# SNS COLLEGE OF TECHNOLOGY

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## Department of MCA

## Topic: Location Awareness

**COURSE**

**19CAT701**

**Mobile Application Development**

**UNIT - IV**

**SPRUCING UP MOBILE APPS**

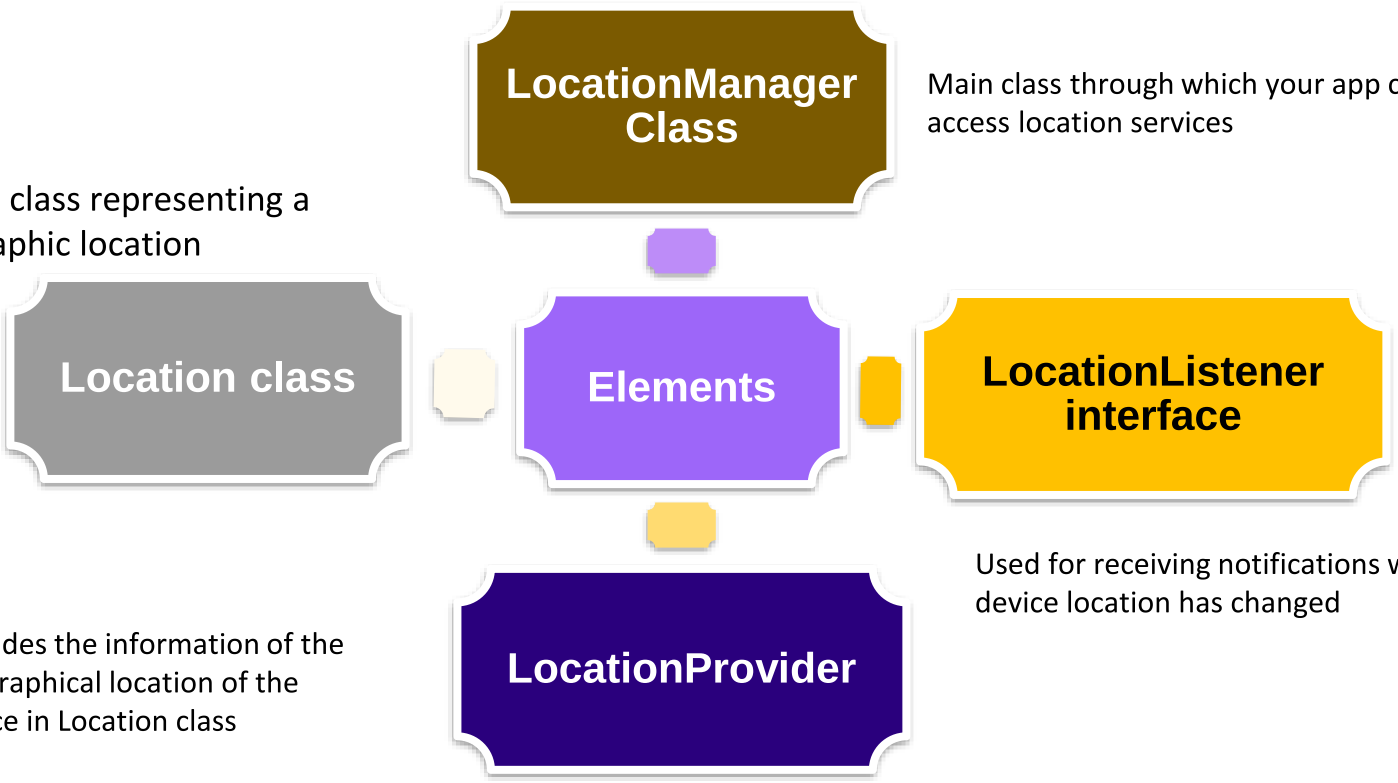
**CLASS**

**III Semester / II MCA**

## Location Awareness

- ❑ Android makes use of information from GPS and WiFi networks to get the location of the device on this Earth
- ❑ To build location-aware applications with the help of Google Play services
- ❑ Google Play services facilitates adding location awareness to your app with automated location tracking, geofencing, and activity recognition
- ❑ Android provides Location Framework contains classes and interfaces to implement the location feature in our app

# Components of Location object



Main class through which your app can access location services

A data class representing a geographic location

Used for receiving notifications when the device location has changed

provides the information of the geographical location of the device in Location class

## Request location permissions

- ❑ Apps that use location services must request location permissions in order to protect user privacy
- ❑ Multiple permissions related to location
- ❑ Which permissions you request, and how you request them, depend on the location requirements for your app's use case are matters
- ❑ **Types of location access**
  - Each permission has a combination of the following characteristics:
    - **Category**: Either foreground location or background location
    - **Accuracy**: Either precise location or approximate location

# Foreground location

- If your app contains a feature that shares or receives location information only once, or for a defined amount of time, then that feature requires foreground location access
- App accesses the device's current location in one of the following situations
  - An App’s activity is visible
  - Your app is running a foreground service
- It is recommended that you declare a foreground service type of location
- Permission can set like

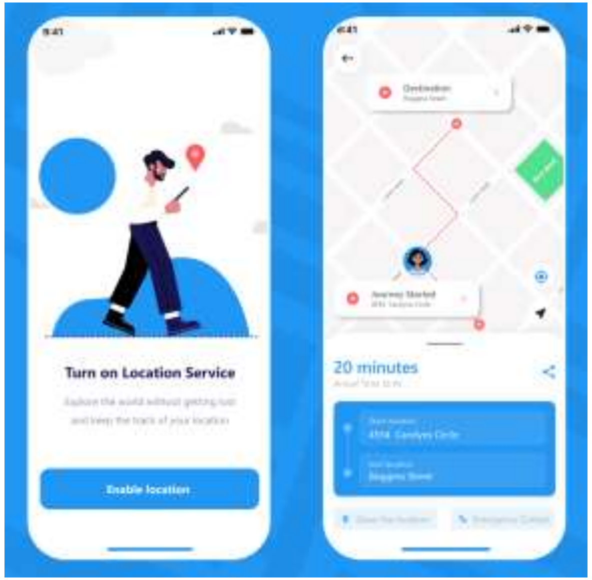
```
<service
   android:name="MyNavigationService"
   android:foregroundServiceType="location" ... >
   <!-- Any inner elements would go here. -->
</service>
```

```
<manifest ... >
  <!-- Always include this permission -->
  <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
  <!-- Include only if your app benefits from precise location access. -->
  <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />
</manifest>
```

## Background location

- ❑ App requires background location access if a feature within the app constantly shares location with other users
- ❑ Permission can set like

```
<manifest ... >
  <!-- Required only when requesting background location access
on Android 10 (API level 29) and higher. -->
  <uses-permission
android:name="android.permission.ACCESS_BACKGROUND_LOC
ATION" />
</manifest>
```



# Location Object

- ❑ Location object represents a geographic location which can consist of a latitude, longitude, time stamp, and other information such as bearing, altitude & velocity

| | |
|---|---|
| **float distanceTo(Location Dest)** | Returns the approximate distance in meters between this location and the given location |
| **float getAccuracy()** | Get the estimated accuracy of this location, in meters |
| **double getAltitude()** | Get the altitude if available, in meters above sea level |
| **float getBearing()** | Get the bearing, in degrees |
| **double getLatitude()** | Get the latitude, in degrees |
| **double getLongitude()** | Get the longitude, in degree |
| **float getSpeed()** | Get the speed if it is available, in meters/second over ground |
| **boolean hasAccuracy()** | True if this location has an accuracy |
| **boolean hasAltitude().** | True if this location has an altitude |
| **boolean hasBearing()** | True if this location has a bearing |

# Location Object

- Location object  method continues

| | |
|---|---|
| **boolean hasSpeed()** | True if this location has a speed |
| **void reset()** | Clears the contents of the location |
| **void setAccuracy(float accuracy)** | Set the estimated accuracy of this location, meters |
| **void setAltitude(double altitude)** | Set the altitude, in meters above sea level |
| **void setBearing(float bearing)** | Set the bearing, in degrees |
| **void setLatitude(double latitude)** | Set the latitude, in degrees |
| **void setLongitude(double longitude)** | Set the longitude, in degrees |
| **void setSpeed(float speed)** | Set the speed, in meters/second over ground |
| **String toString()** | Returns a string containing a concise, human-readable description of this object |

## Access Current Location

- To get the current location,
  - create a location client which is LocationClient object
  - connect it to Location Services using connect() method, and then
  - call its getLastLocation() method, which returns the most recent location
- To have location based functionality in your activity, you will have to implement two interfaces
  - GooglePlayServicesClient.ConnectionCallbacks
  - GooglePlayServicesClient.OnConnectionFailedListener

| | |
|---|---|
| **abstract void onConnected(Bundle connectionHint)** | called when location service is connected to the location client successfully. You will use **connect()** method to connect to the location client |
| **abstract void onDisconnected()** | called when the client is disconnected. You will use **disconnect()** method to disconnect from the location client |
| **abstract void onConnectionFailed( ConnectionResult result)** | called when there was an error connecting the client to the service |

## Access updated Location

- To get the updated location,
    - implement **LocationListener** interface which has callback method

| | |
|---|---|
| **abstract void onLocationChanged(Location location)** | used for receiving notifications from the LocationClient when the location has changed |

## Location Quality of Service (QoS)

- **LocationRequest** object is used to request a quality of service (QoS) for location updates from the **LocationClient**

| | |
|---|---|
| **setExpirationDuration(long millis)** | Set the duration of this request, in milliseconds |
| **setExpirationTime(long millis)** | Set the request expiration time, in millisecond since boot |
| **setFastestInterval(long millis)** | Explicitly set the fastest interval for location updates, in milliseconds |
| **setInterval(long millis)** | Set the desired interval for active location updates, in milliseconds |
| **setNumUpdates(int numUpdates)** | Set the number of location updates |
| **setPriority(int priority)** | Set the priority of the request |

- **Displaying a Location Address**
  - Geocoder.getFromLocation() method to get an address for a given latitude and longitude which need to be called from doInBackground() method of an AsyncTask class

## Maps

- ❑ While Location services determine the geographical coordinates of a location, Maps help plotting these coordinates in a much more comprehensible visual medium
- ❑ Maps to navigate to a desired location, enterprises have figured out their usage in various other scenarios
- ❑ Google Maps Android API to incorporate Maps and related functionalities
- ❑ Using API, we can include maps in our apps, mark places, and draw routes on it
- ❑ We need set permissions for com.google.android.providers.gsf.permission.READ_GSERVICES, ACCESS_NETWORK_STATE, INTERNET, and WRITE_EXTERNAL_STORAGE permissions

## Setting Up Maps

- To setup maps, ensure Google map services API installed
- Then we have to obtain a map key from Google APIs console, so that the app can access Google Maps servers through the Google Maps Android API
- In order to get a map key, we need to create a project in Google APIs console
- Once the project is created, we need to enable the Google Maps Android API
- Following this, we need to create a new Android key by providing, package name, and Secure Hash Algorithm 1 (SHA1) fingerprint of our app in the Credentials sub-section of APIs & auth section
- SHA1 fingerprint is a 40-digit hexadecimal number that represents the shorthand for RSA key required to authenticate our app, before publishing it on an app store

## Add Map

- It is generated using the keytool utility (JDK tool), and get stored inside a keystore – a database to store cryptographic keys and digital certificates

```
keytool -genkey -v -keystore <<fully_qualified_filename>>.keystore -
alias <<aliasname>> -keyalg RSA -keysize 2048 -validity 10000
```

- To list the SHA1 fingerprint, we need to execute the following command

```
keytool -list -v -keystore <<fully_qualified_filename>>.keystore -
alias <<aliasname>> -storepass <<password>> -keypass <<password>>
```

- outcome of the app registration is a map key displayed on Google APIs console. Once we get the map key, we have to add it to the app manifest file

```
<application>
 ...
 <meta-data android:name="com.google.android.maps.v2.API_KEY" android:value="<<Obtained map key>>"/>
 ...
 </application>
```

## Access updated Location

- ❑ Once map is setup, it can be added to our app using MapView UI element /Map_Frament
- ❑ Add the code into the layout file

```
<fragment
  android:id="@+id/mapLayout"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  class="com.google.android.gms.maps.MapFragment" />
```

## Add Map

```
private void initializeMap() {
  coordinates = new LatLng(currentLocation.getLatitude(), currentLocation.getLongitude());
  myMapFragment=(MapFragment)getFragmentManager().findFragmentById(R.id.mapLayout);
  map = myMapFragment.getMap();
  if (map != null) {
  map.setMyLocationEnabled(true);
  map.moveCamera(CameraUpdateFactory.newLatLngZoom(new LatLng(coordinates.latitude, coordinates.longitude), 13));
  }
 }@Override
 protected void onStart() {
  super.onStart();
 mClient.connect();
 }
@Override
 public void onStop() {
  mClient.disconnect();
  super.onStop();
 }
 @Override
  public void onConnected(Bundle arg0) {
  initializeMap(); }
```

## Example – Access Location

```
<?xml version = "1.0" encoding = "utf-8"?>
<manifest xmlns:android = "http://schemas.android.com/apk/res/android"
   package = "com.example.tutorialspoint7.myapplication">
   <uses-permission android:name = "android.permission.ACCESS_FINE_LOCATION" />
   <uses-permission android:name = "android.permission.INTERNET" />
   <applicationa
      android:allowBackup = "true"
      android:icon = "@mipmap/ic_launcher"
      android:label = "@string/app_name"
      android:supportsRtl = "true"
      android:theme = "@style/AppTheme">

      <activity android:name = ".MainActivity">
         <intent-filter>
            <action android:name = "android.intent.action.MAIN" />
            <category android:name = "android.intent.category.LAUNCHER" />
         </intent-filter>
      </activity>
   </application>
</manifest>
```

**Android Manifest file**

## Example – Access Location

```
<?xml version = "1.0" encoding = "utf-8"?>
<LinearLayout xmlns:android = "http://schemas.android.com/apk/res/android"
   android:layout_width = "fill_parent“
   android:layout_height = "fill_parent"
   android:orientation = "vertical" >

 <Button
      android:id = "@+id/button"
      android:layout_width = "fill_parent"
      android:layout_height = "wrap_content"
      android:text = "getlocation"/>
</LinearLayout>
```

**res/layout/activity_main.xml** file

## Example – Access Location

```
public class MainActivity extends Activity
{   Button btnShowLocation;
 private static final int REQUEST_CODE_PERMISSION = 2;
String mPermission = Manifest.permission.ACCESS_FINE_LOCATION;
GPSTracker gps;
@Override
    public void onCreate(Bundle savedInstanceState)
        {     super.onCreate(savedInstanceState);
              setContentView(R.layout.activity_main);
     try {
        if (ActivityCompat.checkSelfPermission(this, mPermission) !=
MockPackageManager.PERMISSION_GRANTED)
         {           ActivityCompat.requestPermissions(this, new String[]{mPermission},
REQUEST_CODE_PERMISSION);
           // If any permission above not allowed by user, this condition will execute every time, else your else part
will work
          }
   } catch (Exception e) {       e.printStackTrace();     }
  btnShowLocation = (Button) findViewById(R.id.button);      // show location button click event
```

**MainActivity.Java**

# Example – Access Location

```
btnShowLocation.setOnClickListener(new View.OnClickListener()
{
    @Override
  public void onClick(View arg0)
 {          // create class object          gps = new GPSTracker(MainActivity.this);
          // check if GPS enabled
        if(gps.canGetLocation())
  {             double latitude = gps.getLatitude();
               double longitude = gps.getLongitude();              // \n is for new line
Toast.makeText(getApplicationContext(), "Your Location is - \nLat: "              + latitude + "\nLong: " +
longitude, Toast.LENGTH_LONG).show();
}else
{           // can't get location           // GPS or Network is not enabled           // Ask user to enable
GPS/network in settings
           gps.showSettingsAlert();
       }
       }
   });
  }}
```

**MainActivity.Java**

# Example – Access Location

```
public class GPSTracker extends Service implements LocationListener
 { private final Context mContext;
 // flag for GPS status
 boolean isGPSEnabled = false;
 // flag for network status
 boolean isNetworkEnabled = false;
 // flag for GPS status
boolean canGetLocation = false;
 Location location; // location
 double latitude; // latitude
double longitude; // longitude
 // The minimum distance to change Updates in meters
private static final long MIN_DISTANCE_CHANGE_FOR_UPDATES = 10; // 10 meters
// The minimum time between updates in milliseconds
private static final long MIN_TIME_BW_UPDATES = 1000 * 60 * 1; // 1 minute
 // Declaring a Location Manager
protected LocationManager locationManager;
 public GPSTracker(Context context)
 { this.mContext = context; getLocation(); }
```

**GpsTracker.java**

# Example – Access Location

GpsTracker.java

```
public Location getLocation()
{ try
        { locationManager = (LocationManager) mContext.getSystemService(LOCATION_SERVICE);
    // getting GPS status
                isGPSEnabled = locationManager.isProviderEnabled(LocationManager.GPS_PROVIDER);
 // getting network status
        isNetworkEnabled = locationManager .isProviderEnabled(LocationManager.NETWORK_PROVIDER);
 if (!isGPSEnabled && !isNetworkEnabled)
{ // no network provider is enabled }
 else
{ this.canGetLocation = true;
// First get location from Network Provider
if (isNetworkEnabled) { locationManager.requestLocationUpdates( LocationManager.NETWORK_PROVIDER,
MIN_TIME_BW_UPDATES, MIN_DISTANCE_CHANGE_FOR_UPDATES, this);
Log.d("Network", "Network"); if (locationManager != null)
{ location = locationManager .getLastKnownLocation(LocationManager.NETWORK_PROVIDER);
if (location != null)
   { latitude = location.getLatitude();
    longitude = location.getLongitude(); } } }
    // if GPS Enabled get lat/long using GPS Services
  if (isGPSEnabled) { if (location == null) { locationManager.requestLocationUpdates( LocationManager.GPS_PROVIDER,
MIN_TIME_BW_UPDATES, MIN_DISTANCE_CHANGE_FOR_UPDATES, this);    Log.d("GPS Enabled", "GPS Enabled");
```

# Example – Access Location

```
if (locationManager != null)
{
location = locationManager .getLastKnownLocation(LocationManager.GPS_PROVIDER);
if (location != null)
   { latitude = location.getLatitude();
   longitude = location.getLongitude(); } } } } }
} catch (Exception e) { e.printStackTrace(); }
return location; }
/** * Stop using GPS listener * Calling this function will stop using GPS in your app * */
 public void stopUsingGPS()
{
   if(locationManager != null)
    { locationManager.removeUpdates(GPSTracker.this); } } /** * Function to get latitude * */
   public double getLatitude()
   { if(location != null)
      { latitude = location.getLatitude(); } // return latitude return latitude; }
       /** * Function to get longitude * */
     public double getLongitude()
      { if(location != null)
        { longitude = location.getLongitude(); } // return longitude
           return longitude; }
```

**GpsTracker.java**

## References

- Anubhav Pradhan, Anil V Deshpande, "Composing Mobile Apps using Android", Wiley Edition, 2014
- https://developer.android.com/training/location
- https://www.tutorialspoint.com/android/android_location_based_services.htm