App Development for Smart Devices

CS 495/595 - Fall 2011

Lec #14: Telephony and SMS

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Objective

- **Telephony**
  - ➢ Initiating phone calls
  - ➢ Reading the phone, network, data connectivity, and SIM states
  - ➢ Monitoring changes to the phone, network, data connectivity, and
- **SMS**
  - ➢ Using Intents to send SMS and MMS messages
  - ➢ Using the SMS Manager to send SMS Messages
  - ➢ Handling incoming SMS messages
- **Presentation**
  - NeuroPhone: Brain-Mobile Phone Interface using a Wireless EEG Headset
    - Presenter: Minhao Dong

Telephony

Overview

- The Android telephony APIs allows:
  - ➢ Access the underlying telephone hardware stack
  - ➢ Create your own dialer
  - ➢ Integrate call handling and phone state monitoring

- For security, you can't create your own "**in call**" Activity
  - ➢ The screen that is displayed when an incoming call is received or an outgoing call has been placed.

Launching the Dialer

- Use Intent **Intent.ACTION_DIAL** to launch dialer activity.
  - Specify the number to dial using the **tel:** schema as the data component of the Intent.
  - Allows you to manage the call initialization (the default dialer asks the user to explicitly initiate the call).
  - Doesn’t require any permissions
  - The standard way applications should initiate calls.

```
Intent intent = new Intent(Intent.ACTION_DIAL, Uri.parse("tel:1234567"));
startActivity(intent);
```

Telephony Manager

- Access to the telephony APIs is managed by the Telephony Manager

```
String srvcName = Context.TELEPHONY_SERVICE;
TelephonyManager telephonyManager =  (TelephonyManager)getSystemService(srvcName);
```

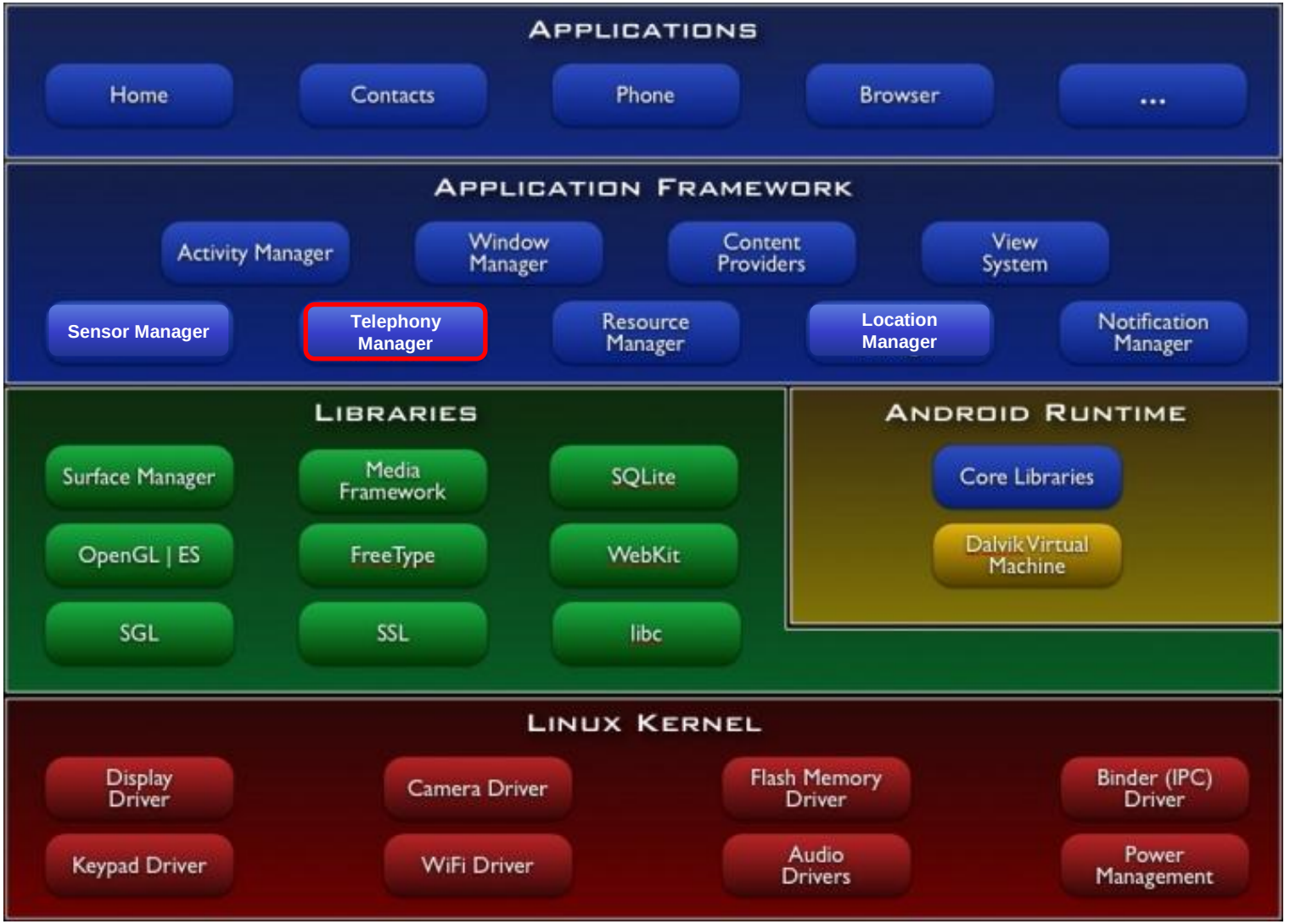
- Thru Telephony Manager you can obtain:
  - ➤ the phone type (GSM or CDMA),
  - ➤ unique ID (IMEI or MEID),
  - ➤ software version,
  - ➤ number.

- Requires the **READ_PHONE_STATE** uses-permission be included in the application manifest.

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

Telephony Manager Reference:
http://developer.android.com/reference/android/telephony/TelephonyManager.html

Telephony Manager



Reading Phone Details

```
// Read the phone's type
int phoneType =    telephonyManager.getPhoneType();
switch (phoneType) {
      case (TelephonyManager.PHONE_TYPE_CDMA): //do something
            break;
      case (TelephonyManager.PHONE_TYPE_GSM) :  //do something
            break;
      case (TelephonyManager.PHONE_TYPE_NONE): //do something
            break;
      default:
            break;
}

// -- These require READ_PHONE_STATE uses-permission --
// Read the IMEI for GSM or MEID for CDMA
String deviceId = telephonyManager.getDeviceId();

// Read the software version on the phone (note -- not the SDK version)
String softwareVersion = telephonyManager.getDeviceSoftwareVersion();

// Get the phone's number
String phoneNumber = telephonyManager.getLine1Number();
```

Reading Data Connection Status

```
int dataActivity = telephonyManager.getDataActivity();
int dataState = telephonyManager.getDataState();
switch (dataActivity) {
     case TelephonyManager.DATA_ACTIVITY_IN: //Currently receiving IP PPP traffic.
          break;
    case TelephonyManager.DATA_ACTIVITY_OUT: //Currently sending IP PPP traffic.
          break;
    case TelephonyManager.DATA_ACTIVITY_INOUT: //Currently both IN & OUT
          break;
    case TelephonyManager.DATA_ACTIVITY_NONE:  //No traffic.
          break;
}
switch (dataState) {
     case TelephonyManager.DATA_CONNECTED: //Connected.
          break;
     case TelephonyManager.DATA_CONNECTING: //Currently setting up data connection
          break;
     case TelephonyManager.DATA_DISCONNECTED:  //Disconnected
          break;
     case TelephonyManager.DATA_SUSPENDED:  //Suspended
          break;
}
```

Reading Network Details

```
// Get connected network country ISO code
String networkCountry = telephonyManager.getNetworkCountryIso();
// Get the connected network operator ID (MCC + MNC)
String networkOperatorId = telephonyManager.getNetworkOperator();
// Get the connected network operator name
String networkName = telephonyManager.getNetworkOperatorName();
// Get the type of network you are connected to
int networkType = telephonyManager.getNetworkType();
switch (networkType) {
    case (TelephonyManager.NETWORK_TYPE_1xRTT):      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_CDMA) :      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_EDGE) :      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_EVDO_0) : /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_EVDO_A) : /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_GPRS) :      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_HSDPA) :   /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_HSPA) :      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_HSUPA) :   /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_UMTS) :      /* … */  break;
    case (TelephonyManager.NETWORK_TYPE_UNKNOWN): /* … */  break;
    default: break;
}
```

Info about Service Providers in USA:
http://en.wikipedia.org/wiki/List_of_United_States_wireless_communications_service_providers

Reading SIM Details

```
int simState = telephonyManager.getSimState();
switch (simState) {
    case (TelephonyManager.SIM_STATE_ABSENT): break;
    case (TelephonyManager.SIM_STATE_NETWORK_LOCKED): break;
    case (TelephonyManager.SIM_STATE_PIN_REQUIRED): break;
    case (TelephonyManager.SIM_STATE_PUK_REQUIRED): break;
    case (TelephonyManager.SIM_STATE_UNKNOWN): break;
    case (TelephonyManager.SIM_STATE_READY): {
        // Get the SIM country ISO code
        String simCountry = telephonyManager.getSimCountryIso();
        // Get the operator code of the active SIM (MCC + MNC)
        String simOperatorCode = telephonyManager.getSimOperator();
        // Get the name of the SIM operator
        String simOperatorName = telephonyManager.getSimOperatorName();
        // -- Requires READ_PHONE_STATE uses-permission --

        // Get the SIM's serial number
        String simSerial = telephonyManager.getSimSerialNumber();

        break;
     }
    default: break;
}
```

Monitoring Phone Status

- Android lets you:
  - ➢ monitor phone state,
  - ➢ retrieve incoming phone numbers,
  - ➢ observe changes to data connections, signal strength, and network connectivity.
- Must specify the **READ_PHONE_STATE** uses-permission in its manifest
- Extend **PhoneStateListener** class to listen and respond to:
  - ➢ Phone state change events including call state (ringing, off hook, etc.),
  - ➢ Cell location changes,
  - ➢ Voice-mail and call-forwarding status,
  - ➢ Phone service changes,
  - ➢ Changes in mobile signal strength.

PhoneStateListener Reference:
http://developer.android.com/reference/android/telephony/PhoneStateListener.html

Monitoring Phone Status

- **Phone State Listener skeleton class**

```
PhoneStateListener phoneStateListener = new PhoneStateListener() {
    public void onCallForwardingIndicatorChanged(boolean cfi) {}
    public void onCallStateChanged(int state, String incomingNumber) {}
    public void onCellLocationChanged(CellLocation location) {}
    public void onDataActivity(int direction) {}
    public void onDataConnectionStateChanged(int state) {}
    public void onMessageWaitingIndicatorChanged(boolean mwi) {}
    public void onServiceStateChanged(ServiceState serviceState) {}
    public void onSignalStrengthChanged(int asu) {}
 };
```

- **Registering a Phone State Listener**

```
telephonyManager.listen(phoneStateListener,
            PhoneStateListener.LISTEN_CALL_FORWARDING_INDICATOR |
            PhoneStateListener.LISTEN_CALL_STATE |
            PhoneStateListener.LISTEN_CELL_LOCATION |
            PhoneStateListener.LISTEN_DATA_ACTIVITY |
            PhoneStateListener.LISTEN_DATA_CONNECTION_STATE |
            PhoneStateListener.LISTEN_MESSAGE_WAITING_INDICATOR |
            PhoneStateListener.LISTEN_SERVICE_STATE |
            PhoneStateListener.LISTEN_SIGNAL_STRENGTH);
```

Monitoring Phone Calls

- The **onCallStateChanged** handler receives the phone number associated with incoming calls, and the state parameter represents the current call state:
  - ➤ TelephonyManager.CALL_STATE_IDLE When the phone is neither ringing nor in a call
  - ➤ TelephonyManager.CALL_STATE_RINGING When the phone is ringing
  - ➤ TelephonyManager.CALL_STATE_OFFHOOK When the phone is currently in a call

```
PhoneStateListener callStateListener = new PhoneStateListener() {
    public void onCallStateChanged(int state, String incomingNumber) {
        // TODO React to incoming call.
    }
};

 telephonyManager.listen(callStateListener, PhoneStateListener.LISTEN_CALL_STATE);
```

Tracking Cell Location Changes

- Override **onCellLocationChanged** to listen for cell location changes
- Add the ACCESS_COARSE_LOCATION permission to your application manifest.

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

- Handler receives a **CellLocation** object that includes methods for extracting the cell ID (**getCid**) and the current LAC (**getLac**).

```
PhoneStateListener cellLocationListener = new PhoneStateListener() {
    public void onCellLocationChanged(CellLocation location) {
        GsmCellLocation gsmLocation = (GsmCellLocation)location;
          Toast.makeText(getApplicationContext(),
                                    String.valueOf(gsmLocation.getCid()),
                                    Toast.LENGTH_LONG).show();
    }
};

telephonyManager.listen(cellLocationListener,  PhoneStateListener.LISTEN_CELL_LOCATION);
```

Tracking Service Changes

- The **onServiceStateChanged** handler tracks the service
- Use the **ServiceState** parameter with **getState** method to find details of the current service state.
  - ➤ STATE_IN_SERVICE Normal phone service is available.
  - ➤ STATE_EMERGENCY_ONLY Phone service is available only for emergency calls.
  - ➤ STATE_OUT_OF_SERVICE No cell phone service is currently available.
  - ➤ STATE_POWER_OFF The phone radio is turned off
- **getOperator*** methods to retrieve details on the operator while **getRoaming** tells you if the device is using a roaming profile.

```
PhoneStateListener serviceStateListener = new PhoneStateListener() {
    public void onServiceStateChanged(ServiceState serviceState) {
        if (serviceState.getState() == ServiceState.STATE_IN_SERVICE) {
            String toastText = serviceState.getOperatorAlphaLong();
            Toast.makeText(getApplicationContext(), toastText, Toast.LENGTH_SHORT);
        }
    }
};
lephonyManager.listen(serviceStateListener, PhoneStateListener.LISTEN_SERVICE_STATE);
```

ServiceState Reference:
http://developer.android.com/reference/android/telephony/ServiceState.html

Monitoring Data Connection/Activity

- Override **onDataActivity** to track data transfer activity, and **onDataConnectionStateChanged** to request notifications for data connection state changes.

```
PhoneStateListener dataStateListener = new PhoneStateListener() {
    public void onDataActivity(int direction) {
        switch (direction) {
            case TelephonyManager.DATA_ACTIVITY_IN : break;
            case TelephonyManager.DATA_ACTIVITY_OUT : break;
            case TelephonyManager.DATA_ACTIVITY_INOUT : break;
            case TelephonyManager.DATA_ACTIVITY_NONE : break;
        }
    }
    public void onDataConnectionStateChanged(int state) {
        switch (state) {
            case TelephonyManager.DATA_CONNECTED : break;
            case TelephonyManager.DATA_CONNECTING : break;
            case TelephonyManager.DATA_DISCONNECTED : break;
            case TelephonyManager.DATA_SUSPENDED : break;
        }
    }
};

telephonyManager.listen(dataStateListener, PhoneStateListener.LISTEN_DATA_ACTIVITY |
                                           PhoneStateListener.LISTEN_DATA_CONNECTION_STATE);
```

SMS and MMS

Overview

- SMS sends short text messages between mobile phones.
  - ➢ Supports sending both text messages and data messages
- MMS (multimedia messaging service) messages have allowed users to send and receive messages that include multimedia attachments such as photos, videos, and audio.
- Using the **SMSManager**, you can replace the native SMS application to send text messages, react to incoming texts, or use SMS as a data transport layer.
- Use the **SEND** and **SEND_TO** actions in Intents to send both SMS and MMS messages using a messaging application installed on the device.

Sending SMS/MMS thru Native App

- Use Intent with **Intent.ACTION_SENDTO** action:
  - ➢ Specify a target number using **sms: schema** notation as the Intent data.
  - ➢ Include the message you want to send within the Intent payload using an **sms_body extra**.

```
Intent smsIntent = new Intent(Intent.ACTION_SENDTO, Uri.parse("sms:55512345"));
smsIntent.putExtra("sms_body", "Press send to send me");
startActivity(smsIntent);
```

Sending SMS/MMS thru Native App

- You can also attach files (effectively creating an MMS message) to your messages
  - ➢ Add an **Intent.EXTRA_STREAM** with the URI of the resource to attach.
  - ➢ Set the Intent **type** to the **mime-type** of the attached resource.
  - ➢ Use **ACTION_SEND** and include the target phone number as an address extra

```
// Get the URI of a piece of media to attach.
Uri attached_Uri = Uri.parse("content://media/external/images/media/1");

// Create a new MMS intent
Intent mmsIntent = new Intent(Intent.ACTION_SEND, attached_Uri);
mmsIntent.putExtra("sms_body", "Please see the attached image");
mmsIntent.putExtra("address", "07912355432");
mmsIntent.putExtra(Intent.EXTRA_STREAM, attached_Uri);
mmsIntent.setType("image/png");
startActivity(mmsIntent);
```

Questions?