# 2022-01 TestScript and FHIR Testing

- **Short Description**
  - Testing, and the proper use of it, is fundamental for everything that we do in FHIR. The purpose of this track is to test and enhance the capabilities of the TestScript Resource and promote its use throughout the FHIR implementation community.

- **Long Description**
  - The FHIR specification defines a Testing Framework that defines a Test Execution Engine and the TestScript resource for use in validating and verifying that a FHIR implementation (client and/or server) is conformant to the FHIR specification. The management and proper use of testing is fundamental to effective, interoperable data exchange, so this is an important capability to provide and validate in the Connectathons. We expect and hope to achieve:
    1. improved capabilities of FHIR servers measured by conformance testing,
    2. implementation and implementer experience with the FHIR Testing Framework and TestScript,
    3. identify potential improvements to the FHIR Testing Framework and TestScript,
    4. increased awareness of FHIR Testing and its benefits.

  Related Blog Posts:
  - [David Hay’s blog post on FHIR Testing](#)
  - [AEGIS blog post on the Importance of Testing HL7 FHIR](#)
  - [Press Release: JMIR Publishes FHIR Testing Study](#)
  - [Peter Jordan blog post on Test-Driven Development (TDD) with FHIR](#)

- **Type**
  - Test the design of a Resource/set of Resources

- **Submitting Work Group/Project/Accelerator/Affiliate/Implementer Group**
  - FHIR Implementers (FHIR-I)

- **Track Lead(s)**
  - Richard Ettema, Ryan Moehrke

- **Track Lead Email(s)**
  - richard.ettema@aegis.net; ryan.moehrke@aegis.net

- **Related Tracks**
  - Patient Track (Link TBD), Terminology Track (Link TBD), Any other track that has been/is using TestScript

- **FHIR Version**
  - Current build, FHIR R4
| Specification(s) this track uses | FHIR Testing Framework: (Current Build) [http://build.fhir.org/testing.html](http://build.fhir.org/testing.html); (FHIR R4) [http://hl7.org/fhir/testing.html](http://hl7.org/fhir/testing.html)  
TestScript Resource: (Current Build) [http://build.fhir.org/testscript.html](http://build.fhir.org/testscript.html); (FHIR R4) [http://hl7.org/fhir/testscript.html](http://hl7.org/fhir/testscript.html)  
TestReport Resource: (Current Build) [http://build.fhir.org/testreport.html](http://build.fhir.org/testreport.html); (FHIR R4) [http://hl7.org/fhir/testreport.html](http://hl7.org/fhir/testreport.html) |
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| Artifacts of focus | FHIR Testing Framework: (Current Build) [http://build.fhir.org/testing.html](http://build.fhir.org/testing.html); (FHIR R4) [http://hl7.org/fhir/testing.html](http://hl7.org/fhir/testing.html)  
TestScript Resource: (Current Build) [http://build.fhir.org/testscript.html](http://build.fhir.org/testscript.html); (FHIR R4) [http://hl7.org/fhir/testscript.html](http://hl7.org/fhir/testscript.html)  
TestReport Resource: (Current Build) [http://build.fhir.org/testreport.html](http://build.fhir.org/testreport.html); (FHIR R4) [http://hl7.org/fhir/testreport.html](http://hl7.org/fhir/testreport.html) |
| Expected participants | Expected attendees (please feel free to add your name or let us know if you will be participating):  
- AEGIS - Touchstone tool and test scripts  
- MITRE - Crucible / Inferno  
Mario Hyland will be speaking on Tuesday Jan 11th at 3pm on Test-Driven-Development (TDD) and FHIR Testing in support of Implementations |
| Track Details | **Prerequisites**  
- For all levels of testing the required prerequisite is the fundamental requirement that all FHIR implementations SHALL support the capabilities interaction.  
- Review and have a basic understanding of the FHIR TestScript Resource Type definition.  
- Review and have a basic understanding of the FHIR Testing Framework definition.  
**Track Kick Off**  
Fri, Jan 7, 2022 3:00 PM - 3:30 PM (EST)  
[https://global.gotomeeting.com/join/122572637](https://global.gotomeeting.com/join/122572637)  
You can also dial in using your phone.  
United States: +1 (872) 240-3412  
Access Code: 122-572-637  
- Kickoff Recording  
**Whova Sessions**  
Jan 11 11:00am-1:00pm ET - Session 1  
Jan 11 3:00pm-5:00pm ET - Session 2  
- 3:00pm to 4:00pm - Review of FHIR Testing and Test-Driven-Development (TDD) and techniques to accelerate implementations - host Mario Hyland (Interopguy)  
- Test Driven Development and FHIR Testing Slide Deck  
Jan 12 11:00am-1:00pm ET - Session 3  
Jan 12 3:00pm-5:00pm ET - Session 4  
- 3:00pm to 4:00pm - Review and discussion of FHIR Shorthand TestScript generation - host Ryan Moehrke  
**User Roles**  
These are the human actors that have the requisite subject matter knowledge and expertise.  
- Test Scenario Author/SME  
- TestScript Author  
- Test Execution Results Reviewer  
**System roles**  
These are the software implementations / applications that perform the actual testing execution processes.  
**FHIR Testing Engine/Platform**  
- Will implement the functionality and behavior as defined in the FHIR Testing Framework - [http://hl7.org/fhir/testing.html](http://hl7.org/fhir/testing.html)  
- Support the TestScript resource - [http://hl7.org/fhir/testscript.html](http://hl7.org/fhir/testscript.html)  
- Implement the Execution behavior and functionality - [http://hl7.org/fhir/testing.html#execution](http://hl7.org/fhir/testing.html#execution)  
- Provide meaningful and human readable test execution results  
- Support execution of TestScript operations acting as the origin (client) test system actor if no external origin (client) is defined  
**FHIR Client (System Under Test)** |
Scenarios

Scenario 1 - TestScript Structure and Functional Review
This scenario is a review (breakout session) of the current TestScript resource definition and will focus on the overall structure and intended functionality of the TestScript. A review of specific TestScript elements and coded values will be done to determine correct usage and, if needed, any updates/additions, etc.

Potential Outcomes:
- Recommendations on improvements to the TestScript resource definition
- HL7 FHIR JIRA issues - new and/or existing

Scenario 2 - TestScript ImplementationGuide Integration
This scenario will explore how the TestScript Resource integrates into an ImplementationGuide.

The following is an initial list of topics to discuss:
- Include in IG validation packages
- Availability for download as separate package (ZIP archive)
- How do we integrate/represent TestScripts in a published IG?
- IG Profiles - Can/should every IG profile have TestScript(s) for documentation and validation

Potential Outcomes:
- Recommendations on improvements to IG Publishing
- HL7 FHIR JIRA issues - new and/or existing

Scenario 3 - TestScript Usage - How can/should TestScript be used in the FHIR specification?
This scenario will explore areas of how and where TestScript is useful/needed/required. This is similar to the IG Integration scenario but focused on the base FHIR specification.

Possible discussion areas:
- Implementing a Base FHIR Resource
  - Can/should every resource type definition have TestScript(s) for documentation and validation?
- Defining the Base FHIR REST API
  - Can/should we define TestScript(s) that clearly document the conformance rules for the FHIR operations?
- Implementing the FHIR $ Extended Operations
  - Can/should we define TestScript(s) that clearly document the conformance rules for the FHIR $ extended operations?

Potential Outcomes:
- Recommendations on incorporating TestScripts as conformance rules documentation in the base FHIR specification
- HL7 FHIR JIRA issues - review existing, create new

Scenario 4 - Gap Analysis - Gap Analysis of Testscript Narrative in Spec
This scenario will explore the narrative documentation in the FHIR specification around TestScript authoring and find gaps. The intent is that for any particular test plan a layman in TestScript should be able to read the spec and know how to express that in the resource.

Possible discussion areas:
Operations for the common: Search, Read, Update, Create
Asserts for basic confirmation: Content-Type, Custom Header values, HTTP request types, Response codes
More complex asserts: validation, minimumId, compareToSource
Operators vs different types: collection vs single value, for both strings and values

Potential Outcomes:
- HL7 FHIR JIRA issues - new tickets for clarifications to resolve any new and existing narrative issues

Scenario 5 (Bonus) - TestScript Test Execution Interoperability
This scenario will explore the TestScript resource interoperability with execution of a TestScript resource on multiple FHIR Testing Engines.

Preconditions:
- Two (or more) FHIR Test Engines that are capable of executing a TestScript
- A common FHIR Server destination endpoint for all Test Engines
- A TestScript that all Test Engines fully understand and can execute

Step 1 - Choose/define TestScript to be executed by all Test Engines
Step 2 - Run agreed upon TestScript in a Test Engine
  - **Action:** Note and document the operation and assert results
Step 3+ - Run agreed upon TestScript in another Test Engine
  - **Action:** Repeat Step 2 for all additional Test Engine(s)

Success Criteria:
- Operation and Assert results from all Test Engines are compared and shown to have common, consistent results

TestScript(s):
- **Example TestScripts (Zip archive)**

Security and Privacy Considerations:
Generally, open FHIR servers will be used which do not require OAuth or have a security layer. Some servers may require TLS, mutual-TLS, OAuth, etc.