region/country.

The background, rationale and the design and development of the QEWDjs framework are explained on the website & comprehensive documentation site. <http://www.qewdjs.com/>

The background explanation for the use of QEWDjs within the Ripple Showcase Stack (QEWD-Ripple) is that most health IT developments

quickly require some degree of integration once they move into production. Most/all integration technologies on the market today are large, complicated/comprehensive technologies that are non-trivial to learn/get started with and expensive to scale/maintain.

As integration was a key requirement in the Ripple Foundations open source showcase stack in healthcare, QEWDjs was chosen to fulfil the requirement of a quick and easy technology for healthIT novices to get started with (using the hugely popular Javascript and NodeJS) , while being capable of scale of quality at an enterprise level when appropriate.

<http://docs-showcase.ripple.foundation/qewd-ripple-explained.html>

Our proposal is a focused one on improvements we can make to the open source Qewd-Ripple framework to ensure its value to the global community as a Global Good is increased. In particular we would like to explore its potential in the context of the thought leading openHIE initiative and its Standards Based/Implementable/Interchangeable openHIE Architectural Strategy, which we see as a very good fit with our work <https://ohie.org/architecture/#strategy>

- Integration within the context of existing Digital Health technologies

The Ripple Foundation are already using QEWD-Ripple to support key integration with legacy healthcare systems as well as the latest FHIR and openEHR based systems. We believe that this powerful yet lightweight integration framework for healthcare is already capable of being reusable anywhere in the world.

In the first part of this project proposal we propose testing its versatility, power and potential to quickly integrate with existing digital health technologies such as the [openHIE reference technologies](#), with QEWD-Ripple as the Interoperability Layer.

As part of that trial we would welcome views from others as to how the power and potential of this leading edge technology can be improved and any gaps that need to be addressed.

Once these improvements have been identified we are keen 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 healthcare integration

- Compare/Contrast/Improve with existing/other Integration Ready Global Goods -

Once again in line with the Implementable & Interchangeable principles of the OHIE Architecture, we would suggest a focused piece of work exploring the overlap/differences between the approach taken to healthcare integration and another leading edge open source integration technology such as openHIM, in particular how to connect these technologies as well as to compare their approaches to connectors/mediators.

We welcome support for our proposal and look forward to sharing QEWDjs /QEWD-Ripple 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

### QEWDjs

QEWDjs is an open source web development and integration framework, supported by the non profit Ripple Foundation. Designed with the complexity of healthcare in mind, it leverages key patterns in healthcare to deliver a lightweight yet robust integration framework based on ubiquitous web technology (Javascript and NodeJS) and is aimed at being easy to use.

The name QEWDjs can be explained as both Quick and Easy as well as Quality and Enterprise grade.

QEWDjs primary purpose in the Ripple framework setting is to act as an integration middleware technology between the UI framework (PulseTile) and DB Data Repository (EtherCIS) in our showcase stack. Therefore it excels at supporting data exchange , primarily using a RESTful API approach but well able to support a wide variety of data access and exchange mechanisms via the NPM ecosystem that NodeJS based technologies can leverage. QEWDjs has been tried and tested in our work to support interoperability between FHIR and openEHR services using a lightweight JSON mapping based approach that is showcased here..

<https://www.youtube.com/watch?v=iaGGGgJdWvM&t=0s&list=PLNxHSK29ViKLrrhdPTqbYr6XGTya4uGBv&index=5>

QEWDjs is most akin to the Interoperability Layer in the openHIE architectural model, with significant common ground in thinking with the openHIM technology from Jembi. As our proposal makes clear we wish to connect QEWDjs with a openHIE technology such as openHIM as part of this proposal. We believe that QEWDjs has unique properties that make it an excellent fit for healthcare, including its fit with Global Data Storage technology that has been used in healthcare for years, though poorly explained and now misunderstood.

See here <http://mgateway.com/docs/universalNoSQL.pdf>

In the Ripple showcase stack setting, this aspect is used to provide a high speed cache.

QEWDjs is explained in great depth with comprehensive documentation from its website. <http://docs.qewdjs.com/> We are aware this is enterprise grade technology that may be a bit of a challenge for the newcomer, yet we are working to ensure quick and easy means to get started are available, from blog articles to tutorials to install scripts to Docker containers etc etc.

QEWDjs is available on github under an open source Apache 2.0 license and all related documentation is freely and openly available. So too are the derivative libraries (e.g microservices) that Ripple uses in its showcase stack.

<https://github.com/robtweed/qewd>

## Community Feedback

QEWD.js

Amanda BenDor

Would be great to see linkages to other interoperability platform proposals (OpenHIM and OpenFN) in particular about potential integrations across the platforms.

The comparison of interop engines (when to use them, how to bring them together) sounds interesting. Would be great to see a joint effort on this regard. Where are you thinking the comparison would live?

JEMBI team- by email

I must say I'm quite impressed by some of the tech (particularly your work in interoperability) and your Digital Square proposal -- Jembi submitting on the OpenHIM tool we've built. A lot of our call schedules are found on the <http://wiki.ohie.org> and it would be great to have you join them. I'd also be interested in having you on an up and coming Interoperability layer call (IOL) and seeing if you'd be interested in presenting some of the tools and tech that you have. Our OpenHIM.org is also a JavaScript tool and I'm interested if there are synergies in linkages here.

### 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



Sprint 1	Integration with JEMBI
Sprint 2	Integration with open EMPI
Sprint 3	Integration with openMRS Integration with DHIS2
Sprint 4	Online Demo of PulseTile & QEWD & EtherCIS connected to JEMBI/openHIM, openEMPI, openMRS, DHIS2 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 (openHIM), openEMPI, openMRS and DHIS2) 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 /openHIM
  - openEMPI
  - openMRS
  - DHIS2
- 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	Sprint 3 (as per Sprint plan above)	e.g. August 31st 2018
Month 5	Sprint 4 (as per Sprint plan above)	e.g. Sept 30th 2018
Month 6	Project close and knowledge transfer	e.g. October 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 QEWDjs proposal

Key support

Days

**Key support****Days**

Strategy and Clinical leadership- Dr Tony Shannon -	24
Programme Management and oversight - Phil Barrett -	24
PulseTile UI Development - SliceArt Ltd - Kyrylo Biloborodko	40
QEWDjs Integration - M/Gateway Ltd -Rob Tweed	50
EtherCIS development - Adoc Software Development -Christian Chevalley	10
Clinical modelling - FreshEHR ltd- Dr Ian McNicholl	6

**Total Budget**

USD \$ 181,800

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:**

-  [qewdjs\\_digital\\_health\\_software\\_global\\_good\\_maturity\\_model\\_-\\_selfassessment2018march\\_v1.xlsx](#)
-  [QEWDjs Budget Narrative](#)