HL7 ONC Bulk Data 2019
Final Report
PTE Federal Award No:90AX0019/01-01
Subaward No: HL7-SA-20180-01

Boston Children's Hospital Computational Health Informatics Program

Project Summary

The SMART Health IT team at Boston Children's Hospital Computational Health Informatics Program received a subaward from HL7 and the Office of the National Coordinator to extend the FHIR standard to support bulk data export, and create a suite of tools and resources to support the FHIR bulk data development community. The FHIR Bulk Data API will allow real-time data to become available for clinical research, value-based care, and population health analytics. The FHIR community has agreed on an approach that reuses existing FHIR data models, API formats, and data types wherever possible and leverages existing SMART on FHIR standards for authentication and authorization. The FHIR Bulk Data Access specification has been balloted through HL7. The published implementation guide defines a standardized, FHIR based approach for exporting bulk data from a FHIR server to a pre-authorized client (https://hl7.org/fhir/uv/bulkdata/). The open source tools that were developed by the SMART Health IT team for the FHIR bulk data community under this subaward are described in this report.

Methods & Deliverables

1. a) Attend kickoff meeting scheduled by HL7 and occurring in February, 2019
   b) Provide a design document describing the testing approach to be implemented and considerations for integration with Inferno for review and approval by HL7 and ONC.

Following a series of meetings with HL7, ONC, and the MITRE Inferno team, the SMART team put together a design document detailing the testing approach and test suite that would be developed. The final version of the document was approved by HL7 and ONC in July 2019.

2. Develop a prototype test suite and utility to verify vendor compliance with the bulk data spec Flat FHIR format.

The SMART team created The Bulk Data Tester (BDT), an open source universal toolbox for testing bulk data servers (https://bulk-data-tester.smarthealthit.org/). It is made out of multiple independent modules that can be used separately. There is an online version, but it is also available for download to run locally.

The bulk data testing tool has three major components:

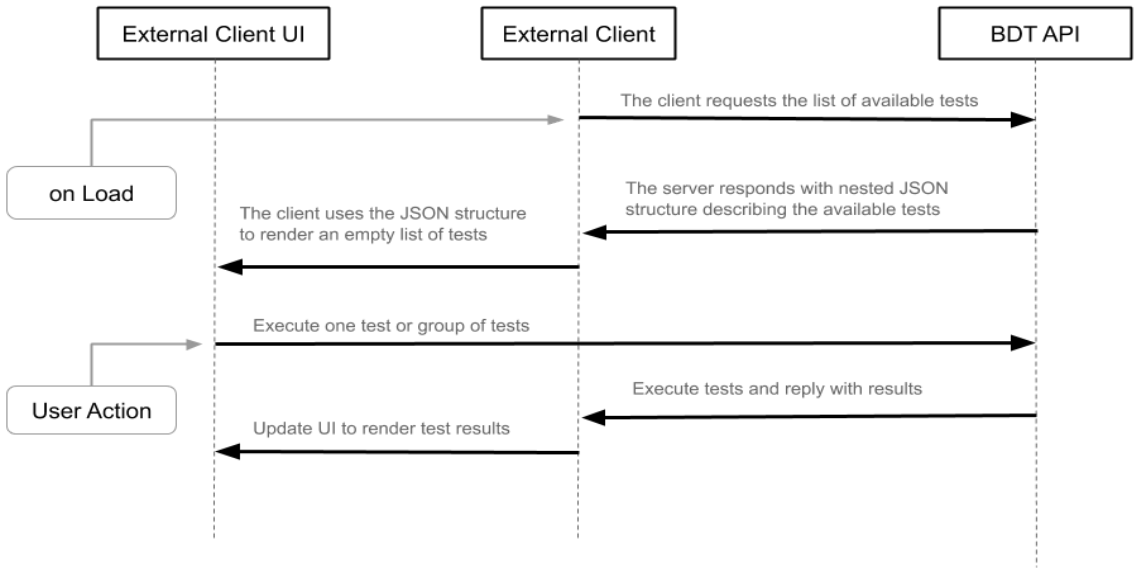
- The test runner, where the actual test suite is located
- Saved servers and configurations; if a user would like to run repeated tests against a server, they can save their configurations from the test runner in the saved servers
- A reporting tab allowing users to view all published server tests

The test suite contains about 76 tests, each containing many assertions.The tests are organized in groups:

- Patient-level, Group-level and System-level Export
- Authorization
    - Kick-off endpoint behavior
    - Token endpoint behavior
    - Status Endpoint
    - Download Endpoint

The tests are independent from each other and can be executed separately in any order.
A test is not a boolean routine, but can generate a lot of detailed information, warnings and messages. Every test uses special Bulk Data API provided to it by the test runner. This allows tests to abstract away the complexity of the bulk data flow and only concentrate on the details that are being tested.

The SMART Bulk Data Tester can also be launched from within the Inferno FHIR testing suite (https://infernotest.healthit.gov/). The diagram below shows how the Bulk Data Tester API (BDT API) can be called from an external browser-based client (such as Inferno) to run tests and pass results back for display to the end user of the external third-party system.



More information about the SMART BDT can be found here: https://docs.google.com/presentation/d/1qYqcWrsFvb7SRH_3SZFdggDfYmFALYNG2syTK1M2wfl/edit?usp=sharing

3. Provide a configuration description document for the Reference server that includes an on-line log for current and future version releases and dates and verifies compliance with FHIR R4.

The SMART Reference Bulk Data Server, designed for client developers, was updated to add R4 Support. The Bulk Data GUI Client ((https://bulk-data.smarthealthit.org/) and FHIR downloader client apps were also updated to support FHIR R4. All configuration and versioning details are documented on GitHub (https://github.com/smart-on-fhir/bulk-data-server).

4. a) Provide a document describing potential approaches to integrating FHIR data from multiple sources
   b) Provide an open source prototype utility to transform NDJSON to at least two non-FHIR formats (CSV and one other TBD by mutual agreement)

The bulk-data-tools repository on GitHub documents some approaches to integrating FHIR data from multiple sources, (https://github.com/smart-on-fhir/bulk-data-tools/blob/master/README.md), and points to an API documentation site that is open to the community (http://docs.smarthealthit.org/bulk-data-tools/).

The Bulk Data File Converter (https://github.com/smart-on-fhir/bulk-data-tools) is a NodeJS library that can convert large files and directories to and from 4 basic file formats; json, ndjson, csv, and tsv).

5. Provide the publication describing the complete package for testing and using FHIR Bulk Data capabilities

The White paper is forthcoming.

6. a) Provide documentation verifying that all remaining and necessary Reference Server updates have been completed.
   b) Provide a Final Report summarizing the results of the project and activities taken to collaborate with the FHIR Community and evangelize FlatFHIR.

Throughout 2019, the SMART Health IT team attended, participated in, and hosted events to evangelize and further develop the FHIR Bulk Data standard. Our team presented information about FHIR bulk data to the community, and provided support for HL7 collectathons. The reference server was updated several times based on community feedback at these events. All configuration and versioning details are documented on GitHub (https://github.com/smart-on-fhir/bulk-data-server).

The Computational Health Informatics Program and SMART Health IT team hosted an invitation-only meeting on behalf of HL7 and the ONC for key stakeholders across the health information ecosystem to talk about bulk data use cases and experience, and plan next steps for the standard and its use.

Event	Location	Date	Event Url

January 2019 Working Group Meeting	San Antonio, TX	January 12 - 18	https://www.hl7.org/events/working_group_meeting/2019/01/
HIMSS Global Health Conference & Exhibition	Orlando, FL	February 11 - 15	https://www.himssconference.org/about/general-info/himss-global-conference-save-date
DevDays US 2019	Remond, WA	June 10 - 12	https://www.hl7.org/events/fhir/devdays/2019/
May 2019 HL7 International Conference & Working Group Meeting	Montreal, Quebec	May 4 -10	https://www.hl7.org/events/working_group_meeting/2019/05/
33rd Annual Plenary & Working Group Meeting	Atlanta, GA	September 14 - 20	http://www.hl7.org/events/working_group_meeting/2019/09/
ONC/SMART FHIR Bulk Data Meeting	Boston, MA	November 6	https://smarthealthit.org/2019-smart-flat-fhir-bulk-data-meeting/

Next Steps

Going forward, it will be important to continue building the tools and resources for the FHIR bulk data developer community, and to continue to expand and improve upon the specification based on community input. As sites begin to implement FHIR Bulk Data, it will be important to document these implementations and understand how the spec is working well for them, and how it could be improved. We heard at the November ONC meeting that an import specification is of high importance, so a reference server for testing import clients would be of high value to the community.