



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

**Goal – Show the power, usability and ease of use of modern APIs in health care**

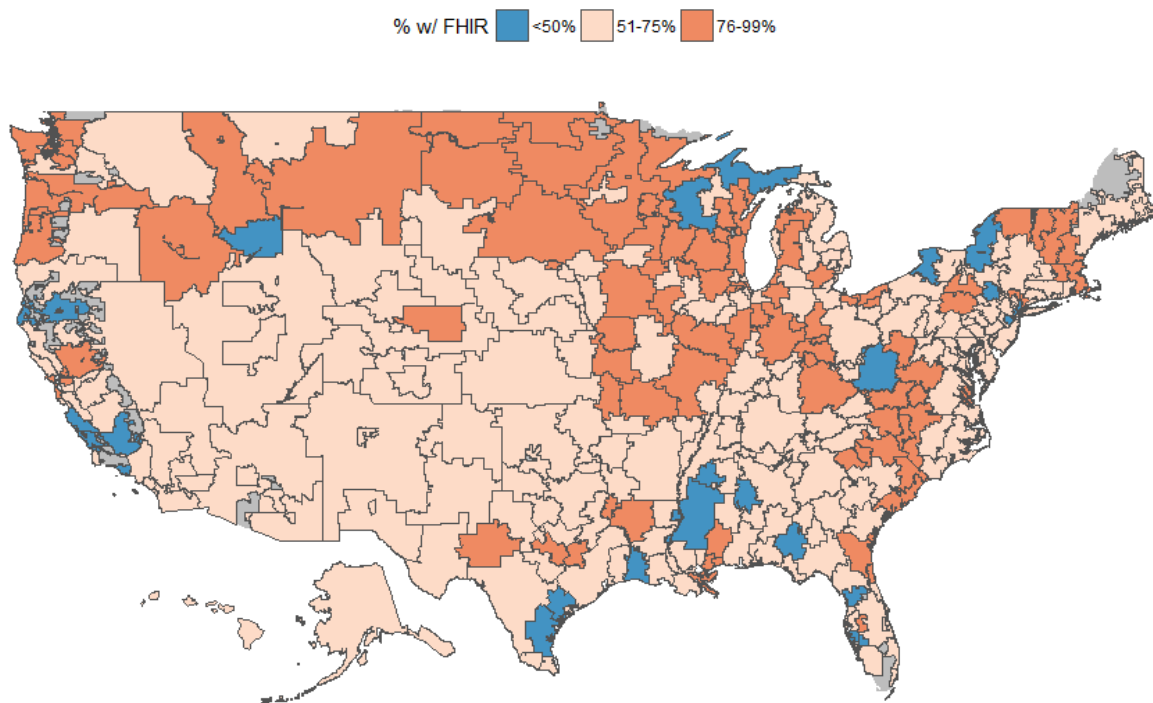
- “(iv) has published **application programming interfaces** and allows health information from such technology to be accessed, exchanged, and used without special effort through the use of application programming interfaces or successor technology or standards, as provided for under applicable law, 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 clinicians. 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 <u>person</u> perform an activity. For example, a web site.	A set of software code, protocols and tools to help <u>developers</u> build applications. For example, embedding a twitter feed into a web site.
It is typically accessible via <u>user interface</u> .	It is typically <u>embedded</u> inside another software program.
Usually contains a <u>lot</u> of functionality that are geared towards end users being able to perform complex tasks.	Usually designed to perform <u>few</u> 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>

The screenshot shows a Google Maps interface with a search bar at the top containing the address "330 C St SW, Washington, DC 20416". Below the search bar, the destination is identified as "The White House, 1600 Pennsylvania Avenue NW, Washington, DC 20505". The map displays a route from "Federal Center SW Station" to "The White House" via "McPherson Square Station". The route is highlighted in blue and orange, indicating the use of the Blue and Orange Metro lines. The estimated travel time is 16 minutes. The map also shows other landmarks such as the United States Capitol, the National Building Museum, and the Washington Monument. The interface includes a sidebar with travel details, including the time "12:56 PM–1:12 PM" and the frequency "7 min every 4 min".

330 C St SW, Washington, DC 20416

The White House, 1600 Pennsylvania Avenue NW, Washington, DC 20505

Leave now ▾ OPTIONS

Send directions to your phone

12:56 PM–1:12 PM 16 min

Blue Orange Silver

12:59 PM from Federal Center SW Station  
7 min every 4 min

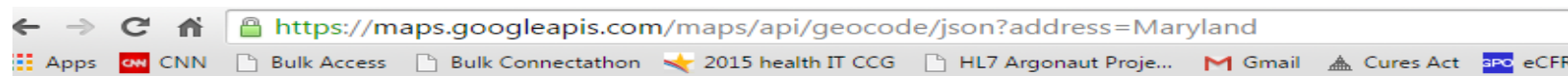
DETAILS

12:56 PM–1:17 PM 21 min

30N 30S 32 36

# 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=AlzaSyDBtwiXKIYQR9E1OvyopnrmaU6qrNXCZ7A>



```
{
  "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/>

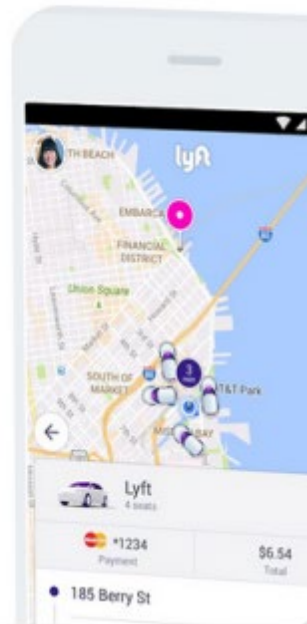


## Connecting drivers and riders

Lyft uses Google Maps APIs to improve rider experience through more efficient pickups and a better drop-off experience. Plus, with the most up-to-date location data and global coverage, riders are able to book a ride faster and easier.

### APIs used

- Google Maps Android API
- Google Maps Geocoding API
- Google Places API for Android

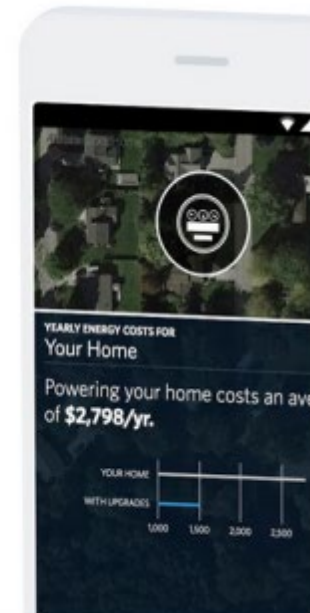


## Estimating insurance costs

Allstate uses Google Maps APIs to help customers estimate insurance costs by visualizing their homes with location specific information about common and costly claims. Customers who use the app are 350% more likely to get a quote.

### APIs used

- Google Maps Geolocation API
- Google Places API
- Google Static Maps API
- Google Street View Image API





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

Application	API
<a href="http://maps.google.com">http://maps.google.com</a>	<a href="https://maps.googleapis.com/maps/api/geocode/json?address=Maryland">https://maps.googleapis.com/maps/api/geocode/json?address=Maryland</a>
Accessible via user interface such as <u>web browsers</u> (e.g. Internet Explorer).	Does not have user interface. But, is embedded inside another software program. For example, Lyft, Allstate, etc.
Contains a <u>lot</u> 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?

- **Fast Healthcare Interoperability Resource (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](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



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Now to Part 2..

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