CSE 162 Mobile Computing

Lab 3 Location and Map Programming

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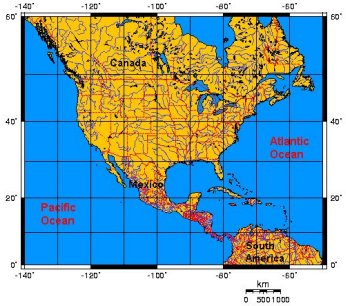
Lecture: Feb 16 / Feb 18

Demo: Feb 23 / Feb 25

Hard Deadline: Mar 2 / Mar 4

What is localization, aka location?



absolute location
(lat, long)

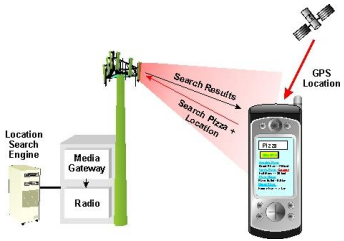
"I hope this bullhorn will make this meeting a little less boring."

relative location

context location

Why should I care about localization?

social application



advertisements

podcasting

Assignments

- Creating a google map, display the map
- Using Location services, set the map view based on the GPS tracking

Create Project

- Create new project: MapsProject
- Select google map activity
- Go to: google_maps_api.xml

```
<resources>
    <!--
    TODO: Before you run your application, you need a Google Maps API key.

    To get one, follow this link, follow the directions and press "Create" at the end:

    https://console.developers.google.com/flows/enableapi?apiid=maps_android_backend&keyType=CLIENT_SID

    You can also add your credentials to an existing key, using these values:

    Package name:
    com.example.mapsproject

    SHA-1 certificate fingerprint:
    5B:E5:C7:B2:82:C2:84:A0:77:AE:09:F6:69:5B:14:47:BA:68:A0:C4

    Alternatively, follow the directions here:
    https://developers.google.com/maps/documentation/android/start#get-key

    Once you have your key (it starts with "AIza"), replace the "google_maps_key"
    string in this file.
    -->
    <string name="google_maps_key" templateMergeStrategy="preserve" translatable="false">YOUR_KEY_HERE<
</resources>
```

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. CONFIGURE CONSENT SCREEN

API Keys

Name	Creation date	Restrictions	Key
API key 1	Feb 8, 2021	Android apps	AIzaSyBGMJ...fGCmPhxWFk

```
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</resources>
```

Registering for Location Updates

- In order for an object to receive updates from GPS, it must implement the **LocationListener** interface

```
// Called when your GPS location changes
@Override
public void onLocationChanged(Location location)

// Called when a provider gets turned off by the user in the settings
@Override
public void onProviderDisabled(String provider)

// Called when a provider is turned on by the user in the settings
@Override
public void onProviderEnabled(String provider)

// Signals a state change in the GPS (e.g. you head through a tunnel and
// it loses its fix on your position)
@Override
public void onStatusChanged(String provider, int status, Bundle extras)
```

Registering for Location Updates

- **LocationManager** handles registrations for GPS and network location updates
- Once the **LocationManager** is obtained, an object registers for updates by calling **requestLocationUpdates** , the arguments passed into the requestLocationUpdates method determine the granularity of location changes that will generate an event
  - send updates that are at least X meters apart
  - send updates at least this far apart in time
  - send updates that have this minimum accuracy

requestLocationUpdates(String provider, long minTimeMs, float minDistanceM, LocationListener listener)

Register for location updates from the given provider with the given arguments.

requestLocationUpdates(long minTimeMs, float minDistanceM, Criteria criteria, LocationListener listener, Looper looper)

Register for location updates using a provider selected through the given Criteria, and a callback on the specified Looper.

requestLocationUpdates(String provider, long minTimeMs, float minDistanceM, LocationListener listener, Looper looper)

Register for location updates using the named provider, and a callback on the specified Looper.

requestLocationUpdates(String provider, long minTimeMs, float minDistanceM, Executor executor, LocationListener listener)

Register for location updates using the named provider, and a callback on the specified Executor.

requestLocationUpdates(long minTimeMs, float minDistanceM, Criteria criteria, PendingIntent pendingIntent)

Register for location updates using a provider selected through the given Criteria, and callbacks delivered via the provided PendingIntent.

requestLocationUpdates(long minTimeMs, float minDistanceM, Criteria criteria, Executor executor, LocationListener listener)

Register for location updates using a provider selected through the given Criteria, and a callback on the specified Executor.

requestLocationUpdates(String provider, long minTimeMs, float minDistanceM, PendingIntent pendingIntent)

Register for location updates using the named provider, and callbacks delivered via the provided PendingIntent.

Location Updates

```
public class MapsActivity extends FragmentActivity implements OnMapReadyCallback, LocationListener {
    private GoogleMap mMap;
    private LocationManager locationManager;
    private double longitude = 151;
    private double latitude = -34;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_maps);

        // Obtain the SupportMapFragment and get notified when the map is ready to be used.
        SupportMapFragment mapFragment = (SupportMapFragment)
getSupportFragmentManager().findFragmentById(R.id.map);
        mapFragment.getMapAsync(this);
        locationManager = (LocationManager) getSystemService(LOCATION_SERVICE);
        if (ContextCompat.checkSelfPermission(this, Manifest.permission.ACCESS_COARSE_LOCATION) ==
PackageManager.PERMISSION_GRANTED)
            locationManager.requestLocationUpdates(LocationManager.NETWORK_PROVIDER, 10,
Criteria.ACCURACY_COARSE, this);
    }

 @Override
    public void onMapReady(GoogleMap googleMap) {
        mMap = googleMap;
    }
```

Location Providers

- The phone's location can be determined from multiple providers
- GPS location updates consume significantly more power than network location updates but are more accurate
  - GPS: 25 seconds * 140mA = 1mAh
  - Network: 2 seconds * 180mA = 0.1mAh
- The provider argument determines which method will be used to get a location
- You can also register for the PASSIVE_PROVIDER which only updates you if another app is actively using GPS / Network location

String	GPS_PROVIDER Name of the GPS location provider.
String	NETWORK_PROVIDER Name of the network location provider.
String	PASSIVE_PROVIDER A special location provider for receiving locations without actually initiating a location fix.

Getting Location Info

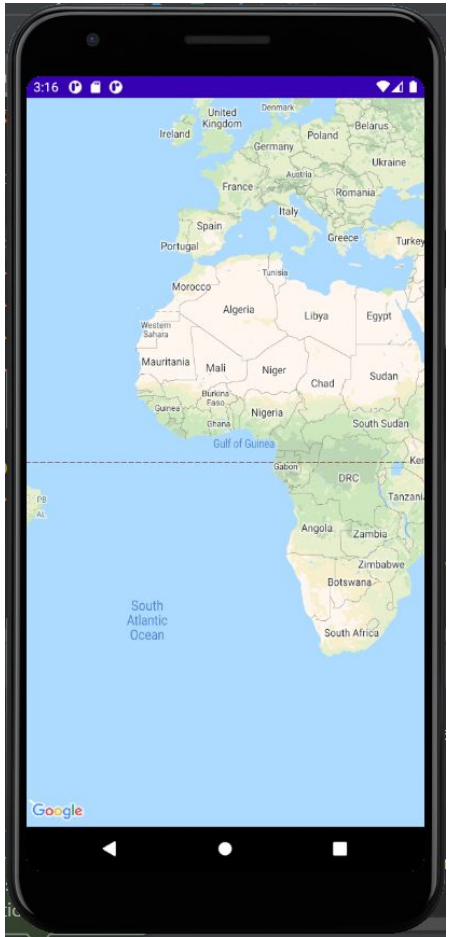
```
@Override
  public void onLocationChanged(Location location) {
      longitude = location.getLongitude();
      latitude = location.getLatitude();
      AlertDialog alertDialog = new AlertDialog.Builder(MapsActivity.this).create();
      alertDialog.setTitle("Location Detected");
      alertDialog.setMessage(String.valueOf(latitude) + "," + String.valueOf(longitude));
      alertDialog.setButton(AlertDialog.BUTTON_NEUTRAL, "OK",
              new DialogInterface.OnClickListener() {
                  public void onClick(DialogInterface dialog, int which) {
                      dialog.dismiss();
                  }
              });
      alertDialog.show();
      LatLng loc = new LatLng(latitude, longitude);
      mMap.addMarker(new MarkerOptions().position(loc).title("Marker in at your location"));
      mMap.moveCamera(CameraUpdateFactory.newLatLng(loc));
      mMap.animateCamera(CameraUpdateFactory.newLatLngZoom(loc, 12.0f));
  }
```

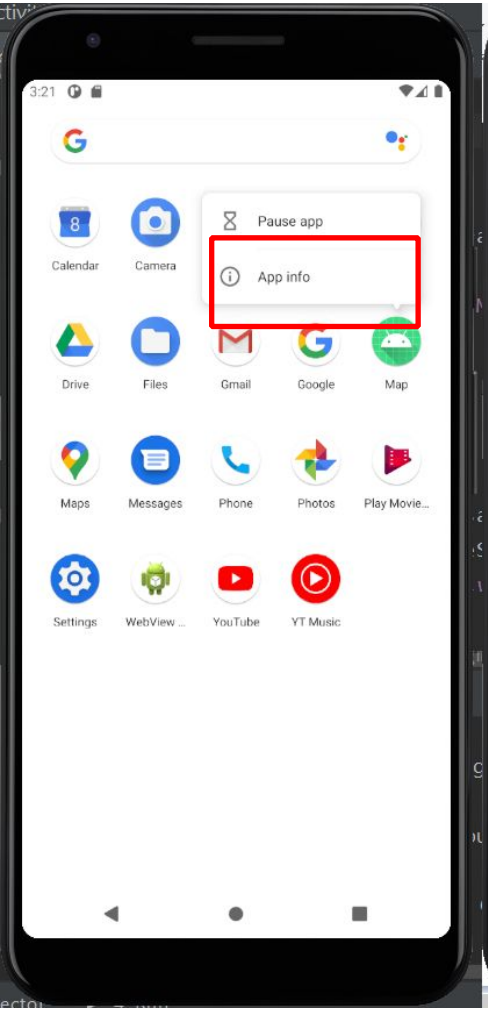
Being a Good Citizen

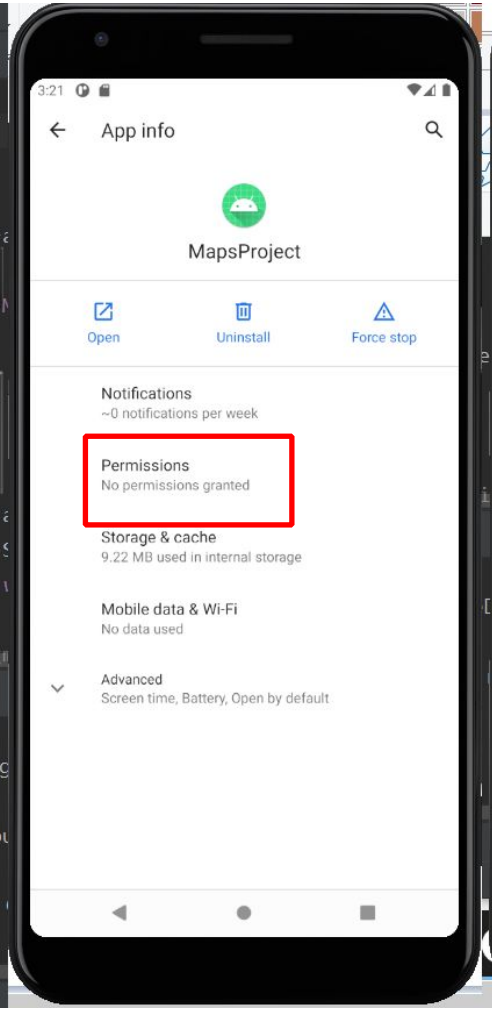
- It is important that you unregister your App when you no longer need updates
- For example, you should always unregister your listener when your Activity is paused!
- If you unregister when you pause, you must also reregister when you resume
- This is true for all sensors!

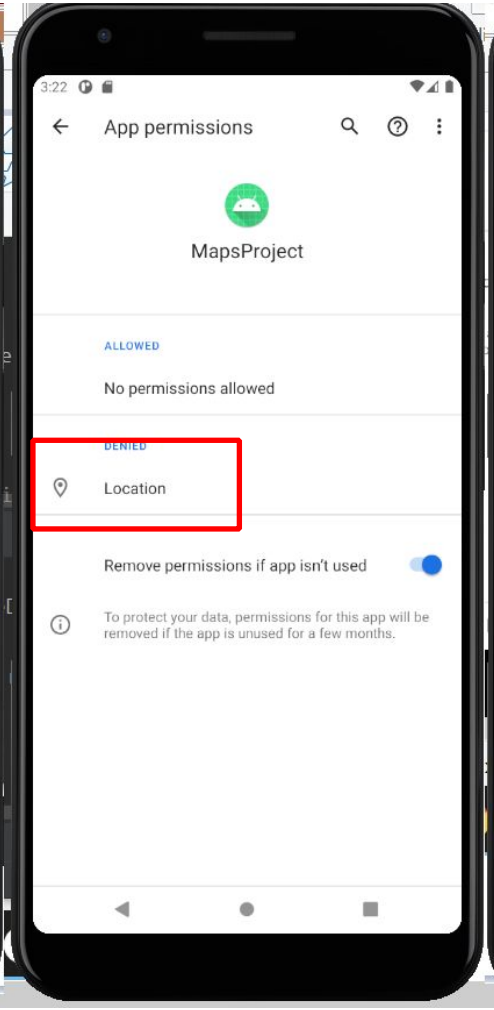
```
protected void onPause() {
      super.onPause();
      try {
         locationManager.removeUpdates(this);
      } catch (SecurityException e) {
         Log.e("Err", "No Location update permission remover");
      }
  }

  protected void onResume() {
      super.onResume();
      if (ContextCompat.checkSelfPermission(this,
Manifest.permission.ACCESS_COARSE_LOCATION) == PackageManager.PERMISSION_GRANTED)
         locationManager.requestLocationUpdates(LocationManager.GPS_PROVIDER, 10,
Criteria.ACCURACY_COARSE, this);
  }
```

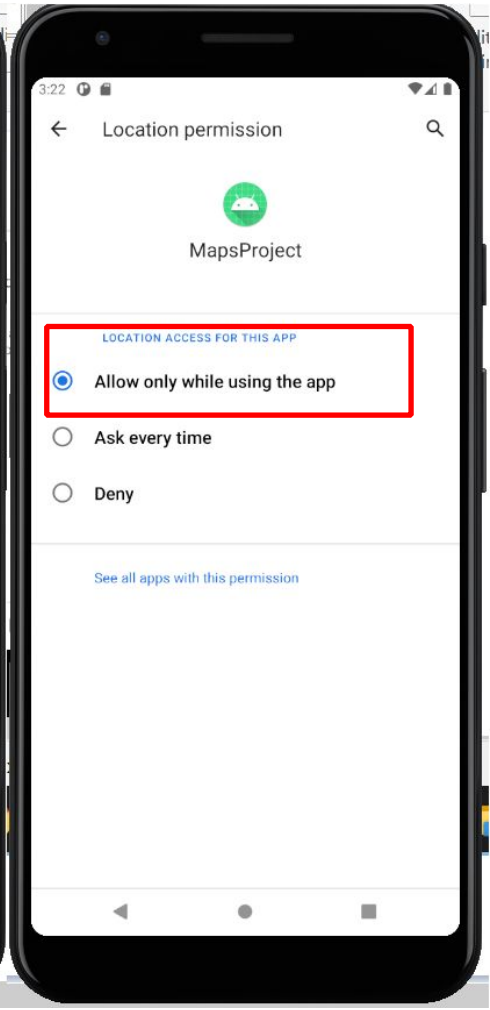
Run the app

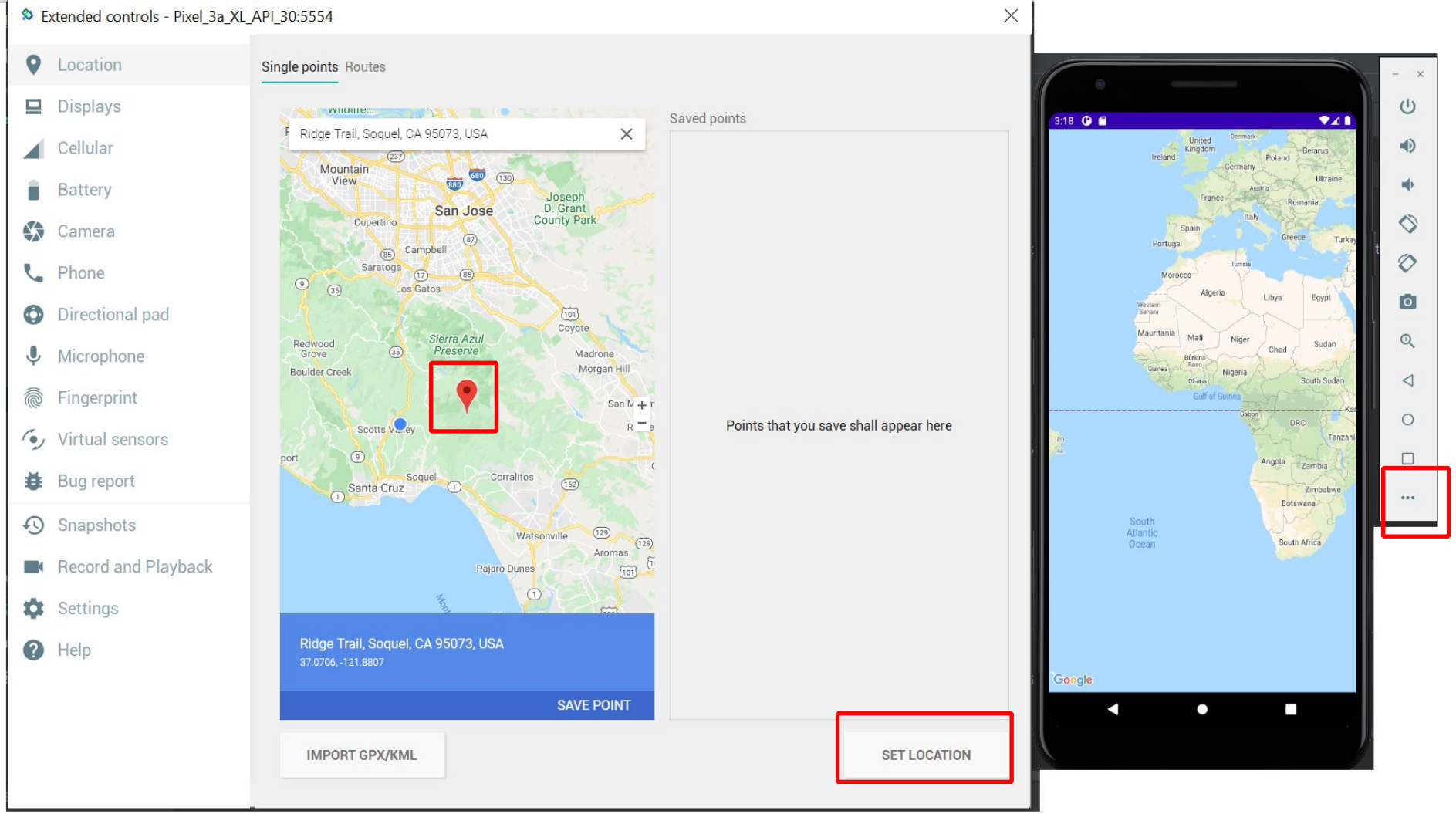

3:16
United Kingdom
Ireland
Denmark
Poland
Belarus
Germany
Ukraine
France
Austria
Romania
Italy
Spain
Greece
Portugal
Tunisia
Morocco
Algeria
Libya
Egypt
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Guinea
Burkina Faso
Nigeria
Ghana
South Sudan
Gulf of Guinea
Gabon
DRC
Angola
Zambia
Zimbabwe
Botswana
South Atlantic Ocean
South Africa
Google

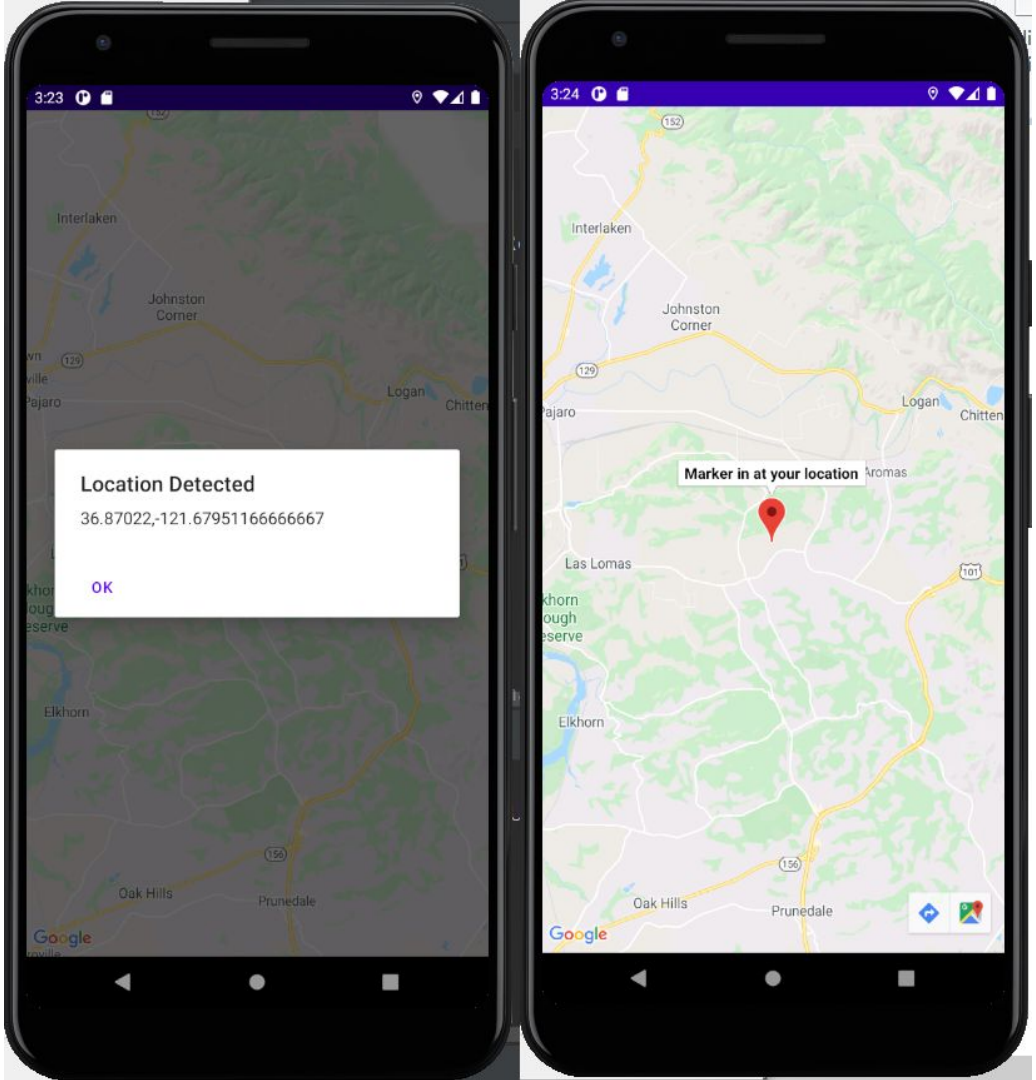

3:21
Pause app
App info
Calendar
Camera
Drive
Files
Gmail
Google
Map
Maps
Messages
Phone
Photos
Play Movie...
Settings
WebView ...
YouTube
YT Music


3:21
App info
MapsProject
Open
Uninstall
Force stop
Notifications
~0 notifications per week
Permissions
No permissions granted
Storage & cache
9.22 MB used in internal storage
Mobile data & Wi-Fi
No data used
Advanced
Screen time, Battery, Open by default


3:22
App permissions
MapsProject
ALLOWED
No permissions allowed
DENIED
Location
Remove permissions if app isn't used
To protect your data, permissions for this app will be removed if the app is unused for a few months.


3:22
Location permission
MapsProject
LOCATION ACCESS FOR THIS APP
Allow only while using the app
Ask every time
Deny
See all apps with this permission


Extended controls - Pixel_3a_XL_API_30:5554
Location
Displays
Cellular
Battery
Camera
Phone
Directional pad
Microphone
Fingerprint
Virtual sensors
Bug report
Snapshots
Record and Playback
Settings
Help
Single points
Routes
Ridge Trail, Soquel, CA 95073, USA
Mountain View
San Jose
Joseph D. Grant County Park
Cupertino
Campbell
Saratoga
Los Gatos
Sierra Azul Preserve
Redwood Grove
Boulder Creek
Coyote
Madrone
Morgan Hill
Scotts Valley
Soquel
Santa Cruz
Corralitos
Watsonville
Aromas
Pajaro Dunes
Ridge Trail, Soquel, CA 95073, USA
37.0706, -121.8807
SAVE POINT
Saved points
Points that you save shall appear here
IMPORT GPX/KML
SET LOCATION
3:18
Google


3:23
Interlaken
Johnston Corner
Logan
Location Detected
36.87022,-121.67951166666667
OK
Elkhorn
Oak Hills
Prunedale
Google
3:24
Interlaken
Johnston Corner
Logan
Marker in at your location
Las Lomas
Elkhorn
Oak Hills
Prunedale
Google