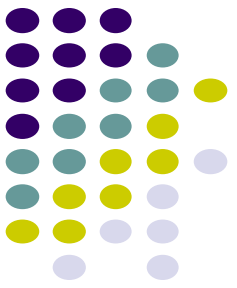


FHIR

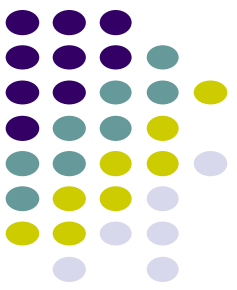
Fast Healthcare Interoperability Resources

Background: FHIR



- Standardized API to aid in the exchange of electronic health records
- Health Level Seven International (HL7)
- 2014: Release 1 -
 - Draft Standard for Trial Use
- 2017: Release 3 -
 - Standards for Trial Use
- Easily integrated into already existing systems and provides an alternative to using third party applications for document retrieval.

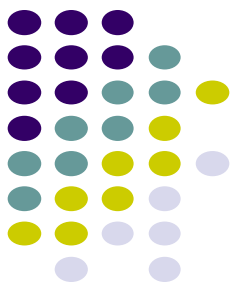




Problems it Solves

- Easier implementation of HL7 data formats
 - XML
 - JSON
- Request discrete data elements instead of full documents
 - Before: Lengthy 500+ page continuity of care document (CCD)
 - Now: Just last lab results
- Allows for patients to get their own data
- Makes it easier for health care providers to obtain, distribute, and store medical information that can be passed over their networks.
- Real-time data retrieval parsed from wire-data.

Implementations

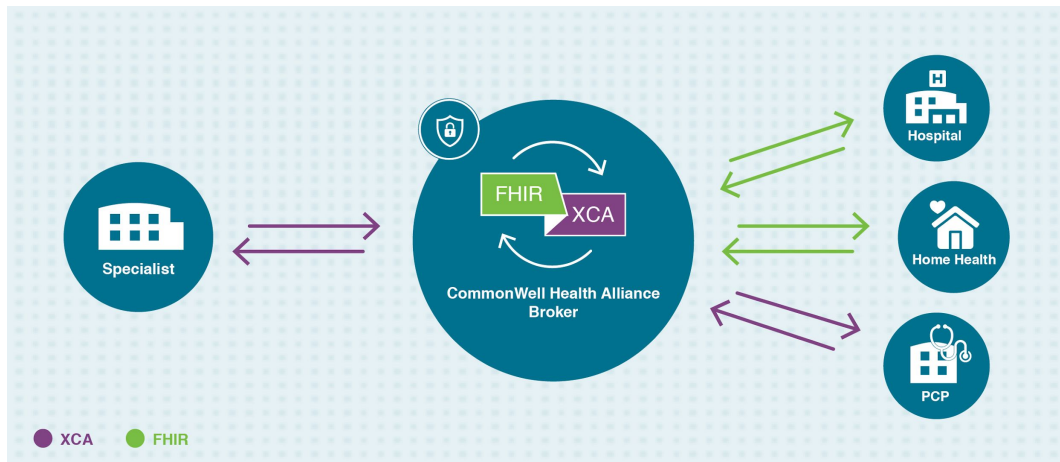


- SMART on FHIR
 - Boston Children's Hospital Computational Health Informatics Program
 - Joined FHIR development 2013
 - Software libraries in a variety of libraries
 - Build into EHR vendor software
- HAPI FHIR
 - Smile CDR
 - First release in 2014
 - Java Library
 - Separate storage and dealing with data

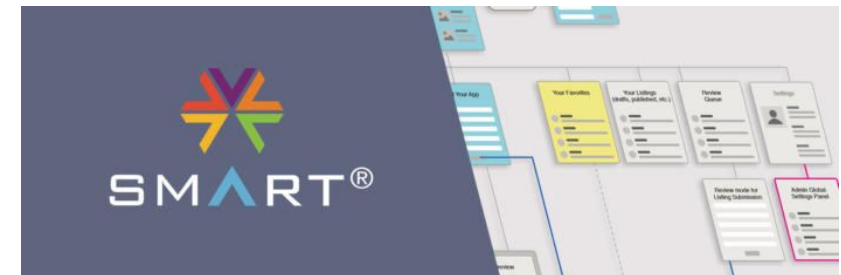


Real World Examples

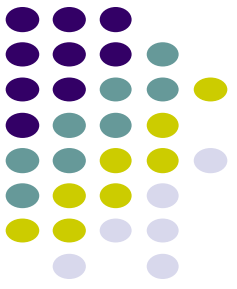
- CommonWell
 - Request remote patient content for personal enrollment
 - Access all available clinical data
 - Distributes important data remotely for patients



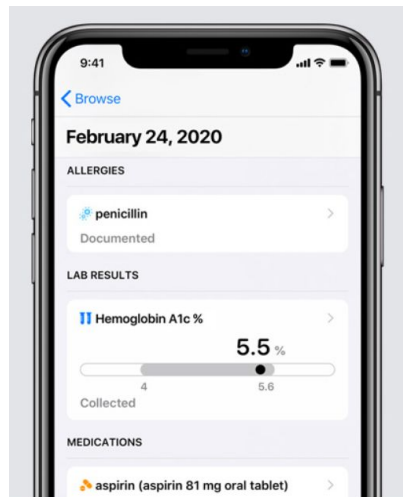
- SMART App Gallery
 - Over 100 listings
 - Mostly geared for Clinicians
 - ASCVD Risk Calculator
 - Calculates 10 year/ lifetime risk cardiac disease risk score
 - BP Centiles v1
 - Calculates blood pressure percentile in children



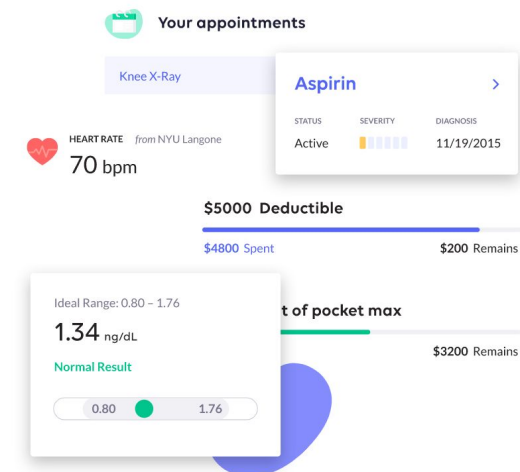
Real World Examples



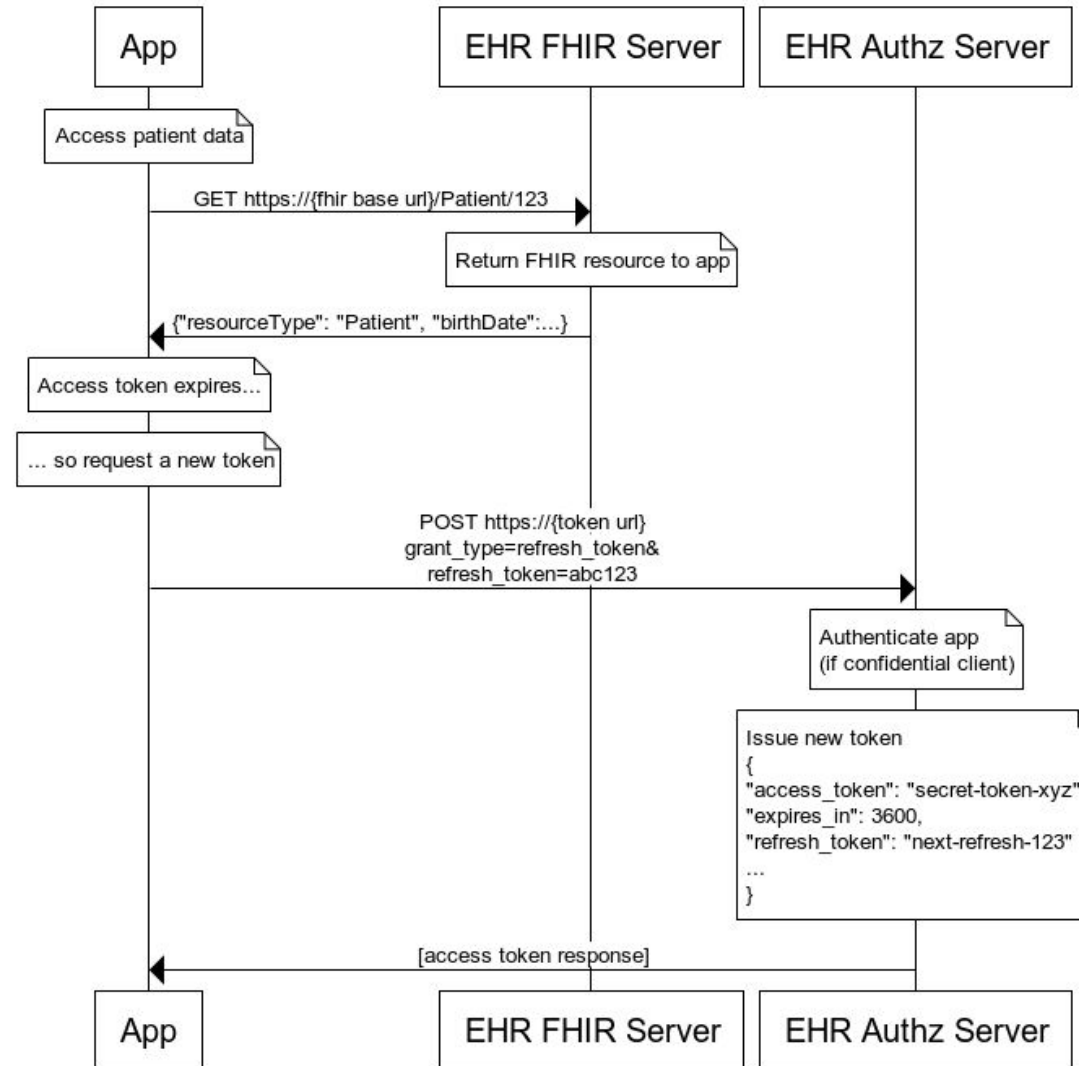
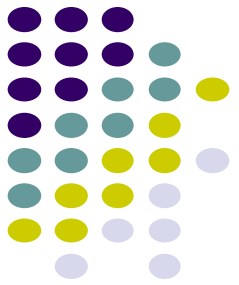
- Apple Health
 - iPhone app
 - Combines your data across your care organizations
 - Lab results
 - Medications



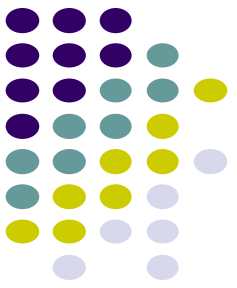
- OneRecord
 - Android and iPhone
 - Combines your data across
 - Share your records
 - Family
 - Healthcare Providers



Overview



Code snippet: Reading a Resource



```
import ca.uhn.fhir.context.FhirContext;
import ca.uhn.fhir.rest.api.MethodOutcome;
import ca.uhn.fhir.rest.server.exceptions.ResourceNotFoundException;
import ca.uhn.fhir.rest.client.api.IGenericClient;
import org.hl7.fhir.r4.model.DateType;
import org.hl7.fhir.r4.model.Enumerations;
import org.hl7.fhir.r4.model.Patient;
import org.hl7.fhir.instance.model.api.IIdType;

public static void step1_read_a_resource() {

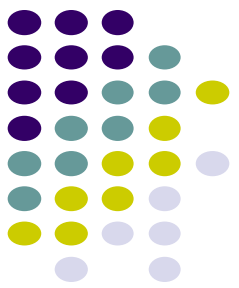
    FhirContext ctx = FhirContext.forDstu3();
    IGenericClient client = ctx.newRestfulGenericClient("http://fhirtest.uhn.ca/baseDstu3");

    Patient patient;
    try {
        // Try changing the ID from 952975 to 999999999999
        patient = client.read().resource(Patient.class).withId("952975").execute();
    } catch (ResourceNotFoundException e) {
        System.out.println("Resource not found!");
        return;
    }

    String string = ctx.newXmlParser().setPrettyPrint(true).encodeResourceToString(patient);
    System.out.println(string);

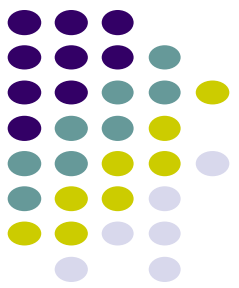
}
```


Code snippet: Searching for patient

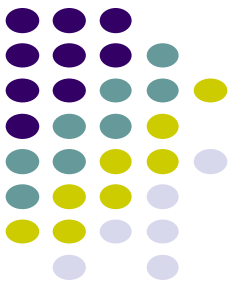


```
1 public static void step2_search_for_patients_named_test() {  
2     FhirContext ctx = FhirContext.forDstu3();  
3     IGenericClient client = ctx.newRestfulGenericClient("http://fhirtest.uhn.ca/baseDstu3");  
4  
5     org.hl7.fhir.r4.model.Bundle results = client  
6         .search()  
7         .forResource(Patient.class)  
8         .where(Patient.NAME.matches().value("test"))  
9         .returnBundle(org.hl7.fhir.r4.model.Bundle.class)  
10        .execute();  
11  
12    System.out.println("First page: ");  
13    System.out.println(ctx.newXmlParser().encodeResourceToString(results));  
14  
15    // Load the next page  
16    org.hl7.fhir.r4.model.Bundle nextPage = client  
17        .loadPage()  
18        .next(results)  
19        .execute();  
20  
21    System.out.println("Next page: ");  
22    System.out.println(ctx.newXmlParser().encodeResourceToString(nextPage));  
23  
24 }
```

Code snippet: Creating a patient

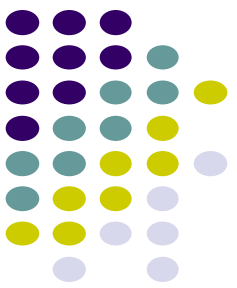


```
public static void step3_create_patient() {  
    // Create a patient  
    Patient newPatient = new Patient();  
  
    // Populate the patient with fake information  
    newPatient  
        .addName()  
        .setFamily("DevDays2015")  
        .addGiven("John")  
        .addGiven("Q");  
    newPatient  
        .addIdentifier()  
        .setSystem("http://acme.org/mrn")  
        .setValue("1234567");  
    newPatient.setGender(Enumerations.AdministrativeGender.MALE);  
    newPatient.setBirthDateElement(new DateType("2015-11-18"));  
  
    // Create a client  
    FhirContext ctx = FhirContext.forDstu3();  
    IGenericClient client = ctx.newRestfulGenericClient("http://fhirtest.uhn.ca/baseDstu3");  
  
    // Create the resource on the server  
    MethodOutcome outcome = client  
        .create()  
        .resource(newPatient)  
        .execute();  
  
    // Log the ID that the server assigned  
    IIdType id = outcome.getId();  
    System.out.println("Created patient, got ID: " + id);  
}
```



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