

Ring of FHIR Overview


CT Medication Reconciliation Hackathon


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Ring of FHIR® Overview


- Composed of:
 - 18 FHIR PIT's - servers that represent real world healthcare organizations
 - Active Care Relationship Server (ACRS) that maps patient provider attributions
 - A Health Directory Server that lists endpoints for healthcare practitioners
 - A “FHIR Station” query broker
- All FHIR PIT's are populated with synthetic healthcare data
- Each FHIR PIT has a unique RESTful end point and a simple web user interface
- Each FHIR PIT is secured with basic authentication


 Pharmacy 1

 Pharmacy 2


 Pharmacy 3

 Payer 1

 Payer 2

 Payer 3

 Payer 4

 Payer 5

 ACO EHR 1

 ACO EHR 2

 ACO EHR 3

 HIE 1

 HIE 2

 HIE 3

 CQF Ruler PIT

 PO EHR 1

 PO EHR 2

 PO EHR 3

 FHIR Station

 HD

 ACRS

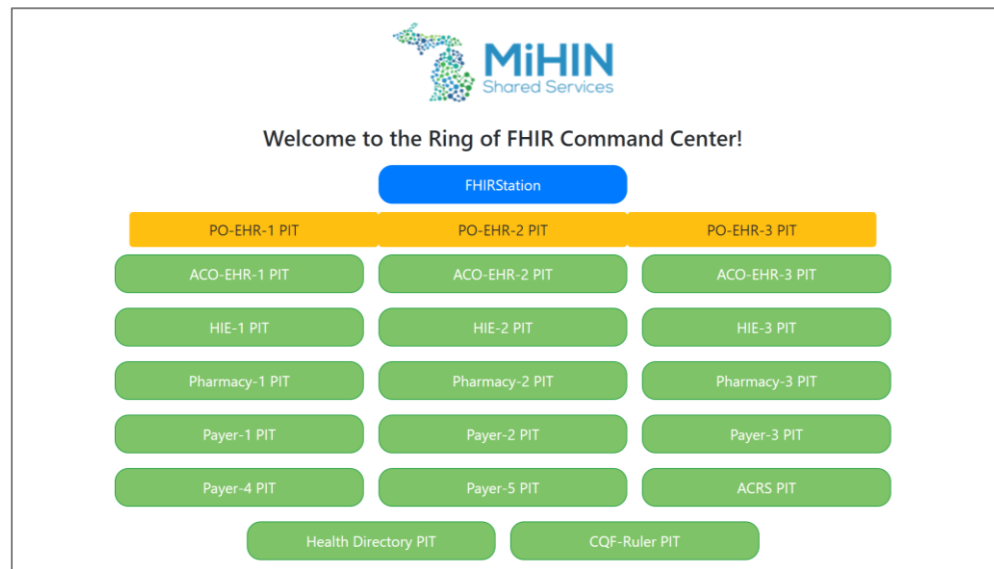
Synthetic FHIR Resources

Synthetic FHIR resources are mapped to FHIR PIT's based on the FHIR PIT's function (e.g. EHR, Payer, HD, ACRS, etc.)

- | | | |
|-----------------------|----------------------|--------------------|
| ■ Observation | ■ CarePlan | ■ Endpoint |
| ■ Encounter | ■ Diagnostic Report | ■ Practitioner |
| ■ Procedure | ■ Person | ■ PractitionerRole |
| ■ Immunization | ■ Patient | ■ Basic |
| ■ MedicationRequest | ■ AllergyIntolerance | ■ Contract |
| ■ MedicationStatement | ■ ImagingStudy | ■ Location |
| ■ Condition | ■ Organization | ■ Medication |

Step 1 - Getting Started

1. Visit the Ring of FHIR Command Center in your browser to view a clickable list of all FHIR PIT's in the Ring. The URL of the Command Center is - <https://fire-pit.mihin.org/FHIRCommandCenter/>
2. Click the “ACRS PIT” button to navigate to the ACRS PIT web UI.



Ring of FHIR Command Center



Step 2 – Log In

1. Sign on to the ACRS PIT using the user name and password provided prior to the event.



The login interface for MiHIN Shared Services. At the top, there is a logo consisting of a stylized map of Michigan made of blue and green dots, followed by the text "MiHIN Shared Services". Below this is a grey button labeled "qh-in-acrs". A horizontal line separates the header from the login fields. There are two input fields: the first is for the username, containing "matt.inglehart@mihin.org", and the second is for the password, represented by a series of dots. Below the password field is a blue "Log in" button.

Step 3 – Explore the Web UI

1. Set options according to your preference
2. View the resources types and counts available on the server
3. View the servers conformance or capability statement

1

Options

Encoding	(default)	XML	JSON		
Pretty	(default)	On	Off		
Summary	(none)	true	text	data	count

2

Resources

Patient 1096043

Observation 260252

MedicationStatement 28060

Encounter 20643

Condition 12923

ValueSet 11457

Claim 10975

Procedure 9790

ExplanationOfBenefit 8915

Binary 8156

Immunization 5200

3

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

Conformance

Step 4 – A Simple Query

1. Click “Patient” in the left rail “Resources” menu
2. Click “Search” to return a Bundle of Patient resources from the server
3. View the generated HAPI FHIR java client code
4. View the GET URL to return all Patient resources on the server - <https://fire-pit.mihin.org/qhin-acrs/baseDstu3/Patient>

Resources

1 Patient 1096043

Observation 260252

MedicationStatement 28060

Search Queries CRUD Operations Tag

2 Search

Search Parameters Optionally add parameter(s) to the search

+ _language - The language of the resource

Includes Also include resources which are referenced

3 Client Code - Use the following code snippet to execute this action in your own client.

```
// Create a client (only needed once)
FhirContext ctx = new FhirContext();
IGenericClient client = ctx.newRestfulGenericClient("http://hapi.fhir.org/baseDstu3");

// Invoke the client
Bundle bundle = client.search().forResource(Patient.class)
    .prettyPrint()
    .execute();
```

4

➤ Request	GET http://hapi.fhir.org/baseDstu3/Patient?_pretty=true
Request Headers	Accept-Charset: utf-8 Accept: application/fhir+xml;q=1.0, application/fhir+json;q=1.0 User-Agent: HAPI-FHIR/3.8.0-SNAPSHOT (FHIR Client; FHIR 3.0.1/D Accept-Encoding: gzip

Step 4 Continued – A Simple Query

1. View the resources returned in the response bundle
2. View the raw message body content
3. Click “Read” next to a Patient in the “Result Body” section

1

Result Body
JSON bundle
(24065 bytes)

Bundle contains 20 entries [Prev Page](#) [Next Page](#)

	ID	Updated
3 Read Update	Patient/1576427/_history/1	2019-03-06 14:33:07
Read Update	Patient/1576428/_history/1	2019-03-06 14:33:12
Read Update	Patient/1576430/_history/1	2019-03-06 14:33:17
Read Update	Patient/1576432/_history/1	2019-03-06 14:33:21

2 Raw Message

```
{
  "resourceType": "Bundle",
  "id": "552b8b75-acdf-4f81-a815-3f321c86dada",
  "meta": {
    "lastUpdated": "2019-03-18T01:45:31.561+00:00"
  },
  "type": "searchset",
  "link": [
    {
      "relation": "self",
      "url": "http://hapi.fhir.org/baseDstu3/Patient?pretty=true"
    },
    {
      "relation": "next",
      "url": "http://hapi.fhir.org/baseDstu3?_getpages=552b8b75-acdf-4f81-a815-3f321c86dada&_getpagesoffset=20&_count=20&pretty=true&_bundletype=searchset"
    }
  ],
  "entry": [
    {
      "fullurl": "http://hapi.fhir.org/baseDstu3/Patient/1576427",
      "resource": {
        "resourceType": "Patient",
        "id": "1576427",
        "meta": {
          "versionId": "1",
          "lastUpdated": "2019-03-06T14:33:07.608+00:00"
        },
        "text": {
          "status": "generated",
          "div": "<div xmlns='http://www.w3.org/1999/xhtml'> </div>"
        }
      }
    }
  ]
}
```


Step 4 Continued – A Simple Query

1. View the GET URL to return a specific Patient resource on the server - <https://fire-pit.mihin.org/qhin-acrs/baseDstu3/Patient/318>
2. View the raw message body content

Request	1 GET http://hapi.fhir.org/baseDstu3/Patient/1576427/_history?_pretty=true
Request Headers	Accept-Charset: utf-8 Accept: application/fhir+xml;q=1.0, application/fhir+json;q=1.0, application/xml+fhir;q=0.9, application/json+fhir;q=0.9 User-Agent: HAPI-FHIR/3.8.0-SNAPSHOT (FHIR Client; FHIR 3.0.1/DSTU3; apache) Accept-Encoding: gzip
Response	✓ HTTP 200 OK
Response Headers	date: Mon, 18 Mar 2019 01:55:09 GMT server: nginx/1.14.0 (Ubuntu) last-modified: Wed, 06 Mar 2019 14:33:07 GMT transfer-encoding: chunked x-powered-by: HAPI FHIR 3.8.0-SNAPSHOT REST Server (FHIR Server; FHIR 3.0.1/DSTU3) content-location: http://hapi.fhir.org/baseDstu3/Patient/1576427/_history/1 content-type: application/fhir+json; charset=utf-8 connection: keep-alive etag: w/"1"
Result Body JSON resource (573 bytes)	2 Raw Message <pre>{ "resourceType": "Patient", "id": "1576427", "meta": { "versionId": "1", "lastUpdated": "2019-03-06T14:33:07.608+00:00" }, "text": { "status": "generated", "div": "<div xmlns='http://www.w3.org/1999/xhtml'> </div>" }, "identifier": [{ "use": "usual", "type": { "text": "Computer-Stored Abulatory Records (COSTAR)" }, "value": "10006579", "assigner": { "display": "AccMgr" } }], "active": true, "gender": "unknown", "birthdate": "1924-10-10", "deceasedBoolean": false }</pre>

Step 5 – A More Advanced Query

1. Return to FHIR Command Center and select PO-EHR-2 PIT
2. Click “**Patient**” in the left rail “Resources” menu
3. Click “**Given**” and enter “**Millie**” in the search field.
4. Click the **+** button and add “**Family**” to search criteria and enter “**Bryant**” in search field.
5. Click “Search” to return a Patient resources from the server.
6. Click “Read” next to a Patient in the “Result Body” section.
7. View the GET URL to return Patient resources on the server –

<https://fire-pit.mihin.org/po-ehr-2/baseDstu3/Patient?given=Millie&family=Bryant&pretty=true>

The screenshot displays the FHIR Command Center interface with several numbered callouts (1-5) indicating the steps for an advanced query:

- 1**: Points to the **Resources** section in the left rail, which lists **Patient** (1096043), **Observation** (260252), and **MedicationStatement** (28060).
- 2**: Points to the **Search** button in the **Search Parameters** section.
- 3**: Points to the **Matches** dropdown menu for the **family** parameter, which is set to **Bryant**.
- 4**: Points to the **Search** button in the **Search Parameters** section.
- 5**: Points to the **Read** button in the **Result Body** section, next to the **Patient/MillieBryant/_history/1** entry.

The **Result Body** section shows a JSON bundle with 1 entry. The **Raw Message** section displays the following JSON:

```
{
  "resourceType": "Bundle",
  "id": "0f523e5a-2869-4531-b995-41db8fe6941b",
  "meta": {
    "lastUpdated": "2019-03-27T20:40:18.199+00:00"
  },
  "type": "searchset"
}
```

Step 5 Continued – Advanced Query

1. In the Raw Message section there will be more information about the Patient
2. Look for “Patient ID” - this can be used to search for more information on the Patient
 - a. ID: “MillieBryant”

1 Raw Message

```
{
  "resourceType": "Bundle",
  "id": "0f523e5a-2869-4531-b995-41db8fe6941b",
  "meta": {
    "lastUpdated": "2019-03-27T20:40:18.199+00:00"
  },
  "type": "searchset",
  "total": 1,
  "link": [
    {
      "relation": "self",
      "url": "https://fire-pit.mihin.org/po-ehr-2/baseDstu3/Patient?_pretty=true&family=Bryant&given=Millie"
    }
  ],
  "entry": [
    {
      "fullUrl": "https://fire-pit.mihin.org/po-ehr-2/baseDstu3/Patient/MillieBryant",
      "resource": {
        "resourceType": "Patient",
        "id": "MillieBryant",
        "meta": {
          "versionId": "1",
          "lastUpdated": "2019-03-27T20:00:17.000+00:00",
          "profile": [
            "http://hl7.org/fhir/StructureDefinition/daf-patient"
          ]
        },
        "text": {
          "status": "generated",
          "div": "<div xmlns='http://www.w3.org/1999/xhtml'><div class='hapiHeaderText'>Millie Janine <b>Bryant </b></div><table class='hapiPropertyTable'><tbody><tr><td>Identifier</td><td>19</td></tr><tr><td>Address</td><td><span>647 Kinneck Road SE </span><br/><span>Jackson </span><span>MI </span><span>UNITED STATES </span></td></tr><tr><td>Date of birth</td><td><span>01 July 1945</span></td></tr></tbody></table></div>"
        },
        "extension": [
          {
            "url": "http://hl7.org/fhir/StructureDefinition/us-core-race",
            "valueCodeableConcept": {
              "coding": [
                {
                  "system": "urn:oid:2.16.840.1.113883.6.238",
                  "code": "2106-3",
                  "display": "White"
                }
              ]
            }
          }
        ]
      }
    }
  ]
}
```

Step 6 – Find MedicationStatement

1. Click “**MedicationStatement**” in the left rail “Resources” menu
2. Click “**Subject**” and enter Patient Name – “**MillieBryant**”
3. Click “Search” to return a Bundle of MedicationStatement resources from the server.
4. Click “Read” next to a MedicationStatement in the “Result Body” section.
5. View the generated HAPI FHIR java client code.
6. View the GET URL to return all Patient resources on the server –
https://fire-pit.mihin.org/po-ehr-2/baseDstu3/MedicationStatement?subject=MillieBryant&_pretty=true

The screenshot displays the HAPI FHIR client interface. On the left, a sidebar shows the 'Resources' menu with 'MedicationStatement' selected (56 items), 'DeviceUseStatement' (145 items), and 'Medication' (27 items). The main area features a search bar with the text 'subject - The identity of a patient, animal or group to...' and a dropdown menu showing 'MillieBryant'. Below the search bar, a green button with a plus sign is visible. The 'Result Body' section shows a JSON bundle containing 4 entries. Each entry has a 'Read' button and an 'Update' button. The entries are:

- MedicationStatement/MillieBryantMetforminMS/_history/2
- MedicationStatement/MillieBryantNitroglycerinMS/_history/2
- MedicationStatement/MillieBryantGabapentinMS/_history/4
- MedicationStatement/MillieBryantWarfarin5MS/_history/2

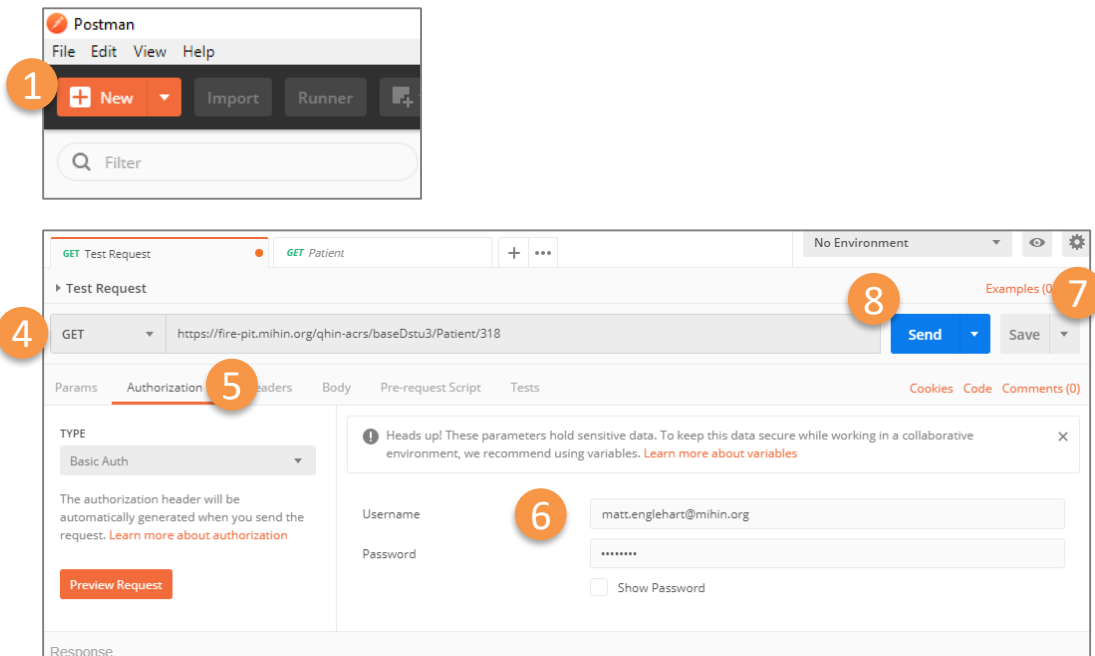
At the bottom, the 'Raw Message' section shows the JSON response:

```
{
  "resourceType": "Bundle",
  "id": "2a6fe70e-ec17-4fc4-a60c-e4fe1270fb83",
  "meta": {
    "lastUpdated": "2019-03-27T20:55:54.936+00:00"
  }
}
```

The Velatura logo is in the bottom right corner.

Try it with Postman

1. Download Postman - <https://www.getpostman.com/downloads/>
2. Click the down arrow on the orange "New" button and select "Request"
3. Create a request name like "Test Request"
4. Click "Save"
5. Select "Get" and copy the following URL into the "Enter request URL" input box - <https://fire-pit.mihin.org/qhin-acrs/baseDstu3/Patient/318>
6. Click "Authorization" then select "Basic Auth" from the "Type" dropdown menu
7. Enter your user name and password on the right
8. Click "Save"
9. Click "Send"



Ring of FHIR URL's

EHR 1 (Golden Record)

<https://fire-pit.mihin.org/po-ehr-1/user-login>

EHR 2

<https://fire-pit.mihin.org/po-ehr-2/user-login>

EHR 3

<https://fire-pit.mihin.org/po-ehr-3/user-login>

Med Rec Personas

Millie Bryant



George Tullison



Sarah Thompson



Christy Munson



Alex Gonzales



Santiago Morales



Hackathon Activity

- Each of the Personas represent a Medication Reconciliation scenario that needs to be performed. Participants should identify the issue with each Persona and propose a solution(s) for Medication Reconciliation leveraging the available FHIR resources. We encourage participants to leverage all the Personas included and identify which of the following scenario(s) they match with:
 - Duplication of same medication
 - Duplication of generic and brand name medication
 - Missing medications
 - Negative Drug Interaction
 - Conflicting medication records
 - Complex medication management

Thank you!

Contact Information

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