2017 Android of WMNTAA Thread and Web IO

Thread

- Main thread (UI thread)
  - When an application is launched, the system creates the main thread
- others (not Main thread)
  - perform non-instantaneous operations in separate threads (background threads)

Why we need threads?

- Android enforces a worst case reaction time of applications
  - If an activity does not react within 5 seconds to user input, the Android system displays an Application not responding (ANR) dialog

Rules to use thread in Android

- Do not block the UI thread
- Only Main thread (UI thread) can do UI operation

http://developer.android.com/guide/components/processes-and-threads.html

How to use threads in Android

- Java threads
  - Not convenient and has several limitations
- AsyncTask (won't be introduced in this class)
  - The simplest way to use thread
- Handler
  - Can handle multiple runnable tasks and messages

Java Threads

- Java native thread library (java.lang.Thread)
- Should not do any UI operation

Take ImageLoader as an Example

```
public void onClick(View v) {
    new Thread(new Runnable() {
        public void run() {
            Bitmap b = loadImageFromNetwork("http://example.com/image.png");
            mImageView.setImageBitmap(b);
        }
    }).start();
}
```

This seems to work fine:

a new thread to handle the downloading task

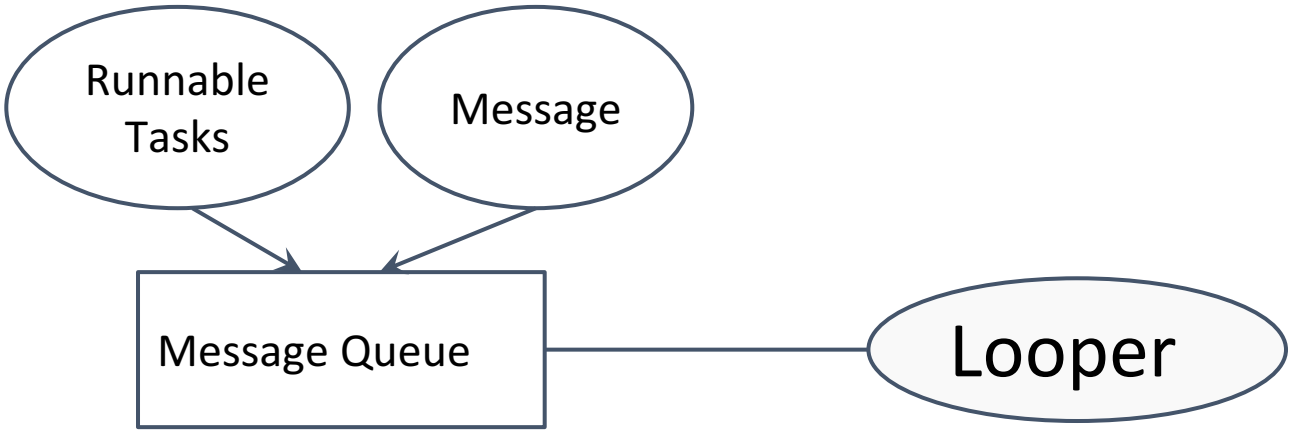
but it violates the second rule

-> change UI from outside UI thread

So how can we do?

Handler

- When a Handler is created, it is bound to a specific Looper (and associated thread and message queue)
- A Handler is a utility class that facilitates interacting with a Looper



Handler

- A Handler can be bound to any thread we designate
- If we don’t designate a thread for a handler, it will be bound to the thread which create the handler

How to Use Handler

- To process a Runnable you can use the post() method
- Override the handleMessage() method to process messages
  - Your thread can send messages via the obtainMessage(Message) or sendMessage(Message) method to the Handler object

Use Handler to update UI

```
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);

    uiHandler = new Handler(); // for main thread
    textView = (TextView) findViewById(R.id.text);
```

Use Handler to update UI

```
waitThread = new Thread(new Runnable() {
    @Override
    public void run() {
        waitForFiveSecond();
        uiHandler.post(new Runnable() {
            @Override
            public void run() {
                textView.setText("updated");
            }
        });
    }
```

Socket

- A socket is an endpoint for communication between two machines.

Use socket

You should require Internet permission in AndroidMenifest.xml

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

Create a socket with specific IP and port

```
InetAddress ip = InetAddress.getByName("cptan.me");
int port = 8080;
Socket socket = new Socket(ip, port);
```

HttpURLConnection

- Why not HttpClient (org.apache.http.client) ?
  - Android says it doesn’t like it :P
  - Android doesn’t support HttpClient after SDK 23
- High performance and lightweight API

Use HttpURLConnection

```
URL url = new URL("http://www.droidheros.com/wp-content/uploads/2014/01/Android-apps-for-boo
HttpURLConnection connection = (HttpURLConnection) url.openConnection();
// Timeout for reading InputStream arbitrarily set to 3000ms.
connection.setReadTimeout(3000);
// Timeout for connection.connect() arbitrarily set to 3000ms.
connection.setConnectTimeout(3000);
// For this use case, set HTTP method to GET.
connection.setRequestMethod("GET");
// Already true by default but setting just in case; needs to be true since this request
// is carrying an input (response) body.
connection.setDoInput(true);
// Open communications link (network traffic occurs here).
connection.connect();
```

Note : Remember to require Internet permission before using HttpURLConnection

Exercise

- There is no exercise this time, we have many example codes (my bad). Please make sure you know every detail of example codes

Challenge

Please use httpURLConnection and VideoView to download and play on your Android phone from http://html5demos.com/assets/dizzy.mp4

You can get this slide (???) and example codes from https://goo.gl/h4otQj