

HL7 FHIR



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Who am I?

- Rik Smithies
- Company: Independent Consultant (NProgram Ltd., UK)
- Background:
 - Technical Committee Chair, HL7 UK (and former Chair)
 - HL7 International Standards Governance Board
 - FHIR project committer, implementer and trainer
 - Architect, analyst and software developer. 20+ years in healthcare IT
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FHIR in one slide

- Fast Healthcare Interoperable Resources
- New free and open healthcare data API
- Builds on simplicity of HL7 V2
- With modern (web) standards
 - XML, JSON, HTTP, REST, UML
 - Familiar to new generation of developers
- Easy to implement the basics
- Getting very rapid take up

FHIR in one bullet

FHIR is:

a set of XML (and/or JSON) health data resources, plus a REST API for accessing them.

Possibly two unfamiliar acronyms there:

JSON is an increasingly popular alternative markup to XML

REST is the name for accessing data via basic HTTP read/write/update operations

Examples

FHIR allows XML (or JSON) data to be read from and written to URLs, via HTTP, in a controlled, organized manner.

Lets see some XML...

```

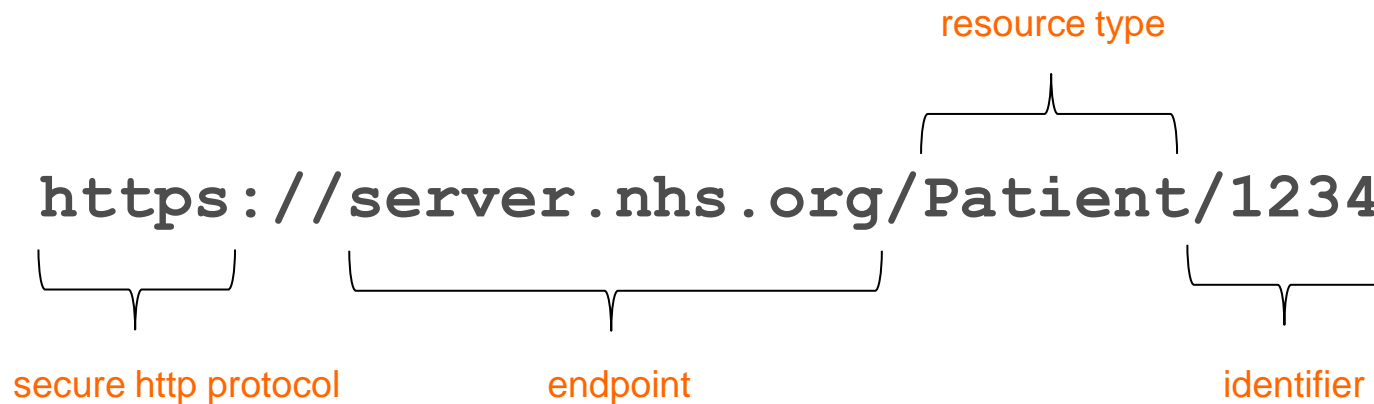
<?xml version="1.0" encoding="utf-8"?>
<Patient xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <p>Harley N Hobbs</p>
      <p>16 Pier Road</p>
      <p>Salisbury</p>
      <p>SY4 7IW</p>
      <p>Date of birth: 1966-06-07</p>
    </div>
  </text>
  <identifier>
    <use value="official"/>
    <type>
      <coding>
        <code value="SSN"/>
      </coding>
    </type>
    <system value="http://hl7.org/fhir/sid/us-ssn"/>
    <value value="1"/>
  </identifier>
  <name>
    <use value="official"/>
    <family value="Hobbs"/>
    <given value="Harley"/>
  </name>
  <birthDate value="1966-06-07"/>
</Patient>

```

This is what a FHIR Patient resource looks like in XML

REST: URL based API

Use REST to get patient #1234 from a FHIR server

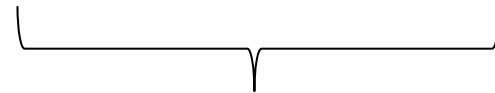


REST: JSON

JSON is an alternative format to XML

To use REST to read the same patient, but get it in JSON instead:

```
https://.../Patient/1234?_format=json
```



Format specifier

Patient resource in JSON

```
{
  "resourceType": "Patient",
  "text": {
    "status": "generated",
    "div": "<div xmlns='http://www.w3.org/1999/xhtml'><p>Harley Hobbs</p>...."
  },
  "identifier": [{
    "use": "official",
    "label": "SSN",
    "system": "http://hl7.org/fhir/sid/us-ssn",
    "value": "1"
  }],
  "name": [{
    "use": "official",
    "family": ["Hobbs"],
    "given": ["Harley"]
  }],
  "birthDate": "1966-06-07",
  "address": [{
    "use": "home",
    "text": "16 Pier Road, Salisbury, SY4 7IW",
    "line": ["16 Pier Road"],
    "city": "Salisbury",
    "zip": "SY4 7IW"
  }]
}
```

```
<?xml version="1.0" encoding="utf-8"?>
<Patient xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <p>Harley N Hobbs</p>
      <p>16 Pier Road</p>
      <p>Salisbury</p>
      <p>SY4 7IW</p>
      <p>Date of birth: 1966-06-07</p>
    </div>
  </text>
  <identifier>
    <use value="official"/>
    <type>
      <coding>
        <code value="SSN"/>
      </coding>
    </type>
    <system value="http://hl7.org/ ... "/>
    <value value="1"/>
  </identifier>
  <name>
    <use value="official"/>
    <family value="Hobbs"/>
    <given value="Harley"/>
  </name>
  <birthDate value="1966-06-07"/>
</Patient>
```

```
{
  "resourceType": "Patient",
  "text": {
    "status": "generated",
    "div": "<div
xmlns='http://www.w3.org/1999/xhtml'><p>Harley
N Hobbs</p><p>16 Pier
Road</p><Salisbury</p><p>SY4 7IW</p>
<p>Date of birth: 1966-06-07</p>
</div>"
  },
  "identifier":
  [{
    "use": "official",
    "type": {
      "coding":
      [{"code": "SSN"}]
    },
    "system": "http://hl7.org/ ... ",
    "value": "1"
  }],
  "name": [{
    "use": "official",
    "family": ["Hobbs"],
    "given": ["Harley"]
  }],
  "birthDate": "1966-06-07"
}
```

REST: Searching

Search is also via URL

`https://.../Patient/search?name=Smith`



This URL searches patient resources.

Step back – HL7?

HL7 (Health Level 7)

- An international “not for profit” organization
- Creates and promotes standards for health data exchange
- 30 years old this year
- Has “affiliates” in many countries:
<http://www.hl7.org.ru/>
- Started in US – but FHIR originated in Australia, The Netherlands and Canada

HL7 standards overview

HL7 V2

- 30 years old – but still runs hospitals all over world
- Focused on in-hospital processes:
 - Patient Admit/Discharge/Transfer
 - Test orders and results
 - Local prescribing etc.
- Looks like: `PID|||123456^^^SMH^PI||JOHN^SMITH`

HL7 V3

- More modern (2000s)
 - “model based” approach
 - Wider uses cases: Full EHRs, *national* prescribing, clinical documents
 - Not replaced V2 but well deployed GB, NL, CA etc. Many billions of messages worldwide
- Looks like: XML (but complex...)

HL7 CDA

- An HL7 V3 based standard for *clinical documents*
- By far the most widely adopted part of V3

Why FHIR?

- HL7 V3 works - but is too hard
- Documents (CDA) aren't enough for all use cases
- HL7 V2 needs a transition path
- The world has evolved
- New markets, web, mobile, cloud
- *Faster* – integration in days or weeks, not months or years

The result



- HL7 undertook a “Fresh look”
 - What would healthcare exchange look like if we started from scratch today - using modern approaches?
- Research on what makes a good interface, led to “RESTful” based APIs
 - Amazon, Twitter, Facebook...
- Drafted a healthcare exchange API based on this approach



This is the DSTU candidate version, for QA review. There's also the version that was balloted for DSTU, and a Nightly Build is also available.

Welcome to FHIR®

First time here? Read the [high level summary](#) and then the [FHIR overview / roadmap](#). See also the [open license](#).

Major Sections:



hl7.org/fhir (FHIR home)

Quick links:

Documentation

- [Resource List](#)
- [XML & JSON](#)
- [REST API & Search](#)
- [Data Types](#)
- [Using Terminologies](#)
- [Extensions](#)
- [Full table of contents](#)

Implementation

- [Downloads](#)
- [FHIR Schemas & Schematrons](#)
- [Examples: XML, JSON](#)
- [Code: Java, C#, Pascal](#)
- [Common Use Cases & Profiles](#)
- [Security](#)
- [Support Links](#)

External Links

- [Stack Overflow \(When to use\)](#)
- [Public Test Servers & Software](#)
- [FHIR Wiki](#)
- [Translations: Japanese](#)

Search the FHIR Specification:

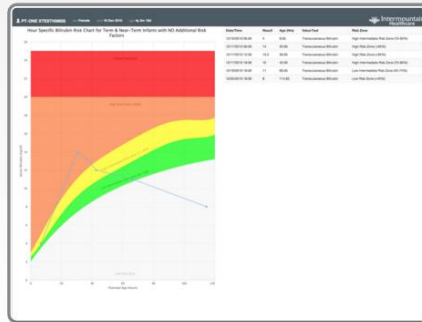
Google™ Custom Search

Note: FHIR requires a browser that is SVG compatible. (Microsoft Internet Explorer 10+, Firefox 3.0+, Chrome, or Safari).

FHIR - examples

Featured Apps

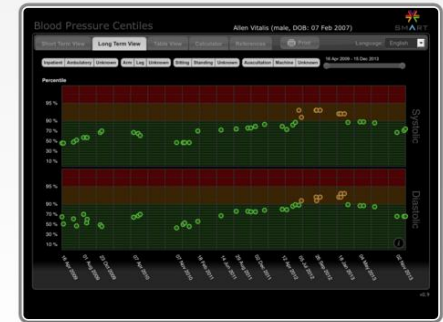
- Recently Updated
- Clinical Care
- Patient Education
- Genomics
- Open Source
- iPhone and iPad
- All Apps



Bilirubin Chart

A screenshot of a web interface for BMJ content discovery. The page shows a search bar, a list of search results, and a detailed view of a specific article. The article title is "BMJ Best Practice" and it includes a list of authors and a brief abstract.

BMJ Content Discovery



BP Centiles

A to Z

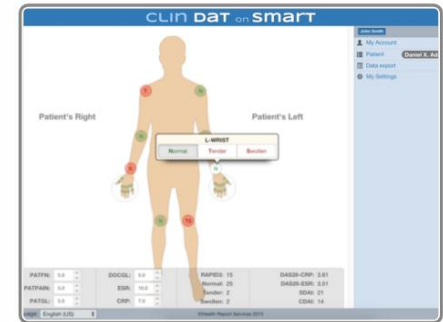
19 apps



Cardiac Risk

A screenshot of a Cerner HIE on SMART interface. The interface shows a list of patients with columns for patient name, age, sex, and other demographic information. It also includes a section for "Patient History" with a list of events and a "Patient Summary" section with various data points.

Cerner HIE on SMART



ClinDat

“F. H. I. R.” ?

- F – Fast, to design & to implement
- H – Health, that’s what it is about
- I – Interoperable, ditto
- R – Resources
 - Building blocks – more on these to follow

Freely available



Free for use

No cost

No usage limitations

If you are looking for the simple free open health API,
this is it

FHIR License

1.0.3

FHIR plain English license:

- FHIR is © HL7. The right to maintain FHIR remains vested in HL7
- You can redistribute FHIR
- You can create derivative specifications or implementation-related products and services
- Derivative Specifications cannot redefine what conformance to FHIR means
- You can't claim that HL7 or any of its members endorses your derived [thing] because it uses content from this specification
- Neither HL7 nor any of the contributors to this specification accept any liability for your use of FHIR

Principles: keep it simple

- You should be able to “figure it out” over a weekend
- Easy to get started, grow into the spec for more complex scenarios
- *FHIR is healthcare interoperability for people who have other things to do*

FHIR supports “common” scenarios

- FHIR is kept readable by focusing on the most common use cases
- Inclusion of content in core specification is based on an “80%” rule
 - If it isn’t used by 80% of implementers, it doesn’t go in
 - Makes it easy to get started, not bogged down in the less common details
 - The remainder is not ignored: 100% coverage is achieved by having by non-core “extensions”
 - *You don’t need to understand those to get started*

Existing technologies

- XML and/or JSON - for data
 - REST API – http web calls
 - read/write data via URLs (web addresses).
 - UML class diagrams - for models
 - XSD, Schematron - for validation
 - HTTPS, OAuth – industry standard security
- ...things you should have heard of ;-)

Implementer focus

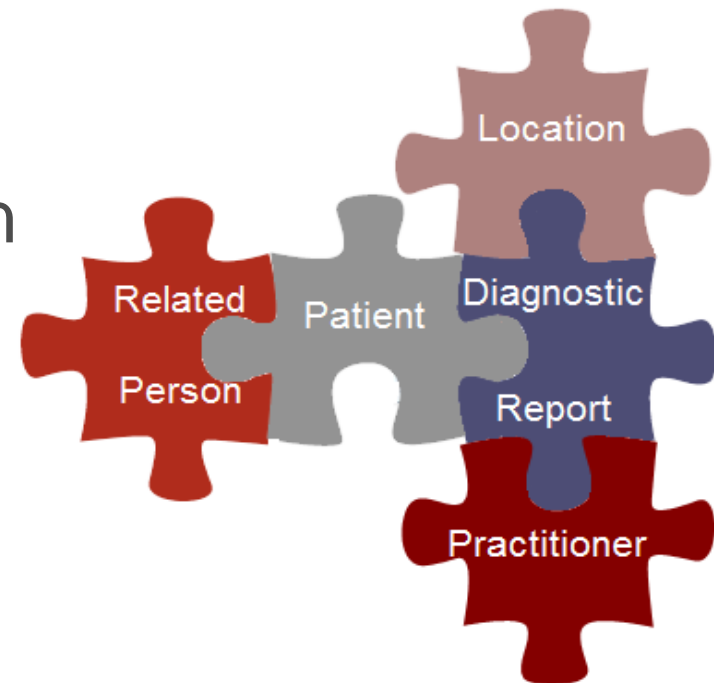
- Specification is written to be *implemented*
- Implementers have been forgotten recently
 - You can design what you want, but if I can't be built...
 - FHIR is tested by implementation *before publication*
- Publicly available test servers
- Working open source code is published with the specification
 - C#, Java (and also exist for ObjC, JavaScript, Swift, Clojure...)
- Connectathons, verify specification works
- Lots of examples, easy to understand

FHIR Resources



Resources are:

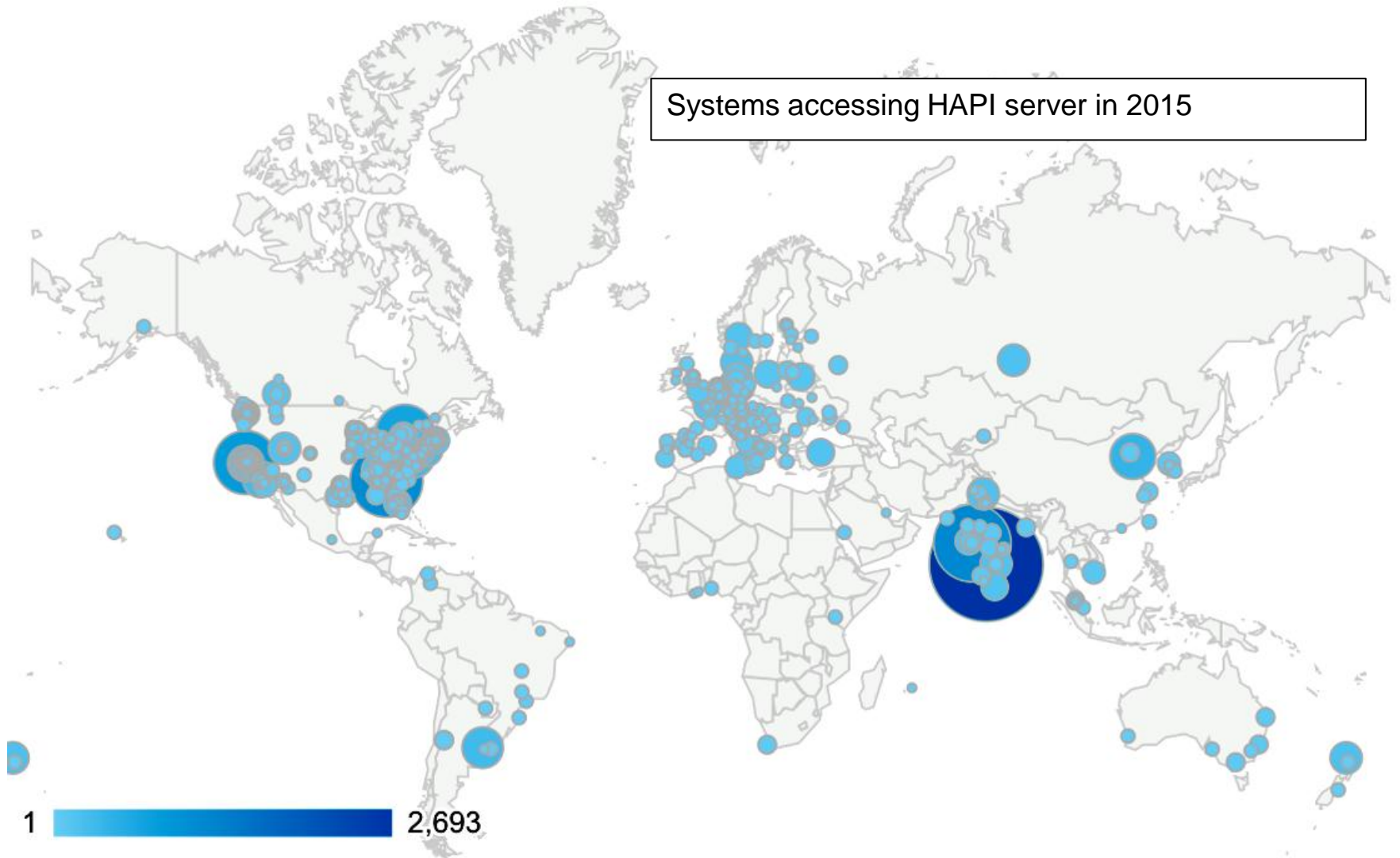
- Small logically discrete units of exchanged data
- Defined behaviour and meaning
- Known identity / location
- Smallest unit of transaction



R.E.S.T.

- The API in FHIR – a key advantage
 - Adds the *behavior* onto the content of the *resources*
- Use HTTP to do “*CRUD*” operations (create, read, update, delete) on resources (records).
- The data is not a website, *but it is convenient to treat it like one.*
- Normal security can be applied via HTTP, firewalls etc.
- Other paradigms: documents, messages, services
 - Same FHIR resources are used

Who's using FHIR?



Thanks to:

Based on presentations by the 3 core architects of FHIR:

Grahame Grieve, Australia

Ewout Kramer, The Netherlands

Lloyd McKenzie, Canada

Final message

FHIR

- is easier and cheaper
- new but is being implemented now (worldwide)
- is likely to significantly impact Health IT

Decide how you want it to impact **your** organization

Live demo:

<http://nprogram.azurewebsites.net/>