

IS216

Web Application Development 2

Google Maps API

Building a CarPark Web Application

Introduction

K. J. Shim

kjshim@smu.edu.sg

Google Maps API



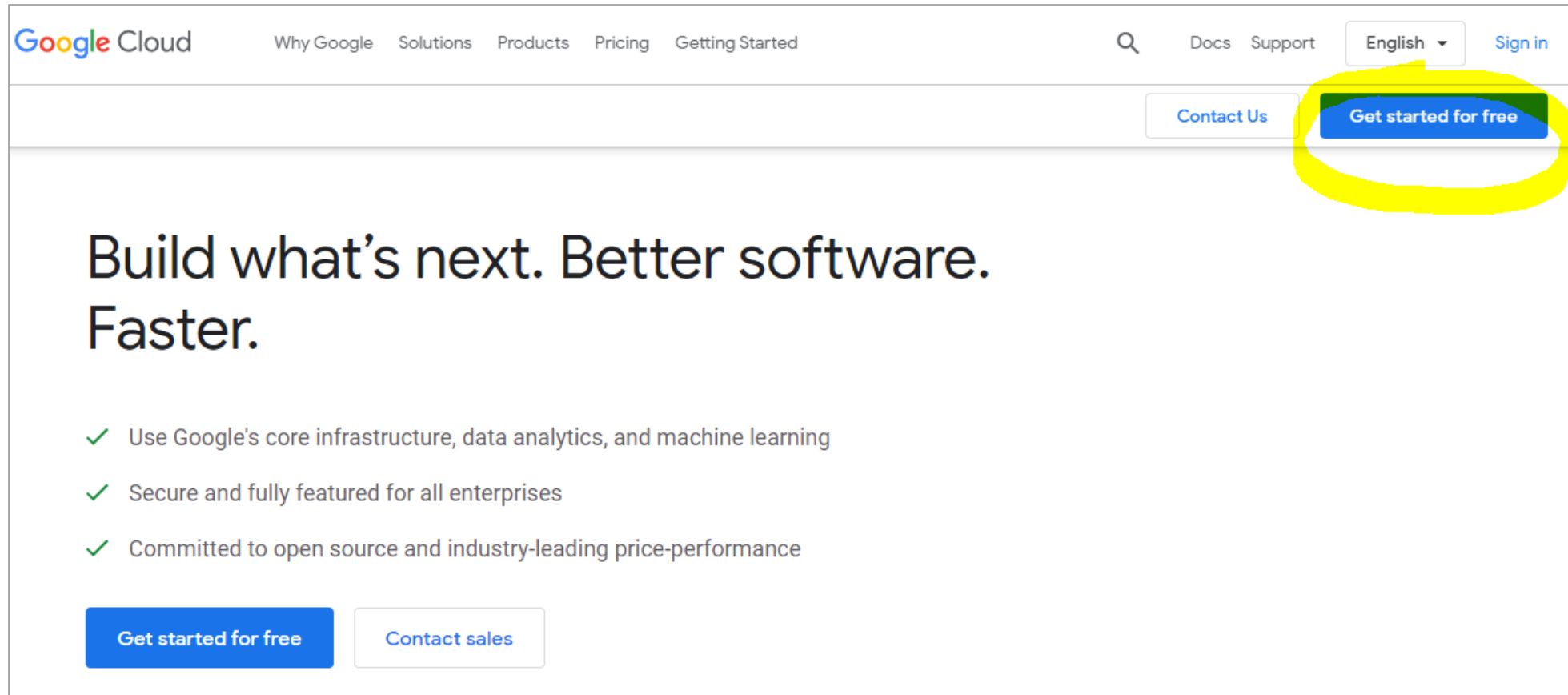
With Google Maps API, we can do...

- Implement basic features of what we can do with Google maps APIs
 - Get **direction**
 - Get **traffic information**
 - Get **distance information from Point A to Point B**
 - *And others...*

Sign up with GCP

<https://cloud.google.com/gcp>

Click **Get started for free**



The screenshot shows the Google Cloud homepage. The header includes the Google Cloud logo, navigation links (Why Google, Solutions, Products, Pricing, Getting Started), a search icon, and links for Docs, Support, English (with a dropdown arrow), and Sign in. Below the header, there are two buttons: 'Contact Us' and 'Get started for free'. The 'Get started for free' button is highlighted with a yellow circle. The main content area features the headline 'Build what's next. Better software. Faster.' followed by three bullet points with green checkmarks: 'Use Google's core infrastructure, data analytics, and machine learning', 'Secure and fully featured for all enterprises', and 'Committed to open source and industry-leading price-performance'. At the bottom, there are two buttons: 'Get started for free' and 'Contact sales'.

Google Cloud

Why Google Solutions Products Pricing Getting Started

Search Docs Support English Sign in


Contact Us Get started for free

Build what's next. Better software. Faster.


- ✓ Use Google's core infrastructure, data analytics, and machine learning
- ✓ Secure and fully featured for all enterprises
- ✓ Committed to open source and industry-leading price-performance

Get started for free Contact sales

Sign Up (Step 1)

 Try Google Cloud for free

Step 1 of 3 Account Information

 **K Shm**
kjshim.github.demo1@gmail.com

[SWITCH ACCOUNT](#)

Country

Singapore

What best describes your organization or needs?

Please select
Personal project

Terms of Service

☒ I have read and agree to the [Google Cloud Platform Terms of Service](#), [Supplemental Free Trial Terms of Service](#), and the terms of service of [any applicable services and APIs](#).

Required to continue

Email updates

☐ I would like to receive periodic emails on news, product updates and special offers from Google Cloud and Google Cloud Partners.

CONTINUE

Access to all Cloud Platform Products

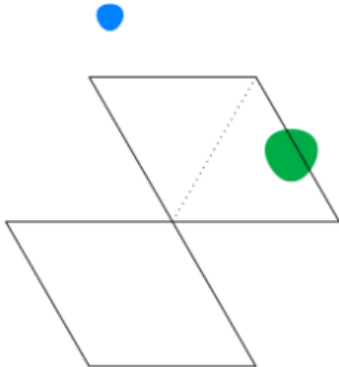
Get everything you need to build and run your apps, websites and services, including Firebase and the Google Maps API.

\$300 credit for free


Put Google Cloud to work with \$300 in credit to spend over the next 90 days.

No autocharge after free trial ends

We ask you for your credit card to make sure you are not a robot. You won't be charged unless you manually upgrade to a paid account.



Sign Up (Step 2)

 Try Google Cloud for free

Step 2 of 3 Identity Verification and Contact Information


We'll send a text message with a 6-digit code to verify your identity and confirm where we can reach you about solutions to support your Cloud experience. Standard rates apply.



+65

 Enter a phone number.

 [SEND CODE](#)

 Try Google Cloud for free

Step 2 of 3 Identity Verification and Contact Information

Enter the 6-digit code.



G-


 [VERIFY](#)

[GO BACK](#)

Sign Up (Step 3)

Step 3 of 3 Payment Information Verification

Your payment information helps us reduce fraud and abuse. You won't be charged unless you turn on automatic billing.


Account type 

Individual

Only Business accounts can have multiple users. You cannot change the account type after signing up. In some countries, this selection affects your tax options. [Learn more](#)

Payment method

 Add credit or debit card 

Visa 

Address line 1

Address line 2

Postal code

You'll be charged automatically on the 1st of each month. If your balance reaches your payment threshold before then, you'll be charged immediately. [Learn more](#)

Tax information  

Tax status: Individual

To make sure taxes for this service are processed correctly, follow the instructions in the email you'll receive from Google after you finish signup.


The personal information you provide here will be added to your payments profile. It will be stored securely and treated in accordance with the [Google Privacy Policy](#).





 Google Cloud Platform


Welcome K!

Your free trial includes \$300 in credit to spend over the next 90 days. To help us serve you better, please answer 4 questions.

☒ What best describes your organization or needs? 

☒ What brought you to Google Cloud? 

☒ What are you interested in doing with Google Cloud? 

☐ 4 What best describes your role? 

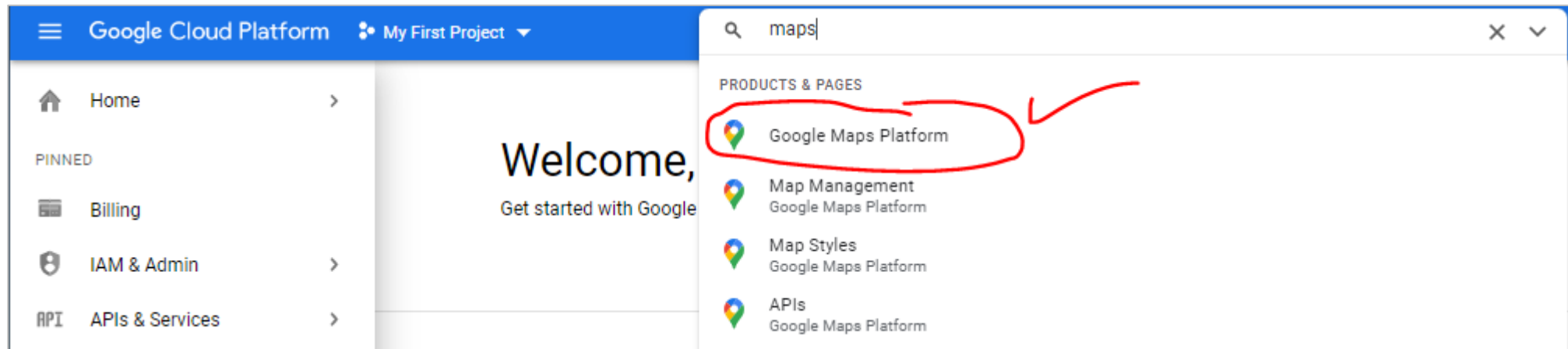
Please select *

Engineer / Developer 

CLOSE



Go to “Google Maps Platform”



Select “Maps Static API”

The screenshot displays the Google Cloud Platform console interface for the Google Maps Platform. The top navigation bar includes the Google Cloud Platform logo, the project name 'My First Project', and a search bar containing the text 'maps'. The left sidebar lists various navigation options: Overview, APIs, Metrics, Quotas, Credentials, Support, Locator Plus Solution, Autocomplete Solution, Map Management, and Map Styles (marked as 'NEW'). The main content area is titled 'Maps APIs and Services' and provides a list of available APIs and services. The 'Maps Static API' is highlighted with a yellow circle and a red checkmark.

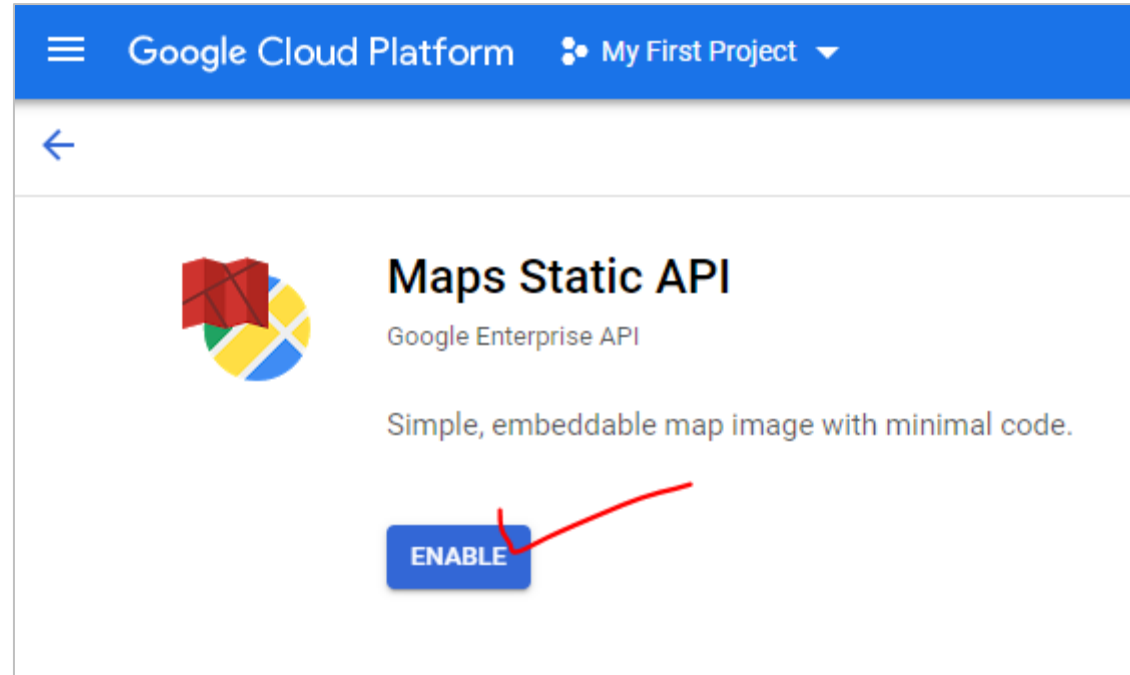
Google Cloud Platform **My First Project** **maps**

Google Maps Platform **Maps APIs and Services**

To get started with Google Maps Platform browse and enable APIs and services listed below that best suit your needs.

 Geolocation API Google Enterprise API ? Location data from cell towers and WiFi nodes.	 Maps SDK for Android Google Maps for your native Android app.	 Roads API Google Enterprise API ? Snap-to-road functionality to accurately trace GPS breadcrumbs.	 Places API Google Enterprise API ? Get detailed information about 100 million places
 Maps JavaScript API Google Maps for your website	 Maps Embed API Google Enterprise API ? Make places easily discoverable with interactive Google Maps.	 Time Zone API Google Enterprise API ? Time zone data for anywhere in the world.	 Distance Matrix API Google Enterprise API ? Travel time and distance for multiple destinations.
 Maps SDK for iOS Google Maps for your native iOS app.	 Maps Elevation API Google Enterprise API ? Elevation data for any point in the world.	 Directions API Google Enterprise API ? Directions between multiple locations.	 Maps Static API Google Enterprise API ? Simple, embeddable map image with minimal code.
 Geocoding API Google Enterprise API ? Convert between addresses and geographic coordinates.	 Street View Static API Google Enterprise API ? Real-world imagery and panoramas.		

Enable “Maps Static API”



Enable “Maps Static API”

The screenshot shows the Google Maps Platform console. The left sidebar contains navigation links: Overview, APIs (selected), Metrics, Quotas, Credentials, Support, Locator Plus Solution, Autocomplete Solution, Map Management, and Map Styles (marked as NEW). The main content area is titled 'APIs' and is divided into two sections: 'Enabled APIs' and 'Additional APIs'. The 'Enabled APIs' section has a sub-header 'Select an API to view details. Figures are for the last 30 days.' and a table with one row: 'Maps Static API'. The 'Additional APIs' section has a sub-header 'Select an API to view details in Marketplace' and a list of APIs: 'Maps SDK for Android', 'Directions API', 'Distance Matrix API', 'Maps Elevation API', 'Maps Embed API', 'Geocoding API', 'Geolocation API', 'Maps JavaScript API', 'Roads API', 'Maps SDK for iOS', 'Time Zone API', 'Places API', and 'Street View Static API'. The 'Directions API', 'Geocoding API', 'Geolocation API', 'Maps JavaScript API', and 'Places API' are highlighted in yellow.

API
Maps Static API

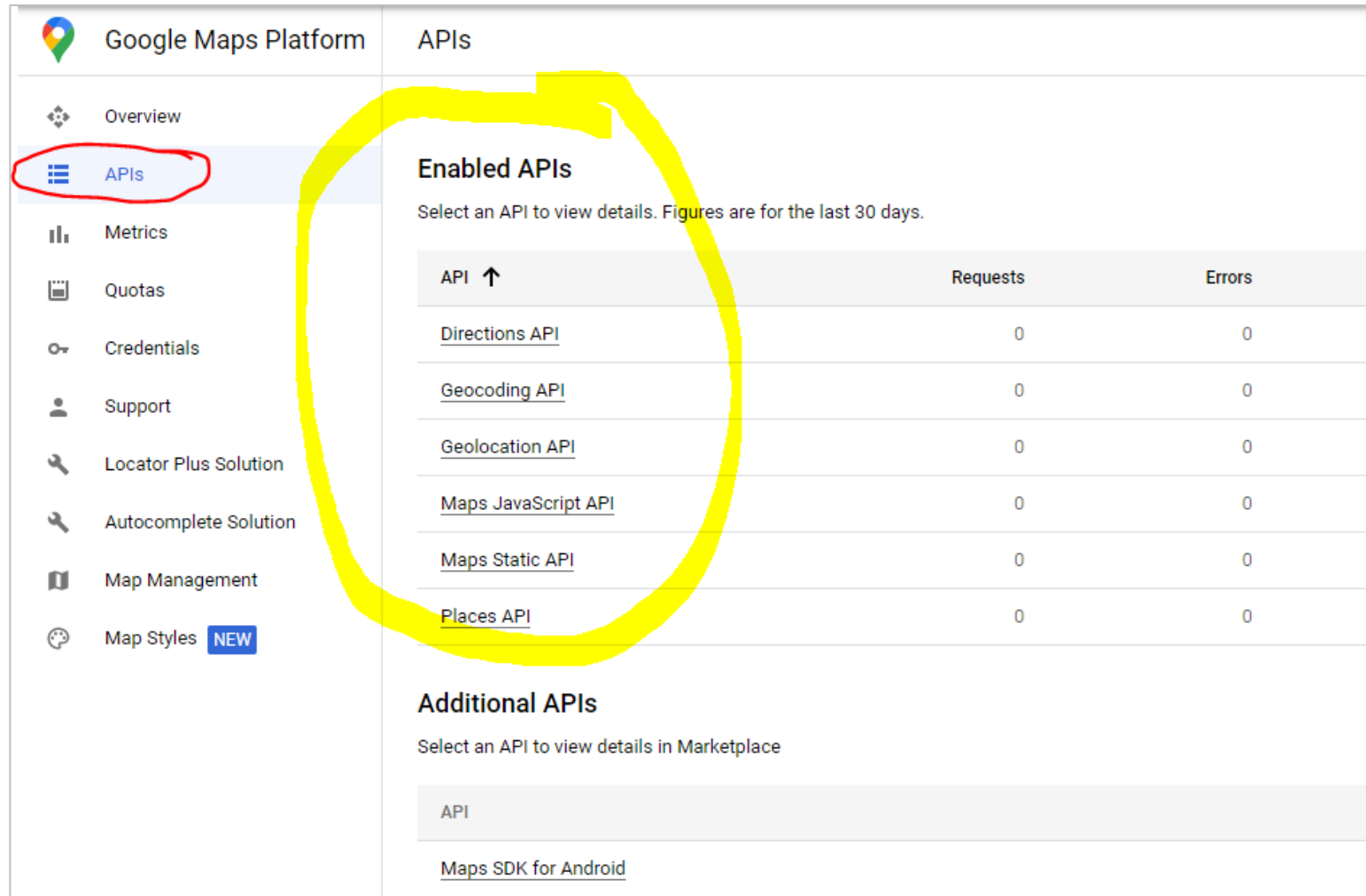
API
Maps SDK for Android
Directions API
Distance Matrix API
Maps Elevation API
Maps Embed API
Geocoding API
Geolocation API
Maps JavaScript API
Roads API
Maps SDK for iOS
Time Zone API
Places API
Street View Static API

This API access is **enabled**.

Click on each **highlighted** API and **enable** access

Finding Enabled APIs

Menu (on the left) → APIs



The screenshot shows the Google Maps Platform console interface. On the left sidebar, the 'APIs' menu item is highlighted with a red circle. A yellow circle is drawn around the 'Enabled APIs' section in the main content area, which includes a table of enabled APIs and their usage statistics.

Google Maps Platform

APIs

Enabled APIs

Select an API to view details. Figures are for the last 30 days.


API ↑	Requests	Errors
Directions API	0	0
Geocoding API	0	0
Geolocation API	0	0
Maps JavaScript API	0	0
Maps Static API	0	0
Places API	0	0

Additional APIs

Select an API to view details in Marketplace

API
Maps SDK for Android

Getting API Key (Step 1)

 Google Maps Platform

Overview

APIs

Metrics

Quotas

Credentials

Support

Locator Plus Solution

Autocomplete Solution

Map Management

Map Styles NEW

Credentials

All Google Maps Platform APIs ▾ + CREATE CREDENTIALS

To view all credentials visit [Credentials in APIs & Services](#)

⚠ Remember to configure the OAuth consent screen with information about your application.

CONFIGURE CONSENT SCREEN

API Keys

Name	Creation date	Restrictions ▾	Key	Actions
No API keys to display				

OAuth 2.0 Client IDs

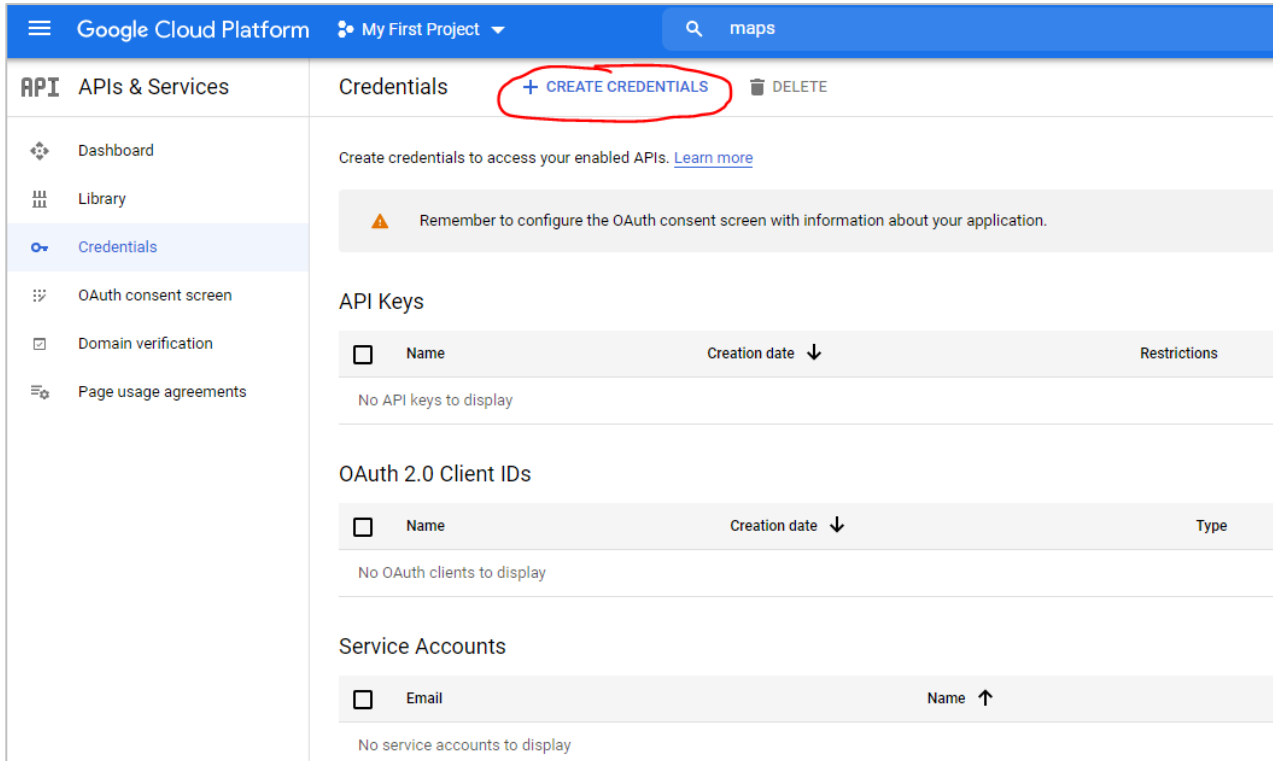
Name	Creation date ▾	Type	Client ID	Actions
No OAuth clients to display				

Service Accounts

[Manage service accounts](#)

Email	Name	Usage with this service (last 30 days) ? ▾	Usage with all services (last 30 days) ?	Actions
No service accounts to display				

Getting API Key (Step 2)



This screenshot shows the Google Cloud Platform 'Credentials' page for a project named 'My First Project'. The left sidebar contains a navigation menu with 'APIs & Services' selected. The main content area has a 'Credentials' header with a red circle around the '+ CREATE CREDENTIALS' button. Below this, there is a warning message about OAuth consent screens. The page is divided into three sections: 'API Keys' (currently empty), 'OAuth 2.0 Client IDs' (currently empty), and 'Service Accounts' (currently empty). Each section has a table header with columns for Name, Creation date, and Restrictions/Type.

Google Cloud Platform My First Project maps

APIs & Services Credentials + CREATE CREDENTIALS DELETE

Create credentials to access your enabled APIs. [Learn more](#)

Remember to configure the OAuth consent screen with information about your application.

API Keys

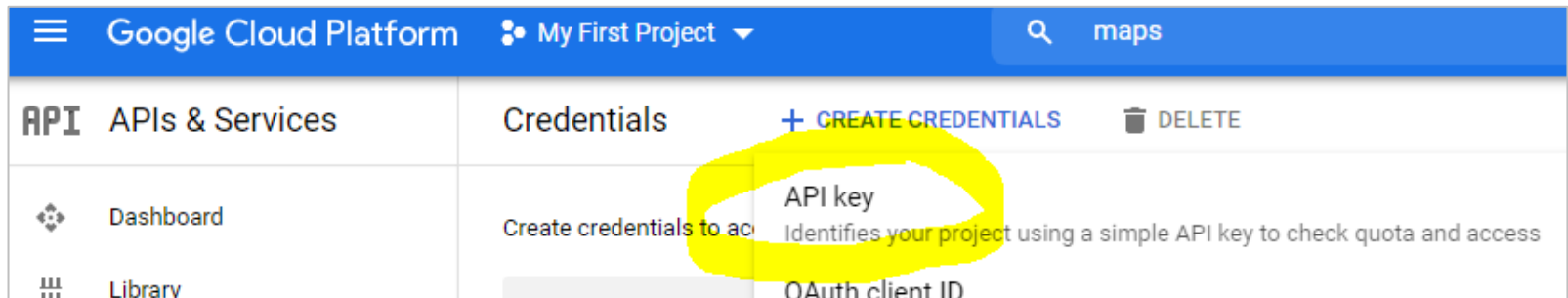
<input type="checkbox"/>	Name	Creation date ↓	Restrictions
No API keys to display			

OAuth 2.0 Client IDs

<input type="checkbox"/>	Name	Creation date ↓	Type
No OAuth clients to display			

Service Accounts

<input type="checkbox"/>	Email	Name ↑
No service accounts to display		



This is a close-up view of the Google Cloud Platform 'Credentials' page. It highlights the '+ CREATE CREDENTIALS' button and the 'API key' option, which is circled in yellow. The description for the API key states: 'Identifies your project using a simple API key to check quota and access'.

Google Cloud Platform My First Project maps

APIs & Services Credentials + CREATE CREDENTIALS DELETE

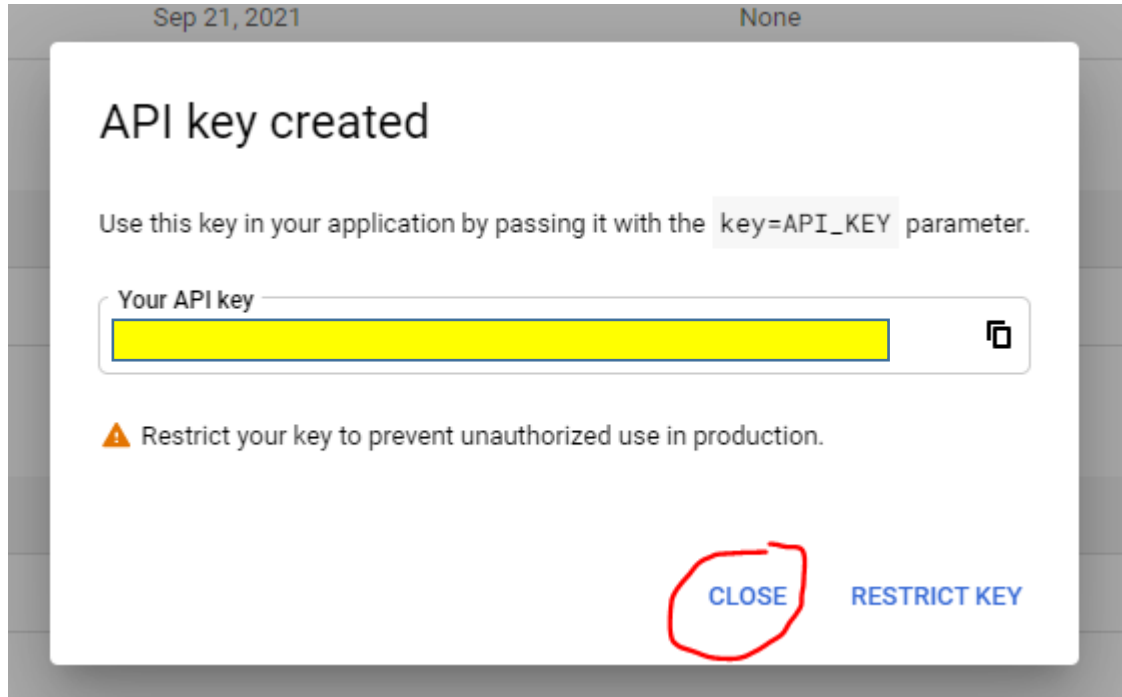
Create credentials to access your enabled APIs. [Learn more](#)

Remember to configure the OAuth consent screen with information about your application.

API key
Identifies your project using a simple API key to check quota and access

OAuth client ID

Getting API Key (Step 3)



IMPORTANT

Your new GCP account comes with **\$300 USD Free Credits** available for the first **90 days** only.

Your **API Key** is tied to your **billing credit card** – which will be **billed *beyond* \$300**.

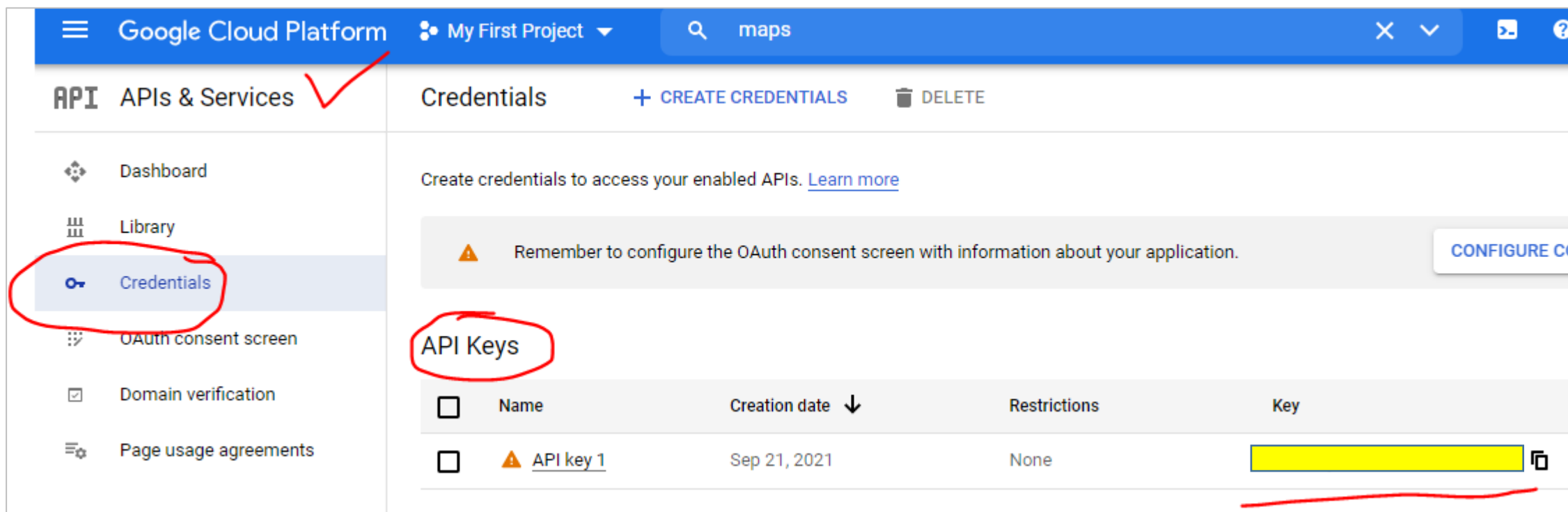
Please **DO NOT SHARE** your API Key with others – as you may exhaust \$300 USD Free Credits fast.

Keep it safe – don't push to public GitHub repos by mistake!!!

Please **track usage** actively – especially if you choose to share your **API Key** with IS216 group members.

Finding API Key(s)

Menu (on the left) → Credentials



The screenshot shows the Google Cloud Platform console interface. The top navigation bar includes the Google Cloud Platform logo, the project name 'My First Project', and a search bar containing 'maps'. The left sidebar contains a menu with items: 'APIs & Services' (checked with a red checkmark), 'Dashboard', 'Library', 'Credentials' (circled in red), 'OAuth consent screen', 'Domain verification', and 'Page usage agreements'. The main content area is titled 'Credentials' and includes a '+ CREATE CREDENTIALS' button and a 'DELETE' button. Below this, there is a message: 'Create credentials to access your enabled APIs. [Learn more](#)'. A warning banner states: 'Remember to configure the OAuth consent screen with information about your application.' with a 'CONFIGURE C...' button. The 'API Keys' section (circled in red) displays a table with the following data:






<input type="checkbox"/>	Name	Creation date ↓	Restrictions	Key
<input type="checkbox"/>	API key 1	Sep 21, 2021	None	[Redacted Key]

The key value in the first row is highlighted in yellow and has a red underline.

Secure your new API key (Step 1)

Go to Google Maps Platform <https://console.cloud.google.com/google/maps-apis>

Click **SECURE CREDENTIALS**

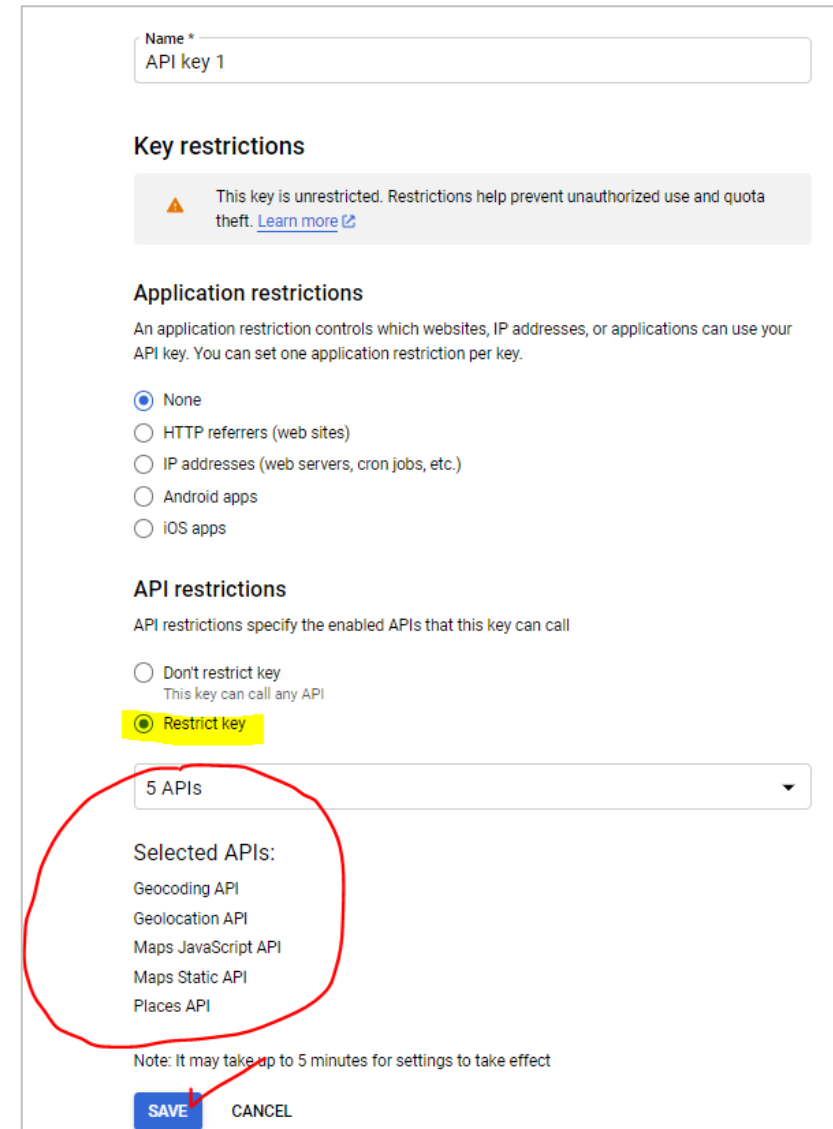
 Google Maps Platform	Overview All Google Maps Platform APIs ▼
 Overview	<div> You should secure your new API key</div> <div>SECURE CREDENTIALS</div>
 APIs	
 Metrics	

Secure your new API key (Step 2)

Under **API restrictions**, select **Restrict key**

Select the 5 **APIs** which you just enabled access for earlier


Click **Save**



Name *

API key 1

Key restrictions

 This key is unrestricted. Restrictions help prevent unauthorized use and quota theft. [Learn more](#)

Application restrictions

An application restriction controls which websites, IP addresses, or applications can use your API key. You can set one application restriction per key.

☒ None

☐ HTTP referrers (web sites)

☐ IP addresses (web servers, cron jobs, etc.)

☐ Android apps

☐ iOS apps

API restrictions

API restrictions specify the enabled APIs that this key can call

☐ Don't restrict key
This key can call any API

☒ Restrict key

5 APIs

Selected APIs:

- Geocoding API
- Geolocation API
- Maps JavaScript API
- Maps Static API
- Places API

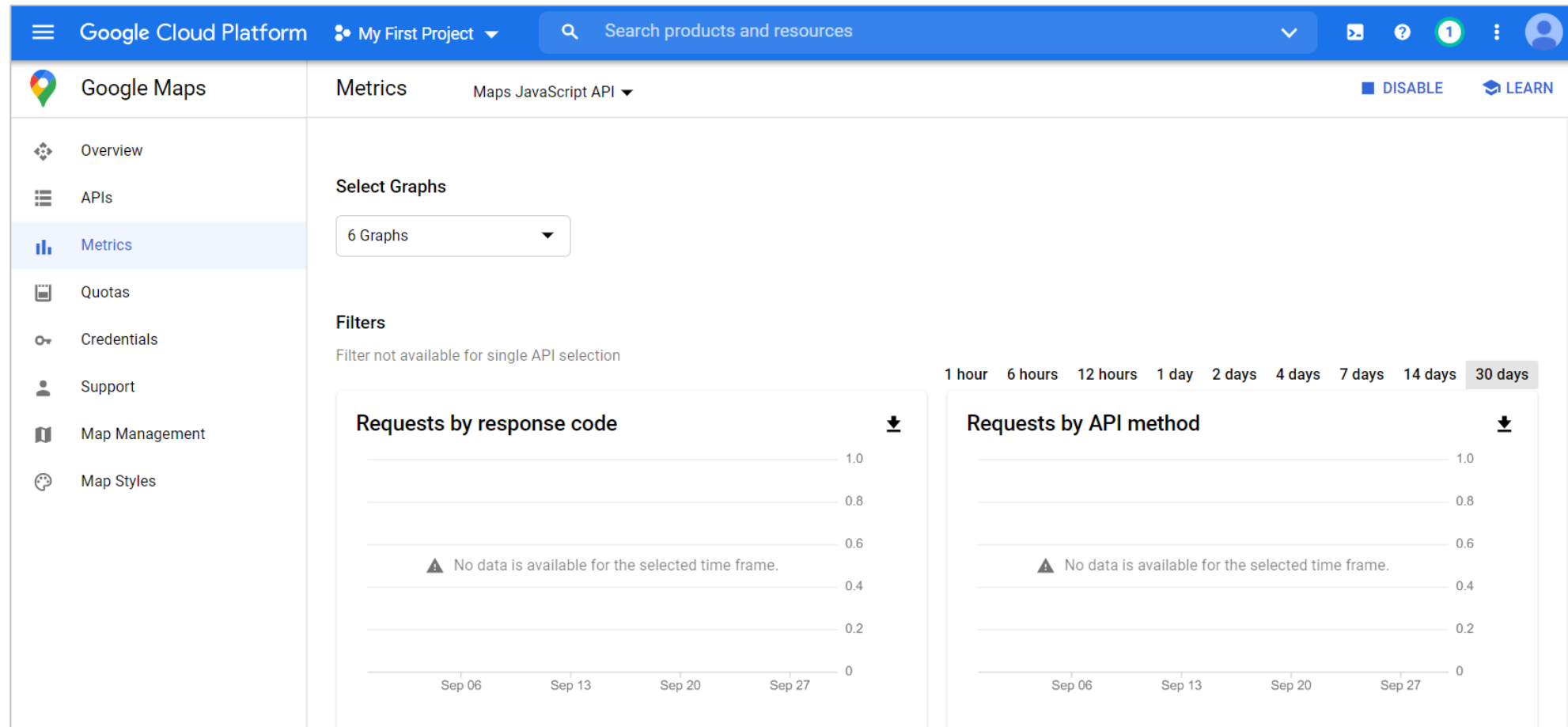
Note: It may take up to 5 minutes for settings to take effect

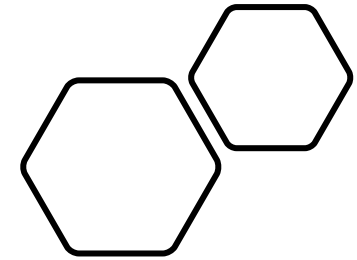
SAVE **CANCEL**

Tracking API Key Usage

Go to Google Maps Platform <https://console.cloud.google.com/google/maps-apis>

(Left menu) Click **Metrics** and you can see the usage



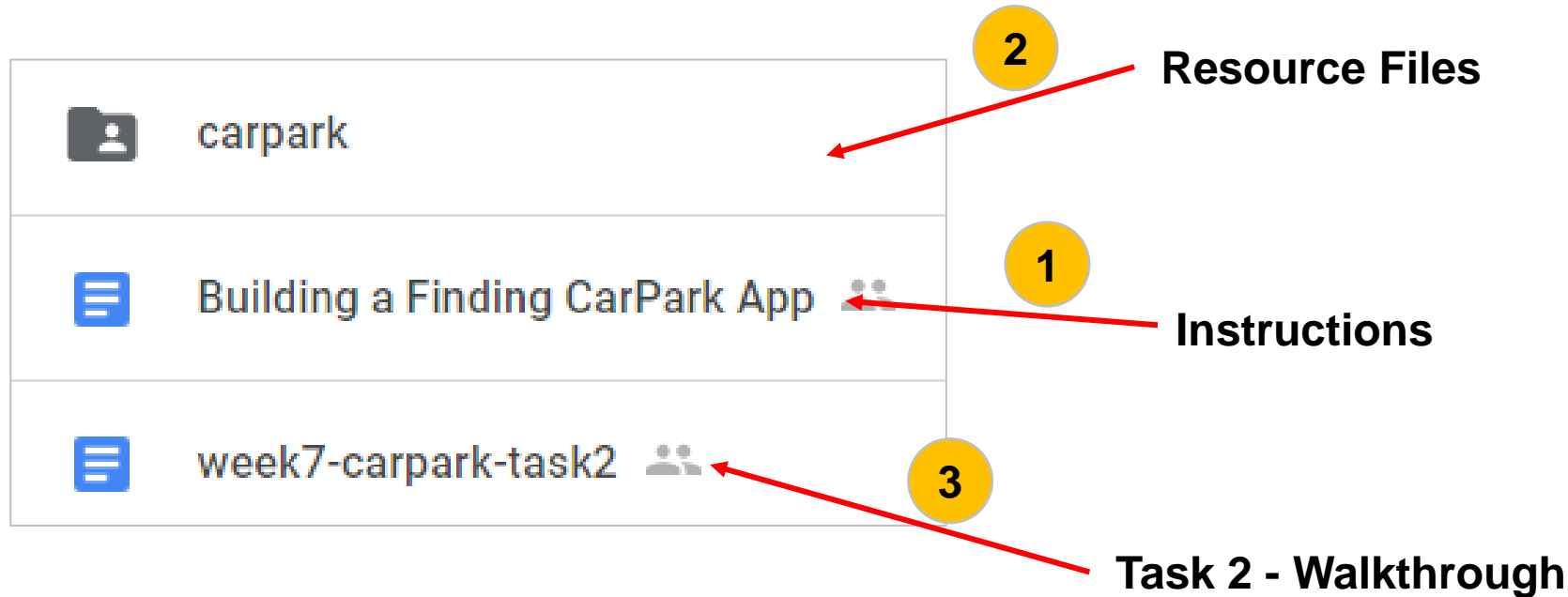


CarPark Web App

*Using
Google Maps API*

CarPark App – Instructions & Resource Files

Go to: <https://smu.sg/is216-session7-maps>

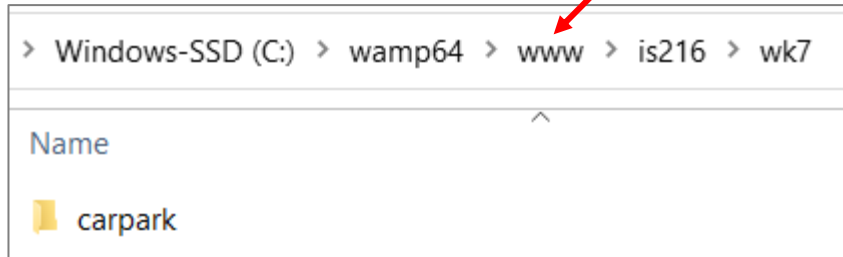


Setting Up Development Environment

On your local machine (e.g. laptop):

1. Download & unzip **carpark** in **<webroot>/is216/wk7/**

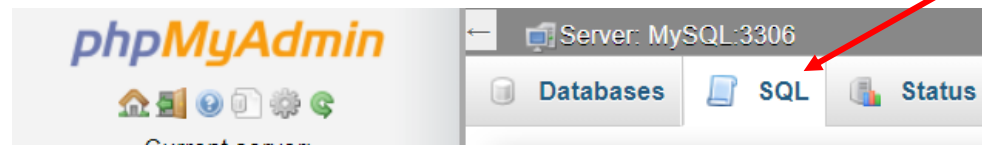
WAMP “webroot”



2. Start **WAMP** (or **MAMP**)
3. In **Google Chrome web browser**, go to: <http://localhost/is216/wk7/carpark/app.html>

Import Carpark Database

1. In **Google Chrome web browser**, go to <http://localhost/phpmyadmin/>
 - WAMP
 - Username: **root**
 - Password: <empty>
 - MAMP
 - Username: **root**
 - Password: **root**
2. In **Visual Studio Code**, open **carpark** folder (e.g. C:\wamp64\www\is216\wk7\carpark)
3. Go to **carpark** → **REST** → **model** (folder)
4. Open **carpark_full.sql**
 - Import the entire content into PHPMyAdmin
 - Go to **Google Chrome web browser** → **PHPMyAdmin** (Step 1)
 - Go to **SQL** tab
 - Paste and run SQL statements



Verify Carpark Database

Click **carpark** table
(inside carpark schema)

The screenshot shows the phpMyAdmin interface. On the left, the database structure tree is visible, with the 'carpark' table selected under the 'carpark' schema. A red arrow points from the text 'Click carpark table (inside carpark schema)' to this selection. The main panel displays the 'Structure' tab for the 'carpark' table. It shows a green status bar indicating 'Showing rows 0 - 24 (2139 total, Query took 0.0003 seconds.)'. Below this, the SQL query 'SELECT * FROM `carpark`' is shown. The table structure is defined with two columns: 'cpID' and 'postcode'. The data is displayed in a table with 25 rows, showing 'cpID' values ranging from A1 to A24 and corresponding 'postcode' values.

cpID	postcode
A1	560215
A10	
A100	560650
A11	
A12	
A13	
A15	568226
A2	
A20	
A21	
A23	561347
A24	560340

Configure ConnectionManager.php

1. Go to **carpark** → **REST** → **model** (folder)
2. Open **ConnectionManager.php**
 - Change \$username, \$password, \$port (*if necessary*)
3. Go to **carpark** and open **app.html**
4. Look for **googleAPIKey** variable and assign **your own Google Maps API key** as a String value.

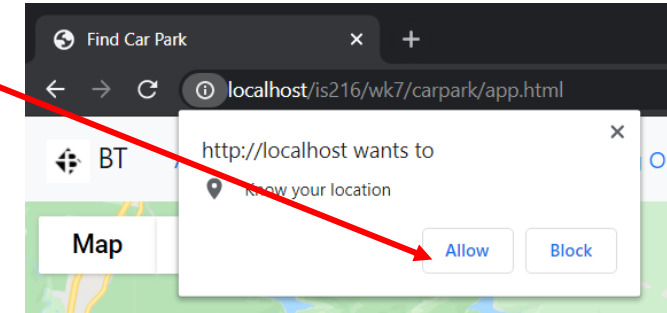
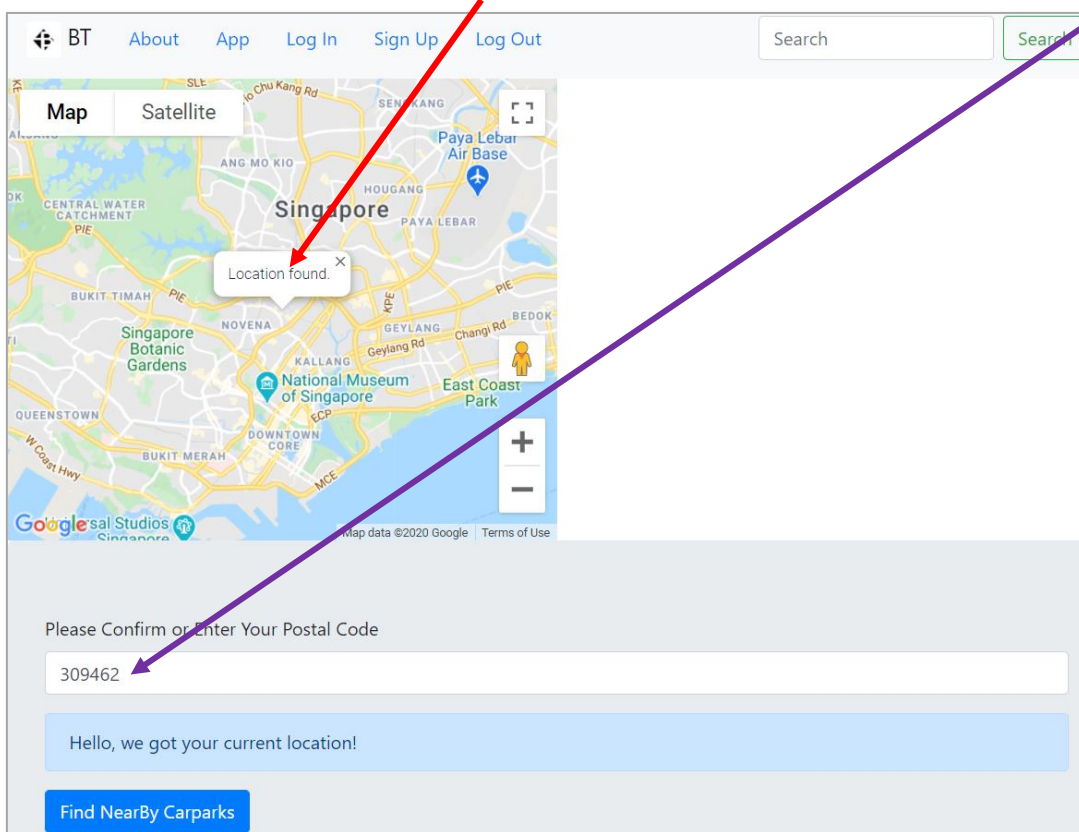
```
<script>  
    // APIs that we are going to use  
    var googleAPIKey = ""; // Change to your own
```

5. Scroll to the bottom of **app.html** and look for the below segment and replace the yellow portion with **your own Google Maps API key**

```
<!-- load the map asynchronously, i.e., load data soon as it becomes available -->  
<script async defer  
    src="https://maps.googleapis.com/maps/api/js?key=[REDACTED]&callback=initMap">  
</script>
```

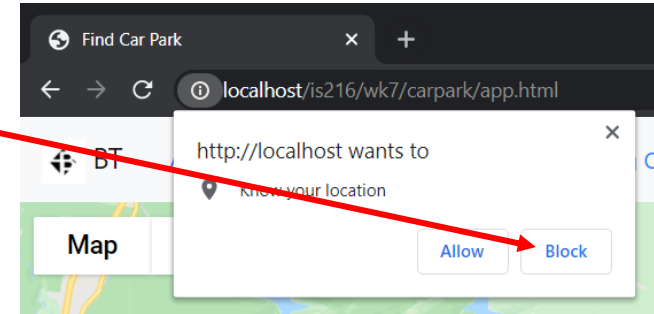
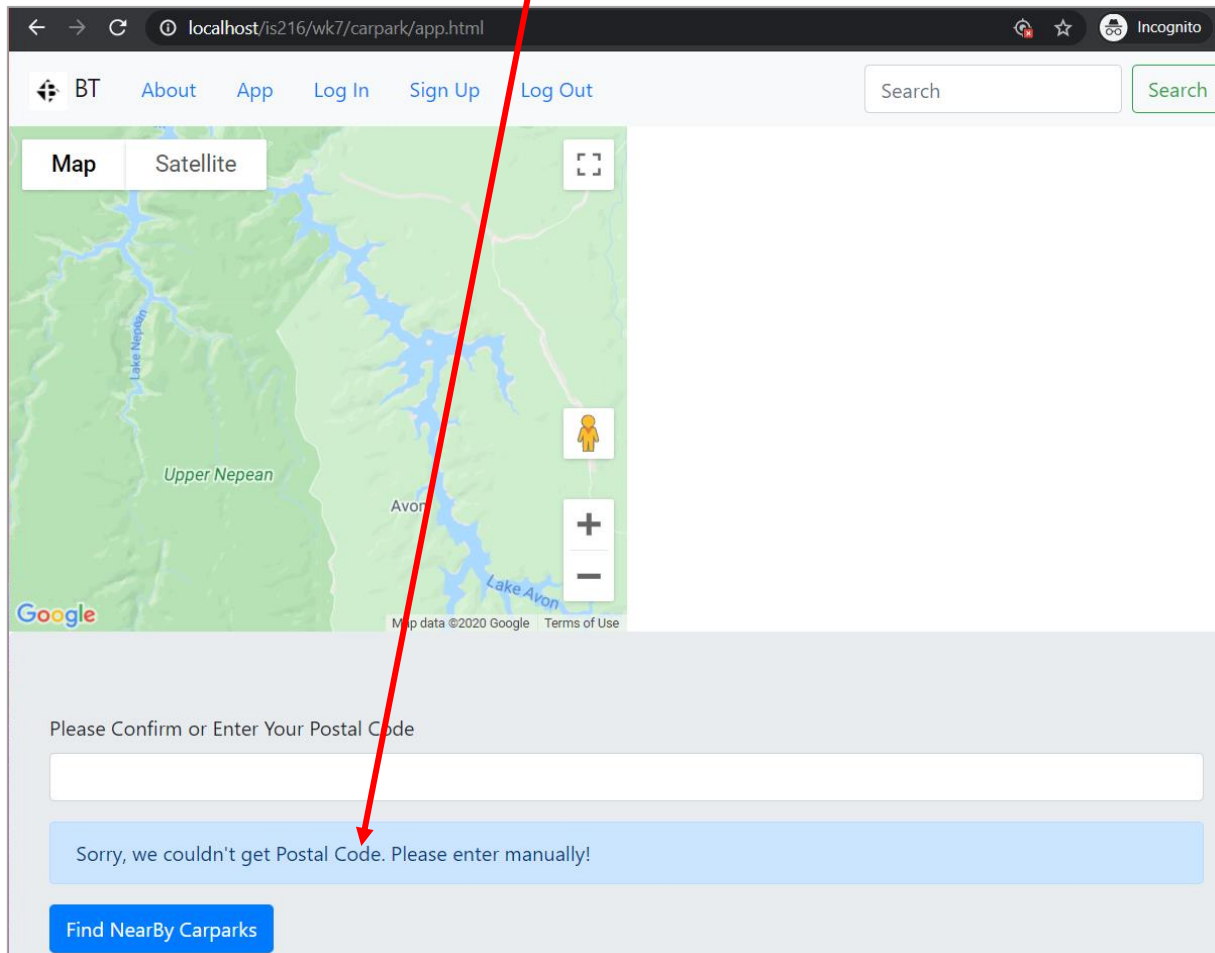
CarPark Web Application

1. In **Google Chrome** web browser, go to <http://localhost/is216/wk7/carpark/app.html>
2. When prompted for “**Know your location**”, press **Allow**
3. You will see **Location found** popup and **Postal Code**



CarPark Web Application

1. What happens if you press **Block**?
2. You will see **this message** at the bottom



CarPark Web Application

1. Enter **Postal Code 178902**

Please Confirm or Enter Your Postal Code

2. Press **Find NearBy Carparks**

3. At the **bottom of the webpage**, you should see a **dropdown menu** with **nearby carpark names**

Nearby Car Parks:

BLK 270/271 ALBERT CENTRE BASEMENT CAR PARK

BLK 2A DOVER ROAD

BLK 26 AND 27 DOVER CRESCENT

BLK 28 DOVER CRESCENT

BLK 19A DOVER CRESCENT

12 TO 14 DOVER CLOSE EAST

BLK 12A DOVER CLOSE EAST

BLK 20/22/23 DOVER CRESCENT

BLK 1001/1010 BUKIT MERAH LANE 1/3

BLK 56/57 LENGKOK BAHRU

BLK 55 LENGKOK BAHRU

BLK 44/47 LENGKOK BAHRU

BLK 34-36 JALAN RUMAH TINGGI

BLK 88/89 REDHILL CLOSE

BLK 28 HOY FATT ROAD

BLK 89/90 REDHILL CLOSE


BLK 17 REDHILL CLOSE

BLK 13 REDHILL CLOSE

BLK 1/3/5 JALAN BUKIT MERAH

BLK 115/116 BUKIT MERAH CENTRAL

BLK 270/271 ALBERT CENTRE BASEMENT CAR PARK



Map data ©2020 Google

anually!

CarPark Web Application

1. Select any **carpark** option and scroll down

2. You should see **carpark availability**

Nearby Car Parks:

BLK 17 REDHILL CLOSE [Get Direction](#)

CarPark ID	CarPark Address	Total Lots	Lot Type	Available Lots
BM21	BLK 17 REDHILL CLOSE	Not available	Not available	Not available

Carpark Availability Information

3. Select another **carpark** option. The **carpark availability** information section should auto-update to display this carpark's info.

Nearby Car Parks:

BLK 34-36 JALAN RUMAH TINGGI [Get Direction](#)

CarPark ID	CarPark Address	Total Lots	Lot Type	Available Lots
BM21	BLK 17 REDHILL CLOSE	Not available	Not available	Not available
BM25	BLK 13 REDHILL CLOSE	Not available	Not available	Not available
AR9	BLK 20/22/23 DOVER CRESCENT	64	C	4
BM14	BLK 34-36 JALAN RUMAH TINGGI	94	C	23

Carpark Availability Information

CarPark Web Application

1. Select any **carpark** option and press **Get Direction**
2. Scroll up and you should be able to see **directions** from **your location** to the selected **carpark**

Nearby Car Parks:

BLK 34-36 JALAN RUMAH TINGGI

Get Direction

The screenshot displays the CarPark Web Application interface. At the top, there is a navigation bar with links: BT, About, App, Log In, Sign Up, and Log Out. A search bar is located on the right side of the navigation bar. Below the navigation bar, the main content area is divided into two sections. The left section shows a map of Singapore with a blue line indicating a route from a starting point (marked with a red pin 'A') to a destination (marked with a red pin 'B'). The right section displays the directions for the selected route. The starting point is 'Singapore 178902' and the destination is '36 Jln Rumah Tinggi, BLK 34, Singapore 150036'. The total distance is 6.5 km, and the estimated time is about 15 minutes. The directions are listed as follows:

1. Head southeast on Bras Basah Rd toward Queen St 0.2 km
2. Turn right after NTUC Income Ctr/Bras Basah Rd (on the left) 0.2 km
3. Continue onto Hill St 0.5 km
4. Continue onto New Bridge Rd 0.4 km
5. Turn right onto Merchant Rd 0.1 km
6. Take the ramp on the right onto CTE 2.1 km
7. Take exit 1A for Jln Bt Merah 0.2 km
8. Slight right onto Jalan Bukit Merah 2.3 km
9. Turn right onto Hoy Fatt Rd 0.2 km
10. Turn left onto Jln Rumah Tinggi 0.2 km

Destination will be on the left

Map data ©2020 Google, Urban Redevelopment Authority

[Postman] Long/Lat → Postal Code

- **Base URL:** <https://maps.googleapis.com/maps/api/geocode/json>

- **Parameters**

Params ● Auth Headers (6) Body Pre-req. Tests Settings		
Query Params		
	KEY	VALUE
<input checked="" type="checkbox"/>	key	YOUR KEY
<input checked="" type="checkbox"/>	address	1.2967,103.8501

- **address** is a combination of:
 - **Latitude:** 1.2967
 - **Longitude:** 103.8501

[Postman] Long/Lat → Postal Code

Viewer Text

JSON

```
{
  "results": [
    {
      "address_components": [
        {
          "long_name": "70",
          "short_name": "70",
          "types": [
            "street_number"
          ]
        },
        {
          "long_name": "Stamford Road",
          "short_name": "Stamford Rd",
          "types": [
            "route"
          ]
        },
        {
          "long_name": "Museum",
          "short_name": "Museum",
          "types": [
            "neighborhood",
            "political"
          ]
        },
        {
          "long_name": "Singapore",
          "short_name": "Singapore",
          "types": [
            "locality",
            "political"
          ]
        },
        {
          "long_name": "Singapore",
          "short_name": "SG",
          "types": [
            "country",
            "political"
          ]
        },
        {
          "long_name": "178901",
          "short_name": "178901",
          "types": [
            "postal_code"
          ]
        }
      ],
      "formatted_address": "70 Stamford Rd, Singapore 178901"
    }
  ]
}
```

Postal Code

```
function getPostCode(data) {
  //console.log('in getPostCode')
  //console.log(data)
  var addrcomponents = data["results"][0]["address_components"];
  var postcode = addrcomponents.filter(postcodeHelper);
  // country is an array but there should be only one element
  console.log(postcode)
  return postcode[0]["long_name"];
}

function postcodeHelper(addr) {
  return addr["types"][0] == "postal_code" ;
}
```

[Postman] Directions API

- **Base URL:** <https://maps.googleapis.com/maps/api/directions/json>

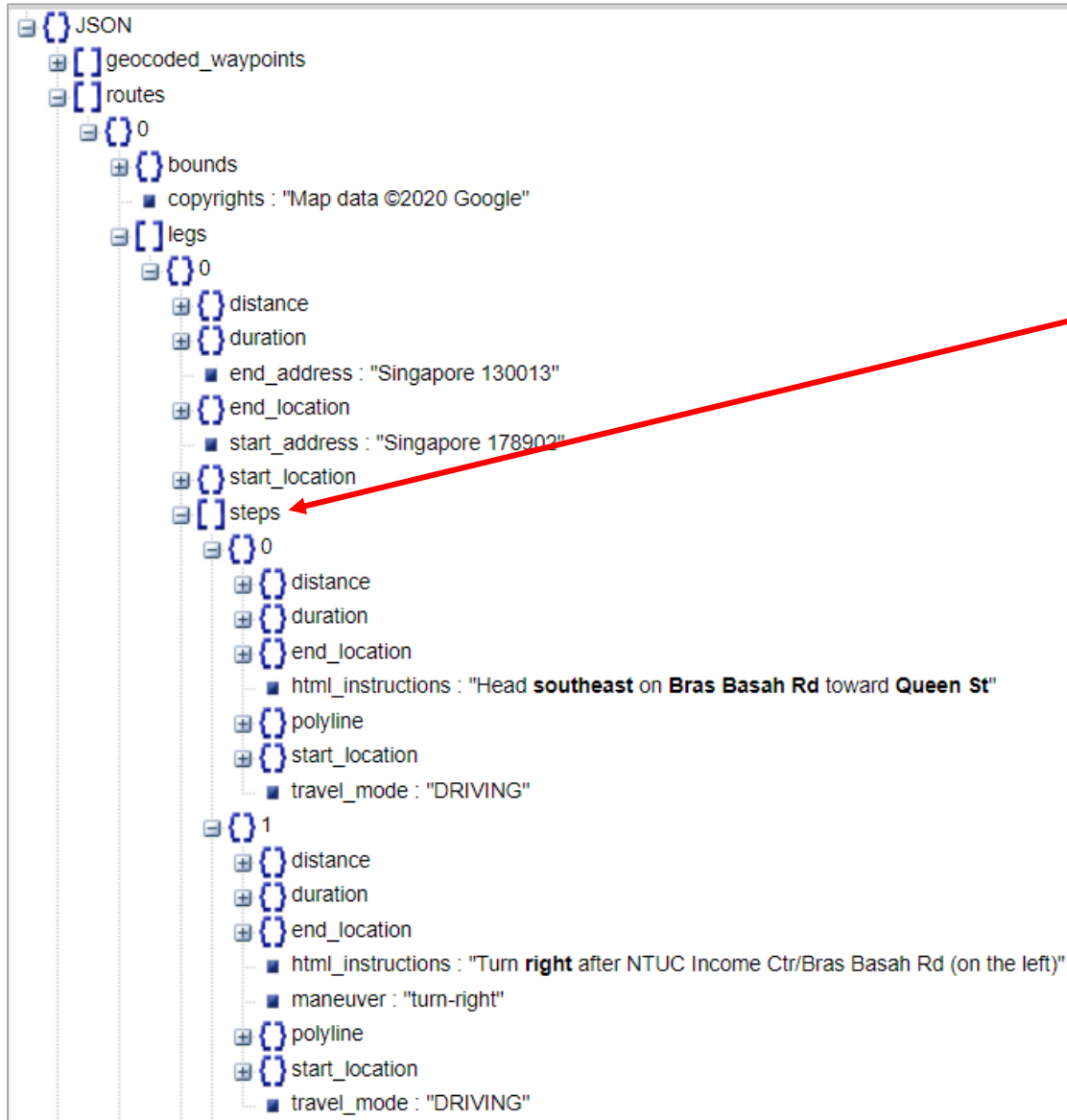
- **Parameters**

Params	Auth	Headers (6)	Body	Pre-req.	Tests	Settings
Query Params						
	KEY	VALUE				
<input checked="" type="checkbox"/>	origin	178902				
<input checked="" type="checkbox"/>	destination	309462				
<input checked="" type="checkbox"/>	key	YOUR KEY				

Params	Auth	Headers (6)	Body	Pre-req.	Tests	Settings
Query Params						
	KEY	VALUE				
<input checked="" type="checkbox"/>	origin	Disneyland				
<input checked="" type="checkbox"/>	destination	Universal+Studios+Hollywood				
<input checked="" type="checkbox"/>	key	YOUR KEY				

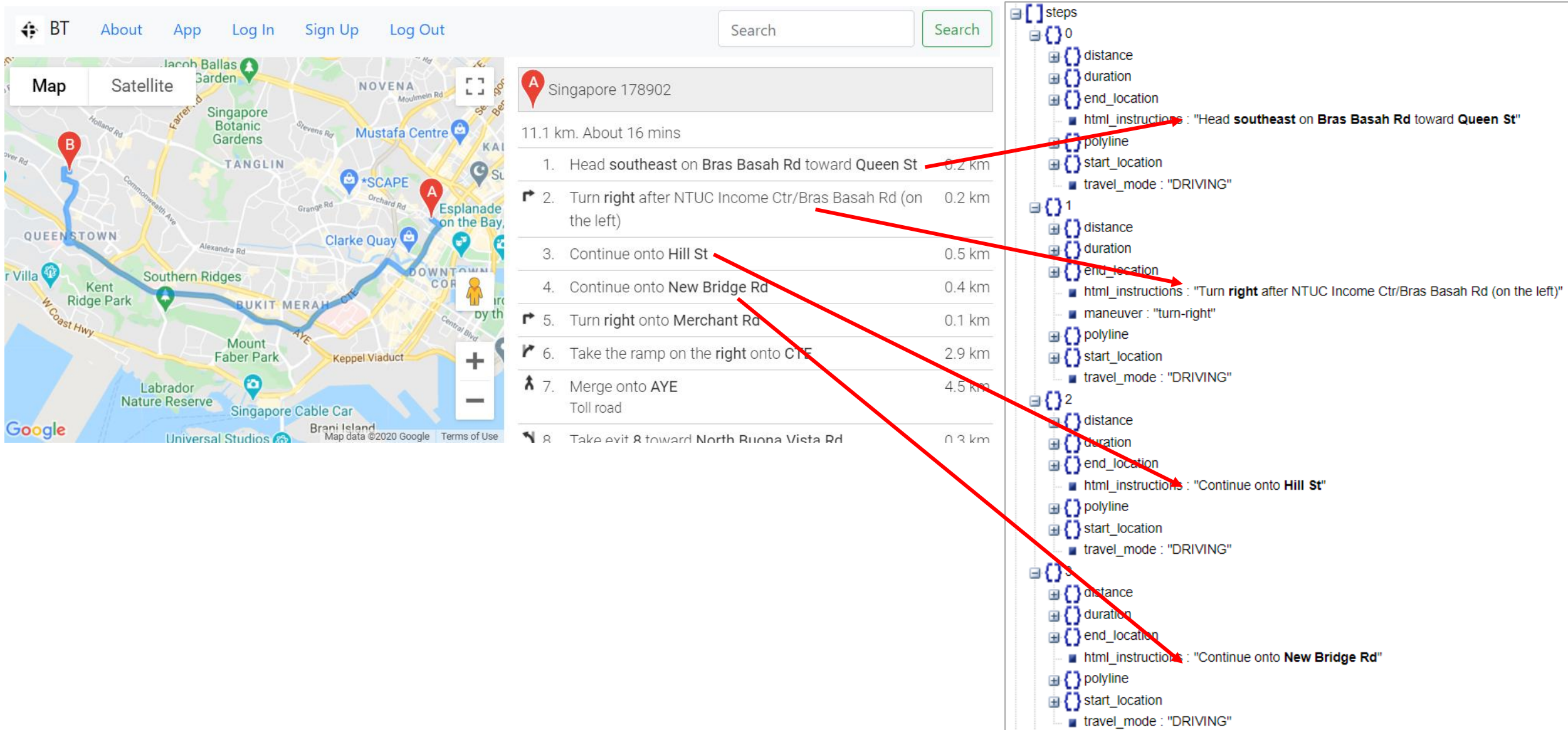
- **Origin/destination** can be
 - Landmark names
 - Postal codes
 - Etc.
- For more comprehensive info, visit **Google Maps “Directions” API documentation**
 - <https://developers.google.com/maps/documentation/directions/overview>

[Postman] Directions API



Steps
(see next slide for
browser-rendered directions)

[Postman] Directions API



Questions? Need Help?

Join us in Slack

@

<https://is216-oppa.slack.com>

Thank You!