

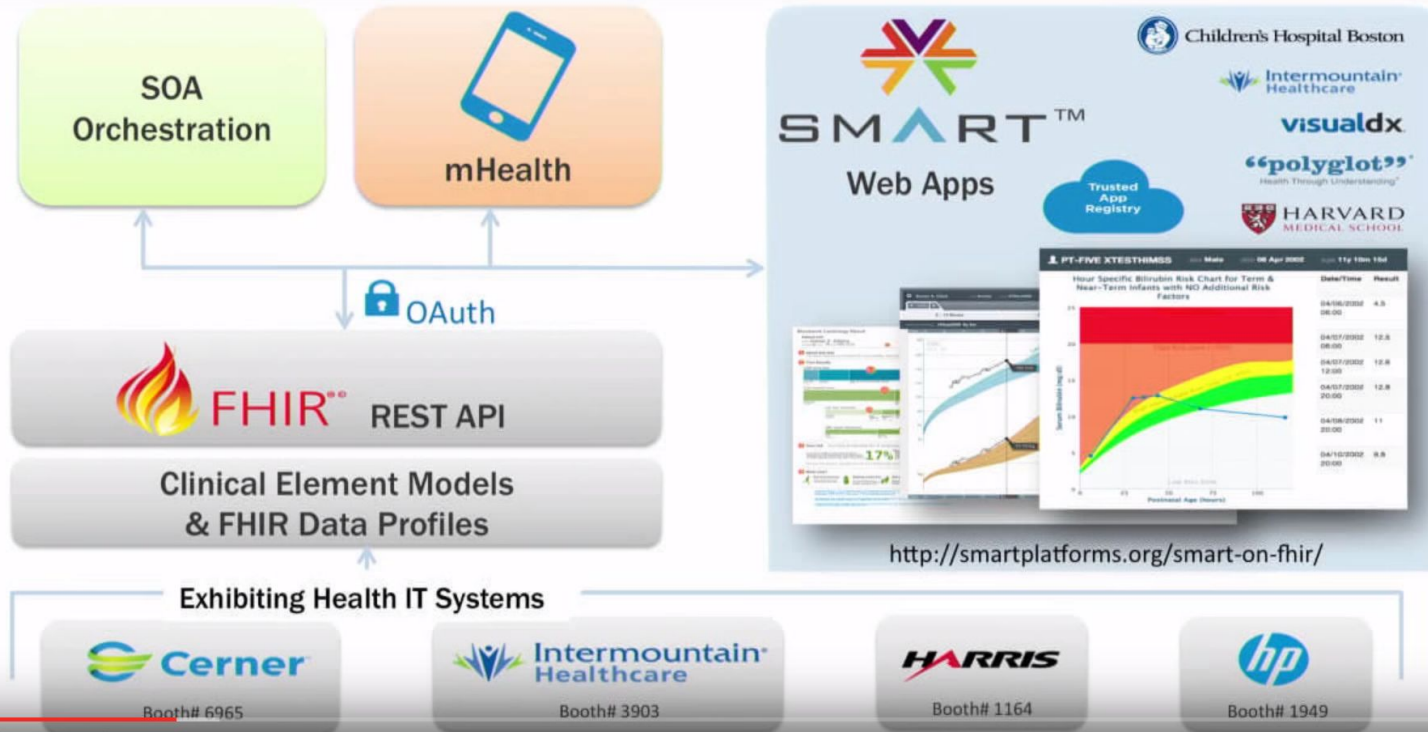
A decorative graphic on the left side of the slide. It consists of a blue parallelogram and a light green parallelogram, both tilted at an angle. The blue shape is in the foreground, and the green shape is partially behind it. They are set against a dark blue background with subtle diagonal lines.

# Smart on FHIR With Cerner

# Smart on FHIR Architecture Overview

SMART on FHIR - Apps for Healthcare

## SMART on FHIR® Demo at HIMSS 2014

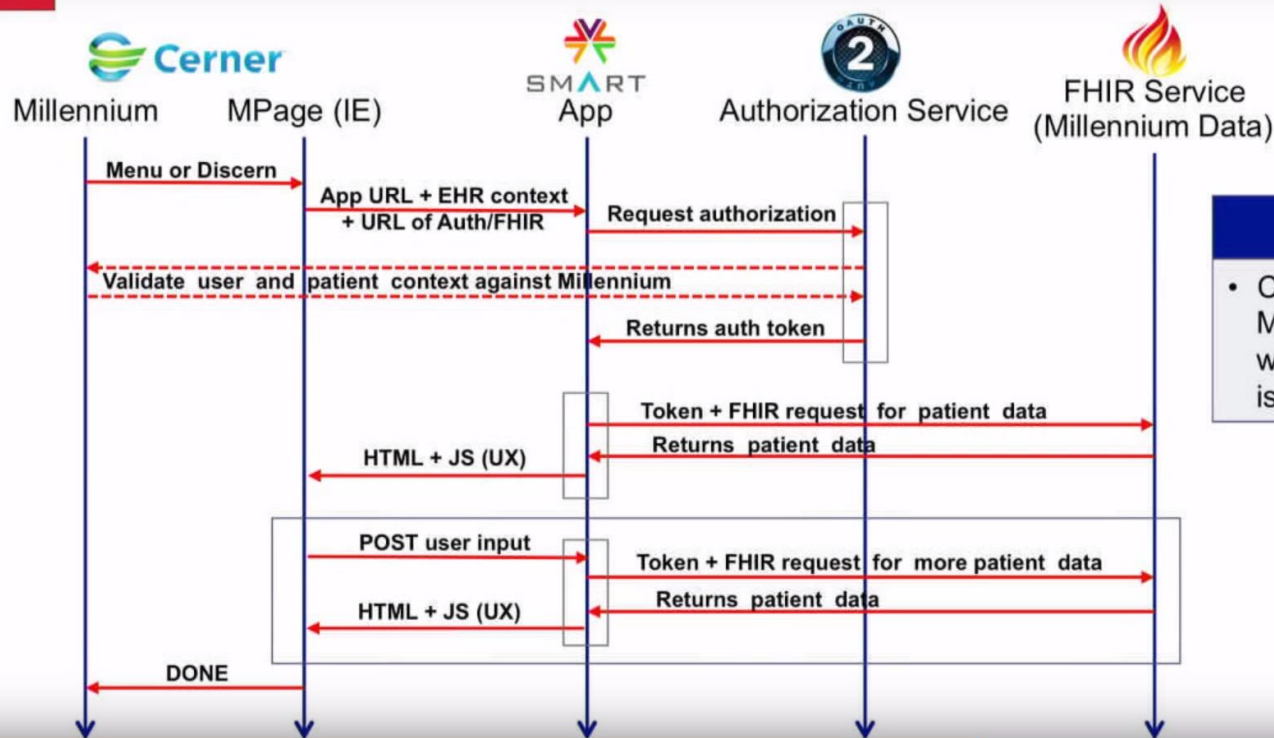


# OAuth2 with Smart on FHIR and Cerner

SMART on FHIR - Apps for Healthcare

DEUCON

## App Invocation – Sequence Diagram

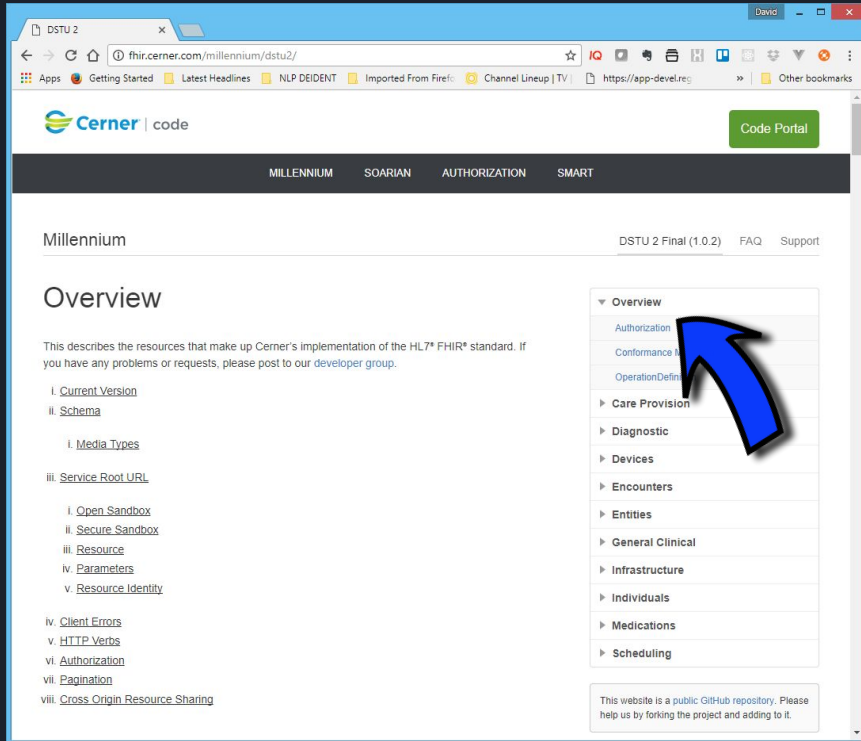


**Done!**

- Control returns to Millennium shell when the MPage is exited

# Cerner FHIR Information

## <http://fhir.cerner.com/millennium/dstu2>



**Millennium** DSTU 2 Final (1.0.2) [FAQ](#) [Support](#)

## Overview

This describes the resources that make up Cerner's implementation of the HL7® FHIR® standard. If you have any problems or requests, please post to our [developer group](#).

- [I. Current Version](#)
- [II. Schema](#)
  - [I. Media Types](#)
- [III. Service Root URL](#)
  - [I. Open Sandbox](#)
  - [II. Secure Sandbox](#)
  - [III. Resource](#)
  - [IV. Parameters](#)
  - [V. Resource Identity](#)
- [IV. Client Errors](#)
- [V. HTTP Verbs](#)
- [VI. Authorization](#)
- [VII. Pagination](#)
- [VIII. Cross Origin Resource Sharing](#)

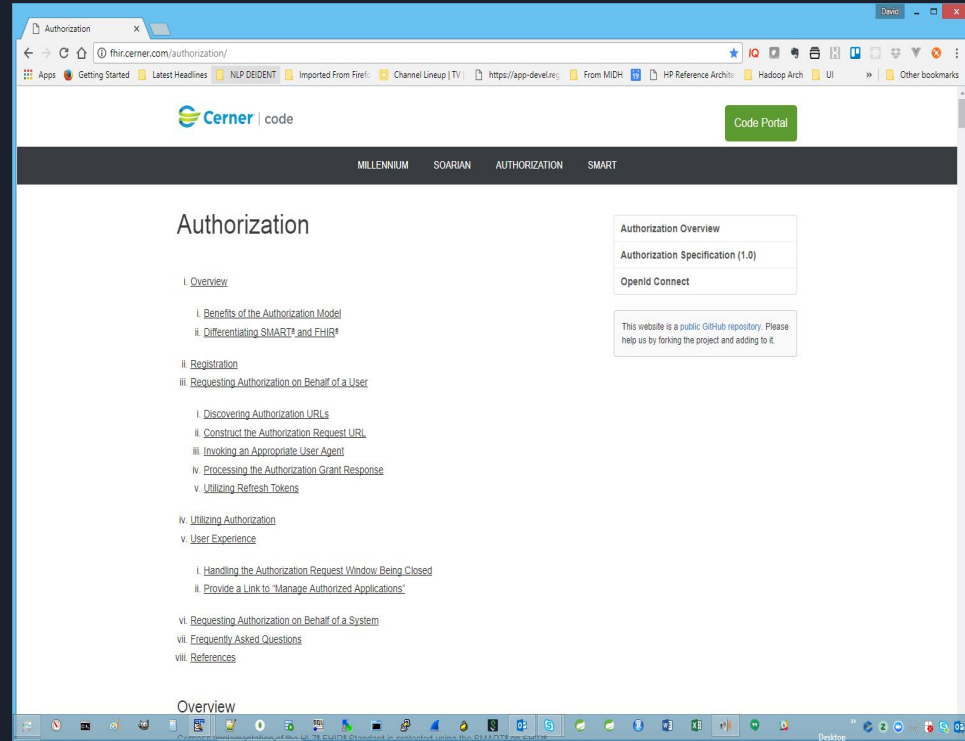
**Overview**

- [Authorization](#)
- [Conformance](#)
- [OperationDefinition](#)

**Care Provision**

- [Diagnostic](#)
- [Devices](#)
- [Encounters](#)
- [Entities](#)
- [General Clinical](#)
- [Infrastructure](#)
- [Individuals](#)
- [Medications](#)
- [Scheduling](#)

This website is a public GitHub repository. Please help us by forking the project and adding to it.



**Authorization**

[Authorization Overview](#)


[Authorization Specification \(1.0\)](#)

[OpenId Connect](#)

This website is a public GitHub repository. Please help us by forking the project and adding to it.

- [I. Overview](#)
  - [I. Benefits of the Authorization Model](#)
  - [II. Differentiating SMART® and FHIR®](#)
- [II. Registration](#)
- [III. Requesting Authorization on Behalf of a User](#)
  - [I. Discovering Authorization URLs](#)
  - [II. Construct the Authorization Request URL](#)
  - [III. Invoking an Appropriate User Agent](#)
  - [IV. Processing the Authorization Grant Response](#)
  - [V. Utilizing Refresh Tokens](#)
- [IV. Utilizing Authorization](#)
- [V. User Experience](#)
  - [I. Handling the Authorization Request Window Being Closed](#)
  - [II. Provide a Link to "Manage Authorized Applications"](#)
- [VI. Requesting Authorization on Behalf of a System](#)
- [VII. Frequently Asked Questions](#)
- [VIII. References](#)

**Overview**



# Cerner FHIR DSTU2 Supported Resource Types

## *Care Provision*

- CarePlan
- Goal

## *Diagnostic*

- DiagnosticReport
- Observation

## *Devices*

- Device

## *Encounters*

- Encounter

## *Entities*

- Contract
- Person

## *General Clinical*

- AllergyIntolerance
- Condition
- Procedure

## *Infrastructure*

- Binary
- DocumentReference

## *Individuals*

- Patient
- Practitioner
- RelatedPerson

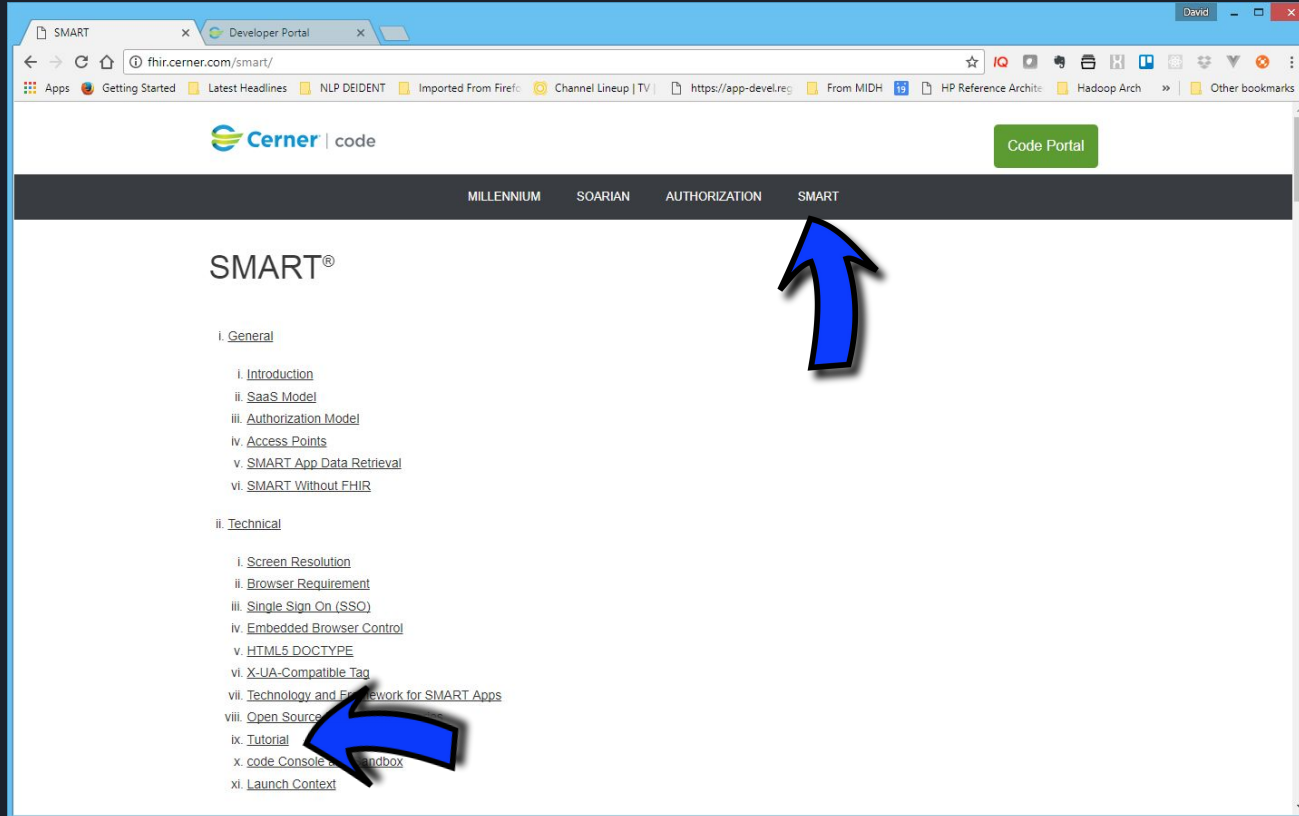
## *Medications*

- Immunization
- MedicationOrder
- MedicationStatement

## *Scheduling*

- Appointment
- Schedule
- Slot

# Cerner Smart Information



The screenshot shows a web browser window with the URL [fhir.cerner.com/smart/](https://fhir.cerner.com/smart/). The page features the Cerner logo and the text "code" in the top left, and a green "Code Portal" button in the top right. A dark navigation bar contains the links: "MILLENNIUM", "SOARIAN", "AUTHORIZATION", and "SMART". The "SMART" link is highlighted with a blue arrow. Below the navigation bar, the page title is "SMART®". The content is organized into two main sections: "i. General" and "ii. Technical". The "General" section includes links for "Introduction", "SaaS Model", "Authorization Model", "Access Points", "SMART App Data Retrieval", and "SMART Without FHIR". The "Technical" section includes links for "Screen Resolution", "Browser Requirement", "Single Sign On (SSO)", "Embedded Browser Control", "HTML5 DOCTYPE", "X-UA-Compatible Tag", "Technology and Framework for SMART Apps", "Open Source", "Tutorial", "code Console and Sandbox", and "Launch Context". A blue arrow points to the "Introduction" link under the "General" section.

SMART®

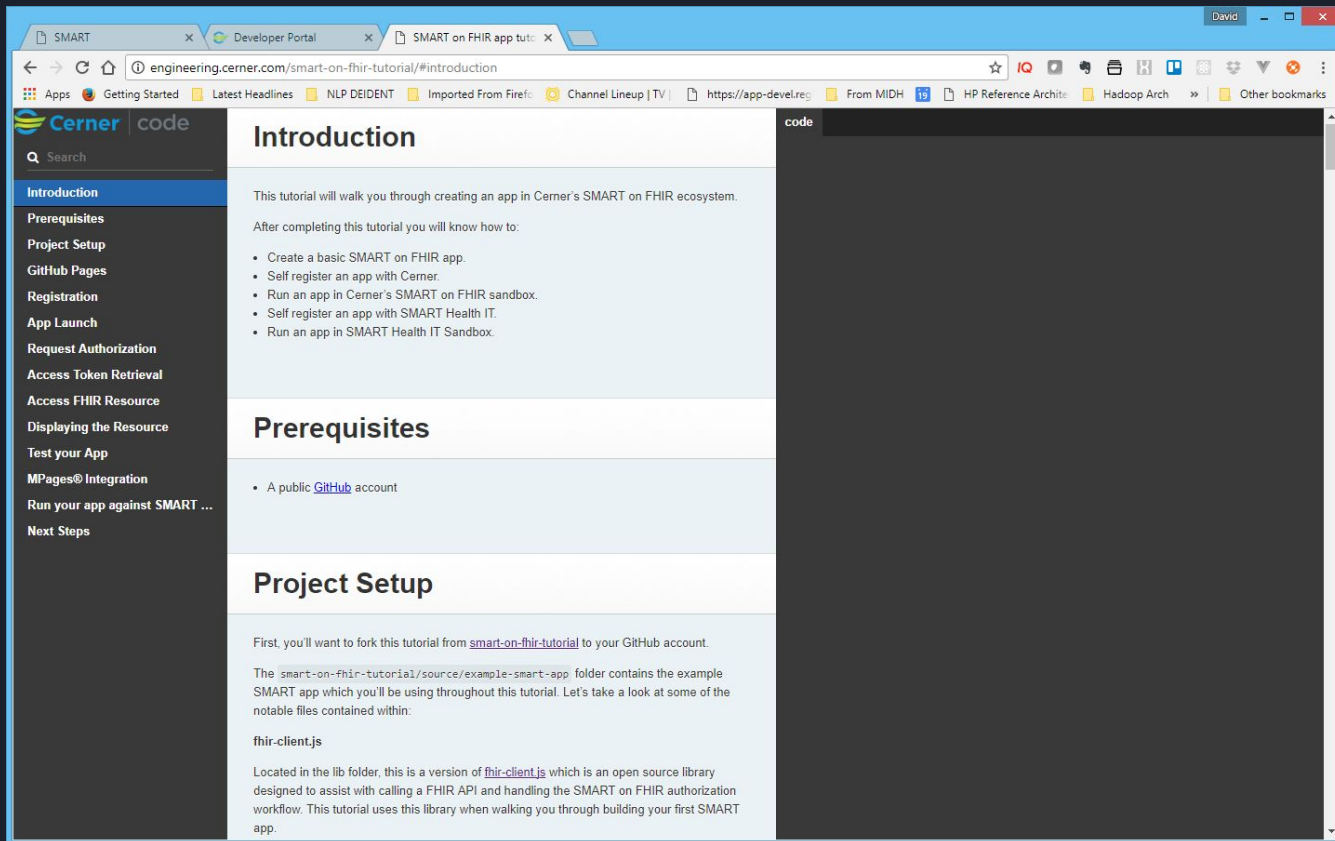
i. General

- [i. Introduction](#)
- [ii. SaaS Model](#)
- [iii. Authorization Model](#)
- [iv. Access Points](#)
- [v. SMART App Data Retrieval](#)
- [vi. SMART Without FHIR](#)

ii. Technical

- [i. Screen Resolution](#)
- [ii. Browser Requirement](#)
- [iii. Single Sign On \(SSO\)](#)
- [iv. Embedded Browser Control](#)
- [v. HTML5 DOCTYPE](#)
- [vi. X-UA-Compatible Tag](#)
- [vii. Technology and Framework for SMART Apps](#)
- [viii. Open Source](#)
- [ix. Tutorial](#)
- [x. code Console and Sandbox](#)
- [xi. Launch Context](#)

# Cerner Step by Step Smart on FHIR Tutorial



The screenshot shows a web browser window with the URL `engineering.cerner.com/smart-on-fhir-tutorial/#introduction`. The page is titled "Introduction" and is part of a tutorial series. The left sidebar contains a navigation menu with the following items: Introduction, Prerequisites, Project Setup, GitHub Pages, Registration, App Launch, Request Authorization, Access Token Retrieval, Access FHIR Resource, Displaying the Resource, Test your App, MPages® Integration, Run your app against SMART ..., and Next Steps. The main content area is divided into three sections: Introduction, Prerequisites, and Project Setup. The Introduction section explains that the tutorial will walk through creating an app in Cerner's SMART on FHIR ecosystem and lists five steps: 1. Create a basic SMART on FHIR app, 2. Self register an app with Cerner, 3. Run an app in Cerner's SMART on FHIR sandbox, 4. Self register an app with SMART Health IT, and 5. Run an app in SMART Health IT Sandbox. The Prerequisites section lists one requirement: a public GitHub account. The Project Setup section instructs the user to fork the tutorial from `smart-on-fhir-tutorial` to their GitHub account and provides information about the `smart-on-fhir-tutorial/source/example-smart-app` folder, which contains the example SMART app. It also mentions the `fhir-client.js` library, which is an open source library designed to assist with calling a FHIR API and handling the SMART on FHIR authorization workflow.

SMART Developer Portal SMART on FHIR app tuto

engineering.cerner.com/smart-on-fhir-tutorial/#introduction

Apps Getting Started Latest Headlines NLP DEIDENT Imported From Fire Channel Lineup | TV | https://app-devel.reg From MIDH HP Reference Archite Hadoop Arch Other bookmarks

Cerner code

Search

Introduction

Prerequisites

Project Setup

GitHub Pages

Registration

App Launch

Request Authorization

Access Token Retrieval

Access FHIR Resource

Displaying the Resource

Test your App

MPages® Integration

Run your app against SMART ...

Next Steps

## Introduction

This tutorial will walk you through creating an app in Cerner's SMART on FHIR ecosystem.

After completing this tutorial you will know how to:

- Create a basic SMART on FHIR app.
- Self register an app with Cerner.
- Run an app in Cerner's SMART on FHIR sandbox.
- Self register an app with SMART Health IT.
- Run an app in SMART Health IT Sandbox.

## Prerequisites

- A public [GitHub](#) account

## Project Setup

First, you'll want to fork this tutorial from [smart-on-fhir-tutorial](#) to your GitHub account.

The `smart-on-fhir-tutorial/source/example-smart-app` folder contains the example SMART app which you'll be using throughout this tutorial. Let's take a look at some of the notable files contained within:

**fhir-client.js**

Located in the `lib` folder, this is a version of [fhir-client.js](#) which is an open source library designed to assist with calling a FHIR API and handling the SMART on FHIR authorization workflow. This tutorial uses this library when walking you through building your first SMART app.

code

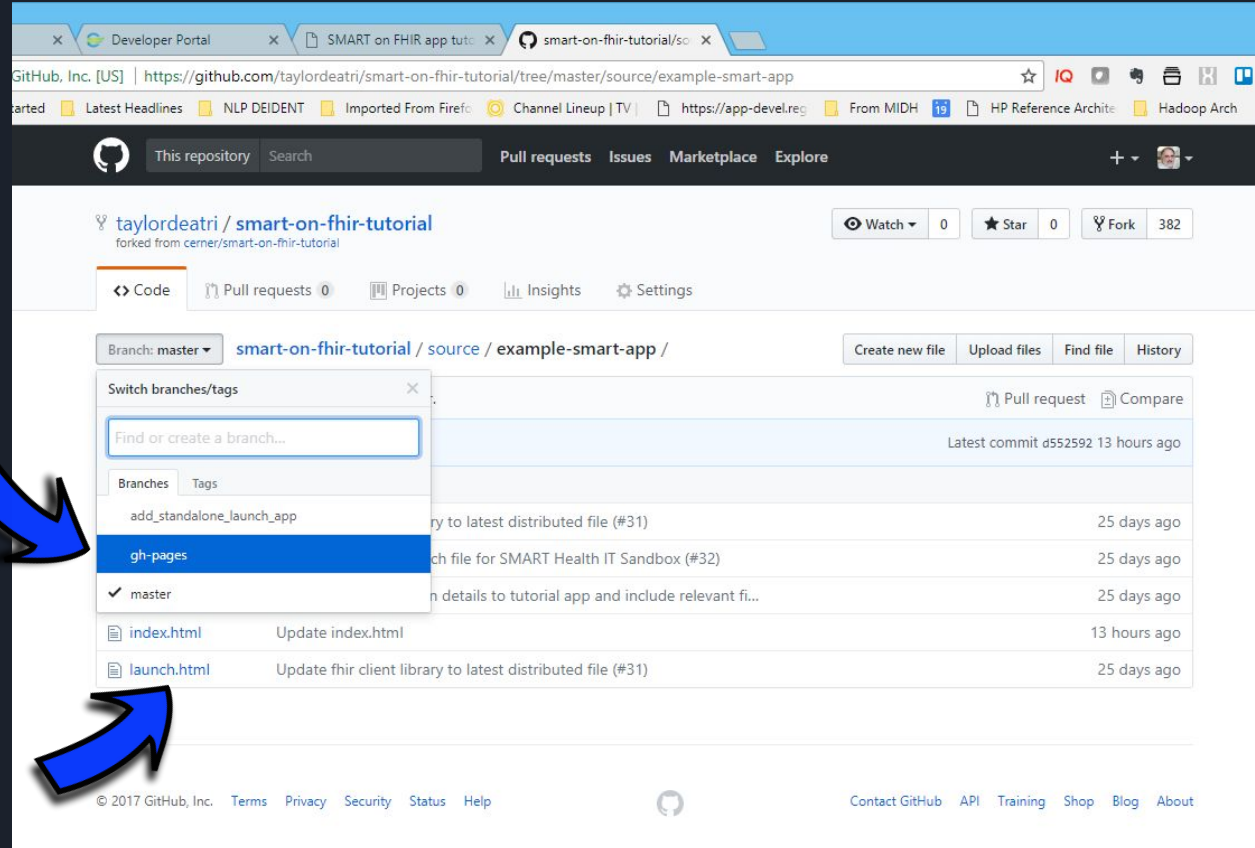
# Tutorial GitHub Project - Fork it to your

The screenshot shows the GitHub repository page for 'cerner/smart-on-fhir-tutorial'. The browser tabs at the top include 'SMART', 'Developer Portal', 'SMART on FHIR app tutorial', and 'cerner/smart-on-fhir-tutorial'. The address bar shows the URL 'https://github.com/cerner/smart-on-fhir-tutorial'. The repository page header includes the repository name, a search bar, and navigation links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. The repository statistics show 8 watches, 20 stars, and 382 forks. The 'Code' tab is selected, showing the repository name 'cerner / smart-on-fhir-tutorial'. Below this, the repository description 'SMART on FHIR developer tutorial' is displayed. The repository statistics section shows 22 commits, 3 branches, 0 releases, and 5 contributors. The 'Branch: master' dropdown and 'New pull request' button are visible. The 'Clone or download' button is highlighted in green. The file list shows the following files and their commit history:

File	Commit Message	Commit Time
source	Create a separate launch file for SMART Health IT Sandbox (#32)	25 days ago
.gitignore	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
.travis.yml	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
CHANGELOG.md	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
Gemfile	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
Gemfile.lock	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
LICENSE	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
README.md	Update README and add SMART Health IT section (#25)	3 months ago
Vagrantfile	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
config.rb	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
deploy.sh	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago
font-selection.json	Initial commit of the SMART on FHIR tutorial in it's final repository...	a year ago



# Cerner Tutorial Repo Forked - Select gh\_pages



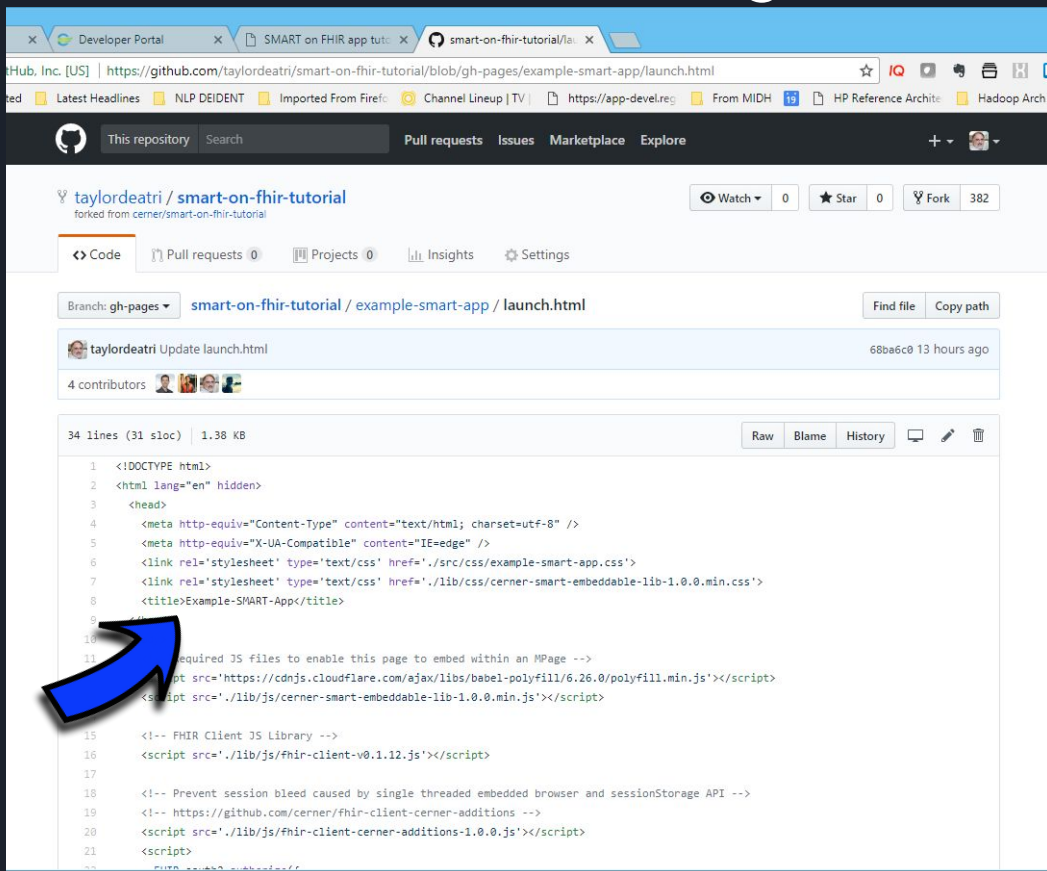
The screenshot shows a web browser with multiple tabs. The active tab is 'smart-on-fhir-tutorial/' showing the GitHub repository page for 'taylordeatri / smart-on-fhir-tutorial', which is a fork of 'cerner/smart-on-fhir-tutorial'. The repository is currently on the 'master' branch. The 'Switch branches/tags' dropdown menu is open, displaying a search bar 'Find or create a branch...' and a list of branches: 'add\_standalone\_launch\_app', 'gh-pages' (highlighted in blue), and 'master' (marked with a checkmark). Below the branches list, there is a table of recent commits. Two large blue arrows are overlaid on the image: one points to the 'Switch branches/tags' dropdown menu, and the other points to the 'gh-pages' branch in the list.

Branches	Tags
add_standalone_launch_app	
gh-pages	
✓ master	

File	Commit Message	Time Ago
index.html	Update index.html	13 hours ago
launch.html	Update fhir client library to latest distributed file (#31)	25 days ago

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# Edit Launch.html using GitHub commit to branch



Developer Portal | SMART on FHIR app tutorial | smart-on-fhir-tutorial

GitHub, Inc. [US] | <https://github.com/taylordeatri/smart-on-fhir-tutorial/blob/gh-pages/example-smart-app/launch.html>

This repository | Search | Pull requests | Issues | Marketplace | Explore

taylordeatri / smart-on-fhir-tutorial  
forked from cerner/smart-on-fhir-tutorial

Code | Pull requests 0 | Projects 0 | Insights | Settings

Branch: gh-pages | smart-on-fhir-tutorial / example-smart-app / launch.html

Find file | Copy path

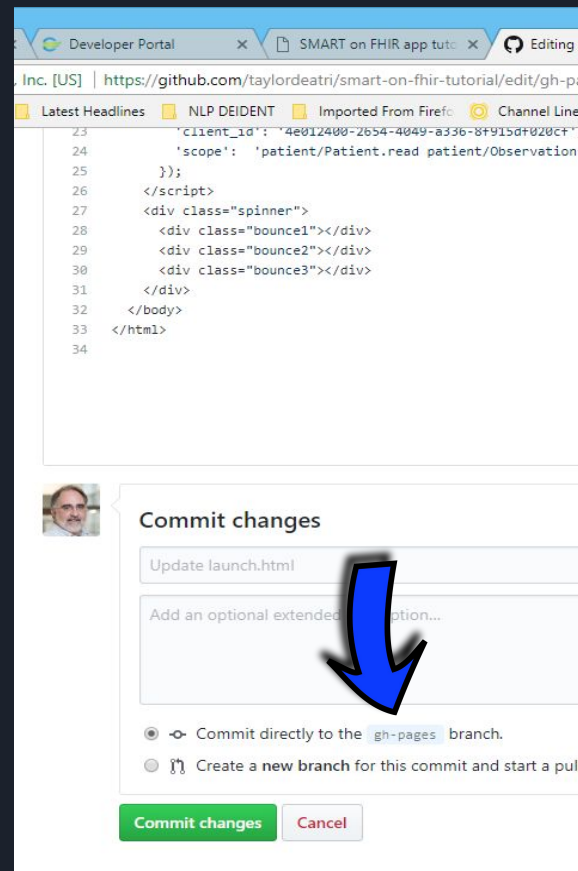
taylordeatri Update launch.html 68ba6c0 13 hours ago

4 contributors

34 lines (31 sloc) | 1.38 KB

Raw | Blame | History

```
<!DOCTYPE html>
<html lang="en" hidden>
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <link rel="stylesheet" type="text/css" href="/src/css/example-smart-app.css">
    <link rel="stylesheet" type="text/css" href="/lib/css/cerner-smart-embeddable-lib-1.0.0.min.css">
    <title>Example-SMART-App</title>
  </head>
  <body>
    <!-- required JS files to enable this page to embed within an MPage -->
    <script src="https://cdnjs.cloudflare.com/ajax/libs/babel-polyfill/6.26.0/polyfill.min.js"></script>
    <script src="/lib/js/cerner-smart-embeddable-lib-1.0.0.min.js"></script>
    <!-- FHIR Client JS Library -->
    <script src="/lib/js/fhir-client-v0.1.12.js"></script>
    <!-- Prevent session bleed caused by single threaded embedded browser and sessionStorage API -->
    <!-- https://github.com/cerner/fhir-client-cerner-additions -->
    <script src="/lib/js/fhir-client-cerner-additions-1.0.0.js"></script>
  </body>
</html>
```



Developer Portal | SMART on FHIR app tutorial | Editing

GitHub, Inc. [US] | <https://github.com/taylordeatri/smart-on-fhir-tutorial/edit/gh-pages/example-smart-app/launch.html>

Latest Headlines | NLP DEIDENT | Imported From Firef | Channel Line

```
23 'client_id': '4e012400-2654-4049-a336-8f915df020cf'
24 'scope': 'patient/Patient.read patient/Observation'
25 });
26 </script>
27 <div class="spinner">
28 <div class="bounce1"></div>
29 <div class="bounce2"></div>
30 <div class="bounce3"></div>
31 </div>
32 </body>
33 </html>
34
```

Commit changes

Update launch.html

Add an optional extended description...

☒ Commit directly to the gh-pages branch.

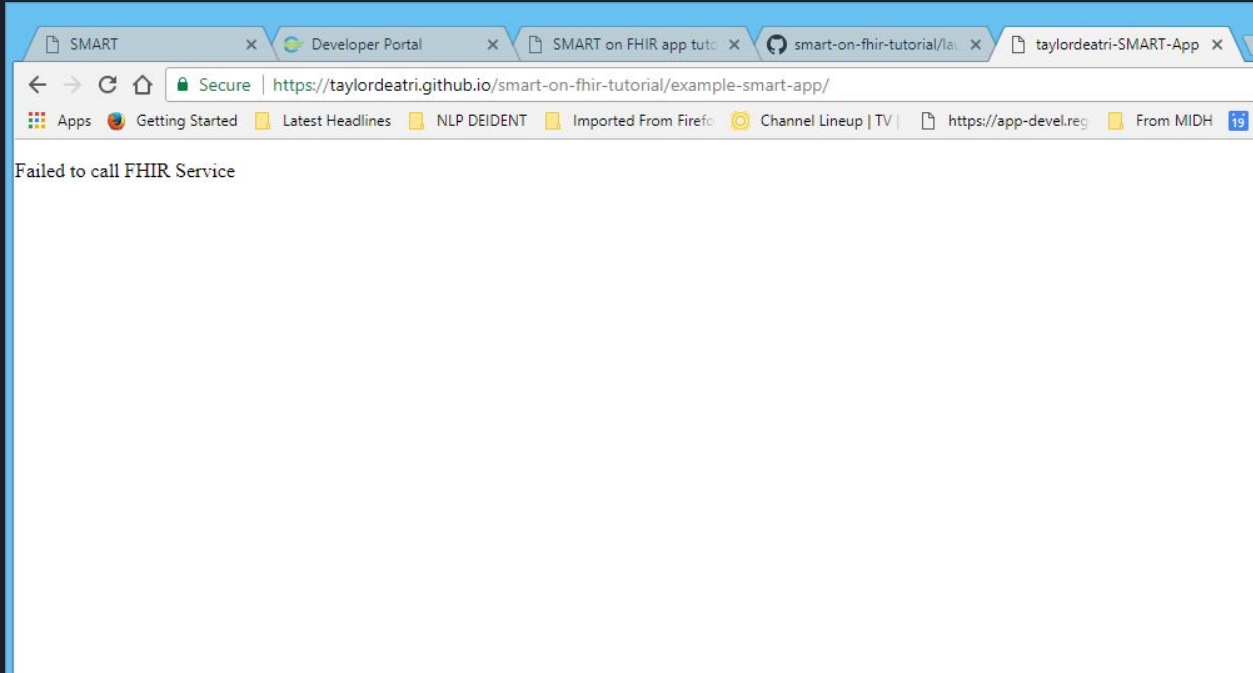
☐ Create a new branch for this commit and start a pull request

Commit changes | Cancel

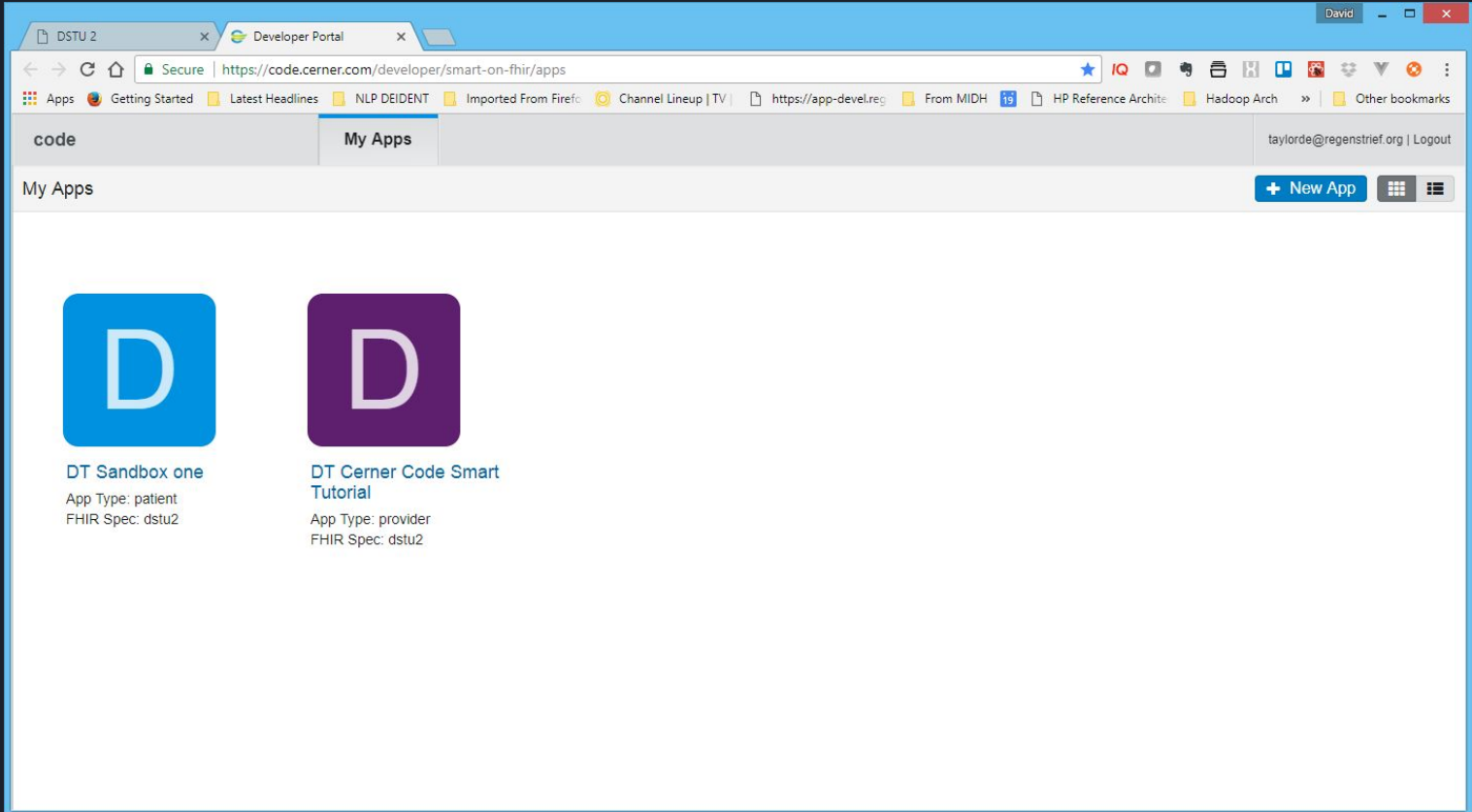


# Test GitHub.io Pages works:

<https://<your-username>.github.io/smart-on-fhir-tutorial/example-smart-app/>



# Cerner Smart on FHIR Code Portal



The screenshot displays a web browser window with the URL <https://code.cerner.com/developer/smart-on-fhir/apps>. The browser's address bar shows the page is secure. The page has a navigation bar with tabs for 'code' and 'My Apps', with 'My Apps' currently selected. The user is logged in as 'taylorde@regenstrief.org'. Below the navigation bar, the 'My Apps' section displays two application cards. The first card, 'DT Sandbox one', has a blue square icon with a white 'D' and lists 'App Type: patient' and 'FHIR Spec: dstu2'. The second card, 'DT Cerner Code Smart Tutorial', has a purple square icon with a white 'D' and lists 'App Type: provider' and 'FHIR Spec: dstu2'. A '+ New App' button is located in the top right corner of the 'My Apps' section.

code My Apps taylorde@regenstrief.org | Logout

My Apps + New App

**DT Sandbox one**  
App Type: patient  
FHIR Spec: dstu2

**DT Cerner Code Smart Tutorial**  
App Type: provider  
FHIR Spec: dstu2

# Cerner Code Portal App Registration

DSTU 2 Developer Portal

code My Apps

## App Registration

\* Indicates a required field.

\* **App Name**

**SMART Launch URI**

The URI to initiate the launch of your SMART app

\* **Redirect URI**

The callback URI for the OAuth2 server to redirect to your SMART App

\* **App Type**

☒ Provider

☐ Patient

☐ System

\* **FHIR Spec**

The FHIR version your SMART App will consume

☒ dstu2

\* **Authorized**

Does your SMART App require OAuth2?

☒ Yes

☐ No

SMART Developer Portal SMART on FHIR app tutorial

code My Apps

\* **Authorized**

Does your SMART App require OAuth2?

☒ Yes

☐ No

**Scopes**

The OAuth access scopes that your SMART App will require to access FHIR resources. [Click here](#) to know more about scopes

**Standard Scopes**

☒ launch

☒ profile

☒ openid

☒ online\_access

☐ offline\_access

**User Scopes**

Resource	Scope
AllergyIntolerance	<input type="checkbox"/> read <input type="checkbox"/> write
Appointment	<input type="checkbox"/> read <input type="checkbox"/> write
Binary	<input type="checkbox"/> read
CarePlan	<input type="checkbox"/> read
Condition	<input type="checkbox"/> read <input type="checkbox"/> write
Contract	<input type="checkbox"/> read
Device	<input type="checkbox"/> read
DiagnosticReport	<input type="checkbox"/> read

**Patient Scopes**

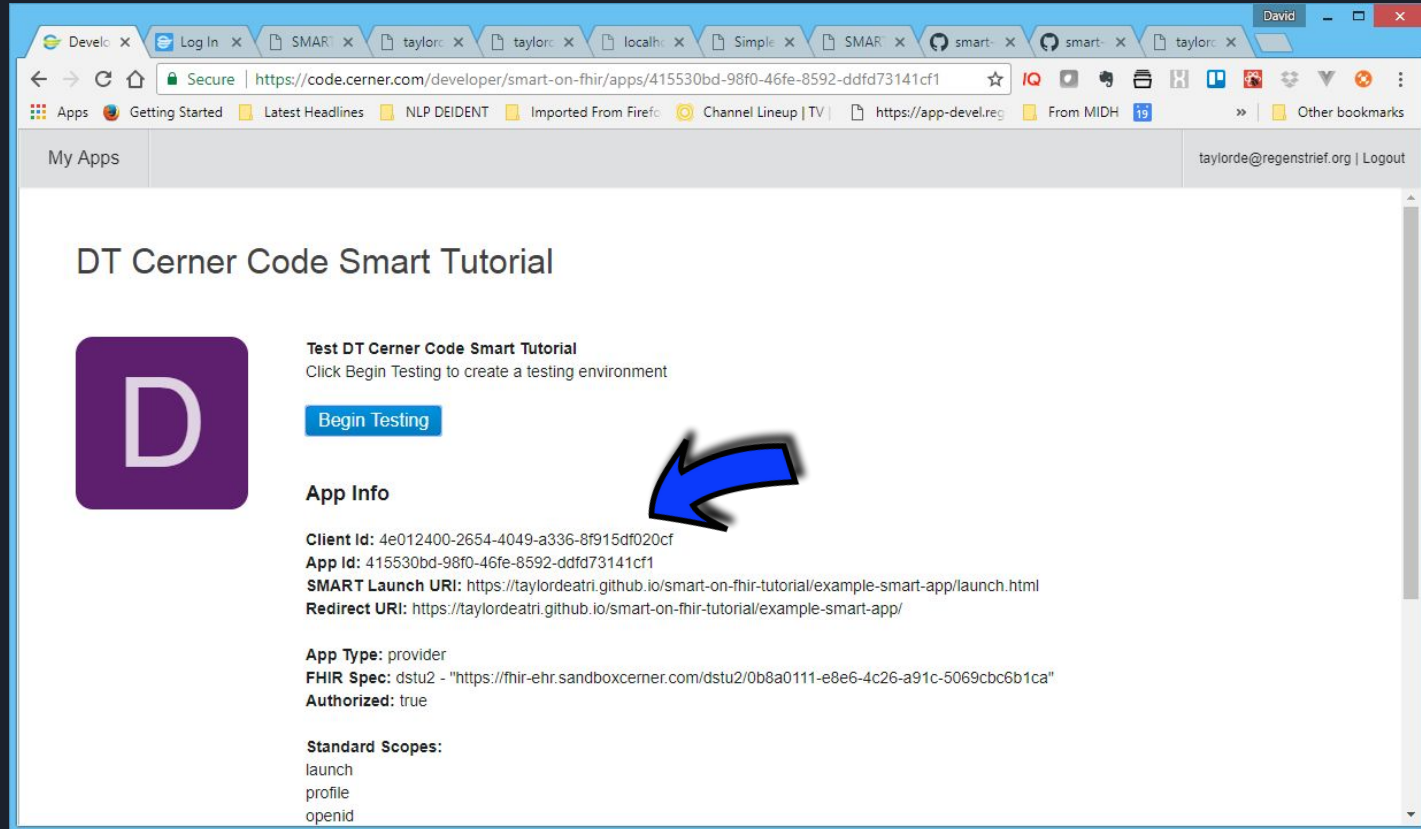
Resource	Scope
AllergyIntolerance	<input type="checkbox"/> read <input type="checkbox"/> write
Appointment	<input type="checkbox"/> read <input type="checkbox"/> write
Binary	<input type="checkbox"/> read
CarePlan	<input type="checkbox"/> read
Condition	<input type="checkbox"/> read <input type="checkbox"/> write
Contract	<input type="checkbox"/> read
Device	<input type="checkbox"/> read
DiagnosticReport	<input type="checkbox"/> read

SMART Developer Portal SMART on FHIR app tutorial

code My Apps


Device	<input type="checkbox"/> read	Device	<input type="checkbox"/> read
DiagnosticReport	<input type="checkbox"/> read	DiagnosticReport	<input type="checkbox"/> read
DocumentReference	<input type="checkbox"/> read <input type="checkbox"/> write	DocumentReference	<input type="checkbox"/> read <input type="checkbox"/> write
Encounter	<input type="checkbox"/> read	Encounter	<input type="checkbox"/> read
Goal	<input type="checkbox"/> read	Goal	<input type="checkbox"/> read
Immunization	<input type="checkbox"/> read	Immunization	<input type="checkbox"/> read
MedicationOrder	<input type="checkbox"/> read	MedicationOrder	<input type="checkbox"/> read
MedicationStatement	<input type="checkbox"/> read <input type="checkbox"/> write	MedicationStatement	<input type="checkbox"/> read <input type="checkbox"/> write
Observation	<input type="checkbox"/> read	Observation	<input type="checkbox"/> read
OperationDefinition	<input type="checkbox"/> read	OperationDefinition	<input type="checkbox"/> read
Patient	<input type="checkbox"/> read	Patient	<input type="checkbox"/> read
Person	<input type="checkbox"/> read	Person	<input type="checkbox"/> read
Practitioner	<input type="checkbox"/> read	Practitioner	<input type="checkbox"/> read
Procedure	<input type="checkbox"/> read	Procedure	<input type="checkbox"/> read
RelatedPerson	<input type="checkbox"/> read	RelatedPerson	<input type="checkbox"/> read
Schedule	<input type="checkbox"/> read	Schedule	<input type="checkbox"/> read
Slot	<input type="checkbox"/> read	Slot	<input type="checkbox"/> read
StructureDefinition	<input type="checkbox"/> read	StructureDefinition	<input type="checkbox"/> read

# After filling out for Step by Step Tutorial



My Apps taylorde@regentrief.org | Logout

## DT Cerner Code Smart Tutorial



**Test DT Cerner Code Smart Tutorial**  
Click Begin Testing to create a testing environment

[Begin Testing](#)

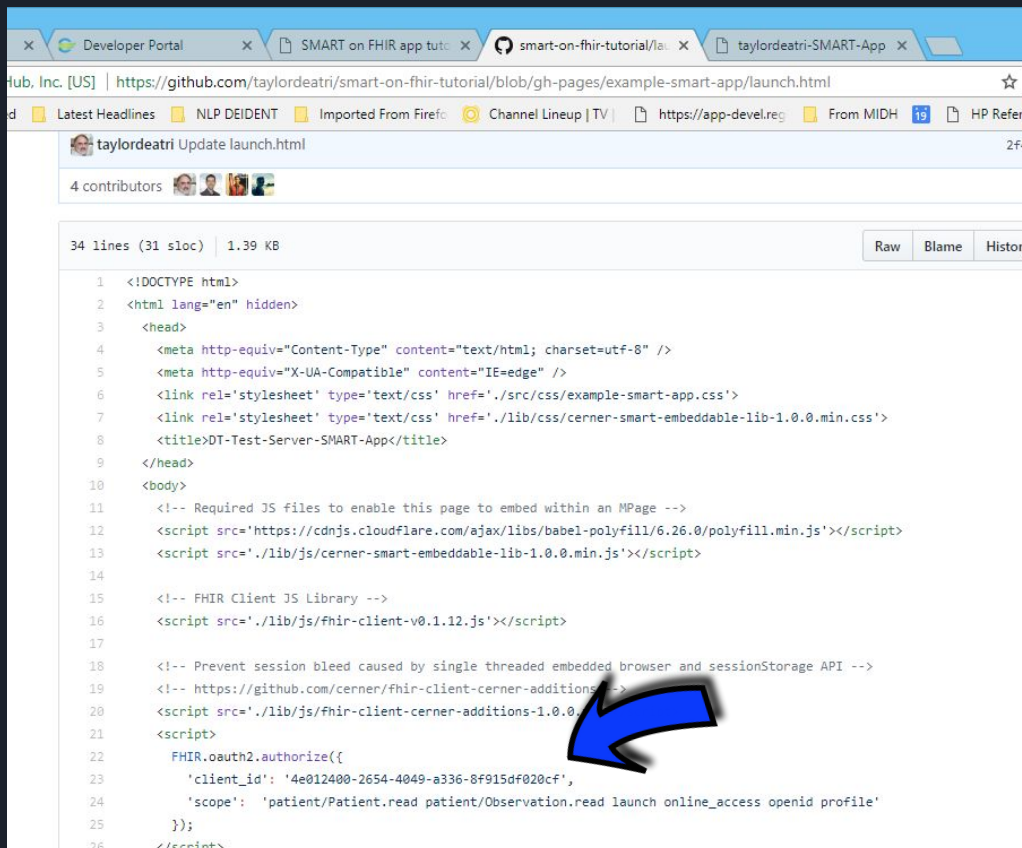
### App Info

**Client Id:** 4e012400-2654-4049-a336-8f915df020cf  
**App Id:** 415530bd-98f0-46fe-8592-ddfd73141cf1  
**SMART Launch URI:** <https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/launch.html>  
**Redirect URI:** <https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/>

**App Type:** provider  
**FHIR Spec:** dstu2 - "https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca"  
**Authorized:** true

**Standard Scopes:**  
launch  
profile  
openid

# Edit Launch.html again to update Client Id

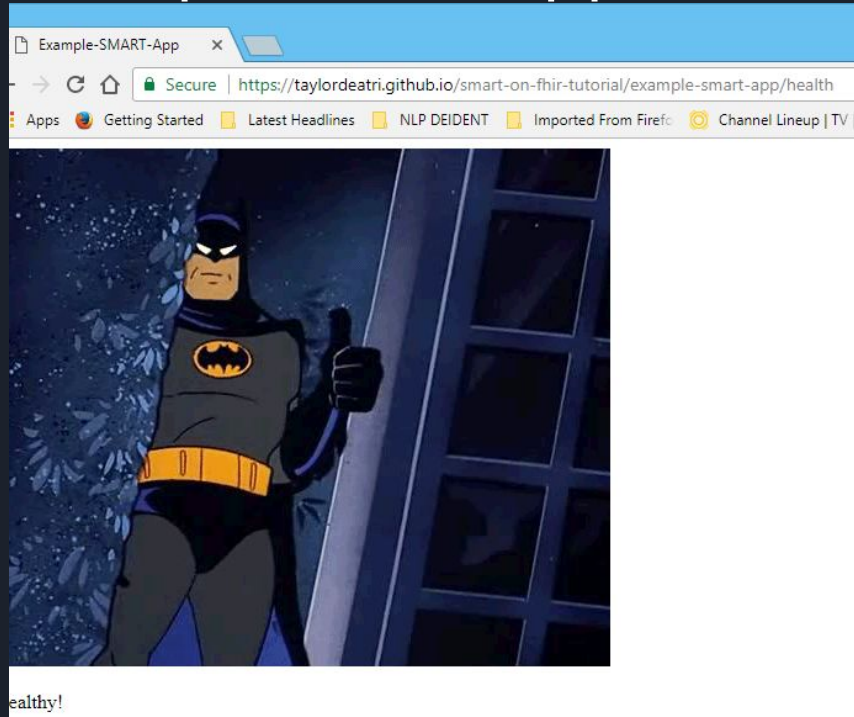


The screenshot shows a web browser displaying the GitHub page for the file `launch.html` in the repository `taylordeatri/smart-on-fhir-tutorial`. The file is 34 lines long (31 sloc) and 1.39 KB. The code is an HTML document that includes a `<script>` tag for `FHIR.oauth2.authorize()`. A large blue arrow points to the `'client_id': '4e012400-2654-4049-a336-8f915df020cf'` value in the `authorize()` function call.

```
1 <!DOCTYPE html>
2 <html lang="en" hidden>
3   <head>
4     <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
5     <meta http-equiv="X-UA-Compatible" content="IE=edge" />
6     <link rel="stylesheet" type="text/css" href="/src/css/example-smart-app.css">
7     <link rel="stylesheet" type="text/css" href="/lib/css/cerner-smart-embeddable-lib-1.0.0.min.css">
8     <title>DT-Test-Server-SMART-App</title>
9   </head>
10  <body>
11    <!-- Required JS files to enable this page to embed within an MPage -->
12    <script src="https://cdnjs.cloudflare.com/ajax/libs/babel-polyfill/6.26.0/polyfill.min.js"></script>
13    <script src="/lib/js/cerner-smart-embeddable-lib-1.0.0.min.js"></script>
14
15    <!-- FHIR Client JS Library -->
16    <script src="/lib/js/fhir-client-v0.1.12.js"></script>
17
18    <!-- Prevent session bleed caused by single threaded embedded browser and sessionStorage API -->
19    <!-- https://github.com/cerner/fhir-client-cerner-additions -->
20    <script src="/lib/js/fhir-client-cerner-additions-1.0.0.js"></script>
21    <script>
22      FHIR.oauth2.authorize({
23        'client_id': '4e012400-2654-4049-a336-8f915df020cf',
24        'scope': 'patient/Patient.read patient/Observation.read launch online_access openid profile'
25      });
26    </script>
```



Verify Health Check on gh-pages url  
<https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/health>





# Test App via Cerner Code Portal

The screenshot shows the Cerner Code Portal interface. A modal dialog titled "Testing Details" is open, displaying the following information:

Does your application require a patient? ☒ Yes ☐ No

Select a Patient:

Patient	Description
<b>SMART, Timmy</b> Male DOB: 2012-02-19	Young male child
<b>Peters, Tim</b> Male DOB: 1961-04-30	
<b>SMART, Wilma</b> Female DOB: 1947-03-16	Communication language set to Hindi

Background app details visible in the portal:

- App Info: Client Id: 4e..., App Id: 4155..., SMART Launch...
- App Type: SMART Launch...
- App Scopes: patient/Observation.read, patient/Patient.read

# Select Patient

The screenshot shows a web browser window with multiple tabs. The active tab is titled "SMART" and the address bar shows the URL: <https://code.cerner.com/developer/smart-on-fhir/apps/415530bd-98f0-46fe-8592-ddfd73141cf1>. The page content is titled "DT Cerner Code Smart Tutorial" and includes a "My Apps" section. A "Testing Details" dialog box is open, displaying a list of patients. The first patient, "SMART, Valerie S", is highlighted in blue. Below the list, there is a question: "Would you like a demographics banner to be shown?" with radio buttons for "Yes" and "No". The "Next" button is highlighted in blue.

code My Apps taylorde@regenstrief.org | Logout

## DT Cerner Code Smart Tutorial

Test DT Cerner Code Smart Tutorial  
Click Begin Test

Begin Test

App Info

Client Id: 4a...  
App Id: 4155...  
SMART Launch...  
Redirect UR...

App Type: p...  
FHIR Spec: ...  
Authorized: ...

Standard Sc...  
launch...  
profile...  
openid...  
online\_access...

Patient Scopes:  
patient/Observation.read  
patient/Patient.read

Edit Details

Testing Details

**SMART, Valerie S**  
Female DOB: 1984-04-15

**Rotunda, Rhonda**  
Female DOB: 1980-05-01 Patient with pregnancy condition

**Read, Amber**  
Female DOB: 2005-11-21

**SMART, Dave**  
Male DOB: 1980-07-15

Would you like a demographics banner to be shown? ☒ Yes ☐ No

Next Cancel

# Launch

The screenshot shows a web browser window with multiple tabs. The active tab is titled "code" and displays the "DT Cerner Code Smart Tutorial" page. A modal dialog titled "Testing Details" is open in the foreground. The dialog contains an information icon and the text: "Ready to launch. Clicking Launch will open a testing environment in a new window." Below this, it instructs the user to use the following username and password for login: "Username: portal" and "Password: portal". At the bottom right of the dialog are two buttons: "Launch" and "Cancel".

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## DT Cerner Code Smart Tutorial

Test DT Cerner Code Smart Tutorial  
Click Begin Test

**Begin Test**

**App Info**

Client Id: 4e...  
App Id: 4153...  
SMART Launch...  
Redirect UR...

App Type: p...  
FHIR Spec: ...  
Authorized:

Standard Sc...  
launch...  
profile...  
openid...  
online\_access

**Patient Scopes:**  
patient/Observation.read  
patient/Patient.read

☒ Edit Details

**Testing Details**

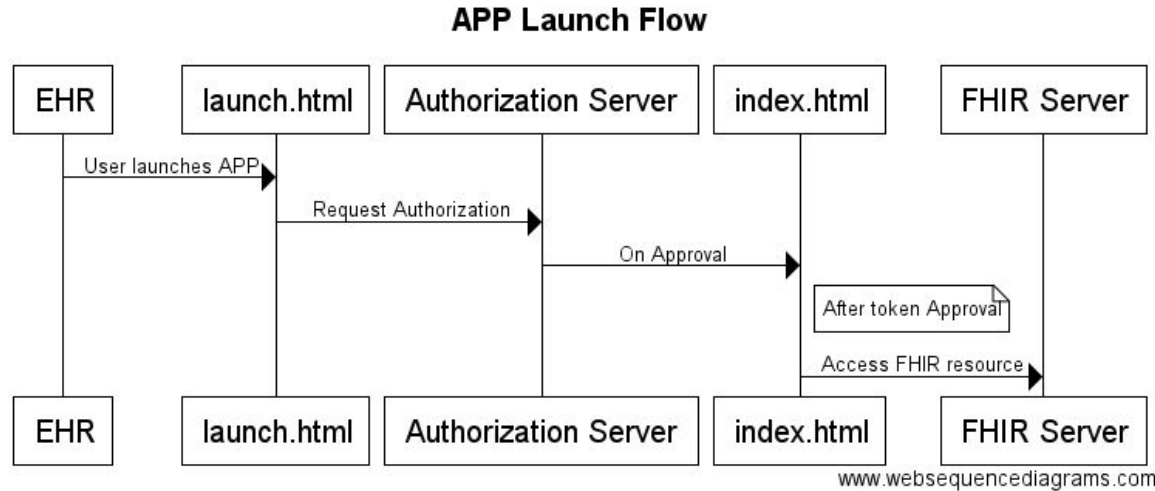
**Ready to launch.** Clicking Launch will open a testing environment in a new window.

Use the following username and password for login:

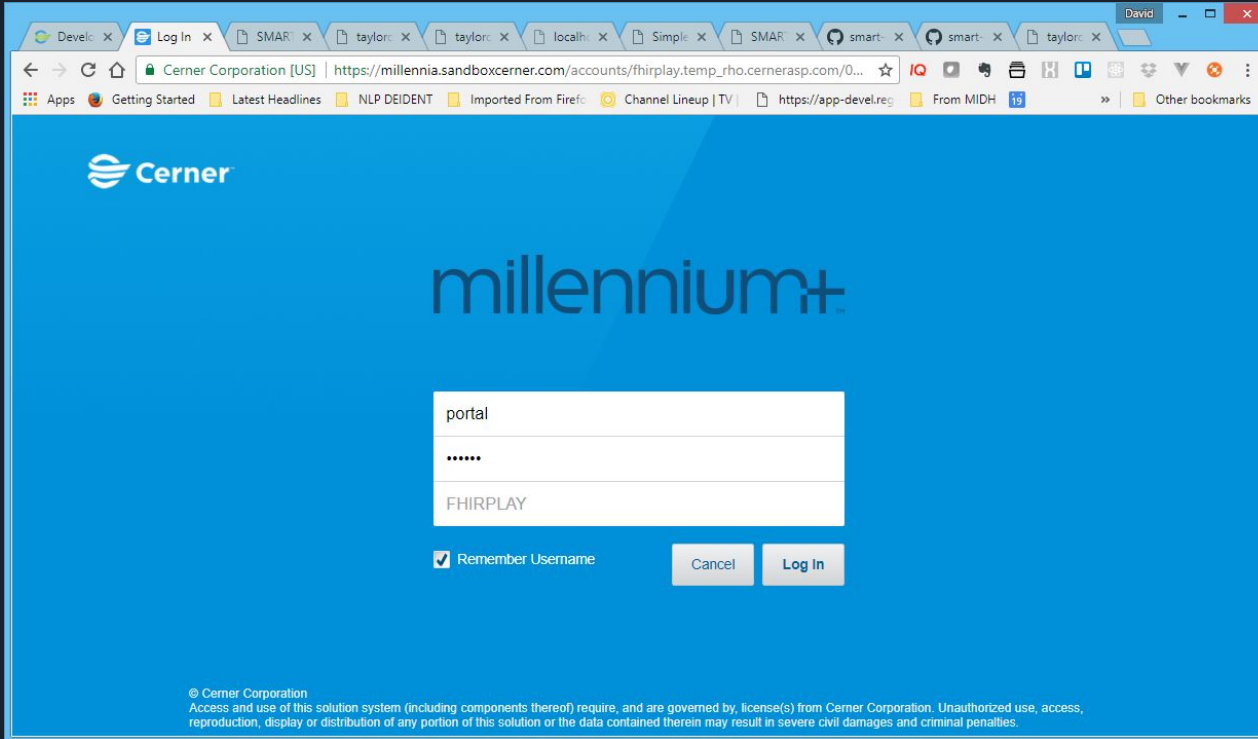
**Username:** portal  
**Password:** portal

**Launch** Cancel

# Another Sequence Diagram for Sandbox



# Cerner after pressing Launch Button



The screenshot shows a web browser window with the Cerner Corporation logo and the Millennium+ logo on a blue background. The login form contains three input fields: the first contains 'portal', the second contains masked characters '\*\*\*\*\*', and the third contains 'FHIRPLAY'. Below the fields is a checkbox labeled 'Remember Username' which is checked, and two buttons labeled 'Cancel' and 'Log In'. The browser's address bar shows the URL 'https://millennia.sandboxcerner.com/accounts/fhirplay.temp\_rho.cernerasp.com/0...'. The browser's tab bar shows several tabs, including 'Develo...', 'Log In', 'SMAR', 'taylorc', 'localh...', 'Simple', 'SMAR', 'smart-', 'smart-', and 'taylorc'. The browser's bookmark bar shows several bookmarks, including 'Apps', 'Getting Started', 'Latest Headlines', 'NLP DEIDENT', 'Imported From Firefo', 'Channel Lineup | TV |', 'https://app-devel.reg', 'From MIDH', and 'Other bookmarks'.

Cerner

millennium+

portal

\*\*\*\*\*

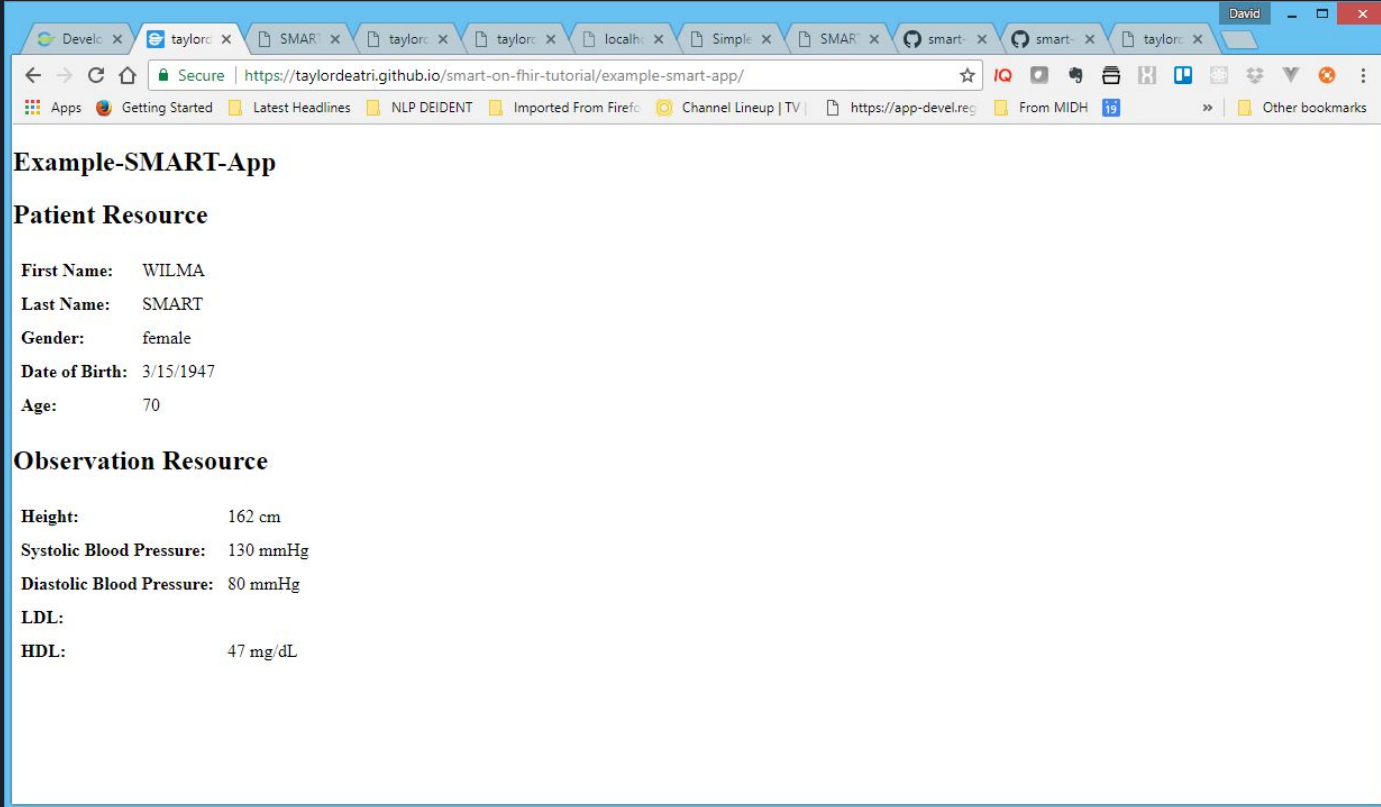
FHIRPLAY

☒ Remember Username

Cancel Log In

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# See the Results in your FHIR App



The screenshot shows a web browser window with multiple tabs. The active tab is titled "Example-SMART-App" and displays a patient resource and an observation resource. The browser's address bar shows the URL "https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/". The browser's bookmark bar includes "Apps", "Getting Started", "Latest Headlines", "NLP DEIDENT", "Imported From Firefo", "Channel Lineup | TV", "https://app-devel.reg", "From MIDH", and "Other bookmarks".

**Example-SMART-App**

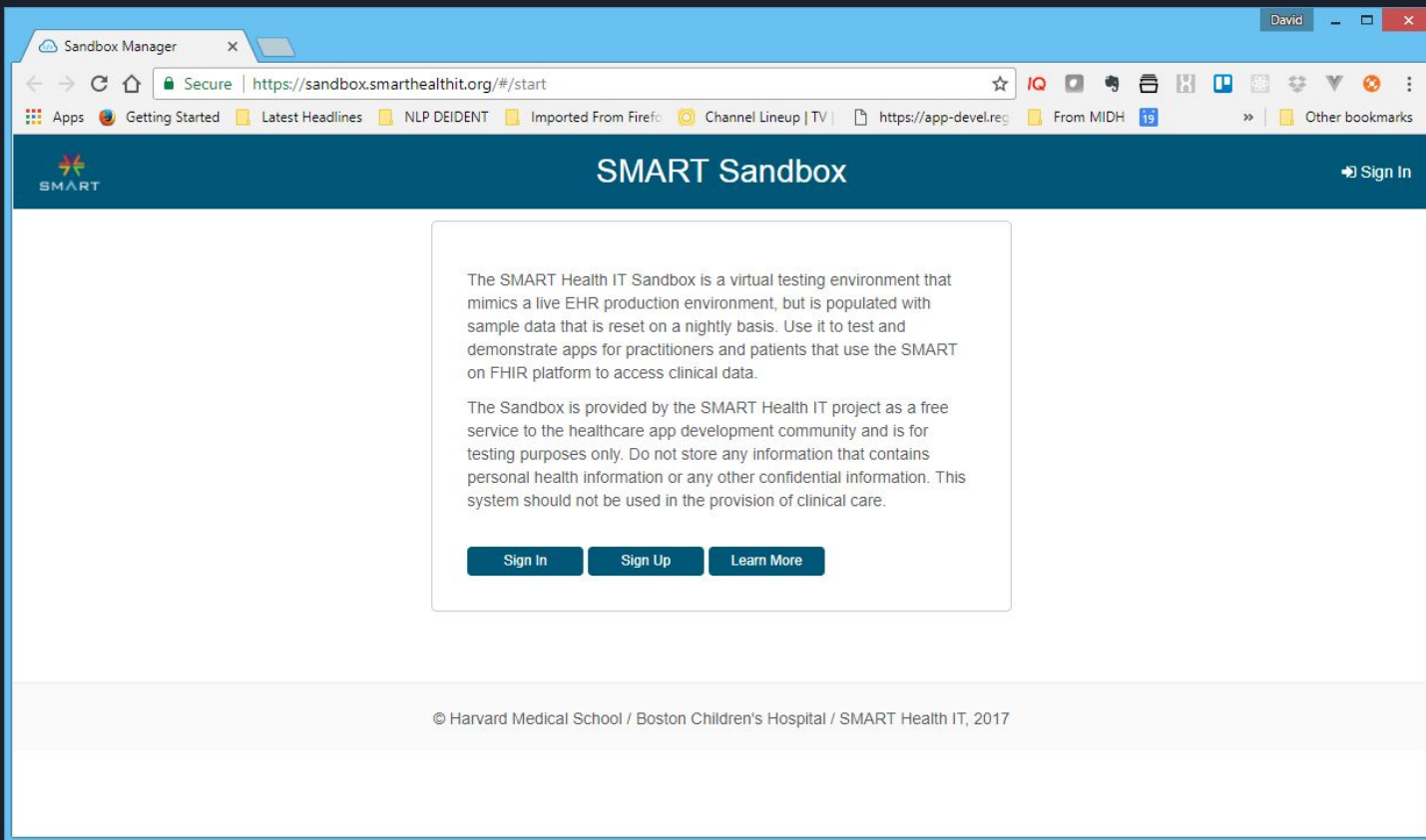
**Patient Resource**

First Name: WILMA  
Last Name: SMART  
Gender: female  
Date of Birth: 3/15/1947  
Age: 70

**Observation Resource**

Height: 162 cm  
Systolic Blood Pressure: 130 mmHg  
Diastolic Blood Pressure: 80 mmHg  
LDL:  
HDL: 47 mg/dL

# Now try it at SmartHealthIT



The screenshot shows a web browser window with the address bar displaying <https://sandbox.smarthealthit.org/#/start>. The page has a dark blue header with the SMART logo on the left, the text "SMART Sandbox" in the center, and a "Sign In" button on the right. Below the header, a white box contains the following text:

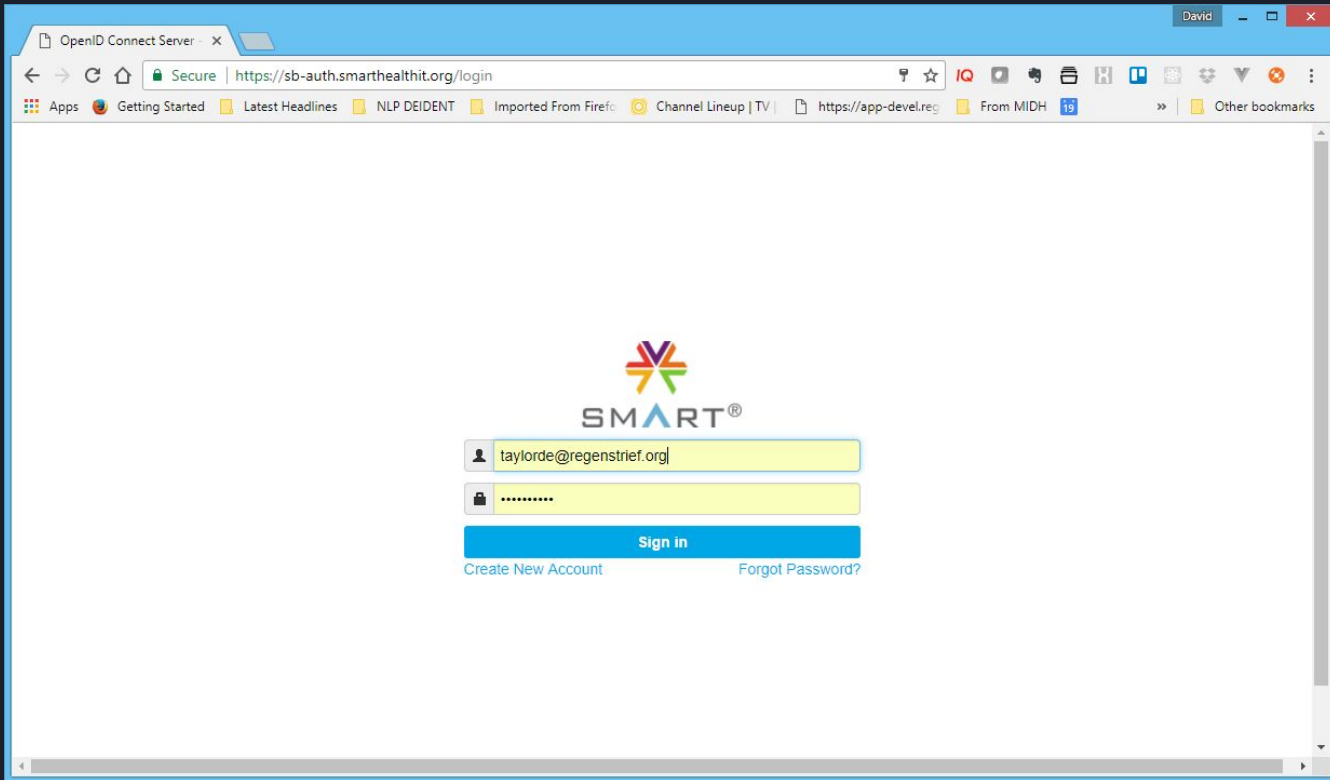
The SMART Health IT Sandbox is a virtual testing environment that mimics a live EHR production environment, but is populated with sample data that is reset on a nightly basis. Use it to test and demonstrate apps for practitioners and patients that use the SMART on FHIR platform to access clinical data.

The Sandbox is provided by the SMART Health IT project as a free service to the healthcare app development community and is for testing purposes only. Do not store any information that contains personal health information or any other confidential information. This system should not be used in the provision of clinical care.

At the bottom of the white box are three buttons: "Sign In", "Sign Up", and "Learn More".

At the bottom of the page, a footer line reads: © Harvard Medical School / Boston Children's Hospital / SMART Health IT, 2017

# Sign into SmartHealthIT



The screenshot shows a web browser window with the title "OpenID Connect Server - x". The address bar displays "Secure | https://sb-auth.smarthealthit.org/login". The browser's bookmark bar includes "Apps", "Getting Started", "Latest Headlines", "NLP DEIDENT", "Imported From Firefox", "Channel Lineup | TV", "https://app-devel.reg", "From MIDH", and "Other bookmarks".

The login page features the SmartHealthIT logo, which consists of a colorful star-like icon above the word "SMART" with a registered trademark symbol. Below the logo are two input fields: the first is for the email address "taylorde@regenstrief.org" and the second is for the password, represented by a series of dots. A blue "Sign in" button is positioned below the password field. At the bottom of the login area, there are two links: "Create New Account" on the left and "Forgot Password?" on the right.



# Select DSTU2 Sandbox and Click Manual Entry

The screenshot shows a web browser window with the URL <https://sandbox.smarthealthit.org/smartdstu2/#/manage-apps>. The page title is "SMART DSTU2 Sandbox" and the user is "DAVID TAYLOR". A modal form titled "Register An App in SMART DSTU2 Sandbox" is open. The form has a sidebar menu on the left with options: Registered Apps, Browse Patients, Browse Practitioners, Data Browser, Launch Scenarios, Personas, Documentation, and Settings. The form fields are: App Type (Public Client), App Name\* (Human Readable Name for Your App e.g.: Growth Chart), App Launch URI\* (e.g.: http://mydomain.com/growth-chart/launch.html), App Redirect URIs (e.g.: http://mydomain.com/growth-chart/index.html), Allow Offline Access (checkbox), Patient Scoped App (checkbox), and App Logo (Select Image button). A note states: "Note: If you provide one or more redirect URIs, your client code must send one of the provided values when performing OAuth2 authorization or you will receive an 'Invalid redirect' error." At the bottom, there is a "Save" button and a "Cancel" button. A footer note says "\*Indicates a required field".

SMART DSTU2 Sandbox

DAVID TAYLOR

### Register An App in SMART DSTU2 Sandbox

App Type: Public Client

App Name\*: Human Readable Name for Your App e.g.: Growth Chart

App Launch URI\*: e.g.: http://mydomain.com/growth-chart/launch.html

App Redirect URIs: e.g.: http://mydomain.com/growth-chart/index.html

Note: If you provide one or more redirect URIs, your client code must send one of the provided values when performing OAuth2 authorization or you will receive an "Invalid redirect" error.

Allow Offline Access: ☐

Patient Scoped App: ☒

App Logo: [Select Image](#) (Display size 210px W X 150px H)

No Image

\*Indicates a required field

Save Cancel

# Cerner Tutorial Steps for SmartHealthIT

engineering.cerner.com/smart-on-fhir-tutorial/#run-your-app-against-smart-health-it-sandbox

Apps Getting Started Latest Headlines NLP DEIDENT Imported From Firefo Channel Lineup | TV https://app-devel.reg From MIDH 19 Other bookmarks

Cerner code

Search

- Introduction
- Prerequisites
- Project Setup
- GitHub Pages
- Registration
- App Launch
- Request Authorization
- Access Token Retrieval
- Access FHIR Resource
- Displaying the Resource
- Test your App
- MPages@ Integration
- Run your app against SMART ...
- Next Steps

Specifications, your application will work with that Cerner SMART on FHIR implementation. Let's see if the app that you've built will work with [SMART Health IT Sandbox](#). The following steps will walk you through setting up your app at SMART Health IT Sandbox.

- Go to <https://sandbox.smarthealthit.org> (create an account or sign in)
- Under My Sandboxes, select SMART DSTU2 Sandbox
- You will come to a list of your Registered Sandbox Apps. There are 3 SMART apps automatically configured on your account (BP Centiles, Cardiac Risk, and Growth Chart).
- Add your SMART example app by clicking "Register Manually" under the "Registered Sandbox Apps" title
- You will see a modal popup that allows you to configure your application details, then hit save.
  - Keep the default App Type: Public Client
  - Fill in relevant details just as you did for the Cerner sandbox (App name, redirect URI)
  - For launch URI, use the following value but replace <your-username> with your GitHub username:
    - `https://<your-username>.github.io/smart-on-fhir-tutorial/example-smart-app/launch-smart-sandbox.html`
  - Keep "Allow Offline Access" checkbox unchecked and the Patient Scoped App checked as well (these are defaults)
- Another modal will appear with your new client ID. Copy this ID and paste it in your `launch-smart-sandbox.html` client ID section (just as you did when you received your Cerner Sandbox client ID). Commit this change in gh-pages branch.
- In your `launch-smart-sandbox.html`, copy the scopes for your application.
- In the SMART Health IT Sandbox, you can now "edit" your application under your registered sandbox apps. Click that, then a side menu will

code

portal 1/1

Update client ID in launch-smart-sandbox.html

<script>

# Filled out Form

The screenshot shows a web browser window with the URL <https://sandbox.smarthealthit.org/smartdstu2/#/manage-apps>. The page title is "Sandbox Manager". A modal window titled "Register An App in SMART DSTU2 Sandbox" is open, displaying a form for registering a new application. The form includes the following fields and options:

- App Type:** A dropdown menu set to "Public Client".
- App Name\*:** A text input field containing "Cerner Tutorial".
- App Launch URI\*:** A text input field containing <https://taylordeatni.github.io/smart-on-fhir-tutorial/example-smart-app/launch-smart-sandbox.html>.
- App Redirect URIs:** A text input field containing "e.g.: http://mydomain.com/growth-chart/index.html". Below this field is a note: "Note: If you provide one or more redirect URIs, your client code must send one of the provided values when performing OAuth2 authorization or you will receive an 'Invalid redirect' error."
- Allow Offline Access:** A checkbox that is currently unchecked.
- Patient Scoped App:** A checkbox that is checked.
- App Logo:** A section with a "Select Image" button (display size 210px W X 150px H) and a placeholder box labeled "No Image".

At the bottom of the form, there is a legend: "\*Indicates a required field". The bottom right of the modal contains "Save" and "Cancel" buttons. The background of the browser shows a sidebar with navigation links: "Registered Apps", "Browse Patients", "Browse Practitioners", "Data Browser", "Launch Scenarios", "Personas", "Documentation", and "Settings". The main content area behind the modal shows a "Growth Chart" visualization.

# After Saving App

The screenshot shows a web browser window with the URL <https://sandbox.smarthealthit.org/smartdstu2/#/manage-apps>. The page title is "Sandbox Manager". The main content area displays a list of registered apps, including "BP Centiles", "Cardiac Risk", "Cerner Tutorial", and "DT Simple Auth". A modal dialog box titled "App Client Id" is open, displaying the following text:

Use this Client Id in your app with the authorization request.

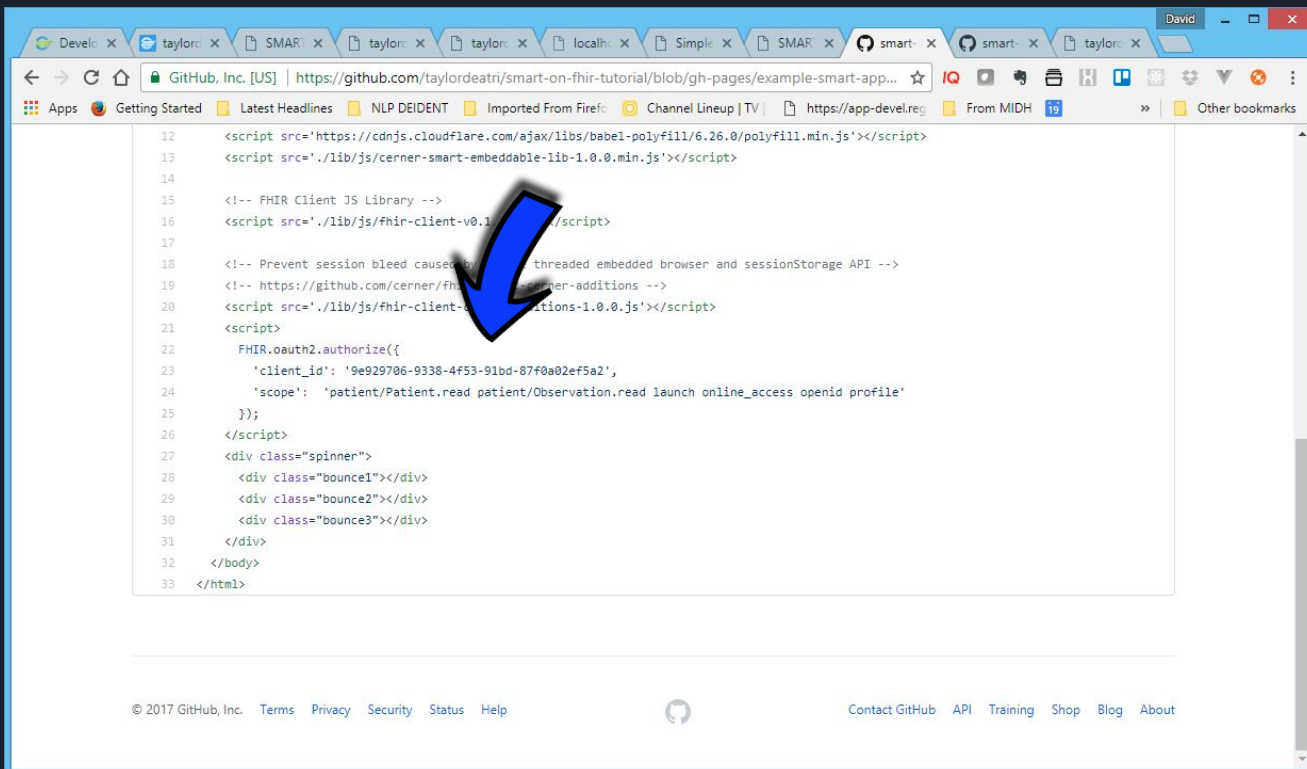
Client Id:

9e929706-9338-4f53-91bd-87f0a02ef5a2

A "Close" button is visible at the bottom right of the dialog box.

The background page shows a sidebar with navigation links: Registered Apps, Browse Patients, Browse Practitioners, Data Browser, Launch Scenarios, Personas, Documentation, and Settings. The main content area also includes a "Custom Values" section with input fields for "Client ID" and "Launch URL".

# Edit Smart On Fhir Tutorial launch-smart-sandbox.html for Client ID



The screenshot shows a web browser window with multiple tabs. The active tab is titled "GitHub, Inc. [US]" and displays the URL <https://github.com/taylordeatri/smart-on-fhir-tutorial/blob/gh-pages/example-smart-app...>. The browser's address bar shows the GitHub logo, the text "GitHub, Inc. [US]", and the URL. Below the address bar is a bookmark bar with several items, including "Apps", "Getting Started", "Latest Headlines", "NLP DEIDENT", "Imported From Firefo", "Channel Lineup | TV", "https://app-devel.reg", "From MIDH", and "Other bookmarks". The main content area of the browser displays a code editor with the following code:

```
12 <script src='https://cdnjs.cloudflare.com/ajax/libs/babel-polyfill/6.26.0/polyfill.min.js'></script>
13 <script src='./lib/js/cerner-smart-embeddable-lib-1.0.0.min.js'></script>
14
15 <!-- FHIR Client JS Library -->
16 <script src='./lib/js/fhir-client-v0.1.0.min.js'></script>
17
18 <!-- Prevent session bleed caused by threaded embedded browser and sessionStorage API -->
19 <!-- https://github.com/cerner/fhir-client/blob/master/additions -->
20 <script src='./lib/js/fhir-client-additions-1.0.0.js'></script>
21 <script>
22   FHIR.oauth2.authorize({
23     'client_id': '9e929706-9338-4f53-91bd-87f0a02ef5a2',
24     'scope': 'patient/Patient.read patient/Observation.read launch online_access openid profile'
25   });
26 </script>
27 <div class="spinner">
28   <div class="bounce1"></div>
29   <div class="bounce2"></div>
30   <div class="bounce3"></div>
31 </div>
32 </body>
33 </html>
```

A blue arrow points to the 'client\_id' field in the FHIR.oauth2.authorize function call, specifically to the value '9e929706-9338-4f53-91bd-87f0a02ef5a2'.

At the bottom of the browser window, the footer contains the text "© 2017 GitHub, Inc. Terms Privacy Security Status Help" on the left, a GitHub logo in the center, and "Contact GitHub API Training Shop Blog About" on the right.

# Choose SmartHealthIT

The screenshot displays the SmartHealthIT Sandbox Manager web application. A modal titled "Choose a Patient" is open, showing a search bar with "john smith ..." and a table of patients. The background interface includes a sidebar with navigation options like "Registered Apps", "Browse Patients", "Browse Practitioners", "Data Browser", "Launch Scenarios", "Personas", "Documentation", and "Settings". The main content area shows "Registered App Details" for an app named "Cerner Tutorial".

**Choose a Patient**

Search for patients by name

john smith ...

| Name                | Gender | Age      |
|---------------------|--------|----------|
| Gaylord, Barbara    | Female | 49 years |
| Abbott, Buena       | Female | 67 years |
| Abbott, Pok         | Female | 15 years |
| Abernathy, Francine | Female | 84 years |
| MacGyver, Mabelle   | Female | 86 years |
| Bednar, Maryland    | Female | 96 years |
| Abernathy, Yu       | Female | 84 years |
| Abshire, Carlton    | Male   | 84 years |
| Abshire, Carrol     | Male   | 36 years |
| Abshire, Cary       | Male   | 27 years |

Showing 1 to 10 of 1545

Next

**Registered App Details**

Launch Save Delete

App Name: Cerner Tutorial

App Type: Public Client

App Id: 9e929706-9338-4f53-91bd-87f0a02ef5a2

App Launch URI: https://taylordeatri.github.io/smart

App Redirect URIs:

Comma separated list of redirect URIs eg. 'http://myhost.com/my-app/,http://myhost.com/my-other-path/app/'

App Logo: Upload Image

(Display size 210px W X 150px H)

No Image



# SmartIT Sandbox after launch

The screenshot shows a web browser window with two tabs: 'Sandbox Manager' and 'OpenID Connect Server'. The active tab is 'OpenID Connect Server', displaying the authorization page for 'sb-auth.smarthealthit.org'. The browser's address bar shows a secure connection to a URL with a long client ID. The page has a navigation bar with links to 'Home', 'About', 'Statistics', and 'Contact', and a user profile dropdown for 'johnglobal@smartdstu2'. A red warning box on the left states: 'Warning: This client does not have any redirect URIs registered and someone could be using a malicious URI here. You will be redirected to the following page if you click Approve: https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/'. The 'Access to:' section lists permissions with checkboxes: 'log in using your identity', 'basic profile information', 'Launch with an existing context', 'Allows the app to maintain authorization as long as the app is online.', 'Read all Observations for a given patient', and 'Read all Patients for a given patient'. The 'Remember this decision:' section has radio buttons for 'remember this decision until I revoke it', 'remember this decision for one hour', and 'prompt me again next time' (which is selected). At the bottom, the question 'Do you authorize "Cerner Tutorial"?' is followed by 'Authorize' and 'Deny' buttons.

Sandbox Manager x OpenID Connect Server x

Secure | [https://sb-auth.smarthealthit.org/authorize?client\\_id=9e929706-9338-4f53-91bd-87f0a02ef5a2&res...](https://sb-auth.smarthealthit.org/authorize?client_id=9e929706-9338-4f53-91bd-87f0a02ef5a2&res...)

Apps Getting Started Latest Headlines NLP DEIDENT Imported From Firefo Channel Lineup | TV | <https://app-devel.reg> From MIDH 19 Other bookmarks

OpenID Connect Server Home About Statistics Contact johnglobal@smartdstu2

**Warning:**  
This client does not have any redirect URIs registered and someone could be using a malicious URI here. You will be redirected to the following page if you click Approve:  
<https://taylordeatri.github.io/smart-on-fhir-tutorial/example-smart-app/>

**Access to:**

- ☒ log in using your identity
- ☒ basic profile information
- ☒ Launch with an existing context
- ☒ Allows the app to maintain authorization as long as the app is online.
- ☒ Read all Observations for a given patient
- ☒ Read all Patients for a given patient

**Remember this decision:**

- ☐ remember this decision until I revoke it
- ☐ remember this decision for one hour
- ☒ prompt me again next time

**Do you authorize "Cerner Tutorial"?**

Authorize Deny

# After approved

Sandbox Manager x taylordetri-SMART-App x

Secure | <https://taylordetri.github.io/smart-on-fhir-tutorial/example-smart-app/>

Apps Getting Started Latest Headlines NLP DEIDENT Imported From Firefo Channel Lineup | TV | <https://app-devel.reg> From MIDH 19 Other bookmarks

## Example-SMART-App

### Patient Resource

**First Name:** Yu  
**Last Name:** Abernathy  
**Gender:** female  
**Date of Birth:** 10/27/1933  
**Age:** 84

### Observation Resource

**Height:**  
**Systolic Blood Pressure:**  
**Diastolic Blood Pressure:**  
**LDL:**  
**HDL:**



