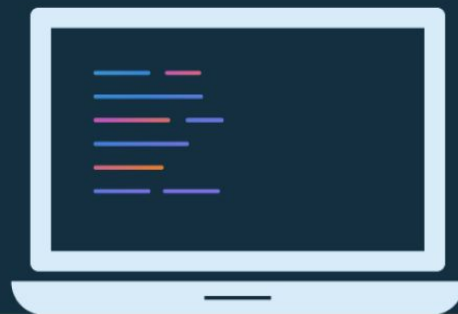




# Lesson 7: Activity and fragment lifecycles



# About this lesson

## Lesson 7: Activity and fragment lifecycles

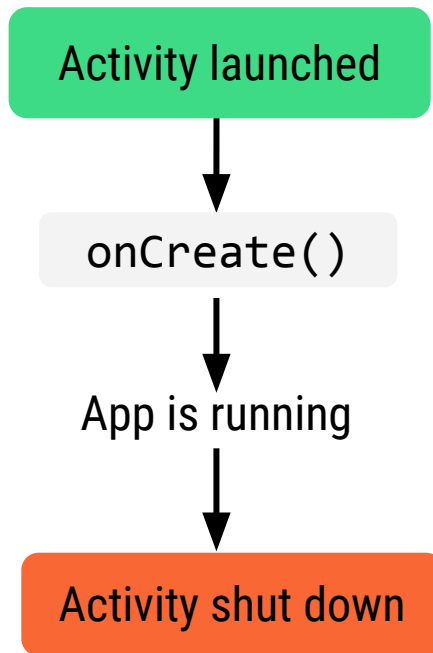
- [Activity lifecycle](#)
- [Logging](#)
- [Fragment lifecycle](#)
- [Lifecycle-aware components](#)
- [Tasks and back stack](#)
- [Summary](#)

# Activity lifecycle

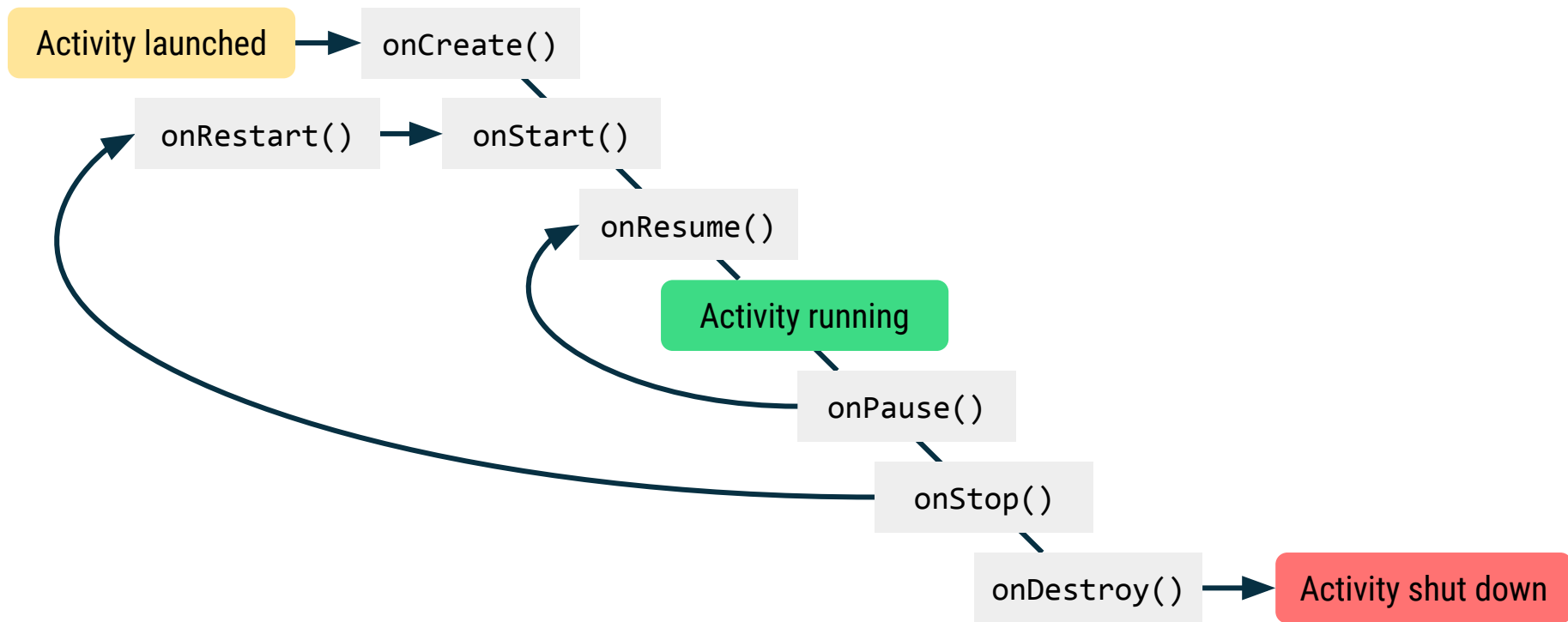
# Why it matters

- Preserve user data and state if:
  - User temporarily leaves app and then returns
  - User is interrupted (for example, a phone call)
  - User rotates device
- Avoid memory leaks and app crashes.

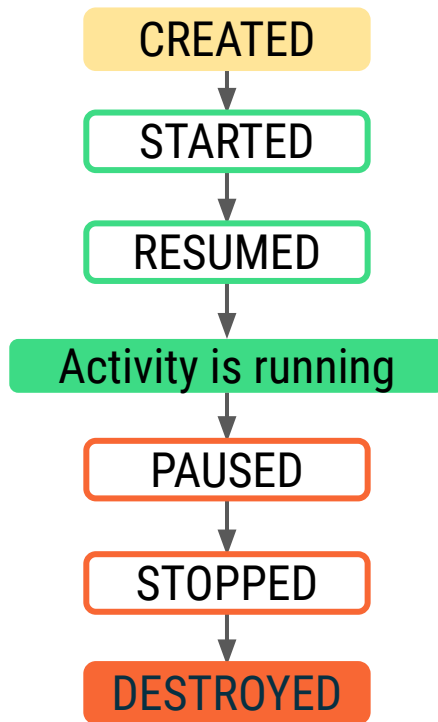
# Simplified activity lifecycle



# Activity lifecycle



# Activity states



# onCreate()

- Activity is created and other initialization work occurs
- You must implement this callback
- Inflate activity UI and perform other app startup logic



# onStart()

- Activity becomes visible to the user
- Called after activity:
  - `onCreate()`
  - or
  - `onRestart()` if activity was previously stopped

# onResume()

- Activity gains input focus:
  - User can interact with the activity
- Activity stays in resumed state until system triggers activity to be paused

# onPause()

- Activity has lost focus (not in foreground)
- Activity is still visible, but user is not actively interacting with it
- Counterpart to `onResume()`

# onStop()

- Activity is no longer visible to the user
- Release resources that aren't needed anymore
- Save any persistent state that the user is in the process of editing so they don't lose their work

# onDestroy()

- Activity is about to be destroyed, which can be caused by:
  - Activity has finished or been dismissed by the user
  - Configuration change
- Perform any final cleanup of resources.
- Don't rely on this method to save user data (do that earlier)

# Summary of activity states

State	Callbacks	Description
Created	<code>onCreate()</code>	Activity is being initialized.
Started	<code>onStart()</code>	Activity is visible to the user.
Resumed	<code>onResume()</code>	Activity has input focus.
Paused	<code>onPause()</code>	Activity does not have input focus.
Stopped	<code>onStop()</code>	Activity is no longer visible.
Destroyed	<code>onDestroy()</code>	Activity is destroyed.

# Save state

User expects UI state to stay the same after a config change or if the app is terminated when in the background.

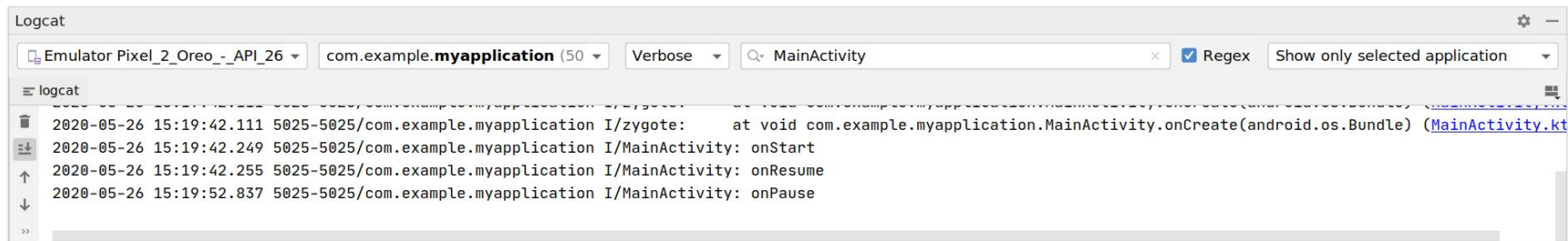
- Activity is destroyed and restarted, or app is terminated and activity is started.
- Store user data needed to reconstruct app and activity Lifecycle changes:
  - Use `Bundle` provided by `onSaveInstanceState()`.
  - `onCreate()` receives the `Bundle` as an argument when activity is created again.

# Logging



# Logging in Android

- Monitor the flow of events or state of your app.
- Use the built-in `Log` class or third-party library.
- Example `Log` method call: `Log.d(TAG, "Message")`

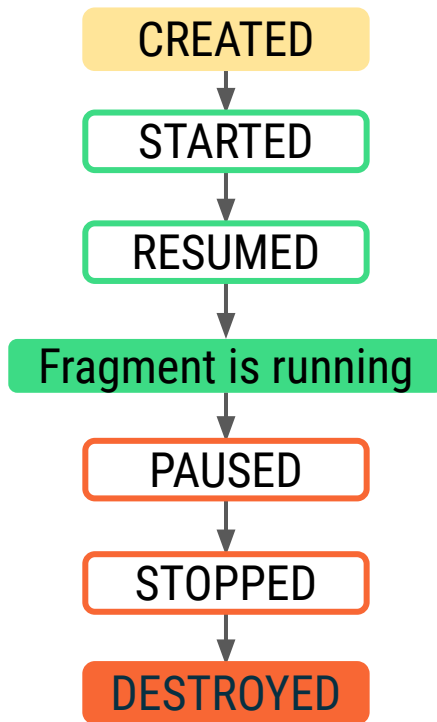


# Write logs

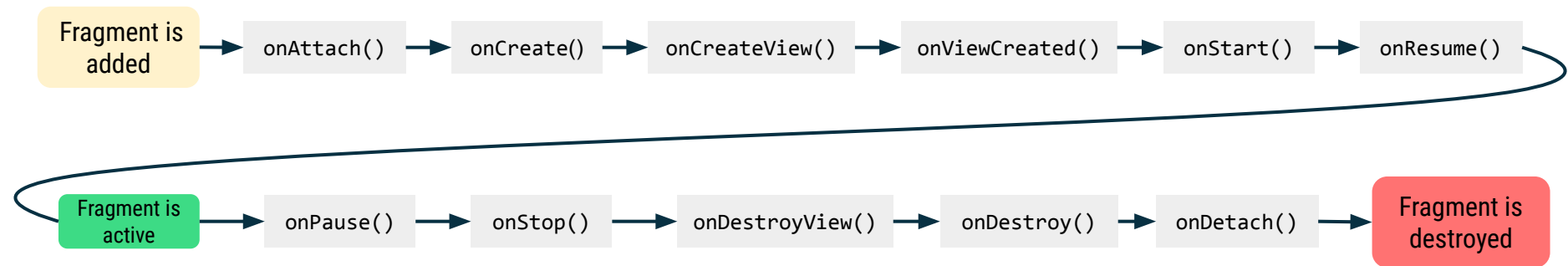
Priority level	Log method
Verbose	<code>Log.v(String, String)</code>
Debug	<code>Log.d(String, String)</code>
Info	<code>Log.i(String, String)</code>
Warning	<code>Log.w(String, String)</code>
Error	<code>Log.e(String, String)</code>

# Fragment lifecycle

# Fragment states



# Fragment lifecycle diagram



# onAttach()

- Called when a fragment is attached to a context
- Immediately precedes `onCreate()`

# onCreateView()

- Called to create the view hierarchy associated with the fragment
- Inflate the fragment layout here and return the root view

# onViewCreated()

- Called when view hierarchy has already been created
- Perform any remaining initialization here (for example, restore state from `Bundle`)



# onDestroyView() and onDetach()

- `onDestroyView()` is called when view hierarchy of fragment is removed.
- `onDetach()` is called when fragment is no longer attached to the host.

# Summary of fragment states

State	Callbacks	Description
Initialized	<code>onAttach()</code>	Fragment is attached to host.
Created	<code>onCreate()</code> , <code>onCreateView()</code> , <code>onViewCreated()</code>	Fragment is created and layout is being initialized.
Started	<code>onStart()</code>	Fragment is started and visible.
Resumed	<code>onResume()</code>	Fragment has input focus.
Paused	<code>onPause()</code>	Fragment no longer has input focus.
Stopped	<code>onStop()</code>	Fragment is not visible.
Destroyed	<code>onDestroyView()</code> , <code>onDestroy()</code> , <code>onDetach()</code>	Fragment is removed from host.

# Save fragment state across config changes

Preserve UI state in fragments by storing state in `Bundle`:

- `onSaveInstanceState(outState: Bundle)`

Retrieve that data by receiving the `Bundle` in these fragment callbacks:

- `onCreate()`
- `onCreateView()`
- `onViewCreated()`

# Lifecycle-aware components

# Lifecycle-aware components

Adjust their behavior based on activity or fragment lifecycle

- Use the `androidx.lifecycle` library
- `Lifecycle` tracks the lifecycle state of an activity or fragment
  - Holds current lifecycle state
  - Dispatches lifecycle events (when there are state changes)

# LifecycleOwner

- Interface that says this class has a lifecycle
- Implementers must implement `getLifecycle()` method

Examples: `Fragment` and `AppCompatActivity` are implementations of `LifecycleOwner`

# LifecycleObserver

Implement `LifecycleObserver` interface:

```
class MyObserver : LifecycleObserver {  
    @OnLifecycleEvent(Lifecycle.Event.ON_RESUME)  
    fun connectListener() {  
        ...  
    }  
}
```

Add the observer to the lifecycle:

```
myLifecycleOwner.getLifecycle().addObserver(MyObserver())
```

# Tasks and back stack



# Back stack of activities



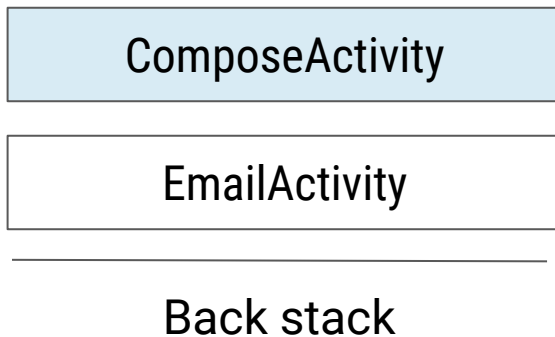
EmailActivity

The diagram illustrates the back stack of activities. It consists of a light blue rectangular box with a thin black border, containing the text 'EmailActivity'. Below this box is a horizontal line, and further down is the text 'Back stack'.

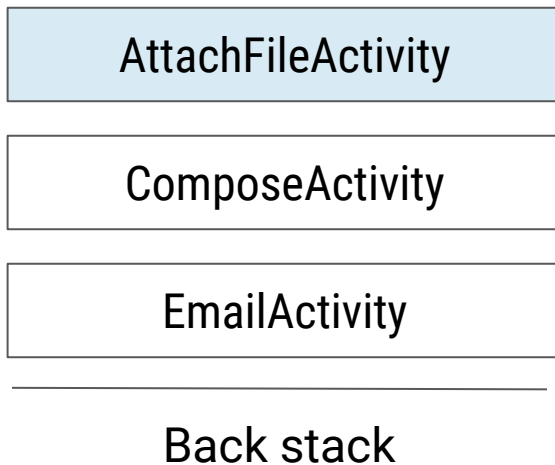
Back stack



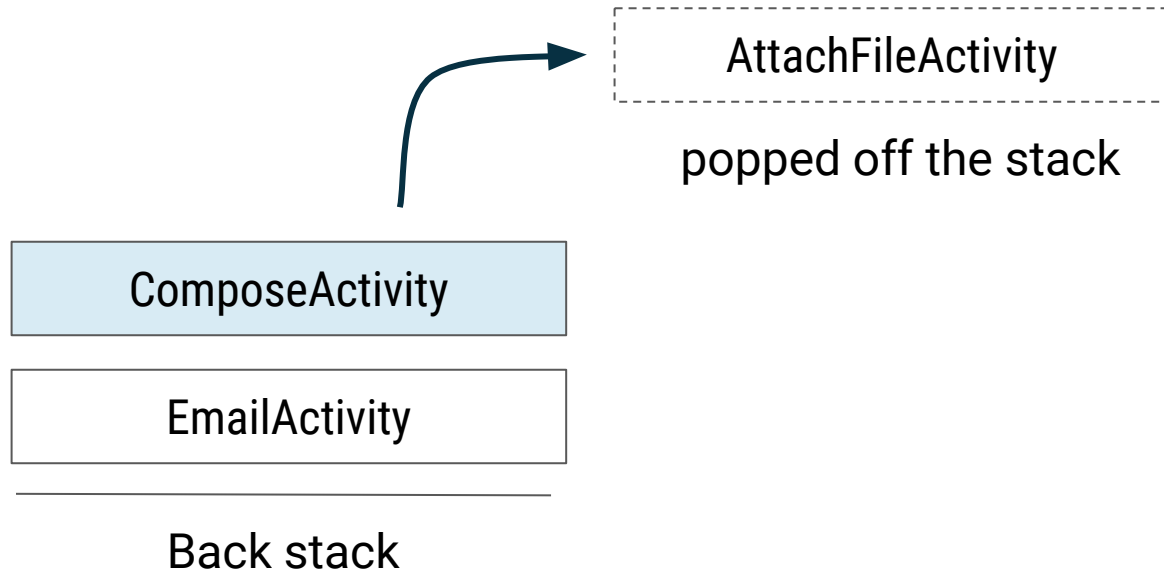
# Add to the back stack



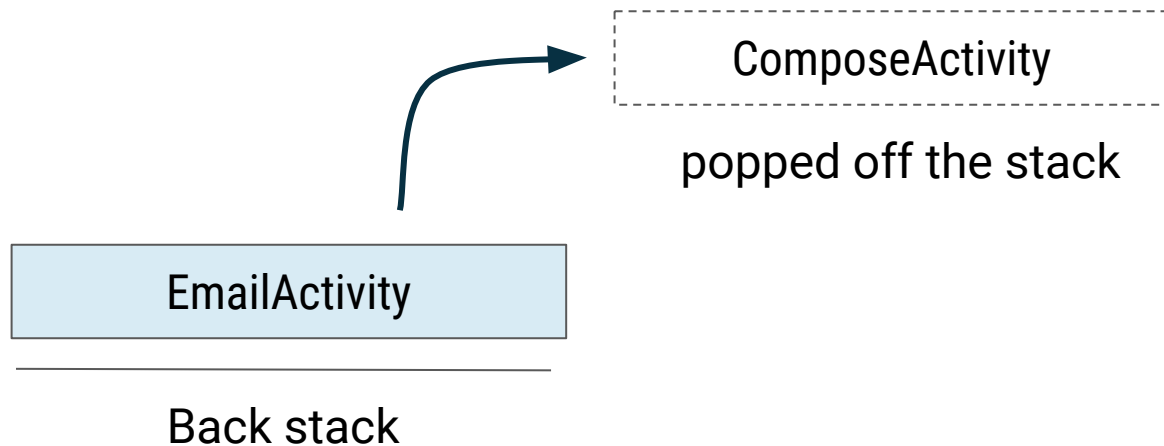
# Add to the back stack again



# Tap Back button



# Tap Back button again



# First destination in the back stack



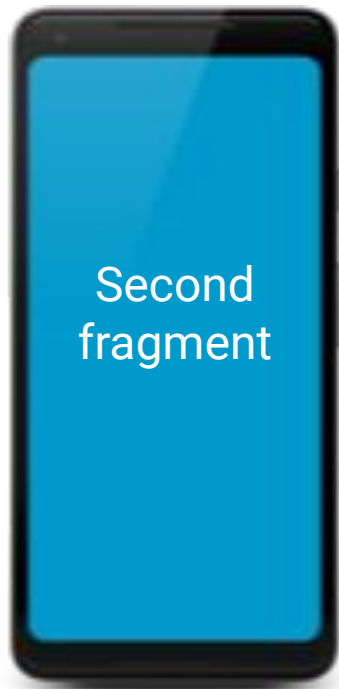
FirstFragment

---

Back stack



# Add a destination to the back stack



SecondFragment

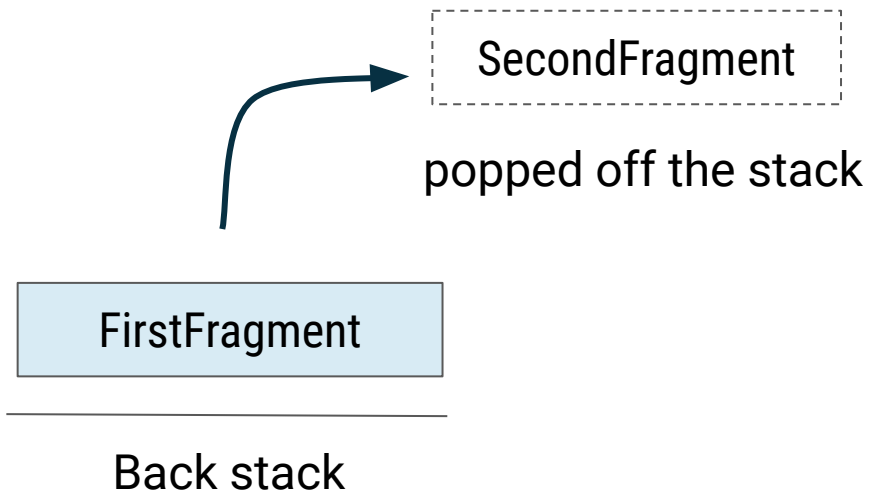
FirstFragment

---

Back stack

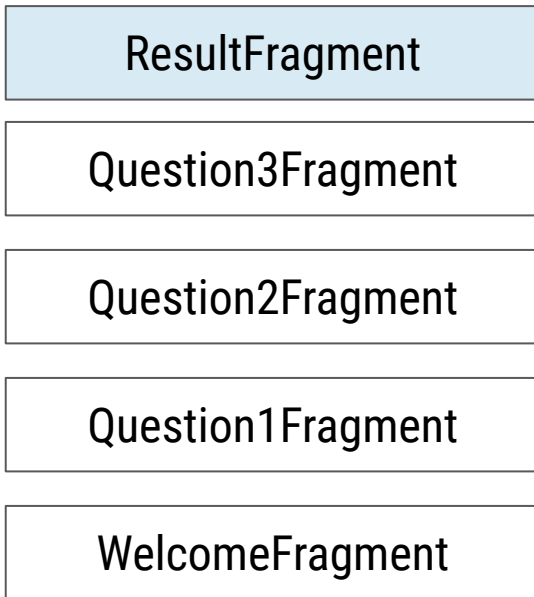
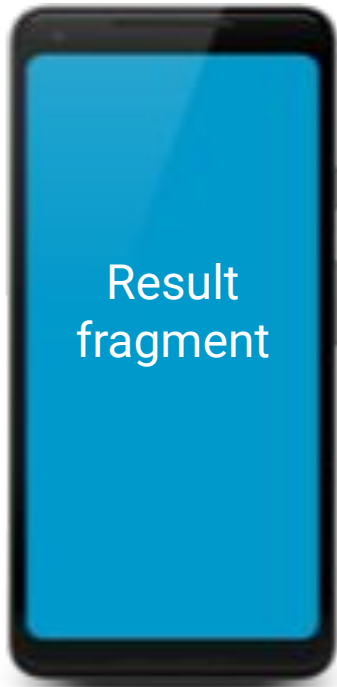


# Tap Back button



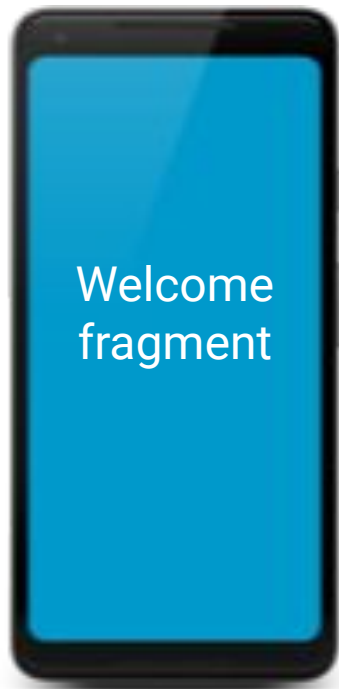


# Another back stack example

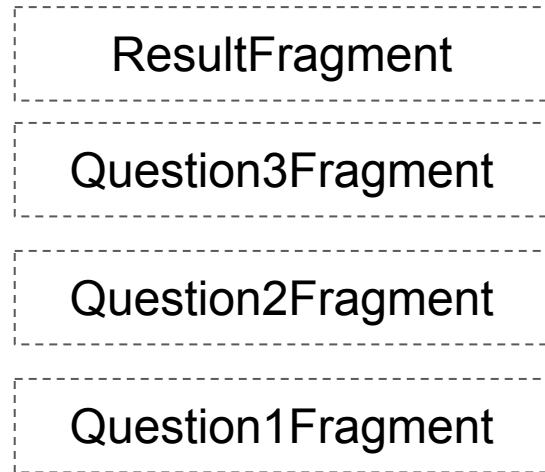
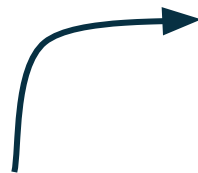


Back stack

# Modify Back button behavior



pop additional destinations  
off the back stack



WelcomeFragment

Back stack



# Summary

# Summary

In Lesson 7, you learned how to:

- Understand how an activity instance transitions through different lifecycle states as the user interacts with or leaves your app
- Reserve UI state across configuration changes using a `Bundle`
- Fragment lifecycle callback methods similar to activity, but with additions
- Use lifecycle-aware components help organize your app code
- Use default or custom back stack behavior
- Use logging to help debug and track the state of the app

# Learn more

- [Understand the Activity Lifecycle](#)
- [Activity class](#)
- [Fragments guide and lifecycle](#)
- [Fragment class](#)

# Pathway

Practice what you've learned by completing the pathway:

[Lesson 7: Activity and Fragment Lifecycles](#)

