

Networking in Android

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Network

- What's a network? Why network?

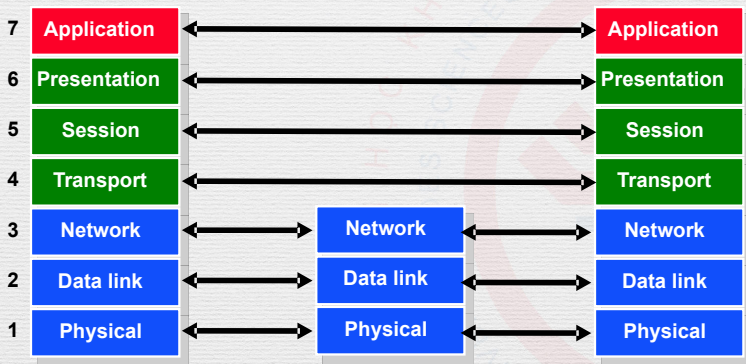
Network

- What's a network? Why network?
- OSI Model? TCP/IP?

Network

- What's a network? Why network?
- OSI Model? TCP/IP?
- How to make a request in JavaScript?

Network Layering



Networking in Android

- Socket: TCP/UDP
- Protocol: HTTP / FTP / SIP / SMTP / IMAP / ...
- In this course
 - HTTP Client with JSON representation
 - Why?

Contents

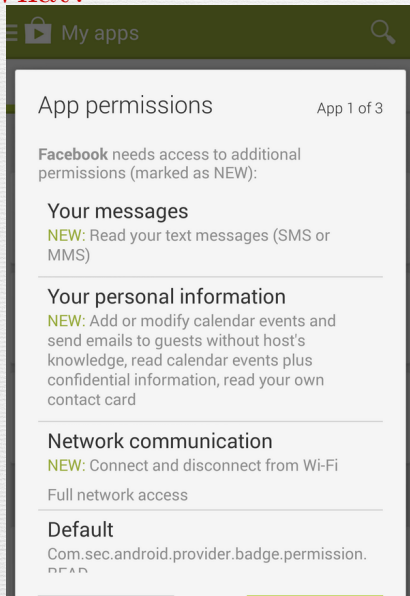
- Permissions
- Embedded package/class
- External library
- Data representation

Permissions

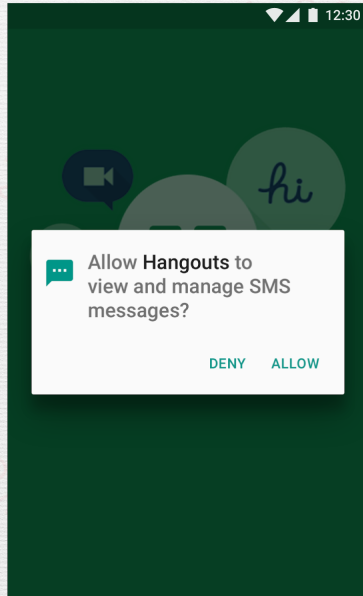
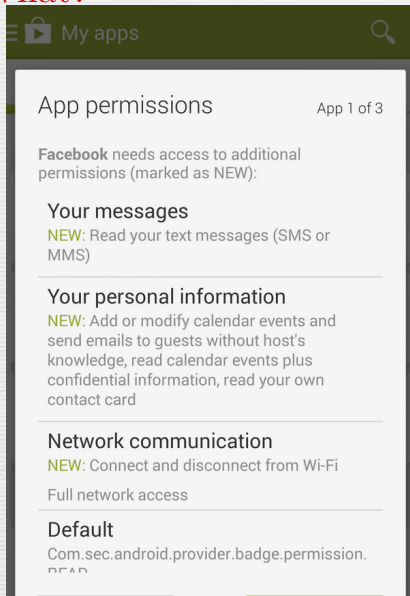
What?



What?



What?



What?

- Android has privilege-separation
- Sandboxing
 - System user ID
 - System group ID
- Specific actions require permissions

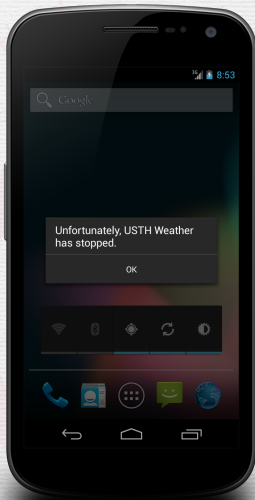
Why?

- Privacy is an important aspect
- Permission is a way to implement/improve security and privacy
- Each “sensitive” action requires a separated permission
 - Read external storage
 - Write external storage
 - Read contact list
 - ...

Why?

What happens if you don't have permission?

```
[138] NetworkDispatcher.run: Unhandled exception  
java.lang.SecurityException: Permission denied  
(missing INTERNET permission?)  
    at java.net.InetAddress.lookupHostByName(InetAddress.java:464)  
    at java.net.InetAddress.getAllByNameImpl(InetAddress.java:252)  
    at java.net.InetAddress.getAllByName(InetAddress.java:215)
```



How?

Marshmallow+ has two main levels of permissions:

- Normal: no effect on user privacy, requires user confirmation
- “Dangerous”: affect user privacy or device operations, requires confirmation

How?

- Normal level
 - Internet access
 - Read network state
 - Set timezone, set wallpaper...

How?

- Normal level
 - Internet access
 - Read network state
 - Set timezone, set wallpaper...
- Dangerous level
 - Read/write external storage
 - Access contact list
 - Access phone (make phone calls, receive calls, call log)
 - Send / receive SMS
 - Calendar, events
 - Microphone
 - Camera

How?

- Define what permissions are needed in the manifest
- For internet access

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

How?

- Define what permissions are needed in the manifest
- For internet access

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

- Normal permission, so no need special treatment
 - Request permissions at runtime
 - or reducing `targetSdkVersion`

Embedded package

Embedded package

- java.net
 - java.net.URL
 - java.net.HttpURLConnection
- java.io.InputStream

Embedded package

1. Create URL from string
2. Make a request to server
3. Receive response
4. Process response

Embedded package

1. Create URL from string

```
URL url = new URL("http://ict.usth.edu.vn/wp-content/" +  
    "uploads/usth/usthlogo.png");
```

2. Make a request to server
3. Receive response
4. Process response

Embedded package

1. Create URL from string
2. **Make a request to server**

```
URLConnection connection =  
    (URLConnection) url.openConnection();  
connection.setRequestMethod("GET");  
connection.setDoInput(true);  
// allow reading response code and response data  
connection.connect();
```

3. Receive response
4. Process response

Embedded package

1. Create URL from string
2. Make a request to server
3. **Receive response**

```
int response = connection.getResponseCode();  
Log.i("USTHWeather", "The response is: " + response);  
InputStream is = connection.getInputStream();
```

4. Process response

Embedded package

1. Create URL from string
2. Make a request to server
3. Receive response
4. **Process response**
 - Different response type requires different data treatment
 - Image: transform to bitmap
 - JSON/XML : parsing (later...)

Embedded package: image response

- Decode data to bitmap

```
Bitmap bitmap = BitmapFactory.decodeStream(is);
```

Embedded package: image response

- Decode data to bitmap

```
Bitmap bitmap = BitmapFactory.decodeStream(is);
```

- Show it

```
ImageView logo = (ImageView) findViewById(R.id.logo);  
logo.setImageBitmap(bitmap);
```

Embedded package: image response

- Decode data to bitmap

```
Bitmap bitmap = BitmapFactory.decodeStream(is);
```

- Show it

```
ImageView logo = (ImageView) findViewById(R.id.logo);  
logo.setImageBitmap(bitmap);
```

- Don't forget to disconnect

```
connection.disconnect();
```

Embedded package: recap

```
// initialize URL
URL url = new URL("http://ict.usth.edu.vn/wp-content/" +
    "uploads/usth/usthlogo.png");

// Make a request to server
URLConnection connection =
    (URLConnection) url.openConnection();
connection.setRequestMethod("GET");
connection.setDoInput(true);
// allow reading response code and response dataconnection.
connection.connect();

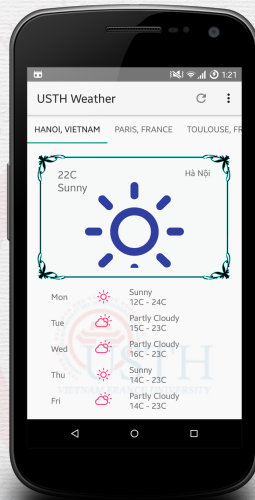
// Receive response
int response = connection.getResponseCode();
Log.i("USTHWeather", "The response is: " + response);
InputStream is = connection.getInputStream();

// Process image response
Bitmap bitmap = BitmapFactory.decodeStream(is);
ImageView logo = (ImageView) findViewById(R.id.logo);
logo.setImageBitmap(bitmap);

connection.disconnect();
```

Practical Work 15

- «Upgrade» your previous AsyncTask
- Perform a **real** network request to USTH's server
 - Download USTH logo
 - Show it on an ImageView of ForecastFragment



Embedded package

- Limitation?
 - «A lot» of code
 - No queue
 - No cache (mem-based and disk-based)

Embedded package

- How can we improve?
- «A lot» of code
- No queue
- No cache

Embedded package

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Embedded package

- How can we improve?
 - «A lot» of code
 - No queue
 - No cache
-
- Code reuse

Embedded package

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- Code reuse
- Make a queue

Embedded package

- How can we improve?
- «A lot» of code
- No queue
- No cache



- Code reuse
- Make a queue
- Make a cache manager

Embedded package

That's **too much**

Embedded package

That's **too much**
Re-invent the wheel

Embedded package

That's **too much**

Re-invent the wheel

There should be someone who has **already** done those

Embedded package

The Google logo is displayed in its standard multi-colored font (blue, red, yellow, blue, green, red). In the background, there is a large, faint watermark of the USTH (University of Science and Technology of Hanoi) seal, which includes the text "ĐẠI HỌC KHOA HỌC VÀ CÔNG NGHỆ" and "UNIVERSITE DES SCIENCES ET DES TECHNOLOGIES".