# 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. Menus and Toolbars
3. Navigation Component
4. ViewPager2
5. Dialog Box

# Communicating Between Activities

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# Using Multiple Activities

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

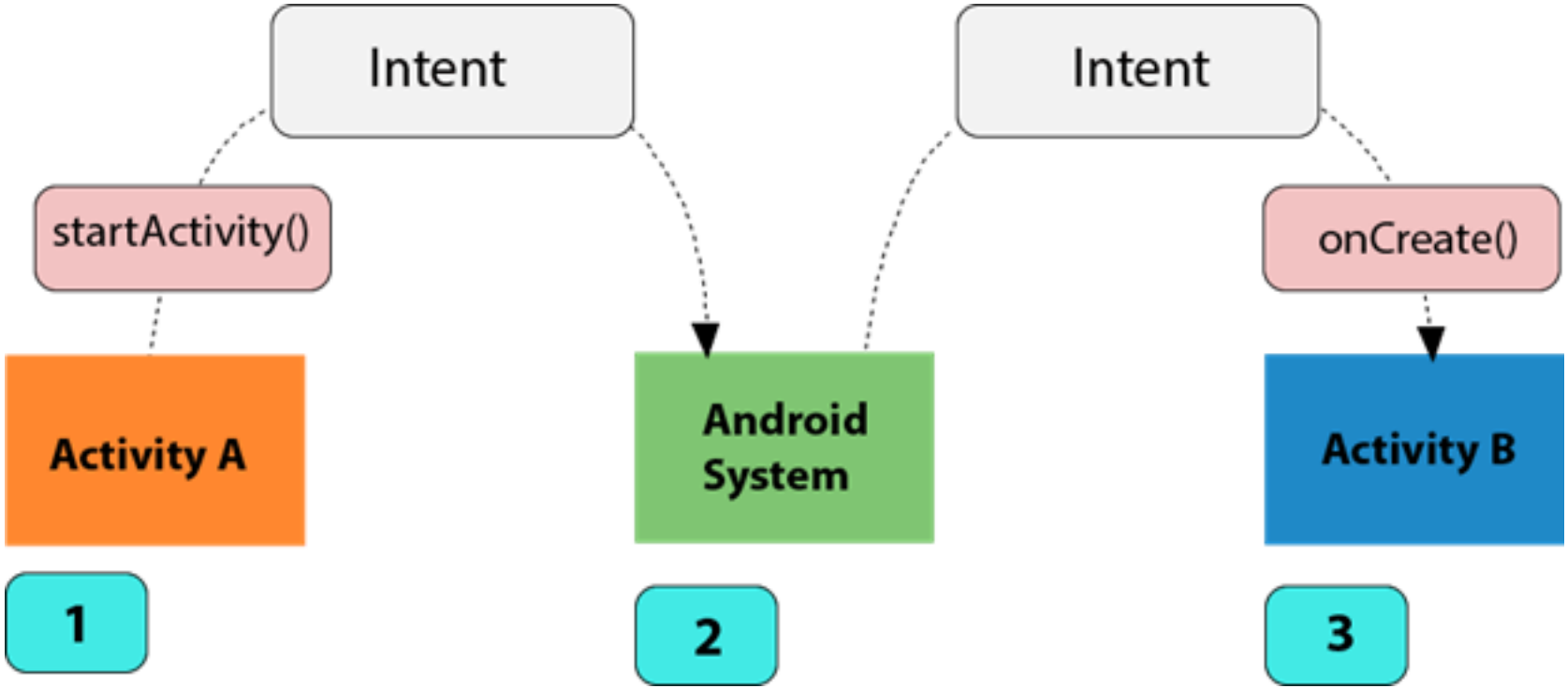
```
val intent = Intent(this, RegisterActivity::class.java)
startActivity(intent)
```

- 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

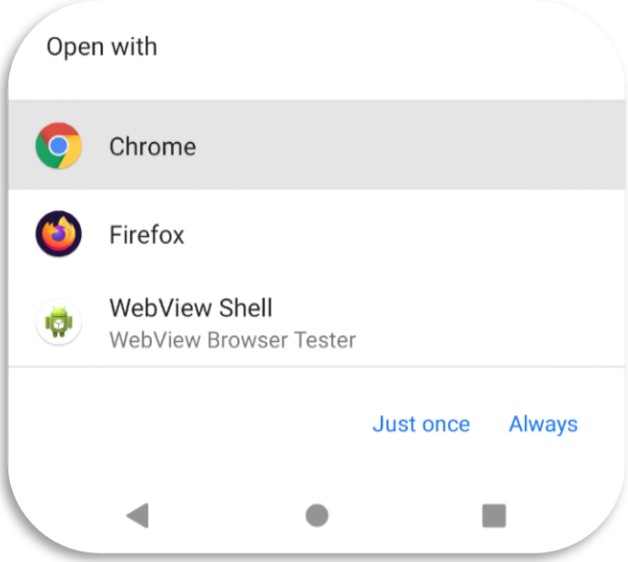
```
intent = Intent(this, RegisterActivity::class.java)

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")
}
```

# Menus and Toolbars

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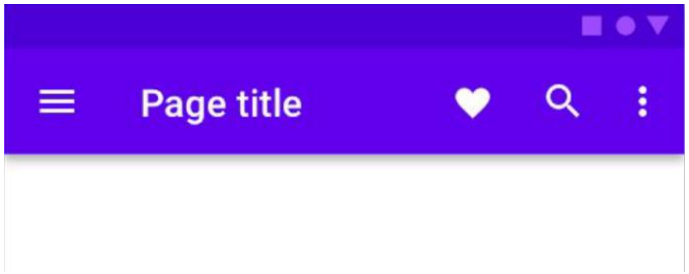
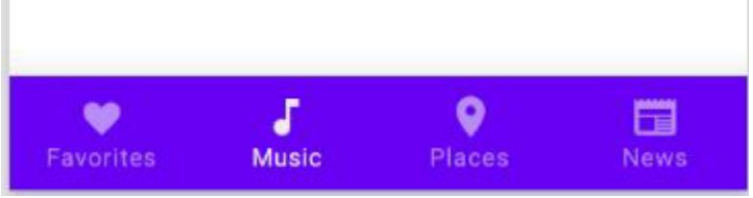
# Menus and Toolbars

- **AppBar**
  - Info and actions related to the current screen
  - Typically positioned on top and has Title, Menu items, Drawer button / Back button




- **Bottom Navigation**
  - Provides movement between **top-level destinations** in an app (2 to 5 options)
  - Positioned on the Bottom of screen and typically has Label/Icon and Notification badges

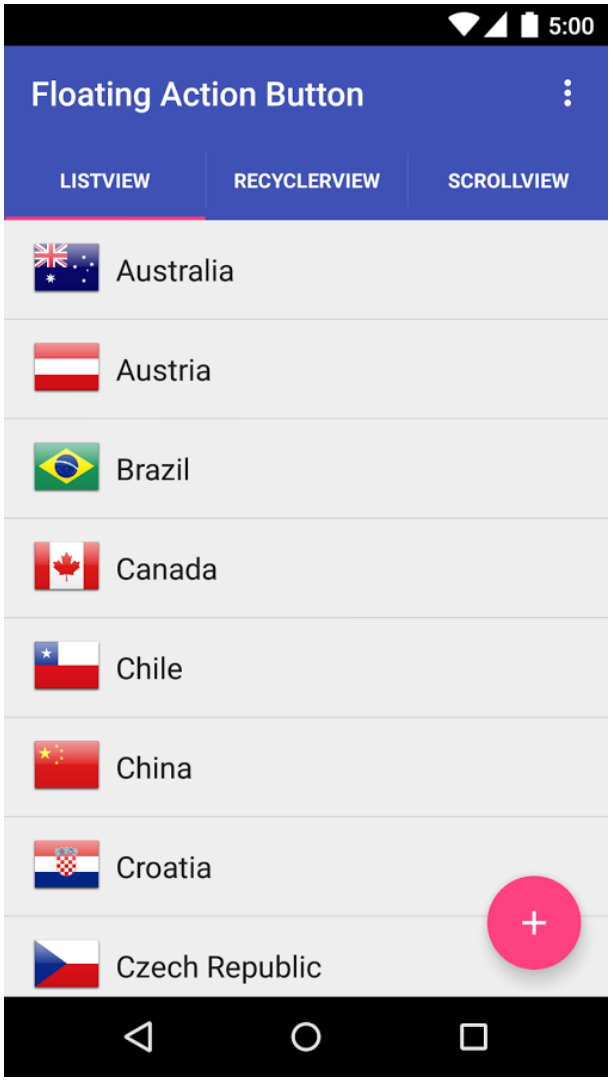


# Navigation drawer

- The navigation drawer is a Ul panel that shows the app's main navigation menu (5+ top level 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

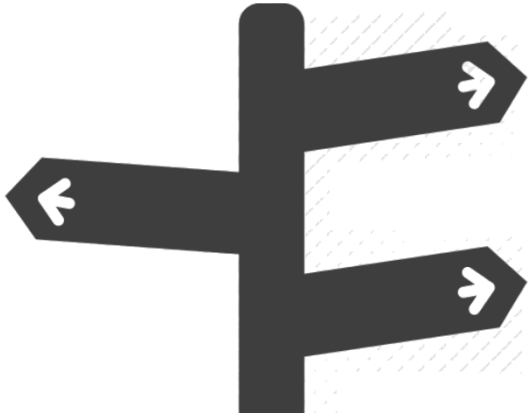
# Floating Action Button (FAB)

- A FAB performs the primary, or most common, action on a screen.
  - It appears in front of all screen content, typically as a circular shape with an icon in its center.



# Navigation Component

A framework for navigating between ‘destinations’ within an app

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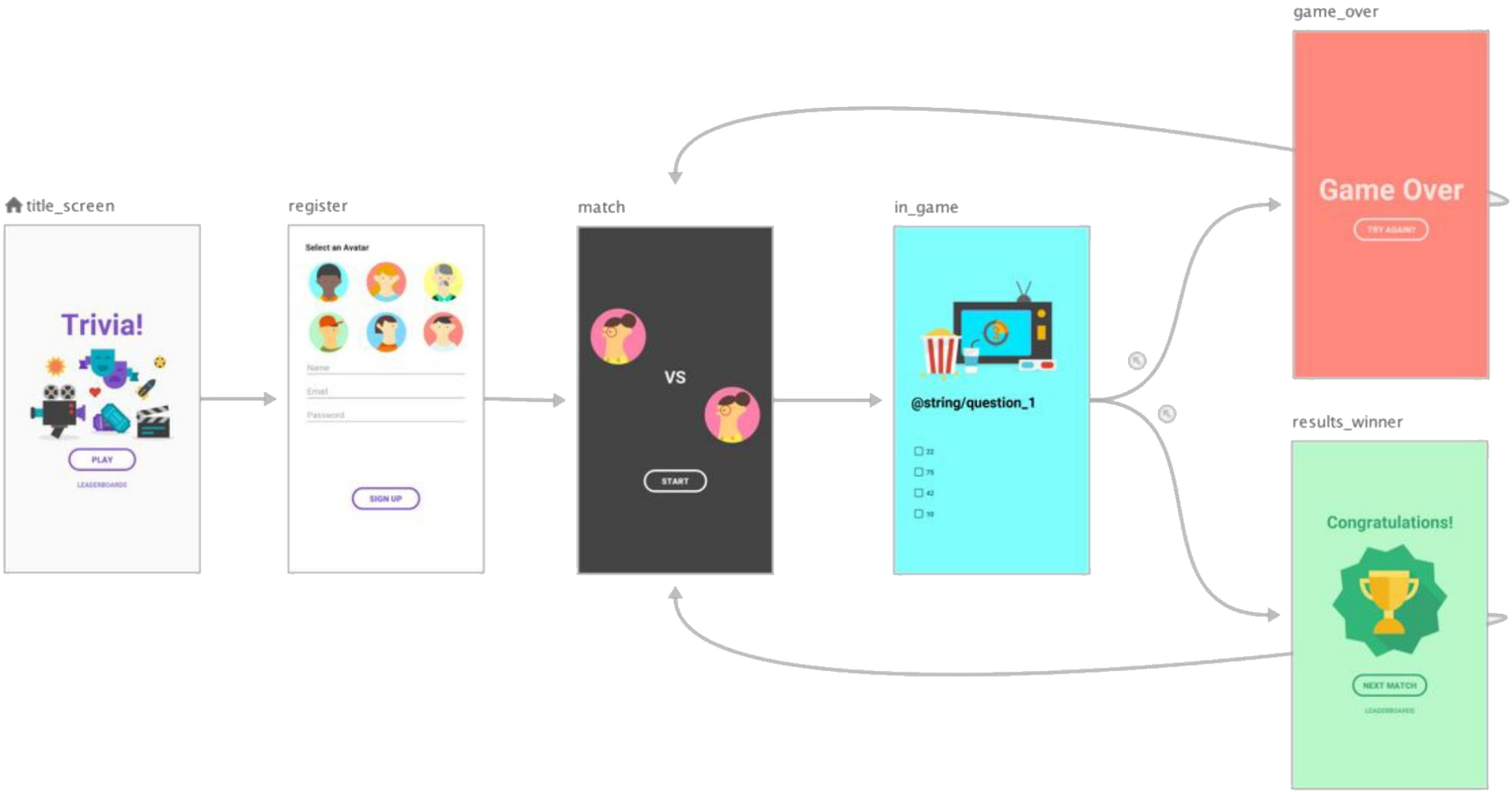
# Navigation Component

- 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)

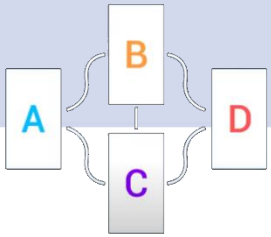
# Example Navigation Graph



# Key Components

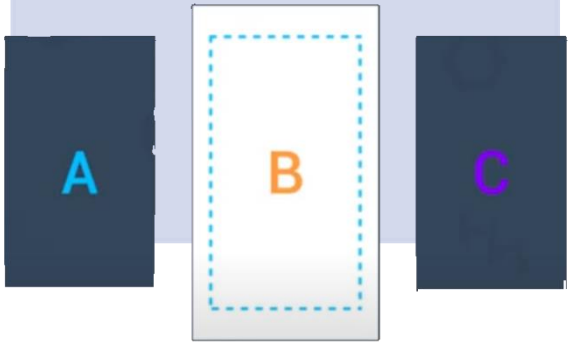
## Navigation Graph

- 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



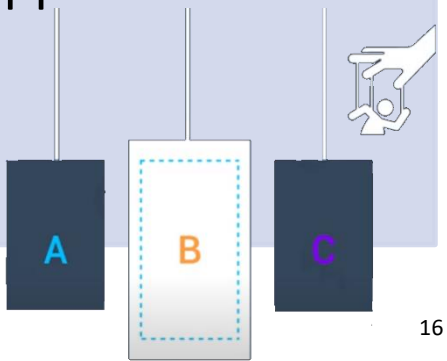

## NavHost

- 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**

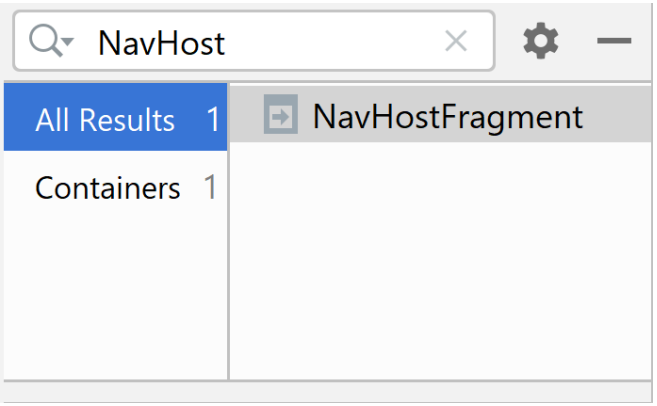
- From any view **`findNavController`** to navigate to a particular action
- The requested destination fragment will be loaded in the NavHostFragment

# 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 Module:app/build.gradle to use Java 8 - add 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`

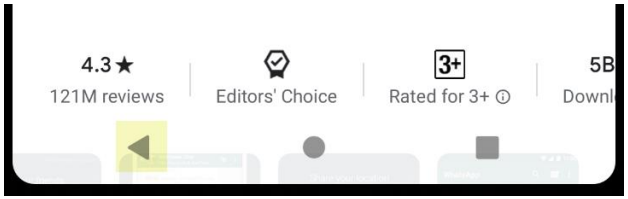
```
navController = findNavController(R.id.navHostFragment)
setupActionBarWithNavController(this, navController)
```

- Handle *Navigate Up* event

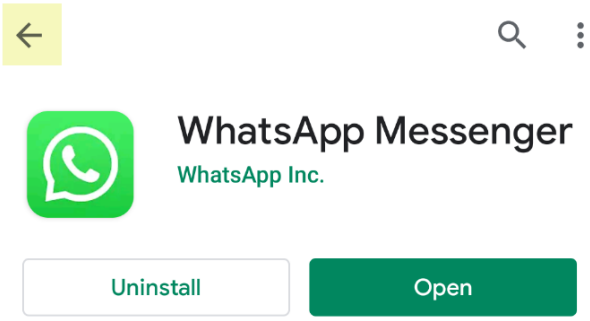
```
override fun onSupportNavigateUp() =  navController.navigateUp()
```

# 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

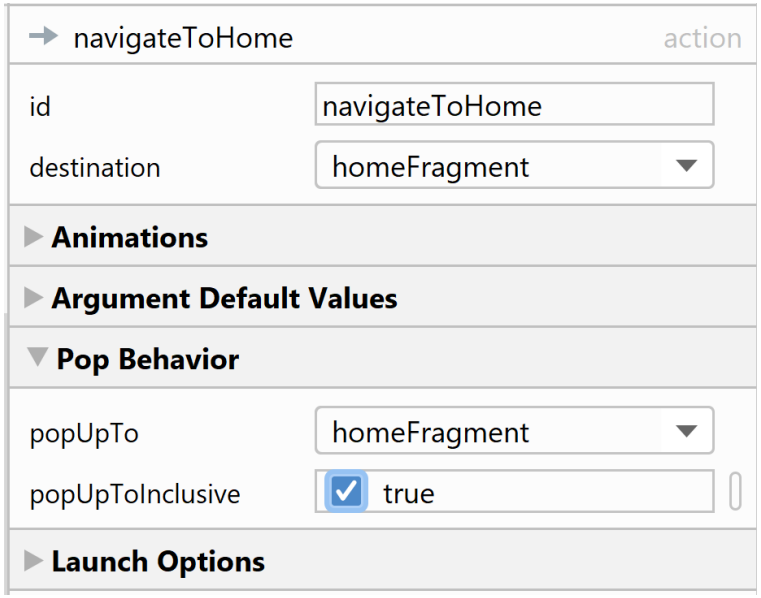



- Navigate Up button on the top app bar of <u>child screens</u> allows **upward navigation** one level upwards within the nav graph until the app's home
  - E.g., Navigate Up on a Funds Transfer confirmation screen navigates back to the app's home



# 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



# 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

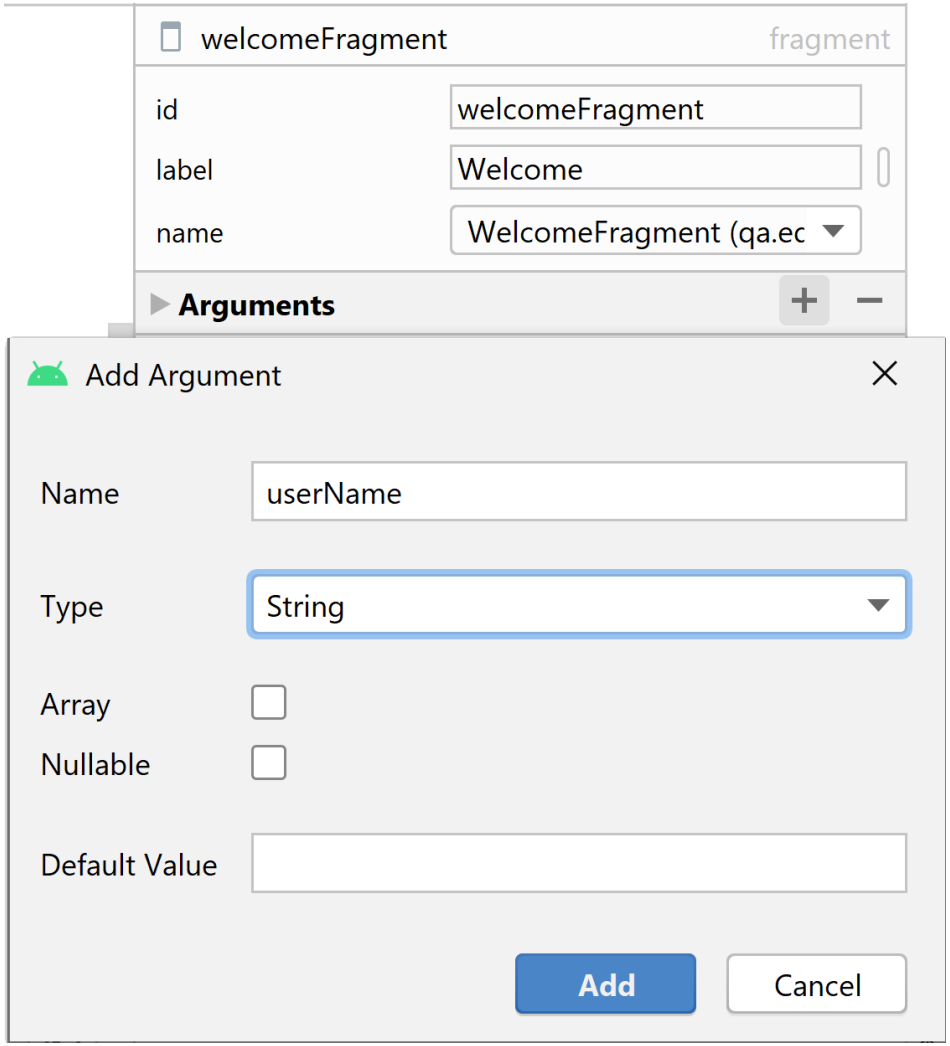
# Connect Bottom Nav Bar to NavController

- 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



# 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"
}
```

# ViewPager2

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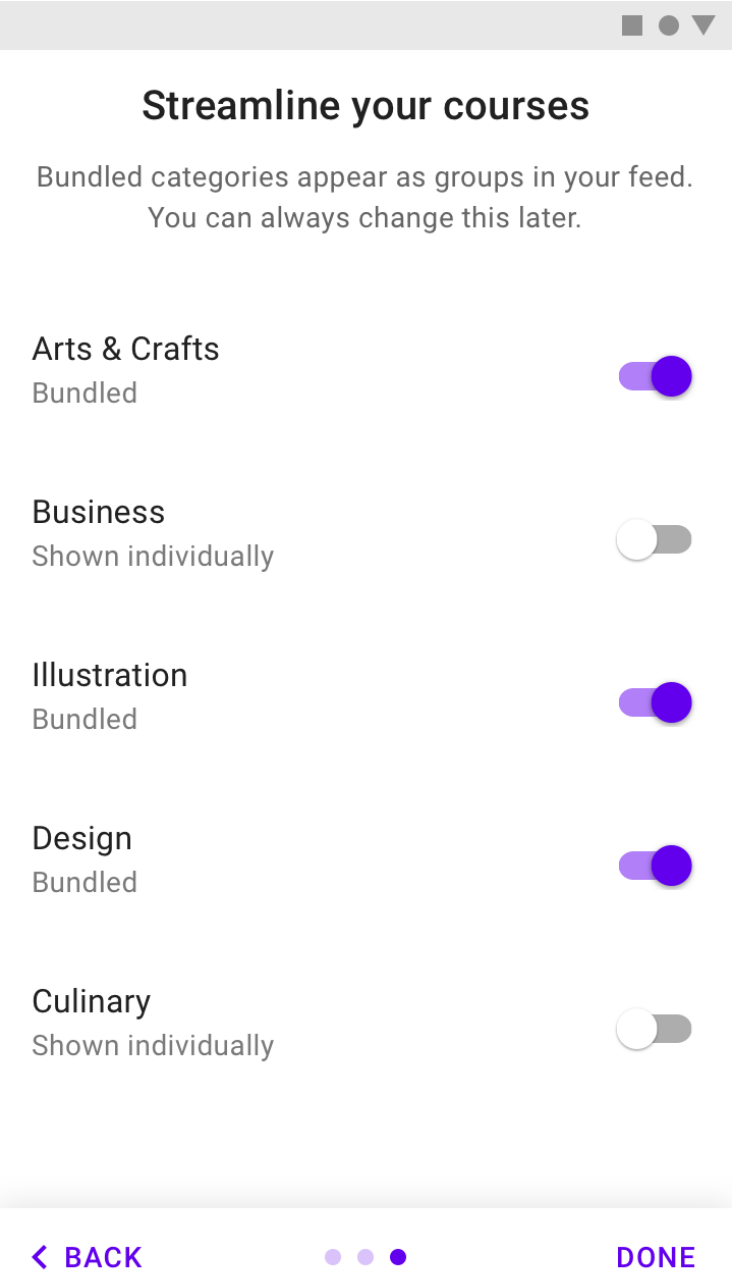
# ViewPager2

- ViewPager2 allows displaying a collection of fragments in a **swipe-able** format, especially popular for:
  - Wizards - multi-steps task (e.g., flight booking flow)
  - Onboarding to help first-time users get quickly started and configure the app
  - Content display screens



# Resources

- 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/