The Office of the National Coordinator for Health Information Technology

Application Programming Interfaces (API) 101

Brief introduction to modern internet enabled APIs and their use in healthcare

Session Goal and Agenda

- Part 1 :
  - Presented by *Avinash Shanbhag*, ONC
  - Provide basic understanding of modern internet enabled APIs and describe the key technical terms developers commonly use when describing APIs
- Part 2:
  - Presented by *Mark Scrimshire*, Entrepreneur-in-Residence, CMS
  - Provide real-world application of the API technology in healthcare

<u>Goal</u> – Show the power, usability and ease of use of modern APIs in health care

21st Century Cures Act (Sec 4002)

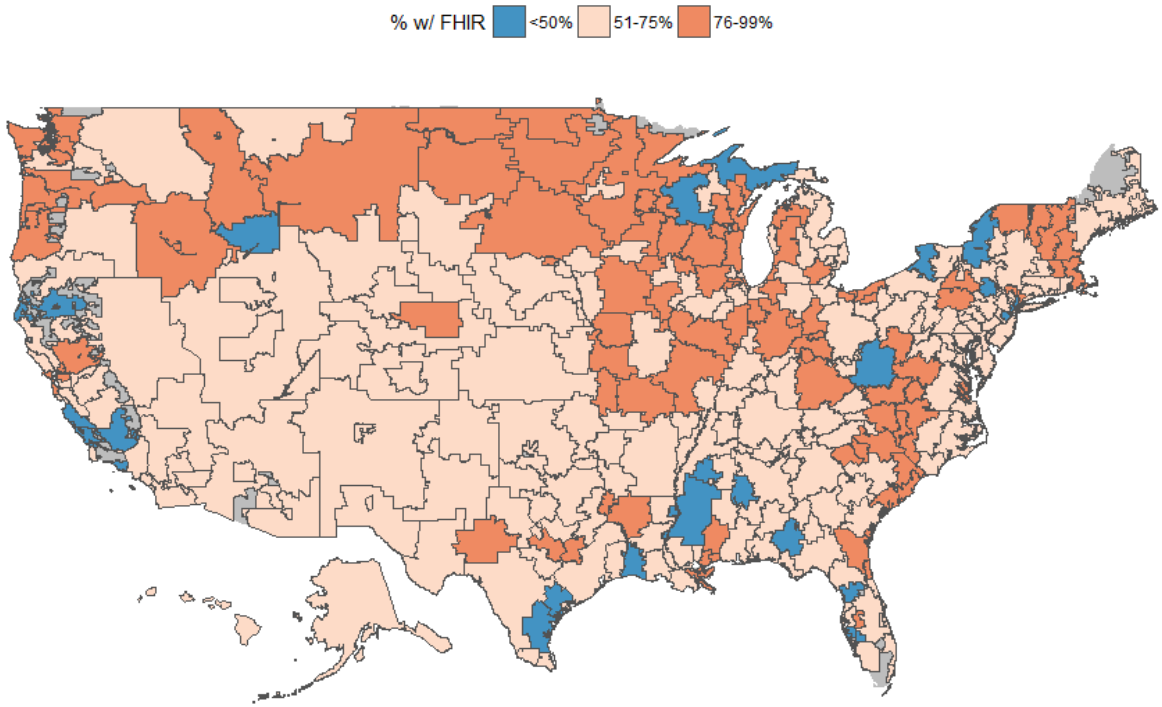
- "(iv) has published **application programming interfaces** and allows health information from such technology to be accessed, exchanged, and used without special effort through the use of application programming interfaces or successor technology or standards, as provided for under applicable law, including providing access to all data elements of a patient's electronic health record to the extent permissible under applicable privacy laws;"

Cures Act has recognized the importance of APIs for interoperability and made it a requirement for developers

Things are heating up for FHIR APIs

Percent of clinicians with a 2015 Edition certified-API enabled with FHIR

By Hospital Referral Region



Source: CHPL; Medicare EHR Incentive Program
Notes: (1) gray areas = HRR with no clinicians; (2) The most recent attestations to the Medicare EHR Incentive Program were used to determine EHR installations for all clinicians. These attestations may not reflect the most currently installed technology for all clincians. In some cases, %'s may be underestimated for HRRs.

Check out the latest ONC blog (Oct 1, 2018)

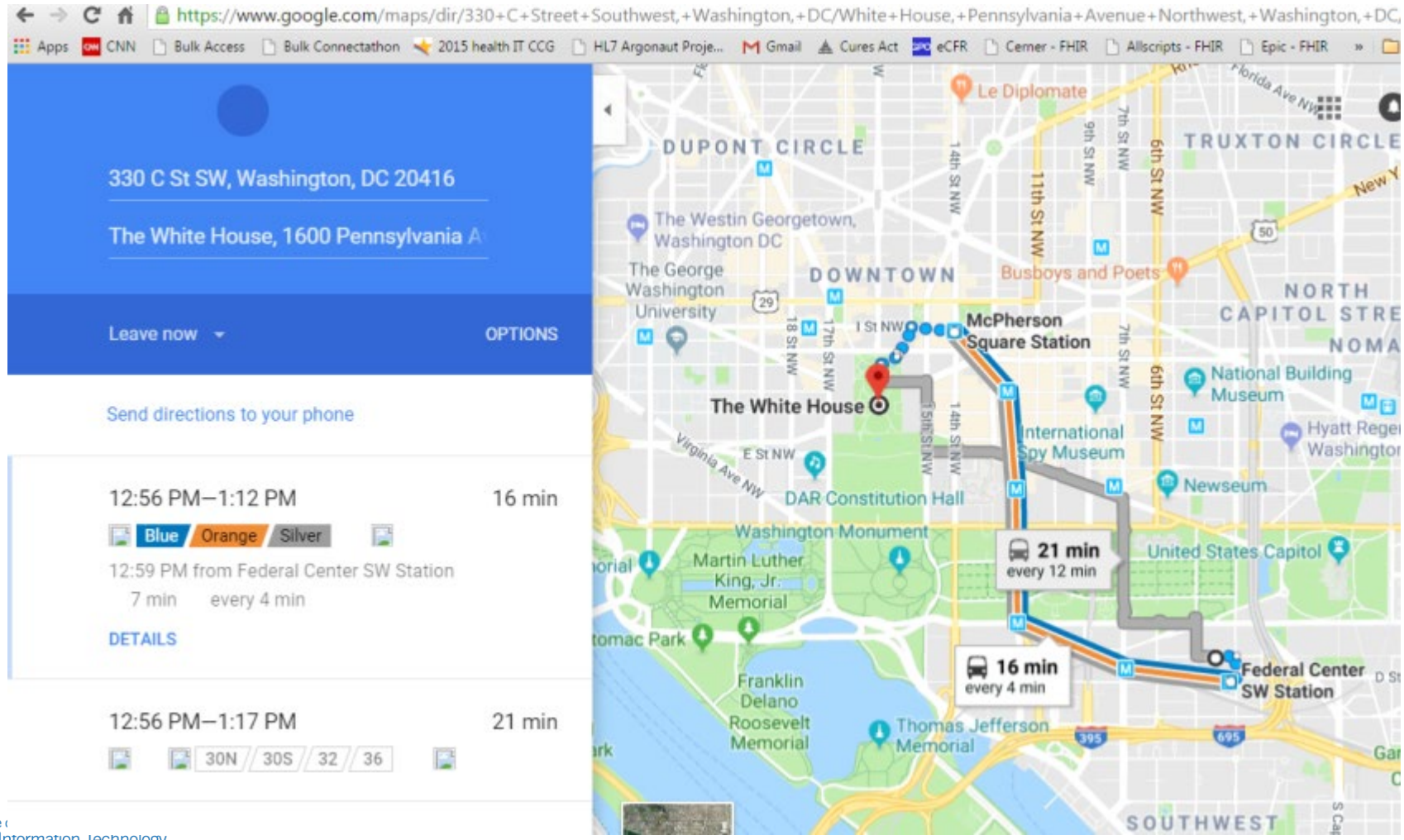
https://www.healthit.gov/buzz-blog/interoperability/heat-wave-the-u-s-is-poised-to-catch-fhir-in-2019/

What are the differences between an “Application” and an “API”

Application	API
Computer program designed to help a person perform an activity. For example, a web site.	A set of software code, protocols and tools to help developers build applications. For example, embedding a twitter feed into a web site.
It is typically accessible via user interface.	It is typically embedded inside another software program.
Usually contains a lot of functionality that are geared towards end users being able to perform complex tasks.	Usually designed to perform few small tasks that are geared towards software developers being able to use it in their software programs.

Google Maps – Example of an Application

http://maps.google.com



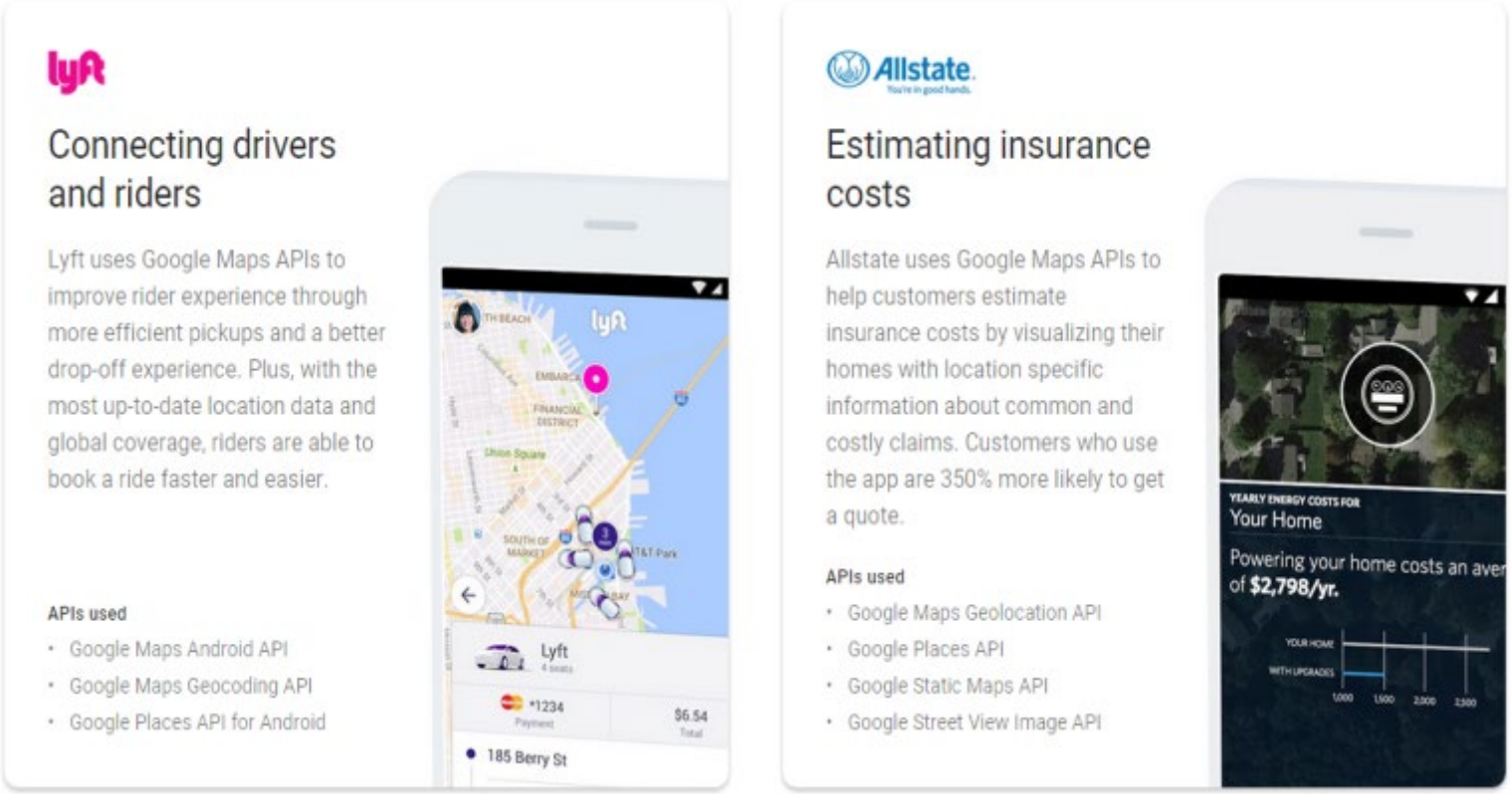
API Example – Google Geocode API

- https://maps.googleapis.com/maps/api/geocode/json?address=Maryland
- https://maps.googleapis.com/maps/api/geocode/json?address=Maryland&key=AIzaSyDBtwiXKlYQR9E1OvyopnrmaU6qrNXCZ7A


```
{
   "results" : [
      {
         "address_components" : [
            {
               "long_name" : "Maryland",
               "short_name" : "MD",
               "types" : [ "administrative_area_level_1", "political" ]
            },
            {
               "long_name" : "United States",
               "short_name" : "US",
               "types" : [ "country", "political" ]
            }
         ],
         "formatted_address" : "Maryland, USA",
         "geometry" : {
            "bounds" : {
               "northeast" : {
                  "lat" : 39.723037,
                  "lng" : -74.98628189999999
               },
               "southwest" : {
                  "lat" : 37.8866049,
                  "lng" : -79.48765109999999
               }
            },
            "location" : {
               "lat" : 39.0457549,
               "lng" : -76.64127119999999
            },
            "location_type" : "APPROXIMATE",
            "viewport" : {
               "northeast" : {
                  "lat" : 39.723037,
                  "lng" : -74.98628189999999
               },
               "southwest" : {
                  "lat" : 37.8866049,
                  "lng" : -79.48765109999999
               }
            }
```

Google Map API – Example of API

- https://developers.google.com/maps/



Differences between “Application” and “API” – Google Maps

Application	API
http://maps.google.com	https://maps.googleapis.com/maps/api/geocode/json?address=Maryland
Accessible via user interface such as web browsers (e.g. Internet Explorer).	Does not have user interface. But, is embedded inside another software program. For example, Lyft, Allstate, etc.
Contains a lot of functionality such as distance, alternate routes, road conditions, etc.	Contains only subset of functionality that is needed for rich experience. But, makes it easy for developers to use.

What are the benefits of providing API vs developing application

- Organizations can monetize their API capabilities to new stakeholders rather than only depending on customers that use their “application”.
- Organizations can make use of APIs to obtain the capability rather than having to build it again.
- Each API provides focused capability, which makes overall cost of development lower and hence lower usage cost.
- Everyone wins!

Anatomy of modern API – REST and JSON

- Google's API is an example of RESTful API
- REST stands for **R**epresentational **S**tate **T**ransfer
- RESTful APIs have following properties
  - » APIs work similar to how we access web sites!
    - – API user (software program) calls the API using the standard HTTP(s) protocol which is the same protocol used for accessing web site.
      - https://maps.googleapis.com/maps/api/geocode/json?address=Maryland
  - » You can use the "search parameters" field in the HTTP request string to get different information
    - – https://maps.googleapis.com/maps/api/geocode/json?address=Maryland&language=fr

Anatomy of modern API – REST and JSON

- API results are structured data formatted in **Javascript Object Notation (JSON)** format which is bunch of key/value pairs, and can be easily parsed by modern programming languages


```
{
   "results" : [
      {
         "address_components" : [
            {
               "long_name" : "Maryland",
               "short_name" : "MD",
               "types" : [ "administrative_area_level_1", "political" ]
            },
            {
               "long_name" : "United States",
               "short_name" : "US",
               "types" : [ "country", "political" ]
            }
         ],
         "formatted_address" : "Maryland, USA",
         "geometry" : {
            "bounds" : {
               "northeast" : {
                  "lat" : 39.723037,
                  "lng" : -74.98628189999999
               },
               "southwest" : {
                  "lat" : 37.8866049,
                  "lng" : -79.48765109999999
               }
```

So… What are the benefits of RESTful APIs

- Easy for API developers to develop and deploy, since they use the same underlying capabilities as a web site
- JSON data structures are easy to read and compute using software programs
- As a result, software developers can begin using API quickly

How is this related to APIs used in health care?

- **F**ast **H**ealthcare **I**nteroperability **R**esource (FHIR) is the most widely used API standard in health care
- **FHIR APIs use the same RESTful pattern**
  - » https://fhir.sitenv.org/open/fhir/Patient/1?_format=json&_pretty=true
- **Results are in the familiar JSON format**


```
{
   "resourceType":"Patient",
    "id":"1",
    "meta":{
        "versionId":"2.0"
    },
    "extension":[
        {

"url":"http://hl7.org/fhir/StructureDefinition/patient-
mothersMaidenName",
            "valueString":"Jane"
        },
        {
```

To Recap

Part 1:

- We understand the difference between “Application” and “API”.
- Benefits of supporting API from lower maintenance and additional use cases.
- Underpinnings of modern APIs – REST and JSON
- FHIR APIs support the same standards used in other industry!

Part 2:

- Presented by *Mark Scrimshire*, Entrepreneur-in-Residence, CMS
- Provide real-world application of the API technology in healthcare

The Office of the National Coordinator for Health Information Technology

Now to Part 2..

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