KLAS Connected Apps Report
http://SmartHealthIT.org/apps-report

CONNECTED APPS IN HEALTHCARE 2017
A Look at Trends and Provider Attitudes in a Growing Market

bit.ly/smart-fhir-tech
“... we had this wonderful population health tool, but we couldn’t get the [EHR] system to interface with it, so we had to enter information by hand. We just had to give up on that because we couldn’t physically keep up.”

- Physician, KLAS Interview
SMART Core Focus

Healthcare Apps

SMART: UX Integration
Authorization
Single Sign-On
Clinical Data

Clinical Systems
(EHRs, Patient Portals, Data Warehouses)
Why SMART?

• Users:
  • App choice (substitutability)

• Developers:
  • Low barriers to entry (open standards, large community)
  • Single app can run in systems by different vendors
  • Single app can run in different contexts (e.g. EHR and Patient Portal)
Modern EHRs become a platform!

- User and Patient Management
- Workflow and core services
- Data persistence
- Regulatory compliance
- Apps
What is FHIR?

API and Data models representing discrete clinical and administrative units (patient, practitioner, allergy, medication order, etc.)

• ~100 have been defined
• Narrative text for “lowest common denominator data exchange”
• Developer readable data format (JSON or XML)
• Can reference other resources by their URL
• Don’t include the kitchen sink

“We only include data elements if we are confident that most normal implementations using that resource will make use of the element”

- Grahame Grieve (FHIR Product Director)
• But, support extensions for faucets, etc.
Patient Resource Example

```json
{
  "resourceType": "Patient",
  "active": true,
  "name": [{
    "use": "official",
    "family": ["Coleman"],
    "given": ["Lisa", "P.""]
  }],
  "gender": "female",
  "birthDate": "1948-04-14"
  ...
}
```
OAuth Based EHR App Launch

1a. Launch information (server URL, token)

1b. Data access requested (scopes)

2a. Auth token for data access / user identity / context (current patient, encounter) / extras (stylesheet, etc.)

3. Display Data

EHR

1. Choose App (from registered apps)

2. Authorize Access (limited data)

3a. FHIR API request (with auth token)

3b. FHIR resources
SMART Authorization Scopes

• Scopes convey what access an app needs

patient/Immunization.read

Access Type FHIR Resource Permission

• Examples:
  • Simple app: patient/Patient.read, patient/Observation.read
  • Complex app: patient/*.read
  • ePrescribing app: patient/MedicationOrder.write
  • Population health app: user/*.read

http://docs.smarthealthit.org/authorization/scopes-and-launch-context/
Adoption: Argonaut Project

Group of EHR vendors and hospitals driving support for SMART and FHIR in USA

• Argonaut Implementation Guides
  • Security and Authorization (SMART)
  • Data element query of the ONC Common Clinical Data Set
  • Document query of static documents
  • US Provider Directory
  • Implementation guide for scheduling clinical services
  • Implementation guide for CDS Hooks

• 2018 Projects
  • Clinical notes
  • Bulk Data & Backend Services
  • Questionnaires
Adoption: Healthcare Organizations

“On October 9, 2015 I successfully logged into our production system for the first time to view real patient data in a FHIR app! I'd love to share screenshots with you, but they contain real patient data, so I can't! Let me say that again: real patient data, via FHIR, within Maestro Care, our Epic-based EHR.”

Ricky Bloomfield Jr, MD
Director of Mobile Technology Strategy
http://www.rickybloomfield.com/2015/10/dukes-on-fhir-for-real-this-time.html
Public App Gallery

• SMART App Gallery offer a single place to find and learn about SMART and FHIR apps

• Vendor and license neutral
  • Not restricted to a single EHR platform
  • Hosts commercial and open source apps

• No cost to list or browse apps
https://apps.smarthealthit.org
FHIR for Populations

Proposed “bulk data” extension to FHIR to support efficient access to data on large groups of individuals

• Use cases include: assess the value of the care provided, conduct population analyses, identify at-risk populations, and track progress on quality improvement

• Queries return data on all patients that the client’s account has access to or all patients in a nominated group, since the starting date time provided

• Can restrict to only records to specific FHIR data models (resource types)
In-workflow decision support
http://cds-hooks.org

Goal: tighter integration of third-party decision services in EHR
- Approach: Enhance workflow with cards displayed inline
- Collaborators: EHR vendors, CDS Vendors, HL7 Clinical Decision Support Workgroup,
- Timeline: 1.0 publication in early 2019
Sync for Science  http://syncfor.science

Goal: helping patients share EHR data with researchers

• Approach: SMART, FHIR, Argonaut, and MU3 API certification requirements

• Collaborators: Government (NIH, ONC, OSTP), EHR vendors (Allscripts, Cerner, eClinicalWorks, Epic, and others)

• Timeline: Piloting with ~10 provider sites and testing with real patients

• All of Us Research Program is one early S4S "customer" (research study). There will be lots more, if we're successful.
Open Source Tools
dev.smarthealthit.org
SMART Sandbox Demo

launch.smarthealthit.org

Glucose sample app:
Code: https://glitch.com/edit/#!/exciting-firefly
EHR launch: https://exciting-firefly.glitch.me/ehr.html
Standalone launch: https://exciting-firefly.glitch.me/standalone.html
Software Libraries for Developers
Open Source Sample Apps
Public Sandboxes for Testing
SMART Sandbox

• De-identified longitudinal medical records

• Over 1,500 synthetically generated patients comprising 150,000 FHIR resources

• PRO data based on NHS pre and post surgery surveys
http://docs.smarthealthit.org/data
SMART App Launcher

App Launch Options

Launch Type
- Provider EHR Launch (practitioner opens the app from within an EHR)
- Simulate launch within the EHR user interface
- Provider Standalone Launch (practitioner opens the app directly and connects to FHIR)
- Patient Standalone Launch (patient opens the app directly and connects to FHIR)
- Backend Service (app connects to FHIR without user login)
- CDS Hooks Service (test your CDS services)

FHIR Version
- R2 (DSTU2)

Open FHIR Server Endpoint: https://launch.smarthealthit.org/vr2/fhir

Patient(s)
- launch or launch/patient scope

Provider(s)
- openId and profile scopes

Advanced
- Active Encounter in EHR
  - launch or launch/encounter scope
  - Show encounter selector
  - Use the patient’s most recent encounter if available

Simulate Authentication Error for Testing
- None

Launch

The app’s client_id is not validated on the SMART test server, so any text string will work. Use the error dropdown above to simulate the server response to an invalid client_id.

The app’s client_secret is not validated on the SMART test server, so any secret will work. If provided, the Authorization header must conform to the standard format (Example). Use the error dropdown above to simulate the server response to an invalid client_secret.

App Launch URL (required)

Launch URL

Full url of the page in your app that will initialize the SMART session (often the path for a launch.html file)
Cerner SMART Tutorial

Code: https://glitch.com/edit/#!/potent-spy
Write-up: http://engineering.cerner.com/smart-on-fhir-tutorial
Standalone launch: https://potent-spy.glitch.me/launch-patient.html