App Development for Smart Devices

CS 495/595 - Fall 2011

Lec #15: Telephony and SMS

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Objective

- Telephony
- **SMS**
  - ➢ Using Intents to send SMS and MMS messages
  - ➢ Using the SMS Manager to send SMS Messages
  - ➢ Handling incoming SMS messages
- **Presentation**
  - Calling All Cars: Cell Phone Networks and the Future of Traffic
    - Presenter: Jeremiah Dunn
  - The Pothole Patrol: Using a Mobile Sensor Network for Road Surface Monitoring
    - Presenter: Timothy Werner

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);
```

Sending SMS Manually

- SMS messaging in Android is handled by the **SmsManager**.

```
SmsManager smsManager = SmsManager.getDefault();
```

- Specify the **SEND_SMS** uses-permission.

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

- Use **sendTextMessage** from the SMS Manager, passing in the address (phone number) of your recipient and the text message you want to send,

```
String sendTo = "5551234";
String myMessage = "Android supports programmatic SMS messaging!";
smsManager.sendTextMessage(sendTo, null, myMessage, null, null);
```

SMS Manager Reference:
http://developer.android.com/reference/android/telephony/SmsManager.html

Tracking and Confirming SMS Delivery

- The final two parameters in **sendTextMessage** let you specify Intents to track the transmission and delivery.
- Implement and register corresponding Broadcast Receivers that listen for the actions you specify when creating the Pending Intents you pass in **sendTextMessage.**
- Intent parameter, **sentIntent**, is fired when the message either is successfully sent or fails to send.
  - ➢ Activity.RESULT_OK
  - ➢ SmsManager.RESULT_ERROR_GENERIC_FAILURE
  - ➢ SmsManager.RESULT_ERROR_RADIO_OFF
  - ➢ SmsManager.RESULT_ERROR_NULL_PDU
- The second Intent parameter, **deliveryIntent**, is fired only after the destination recipient receives your SMS message.

SMS delivery monitoring pattern

```
String SENT_SMS_ACTION = "SENT_SMS_ACTION";
String DELIVERED_SMS_ACTION = "DELIVERED_SMS_ACTION";

// Create the sentIntent parameter
Intent sentIntent = new Intent(SENT_SMS_ACTION);
PendingIntent sentPI = PendingIntent.getBroadcast(getApplicationContext(),
                                                  0, sentIntent, 0);

// Create the deliveryIntent parameter
Intent deliveryIntent = new Intent(DELIVERED_SMS_ACTION);
PendingIntent deliverPI = PendingIntent.getBroadcast(getApplicationContext(),
                                                  0, deliveryIntent, 0);

// Register the Broadcast Receivers
registerReceiver(new BroadcastReceiver() {
        @Override
        public void onReceive(Context _context, Intent _intent)
        {
            switch (getResultCode()) {
                case Activity.RESULT_OK:
                    [ . . . send success actions . . . ];  break;
                case SmsManager.RESULT_ERROR_GENERIC_FAILURE:
                    [ . . . generic failure actions . . . ]; break;
```

SMS delivery monitoring pattern

```
                        case SmsManager.RESULT_ERROR_RADIO_OFF:
                            [ . . . radio off failure actions . . . ]; break;
                        case SmsManager.RESULT_ERROR_NULL_PDU:
                            [ . . . null PDU failure actions . . . ]; break;
                    }
                }
            },
            new IntentFilter(SENT_SMS_ACTION));

registerReceiver(new BroadcastReceiver() {
                @Override
                public void onReceive(Context _context, Intent _intent)
                {
                        [ . . . SMS delivered actions . . . ]
                }
             },
            new IntentFilter(DELIVERED_SMS_ACTION));

// Send the message
smsManager.sendTextMessage(sendTo, null, myMessage, sentPI, deliverPI);
```

Large SMS Messages

- SMS text messages are normally limited to 160 characters.
- Longer messages need to be broken into a series of smaller parts.
  - ➢ **divideMessage** method accepts a string as an input and breaks it into an Array List of messages
  - ➢ use the **sendMultipartTextMessage** method on the SMS Manager to transmit the array of messages
  - ➢ The **sentIntent** and **deliveryIntent** parameters in the **sendMultipartTextMessage** method are Array Lists that is used to specify different Pending Intents to fire for each message part.

```
ArrayList<String> messageArray = smsManager.divideMessage(myMessage);
ArrayList<PendingIntent> sentIntents = new ArrayList<PendingIntent>();
for (int i = 0; i < messageArray.size(); i++)
    sentIntents.add(sentPI);

smsManager.sendMultipartTextMessage(sendTo, null,
                                    messageArray, sentIntents, null);
```

Handling Incoming SMS Messages

- With received SMS, new broadcast Intent is fired with the "**android.provider.Telephony.SMS_RECEIVED**" action.
- Specify the **RECEIVE_SMS** manifest permission.

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

- Use the **pdu** extras key to extract an array of SMS PDUs each of which represents an SMS message
- Call **SmsMessage.createFromPdu** to convert each PDU byte array into an SMS Message object

```
Bundle bundle = intent.getExtras();
if (bundle != null) {
    Object[] pdus = (Object[]) bundle.get("pdus");
    SmsMessage[] messages = new SmsMessage[pdus.length];
    for (int i = 0; i < pdus.length; i++)
        messages[i] = SmsMessage.createFromPdu((byte[]) pdus[i]);
}
```

Example of Incoming SMS Messages

- Register the Broadcast Receiver using an Intent Filter that listens for the android.provider.Telephony.SMS_RECEIVED action String

```
final String SMS_RECEIVED = "android.provider.Telephony.SMS_RECEIVED";
IntentFilter filter = new IntentFilter(SMS_RECEIVED);
BroadcastReceiver receiver = new IncomingSMSReceiver();  //defined below
registerReceiver(receiver, filter);
```

- Broadcast Receiver implementation whose onReceive handler checks incoming SMS texts that start with the string @echo, and then sends the same text back to the number that sent it.

```
public class IncomingSMSReceiver extends BroadcastReceiver {
    private static final String queryString = "@echo";
    private static final String SMS_RECEIVED =
                                    "android.provider.Telephony.SMS_RECEIVED";
```

Example of Incoming SMS Messages

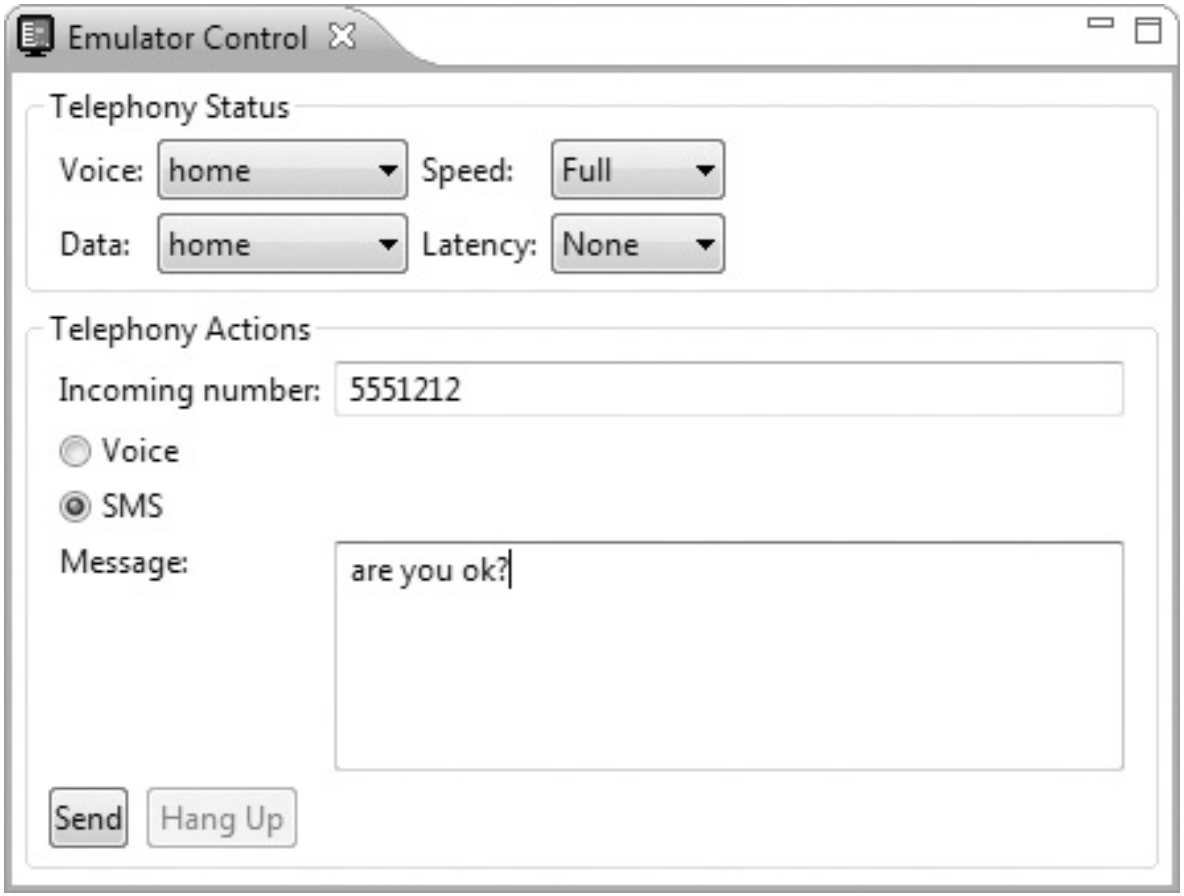
```
public void onReceive(Context _context, Intent _intent) {
        if (_intent.getAction().equals(SMS_RECEIVED)) {
            SmsManager sms = SmsManager.getDefault();
            Bundle bundle = _intent.getExtras();
            if (bundle != null) {
                Object[] pdus = (Object[]) bundle.get("pdus");
                SmsMessage[] messages = new SmsMessage[pdus.length];
                for (int i = 0; i < pdus.length; i++)
                        messages[i] = SmsMessage.createFromPdu((byte[]) pdus[i]);

                for (SmsMessage message : messages) {
                        String msg = message.getMessageBody();
                        String to = message.getOriginatingAddress();

                        if (msg.toLowerCase().startsWith(queryString)) {
                            String out = msg.substring(queryString.length());
                            sms.sendTextMessage(to, null, out, null, null);
                        }
                 }
             }
        }
    }
 }
```

Simulating Incoming SMS Messages/Calls

- Use the Android debug tools to simulate incoming SMS messages or calls from arbitrary numbers.



Questions?

To DO

- Examples –
  - Emergency Responder SMS Example
  - Automating the Emergency Responder
  - Example Link: http://www.cs.odu.edu/~cs495/materials/Lec-15_SMS_Examples.pdf

- Nokia Mobile Data Challenge 2012:
  - http://research.nokia.com/files/public/MDC%202012%20-%20Participation%20Instructions%20-%20Final%2C%20Nov%205.pdf