CMPS 312

Read Chapters 12, 13 & 15

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. Communicating Between Activities
2. Dialogs
3. Navigation UI
4. Navigation Component

Communicating Between Activities

Back

Using Multiple Activities

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

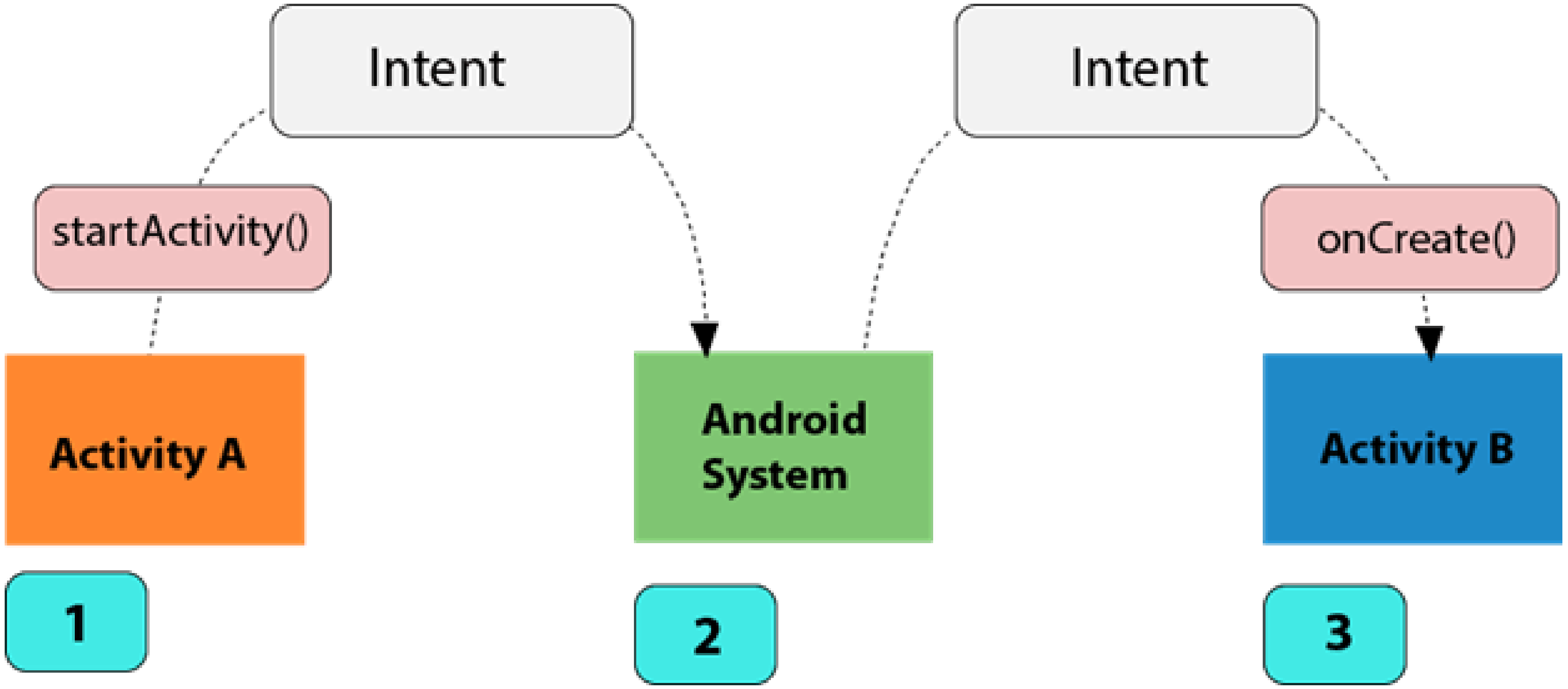
```
val intent = Intent(this, RegisterActivity::class.java)
startActivity(intent)
```

- 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

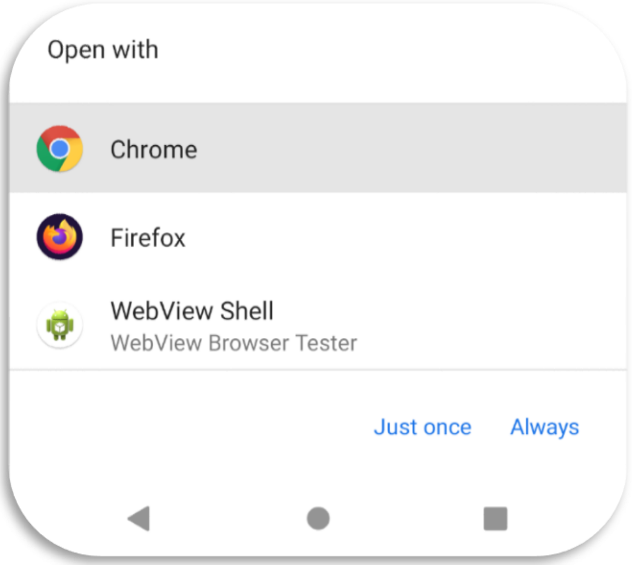
```
intent = Intent(this, RegisterActivity::class.java)

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

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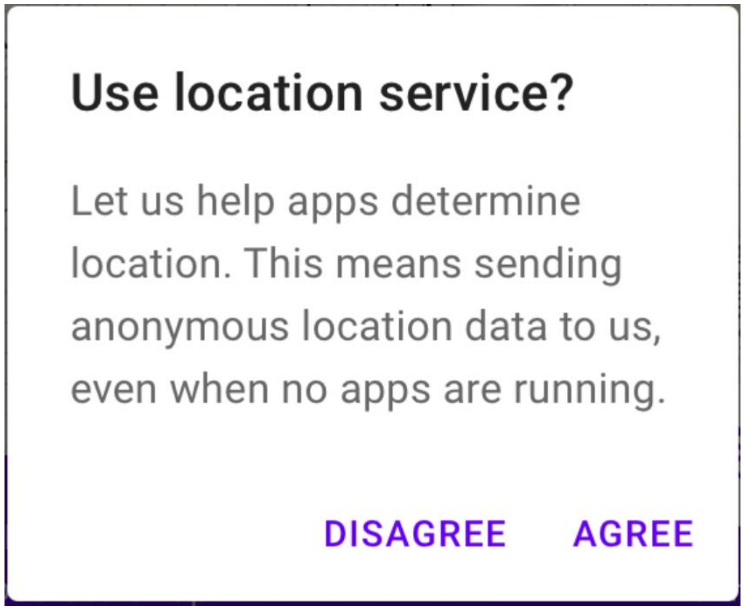
Dialog Box

- 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).

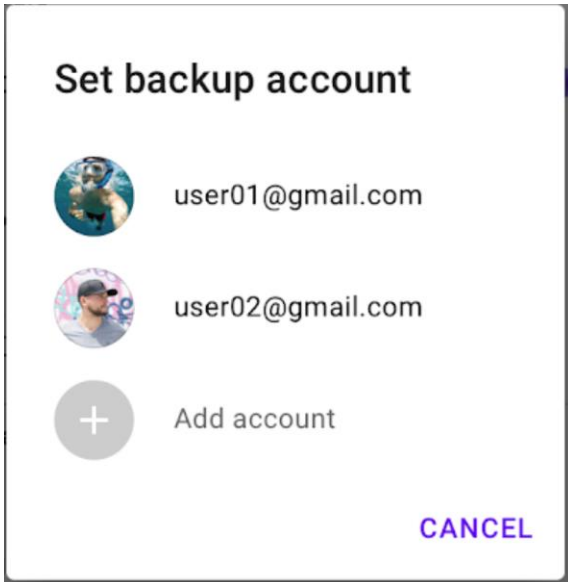
Alert Dialog


Use location service?

Let us help apps determine location. This means sending anonymous location data to us, even when no apps are running.

```
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


Set backup account

user01@gmail.com

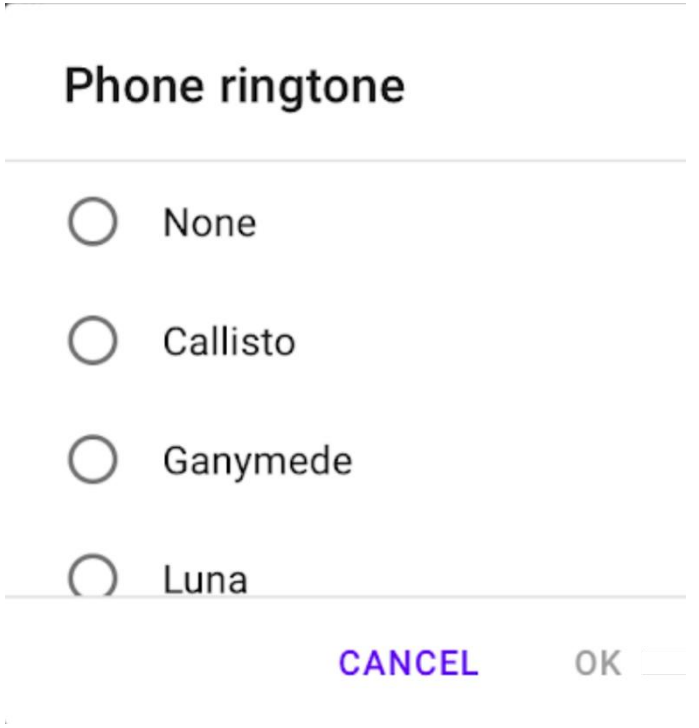
user02@gmail.com

Add account

CANCEL

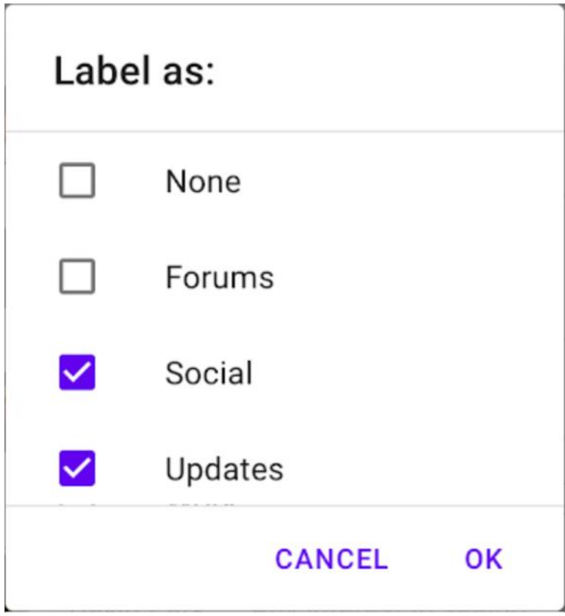
```
val items = arrayOf("user01@gmail.com", "user02@gmail.com", "Add account")
MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Set backup account")
    .setItems(items) { dialog, which ->
        Toast.makeText(activity, "Clicked ${items[which]}",
                               Toast.LENGTH_SHORT).show()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

Confirmation dialog (single choice)



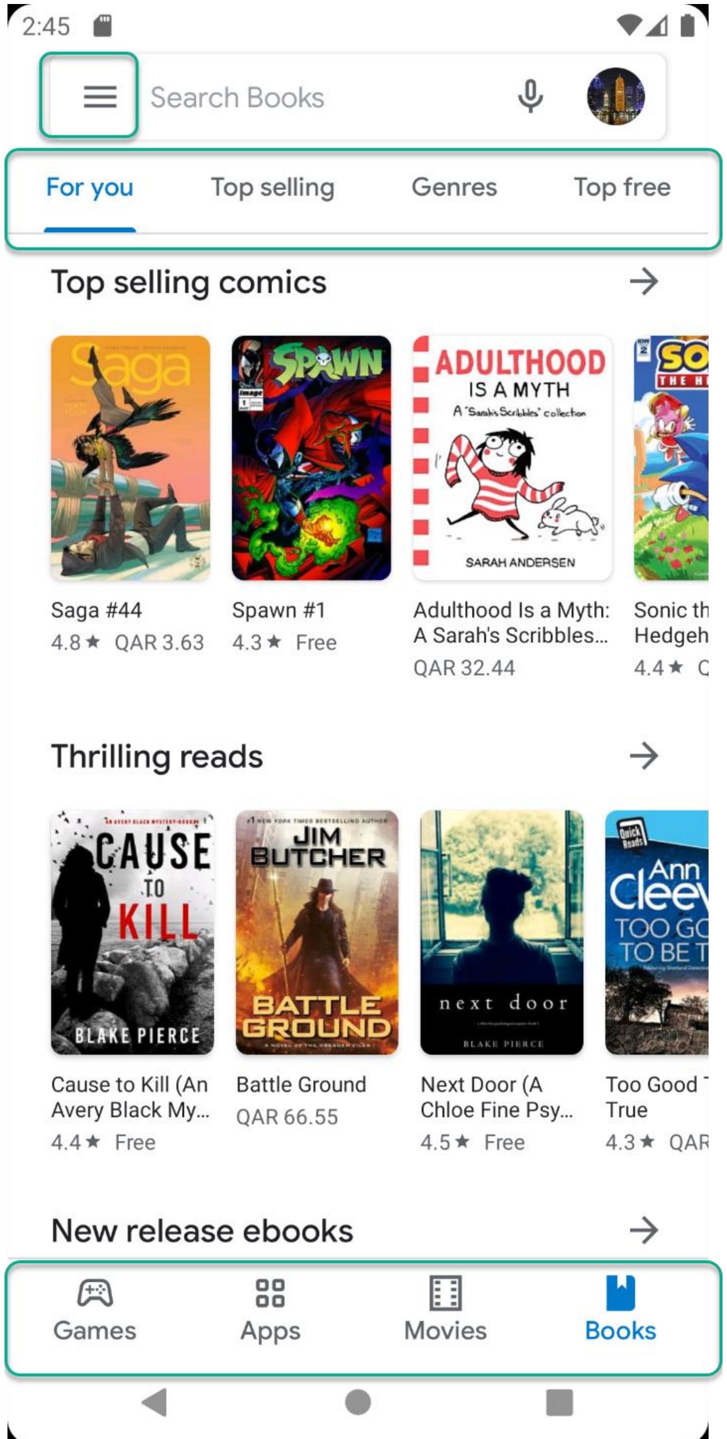
```
val items = arrayOf("None", "Callisto", "Ganymede", "Luna")
val checkedItem = 0
MaterialAlertDialogBuilder(requireActivity())
    .setTitle("Phone ringtone")
    .setSingleChoiceItems(items, checkedItem) { dialog, which ->
        Toast.makeText(activity, "Chose ${items[which]}", Toast.LENGTH_SHORT).show()
    }
    .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)


Label as:

```
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()
```

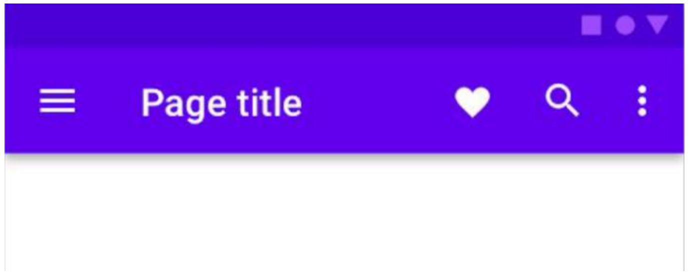
Navigation UI



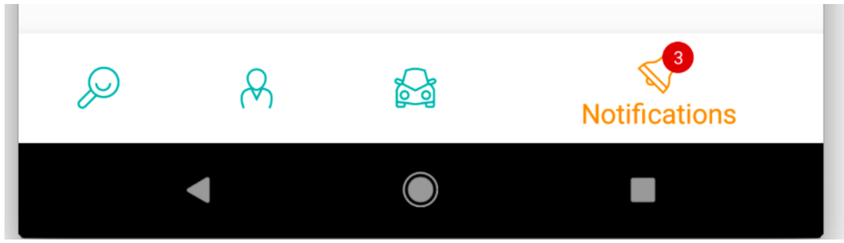
Back

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

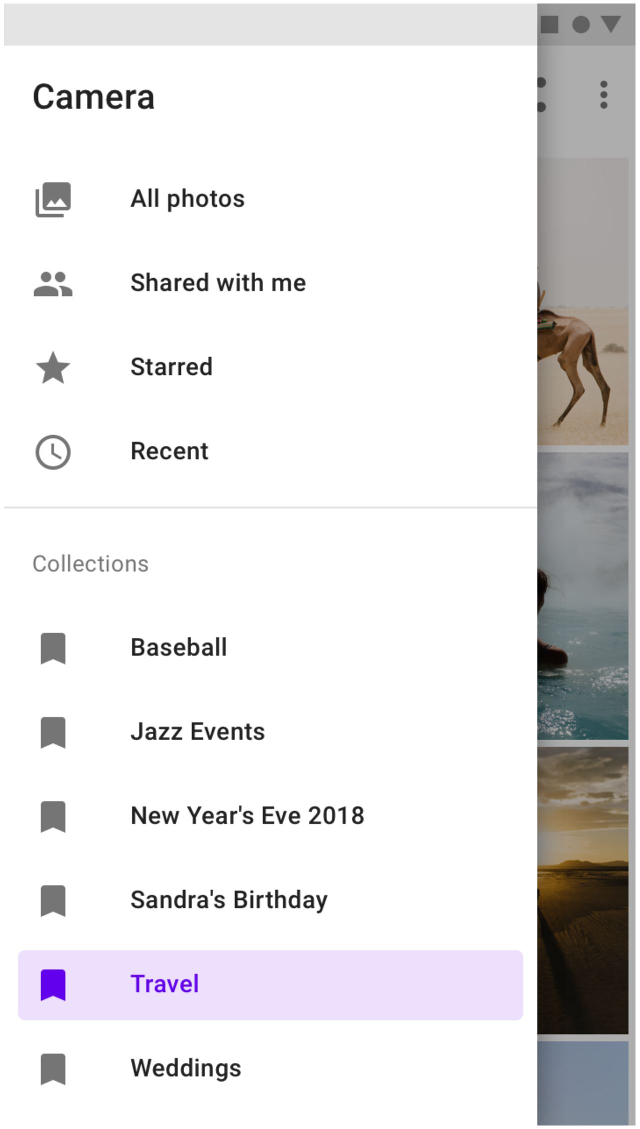


- **Bottom Navigation**
  - Allow movement between the app's primary **top-level destinations** (3 to 5 options)
  - Each destination is represented by an icon and an optional text label / notification badges



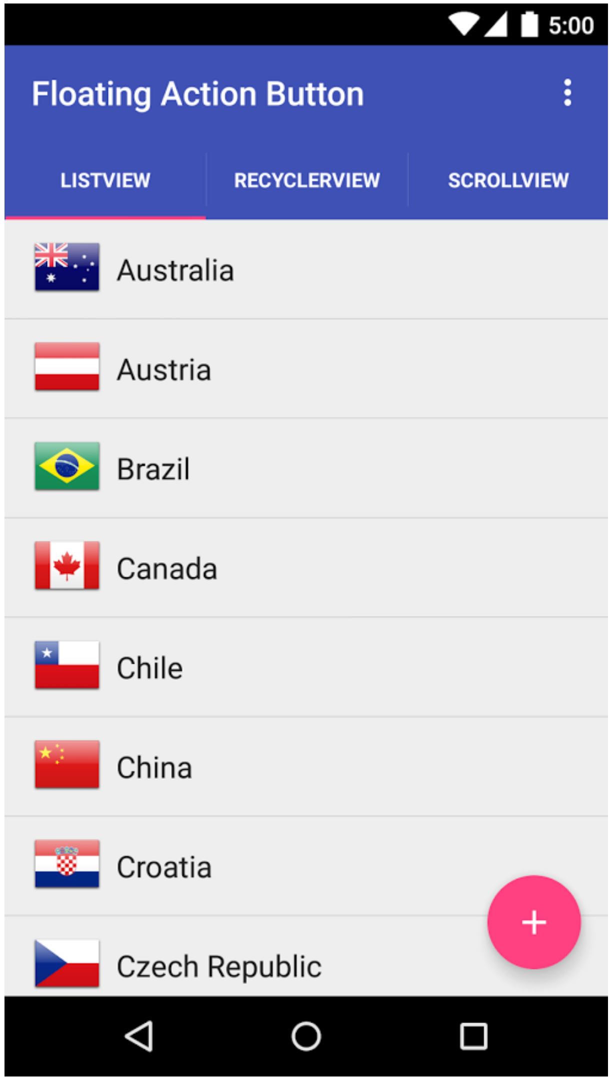
Navigation Drawer

- 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



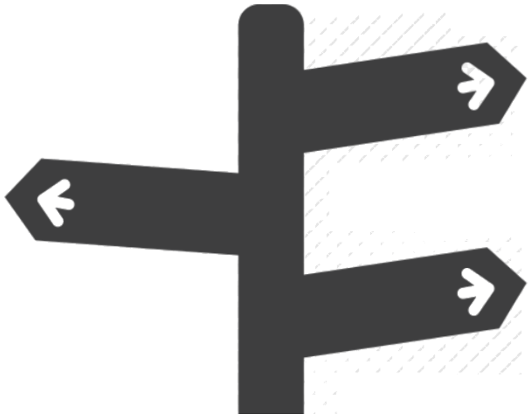
Floating Action Button (FAB)

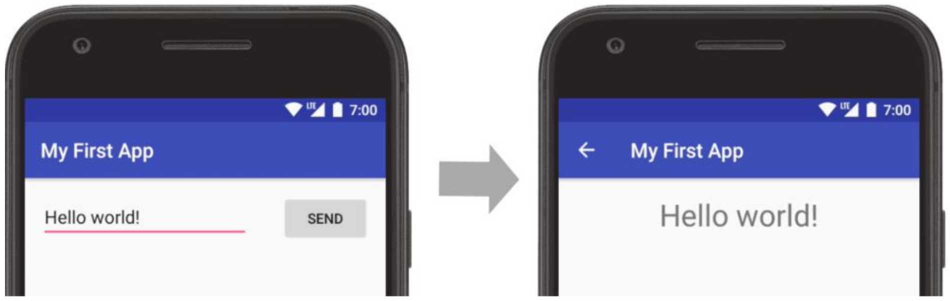
- A FAB performs the primary, or most common, action on a screen, such as drafting a new email
  - It appears in front of all screen content, typically as a circular shape with an icon in its center.
  - FAB is typically placed at the bottom right



Navigation Component

A framework for navigating between ‘destinations’ within an app

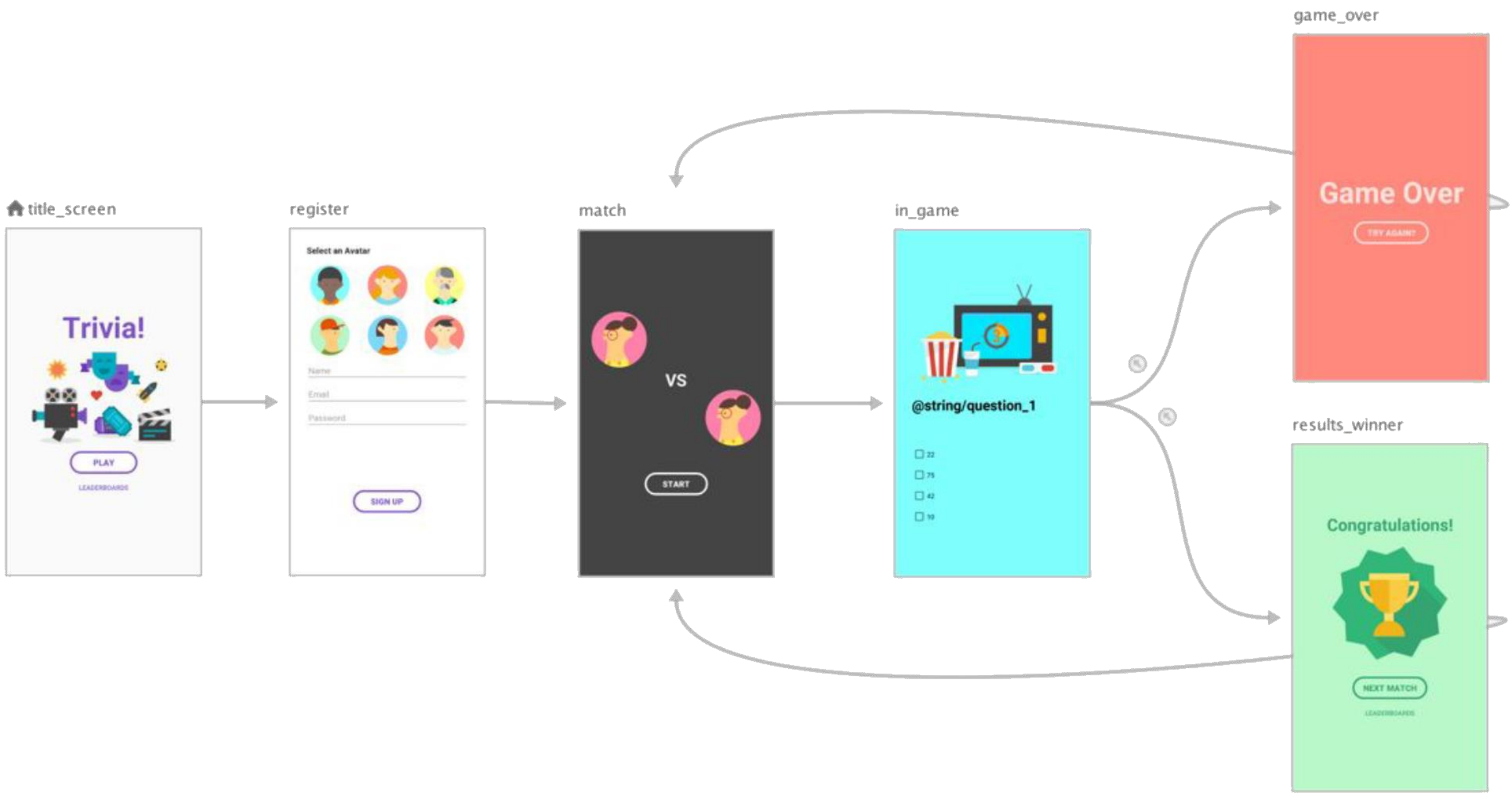




Navigation Component

- Ease implementing Single Activity App hosts several fragments
- GUI-based Editor of **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
- Compile-time validation of destination transitions
- Compile-time validation of fragment arguments
- Integration With Material Design UI (e.g., auto set action bar title)

Example Navigation Graph

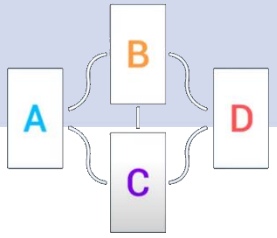


Key Components

Navigation Graph

- XML representation of app navigation (**possible paths** a user can take through an app)

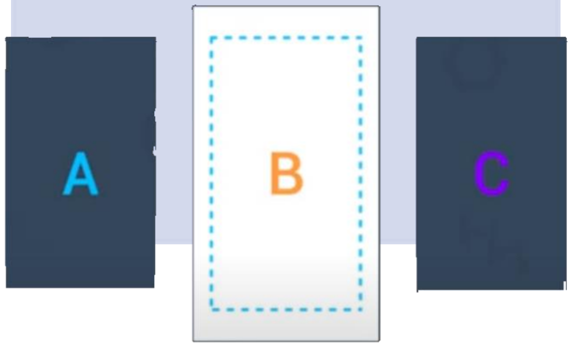
- Shows visually all the destinations that can be reached from a given destination



NavHost

- A container where fragments will be displayed

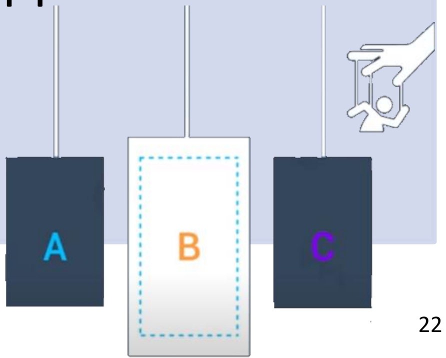
- **NavHostFragment** is typically used to display destinations fragments



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

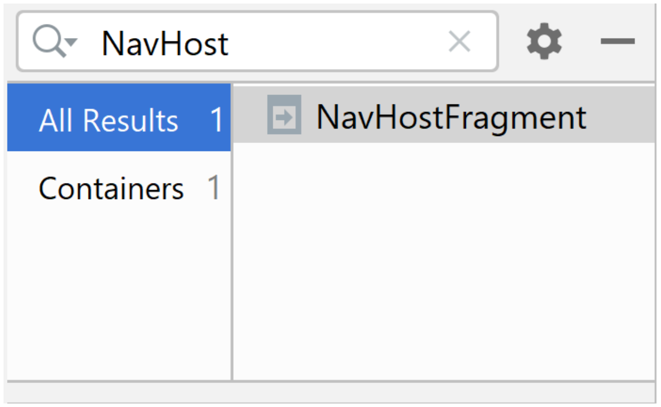
- From any view **`findNavController`** to navigate to a particular action
- The requested destination fragment will be loaded in the NavHostFragment

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 main the 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
  - Use `androidx.navigation.ui.NavigationUI package`

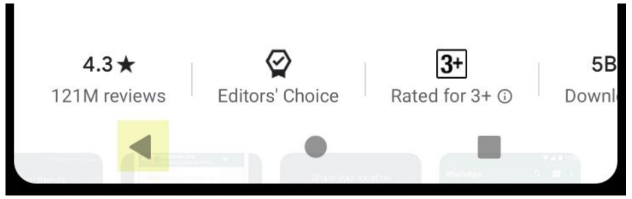
```
navController = findNavController(R.id.navHostFragment)
setupActionBarWithNavController(this, navController)
```

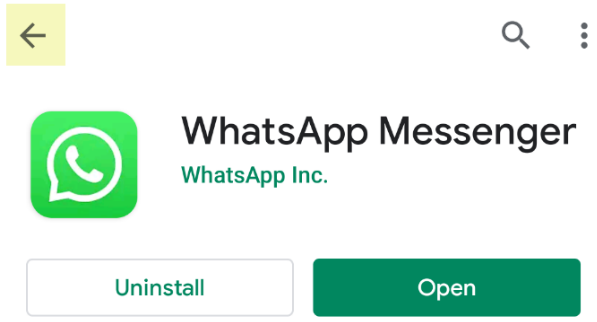
- Handle *Navigate Up* event

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

Back vs. Up Button

- The Back button allows users to navigate recently viewed screens in reverse chronological order
  - Similar the back button on the browser
- 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 a Funds Transfer confirmation screen navigates back to the app's home

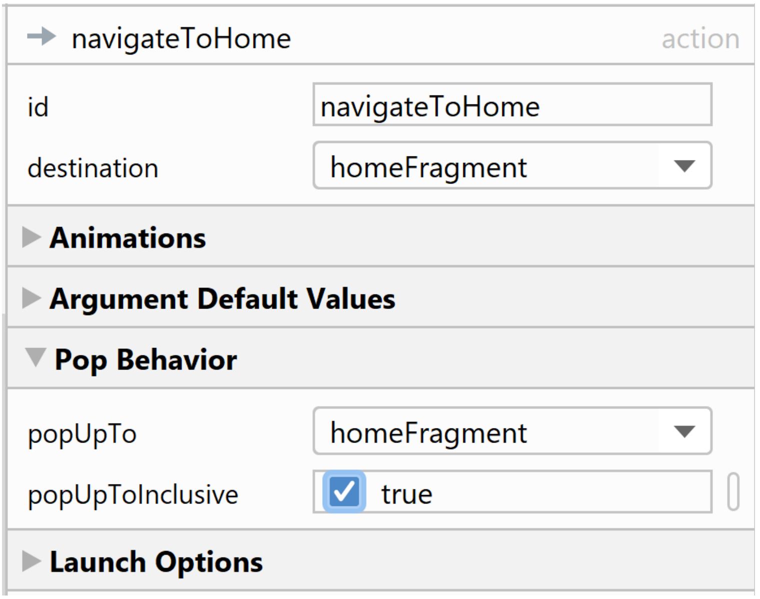




popUpTo and popUpToInclusive

- 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



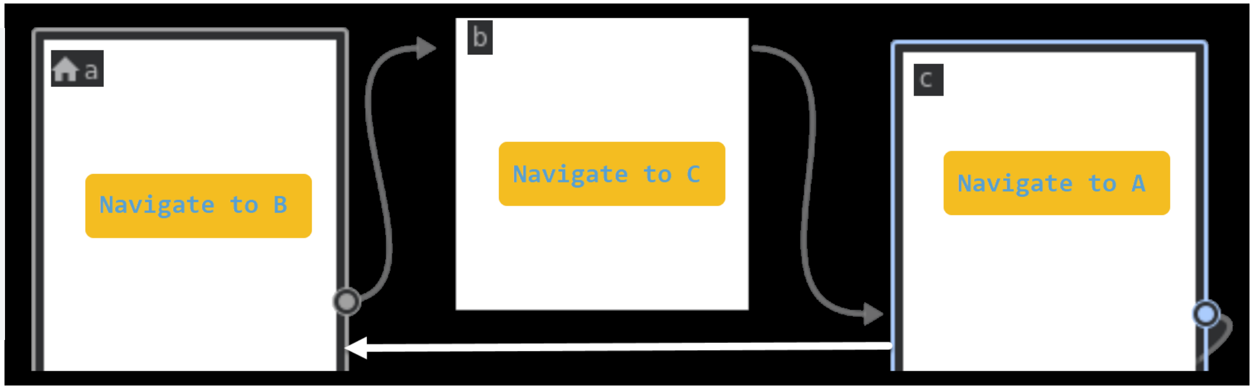
navigateToHome action

id	navigateToHome
destination	homeFragment

popUpTo	homeFragment
popUpToInclusive	✓ true

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

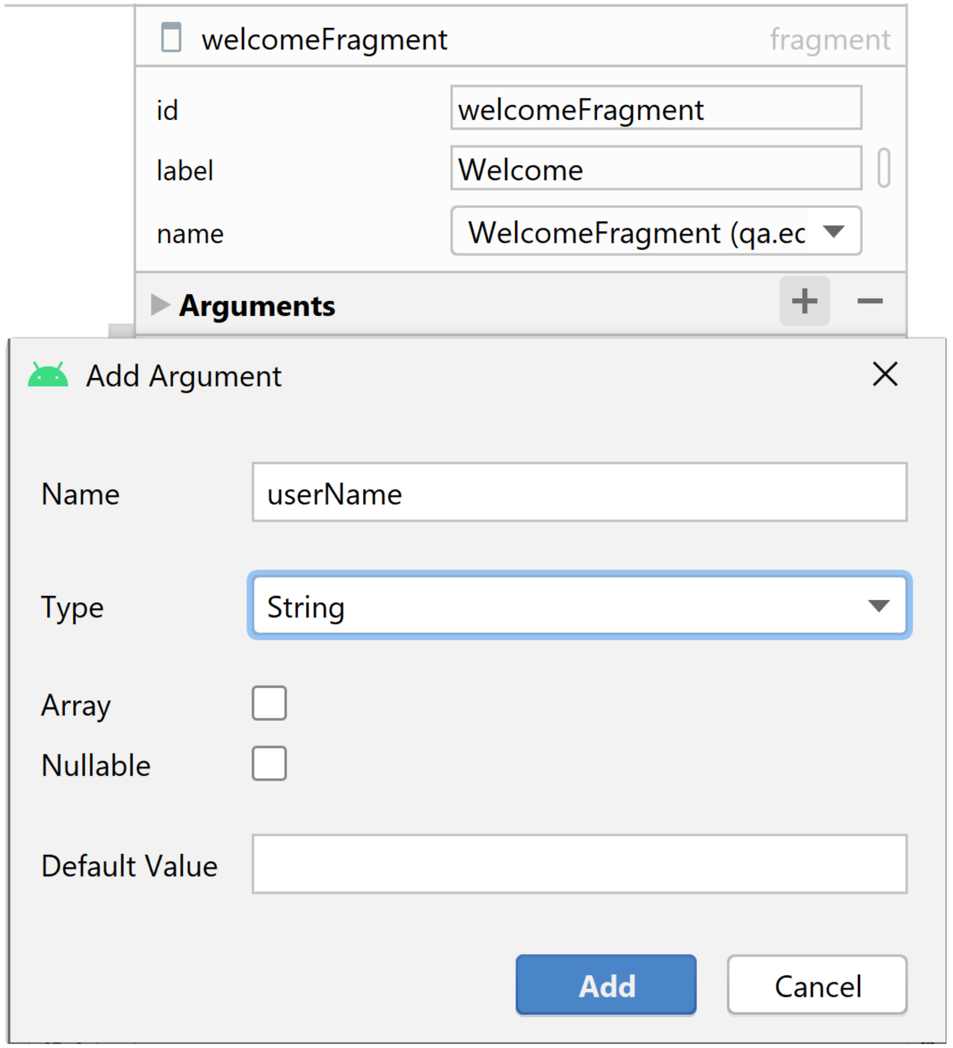
Connect Bottom Nav Bar to NavController

- 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)
```

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


welcomeFragment fragment

id	welcomeFragment
label	Welcome
name	WelcomeFragment (qa.ec

Arguments

Add Argument

Name	userName
Type	String
Array	☐
Nullable	☐
Default Value	

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/