

GEVITY

Catch FHIR

The next step in health care interoperability

Informatics for a healthier world

Introductions



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Topics

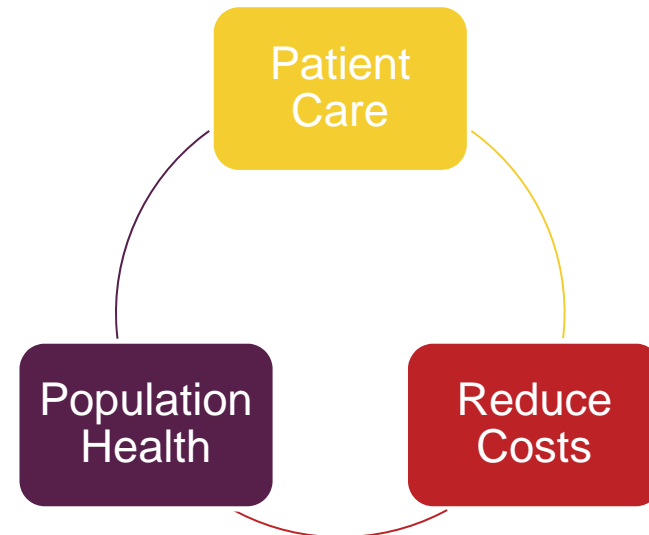


- Interoperability challenges in Canada
- Introduction to HL7 FHIR®
- Accelerating development with FHIR
- SMART on FHIR
- Canadian activities

Triple Aim of Healthcare



- Improving the patient experience of care (including quality and satisfaction)
- Improving the health of populations
- Reducing the per capita cost of health care



<http://www.ihl.org/engage/initiatives/tripleaim/Pages/default.aspx>

INTEROPERABILITY CHALLENGES

Interoperability Challenges



- Human vs Machine
 - Human aspects are much more difficult
- Too much choice
 - Lots of time & effort spent on choosing standards
- Impact of complexity and time
 - Current environment is a kaleidoscope of different hardware & software
 - Technology and political will changes, sometimes very quickly
- Vendor centric and vendor driven
 - Jurisdictions are hard pressed to enact conformance

Interoperability Challenges



Interoperability is fundamentally
about **people**, not technology

INTRODUCTION TO FHIR®

Name



F – Fast (to model and implement)

H – Healthcare (that's why we're here)

I – Interoperability (ditto)

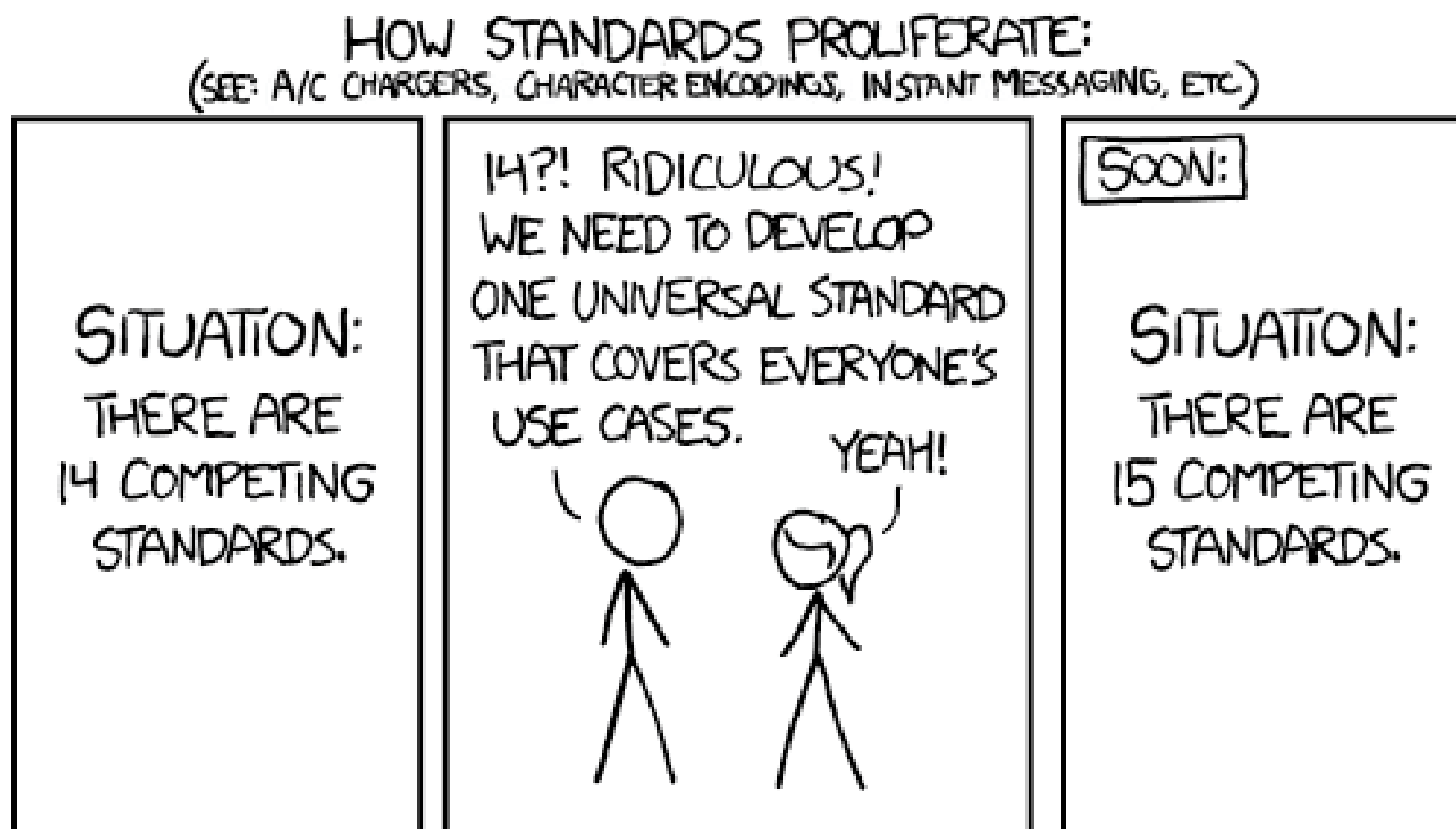
R – Resources (more on this in a minute)

What is it?



- FHIR is essentially four things:
 - A **data model** for describing health and administrative data
 - A set of **exchange mechanisms** that support multiple integration paradigms
 - A set of **open source tools** to implement and test FHIR applications
 - A set of **FHIR servers** (public and private) that you can interact with

Why FHIR?



FHIR manifesto



- Focus on **implementers**
- Target support for **common scenarios**
- Leverage cross-industry **web technologies**
- Support **human readability** as a base level of interoperability
- Make content **freely available**
- Support **multiple paradigms** and architectures

Resources



- FHIR defines a set of roughly 150 **resources**
- These are the building blocks of the specification
 - **Patient**: a person who receives healthcare
 - **Encounter**: an appointment or hospital stay
 - **Observation**: a device reading or lab value
 - **DiagnosticReport**: a whole lab or DI report
 - **MedicationOrder**: a prescription (in a community context) or order (in acute care) for medication

What's a resource?



Examples

- Administrative
 - Patient
 - Practitioner
 - Location
- Clinical
 - Allergy
 - Observation
 - DiagnosticReport

Non-Examples

- Gender
 - Too small
- EHR
 - Too big
- Blood pressure
 - Too specific
- Intervention
 - Too broad

ACCELERATING DEVELOPMENT

With HL7 FHIR®

DSTU updates:

- [Oct-24 2015](#): Corrections to invariants, generated conformance resources, extension cardinalities, examples
- [May-15 2016](#): New security note about [risks associated with XML Entities](#), and release an [updated validator](#)

Major Sections:



Quick links:

Documentation

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

Implementation

- [Downloads](#)
- [Adapting FHIR for local use](#)
- [Implementation Guides](#)
- [FHIR Schemas & Schematrons](#)
- [Examples: XML, JSON](#)
- [Code: Java, C# \[↗\]\(#\), Pascal, iOS \[↗\]\(#\), JS, XML](#)
- [Common Use Cases & Profiles](#)
- [Security](#)

External Links

- [Support Links \[↗\]\(#\)](#) (StackOverflow, Forum, etc.)
- [Public Test Servers & Software \[↗\]\(#\)](#)
- [How FHIR is developed \[↗\]\(#\)](#)
- [FHIR Wiki \[↗\]\(#\)](#)
- [Implementation guide registry \[↗\]\(#\)](#)
- [Blogs that cover FHIR \[↗\]\(#\)](#)
- [Translations: Russian \[↗\]\(#\), Japanese \[↗\]\(#\)](#)

3.0 Resource Index

Categorized

Alphabetical

This page is provided to help find resources quickly. There is also a more [detailed classification, ontology, and description](#).

Clinical

General:

- [AllergyIntolerance](#) 1
- [Condition \(Problem\)](#) 2
- [Procedure](#) 1
- [ClinicalImpression](#) 0
- [FamilyMemberHistory](#) 1
- [RiskAssessment](#) 0
- [DetectedIssue](#) 1

Care Provision:

- [CarePlan](#) 1
- [Goal](#) 1
- [ReferralRequest](#) 1
- [ProcedureRequest](#) 1
- [NutritionOrder](#) 1
- [VisionPrescription](#) 0

Medication & Immunization:

- [Medication](#) 1
- [MedicationOrder](#) 1
- [MedicationAdministration](#) 1
- [MedicationDispense](#) 1
- [MedicationStatement](#) 1
- [Immunization](#) 1
- [ImmunizationRecommendation](#) 1

Diagnostics:

- [Observation](#) 3
- [DiagnosticReport](#) 3
- [DiagnosticOrder](#) 1
- [Specimen](#) 1
- [BodySite](#) 0
- [ImagingStudy](#) 2
- [ImagingObjectSelection](#) 1

Identification

Individuals:

- [Patient](#) 3
- [Practitioner](#) 1
- [RelatedPerson](#) 1

Groups:

- [Organization](#) 1
- [HealthcareService](#) 1
- [Group](#) 1

Entities:

- [Location](#) 1
- [Substance](#) 1
- [Person](#) 1
- [Contract](#) 0

Devices:

- [Device](#) 1
- [DeviceComponent](#) 1
- [DeviceMetric](#) 1

Workflow

Patient Management:

- [Encounter](#) 1
- [EpisodeOfCare](#) 1
- [Communication](#) 1

Scheduling:

- [Appointment](#) 1
- [AppointmentResponse](#) 1

Workflow #1:

- [Order](#) 0
- [OrderResponse](#) 0
- [CommunicationRequest](#) 1

Workflow #2:

- [ProcessRequest](#) 0
- [ProcessResponse](#) 0
- [SupplyRequest](#) 0

Accelerating development



Options

Encoding: (default) XML JSON

Pretty: (default) On Off

Summary: (none) true text data count

Server

Server Home/Actions

Resources

- Observation 15091
- Patient 7453
- Condition 1229
- ValueSet 1206
- Organization 942
- Encounter 688
- Practitioner 608
- MedicationOrder 599
- MedicationStatement 482
- Procedure 418
- QuestionnaireResponse 361



You are accessing the public FHIR server **UHN/HAPI Server (DSTU2 FHIR)**. This server is hosted elsewhere on the internet but is being accessed using the HAPI client implementation.

⚠ This is not a production server! Do not store any information here that contains personal health information or any other confidential information. This server will be regularly purged and reloaded with fixed test data.

Server	UHN Test Server (DSTU2 Resources)
Software	HAPI FHIR Server - 2.0-SNAPSHOT
FHIR Base	http://fhirtest.uhn.ca/baseDstu2

Server Actions

Retrieve the server's **conformance** statement.

Conformance

Retrieve the update **history** across all resource types on the server.

History

Since



Limit # (opt)

Post a bundle containing multiple resources to the server and store all resources within a single atomic transaction.

Transaction

Bundle *

Show all of the tags currently in use on the server

Get Tags

FHIR's popularity



A snippet from a Forbes article. It includes the word "Forbes" in a large serif font, a date "JAN 18, 2016 @ 10:48", a title "The Last Interoperability...", a profile picture of a man, the name "David", and the text "I write Opinions". Below this is a paragraph starting with "Can an impassioned system from its worst instincts, and deliver at least a soupcon of real interoperability?".

The Big Picture

- We are aggressively promoting and moving toward HL7-FHIR with our Partners CHI, eHealth Ontario, cGTA, UHN, cSWO, HHSC, SunnyBrook, ImmunizeCA, BORN, HQIC, Wise Elephant....
- Common Message to Vendors – FHIR is Coming!
- Common Authentication Model
- Ontario Connected Backbone (HIAL) is adding FHIR
- Modern Technology, API Management
- FHIR 1.4
- **DHIR and DHDR Interfaces available for Developers to Explore (See the Team)**
- **Demonstrations available for PINC and M-IMMS (Curl for you developers)**

at

t

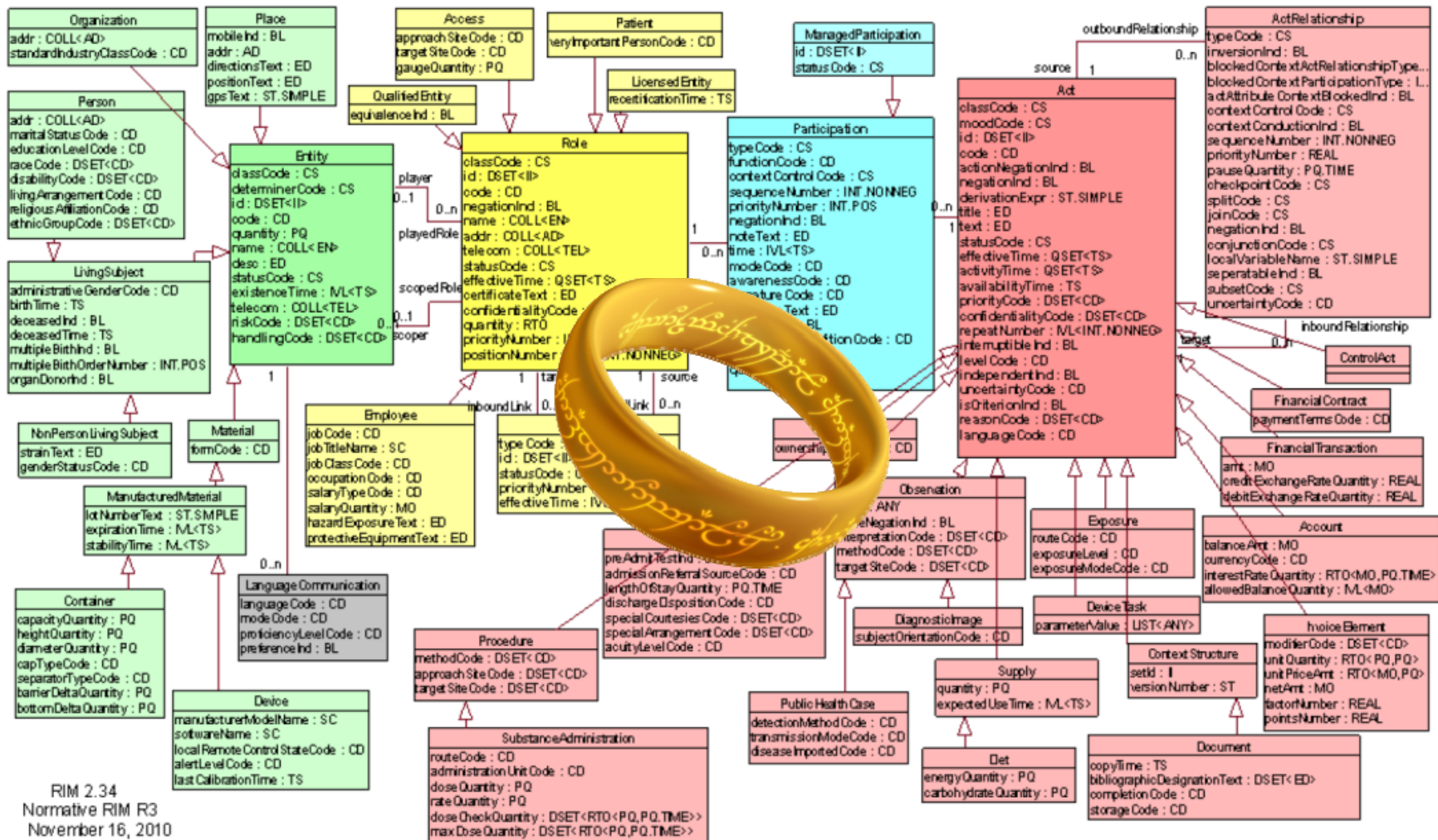
Can an impassioned system from its worst instincts, and deliver at least a soupcon of real interoperability?

Informatics for a healthier world

FHIR: so what's the big deal?



- FHIR has the potential to reduce the **risk**, **timeline and cost** of developing *next generation* healthcare applications (compared to using current standards)
- To understand why this is true, you have to understand a bit of HL7 history and a bit about the current technology market




```
<controlActEvent classCode="CACT" moodCode="EVN">
  <id specializationType="II.BUS" root="2.16.840.1.113883.19.3.207.15.1.1" extension="52379653" use="BUS" />
  <code code="PRPA_TE101101CA" codeSystem="2.16.840.1.113883.1.18" />
  <statusCode code="completed" />
  <effectiveTime>
    <low value="20160604154525.347-0400" />
  </effectiveTime>
  <reasonCode code="PATCAR" codeSystem="2.16.840.1.113883.11.14878" />
  <author typeCode="AUT" contextControlCode="AP">
    <time specializationType="TS.FULLDATETIME" value="20160604154525.300-0400" />
    <assignedEntity1 classCode="ASSIGNED">
      <id root="1.1.1.4" extension="5763665838" displayable="true" use="BUS" />
      <assignedPerson classCode="PSN" determinerCode="INSTANCE">
        <name specializationType="PN.BASIC">
          <family partType="FAM">Huber</family>
          <given partType="GIV">Basti</given>
        </name>
      </assignedPerson>
      <representedOrganization classCode="ORG" determinerCode="INSTANCE">
        <id specializationType="II.PUBLIC" root="1.1.1.5" extension="123456789012" displayable="true" />
        <name mediaType="text/plain" representation="TXT">Mohawk College Hospital</name>
      </representedOrganization>
    </assignedEntity1>
  </author>
  <queryByParameter>
    <queryId specializationType="II.TOKEN" root="1783BD6A-2AE2-49AF-8A8F-0BD95C8A0E76" />
    <initialQuantity specializationType="INT.POS" value="10" />
    <parameterList>
      <clientIDPub>
        <value specializationType="II.PUBLIC" root="2.16.840.1.113883.4.59" extension="" />
      </clientIDPub>
    </parameterList>
  </queryByParameter>
</controlActEvent>
```

What changed?



- Mobile and Web



- Demand quickly emerged among patients and clinicians for health applications

FHIR: so what's the big deal?



```
"entry":[
  {
    "fullUrl":"http://fhirtest.uhn.ca/baseDstu2/Patient/5149",
    "resource":{
      "resourceType":"Patient",
      "id":"5149",
      "meta":{
        "versionId":"1183",
        "lastUpdated":"2016-05-27T08:23:26.716-04:00",
        "tag":[
          {
            "system":"http://example.org/codes/tags",
            "code":"entered-by-hand",
            "display":"Patient File entered by hand"
          }
        ]
      },
      "text":{
        "status":"generated",
        "div":"<div xmlns=\"http://www.w3.org/1999/xhtml\"> Date-Time: Wed May 25 2016 11:51:51 GMT+0200
      },
      "name":[
        {
          "use":"official",
          "family":[
            "Huber"
          ],
          "given":[
            "Basti"
          ]
        }
      ],
      "gender":"f"
    },
    "search":{
      "mode":"match"
    }
  },
]
```


FHIR: in practical terms



- Everyone gets it
 - And everyone **can** get it
 - Free and open standard
 - Simply defined resources
- Tools, tools, tools
 - And more tools
 - Free and open test servers
 - In line with today's tech trends
- Showing results faster
 - Pragmatic approach – implementation comes first
 - Modern approaches to development

SMART ON FHIR

What is SMART?



- The **SMART Health IT** project is run by the Boston Children's Hospital and Harvard Medical School
- SMART aims to create an **open, standards-based technology platform** that enables developers to create apps



What is SMART on FHIR?



- FHIR is a **tool**, not an out-of-the-box solution
 - Doesn't deal with authorization, authentication, user experience, etc.
- SMART on FHIR is a **complete platform**; provides an out-of-the-box solution for building health apps
 - Clinical data → FHIR
 - Authorization → OAuth 2.0
 - Authentication → OpenID Connect
 - UX → Open-source “glue”

Demo



- SMART maintains an “app gallery”
 - Showcases what has been built with the SMART on FHIR platform
 - Try apps in your Web browser
 - These are **real, working apps** – not mock-ups!

<https://gallery.smarthealthit.org/>

SMART Lessons



1. We can live without most features
 - e.g. inter-app communication, complex ordering
2. Developer experience is more important than theoretical elegance
3. Community is key

SMART Community



- Standards development (HL7)
- Vendors (many – including Cerner, etc.)
- Care providers (HCA, HSPC, Intermountain)
- Data networks (SureScripts)
- Content & app dev (Polyglot, British Medical Journal)
- Pharma (Eli Lilly)

CANADIAN ACTIVITIES

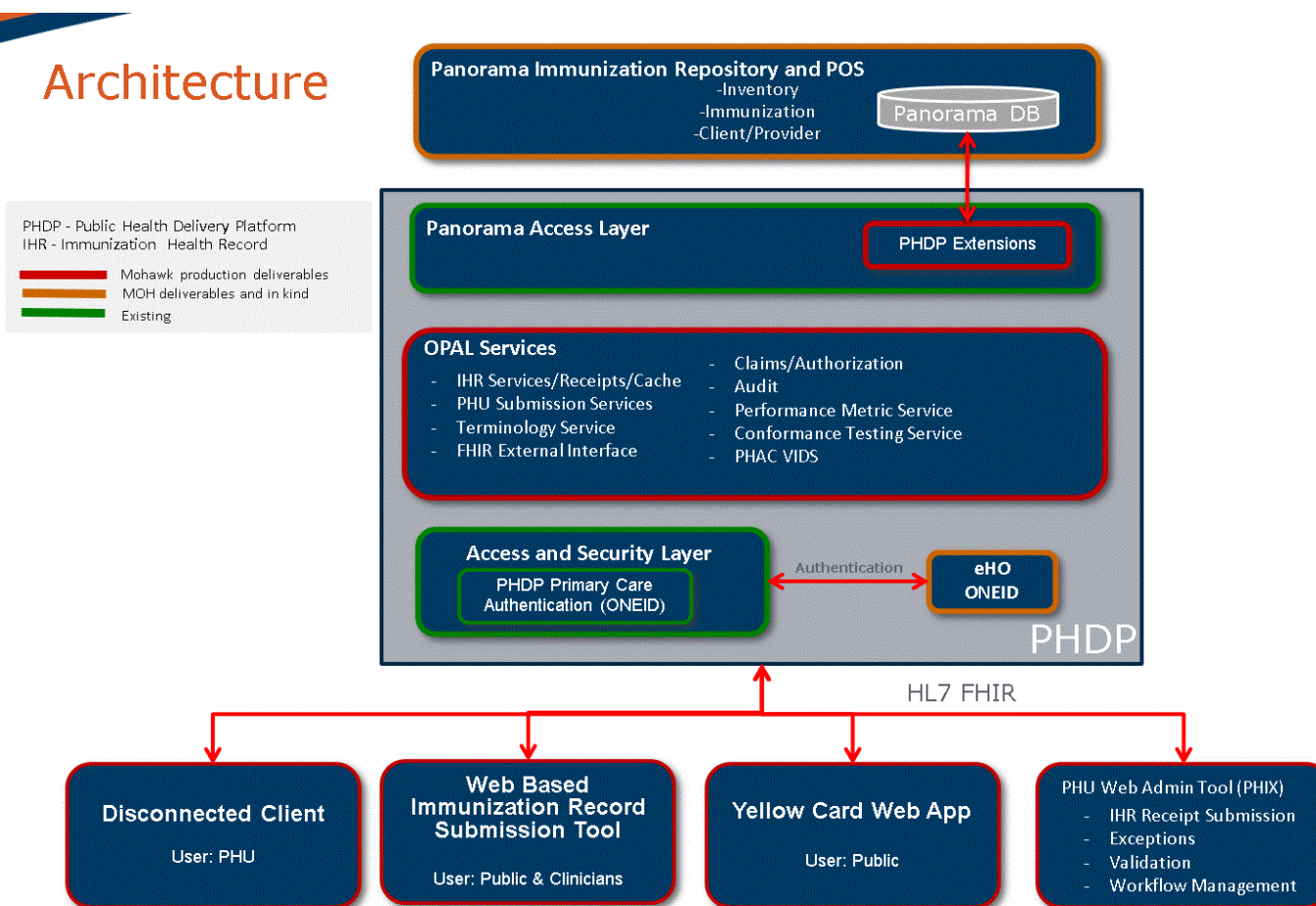
FHIR Initiatives in Canada

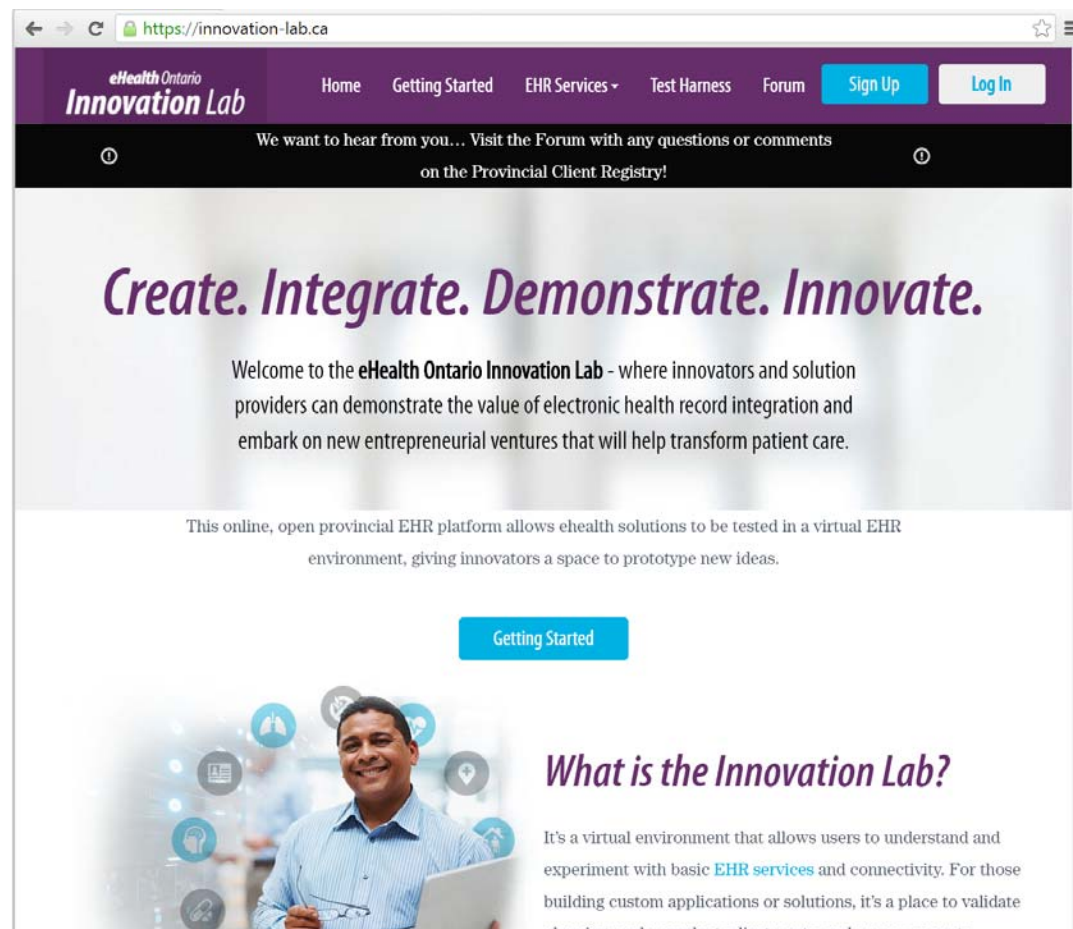
Canadian FHIR Initiatives



- Ontario Ministry of Health
 - Immunization Connect / Public Health Delivery Platform
- eHealth Ontario
 - Innovation Lab (<https://www.innovation-lab.ca/>)
- University Health Network
 - Public FHIR test servers
- FHIR North Connectathon
 - Presented by Gevity, Mohawk College & UHN

Architecture





University Health Network



A screenshot of a web browser showing the HAPI-FHIR interface for the UHN Test Server. The browser's address bar shows 'fhirstest.uhn.ca'. The page has a dark header with 'Home', 'Server: UHN/HAPI Server (DSTU2 FHIR)', 'Source Code', and 'About This Server'. On the left is a sidebar with 'Options' (Encoding: default, XML, JSON; Pretty: default, On, Off; Summary: none, true, text, data, count) and 'Resources' (Observation: 6511, Patient: 4472, ValueSet: 1157, Condition: 1093, Organization: 800, Encounter: 615, MedicationOrder: 371, Practitioner: 359). The main content area features the HAPI-FHIR logo with a smiley face, the text '<Hapi/> HAPI-FHIR fhir made simple.', and the FHIR logo. Below this is a warning: 'You are accessing the public FHIR server UHN/HAPI Server (DSTU2 FHIR). This server is hosted elsewhere on the internet but is being accessed using the HAPI client implementation. This is not a production server! Do not store any information here that contains personal health information or any other confidential information. This server will be regularly purged and reloaded with fixed test data.' A table lists server details: Server (UHN Test Server (DSTU2 Resources)), Software (HAPI FHIR Server - 1.6-SNAPSHOT), and FHIR Base (http://fhirstest.uhn.ca/baseDstu2). The 'Server Actions' section includes buttons for 'Conformance', 'History' (with a 'Since' date input and 'Limit # (opt)' field), and 'Transaction' (with a 'Bundle' input field).

FHIR North



CONCLUSIONS

Some final thoughts

Conclusions



- FHIR **will not** solve interoperability
 - Interoperability is fundamentally about people
 - FHIR is a good tool, but not a solution to every interoperability challenge
- Old standards **will not** go away immediately
 - FHIR will co-exist with HL7 v2, v3, etc. for **many years** to come
 - It's often not practical to convert existing systems to FHIR (time, effort, cost)

Conclusions



- FHIR **will** have a major impact on healthcare interoperability
 - Vendors are investing heavily, healthcare delivery organizations are interested
- **Now is the time** to learn about FHIR and plan for how NSHA will approach it
 - Where can it solve problems and add value?
 - How will FHIR co-exist with legacy systems and standards? Where does it fit?
 - Is training required?

Thank you!



Questions? Comments? Discussion?

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