CMPS 312

Navigation

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Navigation

The act of moving between screens of an app to complete tasks

Designing effective navigation = Simplify the user journey

Outline

1. Navigating Between Activities
2. Dialogs
3. Navigation UI
4. Navigation Component

Navigating Between Activities

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Using Multiple Activities

- How do we **navigate** to a new screen?
  - Start a new Activity using an **Intent**

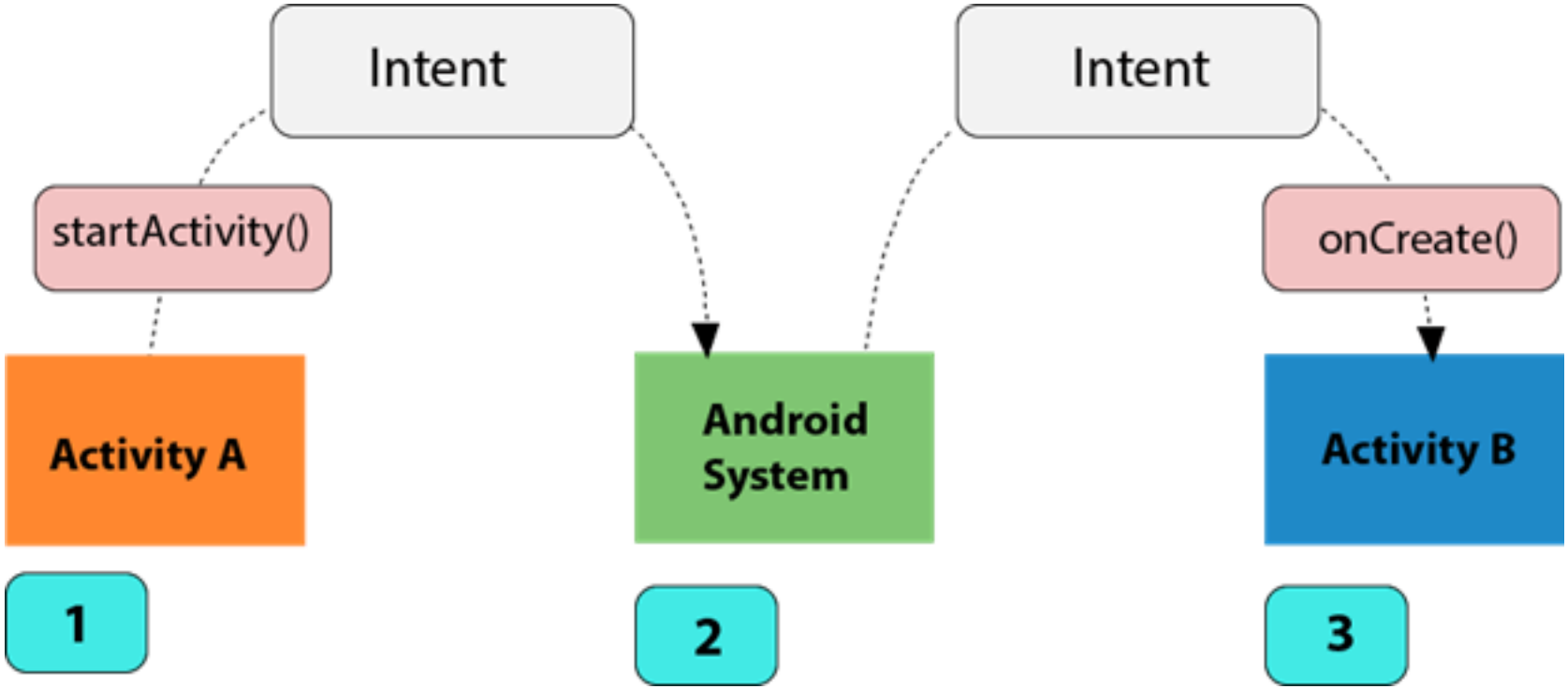
```
val intent = Intent(this, RegisterActivity::class.java)
startActivity(intent)
```

- What is an **Intent**?
  - Enables communication between Activities
  - It is a **messaging object** to communicate to the system that some action should be carried out
  - Implicit vs Explicit Intents: choosing a generic action vs starting a specific app component

Explicit Intent

- **Explicit** intents can be used to start a specific Activity

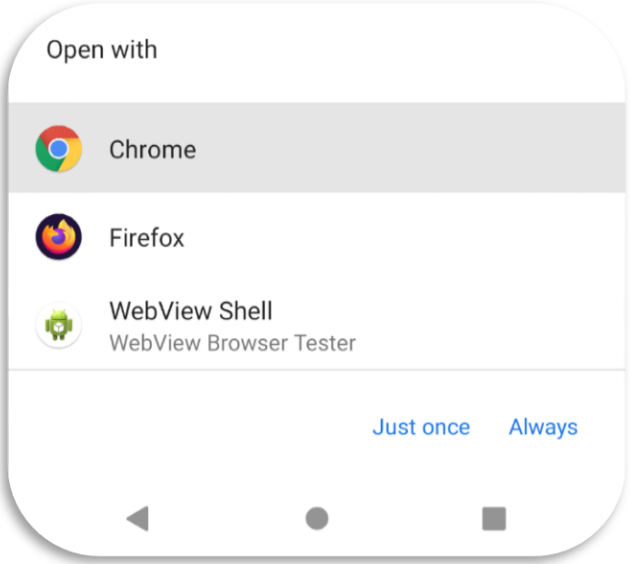
```
intent = Intent(this, RegisterActivity::class.java)

startActivity(intent)
```



Implicit Intent

- Implicit intents describe a general action (without specifying a component to handle it) such as display contacts, broadcast a message, dial a phone call etc.
  - **Display contact**: ACTION_VIEW -> content://contacts/people/1
  - **Dial a number**: ACTION_DIAL -> content://contacts/people/1
  - **Send an email**: ACTION_SEND -> EXTRA_EMAIL, EXTRA_SUBJECT
  - Specifies an **ACTION** and **DATA** (parameters expected by the action)
  - Implicit intents can be handled by **a component in the system** registered to handle that intent type

```
val intent = Intent(Intent.ACTION_VIEW,
Uri.parse("https://www.qu.edu.qa"))
startActivity(intent)
```



Passing Data with Intents

- Pass data

```
val intent = Intent(this, RegisterActivity::class.java)
// Pass student ID and student name with Intent so it can be
// used by RegisterActivity when it's started
intent.putExtra("id", 235789)
intent.putExtra("name", "Peter Pan")
startActivity(intent)
```

- Get passed data

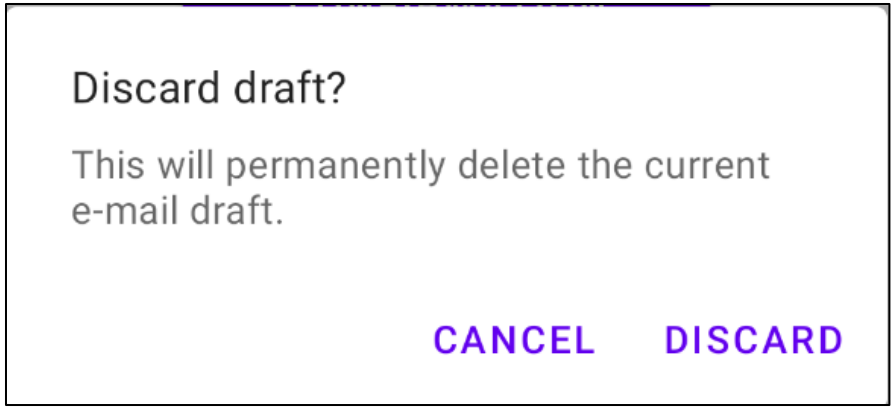
```
override fun onCreate(savedInstanceState: Bundle?) {
    ...
    // Read data sent by the caller
    val id = intent.getIntExtra("id", 0)
    val name = intent.getStringExtra("name")
}
```

Dialogs

Dialog Box

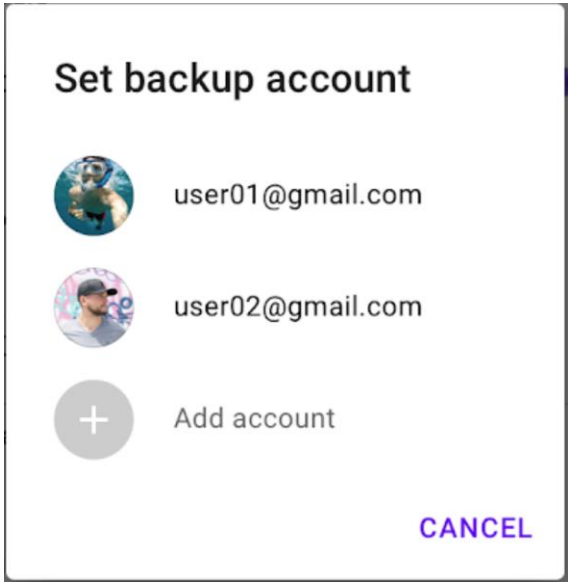
- Dialogs are displayed in front of app content
  - Inform users about a task that may contain **critical information** and/or **require a decision**
  - Interrupt the current flow and remain on screen until dismissed or action taken. Hence, they should be used sparingly
- 3 Types:
  - **Alert dialog**: request user action/confirmation. Has a title, optional supporting text and action buttons
  - **Simple dialog:** Used to present the user with a list of actions that, when tapped, take immediate effect.
  - **Confirmation dialog:** Used to present a list of single- or multi-select choices to a user. Action buttons serve to confirm the choice(s).

Alert Dialog



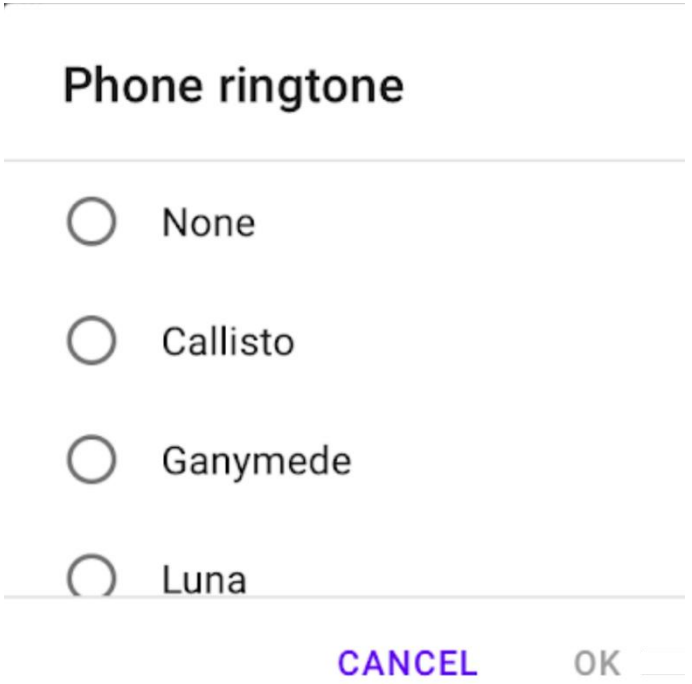

```
MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Discard draft?")
    .setMessage("This will permanently delete the current e-mail draft.")
    .setPositiveButton("Discard") { dialog, which ->
        Toast.makeText(activity, "Clicked discard", Toast.LENGTH_SHORT).show()
    }
    .setNegativeButton("Cancel") { dialog, which ->
        Toast.makeText(activity, "Clicked cancel", Toast.LENGTH_SHORT).show()
    }
    .show()
```

Simple dialog



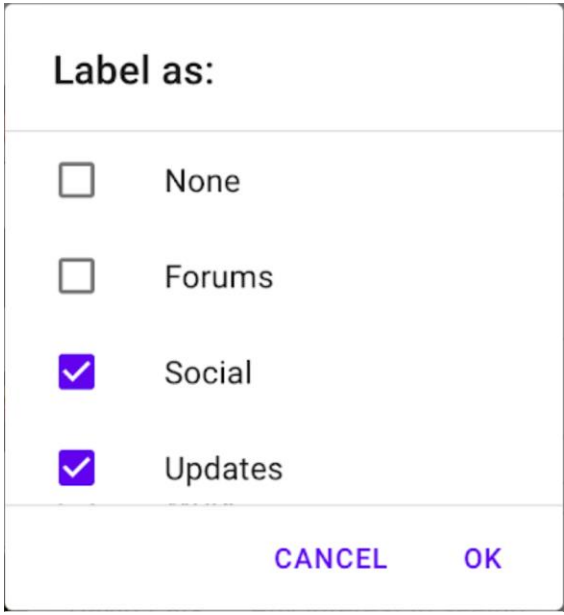

```
val items = arrayOf("user01@gmail.com", "user02@gmail.com", "Add account")
MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Set backup account")
    .setItems(items) { dialog, which ->
        Toast.makeText(activity, "Clicked ${items[which]}",
                       Toast.LENGTH_SHORT).show()
    }
    .show()
```

Confirmation dialog (single choice)



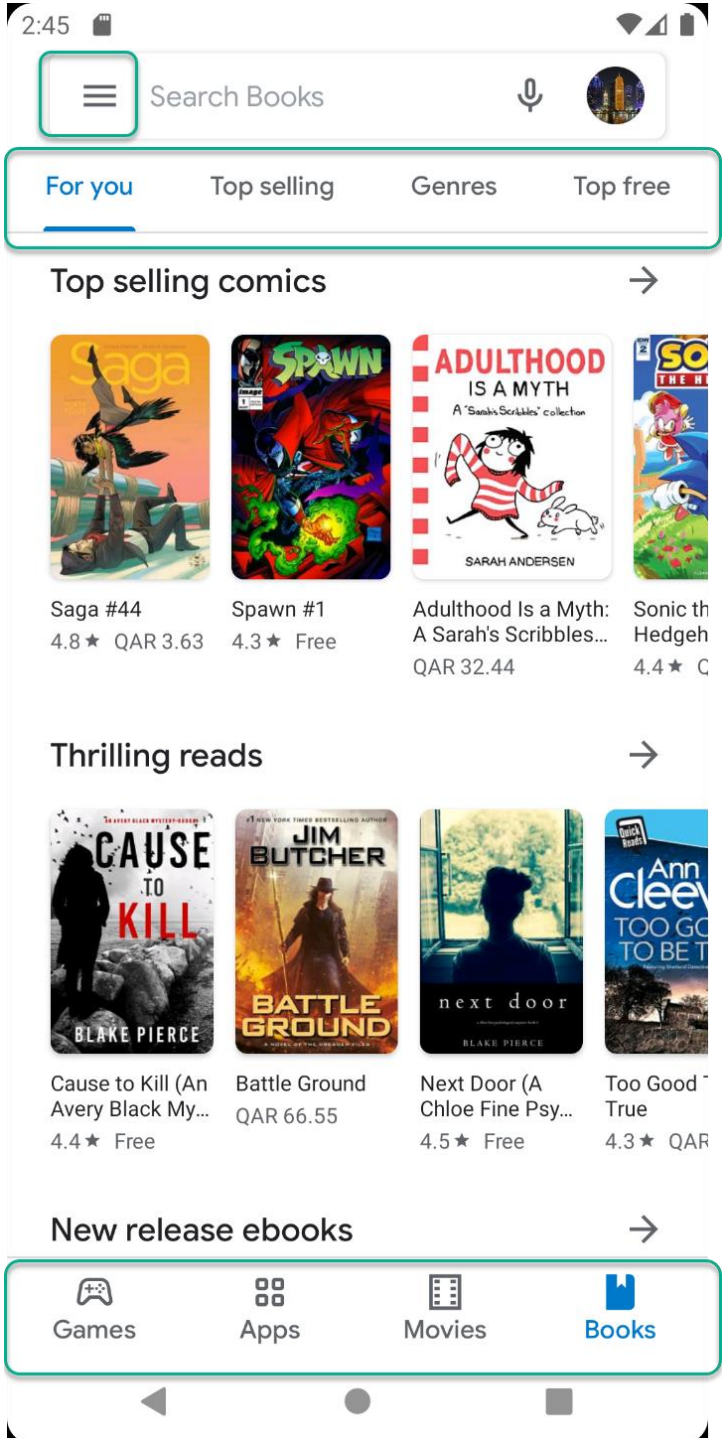

```
val items = arrayOf("None", "Callisto", "Ganymede", "Luna")
val checkedItem = 0

MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Phone ringtone")
    .setSingleChoiceItems(items, checkedItem) { dialog, which ->
        Toast.makeText(activity, "Chose ${items[which]}", Toast.LENGTH_SHORT).show()
    }
    .setPositiveButton("Ok") { dialog, which ->
        Toast.makeText(activity, "Clicked ok - Chose ${items[which]}", Toast.LENGTH_SHORT).show()
    }
    .setNegativeButton("Cancel") { dialog, which ->
        Toast.makeText(activity, "Clicked cancel - Chose ${items[which]}", Toast.LENGTH_SHORT).show()
    }
    .show()
```

Confirmation dialog (multi choice)




```
val items = arrayOf("None", "Forums", "Social", "Updates")
val checkedItems = booleanArrayOf(true, false, false, false)
MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Label as:")
    .setMultiChoiceItems(items, checkedItems) { dialog, which, checked ->
        Toast.makeText(activity, "Chose ${items[which]} - $checked",
                Toast.LENGTH_SHORT).show()
    }
    .setPositiveButton("Ok") { dialog, which ->
        Toast.makeText(activity, "Clicked ok", Toast.LENGTH_SHORT).show()
    }
    .setNegativeButton("Cancel") { dialog, which ->
        Toast.makeText(activity, "Clicked cancel", Toast.LENGTH_SHORT).show()
    }
    .show()
```

Navigation UI



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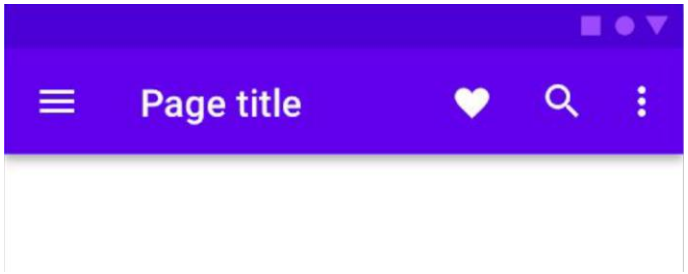
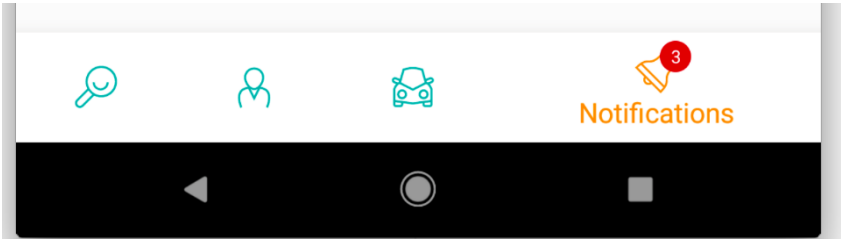
Top App Bar & Bottom Navigation

- **Top App Bar**
  - Info and actions **related to the current screen**
  - Typically has Title, Menu items, Drawer button / Back button



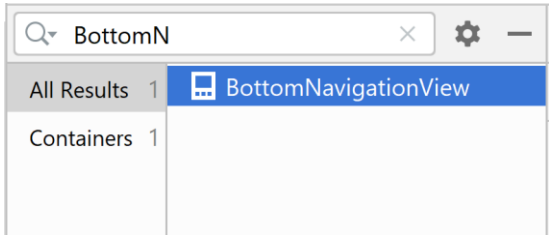
- **Bottom Navigation**
  - Allow movement between the app's primary **top-level destinations** (3 to 5 options)
  - Each destination is represented by an icon and an optional text label. May have notification badges



Adding Bottom Navigation

- Add **BottomNavigationView** to the main activity layout and connect it with the bottom nav menu

```
<com.google.android.material.bottomnavigation.BottomNavigationView
    android:id="@+id/bottomNavBar"
    ...
    app:menu="@menu/menu_bottom_nav"/>
```

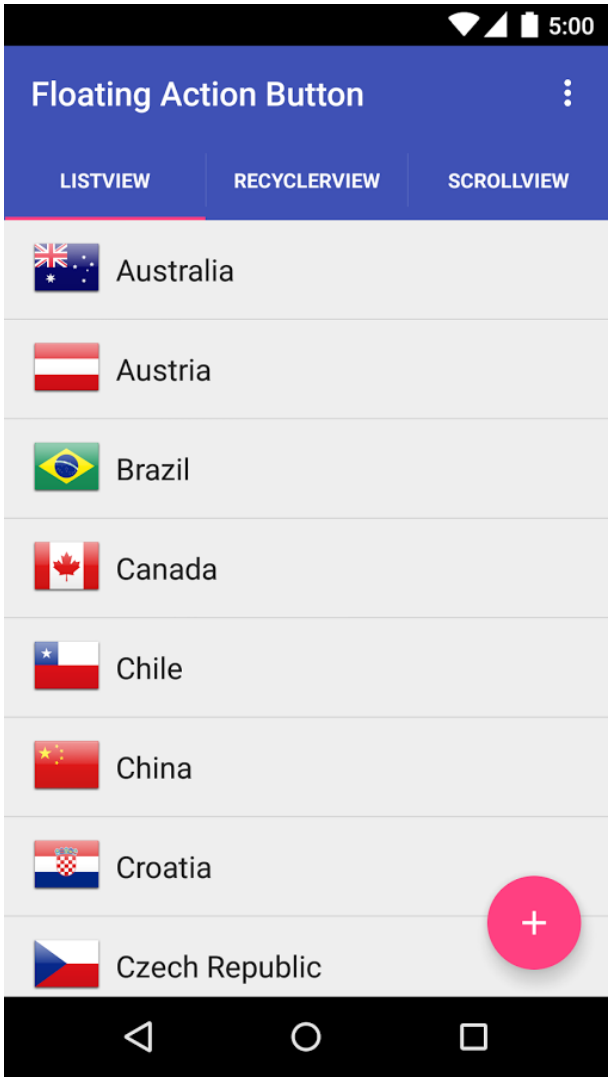


- Handle **NavigationItemSelected** event

```
bottomNavBar.setOnNavigationItemSelectedListener {
    when (it.itemId) {
        R.id.registerMi -> {
            ...
            true
        }
    }
}
```

Floating Action Button (FAB)

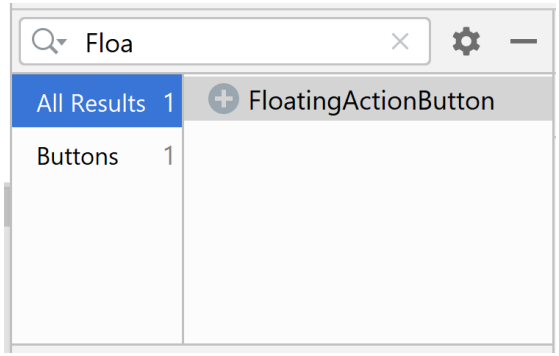
- A FAB performs the primary, or most common, action on a screen, such as drafting a new email
  - It appears in front of all screen content, typically as a circular shape with an icon in its center.
  - FAB is typically placed at the bottom right



Adding FAB

- Add **`FloatingActionButton`** to the fragment layout and set its layout constraints

```
<com.google.android.material.floatingactionbutton.FloatingActionButton
    android:id="@+id/addBlogPostFab"
    ...
    app:layout_constraintBottom_toTopOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:srcCompat="@drawable/ic_add" />
```

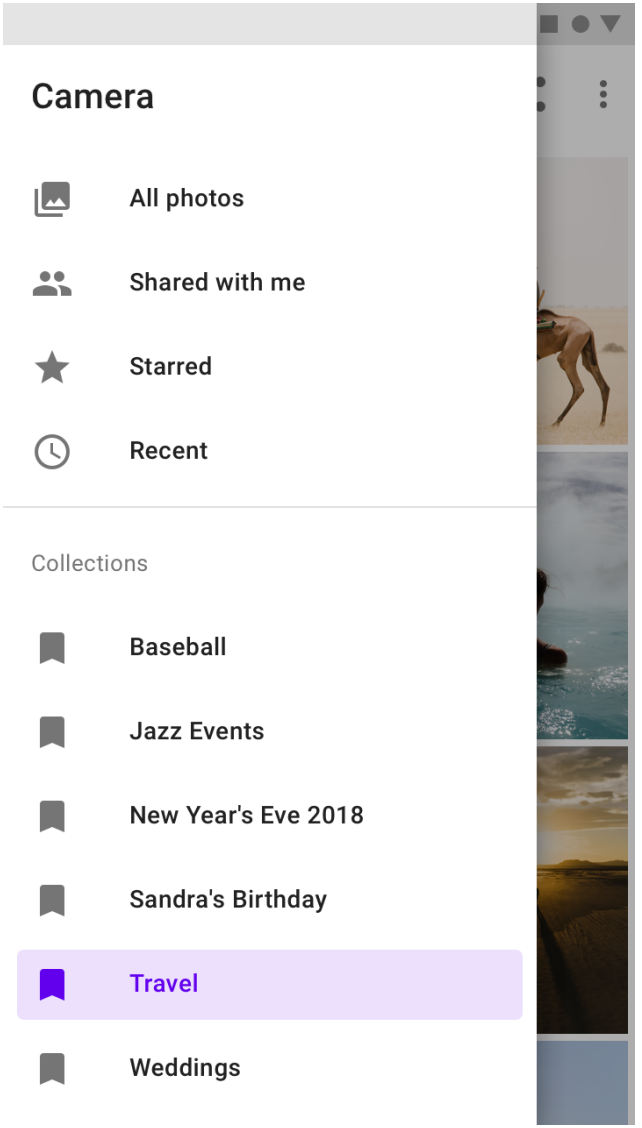


- Handle **`OnClick`** event

```
view.addBlogPostFab.setOnClickListener {
    findNavController().navigate(R.id.toAddBlogPost)
}
```

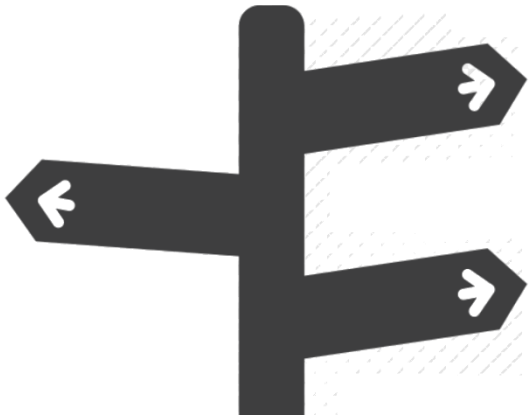
Navigation Drawer

- Navigation Drawer provides access to **primary destinations**, such as switching accounts
  - Recommended for five or more top-level destinations
  - Quick navigation between unrelated destinations
- The drawer appears when the user touches the drawer icon ☰ in the app bar or when the user swipes a finger from the left edge of the screen
- See the example done in the Lab



Navigation Component

A framework for navigating between ‘destinations’ within an app



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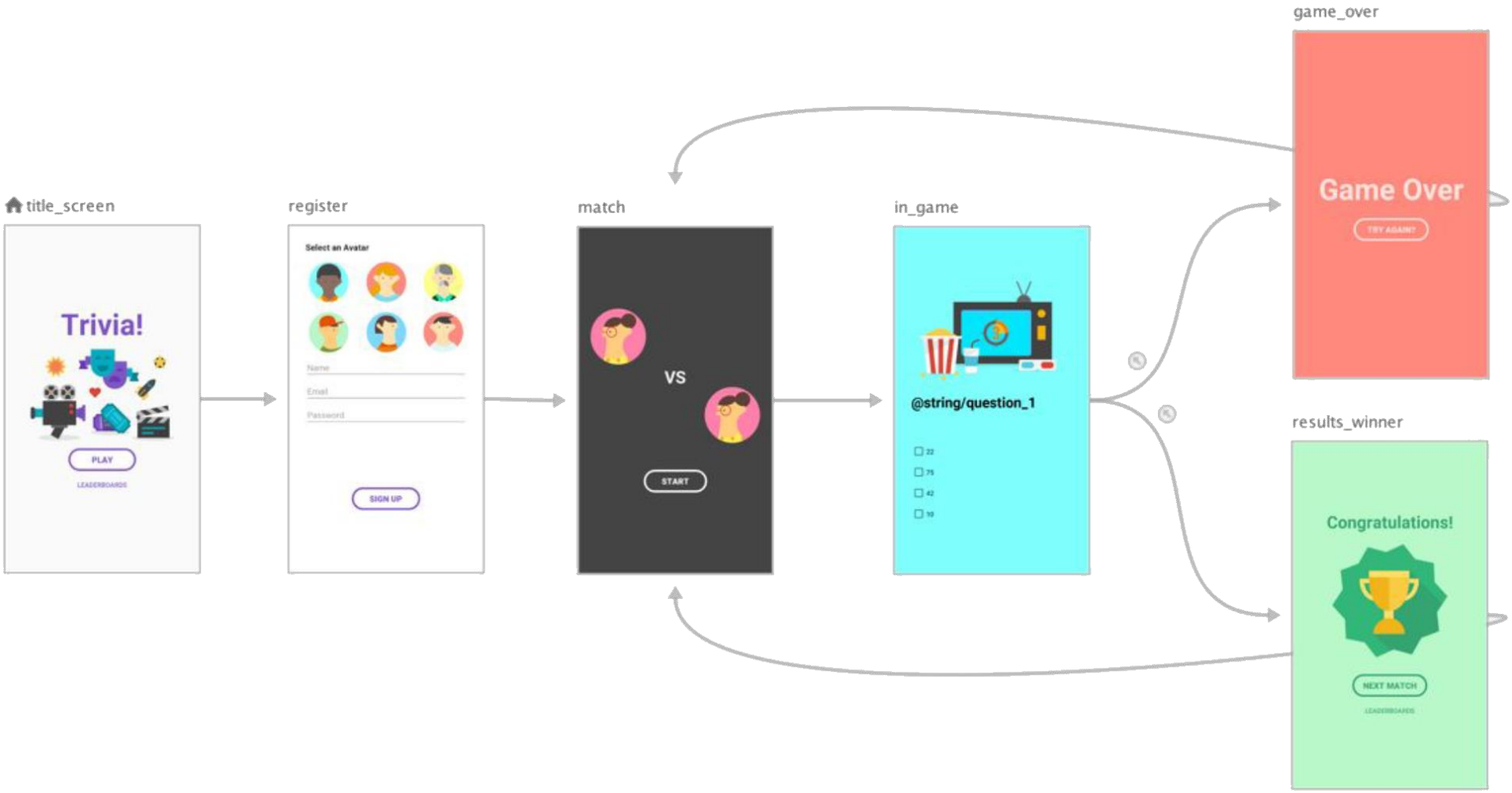
Single Activity with Multi-Fragments

- App UI = { 1 Activity + Multi-fragments }
- A Fragment represents **a portion of the UI** in an activity
  - You can add or remove a Fragment at runtime
  - You can reuse a Fragment in multiple activities
- Like an activity:
  - A Fragment is defined in a Kotlin class
  - A Fragment's UI is defined in an XML layout file
  - A Fragment has its own lifecycle and receives its own input events

Navigation Component

- Enables implementing Single Activity App with Multi-Fragments
- Provides an Editor for the **Navigation Graph** to define a visual representation of app navigation flow (how users can move between screens of the app). Graph defines **Destinations** & **Actions**:
  - A ***destination*** is any place inside the app to which a user can navigate
  - 
    Actions are connections between destinations and define the possible **paths** that a user can take through the app
- Integrates with Navigation UI (e.g., auto show the label of current fragment on the Action Bar)

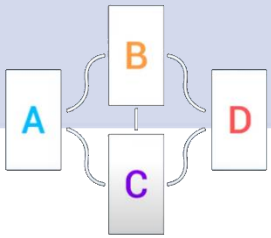
Example Navigation Graph



Key Components

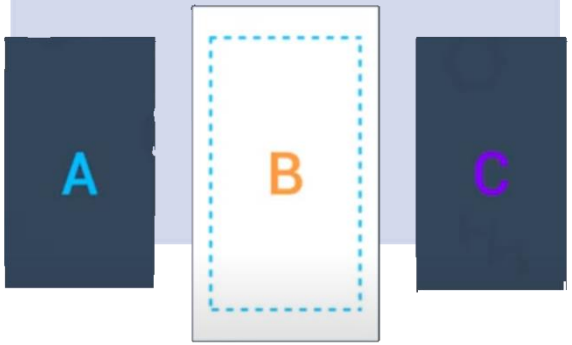
Navigation Graph

- XML representation of app navigation (**possible paths** a user can take through an app)
- Shows visually all the destinations that can be reached from a given destination



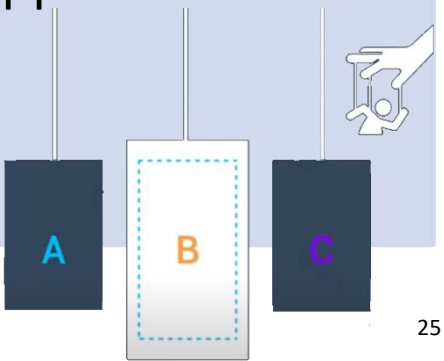
NavHost

- A container where fragments will be displayed
- **NavHostFragment** is typically used to display destination fragments



NavController

- Manages the transitions between graph destinations
- Orchestrates the **swapping** of destination fragments in the NavHost as the user navigates through the app



Implementing Navigation

Create a Nav Graph

- Create an XML file to define the app's navigation graph

Add NavHostFragment to the main activity layout

- Add **NavHostFragment** to the main activity layout. This will be the container that will display fragments as the user navigate through the app
- Associate it with the app nav graph

Navigate to destinations using the NavController

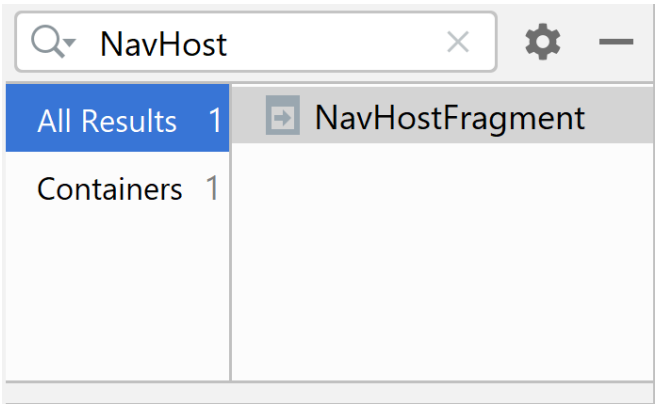
- From any view **`findNavController`** to navigate to a particular action
- The requested destination fragment will be loaded in the NavHostFragment

Dependencies

```
// Project/build.gradle
def nav_version = "2.3.0"
classpath "androidx.navigation:navigation-safe-args-gradle-plugin:$nav_version"


// Module:app/build.gradle
def nav_version = "2.3.0"
implementation "androidx.navigation:navigation-fragment-ktx:$nav_version"
implementation "androidx.navigation:navigation-ui-ktx:$nav_version"


// Module:app/build.gradle
apply plugin: "androidx.navigation.safeargs.kotlin"


// Configure using Java 8 - add Module:app/build.gradle under android { ...
compileOptions {
    sourceCompatibility JavaVersion.VERSION_1_8
    targetCompatibility JavaVersion.VERSION_1_8
}
kotlinOptions {
    jvmTarget = "1.8"
}
```

Add NavHostFragment to the main activity layout

- Add **`NavHostFragment`** to the main activity layout and associate it with the app nav graph




```
<fragment
    android:id="@+id/navHostFragment"
    android:name="androidx.navigation.fragment.NavHostFragment"
    android:layout_width="0dp"
    android:layout_height="0dp"
    android:layout_marginEnd="1dp"
    app:defaultNavHost="true"
    app:navGraph="@navigation/nav_graph"
... />
```

Navigate to destinations using NavController

- From any activity or fragment use **`findNavController()`** to navigate to:
  - a particular action (i.e., a specific path in the navigation graph) or
  - directly to a specific destination
- The requested destination fragment will be loaded in the NavHostFragment

```
// In fragment:
findNavController().navigate(R.id.toSecondFragment)


// In main activity:
findNavController(R.id.navHostFragment).navigate(R.id.toSecondFragment)
```

Navigate Up

- Call **`setupActionBarWithNavController`** in the MainActivity onCreate to show the **Navigate Up** button and the **label** of the current fragment on the Action Bar
  - This method is in `androidx.navigation.ui.NavigationUI` package

```
navController = findNavController(R.id.navHostFragment)
setupActionBarWithNavController(this, navController)
```

- Handle *Navigate Up* event

```
override fun onSupportNavigateUp() =  navController.navigateUp()
```

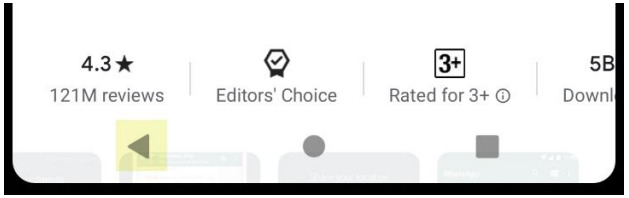
Connect Bottom Nav Bar to NavController

- Add Bottom Nav Bar to the main layout
- Make the id of menu items the same as the id of associated destination in the nav graph
- Connect the buttomNavBar with the navController to auto-handle OnNavigationItemSelected

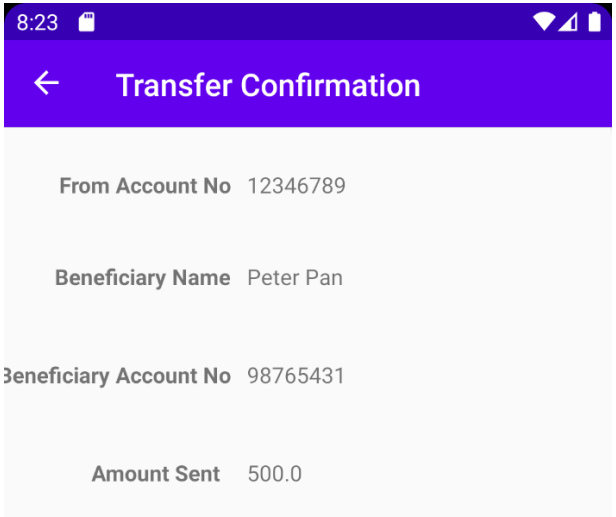
```
bottomNavBar.setupWithNavController(navController)
```

Back vs. Up Button

- The Back button is a system button available on all screens to allow users to navigate recently viewed screens in reverse chronological order



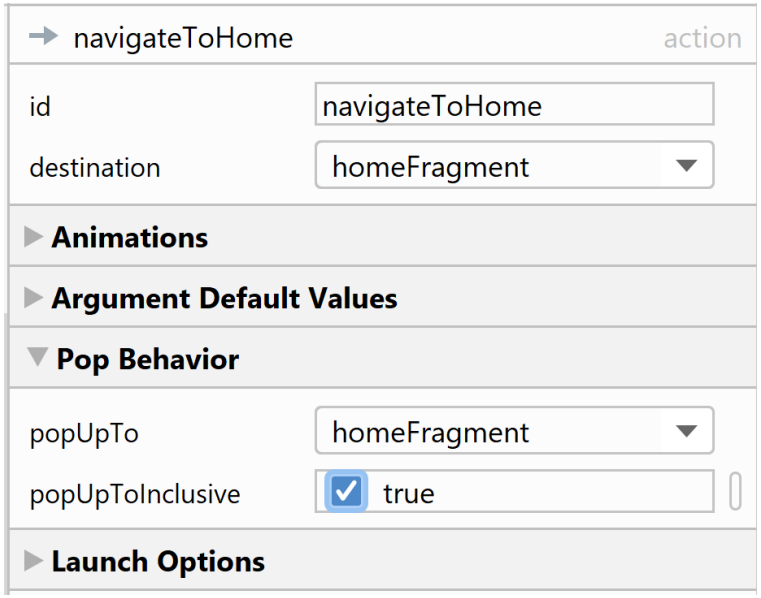
- Navigate Up button on the top app bar of child screens allows **upward navigation** one level upwards within the nav graph until the app's home
  - E.g., Navigate Up on Funds Transfer confirmation screen navigates back to the app's home



popUpTo and popUpToInclusive

- When navigating using an action, you can optionally pop off previously visited destinations of the back stack

- For example, after a login flow, you should **pop off all the login-related destinations** of the back stack so that the Back button doesn't take users back into the login flow.
  - Go back to the home fragment while removing all visited destinations from the back stack
  - If popUpToInclusive="true" the destination specified in popUpTo should also be removed from the back stack



popUpTo Example

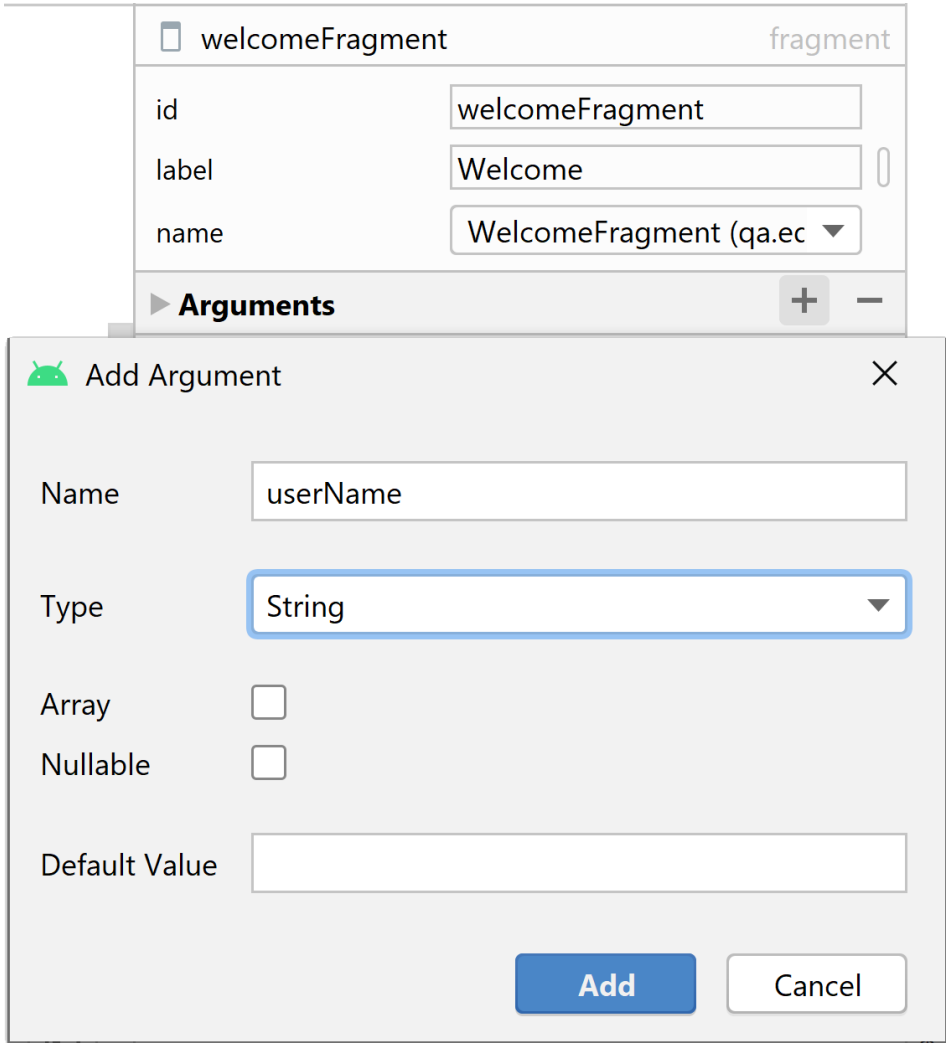
```
<action
 android:id="@+id/action_c_to_a"
 app:destination="@id/a"
app:popUpTo="@+id/a"
app:popUpToInclusive="true"/>
```

- After reaching C, the back stack contains (A, B, C). When navigating back to A, we also **popUpTo A**, which means that we remove B and C from the stack as part of the call to **navigate**(**action_c_to_a**)
  - With popUpToInclusive="true", we also pop off that first A of the stack to avoid having two instances of A

https://developer.android.com/guide/navigation/navigation-navigate#pop

Passing Data between Destinations

- To pass data between destinations, first add the argument to the destination that receives it
  - For example, a user profile destination might take a user ID argument to determine which user to display



Passing Data between Destinations

- Pass data to a destination

```
loginBtn.setOnClickListener {
    val bundle = bundleOf("userName" to userNameEt.text.toString())
    findNavController().navigate(R.id.toWelcome, bundle)
}
```

- Read passed data

```
class WelcomeFragment : Fragment(R.layout.fragment_welcome) {
    override fun onViewCreated(view: View, savedInstanceState: Bundle?) {
        // Read data passed from the login fragment
        val userName = arguments?.getString("userName")
        welcomeTv.text = "Welcome $userName"
    }
}
```

Use Safe Args to pass data with type safety

- Safe Args plug-in generates classes for **type-safe navigation** and access to any associated arguments
- **Pass data to a destination**

```
loginBtn.setOnClickListener {
    val userName = userNameEt.text.toString()
    val action = LoginFragmentDirections.toWelcome(userName)
    findNavController().navigate(action)
}
```

- Read passed data

```
private val args: WelcomeFragmentArgs by navArgs()

override fun onViewCreated(view: View, savedInstanceState: Bundle?) {
    // Read data passed from the login fragment
    val userName = args.userName
    welcomeTv.text = "Welcome $userName"
}
```

Resources

- Navigation UI
  - https://developer.android.com/guide/navigation/navigation-ui
- Get started with the Navigation component
  - https://developer.android.com/guide/navigation/navigation-getting-started
- Navigation Component codelab
  - https://codelabs.developers.google.com/codelabs/kotlin-android-training-add-navigation/