# FHIRed Up

If you were one of the many HL7 members who participated in the May 2012 Vancouver working group meeting, your likely encountered many references (and not a few bad puns) to something called “FHIR”. It received mention in presentations from the CEO, the Board chair, and the chair of the TSC. The FHIR tutorials on Sunday had their room size increased twice and a few of the work group meetings where FHIR was on the agenda were standing room only. So what’s causing all this excitement and interest?

FHIR (Fast Healthcare Interoperability Resources) is a new methodology for HL7. It builds on the semantic foundations of HL7 v3, while leveraging lessons learned from v2, v3 and CDA implementation experience to radically reduce the effort required to build interoperable systems and at the same time to simplify and speed the standards development process.

Before we start:

Some HL7 stakeholders have voiced a concern that the introduction of FHIR will mean the end of HL7’s commitment to other HL7 standards such as v2, v3 or CDA. There is no need to worry. HL7 will continue to support and develop v3 and other standards for so long as implementers require, just as they have continued to support HL7 v2 with the introduction of v3. The proportion of resources spent on FHIR and other initiatives will be driven by the interests and needs of the implementation community.

## Premises and design

FHIR is based on a few simple premises:

1. Interface specifications should be designed first and foremost for implementers. This includes how they’re documented and how they approach technical solutions
2. HL7 should follow current cross-industry best practices about how to do interoperability – including support for a RESTful approach
3. Specifications should standardize only those data elements and processes that are common to the bulk of implementations (“the 80%”)
4. Extensibility is an essential part of robust interoperability, but needs to be properly managed.

The original design of FHIR was based on a popular set of interoperability specifications in the customer relationship management space called 37 Signals. FHIR takes the core ideas that make a RESTful approach easy to implement, as used by many large cloud applications, and applies them to the healthcare domain. The essence of FHIR is as follows:

1. All data structures are broken up into carefully managed chunks called Resources
   1. Resources themselves are designed as XML structures with names and element nesting reflecting the way domain experts and implementers think about the content. The work group designs exactly what the implementer will see with no abstract models in the way.
2. Only those data elements expected to be used by 80% of software systems implementing the resource are candidates for inclusion as “core” elements in the resource (“the 80%”).
3. Data elements include formal mappings to the RIM and ISO 21090 datatype specifications to ensure semantic rigor, but these mappings are presented in a manner that implementers can ignore them if they wish.
   1. Mappings to HL7 v2 and other key industry specifications will also be provided.
4. All resources have the ability to carry a textual representation of the resource in place of or in addition to the structured data representation.
5. All resources have an extensibility section where additional data elements can be conveyed that don’t meet the requirements to be considered “core”.
   1. Extensions are managed as terminologies with a requirement that the extension definition be electronically accessible in a standardized form from within the environment using the extension.
   2. Extensions declare whether they must be understood or can be safely ignored by implementers.
6. Datatypes and value set definitions are also designed reflecting the “80%” approach to implementation.
7. Resources, once normative, will remain wire format backwards compatible for all future releases of FHIR.

## Resources

The core structure of FHIR is “resource”

<put stuff here>

## FHIR Interoperability Paradigms

FHIR supports a number of different interoperability paradigms: REST, messaging, documents and services.

At its core, FHIR is based on a REST approach. Every resource can be exposed as a REST interface from which resource instances can be created, retrieved, updated and “deleted”. This is a powerful, web-based approach to interoperability that has particular interest for the mobile app community. (Many “Web 2.0” systems are based on REST technologies.)

For some use cases, manipulating individual resources is not sufficient. Groups of resources need to be managed together in a transactional manner. In FHIR, this can be done with documents (where the focus is attestation and human-readability) or messaging (where the focus is workflow in a manner similar to HL7 v2). However FHIR offers the ability to combine both aspects together and package resources together with metadata reflecting both a document and messaging perspective.

Finally some use cases require more sophisticated choreographies than can be provided in a simple messaging paradigm. In these situations, service specifications can be designed that use resources

## What does this mean for implementers?

Nothing – yet. FHIR is still in the early stages. Most of the resources that will be needed to create a useful system have not yet been designed and those that have are “proof of concept” and have not been vetted by their respective committees. It will be at least a year before there’s a version of FHIR available that’s suitable for any but the most “bleeding edge” of implementers. (Though trial versions of FHIR already exist for testing – see the website link at the end of this article.)

Once the specification is ready for use, the specific impact of FHIR is harder to gauge. It is unlikely that jurisdictions and implementations with a significant investment in existing standards (be that v2, CDA or v3 messaging) will drop existing functioning solutions to jump to FHIR. Therefore, early adoption is most likely to occur in green field areas, particularly mobile apps.

Further down the road, FHIR creates the promise of significant enhanced interoperability crossing the messaging, document and services paradigms. It also promises better interoperability across borders with a single wire format and consistent extensibility rules allowing common structures such as prescription, patient and lab result to share the same wire syntax regardless of jurisdiction. Unfortunately, FHIR does not solve the issues of terminology variation or varying legislative requirements driving the use of “must understand” extensions - so full out-of-the-box interoperability is still some way off.

## What does this mean for HL7 work groups?

FHIR moves away from the idea of “design by constraint” that was introduced with HL7 v3. While laudable in its intention to ensure semantic consistency across implementations, the result has often been standards that are too complex to easily implement or understand, and development work mired in committees attempting to satisfy every potential use-case. Instead FHIR aims to satisfy the common set of requirements and use a robust extensibility mechanism with a consistent wire format to manage the rest.

This represents a significant change for HL7. In both v2 and v3 specifications, the barrier was relatively low to modify the specification to introduce additional data elements. (Witness the PD1 segment ☺) Work groups will now need to push back more rigorously on requirements to ensure that only those elements that are truly core will be part of a specification.

It also represents a change in the perception of extensions. While extensibility is supported in HL7 v2, its use is frowned upon by implementers. Z-segments are opaque. No-one knows what the data inside them means unless they can contact the analyst at the site that originated the message. HL7 v3 messaging and CDA also support extensibility through the use of foreign namespaces, but that too is frowned upon because of the negative implications it has for schema validation and other processing. V3 and CDA extensibility is also limited to data elements that can be safely ignored by the receiver.

With FHIR, extensibility is a core part of the specification. Most wire instances will have at least a few extensions. It will be common for HL7 to define (and vet) extensions for common

## Timeline

FHIR is moving rapidly. First proposed at the Sept. 2011 working group meeting, FHIR will be going to informative ballot in July, 2012. First DSTU ballot will occur in the fall 2012 ballot cycle, with the hope of the first DSTU version of FHIR available by the end of 2013. Several work groups already have projects in place to develop FHIR resources, with others expected to come on this year and the first part of next year.

The initial focus for work groups will be defining the resources needed to cover their domain and, when necessary, extensions to cover “important” elements used by the domain, likely in an existing HL7 specification such as v2 or v3 messages or CDA implementation guide. Later, focus will shift to defining profiles of resources to meet specific interoperability use-cases.

## Licensing

The HL7 Board has recently begun to license a subset of HL7’s intellectual property for free. This includes HL7 Domain Analysis Models (DAMs) and HL7’s functional profiles. However, FHIR marks the first time that a core interoperability specification has been released under a free and open license. This license allows FHIR to be implemented, profiled and otherwise used without any requirement to pay membership or other licensing fees to HL7. The board has committed to this licensing approach until at least after the release of the first normative edition of FHIR, expected to be published in 3-4 years.

### Governance

Essential to FHIR’s success is the consistency with which FHIR principles are followed in the development of resources. For example, resources cannot overlap – a given clinical concept needs to fit in one and only one resource. As well, committees need to adhere to the rule of only including data elements that fit within the 80% - Those elements that 80% of implementations of the resource will support.

To ensure this consistency, the TSC is putting into place a governance structure with separate bodies responsible for governance (FHIR Governance Board), management (FHIR Management Group) and methodology (MnM) with strong expectations. These various groups will assist with the roll-out of FHIR, including such functions as:

* managing the authority to create resources – what resources will be created, what their scope delineation will be and what work group will be responsible for their content
* creating, approving and applying guidelines created to help ensure the quality of FHIR artifacts

helping to facilitate cross-work group coordination and ensuring consistency in the identification of what data elements are in the 80%.

### Next steps

The FHIR specification can be found here: <http://hl7.org>/fhir. Discussion about FHIR development takes place on both the FHIR HL7 wiki page: ???? and on the FHIR list server (categorized under the Technical Steering Committee section) on the HL87 list server page: ???. Take a look, provide your feedback, participate in the ballots, pass on the other information to others and play your part in this important initiative.