Android Workshop

Probestudium, 15.-20.4.2011

Prof. Dr. Michael Rohs

michael.rohs@ifi.lmu.de

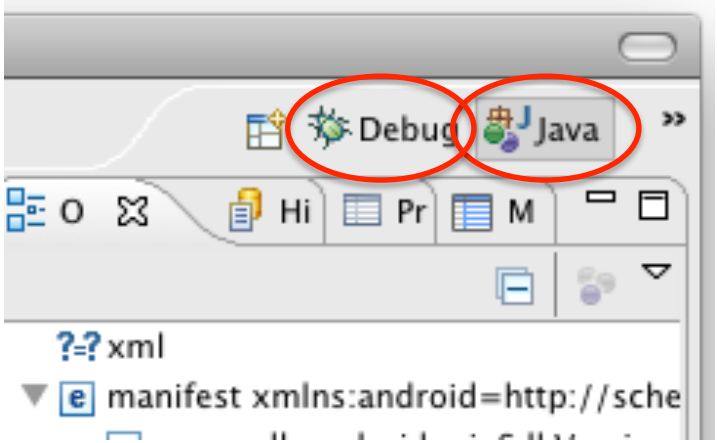
Dipl.-Inform. Sven Kratz

sven.kratz@ifi.lmu.de

Mobile Interaction Lab, LMU München

Eclipse Configuration

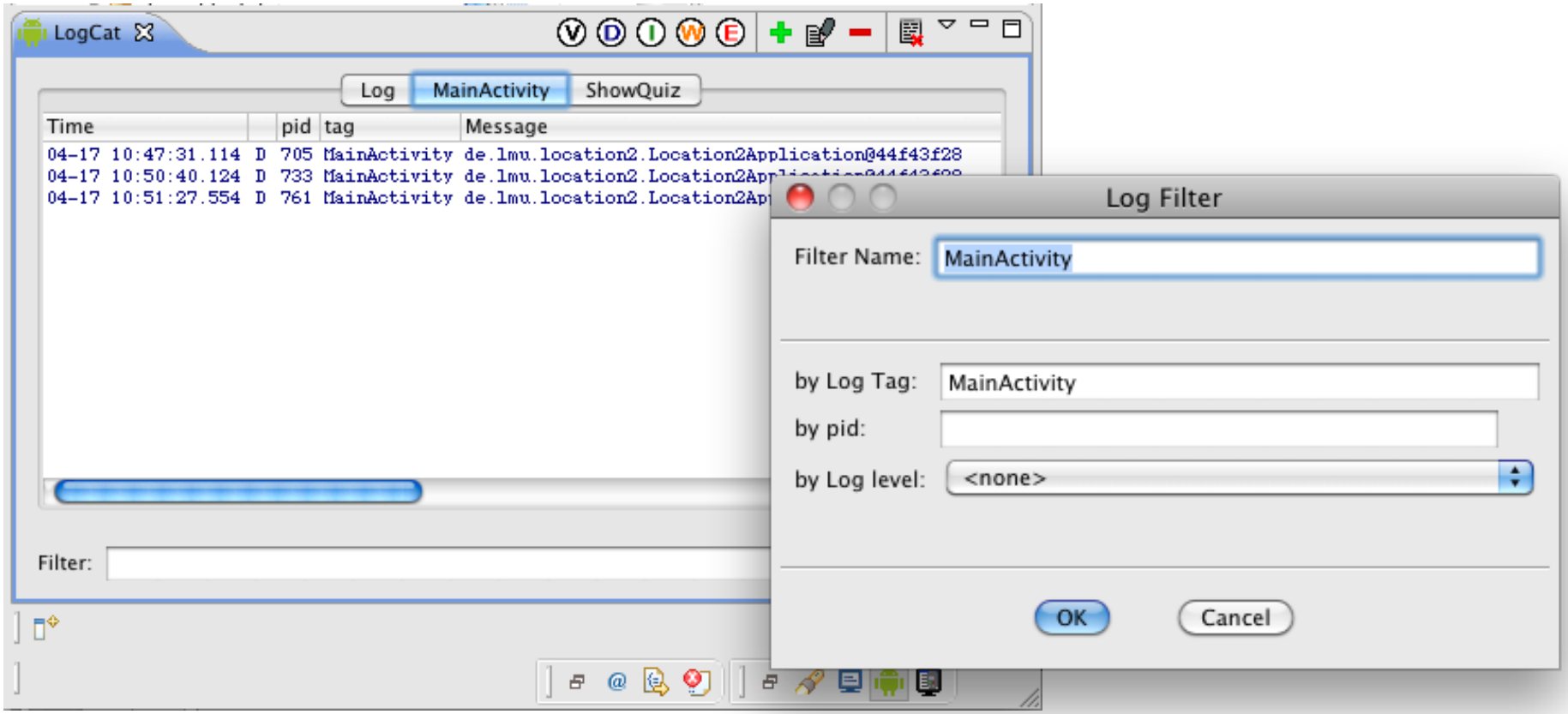
- Java Perspective
  - Writing source code
  - Adding resources
- Debug Perspective
  - Setting breakpoints
  - Inspecting variables



Eclipse tips:
Ctrl + Shift + O: organize imports
Ctrl + Space: show completions
F3: go to definition (e.g. of a class or method)

Filtering Eclipse Debug Output

```
Log.d("MainActivity", "onCreate");
```



The Location Quiz

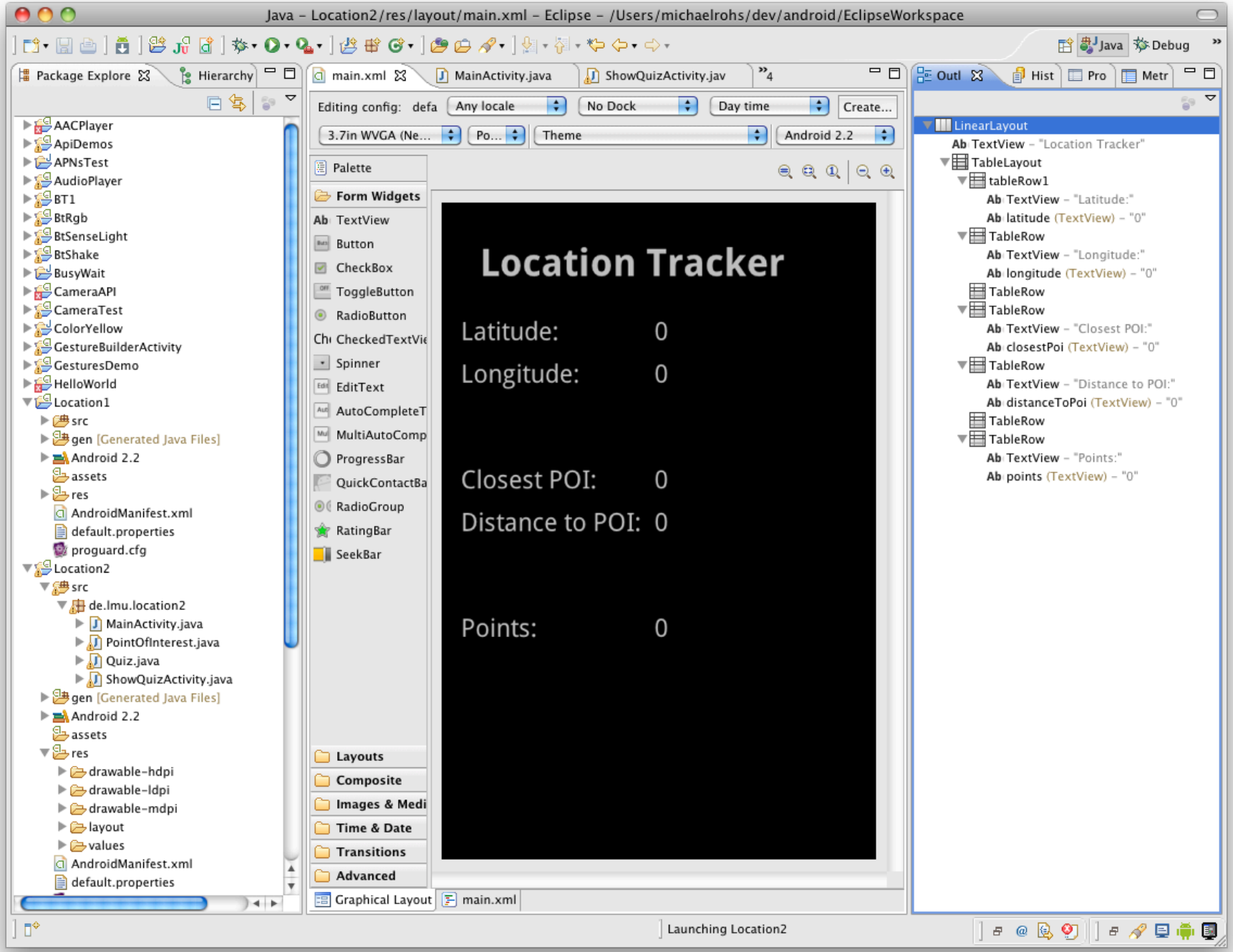
The Main Screen → MainActivity

- Show current location
- Show nearest point-of-interest
- Show number of game points

The Quiz Screen → ShowQuizActivity

- Title of the point-of-interest
- Image of the POI
- Question
- Choices

  (the correct one gives positive, the wrong one negative points)
- Submit button


Java – Location2/res/layout/main.xml – Eclipse – /Users/michaelrohs/dev/android/EclipseWorkspace
Package Explore
Hierarchy
AACPlayer
ApiDemos
APNsTest
AudioPlayer
BT1
BtRgb
BtSenseLight
BtShake
BusyWait
CameraAPI
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GestureBuilderActivity
GesturesDemo
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Transitions
Advanced
Location Tracker
Latitude: 0
Longitude: 0
Closest POI: 0
Distance to POI: 0
Points: 0
Graphical Layout
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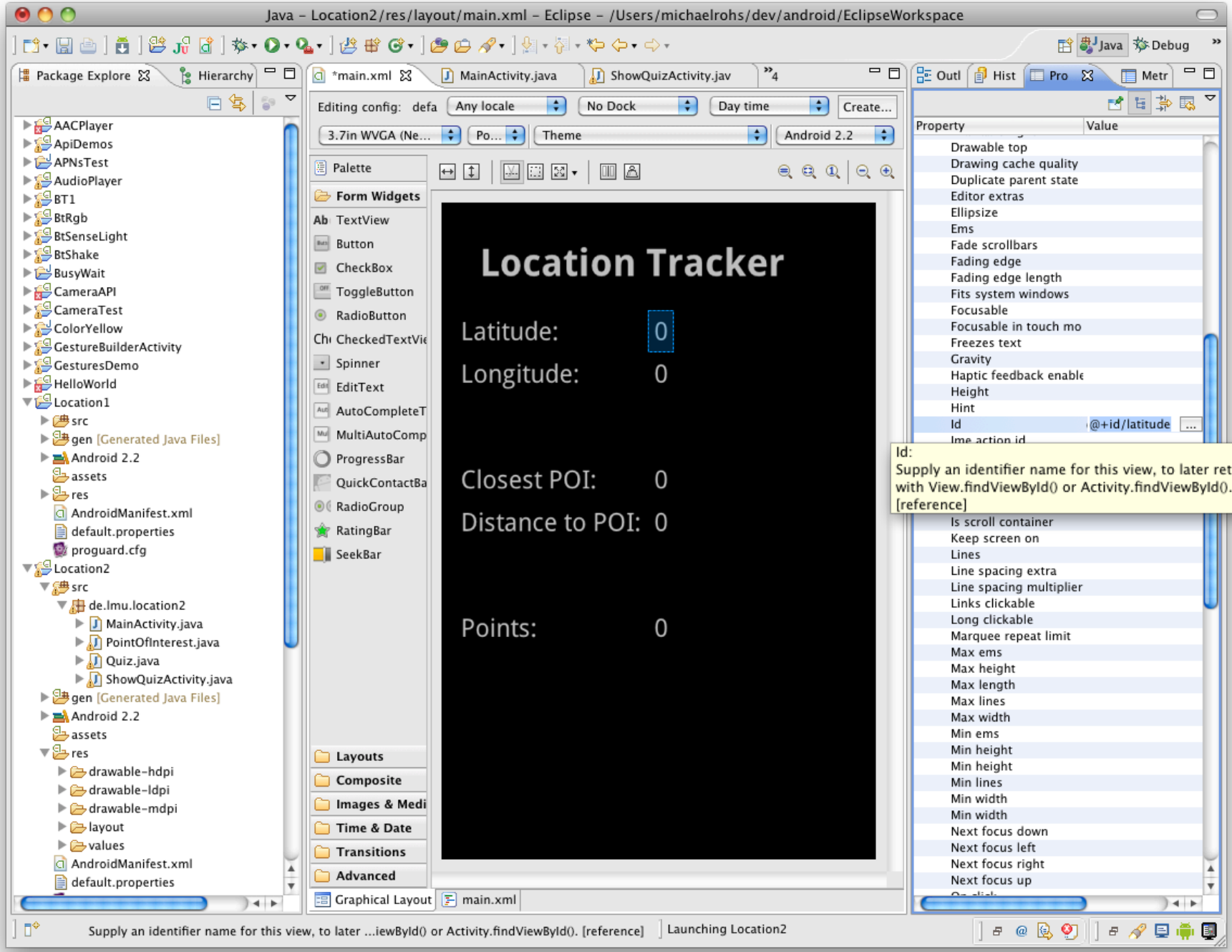
Metr
LinearLayout
TextView – "Location Tracker"
TableLayout
tableRow1
TextView – "Latitude:"
latitude (TextView) – "0"
TableRow
TextView – "Longitude:"
longitude (TextView) – "0"
TableRow
TableRow
TextView – "Closest POI:"
closestPoi (TextView) – "0"
TableRow
TextView – "Distance to POI:"
distanceToPoi (TextView) – "0"
TableRow
TableRow
TextView – "Points:"
points (TextView) – "0"
Launching Location2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Transitions
Advanced
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Latitude: 0
Longitude: 0
Closest POI: 0
Distance to POI: 0
Points: 0
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Fade scrollbars
Fading edge
Fading edge length
Fits system windows
Focusable
Focusable in touch mo
Freezes text
Gravity
Haptic feedback enable
Height
Hint
Id
@+id/latitude
Id:
Supply an identifier name for this view, to later retrieve it with View.findViewById() or Activity.findViewById(). [reference]
Is scroll container
Keep screen on
Lines
Line spacing extra
Line spacing multiplier
Links clickable
Long clickable
Marquee repeat limit
Max ems
Max height
Max length
Max lines
Max width
Min ems
Min height
Min height
Min lines
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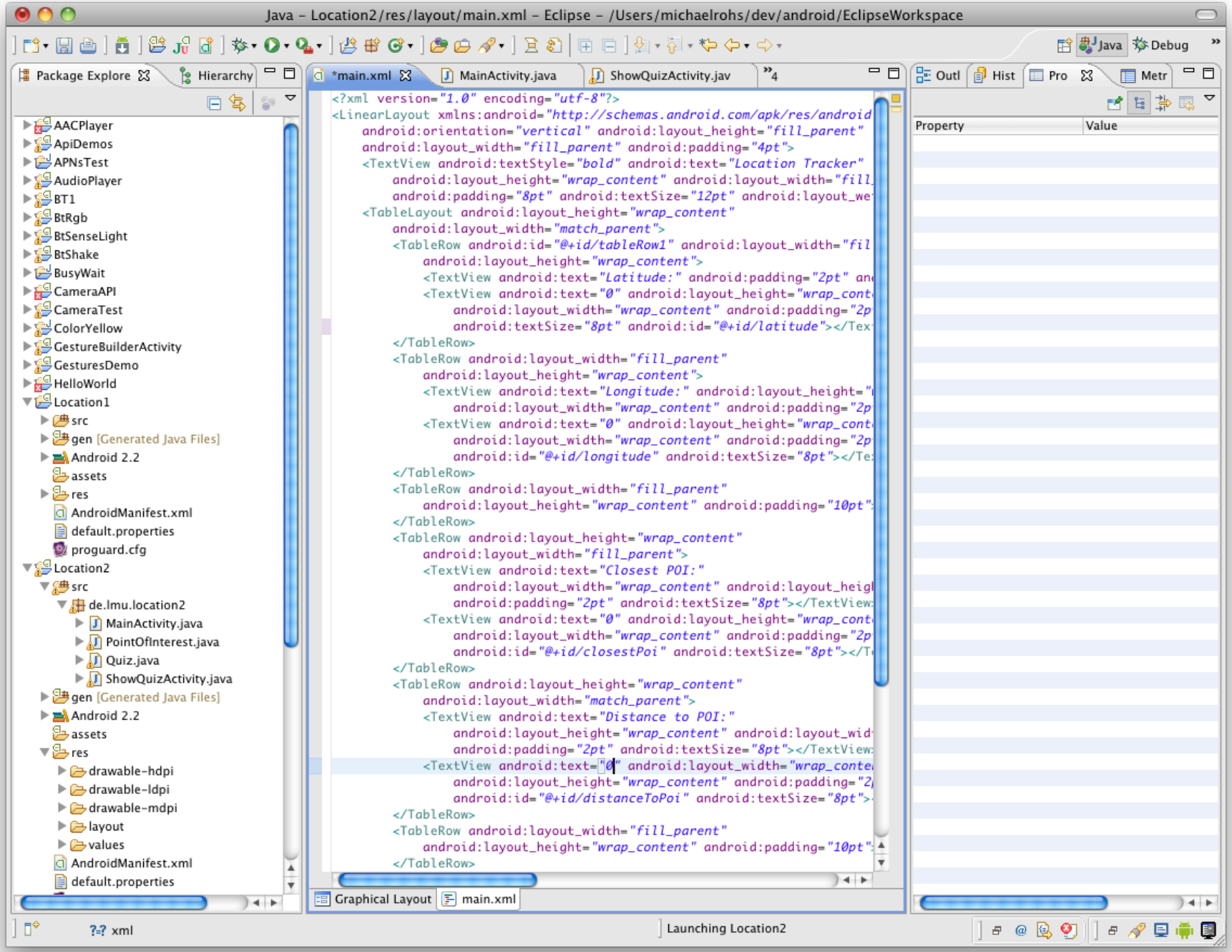
Min width
Next focus down
Next focus left
Next focus right
Next focus up
Supply an identifier name for this view, to later ...iewById() or Activity.findViewById(). [reference]
Launching Location2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<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android
android:orientation="vertical" android:layout_height="fill_parent"
android:layout_width="fill_parent" android:padding="4pt">
<TextView android:textStyle="bold" android:text="Location Tracker"
android:layout_height="wrap_content" android:layout_width="fill
android:padding="8pt" android:textSize="12pt" android:layout_we
<TableLayout android:layout_height="wrap_content"
android:layout_width="match_parent">
<TableRow android:id="@+id/tableRow1" android:layout_width="fil
android:layout_height="wrap_content">
<TextView android:text="Latitude:" android:padding="2pt" an
<TextView android:text="0" android:layout_height="wrap_cont
android:layout_width="wrap_content" android:padding="2p
android:textSize="8pt" android:id="@+id/latitude"></Tex
</TableRow>
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android:padding="2pt" android:textSize="8pt"></TextView
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android:id="@+id/distanceToPoi" android:textSize="8pt">
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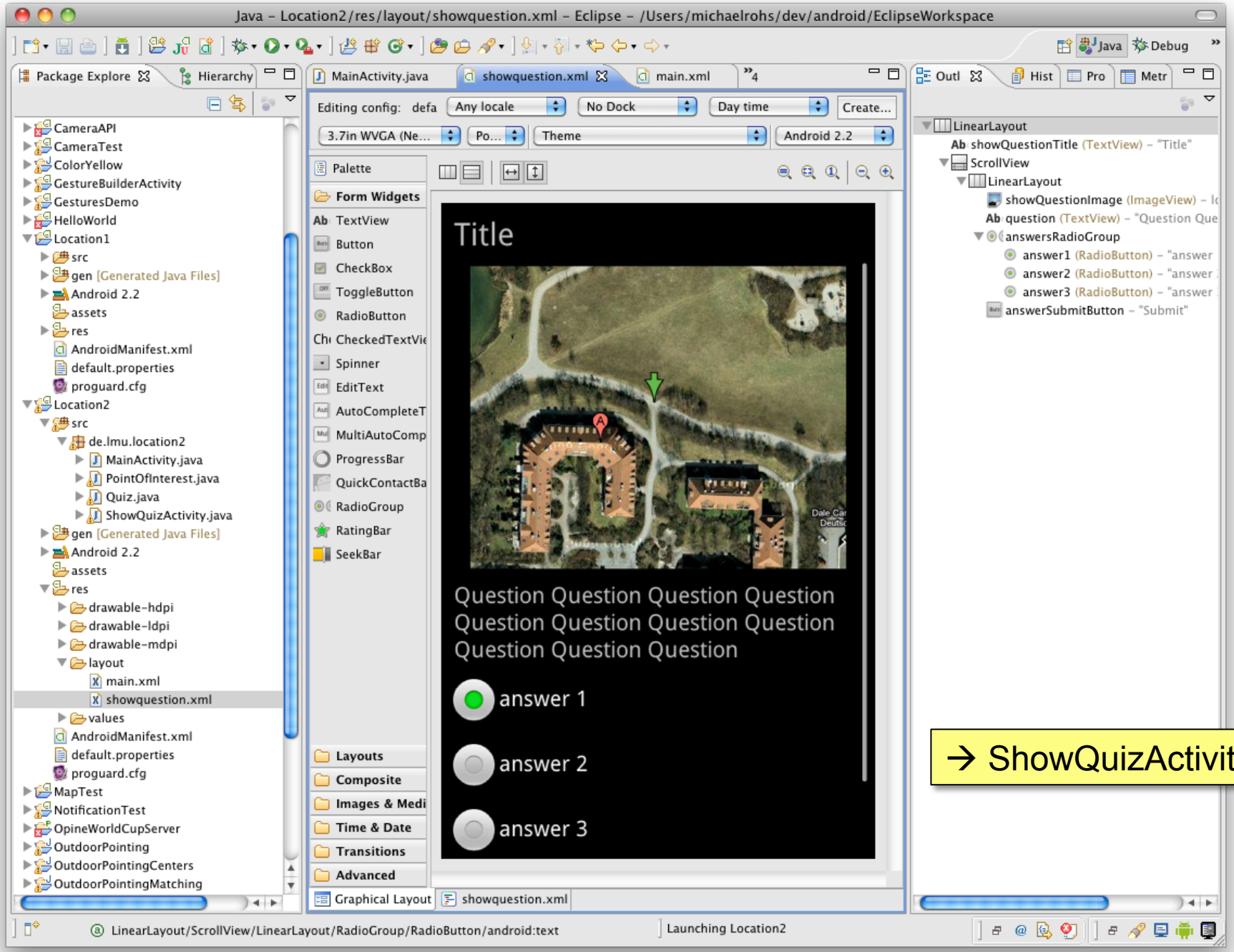
<TableRow android:layout_width="fill_parent"
android:layout_height="wrap_content" android:padding="10pt"
</TableRow>
Graphical Layout
main.xml
?=? xml
Launching Location2

Accessing GUI Elements in Java

```
public class MainActivity extends Activity implements LocationListener {
    TextView latitudeView;
    TextView longitudeView;
    …
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        latitudeView = (TextView) findViewById(R.id.latitude);
        longitudeView = (TextView) findViewById(R.id.longitude);
        closestPoiView = (TextView) findViewById(R.id.closestPoi);
      …
    }
```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LinearLayout
showQuestionTitle (TextView) – "Title"
ScrollView
LinearLayout
showQuestionImage (ImageView)
question (TextView) – "Question Que
answersRadioGroup
answer1 (RadioButton) – "answer
answer2 (RadioButton) – "answer
answer3 (RadioButton) – "answer
answerSubmitButton – "Submit"
→ ShowQuizActivity
LinearLayout/ScrollView/LinearLayout/RadioGroup/RadioButton/android:text
Launching Location2

Demo and Excercise

- Demo: Shows to to create GUI
  - using “Graphical Layout” and XML

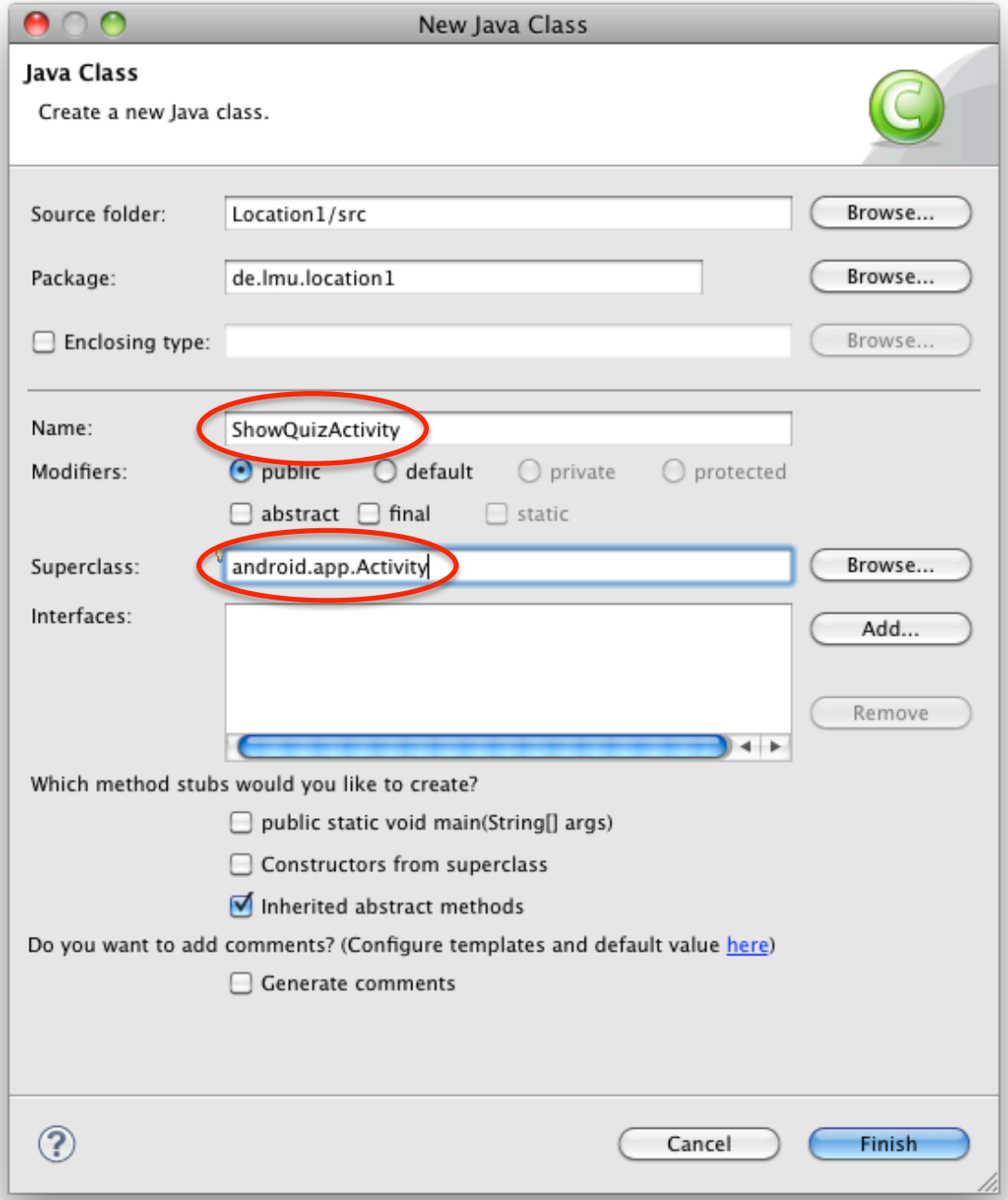
- Exercise: Create Main View and Quiz View
  - main view in /res/layout/main.xml
  - quiz view in /res/layout/showquiz.xml
    (start by copying main.xml, then adapt it)

- Alt+F2: eclipse-ide-3.6

Using Activities

Activities

- Create new class ShowQuizActivity
- Superclass: android.app.Activity



ShowQuizActivity → AndroidManifest.xml

- Activity class:

```
public class ShowQuizActivity extends Activity {
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.showquiz);
} }
```

- AndroidManifest.xml (inside application element)

```
<activity android:name="de.lmu.quiz.ShowQuizActivity"
          android:label="showquiz"
    android:screenOrientation="portrait">
</activity>
```

How to start the new activity?

- Starting an activity:

```
Intent intent = new Intent(this, ShowQuizActivity.class);
startActivityForResult(intent, requestCode);
```

- Processing the result when the activity returns:

```
void onActivityResult(int requestCode, int resultCode, Intent data) {
    // do something with the result…
}
```

- Exercise:
  - Create the ShowQuizActivity
  - Create a menu in the MainActivity
  - Start ShowQuizActivity from the menu

How to return to the previous activity?

- Set result and finish the activity

  setResult(points);

  finish();

- Exercise: Return from ShowQuizActivity to MainActivity
  - Set OnClickListener for submit button in ShowQuizActivity
  - When button is clicked, set result to 123 and finish the task
  - Show the result in the points view in MainActivity

How to copy data from one activity to another?

- Add “extras” to Intent objects

```
Intent intent = new Intent(this, ShowQuizActivity.class);
intent.putExtra("title", "Target 1");
intent.putExtra("image", R.drawable.location1);
startActivityForResult(intent, resultCode);
```

- Can put primitive types and Serializable types into extras
  - java.io.Serializable is just a “tagging” interface (no methods)
- Exercise: Show title and image for a location
  - Use a (small) image from the Web
  - Name the image “location1.png” (or “location1.jpg”)
  - Put the image into all “/res/drawable-*” folders
  - Put title and image-id into intent extras
  - Show the image in the ShowQuizActivity

How to share complex data between activities?

- In the calling activity, create a public static member (class variable) that references the shared object

```
public static PointOfInterest sharedPoi = null;
```

- Before starting the new activity, set the shared object

```
Intent intent = new Intent(this, ShowQuizActivity.class);
sharedPoi = closestPoi;
startActivity(intent);
```

- Use original shared object in called activity

```
TextView titleView = (TextView) findViewById(R.id.showQuestionTitle);
titleView.setText(MainActivity.sharedPoi.title);
```

How to share complex data between activities? (possibility 2)

- Subclass android.app.Application, put shared data there

```
public class LocationQuiz extends Application {
    int points = 0;
    PointOfInterest currentPoi = null;
}
```

- Change AndroidManifest.xml

```
<application android:name="de.lmu.location.LocationQuiz" …>
    …
</application>
```

- Access shared data in activities

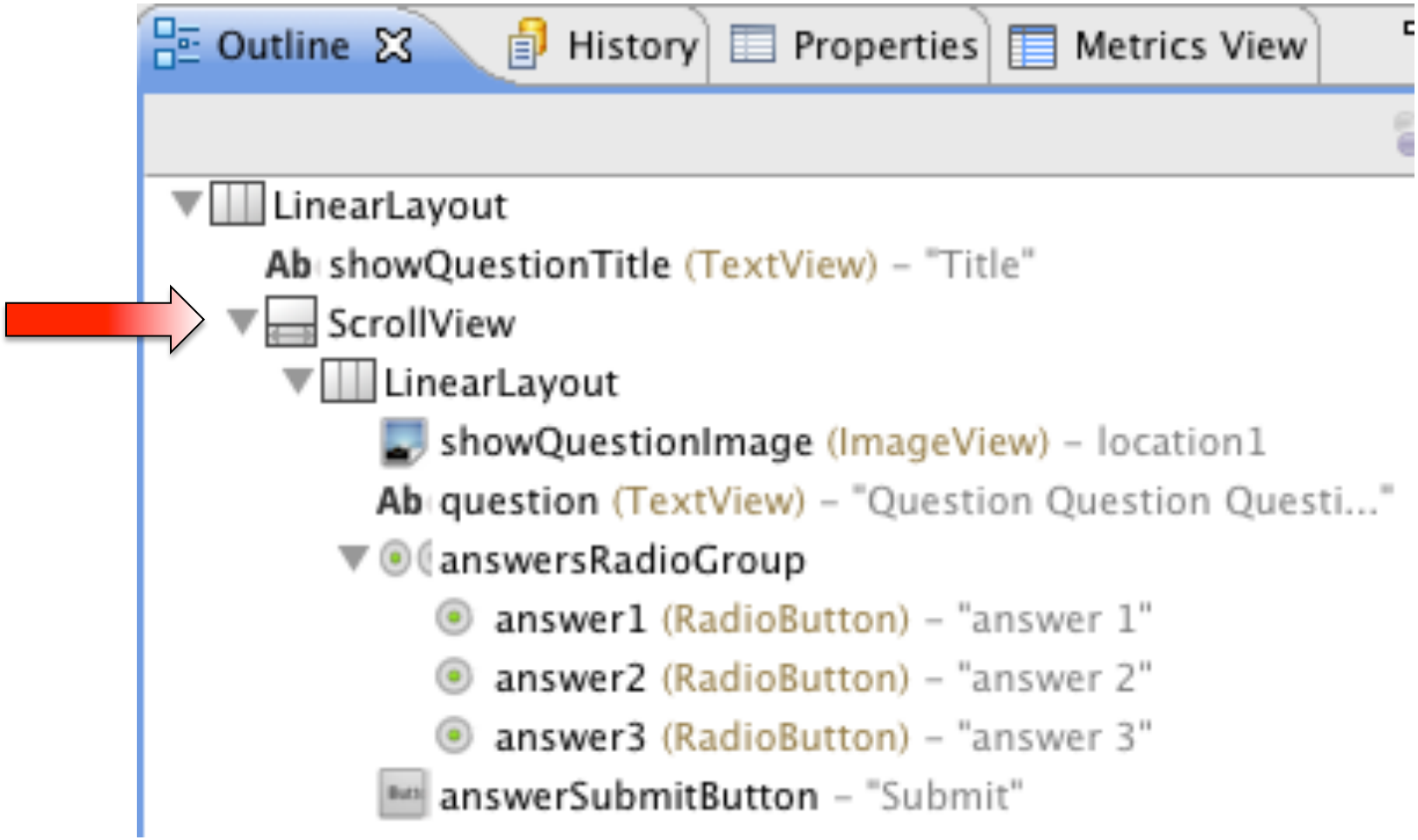
```
LocationQuiz app = (LocationQuiz) getApplication();
app.currentPoi = …;
app.points = 0;
```

Location

GPS (Global Positioning System)

Layout of QuizActivity

- If content can be larger than the screen: ScrollView



Data Structures

- Need to define classes that hold data
- Which classes to define?

- Exercise: Create classes to hold the required data

- Exercise: Example POIs and quizzes
  - Take a few sample points-of-interest and quizzes and enter them in your data structures

class PointOfInterest

- longitude, latitude
  - double
- Name
  - string
- Bild
  - int (Resource-ID)
- Radius
  - double
- Id (?)
  - int
- Frage:
  - QuizQuestion

class QuizQuestion

- Frage
  - String
- Antworten
  - String[n] – feste Anz. Antworten
  - ArrayList<String> -- variable Anz. Antworten
- Bewertung
  - Versch. Punkte pro Antwort: int[n] (nach Schwierigkeitsgrad?)
  - Nur eine richtige Antwort: int

Konstrukor für POI

```
POI(    double lat,
        double lon,
        double radius,
        String name,
        int imageID,
        QuizQuestion q ) {}
QuizQuestion (      String frage,  // per Hand eintippen
                    String antwort1,
                    String antwort2,
                    String antwort3,
                    int richtigeAntwort) {}
```

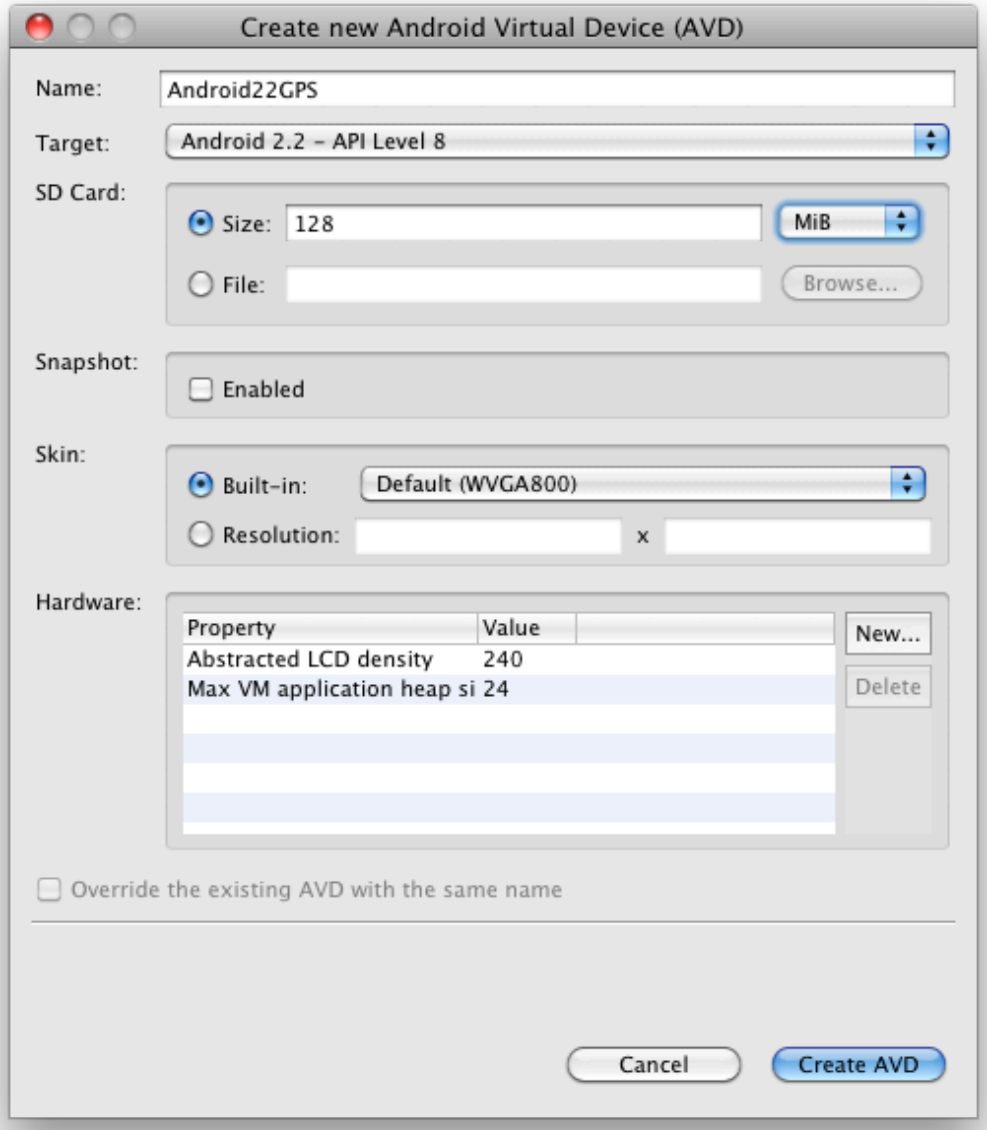
Wo POIs Speichern

- dynamische Liste (z.B. ArrayList)
  - in mainActivity generieren

http://probestudium.ifi.lmu.de/2011

- Arbeitsmaterialien
- Arbeitsgruppen
  - Android-Projekte
    (Eclipse → File → Export → General → Archive File (zip)
  - Bilder der Sehenswürdigkeiten (png oder jpg)
  - Code zum Instantiieren der Objekte in Java

Enabling GPS on the Emulator



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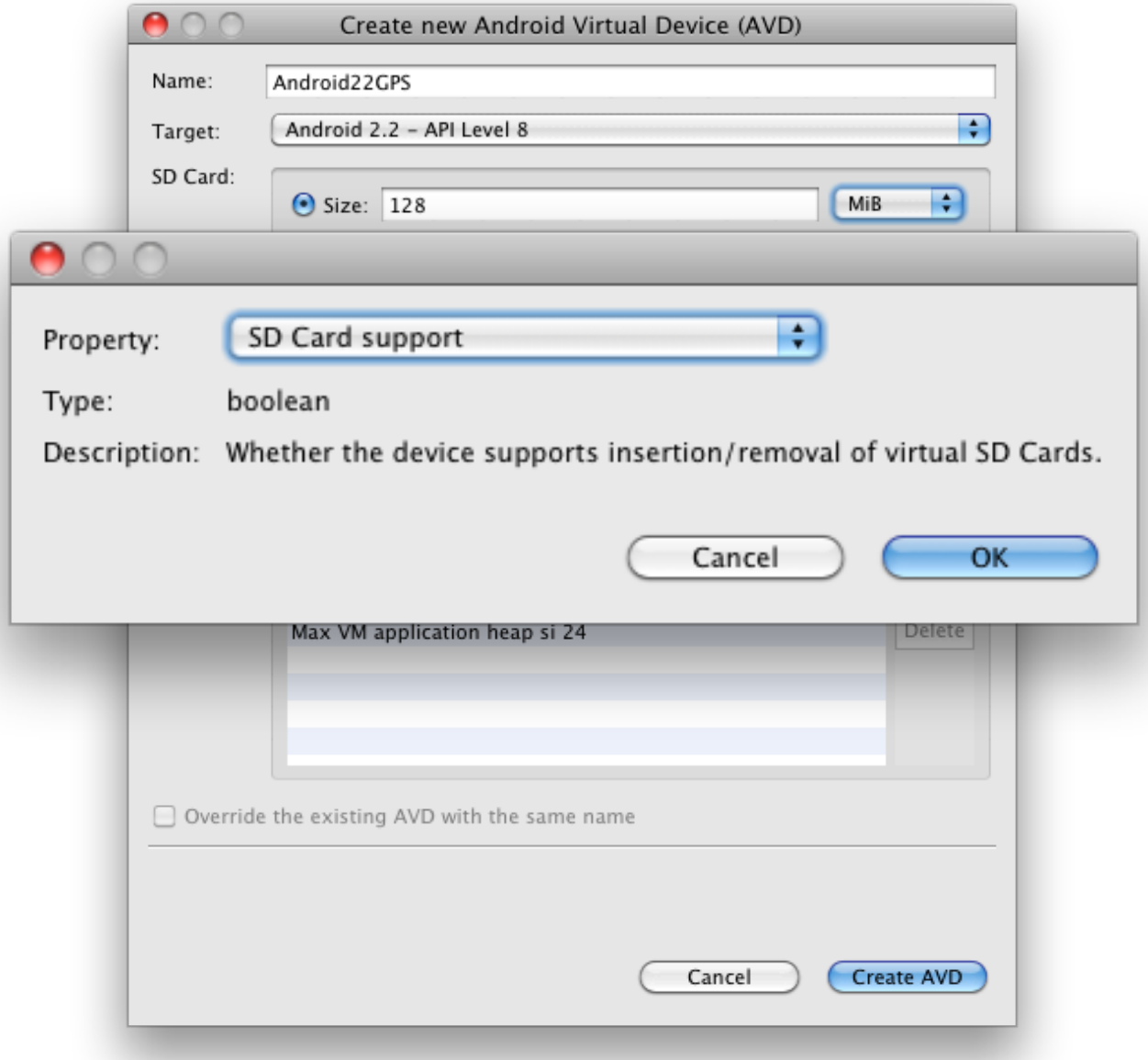

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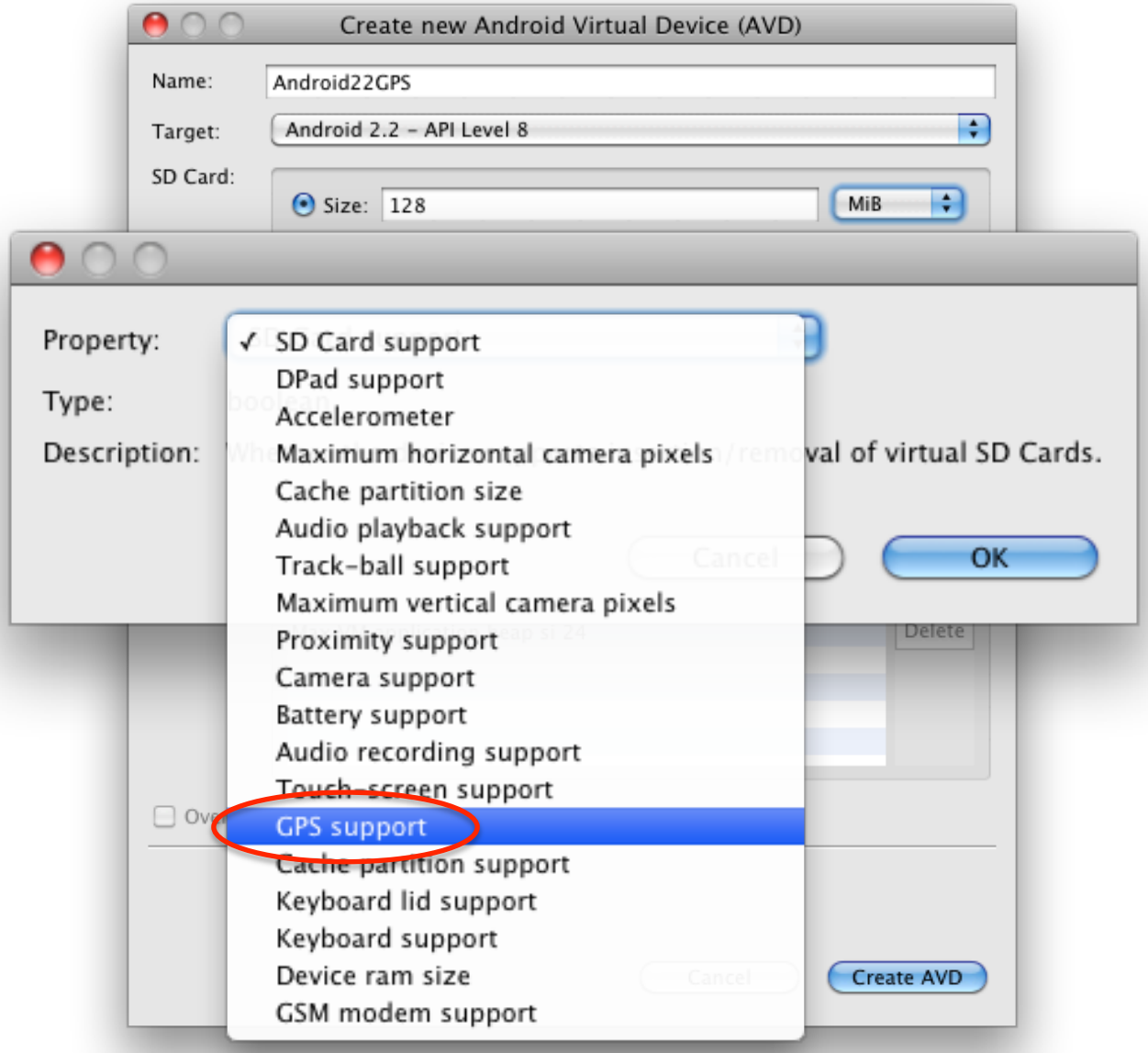

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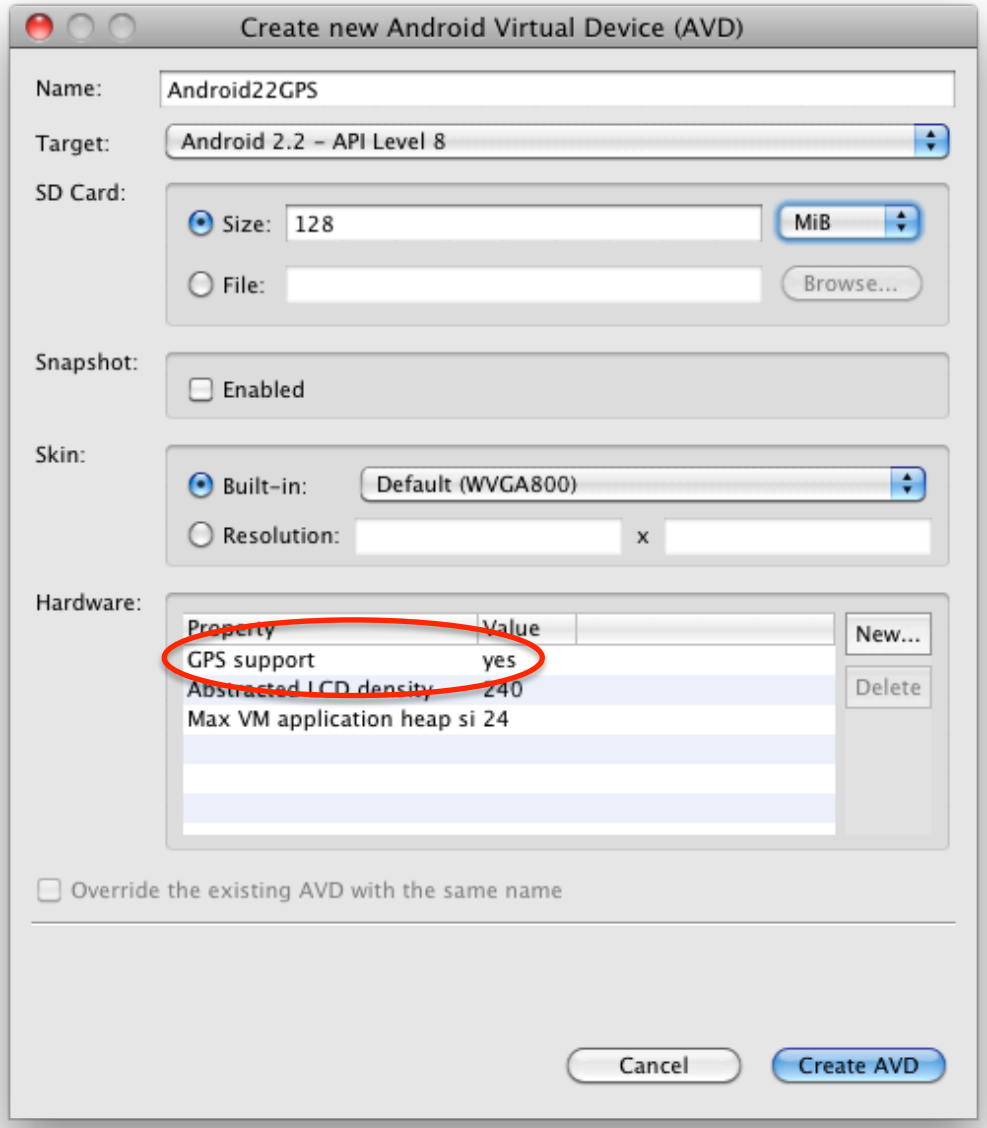
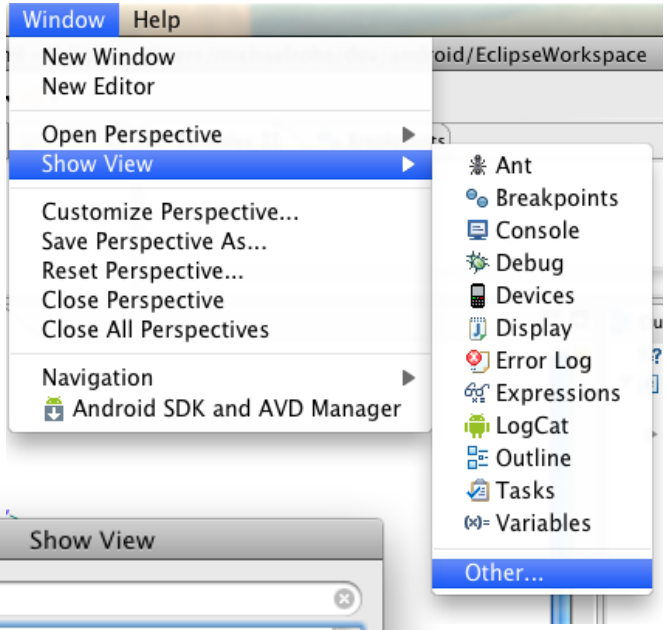
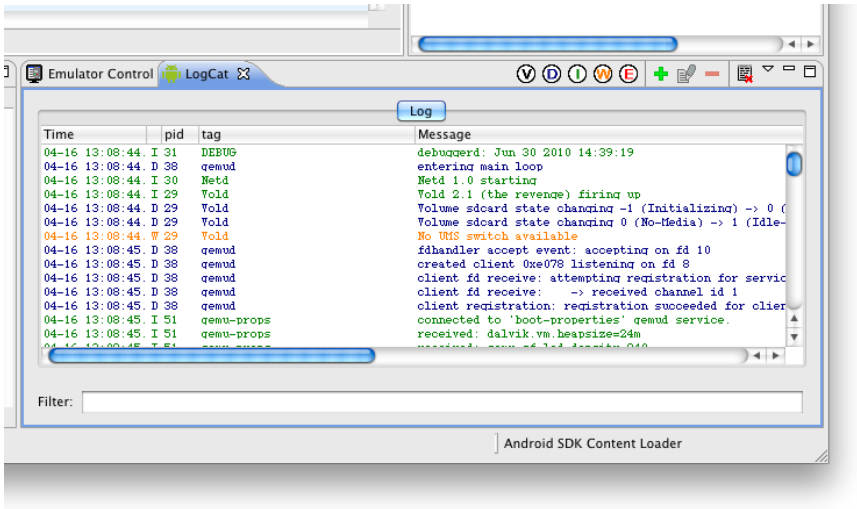
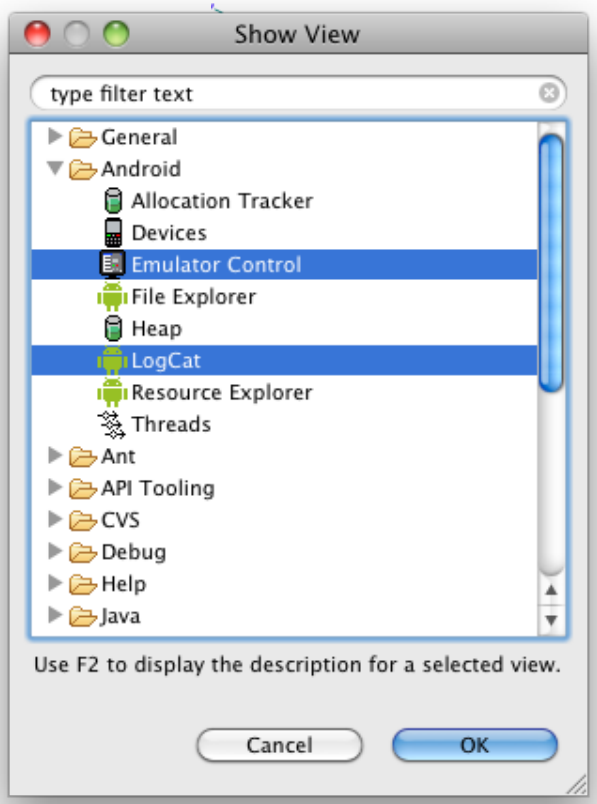


Eclipse Configuration

- LogCat View
  - Log.d output
- Emulator Control View
  - Entering locations



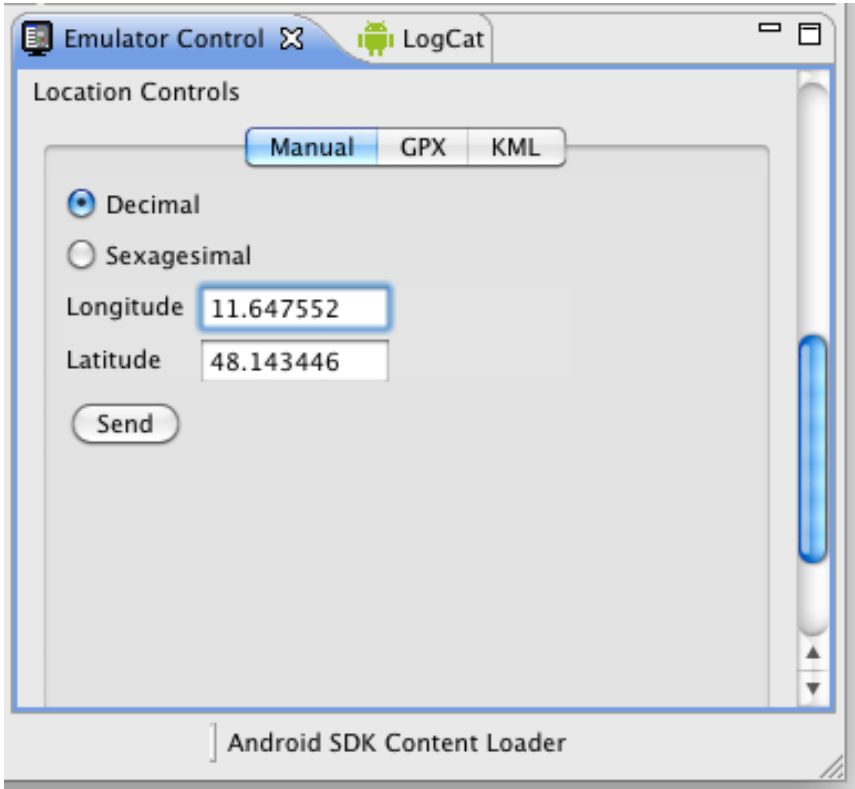




Entering Locations in Emulator Control View

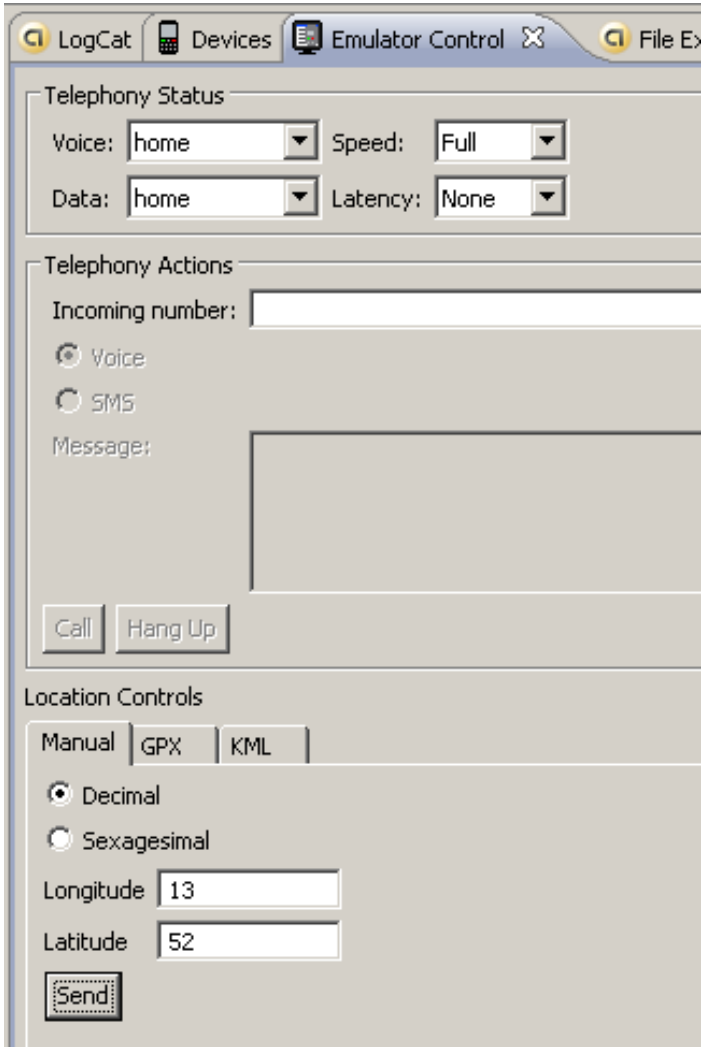
- How to get latitude and longitude?

  see next slides…



Simulated Location for the Emulator

- Dalvik Debug Monitor Service
- Play back GPS traces
  - GPX: GPS Exchange Format
  - KML: Keyhole Markup Language
- Telnet to a running emulator
  - telnet localhost <emulator port>
  - geo fix <lon> <lat>
  - geo nmea <nmea sentence>
- Example
  - telnet localhost 5554
  - geo fix 13 52
  - http://developer.android.com/intl/fr/guide/developing/tools/emulator.html



Keyhole Markup Language (KML)

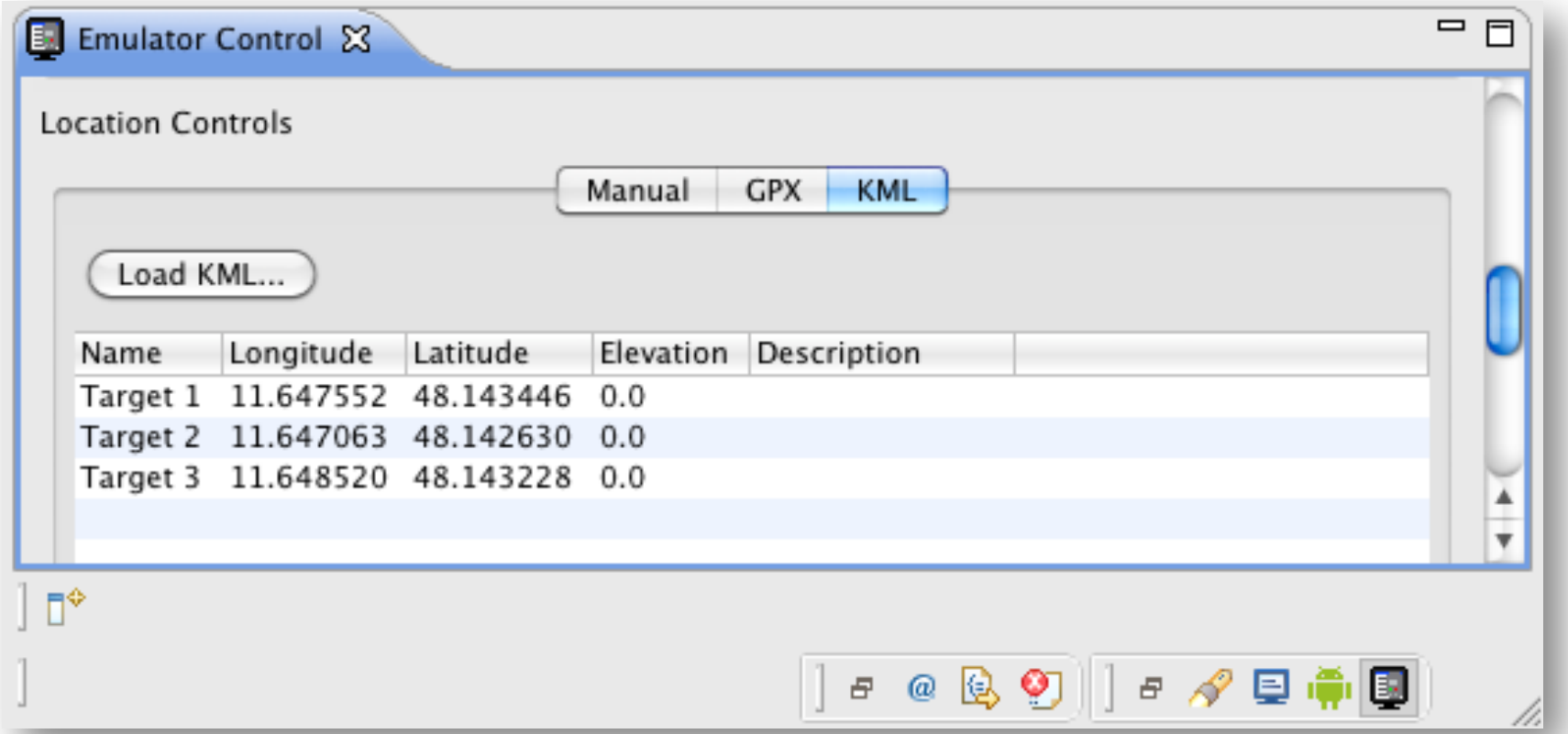
- XML-based language for expressing geographic information
  - Standardized by the Open Geospatial Consortium
  - Used in Google Maps (Mobile), Google Earth
- Example:

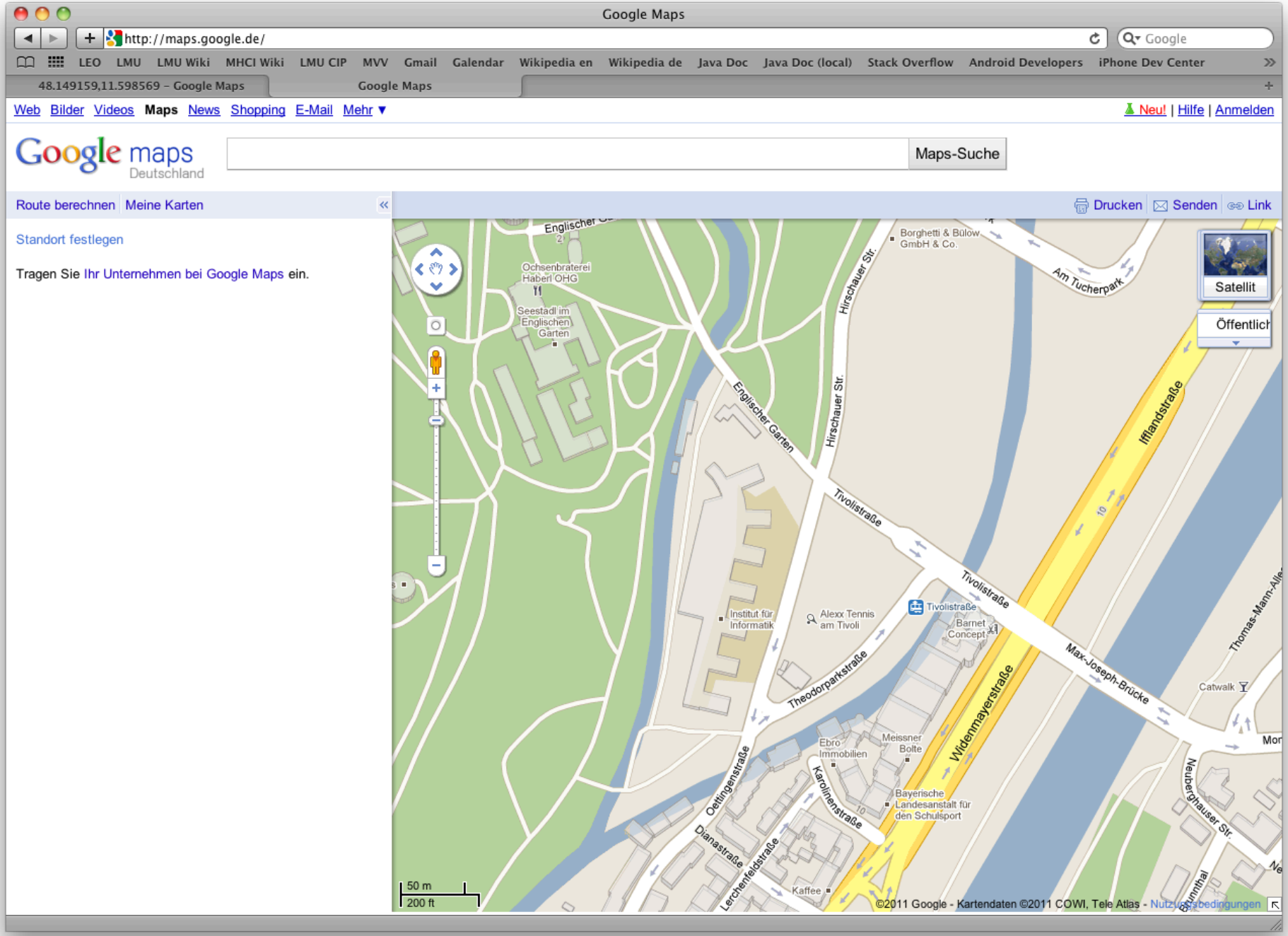
```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
  <Document>
    <Placemark>
      <name>Target 1</name>
      <description>This is the first target.</description>
      <Point>
        <coordinates>11.647552,48.143446,0</coordinates> <!-- longitude, latitude, altitude -->
      </Point>
    </Placemark>
  </Document>
</kml>
```

- Try it out: kml-samples.googlecode.com/svn/trunk/interactive/index.html

KML in the Emulator

- Click a row to send location to emulator




Google Maps
http://maps.google.de/
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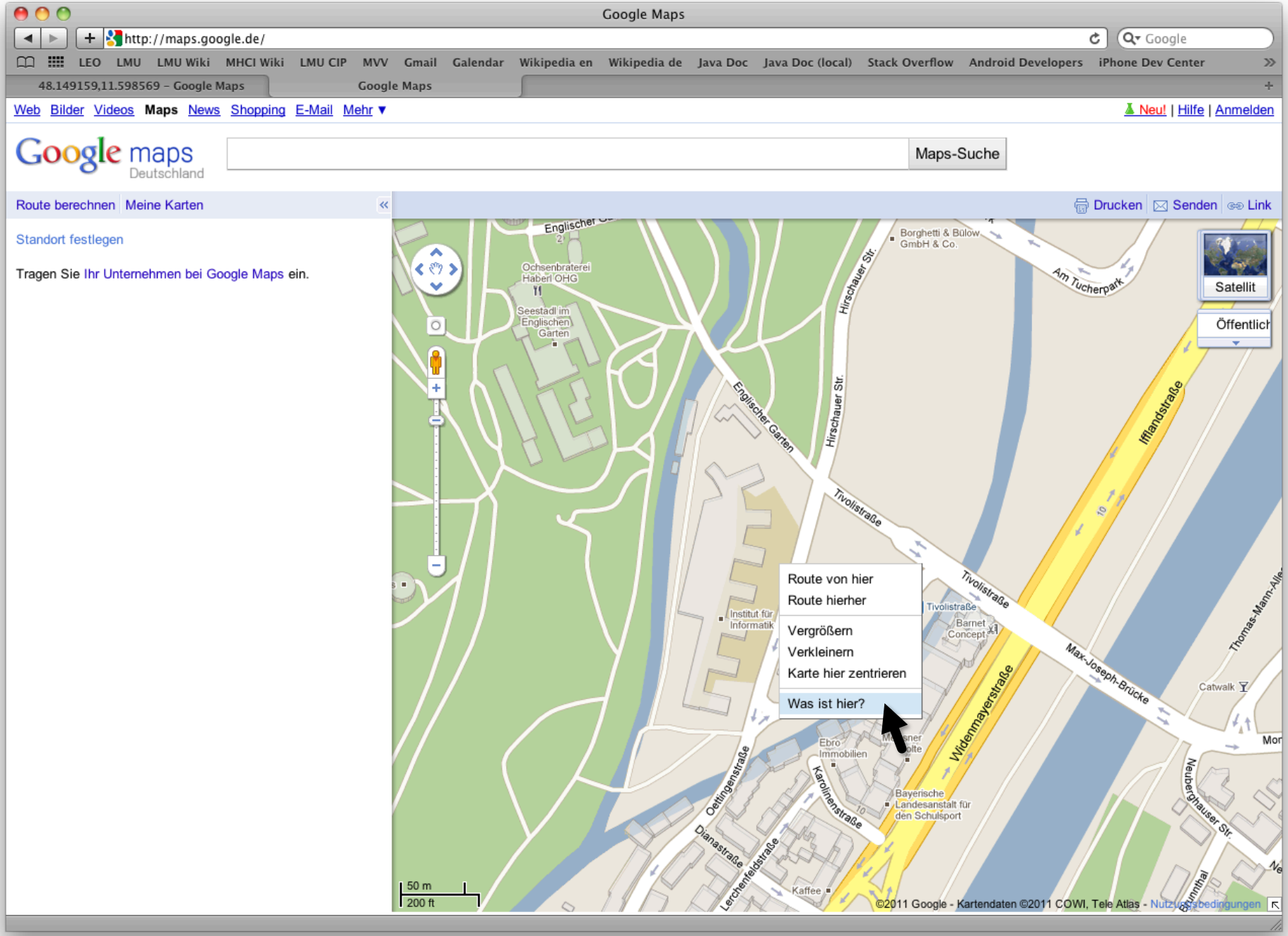
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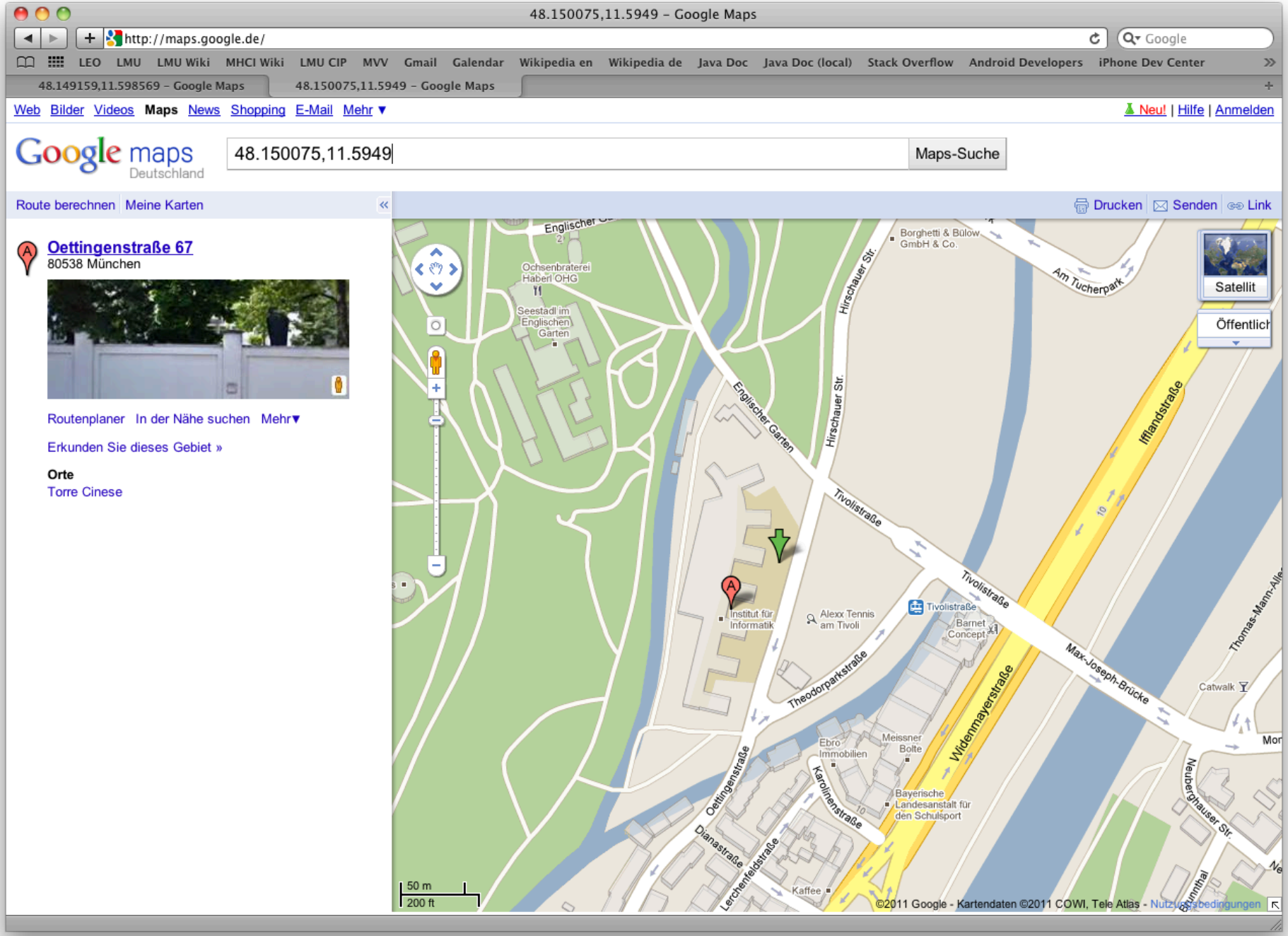
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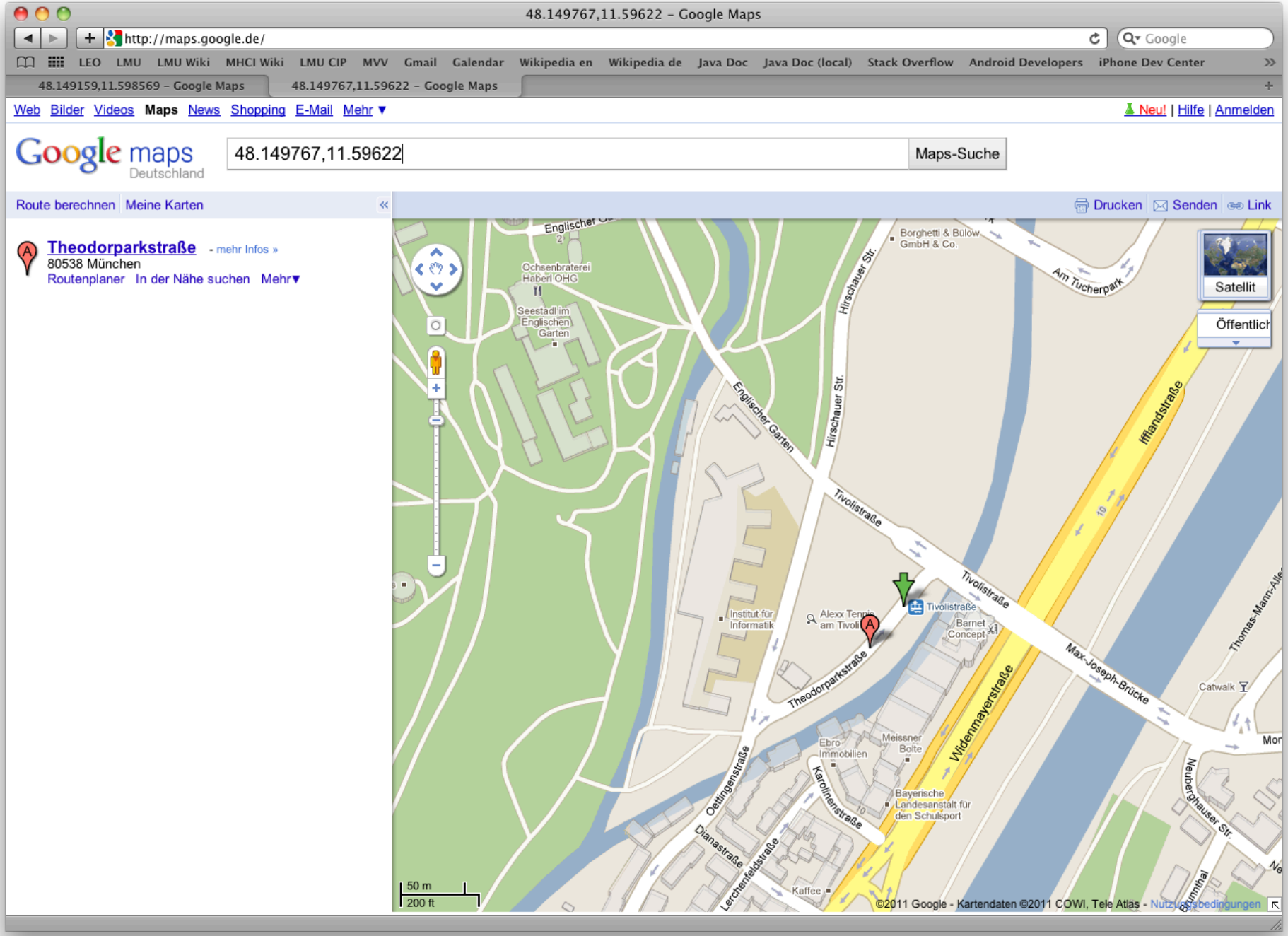
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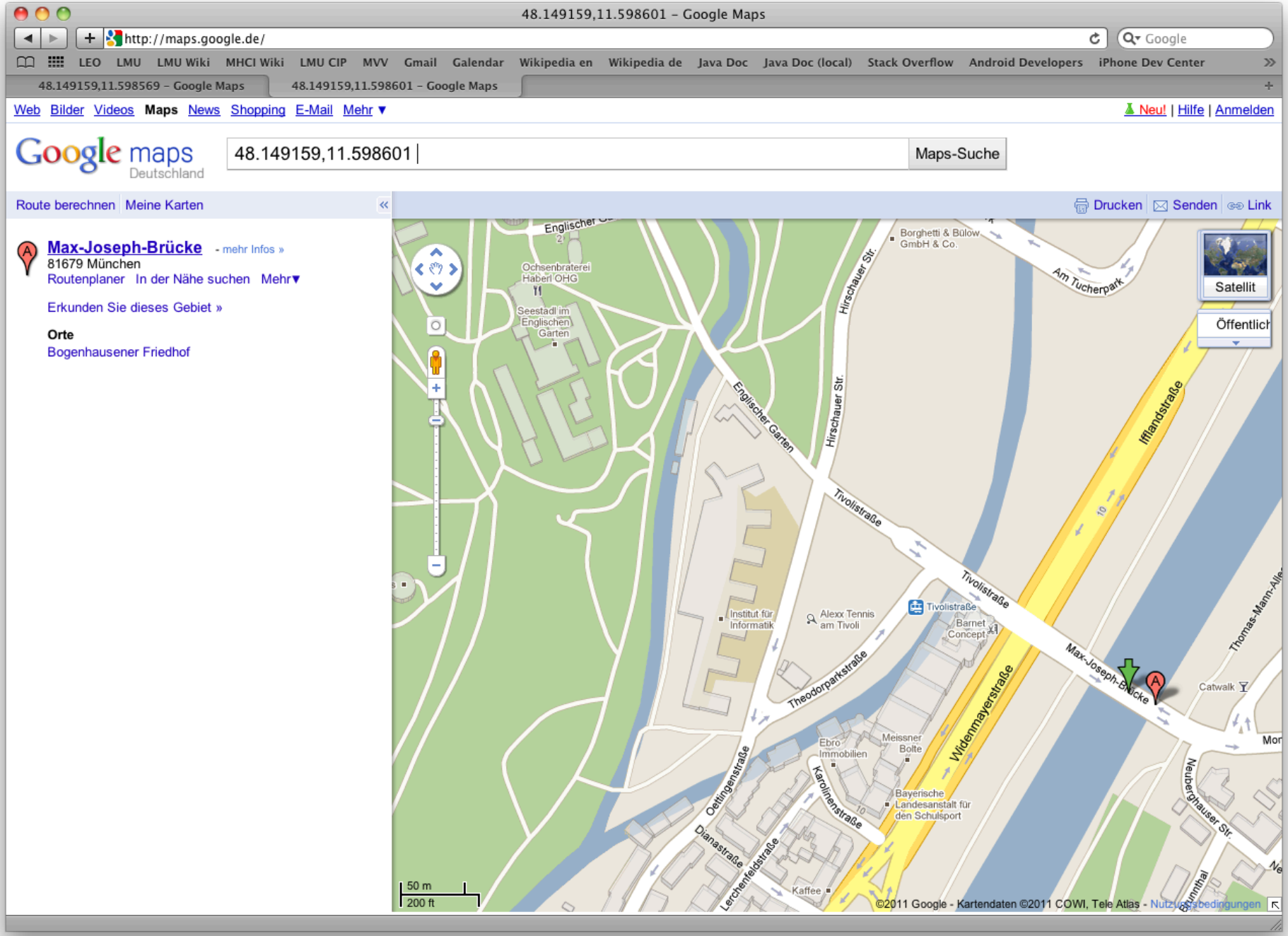
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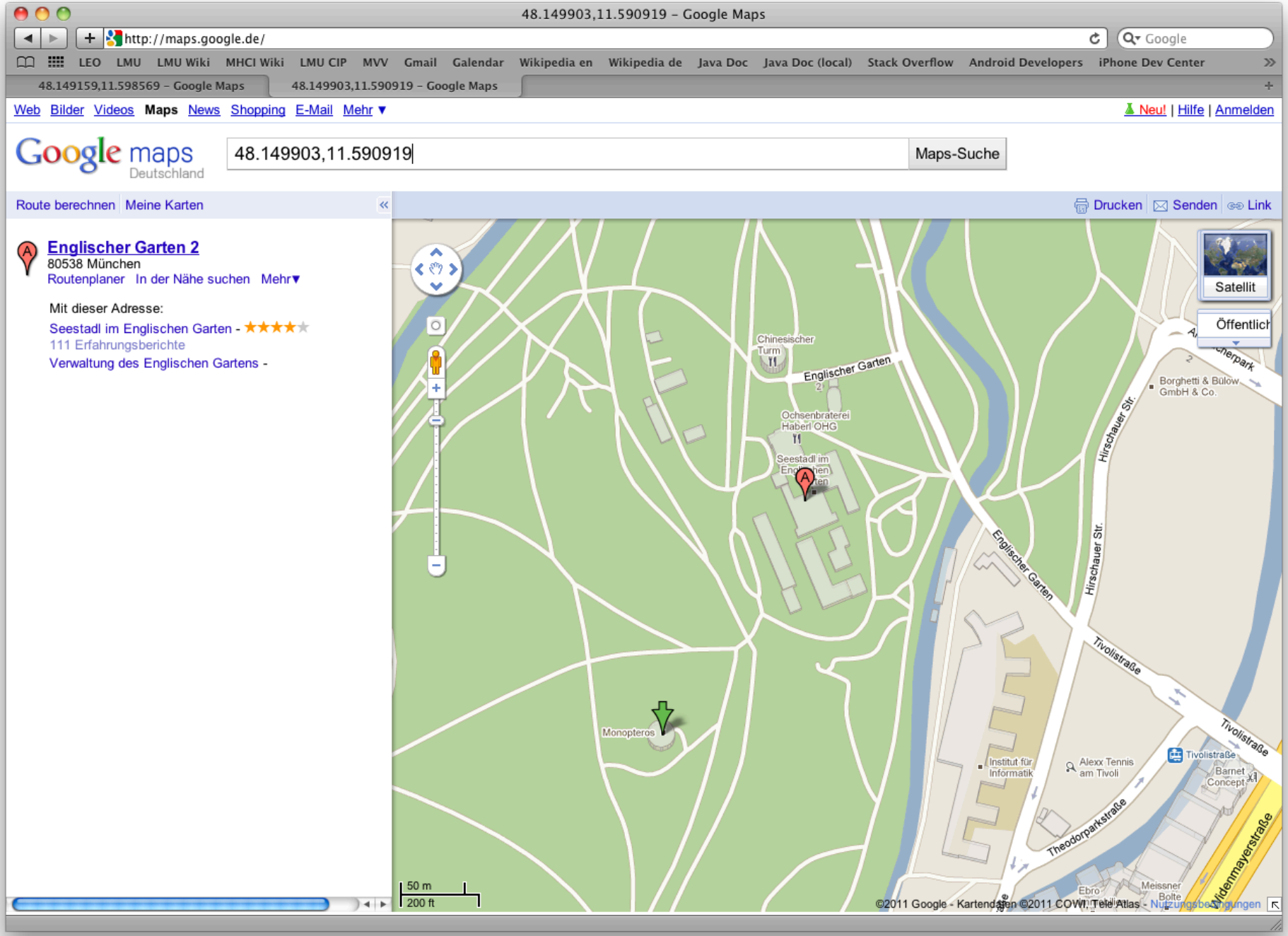
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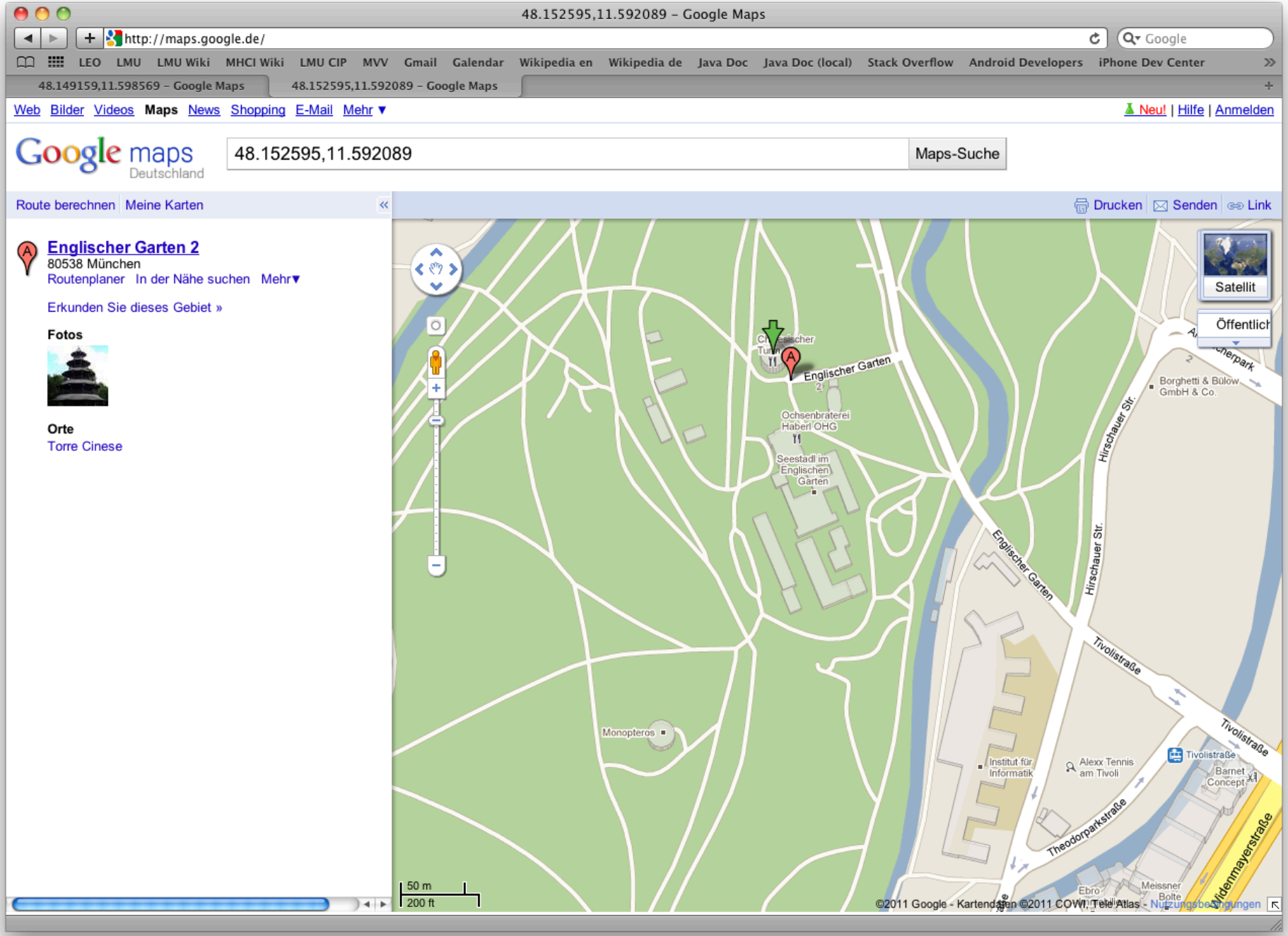
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Permissions (in AndroidManifest.xml)

- Permissions for location-based services

```
<uses-permission
  android:name="android.permission.ACCESS_COARSE_LOCATION" />
<uses-permission
  android:name="android.permission.ACCESS_FINE_LOCATION" />
<uses-permission
  android:name="android.permission.ACCESS_MOCK_LOCATION" />
<uses-permission
  android:name="android.permission.ACCESS_LOCATION_EXTRA_COMMANDS" />
<uses-permission
  android:name="android.permission.INTERNET" />
```

- Overview of Android permissions
  - http://developer.android.com/reference/android/Manifest.permission.html

Example Manifest for Location

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="de.lmu.location"
    android:versionCode="1"
    android:versionName="1.0">
  <uses-sdk android:minSdkVersion="8" />
  <application android:icon="@drawable/icon" android:label="@string/app_name" android:debuggable="true">
    <activity android:name=".MainActivity"
              android:label="@string/app_name">
      <intent-filter>
        <action android:name="android.intent.action.MAIN" />
        <category android:name="android.intent.category.LAUNCHER" />
      </intent-filter>
    </activity>
  </application>
  <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
  <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />
  <uses-permission android:name="android.permission.ACCESS_MOCK_LOCATION" />
  <uses-permission android:name="android.permission.ACCESS_LOCATION_EXTRA_COMMANDS" />
  <uses-permission android:name="android.permission.VIBRATE" />
</manifest>
```

Distance Between Geo-Locations

- Distance (in m) between two geolocations

```
float[] results = new float[1];
Location.distanceBetween(lat, lon, poi.latitude, poi.longitude, results);
float distance = results[0];
```

Exercise: Location Updates

- Register for location updates from the location manager with an interval of 5s.
  - Only register for location updates when the MainActivity is actually active (i.e. use onResume and onPause to register/ unregister updates).
- Handle location updates in the MainActivity itself
  - See next slide for template
- Start ShowQuizActivity if the user enters a POI
  - Put POI data structure into Intent-extra

Template for Location Updates

```
public class MainActivity extends Activity implements LocationListener {
    LocationManager locationManager = null;
    …
    public void onLocationChanged(Location location) {
        if (location != null) {
            // process location update
        }
    }
    public void onProviderDisabled(String provider) {}
    public void onProviderEnabled(String provider) {}
    public void onStatusChanged(String provider, int status, Bundle ext) {}
}
```

How to vibrate the phone?

- Java

  ```
  Vibrator vibrator = (Vibrator) getSystemService(Context.VIBRATOR_SERVICE);
  vibrator.vibrate(1000);
  ```

- AndroidManifest.xml

  ```
  <uses-permission android:name="android.permission.VIBRATE" />
  ```

- Exercise: Make the phone vibrate when the Quiz starts (i.e. when the user enters the target area)

Exercise: Field Test

- Try out your program outdoors

- Come back and improve it
- Find test users to evaluate your program
- Improve it some more…

Prof. Dr. Michael Rohs
michael.rohs@ifi.lmu.de
Dipl.-Inform. Sven Kratz
sven.kratz@ifi.lmu.de
Mobile Interaction Lab, LMU München