twitch.tv/dancojocar

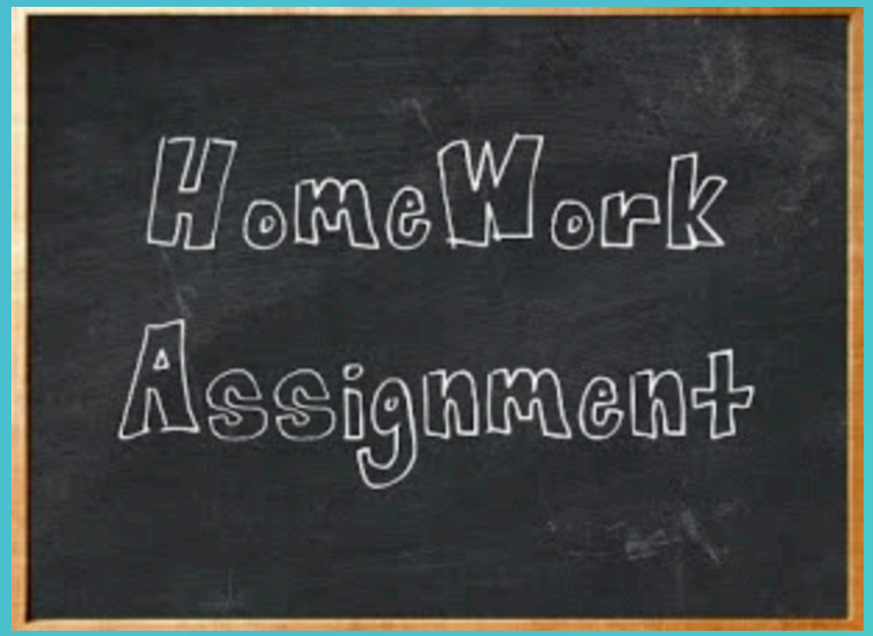
youtube.com/dancojocar

Lecture #2
Lists and Rest
Resources

Mobile Applications
Fall 2024

Homework Assignments

- First assignment - Project details **Due: October 20th**
- One CRUD project
  - UI Only
    - Native **Due: November 10th**
    - Non-Native **Due: December 1st**
  - DB **Due: December 22nd**
  - NET **Due: January 12th**



www.cs.ubbcluj.ro/~dan/ma/labPlan.html

CRUD Application

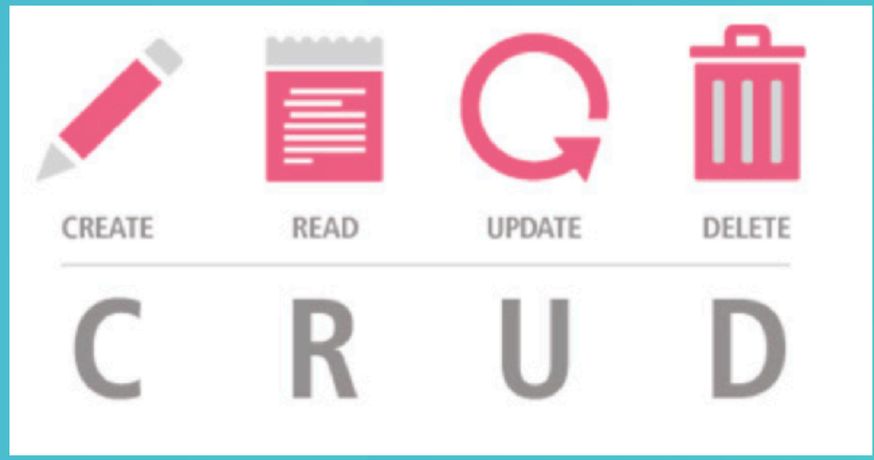
Native

AND

UI Only

Non-Native

Other



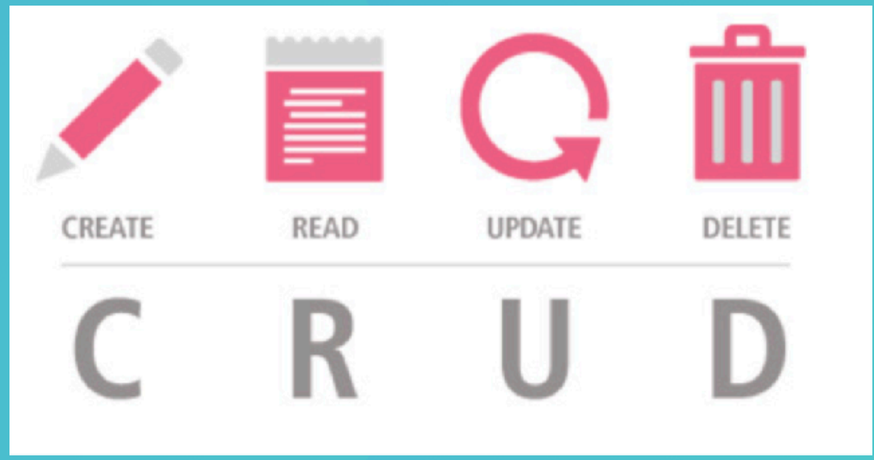
CRUD Application
DB, and NET

Native

Only one

Non-Native

Other



https://www.cs.ubbcluj.ro/~dan/ma/labPlan.html

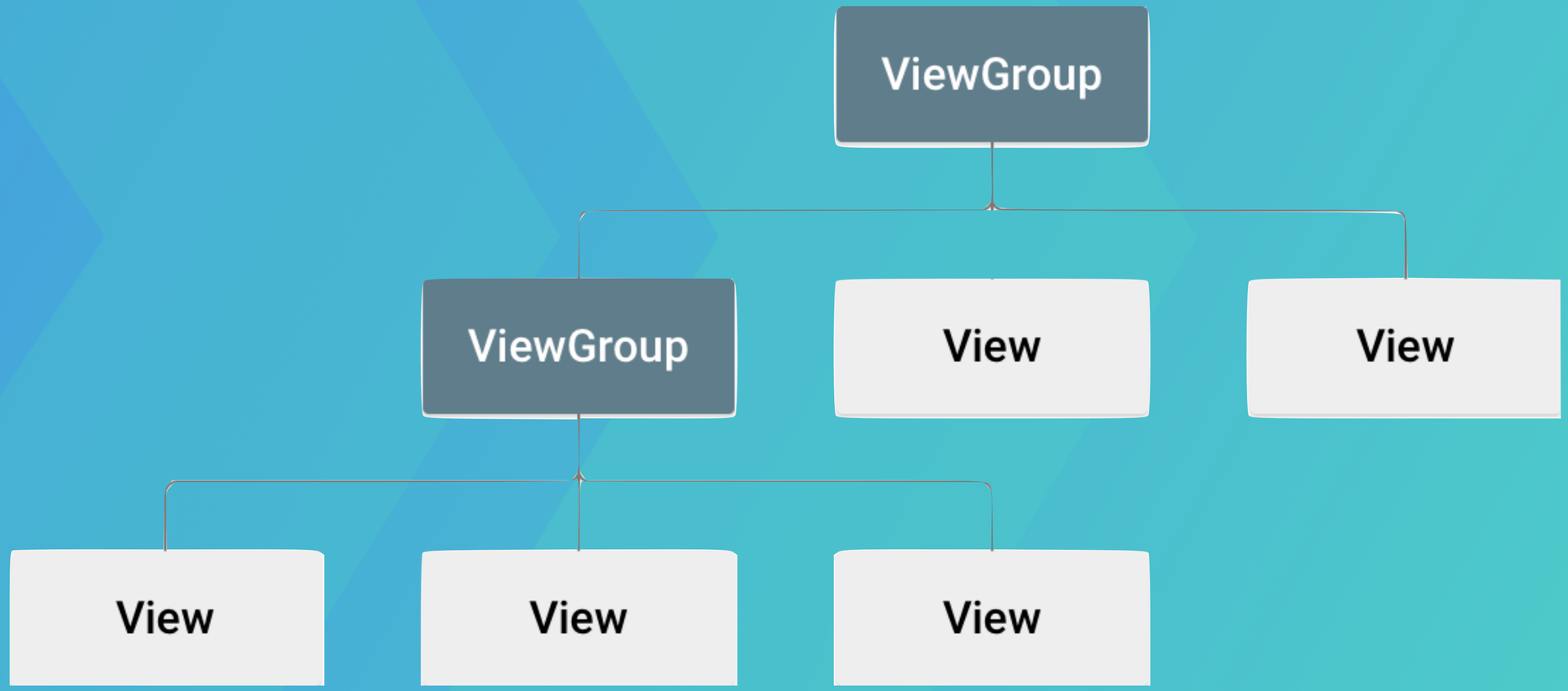
DEMO

Lifecycle

https://developer.android.com/guide/components/activities/activity-lifecycle

Layouts

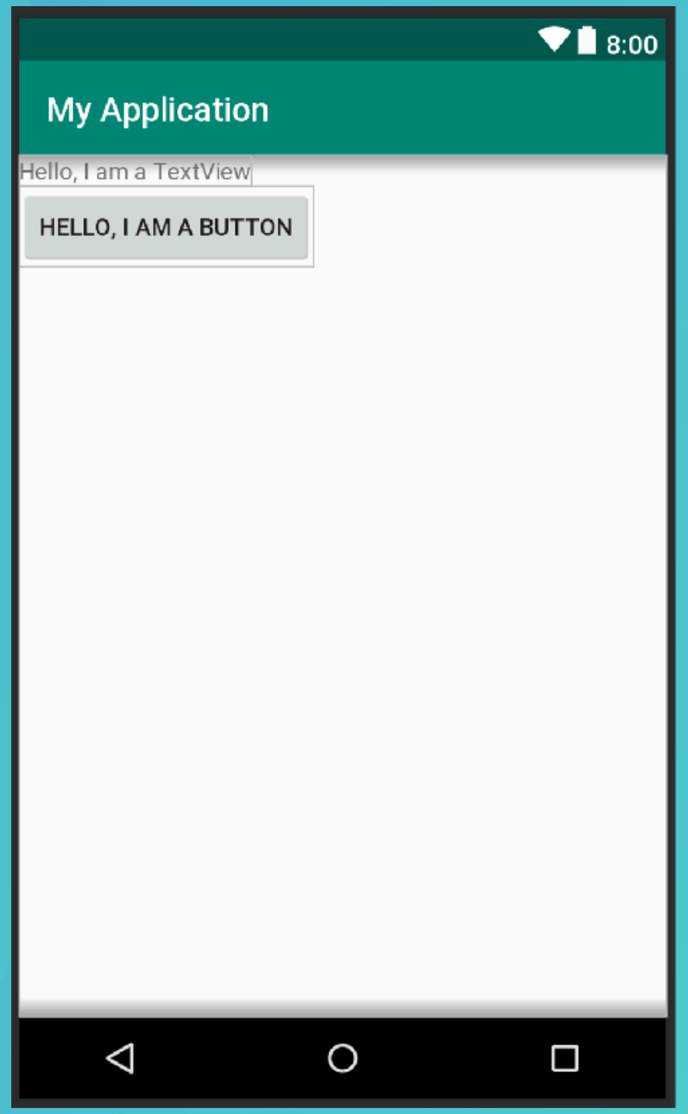
https://developer.android.com/guide/topics/ui/declaring-layout



XML

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://
schemas.android.com/apk/res/android"
              android:layout_width="match_parent"
              android:layout_height="match_parent"
              android:orientation="vertical">
    <TextView android:id="@+id/text"
              android:layout_width="wrap_content"
              android:layout_height="wrap_content"
              android:text="Hello, I am a TextView"/>
    <Button android:id="@+id/button"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Hello, I am a Button"/>
</LinearLayout>
```

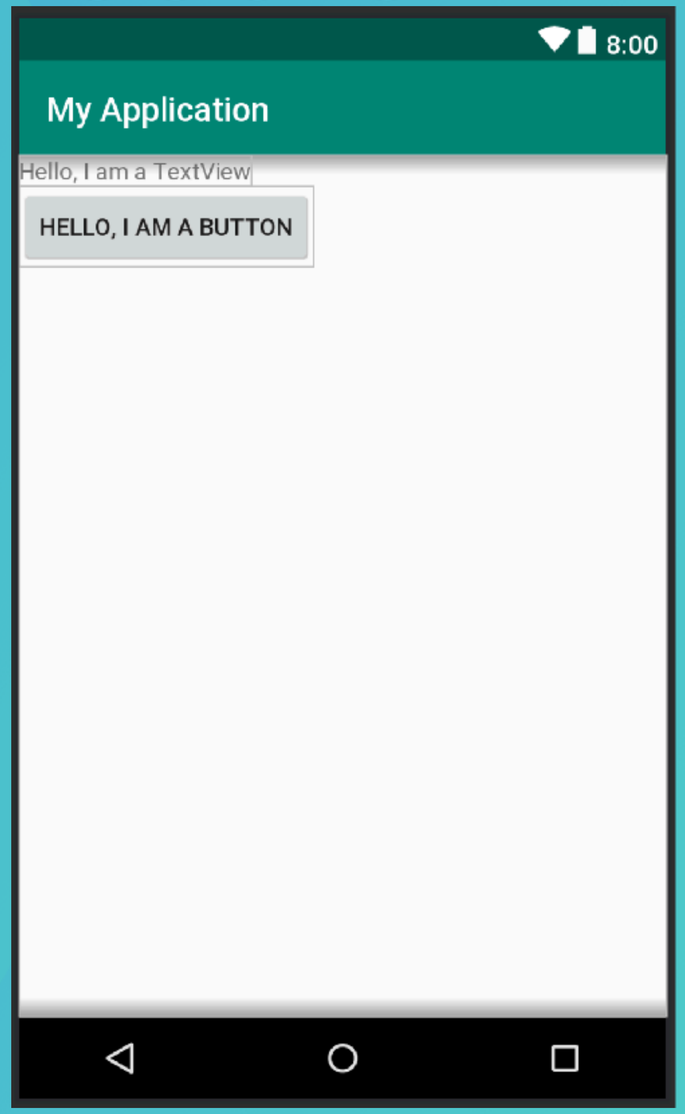
```
fun onCreate(savedInstanceState: Bundle) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.main_layout)
}
```



Accessing Assets

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://
schemas.android.com/apk/res/android"
              android:layout_width="match_parent"
              android:layout_height="match_parent"
              android:orientation="vertical">
    <TextView android:id="@+id/text"
              android:layout_width="wrap_content"
              android:layout_height="wrap_content"
              android:text="Hello, I am a TextView"/>
    <Button android:id="@+id/button"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Hello, I am a Button"/>
</LinearLayout>
```

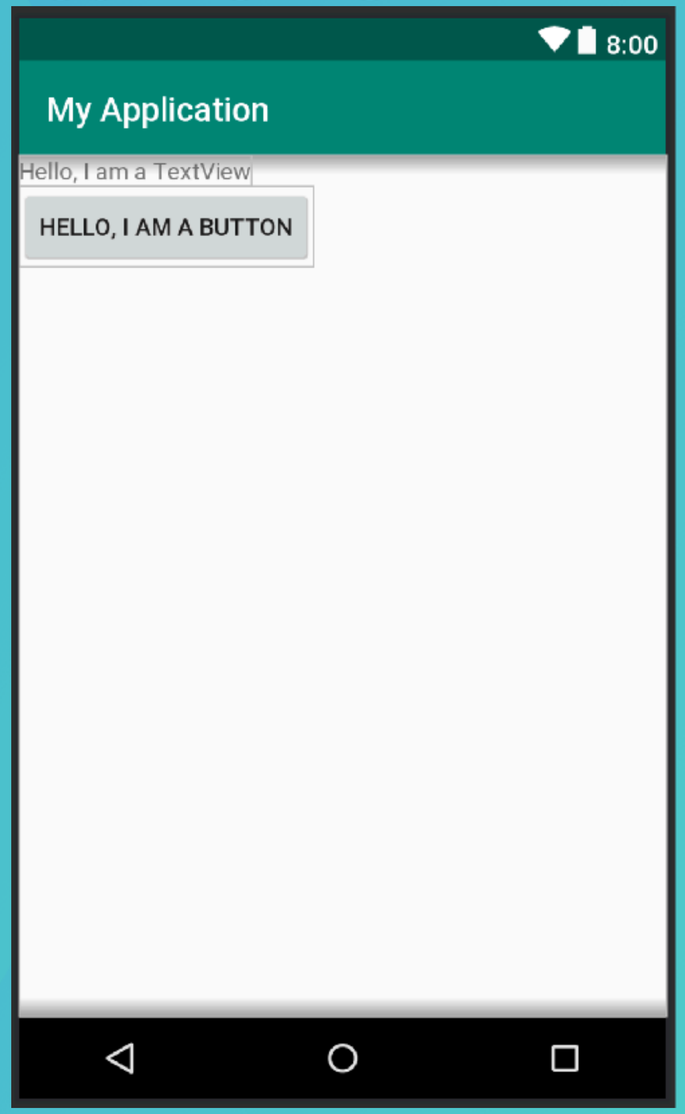
```
fun onCreate(savedInstanceState: Bundle) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.main_layout)
}   val myButton: Button = findViewById(R.id.button)
}
```



Add Event Handler

```
...
    <Button android:id="@+id/button"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Hello, I am a Button"
   />       android:onClick="sendMessage"
...
```

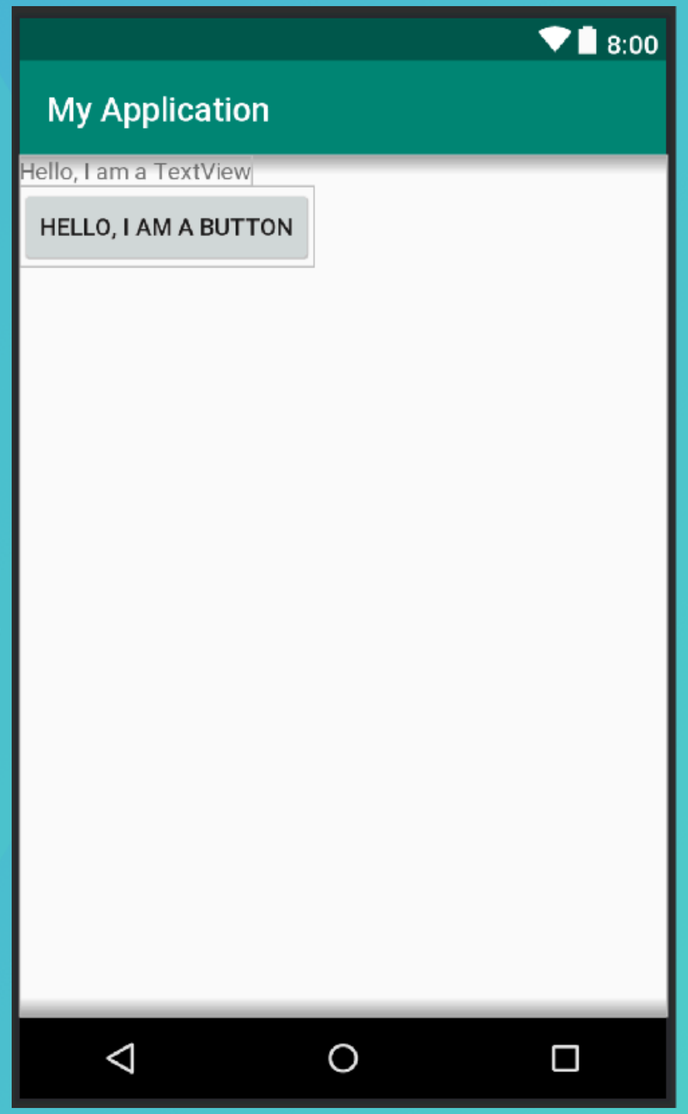
```
fun onCreate(savedInstanceState: Bundle) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.main_layout)
    val myButton: Button = findViewById(R.id.button)
}
fun sendMessage(view: View) {
   logd("Ready!")
}
```



Using Android KTX

```
import kotlinx.android.synthetic.main.activity_main.*
...
    <Button android:id="@+id/button"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Hello, I am a Button"
            android:onClick="sendMessage"
   />
...
```

```
fun onCreate(savedInstanceState: Bundle) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.main_layout)
    val myButton: Button = findViewById(R.id.button)
    button.setOnClickListener {
      text.text = "From editText: ${editText.text.toString()}"
      button.text = "Update"
    }
    logd("Ready!")
}
fun sendMessage(view: View) {
}
```

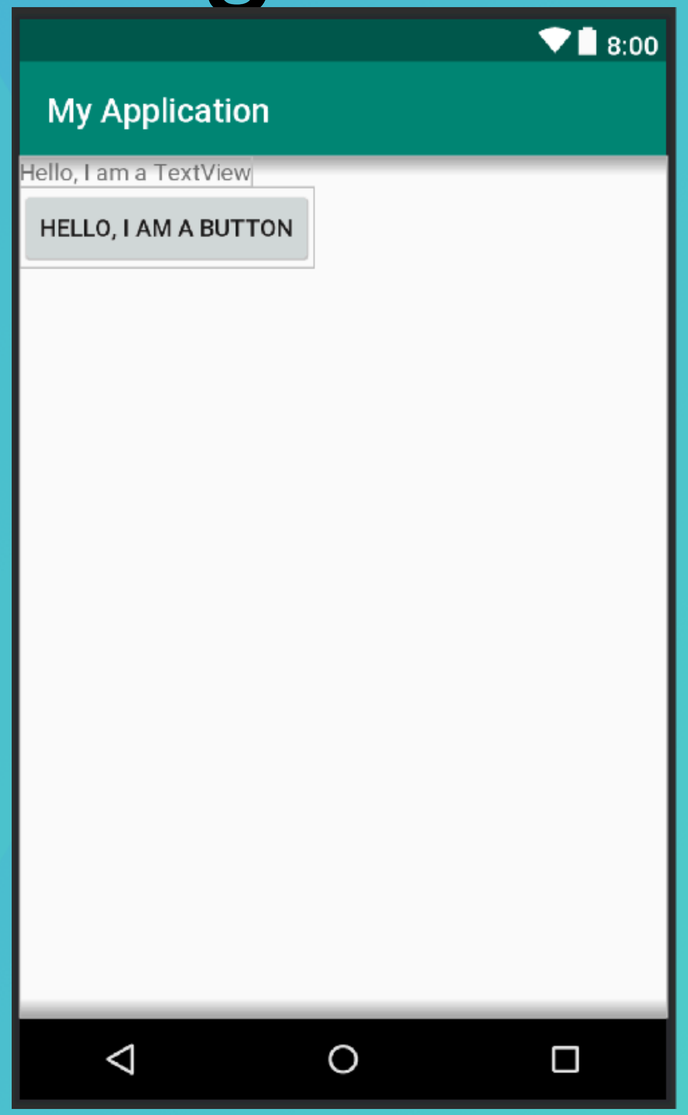


https://developer.android.com/kotlin/ktx

Using ViewBinding

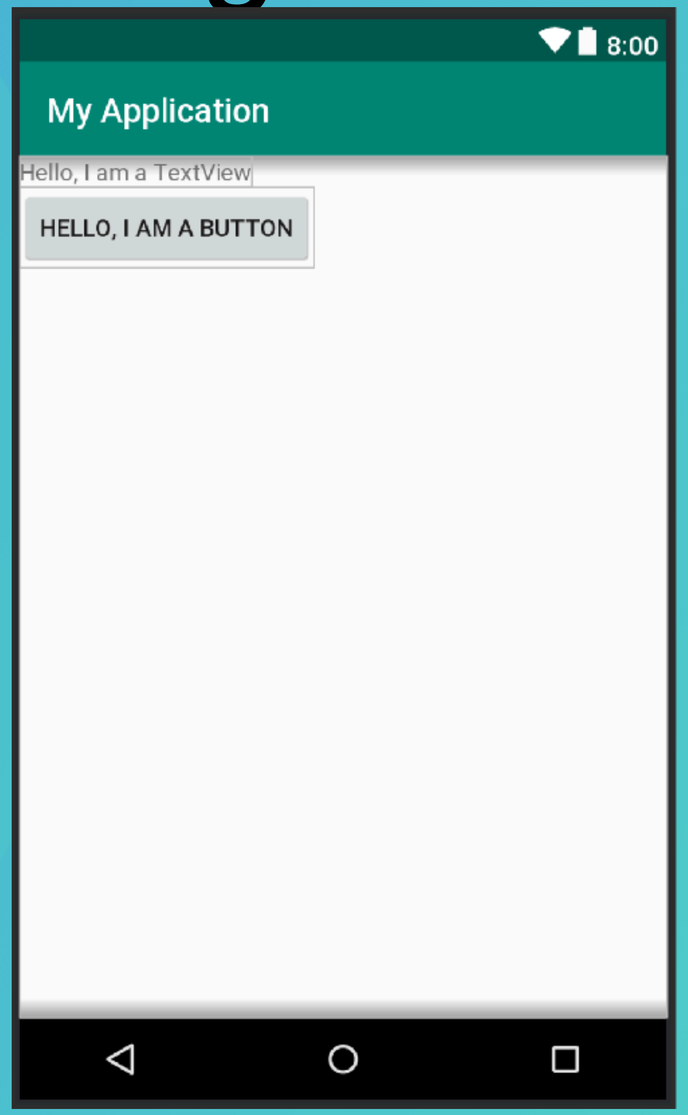
```
plugins {
    kotlin("android.extensions")
}

android {
    ...
    buildFeatures {
        viewBinding = true
    }
}
```

```
private lateinit var binding: MainActivityBinding
override fun onCreate(savedInstanceState: Bundle?) {
    super.onCreate(savedInstanceState)
    binding = MainActivityBinding.inflate(layoutInflater)
    val view = binding.root
    setContentView(view)
}
```



Using ViewBinding

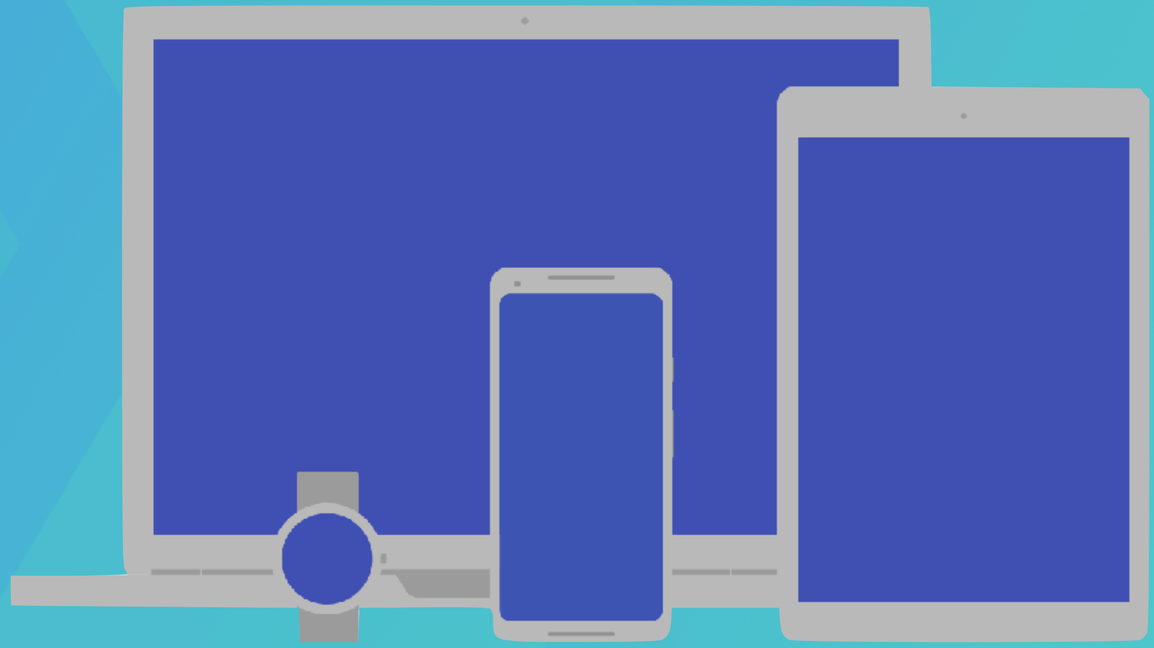
```
private lateinit var binding: MainActivityBinding
override fun onCreate(savedInstanceState: Bundle?) {
    super.onCreate(savedInstanceState)
    binding = MainActivityBinding.inflate(layoutInflater)
    val view = binding.root
    setContentView(view)
}

binding.name.text = “Hello, I am a TextView”
binding.button.setOnClickListener { viewModel.userClicked() }
```



https://developer.android.com/topic/libraries/view-binding

Supporting different screen sizes

- Flexible layouts
- Alternative layouts
- Stretchable images
- Alternative bitmaps
- Vector graphics



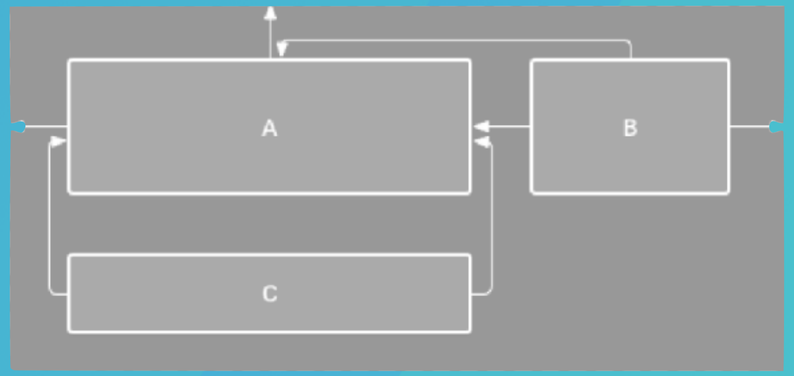
https://developer.android.com/guide/practices/screens_support

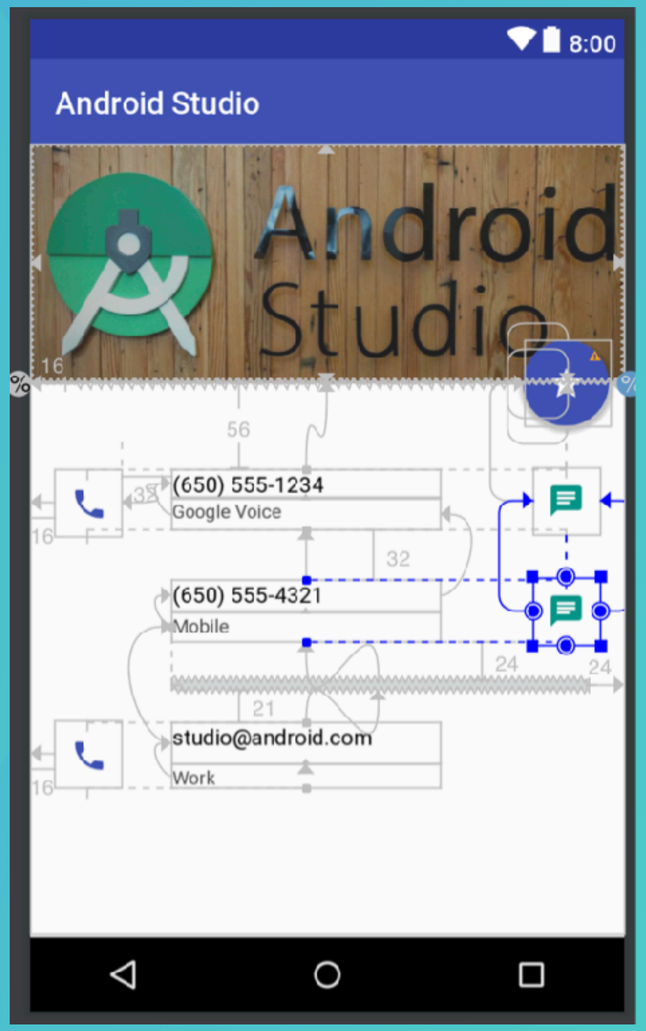
Flexible Layouts

ConstraintLayout

In module-level **gradle.build:**

```
repositories {
    google()
}

dependencies {
 implementation
 'com.android.support.constraint:constraint-layout:2.1.4'
}
```



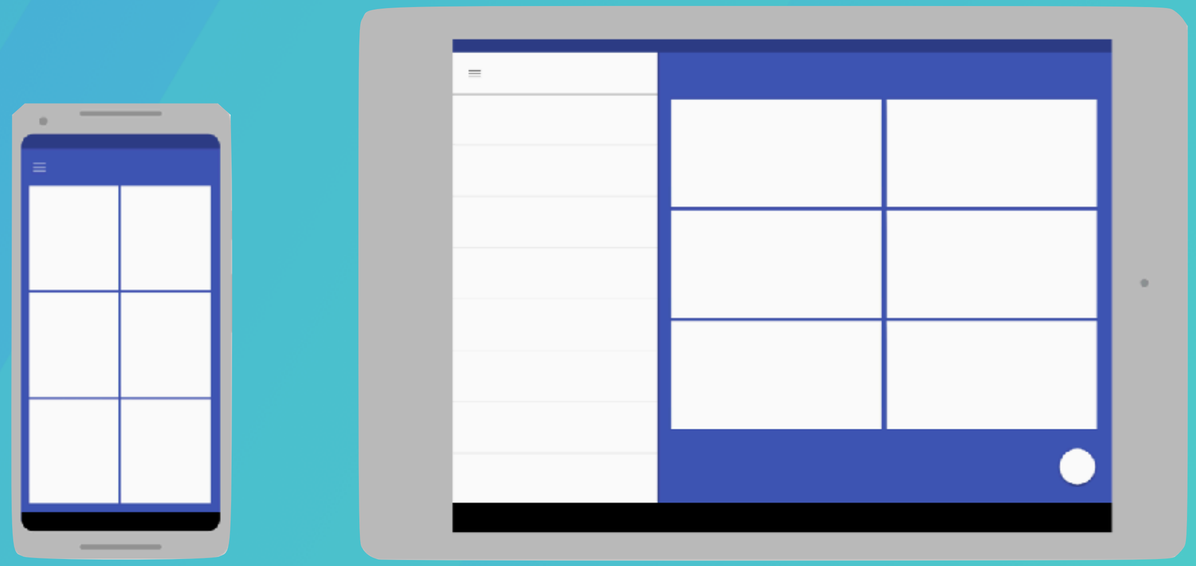


https://developer.android.com/training/constraint-layout/

DEMO

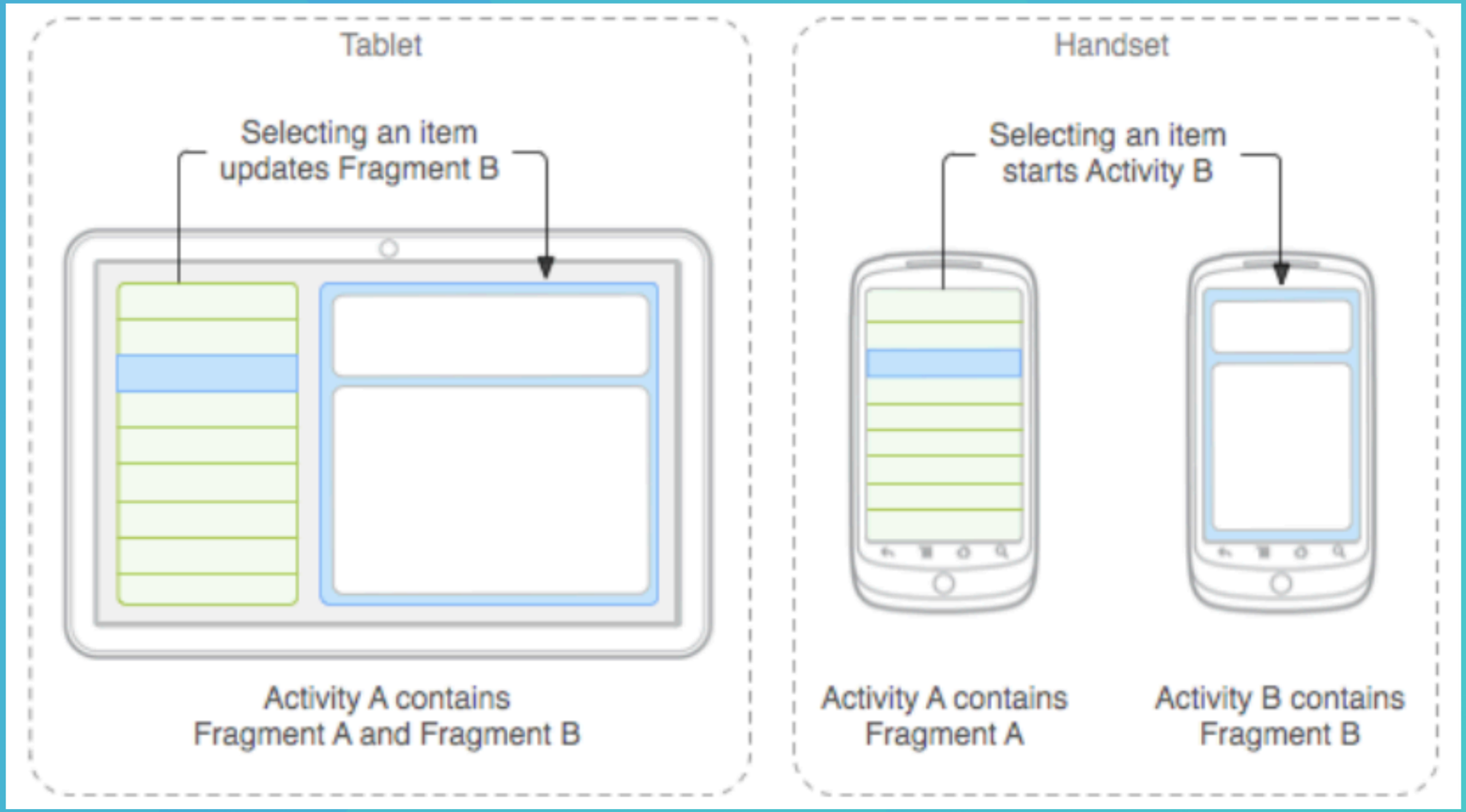
Alternative layouts

```
res/layout/main_activity.xml                  # Default layout
res/layout-land/main_activity.xml             # When in landscape mode
res/layout-sw600dp/main_activity.xml          # For 7” tablets
res/layout-sw600dp-land/main_activity.xml     # For 7” tablets in landscape
```



https://developer.android.com/training/multiscreen/screensizes#alternative-layouts

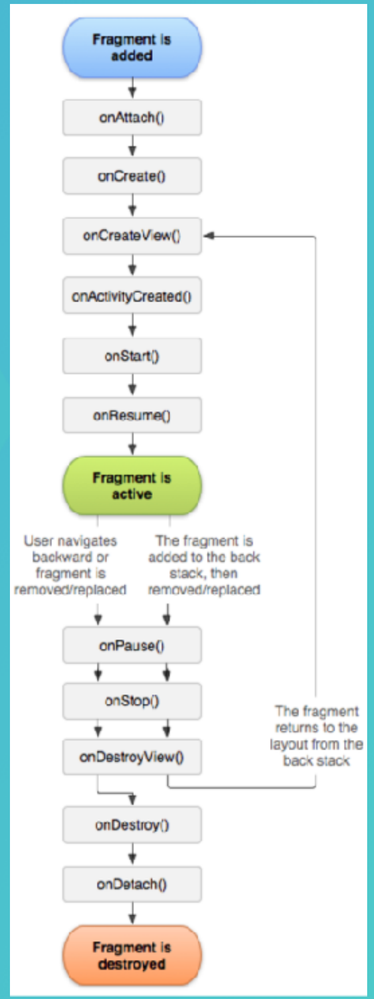
Building a Dynamic UI with Fragments



https://developer.android.com/guide/components/fragments

Creating a Fragment

- New callbacks
  - onAttach
  - onCreateView
  - onActivityCreated
  - onDestroyView
  - onDetach



https://developer.android.com/reference/android/support/v4/app/Fragment

Creating a Fragment

```
class ArticleListFragment : Fragment() {

    override fun onCreateView(
            inflater: LayoutInflater,
            container: ViewGroup?,
            savedInstanceState: Bundle?
    ): View {
        // Inflate the layout for this fragment
        return inflater.inflate(R.layout.example_fragment, container, false)
    }
}
```

Declare the fragment inside the activity's layout file.

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="horizontal"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <fragment android:name="com.example.news.ArticleListFragment"
            android:id="@+id/list"
            android:layout_weight="1"
            android:layout_width="0dp"
            android:layout_height="match_parent" />
    <fragment android:name="com.example.news.ArticleReaderFragment"
            android:id="@+id/viewer"
            android:layout_weight="2"
            android:layout_width="0dp"
            android:layout_height="match_parent" />
</LinearLayout>
```

https://developer.android.com/reference/android/support/v4/app/Fragment

Creating a Fragment

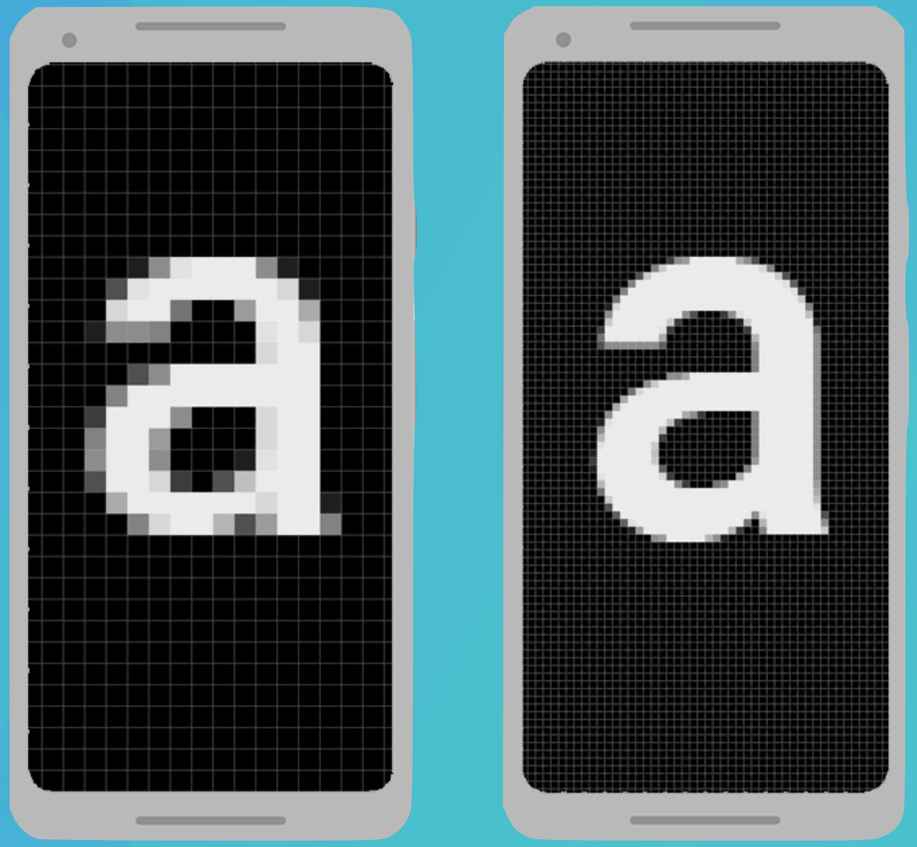
```
class ArticleListFragment : Fragment() {

    override fun onCreateView(
            inflater: LayoutInflater,
            container: ViewGroup?,
            savedInstanceState: Bundle?
    ): View {
        // Inflate the layout for this fragment
        return inflater.inflate(R.layout.example_fragment, container, false)
    }
}
```

Or, programmatically add the fragment to an existing ViewGroup

```
val fragmentManager = supportFragmentManager
val fragmentTransaction = fragmentManager.beginTransaction()

val fragment = ArticleListFragment()
fragmentTransaction.add(R.id.fragment_container, fragment)
fragmentTransaction.commit()
```

https://developer.android.com/reference/android/support/v4/app/Fragment

Density-independent pixels

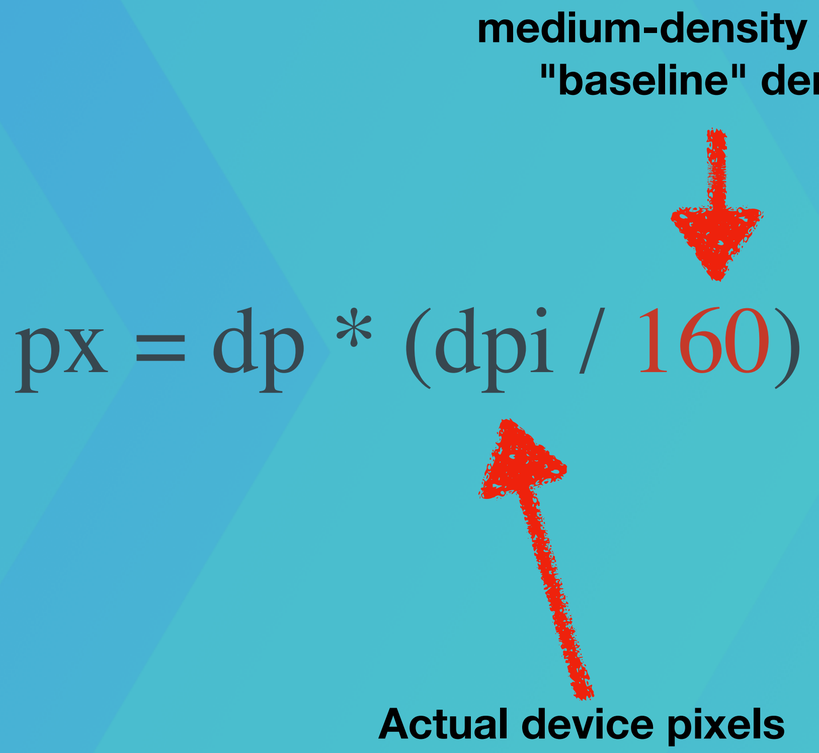


Density-independent pixels

```
<Button android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="@string/clickme"
    android:layout_marginTop="20dp" />
```

```
<TextView android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:textSize="20sp" />
```

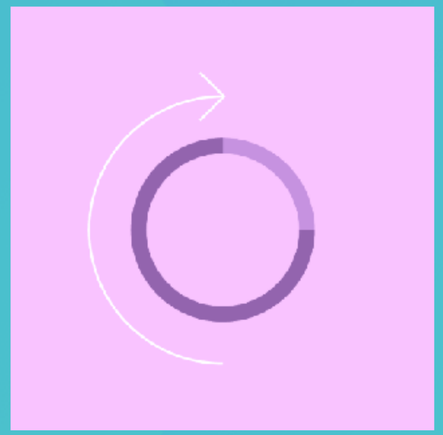
dp units to pixel units



Progress Indicators

- ProgressBar
- RatingBar
- SeekBar

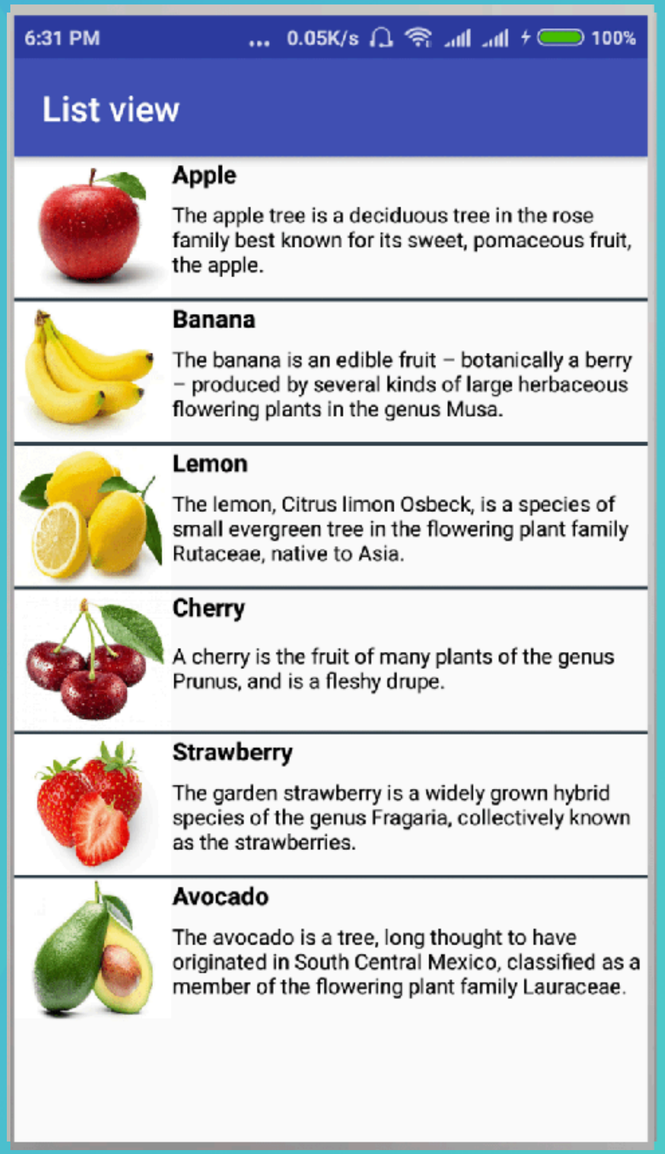
```
<ProgressBar
      android:id="@+id/indicator"
      android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:visibility="gone"
      />

//before starting the action
indicator.visibility = View.VISIBLE

//when the action is done
indicator.visibility = View.GONE
```



https://developer.android.com/reference/android/widget/ProgressBar

Lists

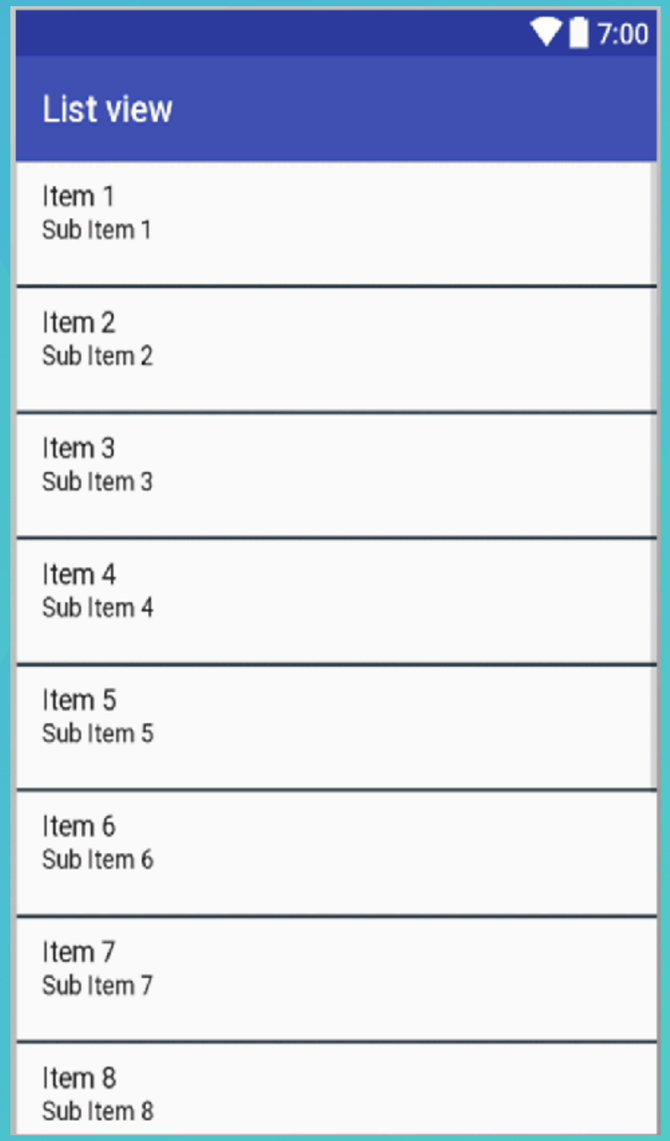
- ListView
- RecyclerView



ListView

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
        android:orientation="vertical"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:paddingLeft="8dp"
        android:paddingRight="8dp">
    <ListView android:id="@android:id/list"
              android:layout_width="match_parent"
              android:layout_height="match_parent"/>
</LinearLayout>
```

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
  xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:orientation="vertical">
    <TextView android:id="@+id/text"
        android:textSize="16sp"
        android:textStyle="bold"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"/>
    <TextView android:id="@+id/subText"
      ...
</LinearLayout>
```

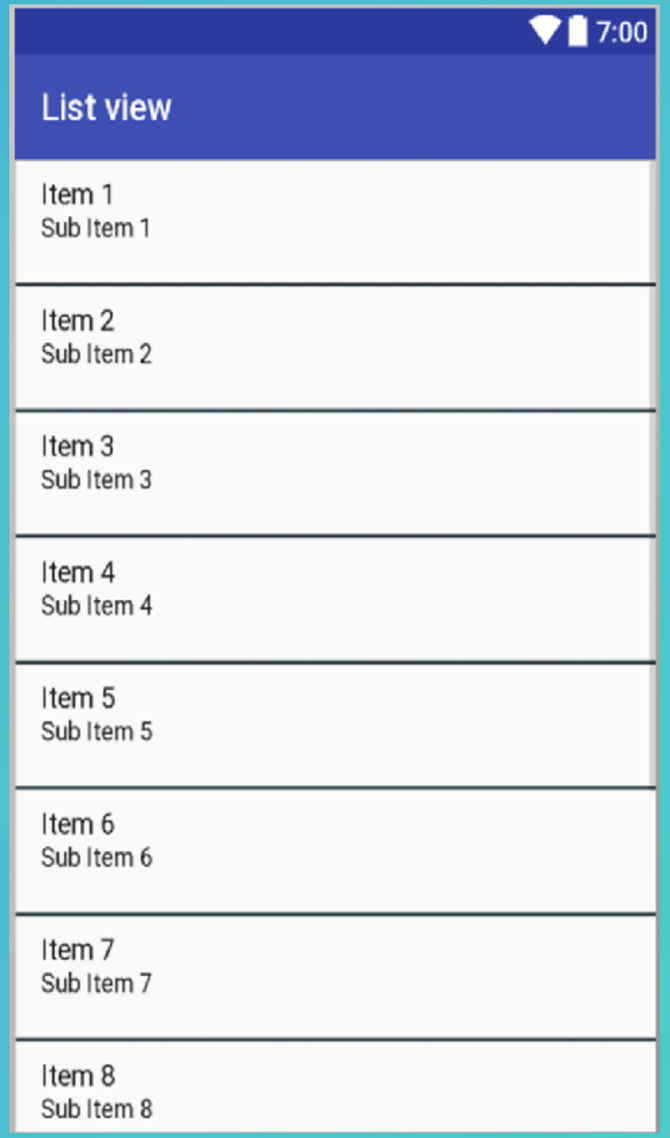


ListView

DEMO

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="..."
        android:orientation="vertical"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:paddingLeft="8dp"
        android:paddingRight="8dp">
    <ListView android:id="@android:id/myList"
              android:layout_width="match_parent"
              android:layout_height="match_parent"/>
</LinearLayout>
```

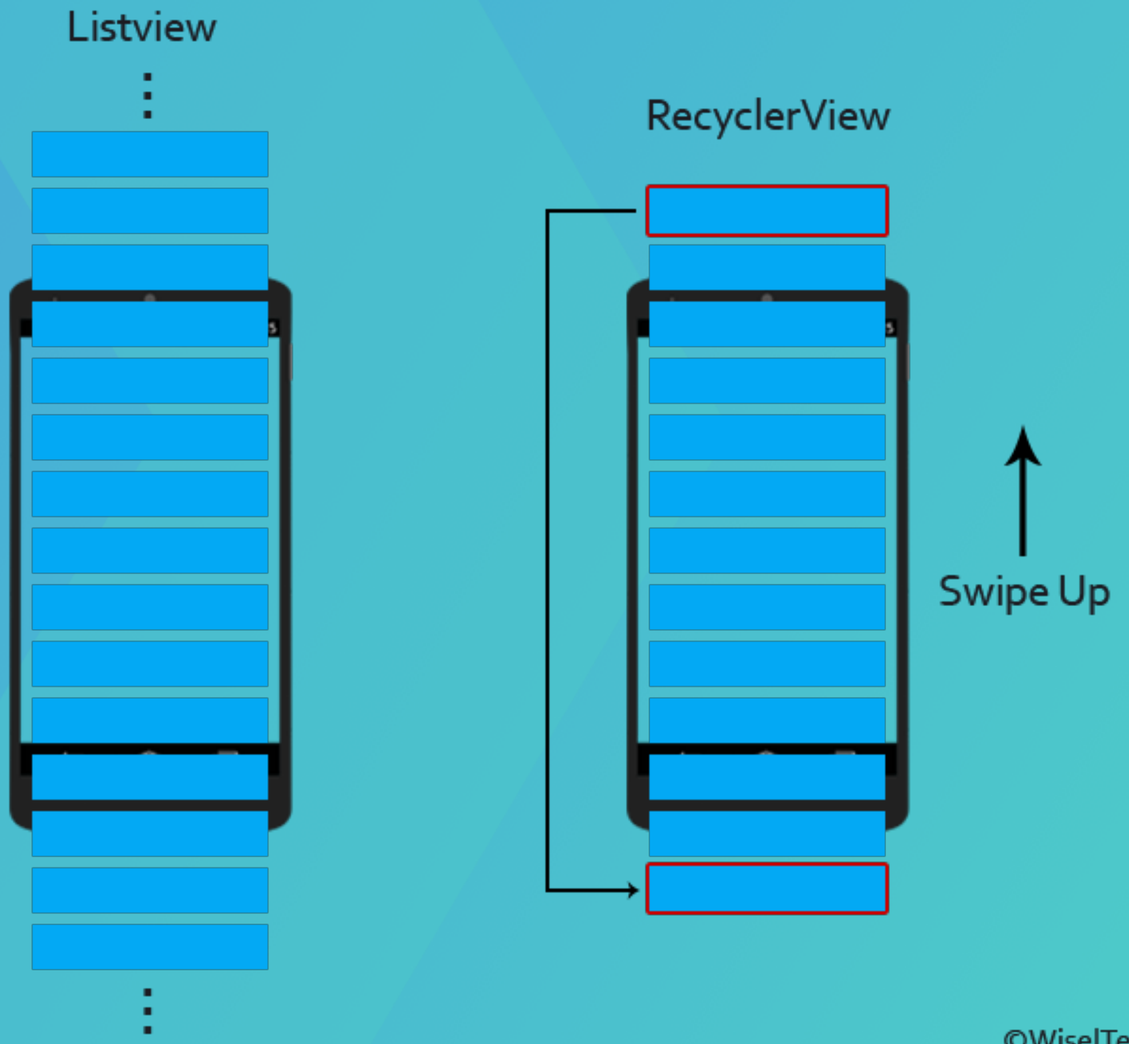
```
val arrayAdapter = ArrayAdapter<String>(this,
  android.R.layout.simple_list_item_1, arrayList)

myList.adapter = arrayAdapter
```



https://developer.android.com/guide/topics/ui/layout/listview

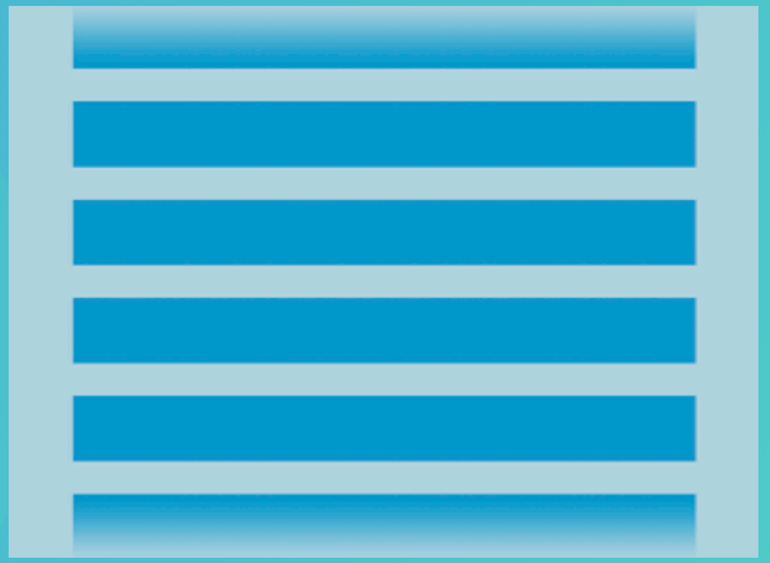
RecyclerView

- ListView
- RecyclerView



RecyclerView

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A RecyclerView with some commonly used attributes -->
<android.support.v7.widget.RecyclerView
    android:id="@+id/my_recycler_view"
    android:scrollbars="vertical"
    android:layout_width="match_parent"
    android:layout_height="match_parent"/>
```



```
class MyActivity : Activity() {
    private lateinit var recyclerView: RecyclerView
    private lateinit var viewAdapter: RecyclerView.Adapter<*>
    private lateinit var viewManager: RecyclerView.LayoutManager
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContentView(R.layout.my_activity)
        viewManager = LinearLayoutManager(this)
        viewAdapter = MyAdapter(myDataset)
        recyclerView = findViewById<RecyclerView>(R.id.my_recycler_view).apply {
            setHasFixedSize(true)
            layoutManager = viewManager
            adapter = viewAdapter
        }
    }
    // ...
}
```

https://developer.android.com/guide/topics/ui/layout/recyclerview

DEMO

RecyclerView.Adapter

```
class MyAdapter(private val myDataset: Array<String>) :
        RecyclerView.Adapter<MyAdapter.MyViewHolder>() {

    class MyViewHolder(val textView: TextView) : RecyclerView.ViewHolder(textView)

    override fun onCreateViewHolder(parent: ViewGroup,
                                    viewType: Int): MyAdapter.MyViewHolder {
        val textView = LayoutInflater.from(parent.context)
                .inflate(R.layout.my_text_view, parent, false) as TextView
        ...
        return MyViewHolder(textView)
    }

    // Replace the contents of a view (invoked by the layout manager)
    override fun onBindViewHolder(holder: MyViewHolder, position: Int) {
        // - get element from your dataset at this position
        // - replace the contents of the view with that element
        holder.textView.text = myDataset[position]
    }

    override fun getItemCount() = myDataset.size
}
```

https://developer.android.com/guide/topics/ui/layout/recyclerview

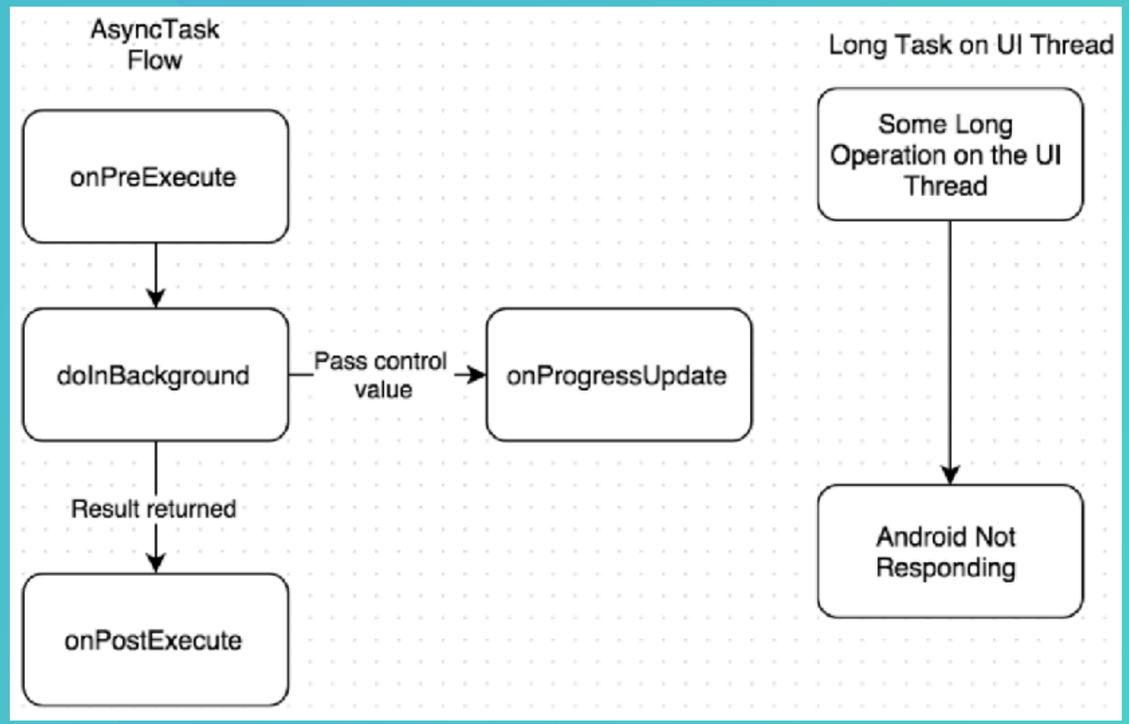
AsyncTask

Deprecated

BackgroundThread

```
class SomeTask():
    AsyncTask<Void, Int, String>() {
  override fun doInBackground(
     vararg params: Void?): String? {
    // ...
  }
  override fun onPreExecute() {
    super.onPreExecute()
    // ...
  }
  override fun onPostExecute(
     result: String?) {
    super.onPostExecute(result)
    // ...
  }
  override fun onProgressUpdate(
     vararg values: Int){
    super.onProgressUpdate(result)
    // ...
  }
}
```

UiThread



https://developer.android.com/reference/android/os/AsyncTask

Anko AsyncTask Alternative

BackgroundThread

```
doAsync {
  //Execute all the long running
  // tasks here
  val s: String = makeNetworkCall()
  uiThread {
    //Update the UI thread here
   alert("Downloaded data is $s",
      "Hi I'm an alert") {
    yesButton { toast("Yay !") }
    noButton { toast(":( !") }
   }.show()
  }
}
```

UiThread

https://github.com/Kotlin/anko/wiki/Anko-Coroutines

Jetpack Compose

https://developer.android.com/jetpack/compose

Compose Layout Basics

Compose transforms state into UI elements, via:

- Composition of elements
- Layout of elements
- Drawing of elements

Goals

- High performance
- Ability to easily write custom layouts

Basics

```
@Composable
fun ArtistCard() {
    Text("Alfred Sisley")
    Text("3 minutes ago")
}
```

Basics

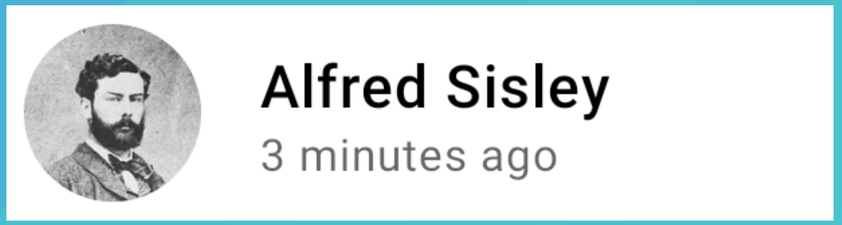
```
@Composable
fun ArtistCard() {
    Column {
        Text("Alfred Sisley")
        Text("3 minutes ago")
    }
}
```

Alfred Sisley

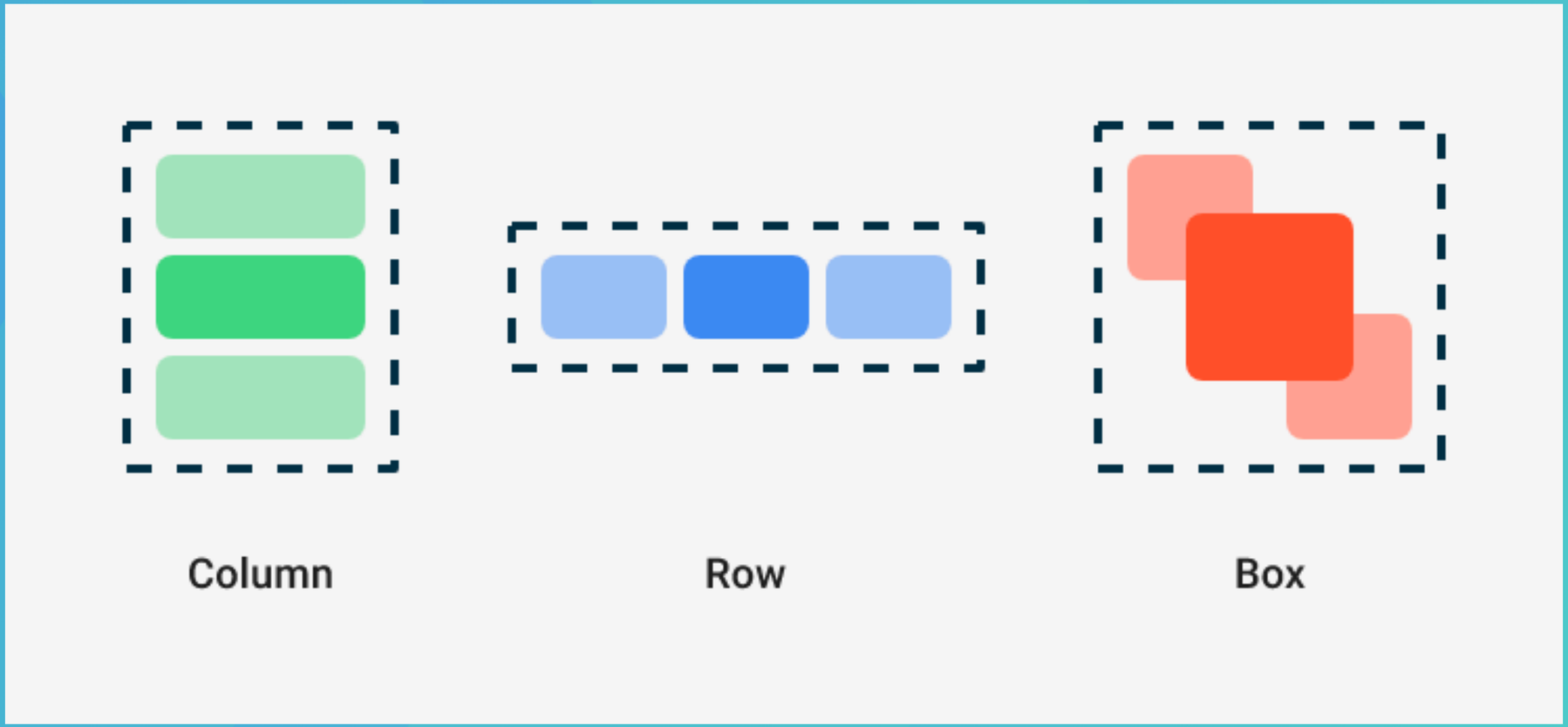
3 minutes ago

Basics

```
@Composable
fun ArtistCard(artist: Artist) {
    Row(verticalAlignment = Alignment.CenterVertically) {
        Image(/*...*/)
        Column {
            Text(artist.name)
            Text(artist.lastSeenOnline)
        }
    }
}
```



Basics



LazyLists


```
import androidx.compose.foundation.lazy.items

@Composable
fun MessageList(messages: List<Message>) {
    LazyColumn {
        items(messages) { message ->
            MessageRow(message)
        }
    }
}
```

https://developer.android.com/jetpack/compose/tutorial

Constraint Layout


```
@Composable
fun ConstraintLayoutContent() {
    ConstraintLayout {
        // Create references for the composables to constrain
        val (button, text) = createRefs()
        Button(
            onClick = { /* Do something */ },
            // Assign reference "button" to the Button composable
            // and constrain it to the top of the ConstraintLayout
            modifier = Modifier.constrainAs(button) {
                top.linkTo(parent.top, margin = 16.dp)
            }
        ) {
            Text("Button")
        }
        // Assign reference "text" to the Text composable
        // and constrain it to the bottom of the Button composable
        Text("Text", Modifier.constrainAs(text) {
```

https://developer.android.com/jetpack/compose/layouts/constraintlayout

Adaptive Layouts

Adaptive Layouts

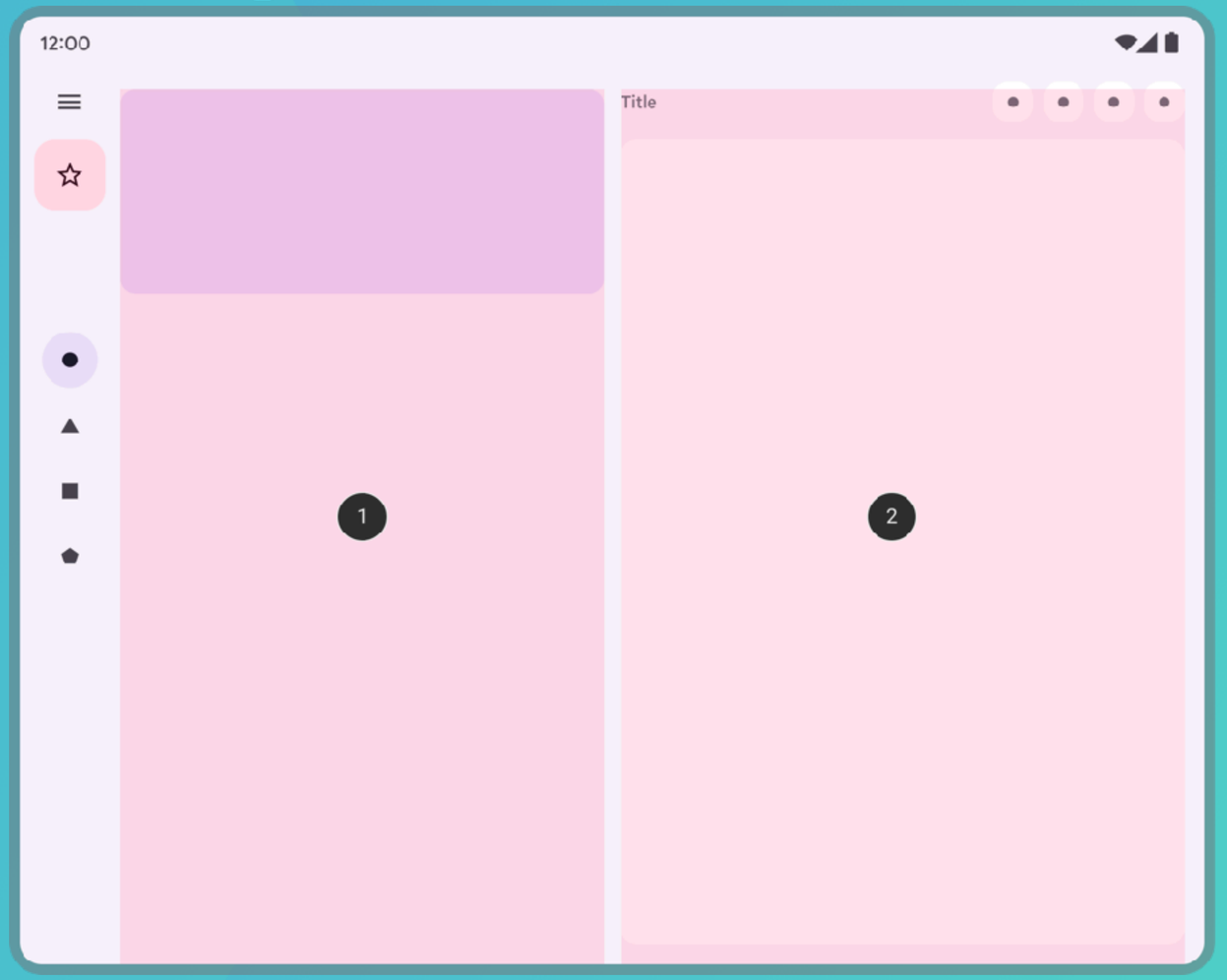
```
enum class WindowSizeClass { Compact, Medium, Expanded }

@Composable
fun MyApp(windowSizeClass: WindowSizeClass) {
    // Perform logic on the size class to decide whether to show
    // the top app bar.
    val showTopAppBar = windowSizeClass != WindowSizeClass.Compact

    // MyScreen knows nothing about window sizes, and performs logic
    // based on a Boolean flag.
    MyScreen(
        showTopAppBar = showTopAppBar,
        /* ... */
    )
}
```

Flexible Layouts

```
@Composable
fun AdaptivePane(
    showOnePane: Boolean,
    /* ... */
) {
    if (showOnePane) {
        OnePane(/* ... */)
    } else {
        TwoPane(/* ... */)
    }
}
```

Flexible Layouts

```
@Composable
fun AdaptivePane(
    showOnePane: Boolean,
    /* ... */
) {
    if (showOnePane) {
        OnePane(/* ... */)
    } else {
        TwoPane(/* ... */)
    }
}
```



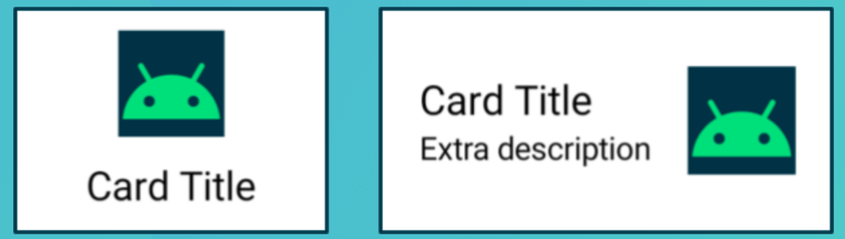
Flexible Layouts

```
@Composable
fun Card(/* ... */) {
    BoxWithConstraints {
        if (maxWidth < 400.dp) {
            Column {
                Image(/* ... */)
                Title(/* ... */)
            }
        } else {
            Row {
                Column {
                    Title(/* ... */)
                    Description(/* ... */)
                }
                Image(/* ... */)
            }
        }
    }
}
```

Flexible Layouts

```
@Composable
fun Card(/* ... */) {
    BoxWithConstraints {
        if (maxWidth < 400.dp) {
            Column {
                Image(/* ... */)
                Title(/* ... */)
            }
        } else {
            Row {
                Column {
                    Title(/* ... */)
                    Description(/* ... */)
                }
                Image(/* ... */)
            }
        }
    }
}
```

DEMO



https://developer.android.com/large-screens

Lecture outcomes

- Support different screen, using layouts and fragments
- ListView, RecyclerView, Progress Indicators
- Retrieve data on background threads