

# Building APIs in Government for Social Good

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# My Time In Government

Deputy Chief Data Officer,  
US Department of Commerce (2015-16)

White House Presidential Innovation Fellow,  
Department of Labor & US Census Bureau (2014-15)





# ○ THE PLAN

- The Reality

- APIs: Sweat and Toil, CitySDK, MIDAAS

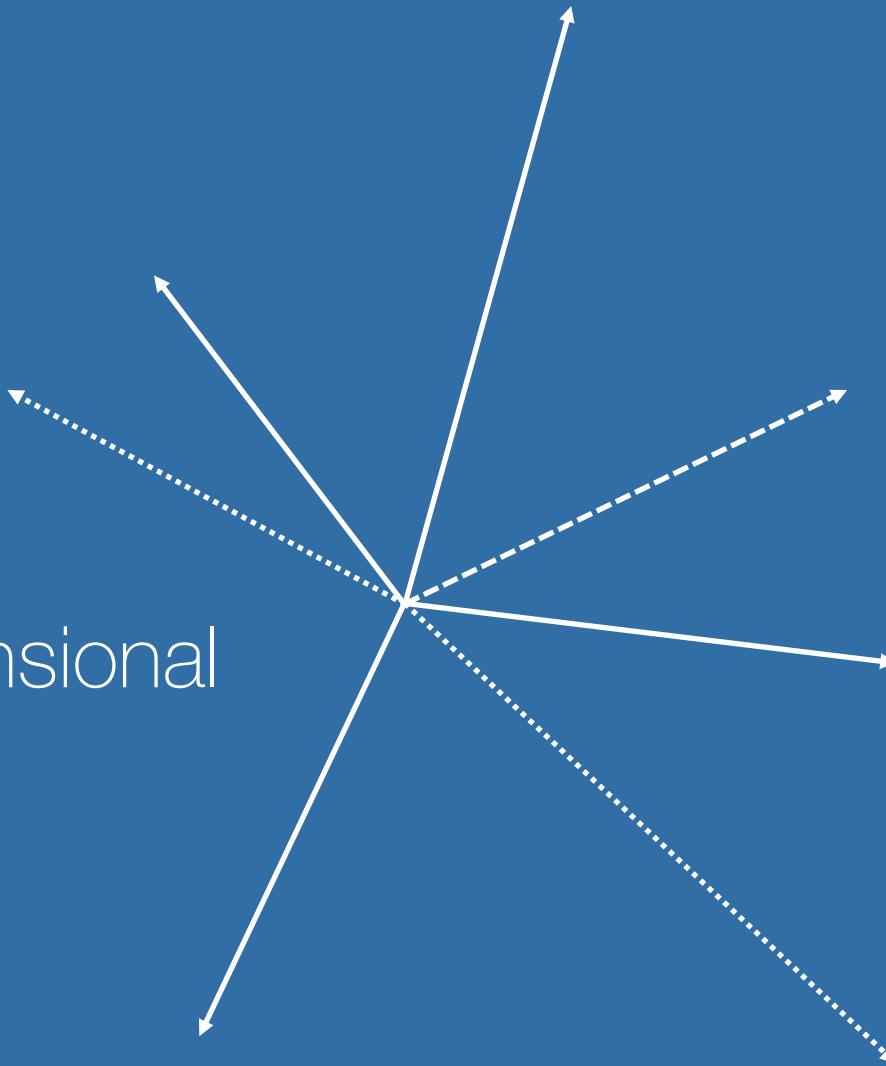
- Lessons

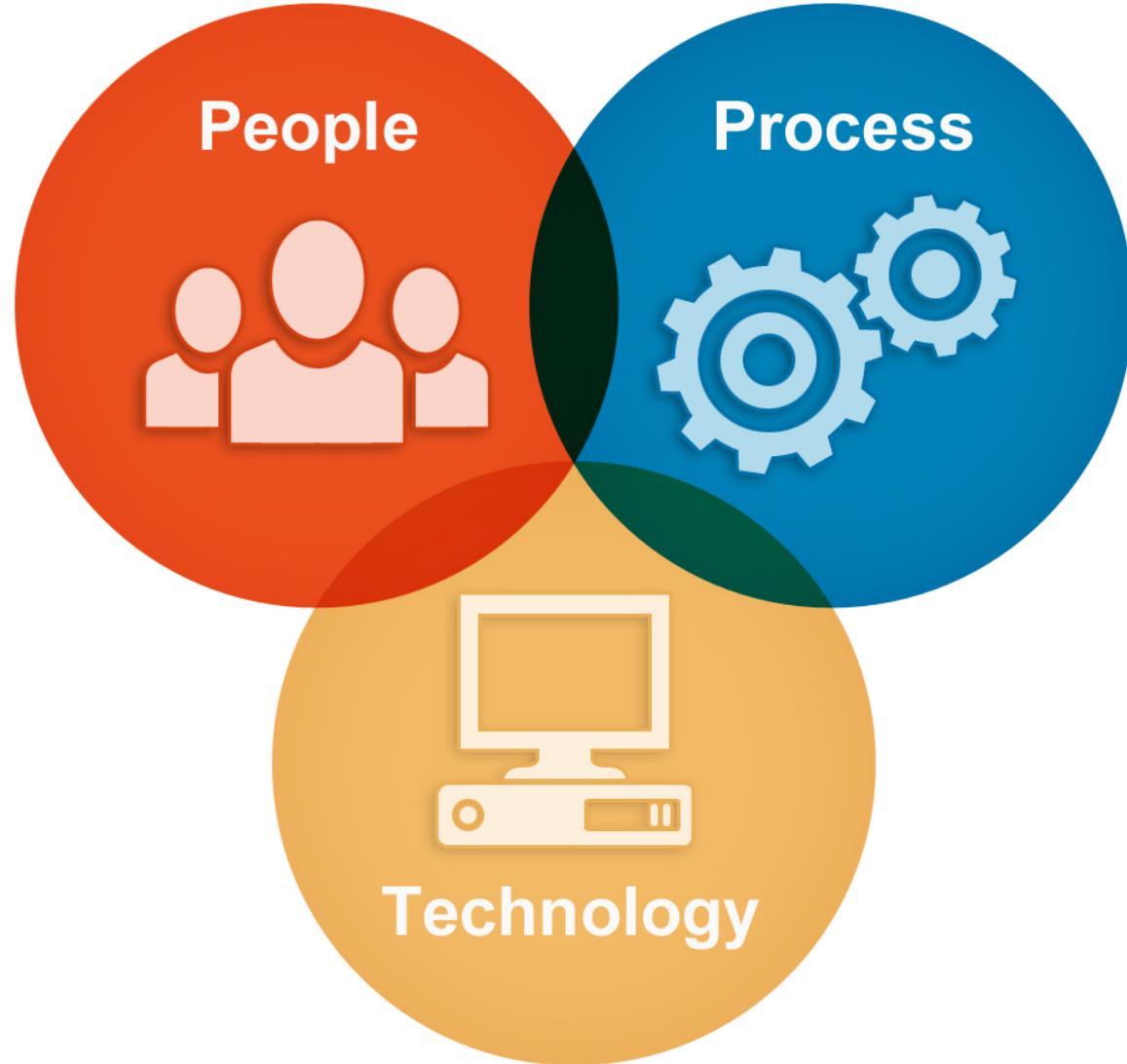
government takes  
on the hardest,  
inelastic problems

optimum



n-dimensional









[Home](#) • Transparency and Open Government

## Transparency and Open Government

### Memorandum for the Heads of Executive Departments and Agencies

**SUBJECT:** Transparency and Open Government

My Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government.

**Government should be transparent.** Transparency promotes accountability and provides information for citizens about what their Government is doing. Information maintained by the Federal Government is a national asset. My Administration will take appropriate action, consistent with law and policy, to disclose information rapidly in forms that the public can readily find and use. Executive departments and agencies should harness new technologies to put information about their operations and decisions online and readily available to the public. Executive departments and agencies should also solicit public feedback to identify information of greatest use to the public.

**Government should be participatory.** Public engagement enhances the Government's effectiveness and improves the quality of its decisions. Knowledge is widely dispersed in society, and public officials benefit from having access to that dispersed

# Executive Order M-13-13

 <https://www.data.gov>

 DATA.GOV

DATA TOPICS ▾ IMPACT APPLICATIONS DEVELOPERS CONTACT

# The home of the U.S. Government's open data

Here you will find data, tools, and resources to conduct research, develop web and mobile applications, design data visualizations, and [more](#).

**GET STARTED**  
SEARCH OVER [186,304 DATASETS](#)

*Federal Student Loan Program Data* 

**BROWSE TOPICS**

 Agriculture	 Business	 Climate	 Consumer	 Ecosystems	 Education	 Energy
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# Federal Source Code Policy

[Discuss](#) | [Edit](#) | [View PDF of Policy](#)[Introduction](#)[1 - Objectives](#)[2 - Scope and Applicability](#)[3 - Three-Step Software Solutions Analysis](#)[4 - Government-Wide Code Reuse](#)[5 - Open Source Software](#)[6 - Exceptions to Government Code Reuse](#)[7 - Implementation](#)[Appendix A - Definitions](#)[Discuss](#)[Edit this page](#)**M-16-21**

## MEMORANDUM FOR THE HEADS OF DEPARTMENTS AND AGENCIES

**FROM:****Tony Scott****United States Chief Information Officer****Anne E. Rung****United States Chief Acquisition Officer****SUBJECT:****Federal Source Code Policy: Achieving Efficiency, Transparency, and Innovation through Reusable and Open Source Software**

The U.S. Government is committed to improving the way Federal agencies buy, build, and deliver information technology (IT) and software solutions to better support cost efficiency, mission effectiveness, and the consumer experience with Government programs. Each year, the Federal Government spends more than \$6 billion on software through more than 42,000 transactions.<sup>1</sup> A significant proportion of software used by the Government is comprised of either preexisting Federal solutions or commercial solutions. These solutions include proprietary, open source, and mixed source<sup>2</sup> code and often do not require additional custom code development.

When Federal agencies are unable to identify an existing Federal or commercial software solution that satisfies



A photograph of the United States Capitol building in Washington, D.C., showing the dome and the surrounding neoclassical architecture. The sky is clear and blue.

# ○ THE PLAN

- The Reality

- APIs: Sweat and Toil, CitySDK, MIDAAS

- Lessons

# Sweat and Toil

<http://developer.dol.gov/others/sweat-and-toil>

<https://github.com/USDepartmentofLabor/Child-Labor>

<https://github.com/USDepartmentofLabor/Child-Labor-Android>



# Building the API – Step 1



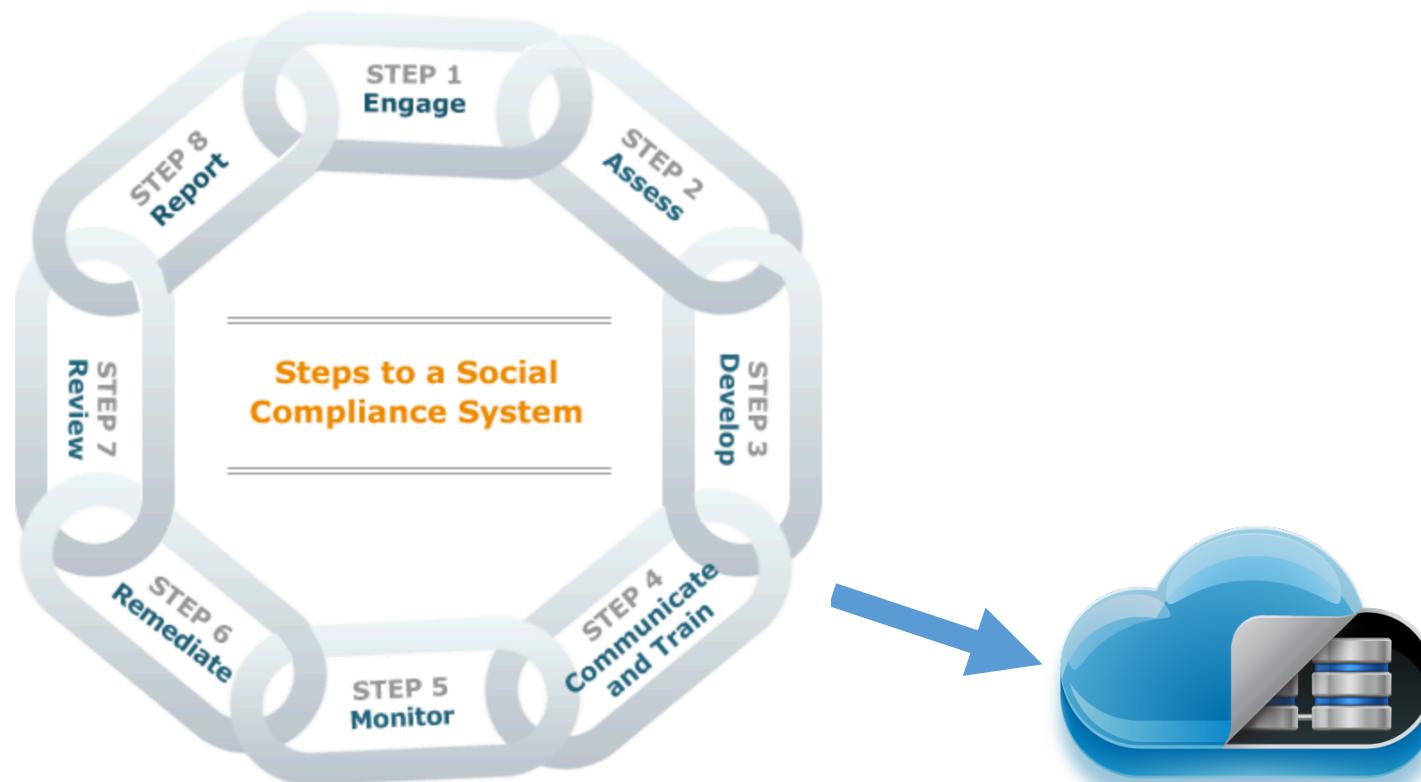
## Coalition and Urgency

# Building the API – Step 2



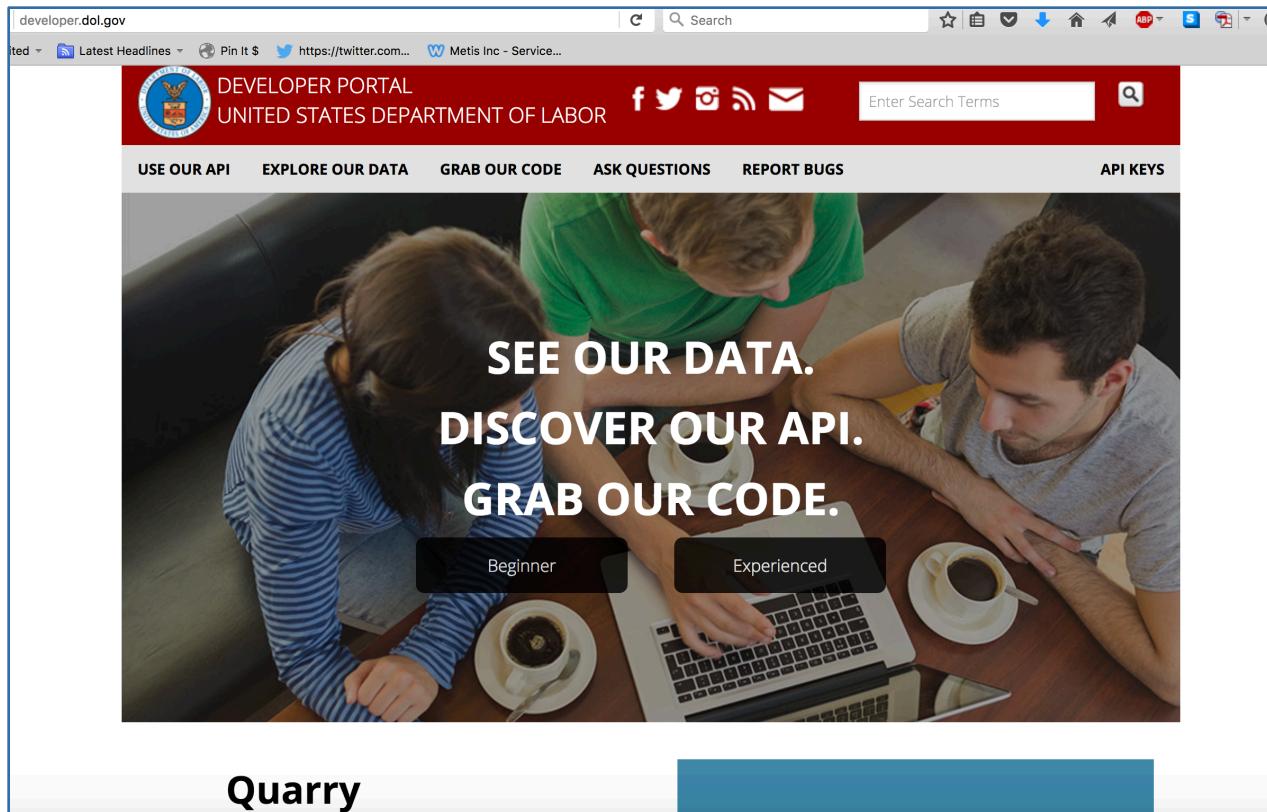
## Understand The Data Production Process

# Building the API – Step 3



## Find Natural Intervention Point

# Building the API – Step 4



## Learn Technology Constraints

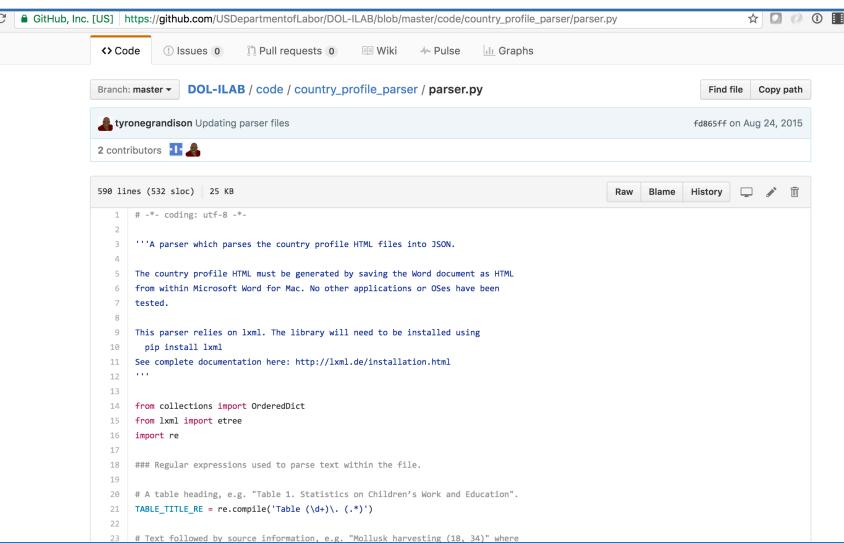
# Building the API – Step 5



## Understand The API User Groups

# Building the API – Step 6

Python → MySQL, MSSQL → Quarry



GitHub, Inc. [US] https://github.com/USDepartmentofLabor/DOL-ILAB/blob/master/code/country\_profile\_parser/parser.py

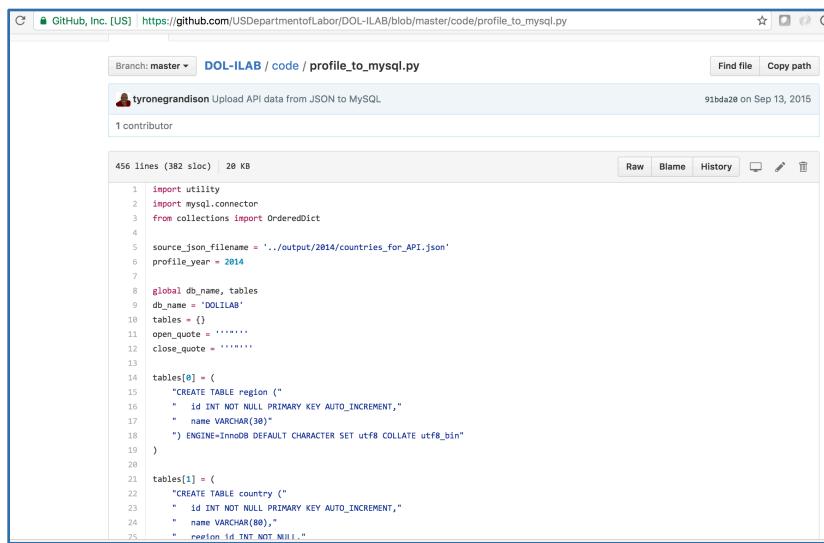
Branch: master DOL-ILAB / code / country\_profile\_parser / parser.py

tyronegrandison Updating parser files

2 contributors

```
598 lines (532 sloc) | 25 KB
```

```
1 # -*- coding: utf-8 -*-
2
3 '''A parser which parses the country profile HTML files into JSON.
4
5 The country profile HTML must be generated by saving the Word document as HTML
6 from within Microsoft Word for Mac. No other applications or OSes have been
7 tested.
8
9 This parser relies on lxml. The library will need to be installed using
10 pip install lxml
11 See complete documentation here: http://lxml.de/installation.html
12 ...
13
14 from collections import OrderedDict
15 from lxml import etree
16 import re
17
18 ## Regular expressions used to parse text within the file.
19
20 # A table heading, e.g. "Table 1. Statistics on Children's Work and Education".
21 TABLE_TITLE_REGEX = re.compile('Table (\d+).(\.*')
22
23 # Text followed by source information, e.g. "Mollusk harvesting (18, 34)" where
```



GitHub, Inc. [US] https://github.com/USDepartmentofLabor/DOL-ILAB/blob/master/code/profile\_to\_mysql.py

Branch: master DOL-ILAB / code / profile\_to\_mysql.py

tyronegrandison Upload API data from JSON to MySQL

91bda28 on Sep 13, 2015

1 contributor

```
456 lines (382 sloc) | 28 KB
```

```
1 import utility
2 import mysql.connector
3 from collections import OrderedDict
4
5 source_json_filename = '../output/2014/countries_for_API.json'
6 profile_year = 2014
7
8 global db_name, tables
9 db_name = 'DOLILAB'
10 tables = {}
11 open_quote = '*****'
12 close_quote = '*****'
13
14 tables[0] = (
15     "CREATE TABLE `region` (" +
16     "    `id` INT NOT NULL PRIMARY KEY AUTO_INCREMENT," +
17     "    `name` VARCHAR(100)," +
18     "    `ENGINE=InnoDB DEFAULT CHARACTER SET utf8 COLLATE utf8_bin"
19 )
20
21 tables[1] = (
22     "CREATE TABLE `country` (" +
23     "    `id` INT NOT NULL PRIMARY KEY AUTO_INCREMENT," +
24     "    `name` VARCHAR(100)," +
25     "    `region_id` INT NOT NULL "
)
```

**Country Profile Table**

[https://data.dol.gov/get/childlabor\\_pro](https://data.dol.gov/get/childlabor_pro)

childlabor\_pro

Column Name	Column Description	Data Type
<b>id</b>	Unique country profile identifier	int
<b>country_id</b>	Unique country identifier	int
<b>profile_year</b>	Year of country profile	int
<b>advancement_id</b>	Unique advancement level identifier	int
<b>description</b>	Country profile summary description	text

**Sector Table**

[https://data.dol.gov/get/childlabor\\_sec](https://data.dol.gov/get/childlabor_sec)

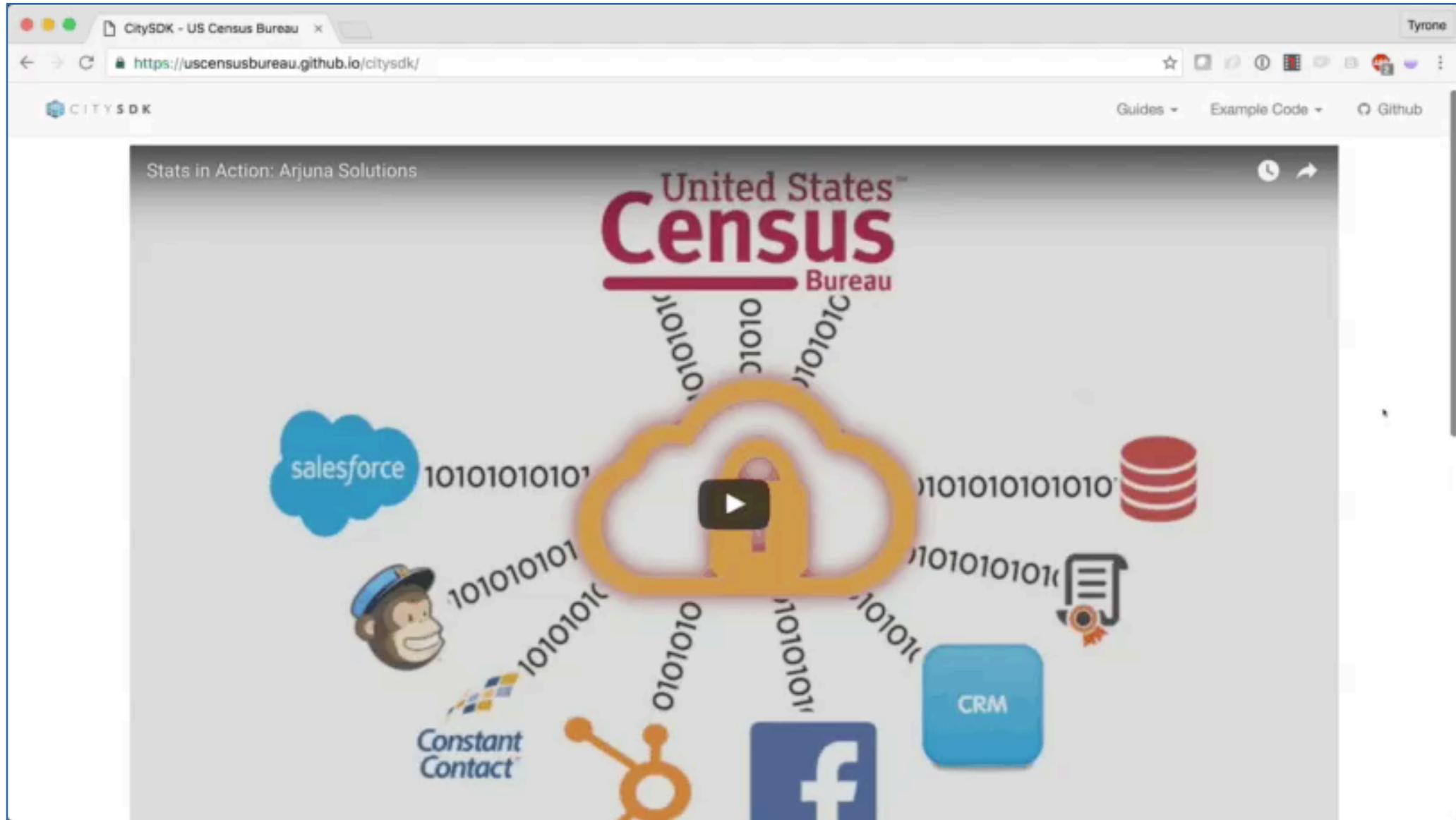
childlabor\_sec

Column Name	Column Description	Data Type
<b>id</b>	Unique sector identifier	int

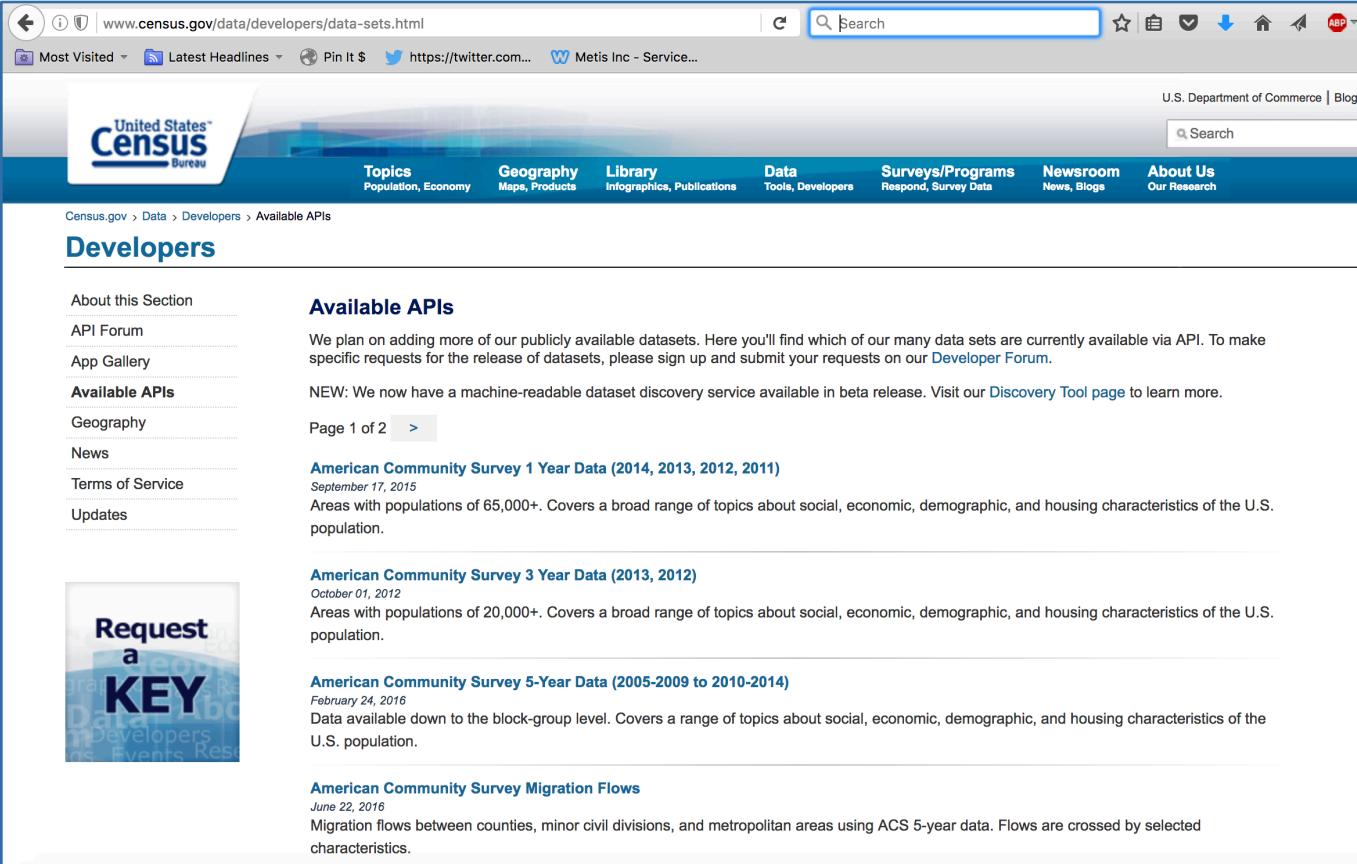
# Census CitySDK

<https://uscensusbureau.github.io/citysdk/>

<https://github.com/uscensusbureau/citysdk>



# Building the API – Step 1



The screenshot shows a web browser displaying the Census.gov Developers page for Available APIs. The page has a blue header with the Census logo and a navigation bar with links like Topics, Geography, Library, Data, Surveys/Programs, Newsroom, and About Us. The main content area is titled "Available APIs" and includes a sidebar with links for About this Section, API Forum, App Gallery, Available APIs (which is selected), Geography, News, Terms of Service, and Updates. The main content lists four datasets:

- American Community Survey 1 Year Data (2014, 2013, 2012, 2011)**  
September 17, 2015  
Areas with populations of 65,000+. Covers a broad range of topics about social, economic, demographic, and housing characteristics of the U.S. population.
- American Community Survey 3 Year Data (2013, 2012)**  
October 01, 2012  
Areas with populations of 20,000+. Covers a broad range of topics about social, economic, demographic, and housing characteristics of the U.S. population.
- American Community Survey 5-Year Data (2005-2009 to 2010-2014)**  
February 24, 2016  
Data available down to the block-group level. Covers a range of topics about social, economic, demographic, and housing characteristics of the U.S. population.
- American Community Survey Migration Flows**  
June 22, 2016  
Migration flows between counties, minor civil divisions, and metropolitan areas using ACS 5-year data. Flows are crossed by selected characteristics.

A large button on the left says "Request a KEY".

## Validate The Demand

# Building the API – Step 2

The screenshot shows an Airtable base titled "API User Research". The main view displays a table with four columns: "ID", "Interview", "Interface", and "Quote". There are 17 rows of data, each containing a timestamp, an interface type (e.g., API, SDK), and a quote from a user. The sidebar on the left lists various engagements, such as "Zillow Hack House", "CitySDK Kick The", "Geocoding Usability", "18F API Usability", "Backlog from Tiff", "Ideascale Inventor", "R Interviews", "NDoCH Follow Up", and "Apigee API Assess".

ID	Interview	Interface	Quote
1	2/8/2015 17:00	API	Mostly, I feel that finding the structure of the data is a pain to process. I work with map data all the time, but sorting out the structure of the data is a big pain this
2	2/8/2015 17:00	API	Nokia HERE Maps has CENSUS layers that can facilitate the analyses of census data.
3	2/8/2015 17:00	API	I would have liked (the API response) to fit the construct of common off-the-shelf front-ends for maps. I would have liked (the API response) to fit the construct of
4	2/8/2015 17:10	API	We spent more than 10 hours converting lat / longs from our point data into Census block-groups...
5	2/8/2015 17:20	API	...Dealing with the Census shapes was the most complicated part... We wanted to compare the data over time, but had to go through a bunch of work just to be
6	2/8/2015 17:30	API	We wanted to filter our query by a (Census) geographic boundary, but the amount of trouble we would have had to go through kept us from doing it that way...We
7	2/8/2015 17:10	API	Across a lot of APIs, you give the url and get parameters with a '?' ... which works if you're doing one specific thing, but I think that's an older paradigm... If you w
8	2/8/2015 17:20	API	I would like to see all the available open data based on a lat/long query (e.g., the Census has x here and crime data is available here) maybe at a certain geograph
9	2/8/2015 17:30	API	HUD had a nice exploration tool that allows you to play with the API, make a call and get a response, which was helpful... however, it would have been nice if (for
10	2/8/2015 17:40	API	First (there is) a 12-digit code that doesn't map to geographic coordinates..
11	2/8/2015 17:40	API	Then the block-group is not a nice square shape, there are a ton of coordinates. It could be a ring shape... overlapping if your using the outer boundary instead of
12	2/8/2015 17:40	API	The HUD API was well documented, for the Census I would have liked to see all the variables listed and their descriptions like it is for HUD ... list all the variables
13	5/19/2015 10:10	SDK	Move examples to github.io pages
14	5/19/2015 10:30	SDK	Enforce a consistent naming convention
15	5/19/2015 10:30	SDK	More aliases ACS aliases to correct (arcGis)
16	5/19/2015 10:10	SDK	List of features (consider making a list of links with teasers, but each having its own page with examples, tutorial, etc.) .IO Pages
17	5/19/2015 10:20	SDK	Variable search engine (still think the Search functionality would be cool here), maybe pull down the Census Reporter functionality

## Understand The User

# Building the API – Step 3

## Geography

Geography is at the heart of all Census Bureau data. All of our data sets pertain to very specific geographies that embody very specific geographic concepts. Although we try to make using our API as intuitive as possible, the greater your understanding of these concepts, the more powerful you become as a developer using these data.

**Every query must include a geography, and this API supports both FIPS and GNIS geography codes.**

To query the API your request URL query string must include a `for` argument which defines the geography level and FIPS code(s).

**For example:**

`http://api.census.gov/data/2010/sf1?key=...&get=P0010001&for=state:06`

will find the total population for the state of California.

The "for" argument may include additional FIPS codes, separated by a comma.

**For example:**

`http://api.census.gov/data/2010/sf1?key=...&get=P0010001&for=state:06,24`

will find the total population for the states of California and Maryland.

In some cases you must also include an `in` argument to fully qualify the geography.

## Understand Technology Constraints

# Building The API – Step 4

## 2. Client-side Javascript library

For client-side only apps, a Javascript library is provided that is expanded by modules which call on various APIs. Each module essentially adds a new data source for scripting to consume. The core library (`citysdk.js`) includes some basic utility functions that return coordinates for state capitals, etc.

### 2.1 Add the Library

Add the script libraries to the page. You will need the CitySDK core and then any modules you wish to use. This example will use the Census Module.

```
<script src="https://cdn.rawgit.com/uscensusbureau/citysdk/Release1.1/js/citysdk.js"></script>
<script src="https://cdn.rawgit.com/uscensusbureau/citysdk/Release1.1/js/citysdk.census.js"></script>
```

Note: jQuery is also a required.

### 2.2 Enable the Library(s)

Make sure you have a Census API key, you may request one [here](#).

```
<script>
    var sdk = new CitySDK(); //Create the CitySDK Instance
    census = sdk.modules.census; //Create an instance of the module
    census.enable("API-KEY"); //Enable the module with the api key
</script>
```

### 2.3 Create the Request

#### Define Location

The location can be defined by coordinates (latitude/longitude), state, zipcode, or address. Generally coordinate points are optimal and

MVP



JS

beta



node.js

## 1. Node API

Once you have acquired an API key, it needs to be included in the [basic auth header](#) of every request.

```
Authorization: Basic <your_api_key>
```

### 1.1 Example with cURL

```
curl --user yourApiKey: http://citysdk.commerce.gov
```

**Note:** leave the `password` field empty.

### 1.2 Endpoints

**Base URL:** <http://citysdk.commerce.gov>

Path	Method	Request Data
------	--------	--------------

/	POST	JSON Request object
---	------	---------------------

/alias-to-variable	GET	Comma separated aliases. Example: ?aliases=income,population
--------------------	-----	--

/variable-to-alias	GET	Comma separated variables. Example: ?variables=P0010001,P0110022
--------------------	-----	--

#### Description

Evaluates request and returns either GeoJSON data or GeoJSON with Census data

Returns a map of alias -> variable for the given parameter values

Returns a map of variable -> alias for the given parameter values

### 1.3 The Request Object

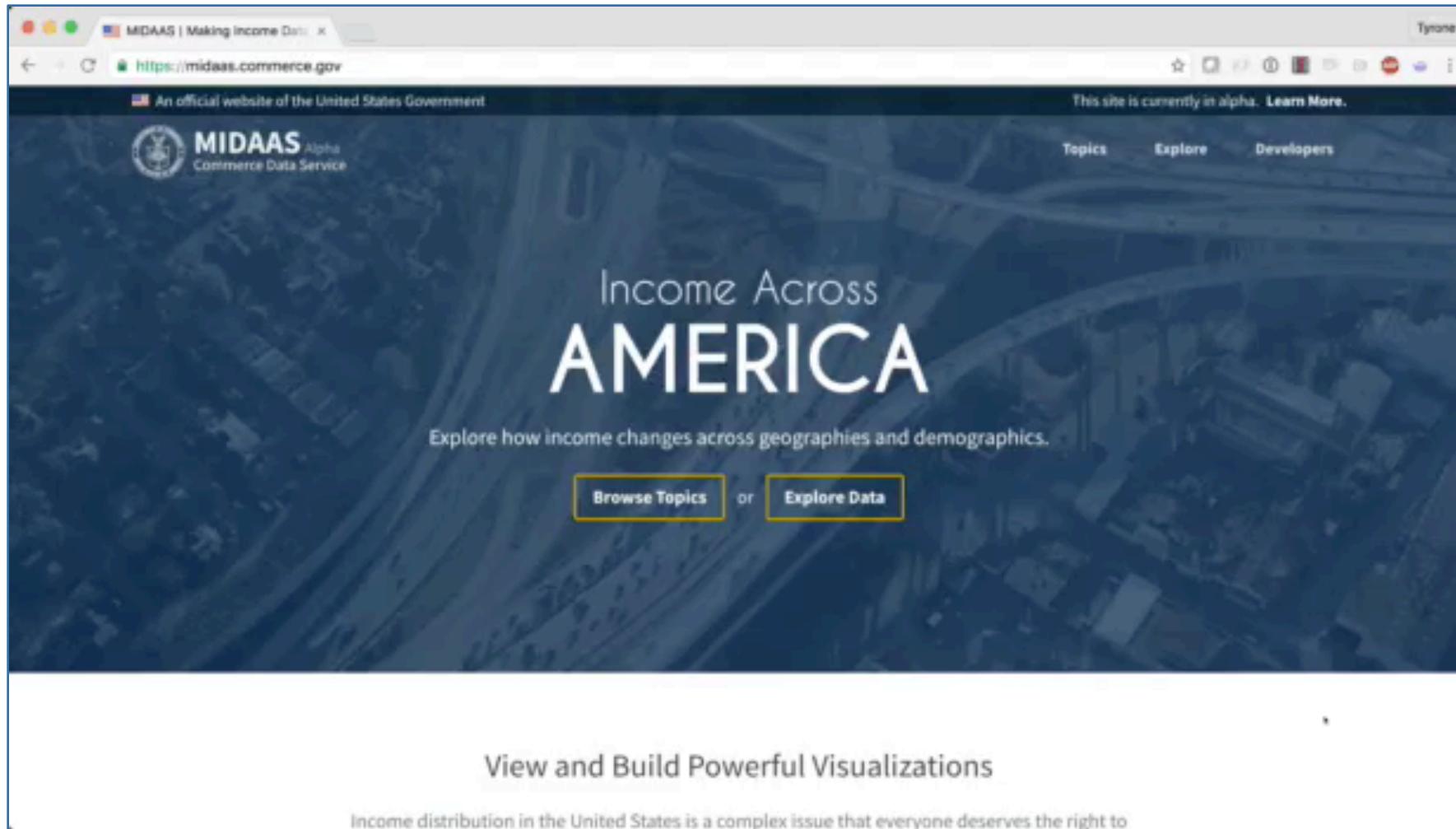
The request object you send using the POST method is just JSON.

Property	Type	Supported Values	Description
----------	------	------------------	-------------

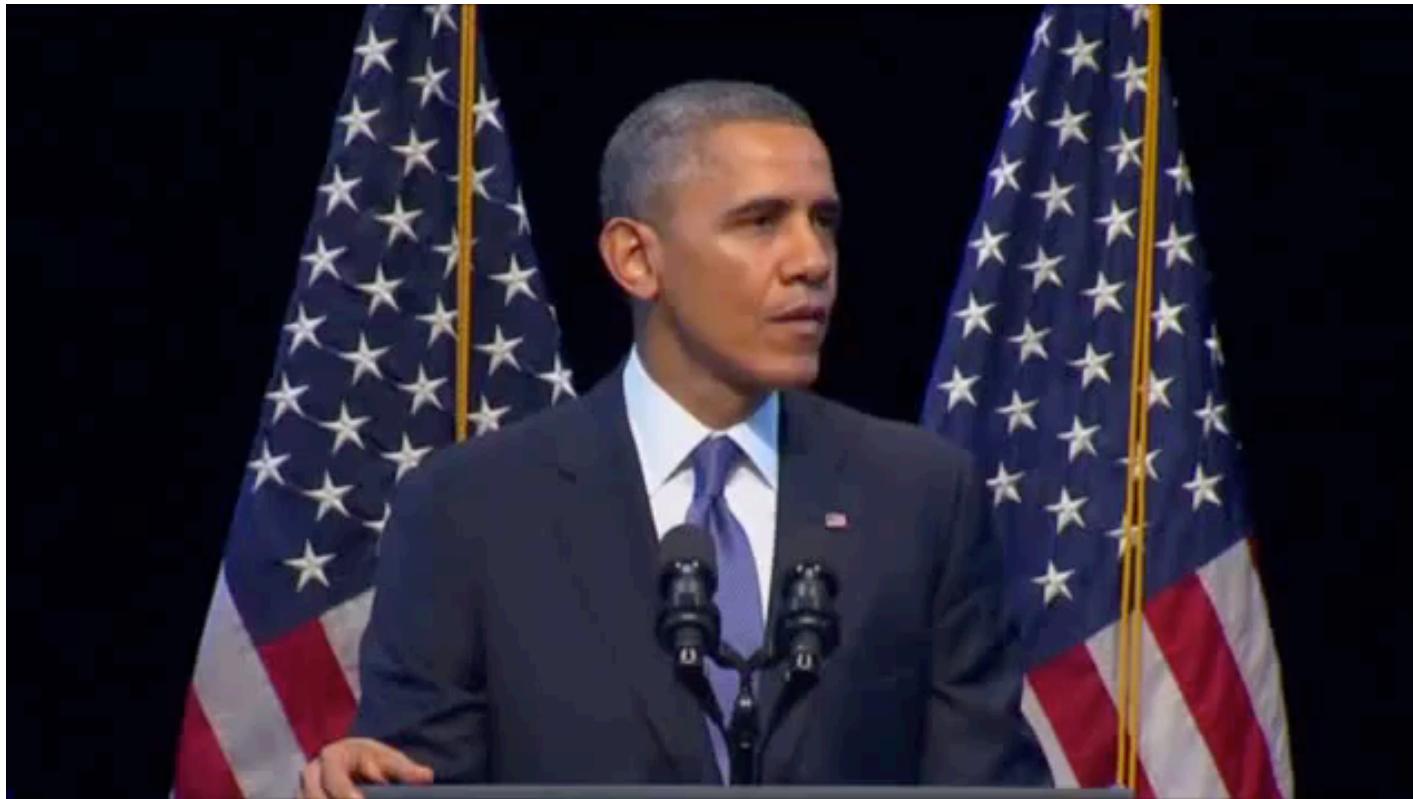
# MIDAAS

<https://midaas.commerce.gov>

<https://github.com/CommerceDataService/midaas-api>



# Building the API – Step 1



Validate The Need

# Building the API – Step 2



Kim Stevenson  
**Intel**  
Council Chair (2015-2016)



Dan Castro  
**Center for Data Innovation**  
Council Chair (2015-2016)



Brian Schimpf  
**Palantir**  
Global Director of Engineering



Steve Adler  
**IBM**  
Chief Information Strategist



Allen Blue  
**LinkedIn**  
Co-Founder + VP



Joy Bonaguro  
**City of San Francisco**  
Chief Data Officer



Katy Börner  
**Indiana University**  
Professor of Information Sciences



Danah Boyd  
**Microsoft**  
Principal Researcher + Privacy Expert



Jack Dangermond  
**ESRI**  
CEO



Christopher DiBona  
**Google**  
Director of Open Source Engineering



Bill Gail  
**Global Weather Corporation**  
CTO



Stan Humphries  
**Zillow**  
Chief Economist



Heather Joseph  
**SPARC**  
Director



Vadim Kutsyy  
**PayPal**  
Head of Data Strategy and Stewardship



Kevin Merritt  
**Socrata**  
CFO



CJ Moses  
**Amazon Web Services**  
General Manager



Jennifer Pahlka  
**Code for America**  
Founder



Colin Parris  
**General Electric**  
CVP Software Research



Karin Remington  
**Arjuna Solutions**  
CTO

## Understand Initial User Stories

# Building the API – Step 3

The screenshot shows the 'Income' topic page on the Census Bureau's website. The top navigation bar includes links for Topics (Population, Economy), Geography (Maps, Products), Library (Infographics, Publications), Data (Tools, Developers), Surveys/Programs (Respond, Survey Data), Newsroom (News, Blogs), and About Us (Our Research). A search bar is located in the top right corner.

The main content area has a heading 'Income' and a sidebar with links: 'About this Topic', 'Data', 'Guidance for Data Users', 'Library', and 'News & Updates'. Below this, there is a text block about income surveys, a 'Read More' link, and three icons: 'News and Updates' (newspaper icon), 'Visualizations' (globe icon), and 'Data Tables' (grid icon).

To the right of the sidebar is a large image of various US coins and bills. Below this, under the 'Latest' section, are four tabs: 'News' (selected), 'Publications', 'Data', and 'Working Papers'. A news item titled 'Income, Poverty and Health Insurance Coverage in the U.S.: 2015' is displayed, along with a timestamp of 'September 13, 2016'.

In the bottom right corner of the page, there is a small sidebar with a timestamp 'Sep 13, 2016 22:59 UTC (+7)', a 'United States' button, a 'World' button, a 'U.S. Population' section showing the number '324,473,463', and a 'COMPONENTS OF POPULATION CHANGE' section.

## Validate with Domain Experts

# Building the API – Step 4



## AWS Granted Authority to Operate for Department of Commerce and NOAA

June 14, 2016 | Chad Woolf | Compliance | ATOs | Authority to operate | Department of Commerce | Federal Cloud Computing Strategy | NOAA

AWS already has [a number of federal agencies](#) onboarded to the cloud, including the Department of Energy, The Department of the Interior, and NASA. Today we are pleased to announce the addition of two more ATOs (authority to operate) for the [Department of Commerce](#) (DOC) and the [National Oceanic and Atmospheric Administration](#) (NOAA). Specifically, the DOC will be utilizing AWS for their [Commerce Data Service](#), and NOAA will be leveraging the cloud for their "Big Data Project." According to NOAA, the goal of the Big Data Project is to "create a sustainable, market-driven ecosystem that lowers the cost barrier to data publication. This project will create a new economic space for growth and job creation while providing the public far greater access to the data created with its tax dollars."

## Understand Technical Constraints

# Building the API – Step 5

**[GET] /quantiles?[year=?][state=?][race=?][sex=?][ageg** [GET] /income/distribution?[year=?][state=?][race=?][sex=?][agegroup=?][compare=?]  
returns the income amounts for each quantile

```
curl 'https://api.commerce.gov/midaas/quantiles?state=CA'
{
  overall: {
    5%: 400,
    10%: 4000,
    20%: 10000,
    30%: 16000,
    40%: 23000,
    50%: 30000,
    60%: 40000,
    70%: 52000,
    80%: 71000,
    90%: 100000,
    95%: 143200,
    99%: 455000
  }
}
```

```
curl 'https://api.commerce.gov/midaas/distribution?state=CA&race=white&agegroup=25-34&sex=male&api_key=
{your_api_key}'
{
  '$20.00k-$30.00k': 0.1261146303655346,
  '$120.00k-$130.00k': 0.018000879457209275,
  '$450.00k-$460.00k': 0.005737466859976182,
  '$160.00k-$170.00k': 0.004153510772184425,
  '$180.00k-$190.00k': 0.002701356626896694,
  '$110.00k-$120.00k': 0.013195357305735017,
  '$220.00k-$230.00k': 0.0006076886021645845,
  '$130.00k-$140.00k': 0.011160008724588761,
  '$370.00k-$380.00k': 0.0001702927752706897,
  '$240.00k-$250.00k': 0.0004910497149928792,
  '$380.00k-$390.00k': 0.00006298499907272085,
  '$300.00k-$310.00k': 0.00014229944234948042,
  '$500.00k-$510.00k': 0.0003919066608969297,
  '$540.00k-$550.00k': 0.00009564388748079833,
  '$30.00k-$40.00k': 0.12264112430556122,
  '$10.00k-$20.00k': 0.11912912741282118,
  '$0.00-$10.00k': 0.1194382204638262,
  '$60.00k-$70.00k': 0.07218664088169667,
  '$80.00k-$90.00k': 0.041483786611488695,
  '$70.00k-$80.00k': 0.05156255285199575,
  '$50.00k-$60.00k': 0.0887400317491051,
  '$90.00k-$100.00k': 0.03705034251009218,
  '$320.00k-$330.00k': 0.0015373005329230756,
```

MVP  
beta



Redshift, Lambda, API Gateway  
Postgres, S3, EC2



# ○ THE PLAN

- The Reality

- APIs: Sweat and Toil, CitySDK, MIDAAS

- Lessons

# Summary

People  
Scope  
Constraints  
Validate  
Show The Thing

# So Far

## Sweat and Toil

- Monthly Data Users > Web Traffic
- Three tools built using this data.

## CENSUS CitySDK

- Over 10 civic solutions built using CitySDK
- Positive User Feedback

# So Far

## Sweat and Toil

- 2016 Department of Labor's Innovation Award.

## CENSUS CitySDK

- 2016 Department of Commerce Gold medal
- 2016 Best Data API Award, API:World
- 2015 FedScoop Innovation Of The Year

The background image shows the United States Capitol building, a neoclassical structure with a prominent white dome topped by a golden statue. In front of the dome is the House of Representatives wing, characterized by its long porticos supported by many columns. A large set of stone steps leads up to the entrance. The foreground is a green lawn with a red flower bed in the center. The sky is blue with some light clouds.

Thank you

[tyronewagrandison@gmail.com](mailto:tyronewagrandison@gmail.com)