FHIR Testing and Tools

The W's of FHIR Testing

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Introductions

- Richard Ettema, AEGIS.net
  - Lead Architect, Touchstone
  - HL7® FHIR® Proficient
  - 7 years contributing to the HL7® FHIR® specification
  - 35 years in software development, design, requirements gathering, use case building, testing and implementation

Session Agenda

- Importance of FHIR Validation Testing
- Getting Started with Touchstone
- Touchstone Demo

Interoperability Challenges

- Interpretation of a specification is often through implementation
    - Limited testing partners
    - 2 systems interacting does not mean they are ‘interoperable’
    - Successful testing is multi-faceted and encompasses ‘real-world’ conditions

The 5 “Ws” of testing FHIR

- WHY test?
  - The CMS & ONC rules require it
  - Mitigate risk and expense
- WHO should test?
  - FHIR-based systems that want to prove conformance to the standard they claim to support
- WHAT should we test?
  - FHIR-based systems should test what they claim to support
- WHEN to test?
  - Continuously: During development, with new partners, at Connectathons, test to maintain Conditions of Certification and prove adherence to regulatory guidelines
- WHERE to test?
  - Several testing tools available
    - AEGIS has Touchstone for testing FHIR-Servers and FHIR-Clients
    - MITRE has Crucible and Inferno for testing FHIR-Servers

WHY Test?

- CMS recently issued new Interoperability and Patient Access final rule (CMS-9115-F)
- ONC recently issued final rule guidance for the 21st Century Cures Act
  - Requires implementation and maintenance of a secure, standards-based Patient Access Application Programming Interface (API) (using Health Level 7® (HL7) Fast Healthcare Interoperability Resources® (FHIR) Release 4.0.1)
  - Real World Testing - § 170.405, CONDITIONS OF CERTIFICATION: “A health IT developer with Health IT Module(s) certified to § 170.315(b), (c)(1) through (3), (e)(1), (f), (g)(7) through (10), and (h) must successfully test the real-world use of the technology for interoperability in the type of setting in which such technology would be marketed.”
- No Surprises
  - Testing as part of your development process reduces risk

WHO Should Test?

- Any software vendor/implementer that wants to have ONC Health IT Certification Program certified Health IT Module(s)
- Any software vendor/implementer that wants to maintain conditions of certification to continue working with CMS
- Any software vendor/implementer who wants to verify that their systems are truly ‘interoperable’ by validating that they conform to the FHIR specification resources and profiles
- Implementation Guide authors who want to ensure their profiles are FHIR-compliant

WHAT Should We Test?

- Ultimately - interoperability
  - System conformance to the specification
    - Validate individual resources, profiles, Implementation Guides
    - Validate use of standard and extended RESTful API operations
  - Implementation Guides
    - Verify the Profiles follow FHIR standards
    - Verify examples provided in the IG
  - Data
    - ‘must support’ elements
    - data integrity

WHEN Should We Test?

- Test Early….Test Often
- During Development
- As part of annual re-certification(s)
- Before, During and After Connectathon Events
- As IGs and Profiles are being built or updated

WHERE Can We Test?

- Several options
  - AEGIS: Touchstone http://touchstone.com
  - MITRE:
    - Crucible https://projectcrucible.org
    - Inferno https://inferno.healthit.gov/inferno
  - Publically available Test Servers
    - https://confluence.hl7.org/display/FHIR/Public+Test+Servers

WHERE Can We Test?

- MITRE: Crucible https://projectcrucible.org
  - FHIR testing for FHIR DSTU2, STU3, R4
  - Crucible supports FHIR-Server Testing for:
    - Conformance to the FHIR standard
    - FHIR Patient record quality and completeness
- MITRE: Inferno https://inferno.healthit.gov/inferno
  - Streamlined FHIR testing platform focused on:
    - SMART-on-FHIR, Bulk Data
    - US Core, Argonaut

WHERE Can We Test?

- AEGIS: Touchstone http://touchstone.com
  - FHIR testing for FHIR DSTU2, STU3, R4 (through 4.0.1)
  - Touchstone supports FHIR-Client Testing, FHIR-Server Testing, Peer-to-Peer, CDS-Hooks, etc.
  - Touchstone works with FHIR Accelerators like DaVinci project, housing publically accessible FHIR Test Scripts for their IGs

DaVinci Approach to Testing

- Commissioned AEGIS Touchstone early in IG writing process
- Open Access Test Scripts for their FHIR IGs
- Promote early, frequent testing at Connectathons and other events
- Paving the way for ‘real world’ FHIR Implementation

GETTING STARTED WITH TOUCHSTONE

Touchstone

- Is available as a publicly accessible cloud-based testing platform
  - https://touchstone.com
- Provides automated, internet-based interoperability testing of the HL7® FHIR® specification (including CDS-Hooks)
- Tests the capabilities of and interoperability between both FHIR Server and Client implementations

Getting Started with Touchstone

- All testing participants need to first Register with Touchstone
- Touchstone retains ALL user's test results
- Registering allows for test results to be associated to Test Systems and Organizations

Organizations in Touchstone

- Users in Touchstone must be part of an Organization
- They may have their own Org (e.g., MyTest Org) or be part of a larger Org (e.g., Initech, Inc.)
  - Orgs set up for multiple users have some advantages, like being able to see user's test results or share Test Scripts that the organization owns
- Organizations may set up Org Groups
  - Facilitates accreditation-type programs where users belong to one org but test under another

Registering Test Systems

- Test Systems acting as FHIR-Servers are assigned proxy urls by Touchstone
  - Touchstone can support Peer to Peer testing due to this setup
  - Touchstone can support both FHIR-Client and FHIR-Server testing due to being able to match up waiting tests to incoming messages from defined Test Systems
- Organizations may choose to keep certain Test Systems private OR may allow other Touchstone users to test against them (e.g., RI)

TestScripts

- Touchstone utilizes the FHIR TestScript resource
- Tests can be run individually, as a group, or a pre-defined ‘suite’ of tests can be selected
  - Test Suites produce graphical & tabular reporting results
  - Test Systems can publish results showing compliance over time
- https://www.hl7.org/fhir/testscript.html

TOUCHSTONE DEMO AND PREVIEW

Touchstone Demo and Preview

- Navigating through Touchstone
- Test execution
- New features in Touchstone v5.0:
  - Conformance Suites
  - Multi-Profile Version Support
- Preview of Touchstone v5.1 (Coming Soon)
  - OAuth2 Support
  - SMART-on-FHIR Support

Q&A