HL7® FHIR® Advanced Developer Study Guide

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Overview

The HL7 FHIR Developer exam serves to identify candidates that can engage in developing and maintaining FHIR-based clients and servers.

This advanced-level certification is a second step for candidates with an IT background (developers, architects) pursuing a career in FHIR-based interoperability.

Recommendations	Description
1 year experience using FHIR, but not required	**Without at least 1 year of experience, it is very unlikely that a candidate will be able to pass the exam.**
A passing score on either the HL7 FHIR Foundational Implementer exam or the HL7 FHIR R4 Proficiency exam	**If the candidate cannot pass the Foundational or Proficiency exams, they are unlikely to pass this exam.**

Competencies

The Advanced Developer certificate demonstrates a basic understanding of HL7 FHIR R4 specification and its use. Those that pass the test will have demonstrated their knowledge of the following concepts:

Competency	% of Test
Create a FHIR Client	48 - 50
Determine the correct method to write a client request to access a FHIR server and locate the capability statement	2 - 4
Determine the correct method to parse the data from a capabilities statement and find specific elements	3 - 5
Determine the correct method to code logic that populates a resource element with multiple possible data types	6 - 8
Given a scenario, select the correct code logic that determines the cause of an error response from a FHIR server	3 - 5
Determine the correct method to set up a development environment with necessary libraries	2 - 4
Determine the correct method to execute FHIR RESTFUL methods for resources	5 - 7
Determine the correct method to execute a standard FHIR operation	4 - 6
Determine the correct method to execute a terminology operation	2 - 4
Determine the correct method to move between pages returned from a FHIR server	2 - 4
Determine the correct method to resolve references to resources	3 - 5
Given a scenario, determine the correct method to process extensions	4 - 6
Determine the correct workflow to implement a transaction from the client side	1 - 3

Competency	% of Test
Create FHIR Facades	21 - 23
Analyze a fragment of code to implement a specific resource handling in the facade server	6 - 8
Determine the correct method to build the facade capability statement	2 - 4
Analyze methods of validation of exchanged resource instances against asserted and/or expected profiles	4 - 6
Determine the correct method to convert between FHIR JSON/XML and internal data structures	3 - 5
Given a scenario, determine the correct method to add custom operations or modify the behavior of existing operations	2 - 4
Use FHIR Technologies	14 - 16
Determine the correct FHIRPath expression to locate a specific element inside of a resource	3 - 5
Deteremine the correct method to use a CDS Hook Service	2 - 4
Given a scenario, determine the correct method to set up subscriptions to receive updates on FHIR resources	2 - 4
Given a scenario, determine the correct method to launch a Smart-on-FHIR app	4 - 6
Advanced Queries and Operations	13 - 15
Given the requirements of a use case, determine if an advanced query is correct	9 - 11
Given a scenario, determine if the method to process a transaction bundle is correct	3 - 5

Preparation

At least 1 year of HL7 FHIR implementation experience is strongly recommended, as well as formal training.

This test applies to the current FHIR Version (is intended to be version independent).

Competency/Skills Details

Create a FHIR Client

Write a client request to access a FHIR server and locate the capability statement

- Retrieve the capability statement
- Retrieve the terminology capabilities statement

Parse the data from a capabilities statement

- Find the supported Version of FHIR
- Find the supported resources
- Find the search parameters for one resource
- Find the supported profiles
- Find the security authorization endpoints
- Find the supported operations
- Find the format
- Find the interactions for one resource

Understand code logic that populates a resource element

- Code logic that populates a resource element with multiple possible data types Given data, complete the code
- Determine the correct code representation for populating data: Person names, addresses, dates, times/instants, identifiers, attachments, coded values, email and telephone numbers, binary, quantities, references to local resource, reference to logical resources, narrative

Implement/code logic that determines the cause of an error response

- Manage HTTP response codes and error handling
- Parse the OperationOutcome response

Execute FHIR RESTFUL methods for resources

- Create a resource
- Update a resource
- Read a specific version
- Delete a resource
- Read the current version of a resource

Execute standard FHIR operations

- Call $validate, $everything and $match
- Parse the results

Execute terminology operations

- Complete the parameters for $expand, $validate-code, $lookup, $translate, $closure
- Call the operation
- Parse the results

Move between pages returned from a FHIR server

- Determine the links to previous and next pages
- Ask for the previous and next pages

Resolve references to resources

- Resolve contained references
- Resolve different server references
- Resolve same server references

Process extensions

- Parse simple and complex extensions
- Process modifier extensions

Implement a transaction from the client side

- Determine the entries
- Determine the method and resource for each entry
- Determine the use of temporary identifiers
- Analyze the transaction response, status and outcome

Create FHIR Facades

Implement resource handling in a facade server

- Map the HTTP requests to the data
- Determine the route for a request
- Security check/scopes

Build the facade capability statement

- Given a set of server functionalities that are supported, create the appropriate CapabilityStatement to reflect them clearly and accurately
- Update capabilities statement when new capabilities are added
- Understand capabilities, requirements, and instance kinds of capabilities statements

Implement validation of exchanged resource instances

- Perform invariant validation
- Create OperationalOutcomes for the client
- Interpret the data from the validator
- Determine how to run a validator
- Determine when it is appropriate to run a validator

Convert between FHIR JSON/XML and internal data structures

- Deserialize/parse into a data structure
- Use the data structure
- Get a data structure for a source
- Serialize data structure into JSON/XML

Add custom operations

- Determine how to handle input and output parameters
- Extend the default API to call specific code
- Create an operation definition resource

Use FHIR Technologies

Use FHIRPath to locate a specific element inside of a FHIR Resource

- Evaluate FHIRPath syntax in the context of invariants

Use a CDS Hook Service

- Populate the context
- Populate the prefetch resources
- Read a CDS Hook Service response

Set up subscriptions to receive updates on FHIR resources

- How to create a subscription
- How to process a subscription notification

Launch a Smart-on-FHIR app

- Understand the different launch types
- Define the Scopes for a SMART-on-FHIR Service
- Populate the context for a Smart-on-FHIR launch
- Understand the different types of authentication

Advanced Queries and Operations

Formulate an advanced query based on a specific use-case

- Translate the requirements into combinations of search parameters and search result parameters
- Determine the correct key words to use (e.g.: _include, _revinclude)
- Combine "and"and "or" strategies
- Create and process batch queries

Implement transaction bundles

- Understand the order in which the HTTP verbs are executed
- Process FHIR bundle transactions, process temporary IDs
- Create FHIR bundle transaction responses

Formal Training

HL7 offers training that can help those preparing for the exam. The test taker might consider one of the following training paths:

- The HL7 FHIR Fundamentals Course (online)
- The HL7 FHIR Intermediate Course (online)
- The HL7 FHIR Proficiency Exam Preparation Course (online)
- The HL7 FHIR Certification Bundle (on-demand recordings)

Note: While training is helpful, no training replaces knowledge and application of the specification.

Test Format

The test is closed book, and the question formats are multiple choice. There are 100 questions on the exam. Candidates will have three (3) hours to complete the exam and must score at least 65% to pass the exam. There is no penalty for guessing.

Candidates will use their camera and a photo ID to identify themselves for testing purposes. No reading or writing materials are allowed during the test.

Mobile phones, messaging devices, and pagers ***must be turned off*** (not just silenced) during the test. Use of such devices during the test may result in disqualification. After the test, you are not allowed to discuss the contents of the test with others.