Google Maps Android API v2 - Tutorial

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Android and Google Maps. This tutorial describes the usage of Google Maps in your Android application. It is based on Eclipse 4.4, Java 1.7 and Android 4.4.

1. Android Basics

The following assumes that you have already basic knowledge in Android development. Please check the Android development tutorial (https://www.vogella.com/tutorials/Android/article.html) for the basics.

2. Google Maps

2.1. MapsView

Google provides via Google play a library for using Google Maps in your application. The following description is based on the Google Maps Android API v2 which provides significant improvements to the older API version.

The library provides the `com.google.android.gms.maps.MapFragment` class and the `MapView` class for displaying the map component.

You need to add additional information to your *AndroidManifest.xml* file to use Google Maps.

```
    package com.vogella.android.maps

    <!--
         The ACCESS_COARSE/FINE_LOCATION permissions are not required to use
         Google Maps Android API v2, but you must specify either coarse or fine
         location permissions for the 'MyLocation' functionality.
    -->
    <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />

    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:supportsRtl="true"
        android:theme="@style/AppTheme">

        <!--
             The API key for Google Maps-based APIs is defined as a string resource.
             (See the file "res/values/google_maps_api.xml").
             Note that the API key is linked to the encryption key used to sign the APK.
             You need a different API key for each encryption key, including the release key
that is used to
             sign the APK for publishing.
             You can define the keys for the debug and release targets in src/debug/ and
src/release/.
        -->
        <meta-data
            android:name="com.google.android.geo.API_KEY"
            android:value="@string/google_maps_key" />

        <activity
            android:name=".MapsActivity"
            android:label="@string/title_activity_maps">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

2.2. MapFragment

The `MapFragment` class extends the `Fragment` class and provides the life cycle management and the services for displaying a `GoogleMap` widget. `GoogleMap` is the class which shows the map. The `MapFragment` has the `getMap()` method to access this class.

the `LatLng` class can be used to interact with the `GoogleView` class.

2.3. Markers

You can create markers on the map via the `Marker` class. This class can be highly customized.

The following code shows an example.

```
private GoogleMap map;
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
    map = ((MapFragment) getFragmentManager().findFragmentById(R.id.map))
            .getMap();

    if (map!=null){
        Marker hamburg = map.addMarker(new MarkerOptions().position(HAMBURG)
                .title("Hamburg"));
        Marker kiel = map.addMarker(new MarkerOptions()
                .position(KIEL)
                .title("Kiel")
                .snippet("Kiel is cool")
                .icon(BitmapDescriptorFactory
                        .fromResource(R.drawable.ic_launcher)));
    }

}
```


On the `GoogleMap` you can register a listener for the markers in your map via the `setOnMarkerClickListener(OnMarkerClickListener)` method. The `OnMarkerClickListener` class defines the `onMarkerClicked(Marker)` method which is called if a marker is clicked.

Similar to you also listen to drag events and info window clicks.

2.4. Changing the GoogleView

The `GoogleMap` can be highly customized.

The following example code is taken from the official Google webpage.

JAVA

```
static final LatLng HAMBURG = new LatLng(53.558, 9.927);
static final LatLng KIEL = new LatLng(53.551, 9.993);

private GoogleMap map;
... // Obtain the map from a MapFragment or MapView.

//Move the camera instantly to hamburg with a zoom of 15.
map.moveCamera(CameraUpdateFactory.newLatLngZoom(HAMBURG, 15));

// Zoom in, animating the camera.
map.animateCamera(CameraUpdateFactory.zoomTo(10), 2000, null);
```

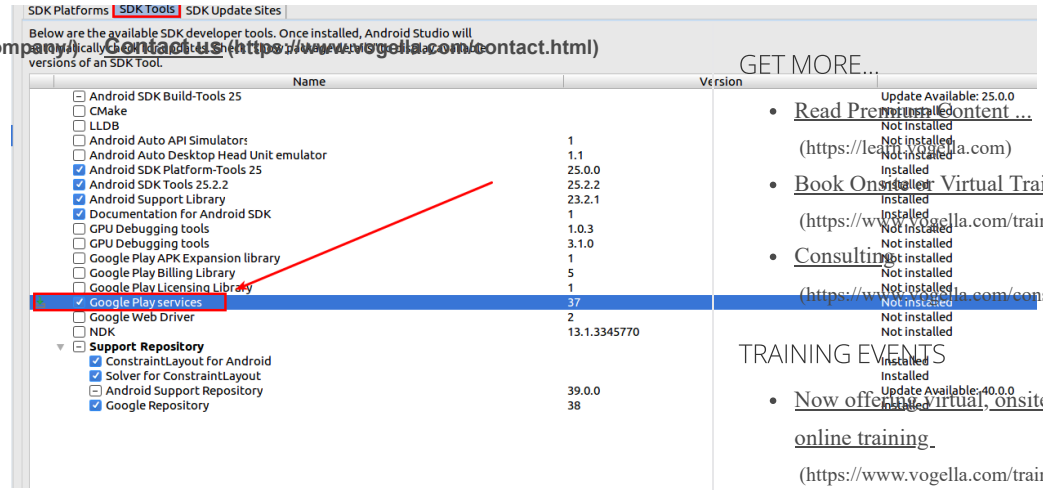
2.5. Android emulator and Google Maps

Ensure you create an Google API based emulator. This emulator can also be used to test Google map and other Google Play Service integration.

3. Install Google Play services

3.1. Download the Google Play services

Open the `Android SDK Manager` and install the `Google Play services`.



Now you can add a dependency to your `app/build.gradle` file.

```
compile 'com.google.android.gms:play-services:9.8.0'
```
GRADLE

4. Getting the Google Map key

4.1. Google console

To use Google Maps you need to create a valid Google Maps API key. The key is free, you can use it with any of your applications that call the Maps API. This key supports an unlimited number of users.

You get this key via the Google APIs Console (https://code.google.com/apis/console). You have to provide your application signature key and the application package name.

This is based on the key with which you sign your Android application during deployment. During development the Android build system, automatically creates and uses a *debug key*.

4.2. Creating the SHA-1 for your signature key

The debug key for signing your application can be found in the *userhome/.android/debug.keystore* file.

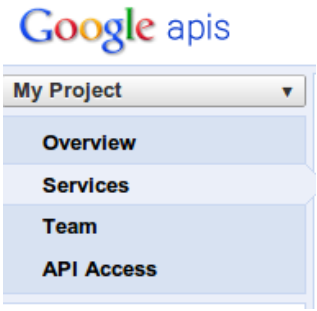
To create the SHA-1 for your debug keystore you use the `keytool` command from your JDK installation.

```
keytool -list -v -alias androiddebugkey \
-keystore <path_to_debug_keystore>debug.keystore \
-storepass android -keypass android
```
JAVA

Copy the SHA-1 output, as you need this later.

4.3. Register with the Google APIs Console

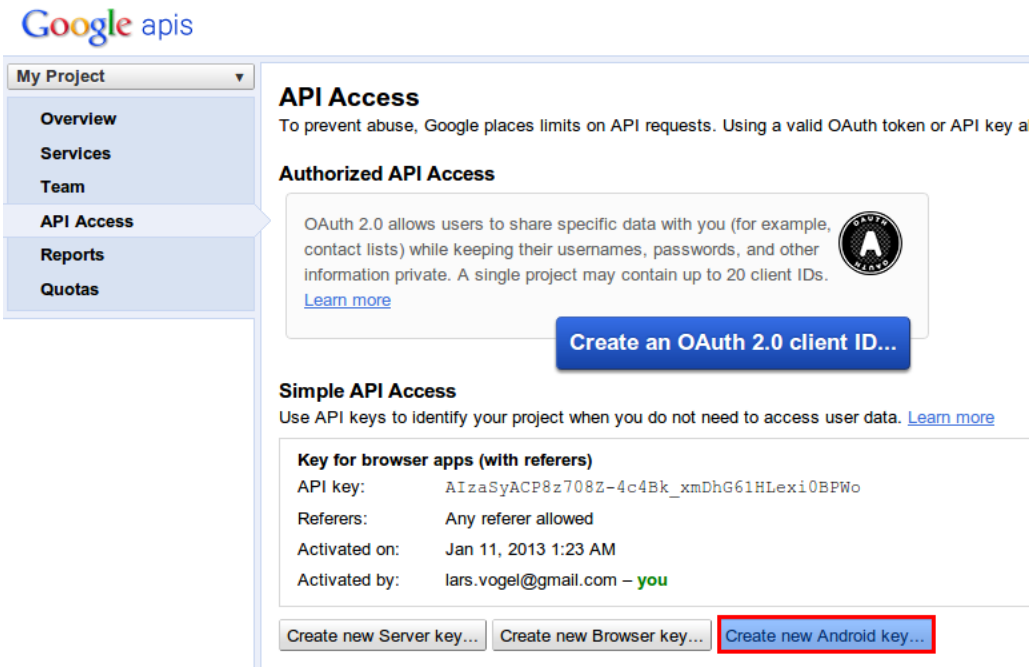
You have to register in the Google APIs Console (https://code.google.com/apis/console/) that you want to use Google Maps for Android. Select here the `Services` entry.



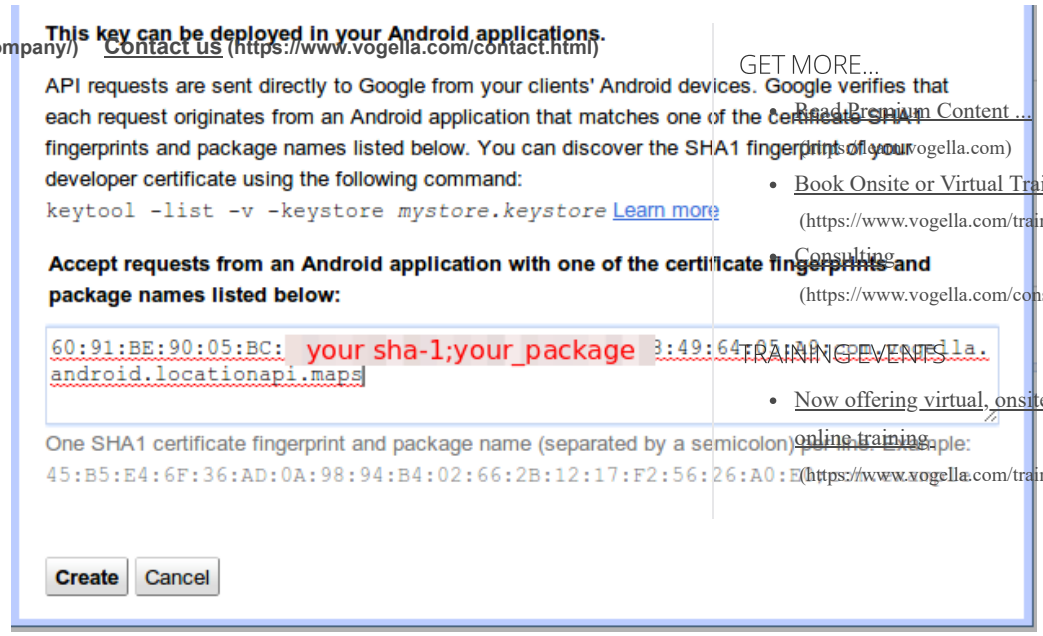
Activate the `Google Maps Android API v2`.

4.4. Create key for your application

You need later to register your application via its package in this console together with the SHA-1 fingerprint of your signature key. For this you select the entry and click on the `API Access` entry. Afterwards click on the *Create new Android key...* entry.



Enter your SHA-1 fingerprint and the package of your application separated by a semicolon. For example, in the following screenshot the `com.vogella.android.locationapi.maps` package is used.



The procedure is described in detail in Getting a Google Maps key (https://developers.google.com/maps/documentation/android/start#installing_the_google_maps_android_v2_api).

5. Tutorial: Google Maps

In this exercise you create an Android application which shows a `GoogleMap` via a fragment.

5.1. Install Google Play Services

Ensure you installed the Google Play Service.

5.2. Create Project

Create a new Android project called *com.vogella.android.maps* and use the *Google Maps Activity* template.

5.3. Validate generated manifest

Check the manifest file for the added permissions by this template.

```
    <!--
         The ACCESS_COARSE/FINE_LOCATION permissions are not required to use
         Google Maps Android API v2, but you must specify either coarse or fine
         location permissions for the 'MyLocation' functionality.
    -->
    <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />

    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:supportsRtl="true"
        android:theme="@style/AppTheme">

        <!--
             The API key for Google Maps-based APIs is defined as a string resource.
             (See the file "res/values/google_maps_api.xml").
             Note that the API key is linked to the encryption key used to sign the APK.
             You need a different API key for each encryption key, including the release key
that is used to
             sign the APK for publishing.
             You can define the keys for the debug and release targets in src/debug/ and
src/release/.
        -->
        <meta-data
            android:name="com.google.android.geo.API_KEY"
            android:value="@string/google_maps_key" />

        <activity
            android:name=".MapsActivity"
            android:label="@string/title_activity_maps">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

The template generated a file called `google_maps_api.xml` . This file contains instruction how to get a Google Maps API key.

Get a valid API key for your application and enter this key in the `google_maps_api.xml` file.

5.4. Adjust layout file

In this example we use the `MapFragment` . Change your layout file to the following code.

```
<fragment xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:map="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:id="@+id/map"
    android:name="com.google.android.gms.maps.SupportMapFragment"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context="com.vogella.android.maps.MapsActivity"
    />
```

5.5. Activity

Change your activity to the following.

```
import android.os.Bundle;

import com.google.android.gms.maps.CameraUpdateFactory;
import com.google.android.gms.maps.GoogleMap;
import com.google.android.gms.maps.MapFragment;
import com.google.android.gms.maps.model.BitmapDescriptorFactory;
import com.google.android.gms.maps.model.LatLng;
import com.google.android.gms.maps.model.Marker;
import com.google.android.gms.maps.model.MarkerOptions;

public class MainActivity extends Activity {
    static final LatLng HAMBURG = new LatLng(53.558, 9.927);
    static final LatLng KIEL = new LatLng(53.551, 9.993);
    private GoogleMap map;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        map = ((MapFragment) getFragmentManager().findFragmentById(R.id.map))
                .getMap();

    }

    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        getMenuInflater().inflate(R.menu.activity_main, menu);
        return true;
    }

}
```

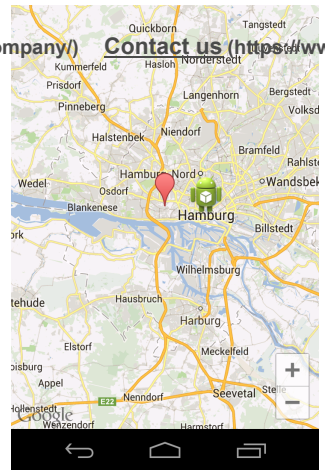
Currently you have to enable multidex support to run this exmaple:

JAVA

```
android {
    compileSdkVersion 25
    buildToolsVersion "24.0.0"
    defaultConfig {
        applicationId "com.vogella.android.maps"
        minSdkVersion 23
        targetSdkVersion 25
        versionCode 1
        versionName "1.0"
        multiDexEnabled true
        testInstrumentationRunner
"android.support.test.runner.AndroidJUnitRunner"
    }
    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android.txt'),
'proguard-rules.pro'
        }
    }
}
```

5.6. Run and Test

Run and test your application. You should be able to move on the Map and to zoom in and out.



6. Links and Literature

6.1. Android Resources

Introduction to Android Development (https://www.vogella.com/tutorials/Android/article.html)

Android Location API and Google Maps (https://www.vogella.com/tutorials/AndroidLocationAPI/article.html)

Android Homepage (https://www.android.com/intl/de_de/)

7. vogella training and consulting support

Appendix A: Copyright, License and Source code