Activity Conversion
Intent & Broadcast

Mobile App Programming

Before start

- Inquires
- PA1
- ConstraintLayout
- Event Log
- Logcat
- Invalidate Cache & Restart

Inquires

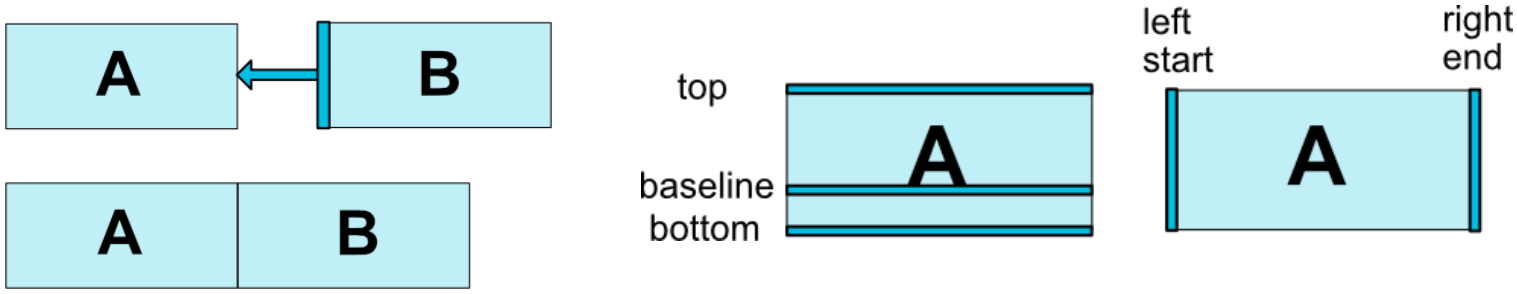
- In case of Inquires:
  - Send e-mail to map.at.skku@gmail.com
  - Do NOT send iCampus message
- PA1 spec:
  - Google Spreadsheet (PA1 docs)
- In case of online class:
  - Send e-mail BEFORE THE CLASS
  - When you entered the online class, you must have been noticed that some circumstance happened before that time.
  - From next week, we may not accept request after time.

PA1

- PA1 is out!
  - See PA1 spec. document
  - Question about Spec.
    - Google Spreadsheet
    - on PA1 spec. document
  - Question about android
    - Google
  - Question about Java
    - Google

ConstraintLayout

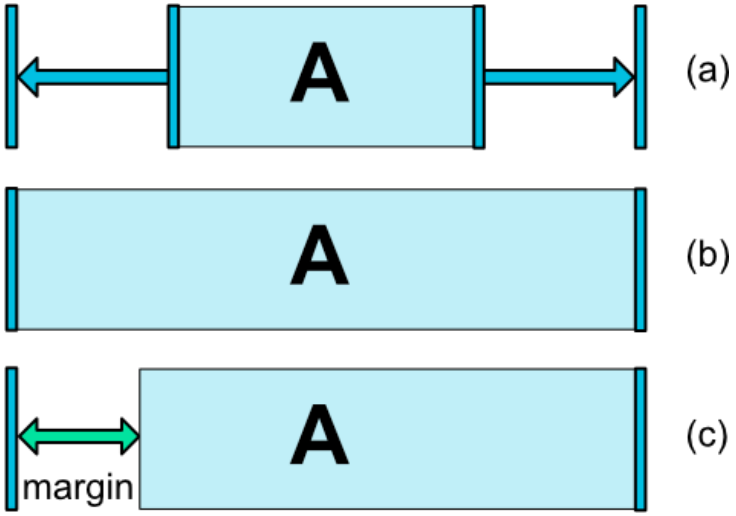
- ConstraintLayout is a ViewGroup which allows you to position and size widgets in a flexible way: Constraint



- Relative: with constraint & margin value & fixed width/height

https://developer.android.com/reference/androidx/constraintlayout/widget/ConstraintLayout

ConstraintLayout



- Center: Two Constraint & no margin & fixed width/height
- Fill: Two Constraint & no margin & width/height "match_constraint"
- Fill with margin: Same as above, but yes margin

https://developer.android.com/reference/androidx/constraintlayout/widget/ConstraintLayout

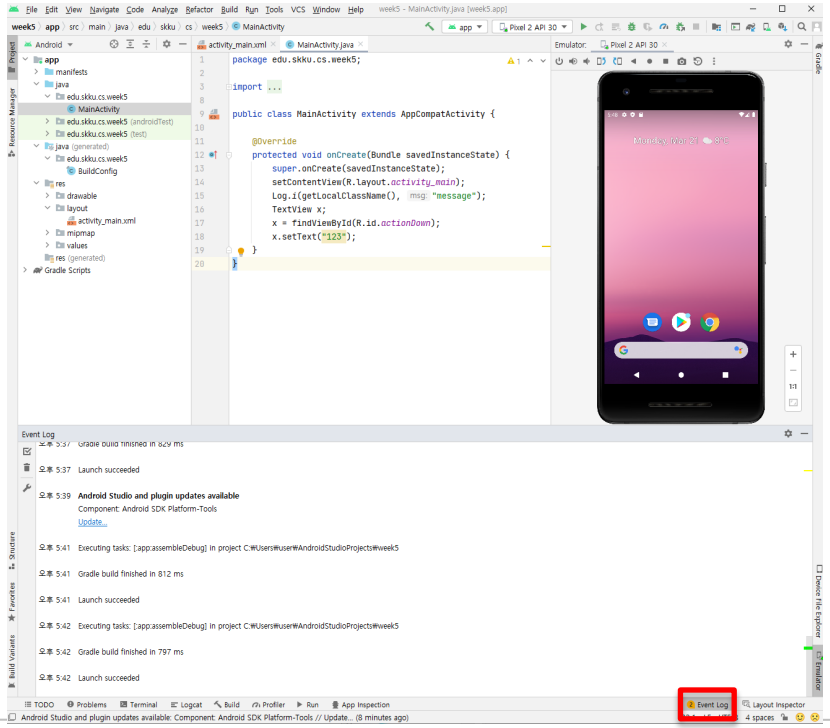
ConstraintLayout

- There are more like
  - Chain: Group many components to distribute in various way
  - Guideline: (Check PA1 Tips)
  - Bias, Ratio, …
- Import things
  - You should check all for horizontal & vertical
    - constraint for start/end, width
    - constraint for top/bottom, height

https://developer.android.com/reference/androidx/constraintlayout/widget/ConstraintLayout

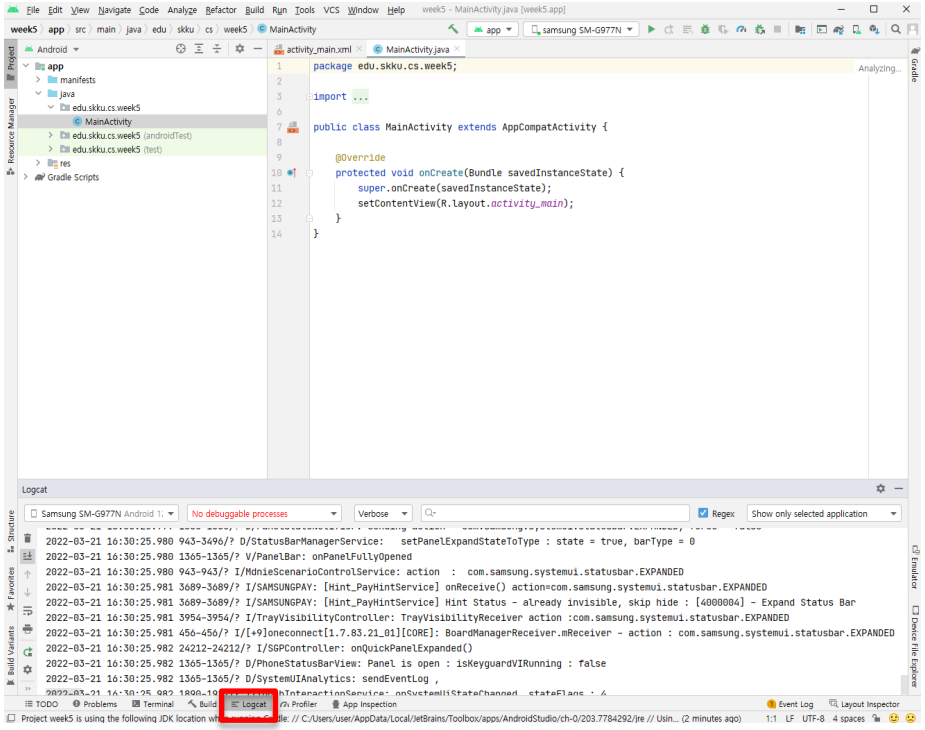
Event Log

- Event Log
  - Bottom-right
  - See what happened to gradle/adb/…



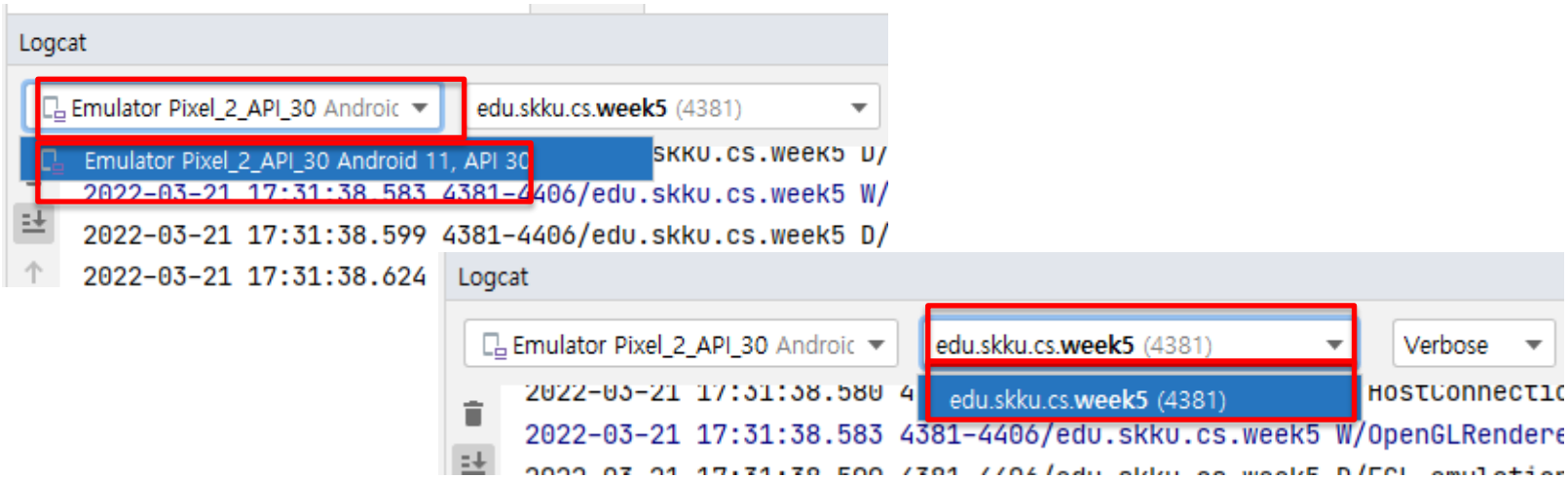
Logcat

- Logcat
  - Bottom- left?middle?
  - See what happened to your android device



Logcat

- Logcat
  - There is a bug! & Double check!
    - Recommended to manually select device & process again (Even though it's already selected)

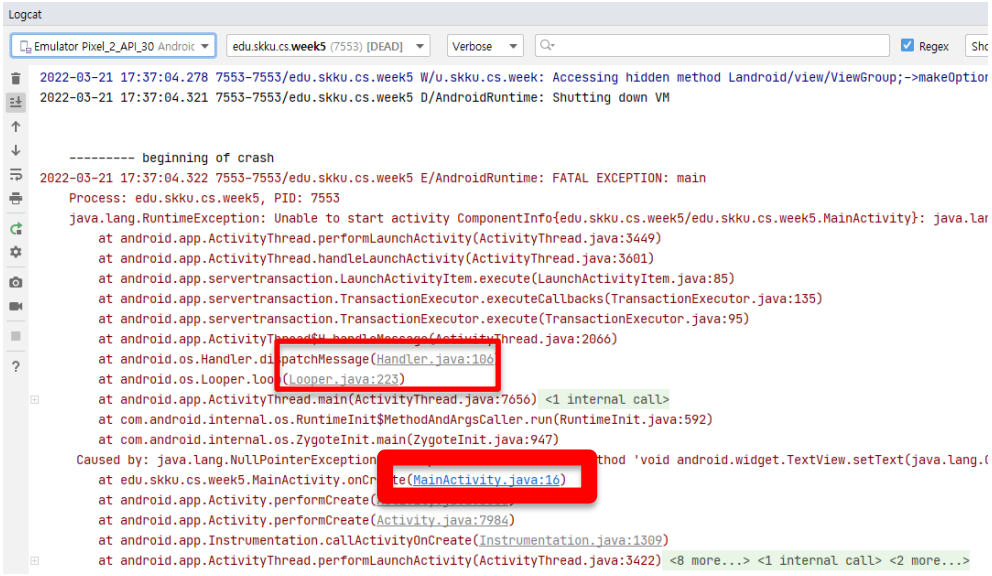


Logcat

- Logcat
  - All the log is shown here
  - You can filter by searching keyword, or debug level
  - Verbose < Debug < Info < Warn < Error < Assert
  - Selecting debug level to showing only above that.
  - If runtime error occurs, check here!

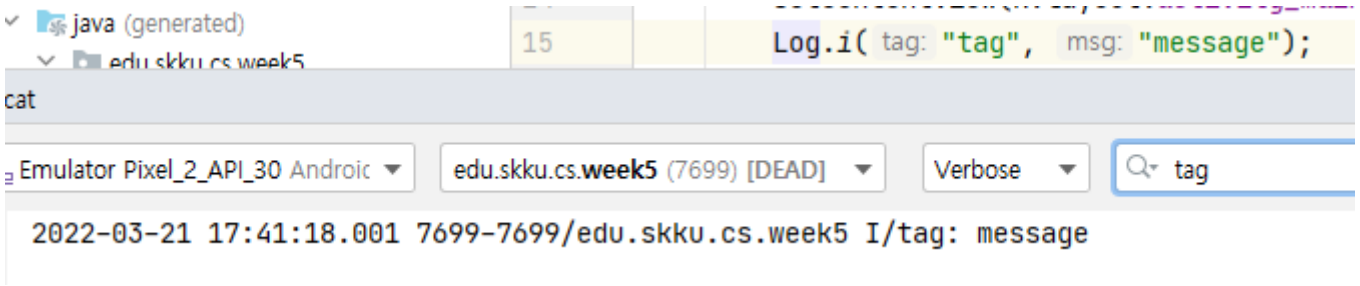
Logcat

- Gray code
  - Android code
  - No need to go deep
- Blue code
  - Your code
  - Click to move there
  - Check the error message above
    - Here, "Caused by: java.lang.NullPointerException: …"
    - Then, maybe you called method on null pointer

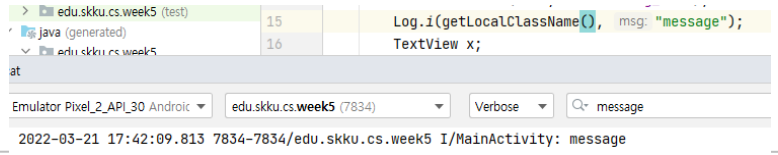


Logcat

- You can manually log
  - Log.v/d/i/w/e("tag string", "message string");
  - verbose/debug/info/warn/error

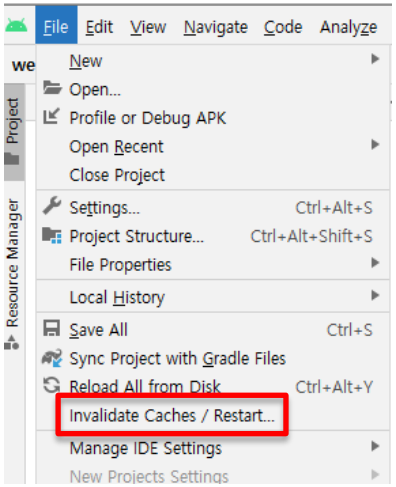


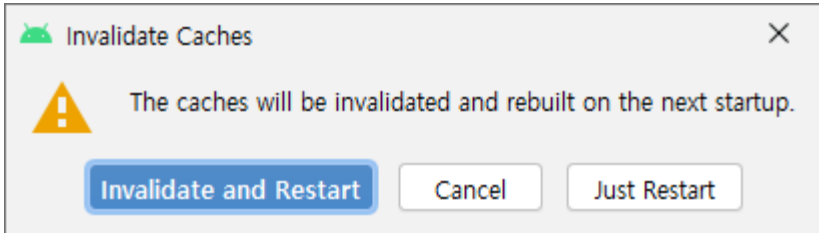
  - Log.?(getLocalClassName(), "debug message");
    - Automatically set tag to its class name



Invalidate Cache / Restart

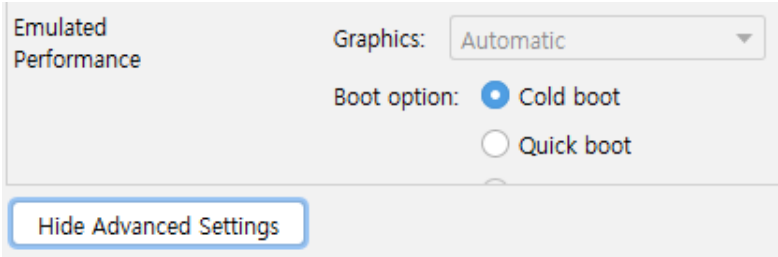
- Invalidate Caches / Restart
  - File > Invalidate Caches / Restart…
    - Can be different (Just 'Invalidate Cache' or different loc, …)
    - Shift+Shift then search!
  - Remove android studio's cache / restart, or just restart





Others

- Another troubleshooting tip: kill all adb.exe
  - adb: Android Debug Bridge, connect desktop & android
  - Due to bug, adb.exe might be executed too many
    - Maybe hard to use virtual device
  - Kill all adb.exe after Android Studio closed, if exists
    - Windows: taskkill /IM “adb.exe” /F
- Another troubleshooting tip: USB debugging
  - When your device is hard to connect, turn USB debugging off and on
  - Developer option: tap build number 10+ times
- Another troubleshooting tip: cold boot
  - Set your emulation device Cold boot



Activity Conversion
Intent & Broadcast

Mobile App Programming

Android Glossary

- There are four main Android app components :
  -> Activity, Service, Broadcast receiver, Content provider.

- Whenever you create or use any of them, you must include elements in the project manifest.

Intent

- An Intent is a messaging object you can use to request an action from another app component.
- Three fundamental use cases:
  - Starting an activity
  - Starting a service
  - Delivering a broadcast
- Two types of intents:
  - Explicit intents
  - Implicit intents

https://developer.android.com/guide/components/intents-filters?hl=ko

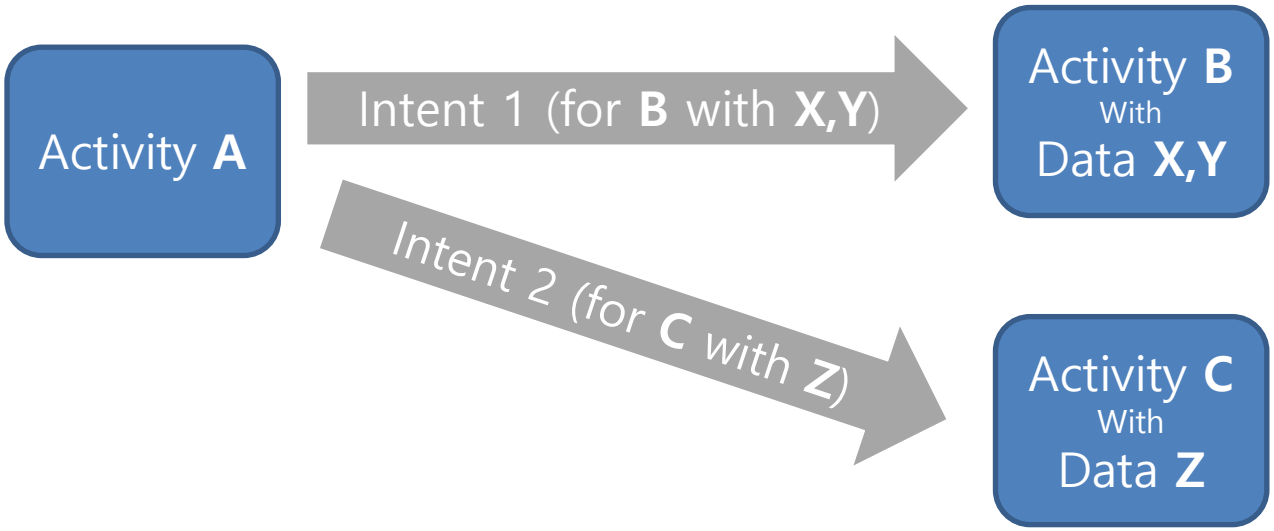
Implicit/Explicit Intent

- Explicit intents
  - Specify package name or component class name

- Implicit intents
  - Do not specify above name
  - Declare general action
    - Call, Message, Location, …

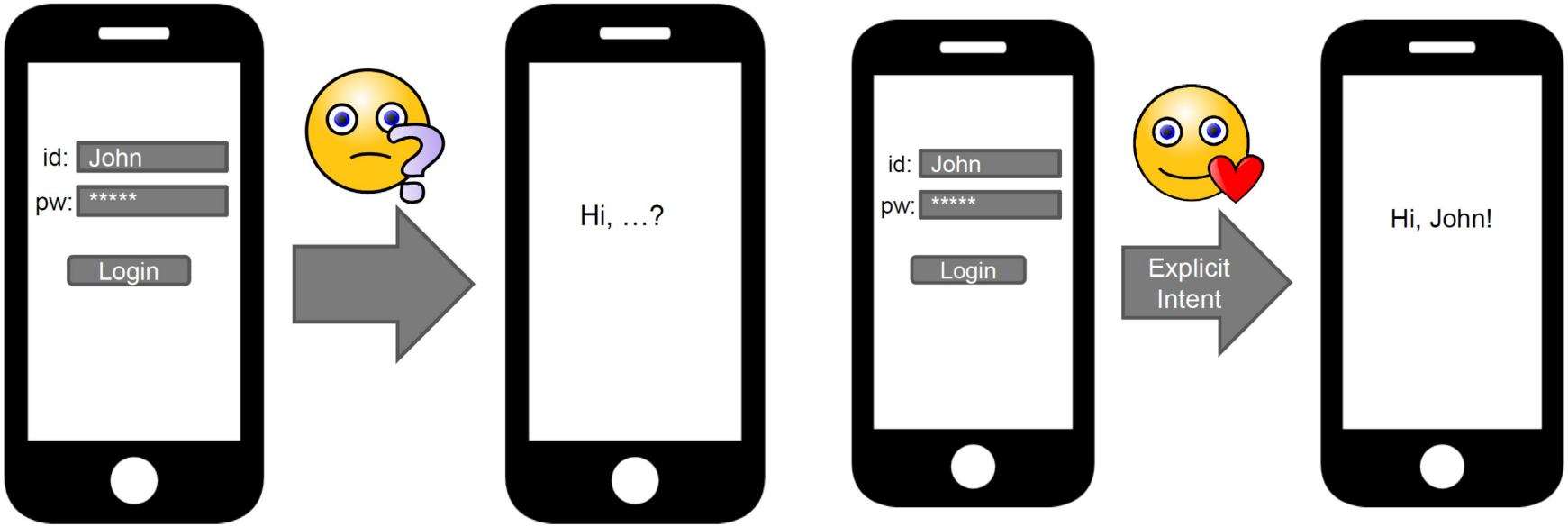
Explicit Intent

- Explicit intents
  - Specify package name or component class name
  - Start an activity in Intent object
  - Data can be passed via Extras



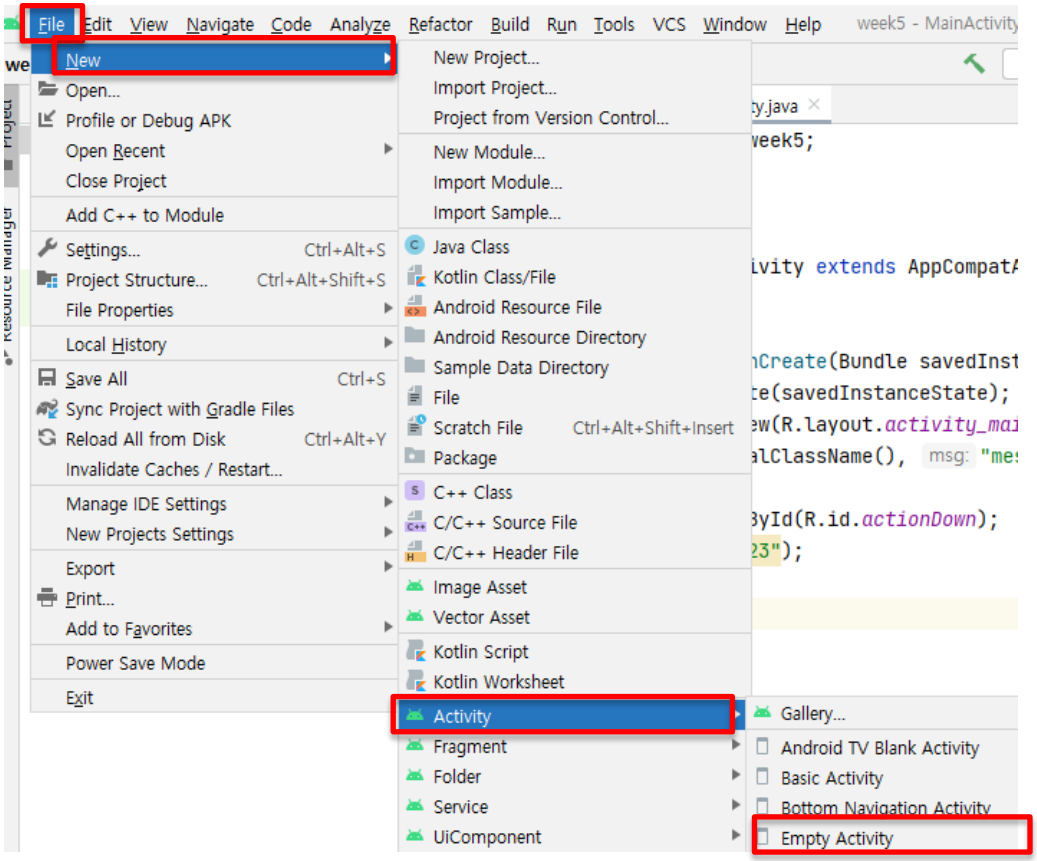
Explicit Intent

- Why Extras needed?



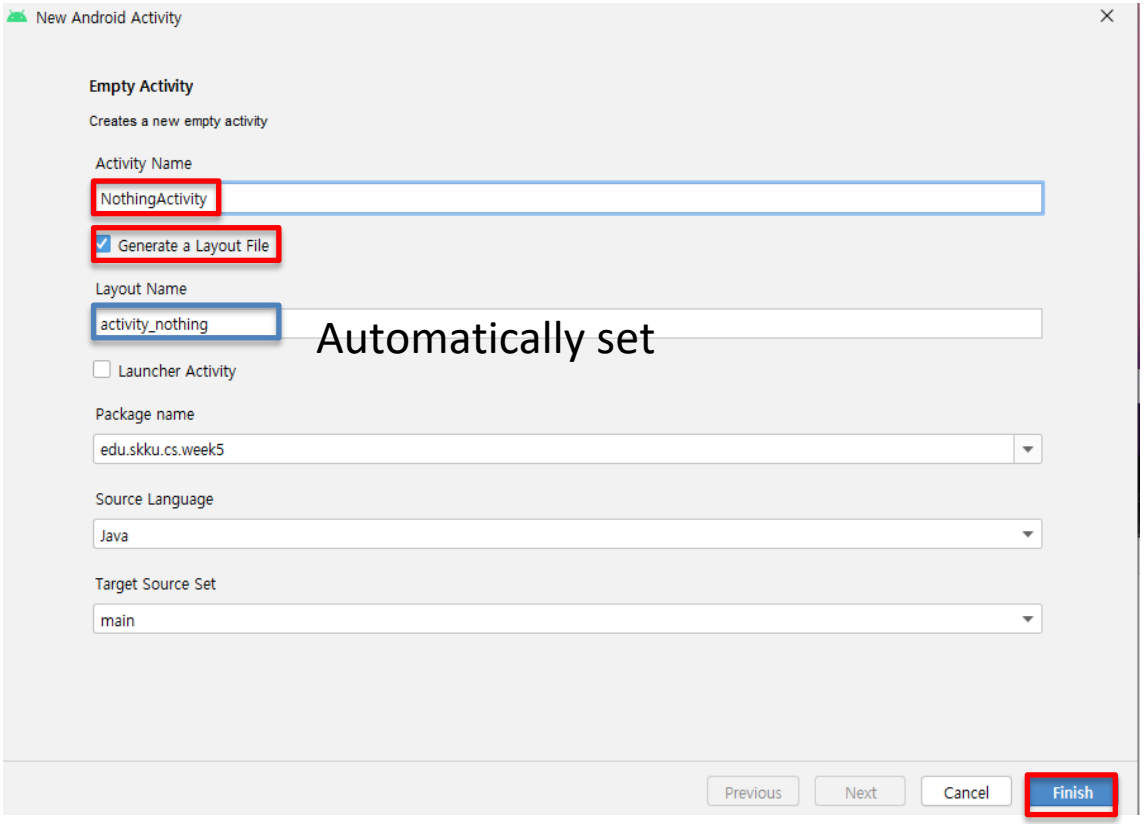
Practice: Another Activity

- Make another activity
  - File > New
    > Activity
    > Empty Activity



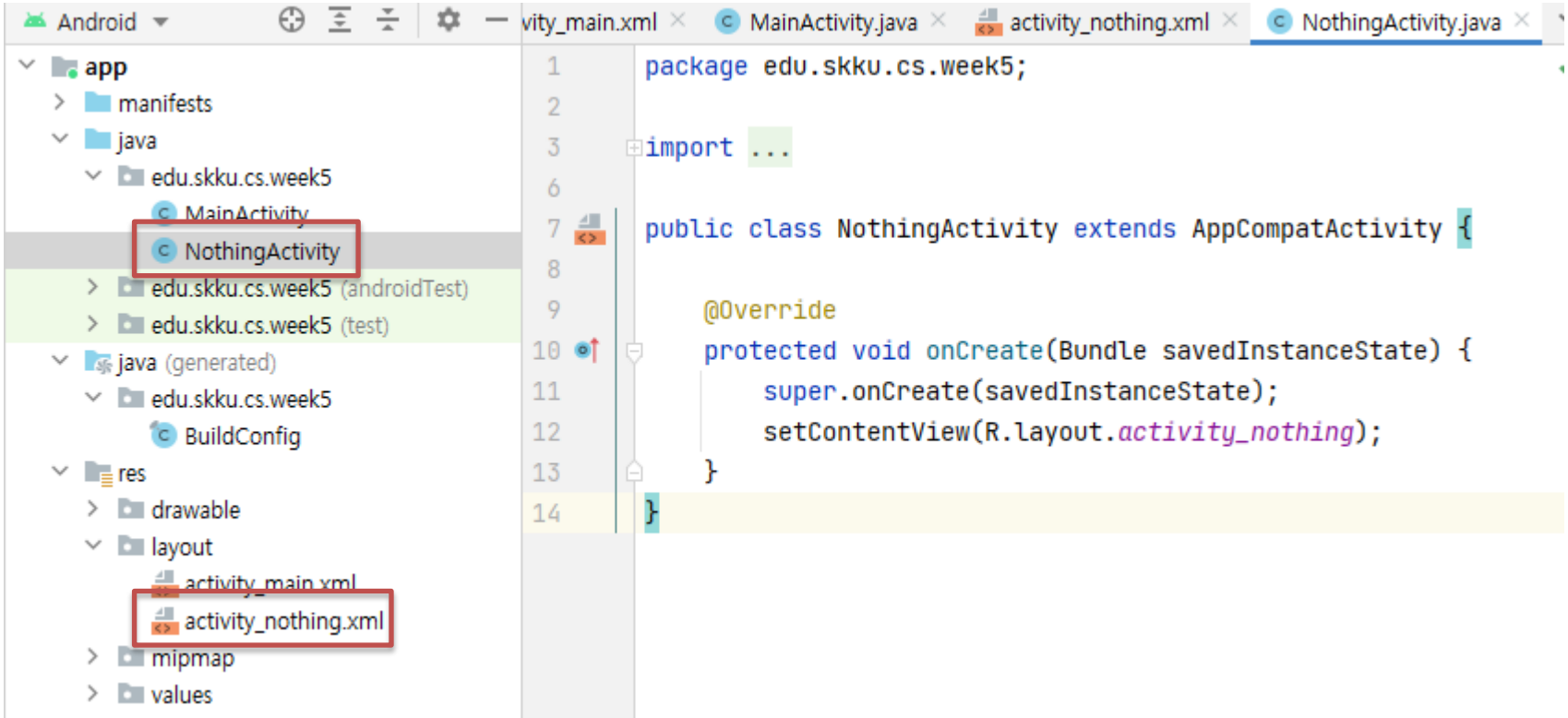
Practice: Another Activity

- Make another activity



Practice: Another Activity

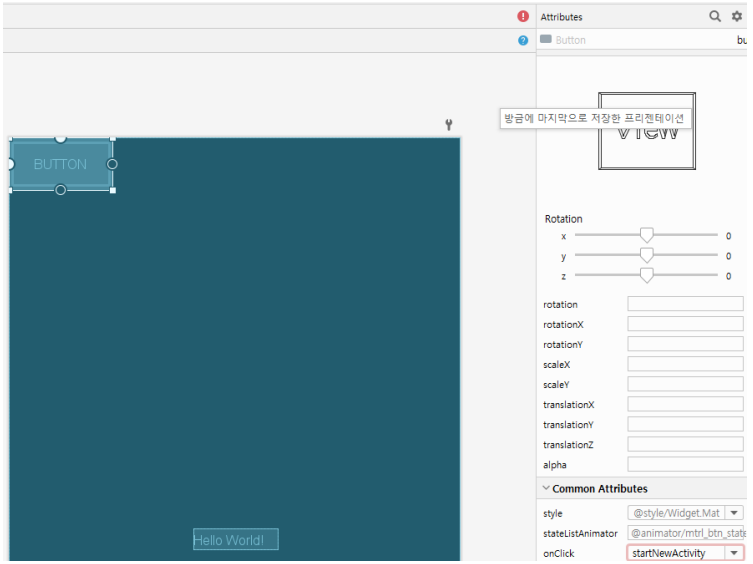
- Make another activity



Practice: Another Activity

- Make Button on MainActivity
  - onClick
    - Automatically set OnTouchListener
    - android:onClick="FunctionName"

```
<Button
    android:id="@+id/button"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Button"
    android:onClick="startNewActivity"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />
```



https://gist.github.com/devquint/79022b0fa97bc7041cb2f41e3bb3043c

Practice: Another Activity

- Make Button on MainActivity
  - android:onClick="FunctionName"
  - When user touch that button, calls "public void FunctionName(View)"
  - Make function matches to its name

```
public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        Log.i(getLocalClassName(),  msg: "message");
        /*
        TextView x;
        x = findViewById(R.id.actionDown);
        x.setText("123");
         */
    }

    public void startNewActivity(View v){

    }
}
```


https://gist.github.com/devquint/79022b0fa97bc7041cb2f41e3bb3043c

Practice: Another Activity

- Make Button on MainActivity
  - Set attribute
    - android:onClick="FunctionName"
  - Make function
    - public void FunctionName(View v){}
  - It do the same with setOnClickListener…
    - lambda or anonymous function not needed

Practice: Another Activity

- Implement to start NothingActivity
  - Make intent
  - Put extras
  - Call startActivity

```
public static final String EXT_NAME = "Name";
public static final String EXT_SID = "StudentId";
public void startNewActivity(View v){
    Intent intent = new Intent( packageContext: MainActivity.this, NothingActivity.class);
    intent.putExtra(EXT_NAME,  value: "홍길동");
    intent.putExtra(EXT_SID,  value: "2022524288");
    startActivity(intent);
}
```


https://gist.github.com/devquint/9d8a5f939c721b4a6f9ba6c10a6d1c34

Practice: Another Activity

- Implement NothingActivity to get Extras
  - Read with getIntent().getStringExtra(<NAME>);
  - Show with Toast

```
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_nothing);

    Intent intent = getIntent();
    String name = intent.getStringExtra(MainActivity.EXT_NAME);
    String sid = intent.getStringExtra(MainActivity.EXT_SID);

    Toast.makeText(getApplicationContext(),
            text: "Welcome, " + name + "(" + sid + ")!",
            Toast.LENGTH_SHORT).show();
}
```


https://gist.github.com/devquint/9d8a5f939c721b4a6f9ba6c10a6d1c34

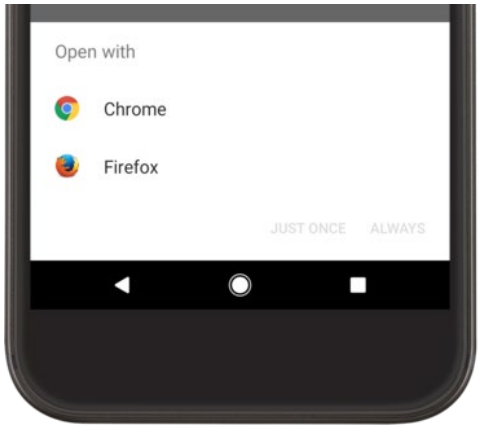
Another Activity

week5

Welcome, 홍길동(2022524288)!

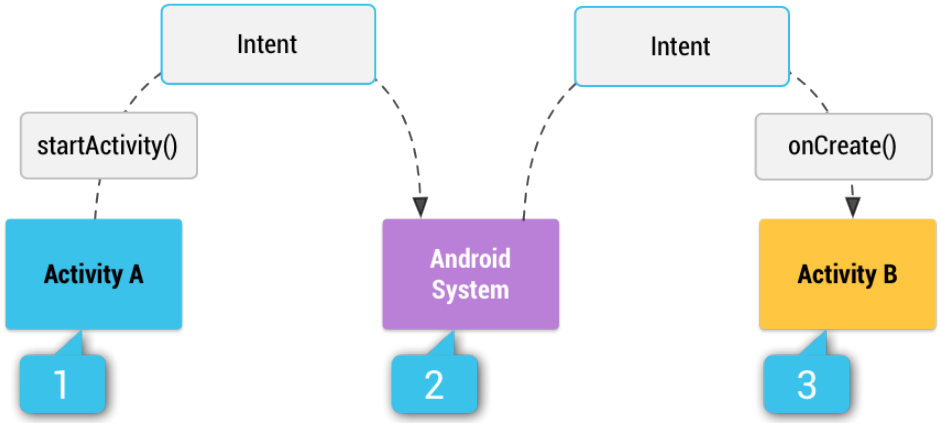
Implicit Intent

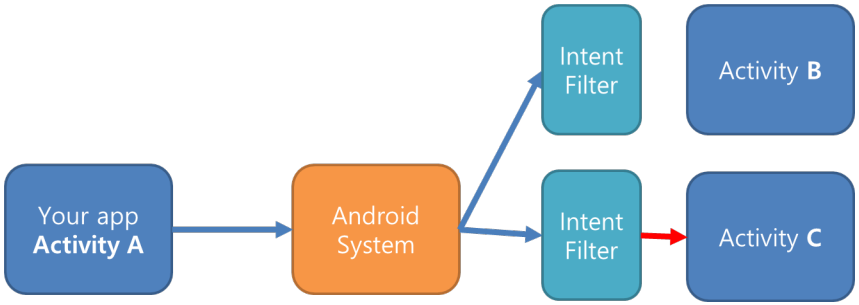
- Why implicit intent need?
  - Lots of application that can
    - call / message
    - show map
    - send email
    - …
  - What application to use?



Implicit Intent

- How it works? Intent Filter
  - Declare general action: ACTION_VIEW, ACTION_CALL, ACTION_SEND…
  - Android System will choose candidate via Intent Filter
  - If no candidate: Fail
  - If multiple candidates: Let user choose





Implicit Intent

- If you want to get implicit intent,
  - Let android system know
    - Intent filter, on AndroidManifest.xml

```
<activity android:name="MainActivity">
    <!-- This activity is the main entry, should appear in app launcher -->
    <intent-filter>
        <action android:name="android.intent.action.MAIN" />
        <category android:name="android.intent.category.LAUNCHER" />
    </intent-filter>
</activity>

<activity android:name="ShareActivity">
    <!-- This activity handles "SEND" actions with text data -->
    <intent-filter>
        <action android:name="android.intent.action.SEND"/>
        <category android:name="android.intent.category.DEFAULT"/>
        <data android:mimeType="text/plain"/>
    </intent-filter>
    <!-- This activity also handles "SEND" and "SEND_MULTIPLE" with media data -->
    <intent-filter>
        <action android:name="android.intent.action.SEND"/>
        <action android:name="android.intent.action.SEND_MULTIPLE"/>
        <category android:name="android.intent.category.DEFAULT"/>
        <data android:mimeType="application/vnd.google.panorama360+jpg"/>
        <data android:mimeType="image/*"/>
        <data android:mimeType="video/*"/>
    </intent-filter>
</activity>
```

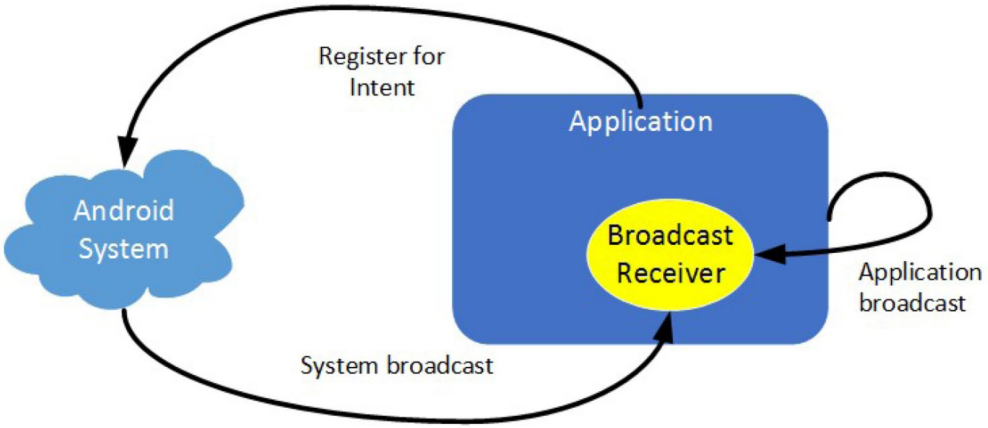
Implicit Intent

- Receive with Broadcast Receiver
  - Receive Intent which is broadcasted from application
  - Usually used when application does not need to react the message
  - ACTION_BOOT_COMPLETED, ACTION_LOCALE_CHANGED, …
  - Notify to all targeted applications when special event happens

- Receive with Activity
  - Receive Intent which is passed with startAcitivty() method
  - Used when Intent must be reacted via Activity
    - Usually used when application need to react

Broadcast

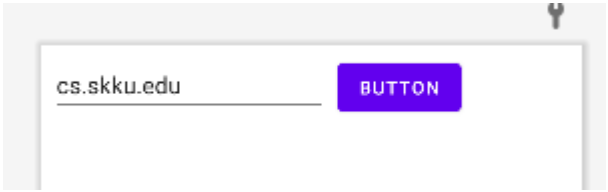
- Sending message protocol which declared by Android system or other application
- Implicit Intent is exactly same with the broadcast message



https://developer.android.com/guide/components/broadcasts?hl=ko

Practice: Implicit Intent

- Make an application that opens web browser app.
- Make EditText on MainActivity




```
<EditText
    android:id="@+id/edittext_uri"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="8dp"
    android:layout_marginTop="8dp"
    android:ems="10"
    android:inputType="textPersonName"
    android:text="cs.skku.edu"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />

<Button
    android:id="@+id/button"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="8dp"
    android:layout_marginTop="8dp"
    android:onClick="startNewActivity"
    android:text="Button"
    app:layout_constraintStart_toEndOf="@+id/edittext_uri"
    app:layout_constraintTop_toTopOf="parent" />
```


https://gist.github.com/devquint/82c2dd0071368e51b1a09fd830c5ff47

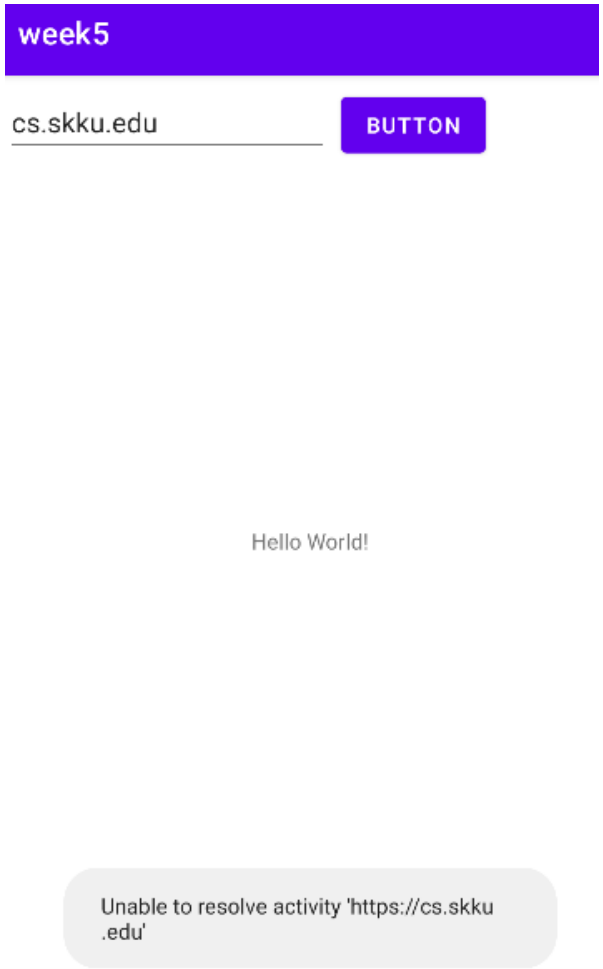
Practice: Implicit Intent

- Change Button onClick function to open web browser
  - Use URI
    - Uniform Resource Identifier
    - URL(Uniform Resource Locator) is subset of URI

```
public void startNewActivity(View v){
    EditText editText = findViewById(R.id.edittext_uri);
    Uri uri = Uri.parse("https://" + editText.getText().toString());
    Intent intent = new Intent(Intent.ACTION_VIEW, uri);
    if(intent.resolveActivity(getPackageManager()) != null){
        startActivity(intent);
    }
    else{
        Toast.makeText(getApplicationContext(),
                text: "Unable to resolve activity '" + intent.getData().toString() + "'",
                Toast.LENGTH_SHORT).show();
    }
}
```


https://gist.github.com/devquint/82c2dd0071368e51b1a09fd830c5ff47

Practice: Implicit Intent



https://gist.github.com/devquint/82c2dd0071368e51b1a09fd830c5ff47

Practice: Implicit Intent

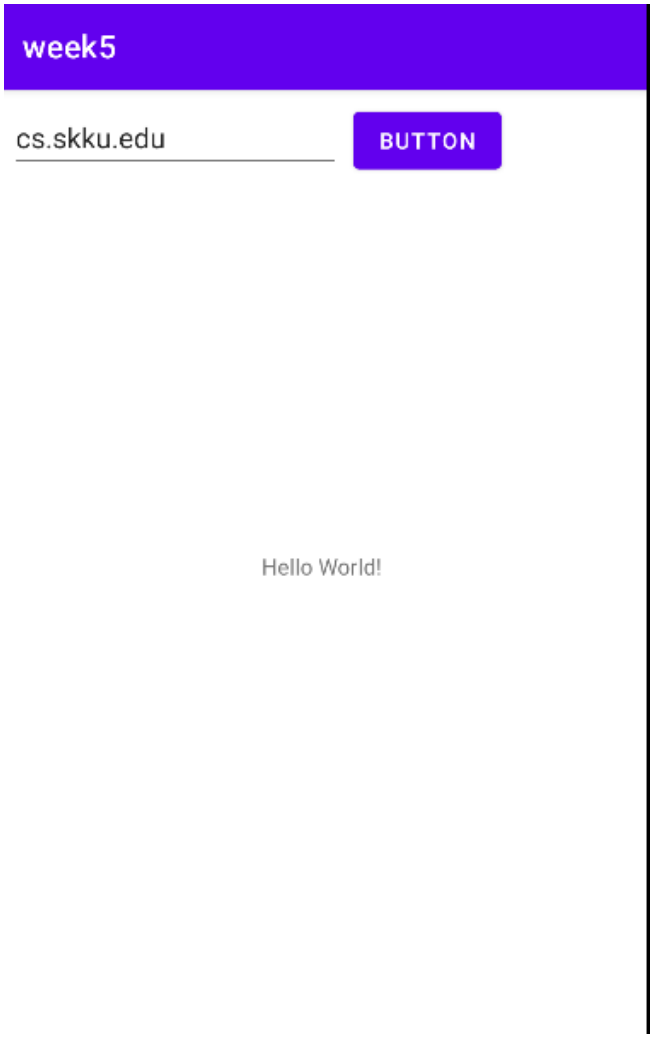
- Unable to resolve! Why?
  - Since Android 11.0(API 30), you must add proper <intent> in <queries> on manifest file
    - or QUERY_ALL_PACKAGES permission

```
    </application>

    <queries>
        <intent>
            <action android:name="android.intent.action.VIEW" />
            <category android:name="android.intent.category.BROWSABLE" />
            <data android:scheme="https" />
        </intent>
    </queries>
</manifest>
```


https://gist.github.com/devquint/82c2dd0071368e51b1a09fd830c5ff47

Practice: Implicit Intent



Practice: Broadcast – custom

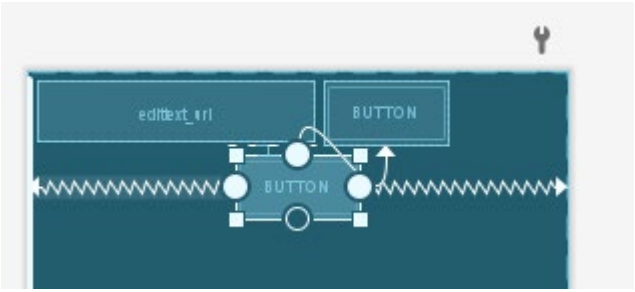
- Make an application that send and receive broadcast

- Your own broadcast could be sent and received
- Receiver side
  - Define intent-filter on onResume(): Got focus
  - Define intent-filter on onPause(): Lost focus
- Sender side
  - sendBroadcast(intent)

https://gist.github.com/devquint/85dfdaa7d04bf7e76c575d119c86baa3

Practice: Broadcast – custom

- For test, we will make both on the same app.
- Add Another button to MainActivity




```
<Button
    android:id="@+id/button_broadcast"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="8dp"
    android:onClick="sendBroadcast"
    android:text="Button"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/button" />
```


https://gist.github.com/devquint/85dfdaa7d04bf7e76c575d119c86baa3

Practice: Broadcast – custom

- MainActivity.java
  - Add broadcast function to onClick function

```
public static final String INTENT_ACTION = "edu.skku.cs.week5.hi";
public void sendBroadcast(View v){
    Intent intent = new Intent(INTENT_ACTION);
    sendBroadcast(intent);
}
```


https://gist.github.com/devquint/85dfdaa7d04bf7e76c575d119c86baa3

Practice: Broadcast – custom

- MainActivity.java
  - Make BroadcastReceiver and manage it
    - Just Toast

```
BroadcastReceiver br = new BroadcastReceiver() {
    @Override
    public void onReceive(Context context, Intent intent) {
        Toast.makeText(context, intent.getAction(), Toast.LENGTH_SHORT).show();
    }
};
```

```
@Override
protected void onResume(){
    super.onResume();
    IntentFilter intentFilter = new IntentFilter();
    intentFilter.addAction(INTENT_ACTION);
    registerReceiver(br, intentFilter);
}

@Override
protected void onPause(){
    super.onPause();
    unregisterReceiver(br);
}
```

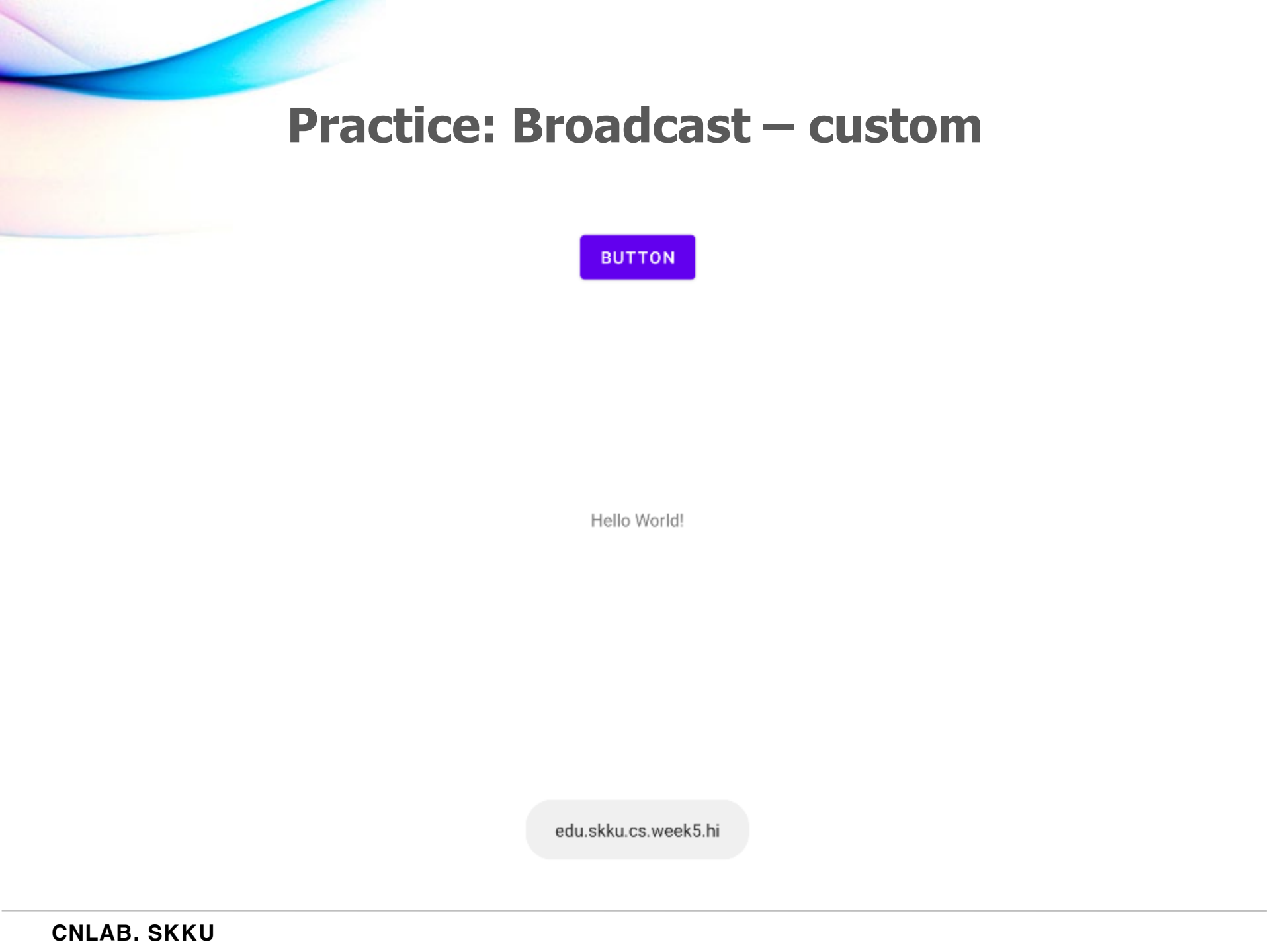

https://gist.github.com/devquint/85dfdaa7d04bf7e76c575d119c86baa3

Practice: Broadcast – custom

- How works?
  - App execution:
    - onCreate() -> onResume()
      - Register BroadcastReceiver
  - Press button
    - sendBroadcast()
      - Send broadcast
        - » Goes to the same app, make Toast!

https://gist.github.com/devquint/82c2dd0071368e51b1a09fd830c5ff47

Practice: Broadcast – custom



Practice: Broadcast – custom

- Receiver should be released at onPause()
  - Android's regulation

- Real-world usage
  - Receiver app. and Sender app. would be different
  - Receiver app. should be focused.
    - Added restriction since Android 8.0(API 26)
  - Download ended?

Practice: Broadcast – system

- Make an app. that receive system broadcast
- How works?
  - Choose one
    - Previous one: Register on runtime
      - App should between onResume() and onPause()
    - New one: Register on AndroidManifest.xml
      - Android system will wake up your code
      - Even if app. is not executed, receiver will work.
      - We will practice this!

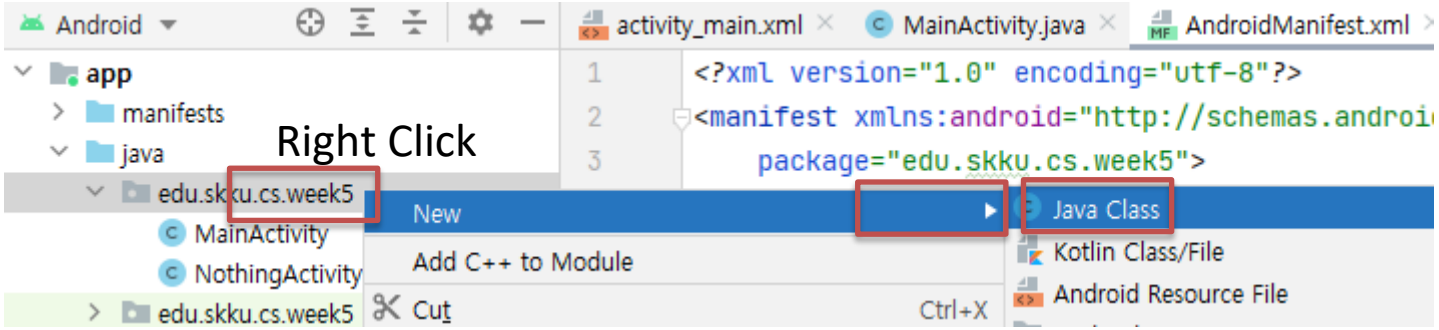
Practice: Broadcast – system

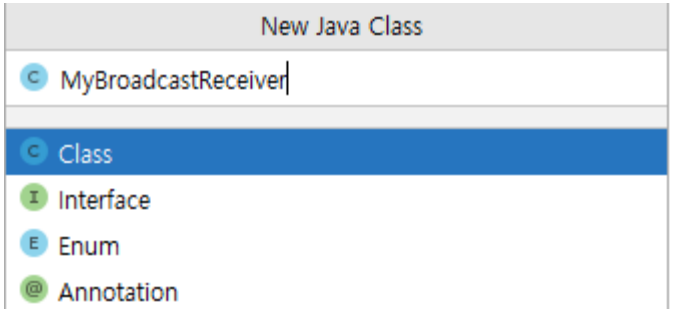
- AndroidManifest.xml

https://gist.github.com/devquint/71ca1f5f2b751df8be9d613f6ea2f1ee

Practice: Broadcast – system

- Create new java file: MyBroadcastReceiver





https://gist.github.com/devquint/71ca1f5f2b751df8be9d613f6ea2f1ee

Practice: Broadcast – system

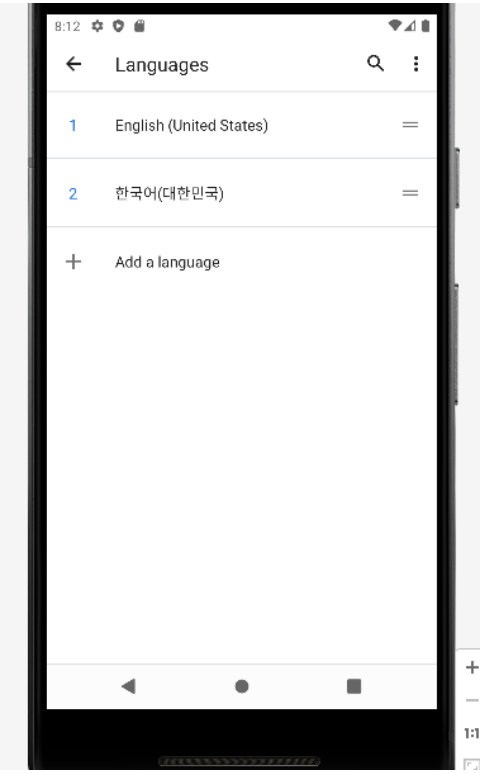
- MyBroadcastReceiver.java
  - Receive -> Just Toast

```
public class MyBroadcastReceiver extends BroadcastReceiver {
    @Override
    public void onReceive(Context context, Intent intent) {
        Toast.makeText(context,
                intent.toString(),
                Toast.LENGTH_SHORT).show();
    }
}
```


https://gist.github.com/devquint/71ca1f5f2b751df8be9d613f6ea2f1ee

Practice: Broadcast – system

- Run app once(for install) -> Change System locale



Practice: Broadcast – system

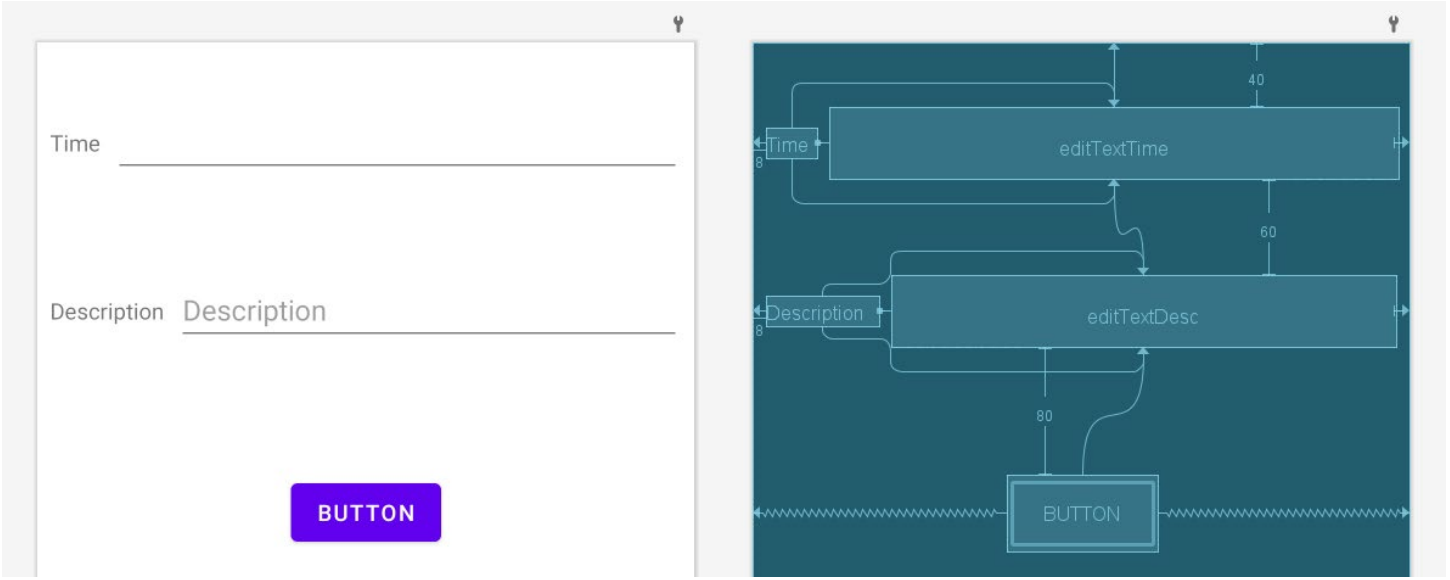
- When we use?
  - Bluetooth connection -> manage it
  - System turned on -> register alarm, …
  - …

Lab – Week #5

- Make an alarm setup application
- First activity
  - EditText: Input hour, minute, and description
  - Button: Press to go on Second activity
- Second activity
  - User can check information
  - Button: Press OK button to call another alarm app.

Lab – Week #5

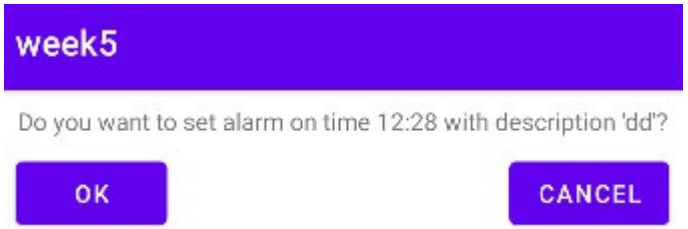
- First activity

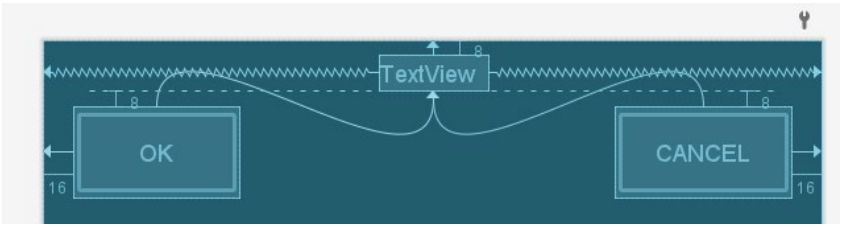


  - Textview to label, EditText to get input.
  - android:inputType="time" / "textPersonName"

Lab – Week #5

- Second activity



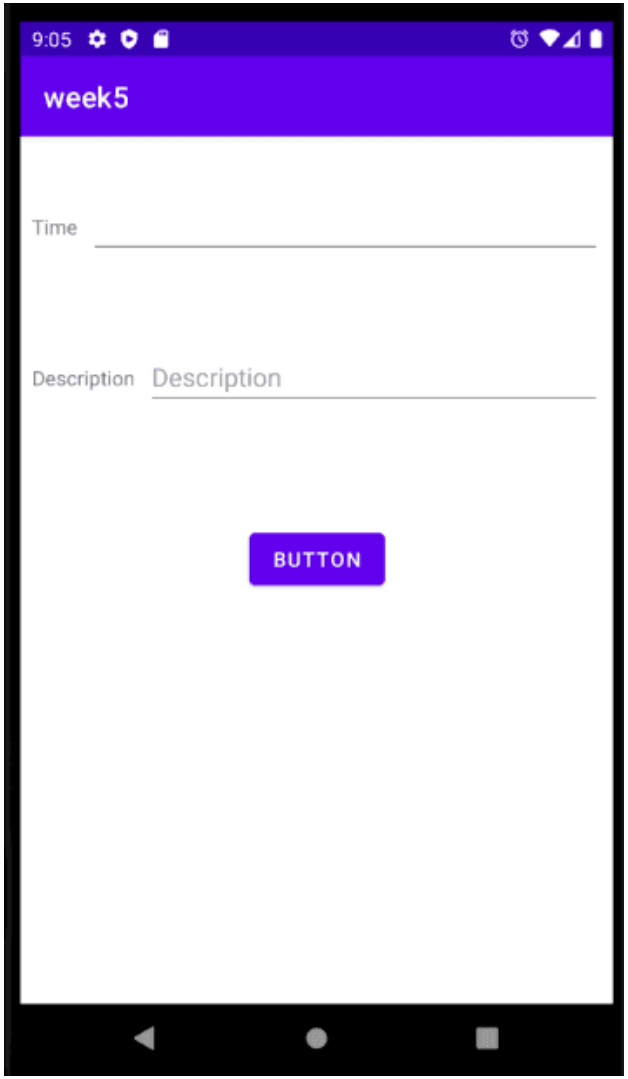


  - Get data from First activity and set TextView to "Do you want to set alarm on time <Time> with description '<Description>'?"
  - Cancel button: close activity
  - OK button: implicit intent to alarm app / close activity

Lab – Week #5

- Scoring Criteria
  - UI
    - Please follow the slides.
    - TAs will help
  - Functionality
    - Data of First Activity must be passed to Second.
    - Second must be able to call implicit intent.
    - You don’t need to verify user input

Lab – Week #5



Lab – Week #5

- Project Environment
  - **minSdk: 26**
  - **compileSdk & targetSdk: 31**
  - **applicationId: "edu.skku.cs.week5"**

- Submission
  - "<Student ID>_w5.zip"
    - Export to Zip, change zip file name
    - Ignore ending -<number>

Lab – Week #5

- Tips
  - Alarm app intent
    - https://developer.android.com/guide/components/intents-common?hl=ko
    - AndroidManifest.xml

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="edu.skku.cs.week5">
    <uses-permission android:name="com.android.alarm.permission.SET_ALARM" />
    <queries>
        <intent>
            <action android:name="android.intent.action.SET_ALARM" />
        </intent>
    </queries>
    <application
```

      - <uses-permission android:name="com.android.alarm.permission.SET_ALARM" />
      - <action android:name="android.intent.action.SET_ALARM" />

Lab – Week #5

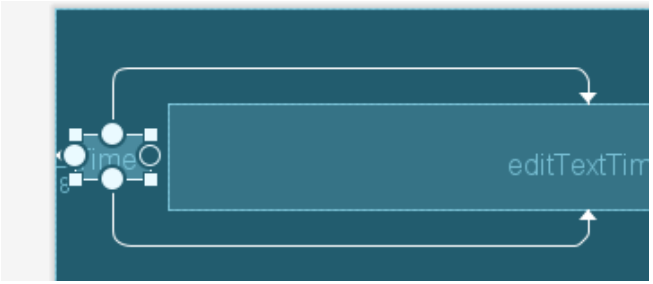
- Tips
  - Alarm app intent
    - Java code
      - new Intent(AlarmClock.ACTION_SET_ALARM)
      - Extra
        - » AlarmClock.EXTRA_MESSAGE
          - Message, String
        - » AlarmClock.EXTRA_HOUR
          - Alarm hour, int, 0~23
        - » AlarmClock.EXTRA_MINUTES
          - Alarm minute, int, 0~59

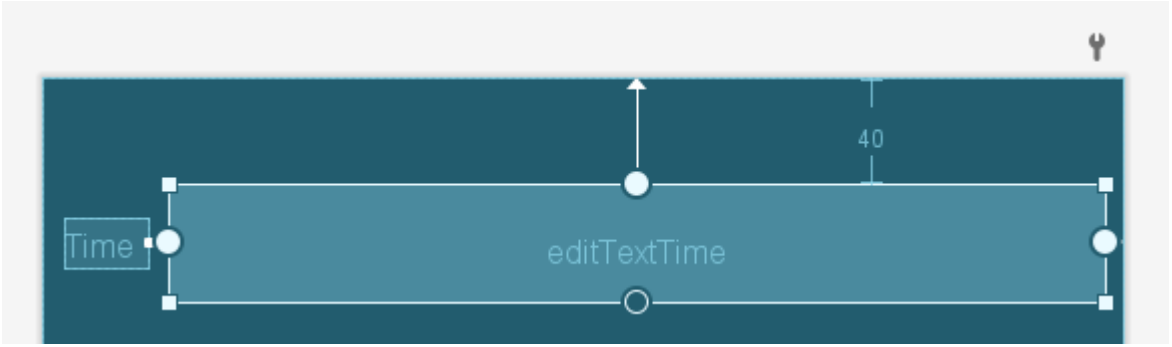
Lab – Week #5

- Tips
  - Close activity
    - this.finish()
  - Slice (hour:minute) to (hour) and (minute)
    - .split(":")[0]
    - .split(":")[1]
  - Parse String to int
    - Integer.parseInt("string_to_parse")
      - Integer.parseInt("123") // 123

Lab – Week #5

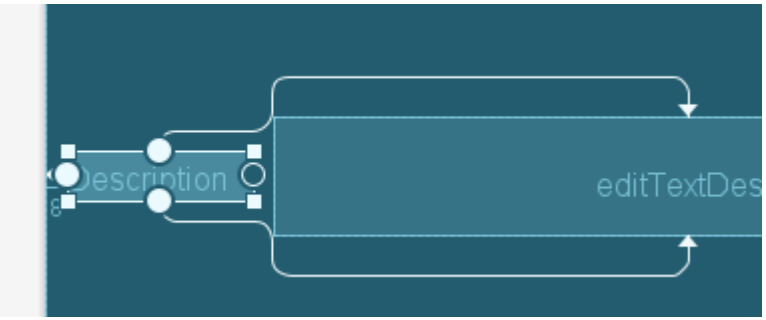
- Tips
  - Activity Layout
    - Invisible margin: 8
    - margin unit: dp

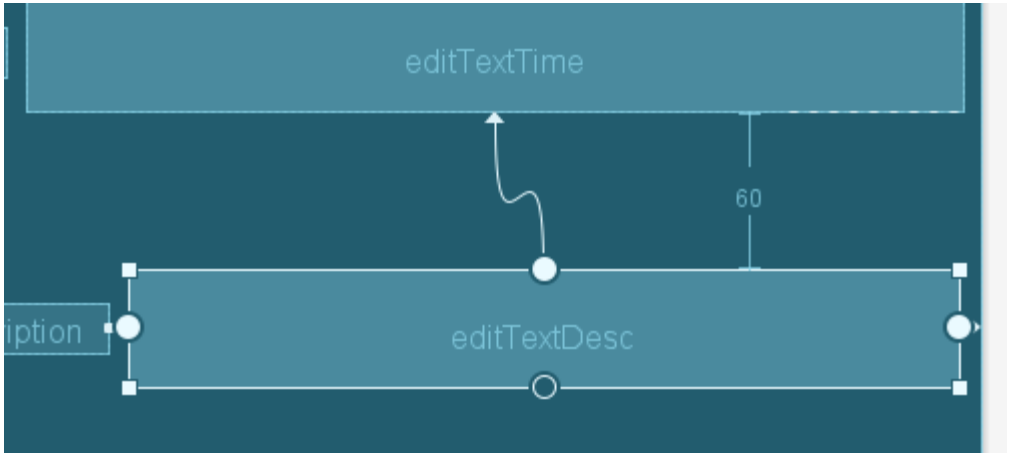


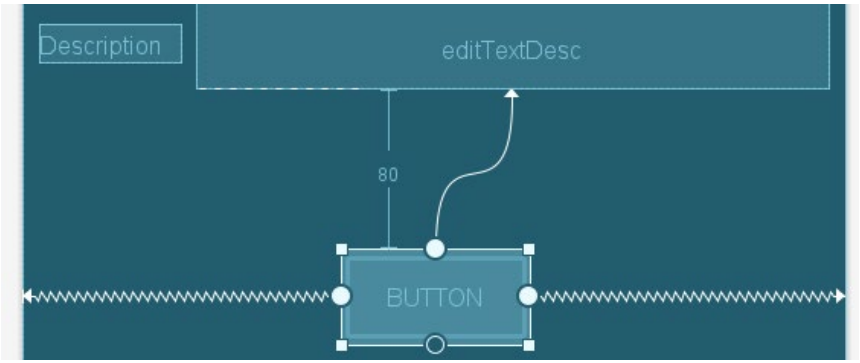


Lab – Week #5

- Tips
  - Activity Layout







Lab – Week #5

- Tips
  - Activity Layout