Beyond the UI

Compose as a Foundation for Multiplatform Apps

mDevCamp - June '25 🇨🇿

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Android GDE Berlin

Jetpack Compose UI

github.com/androidx/androidx/tree/androidx-main/compose/ui

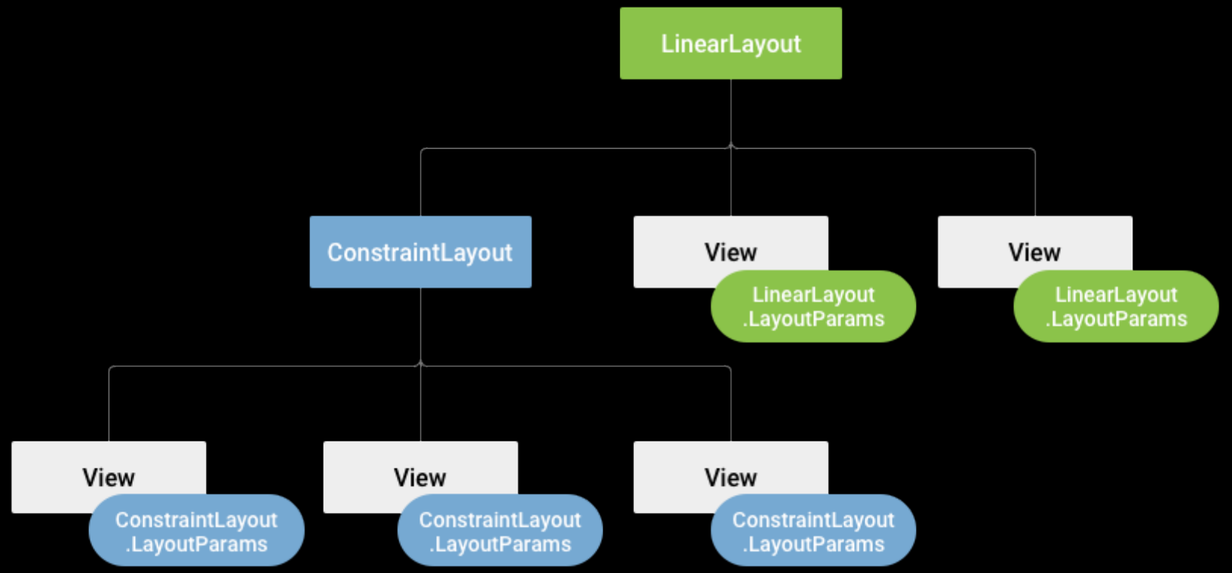
```
@Composable
fun JetpackCompose() {
    Card {
        var expanded by remember { mutableStateOf(false) }
        Column(Modifier.clickable { expanded = !expanded }) {
            Image(painterResource(R.drawable.jetpack_compose))
            AnimatedVisibility(expanded) {
                Text(
                    text = "Jetpack Compose",
                    style = MaterialTheme.typography.bodyLarge,
                )
            }
        }
    }
}
```

Jetpack Compose UI

github.com/androidx/androidx/tree/androidx-main/compose/ui

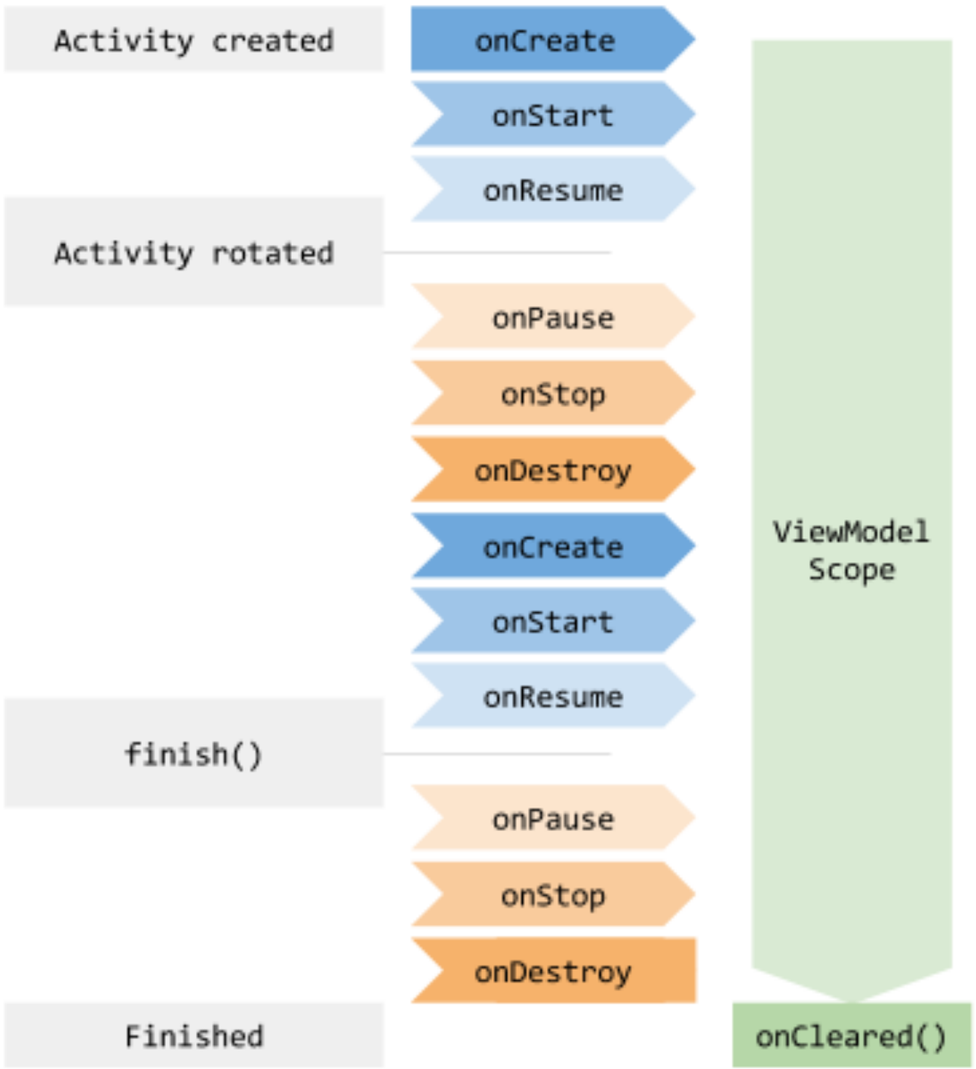
Android Layouts

```
<?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>
```



Android Layouts

Lifecycle



Android Layouts

Lifecycle Abstraction

square/**mortar**

A simple library that makes it easy to pair thin views with dedicated controllers, isolated from most of the vagaries...

20 Contributors | 32 Issues | 2k Stars | 154 Forks

square/**flow**

Name UI states, navigate between them, remember where you've been.

25 Contributors | 33 Issues | 3k Stars | 238 Forks

Android Layouts

Lifecycle Abstraction

square/**workflow-kotlin**

A Swift and Kotlin library for making composable state machines, and UIs driven by those state machines.

66 Contributors · 139 Issues · 25 Discussions · 1k Stars · 104 Forks

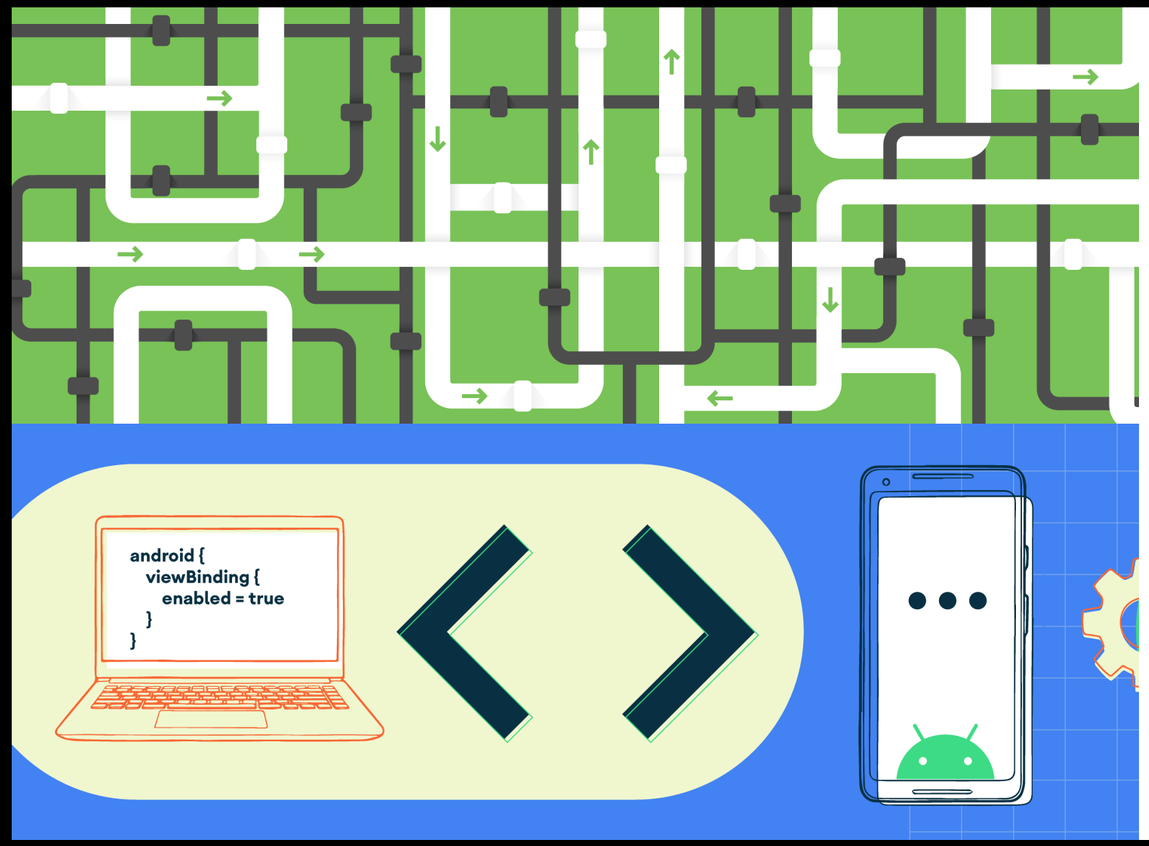
uber/**RIBs**

Uber's cross-platform mobile architecture framework - Android Repository

63 Contributors · 19 Used by · 8k Stars · 906 Forks

Android Layouts

Kotlin Interop



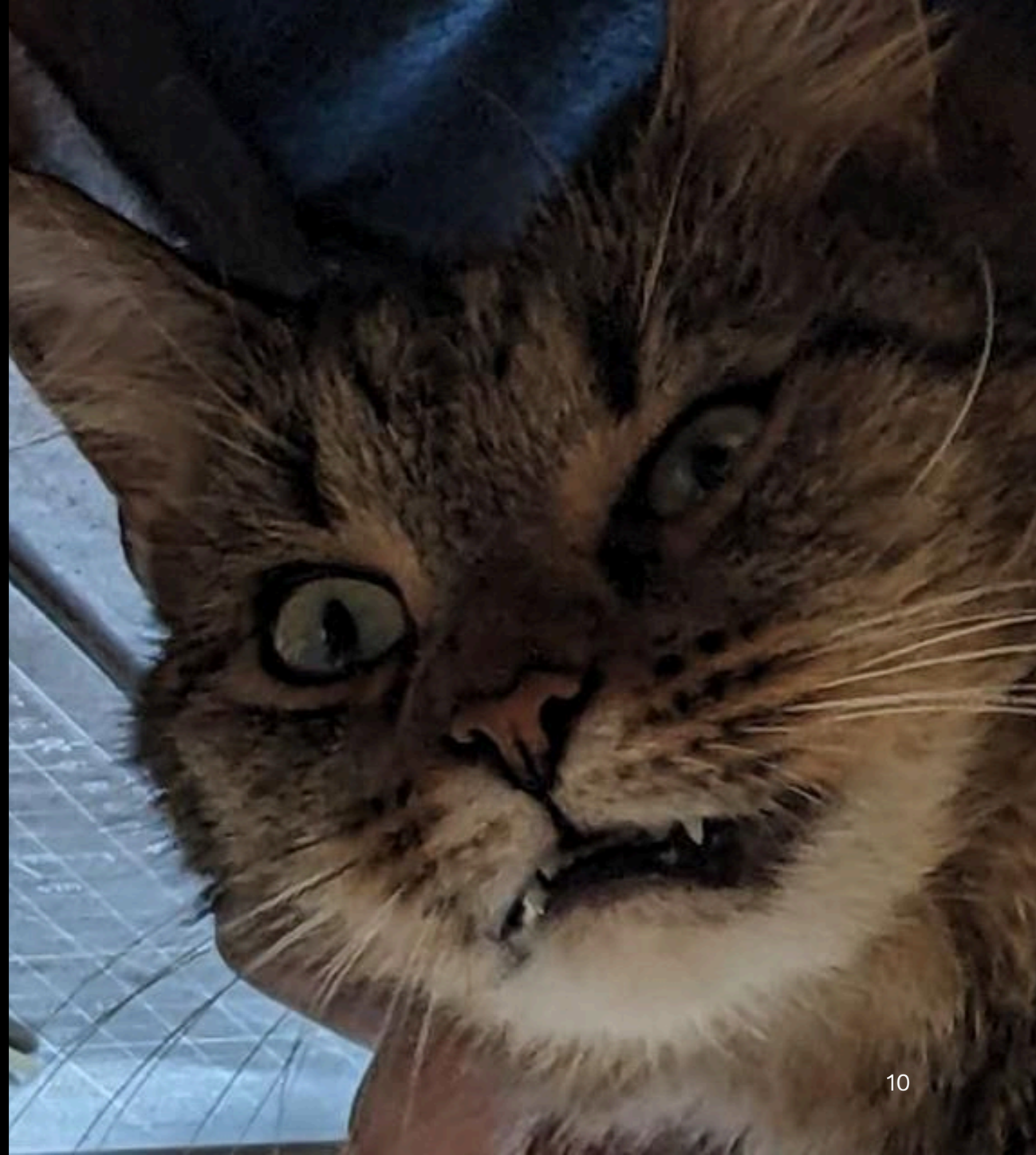
Anko

LouisCAD/**Splitties**

A collection of hand-crafted extensions for your Kotlin projects.

11 Contributors · 51 Issues · 3 Discussions · 3k Stars · 162 Forks

XML?!



Jetpack Compose UI 🚀

1.0 (July 2021)

Declarative UI Framework

Compose UI

Intelligent Recomposition 🧠

Compose UI

```
@Composable
fun ClickCounter(clicks: Int, onClick: () -> Unit) {
    Button(onClick = onClick) {
        Text("I've been clicked $clicks times")
    }
}
```

Kotlin Language Features 💪

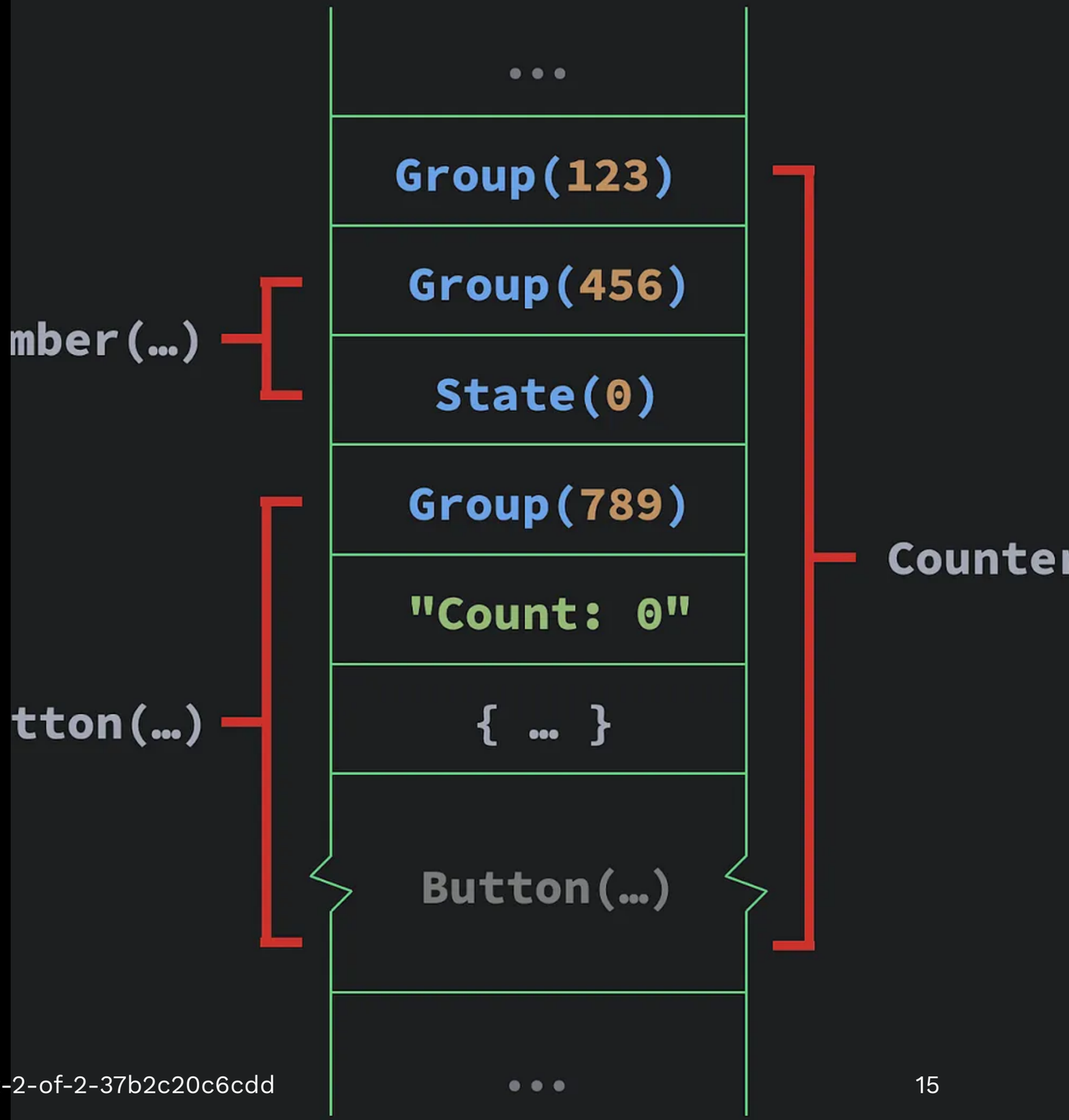
Compose UI

— Default parameters
— Higher order functions
— Trailing lambdas
— Scopes / Receivers
— Delegated properties
— ...

Jetpack Compose UI

Under-the-hood

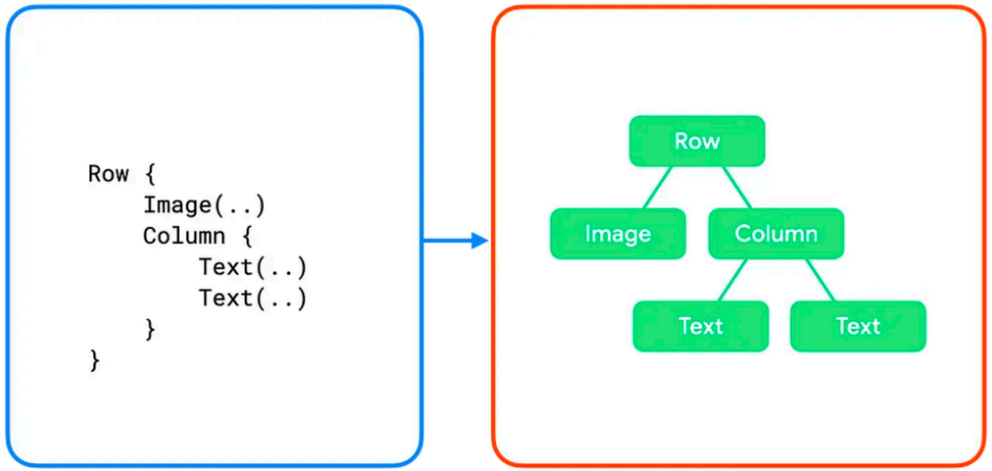
— Kotlin compiler plugin
— Gap buffer data structure



Jetpack Compose UI

Talk is Cheap

```
@Composable
fun Counter() {
    var count by remember { mutableStateOf(0) }

    Button(onClick = { count += 1 }) {
        Text("Count: $count")
    }
}
```


Row {
Image(..)
Column {
Text(..)
Text(..)
}
}
Row
Image
Column
Text
Text

Compose is, at its core, a general-purpose tool for managing a tree of nodes of any type … a “tree of nodes” describes just about anything, and as a result Compose can target just about anything.

— Jake Wharton

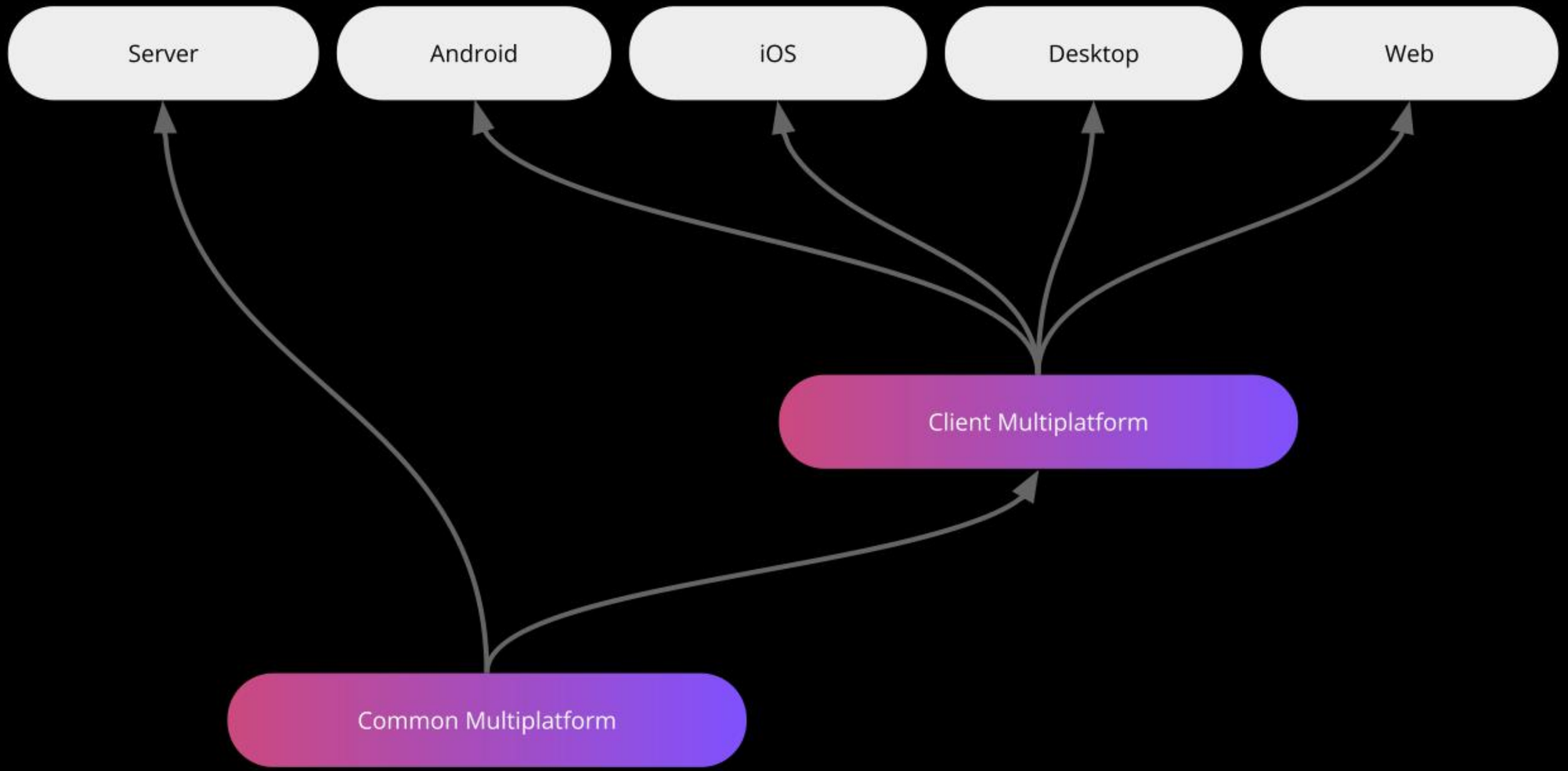
⚠️ Compose != Compose UI

Kotlin Multiplatform

Stable (1.9.20)

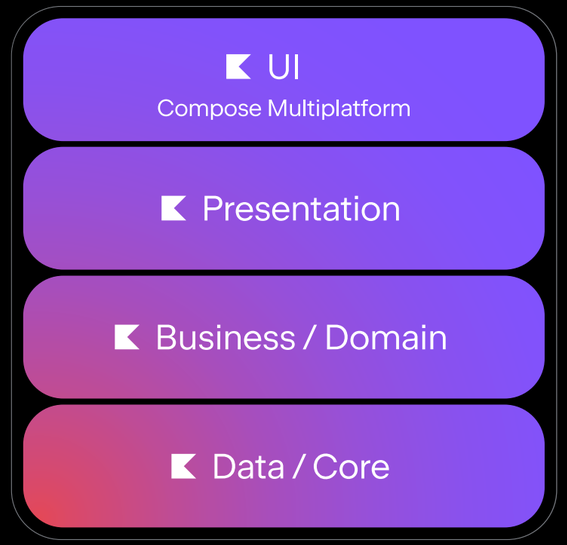
The Before Times

The Before Times


Server
Android
iOS
Desktop
Web
Client Multiplatform
Common Multiplatform

Compose Multiplatform

v1.0 | 2021



JetBrains/**compose-multiplatform-core**

Development environment for Android Jetpack extension libraries under the androidx namespace. Synchronized with Android Jetpack's primary development branch on AOSP.

0 Contributors

0 Issues

541 Stars

87 Forks

github.com/JetBrains/compose-multiplatform-core

Compose Multiplatform Migration

— Change artifact coordinates
— Do nothing
— Profit

```
// Compiled Compose code

fun Counter($composer: Composer) {
    $composer.startRestartGroup(-1913267612)

    /* ... */

    $composer.endRestartGroup()
}

// Compiled Coroutines code

fun counter($completion: Continuation) {
    /* ... */
}
```

KotlinX Coroutines

```
@Suppress("DEPRECATION")
class CallbackLoginPresenter(
  private val service: SessionService,
  private val goTo: (Screen) -> Unit,
) {
  /* ... */

  inner class LoginAsyncTask : AsyncTask<Submit,Void,LoginResult>() {
    private var username: String = ""

    override fun doInBackground(vararg events: Submit?): LoginResult {
      val event = events[0]!!
      username = event.username
      return runBlocking { service.login(event.username, event.password) }
    }

    override fun onPostExecute(result: LoginResult?) {
      when (result) {
        is Success -> goTo(LoggedInScreen(username))
        is Failure -> goTo(ErrorScreen(result.throwable?.message ?: ""))
        else -> {}
      }
    }
  }
}
```

```
Observable.just("Hey")
    .subscribeOn(Schedulers.io())
    .map(String::length)
    .subscribeOn(Schedulers.computation())
    .observeOn(AndroidSchedulers.mainThread())
    .doOnSubscribe { doAction() }
    .flatMap {
        doAction()

        Observable.timer(1, TimeUnit.SECONDS)
            .subscribeOn(Schedulers.single())
            .doOnSubscribe { doAction() }
    }
    .subscribe { doAction() }
```

KotlinX Coroutines

— Lightweight memory usage
— Structured concurrency
— Cancellation propagation
— Lifecycle aware

KotlinX Coroutines

— Native library
— Imperative syntax
— `suspend fun`

Reactive Architecture

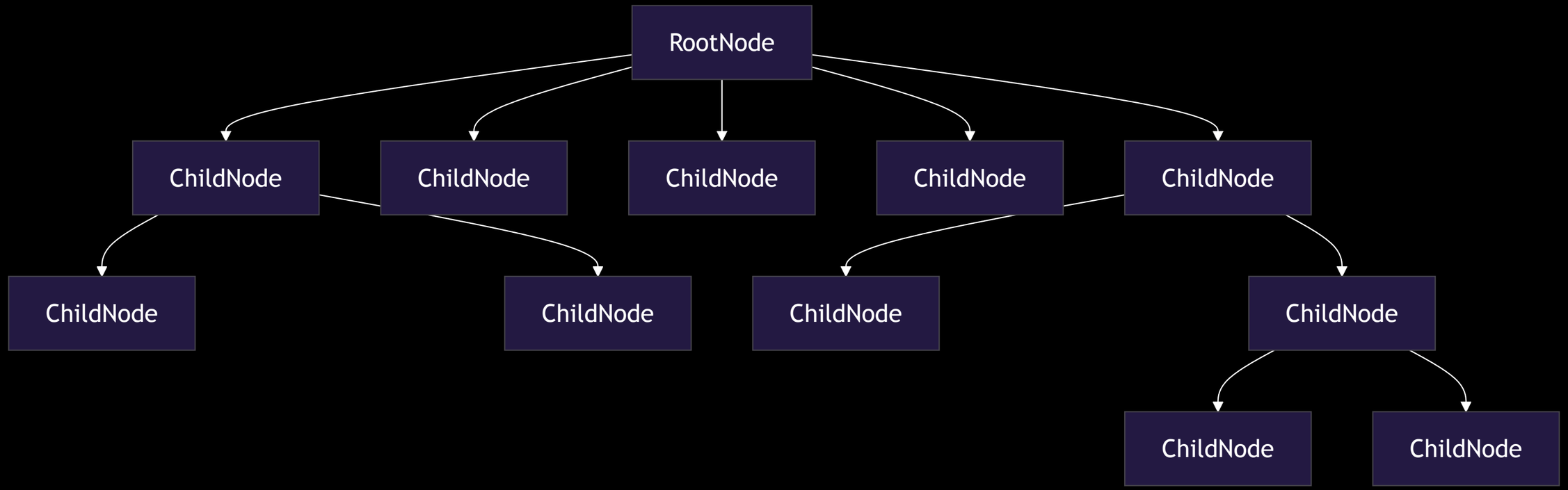
— Push (not pull)
— Unidirectional Data Flow
— Declarative
— Idempotent

```
downloadManager
    .downloadFile("https://.../")
    .addOnCompletionListener { result ->
        fileManager
            .saveFile("storage/file", result)
            .addOnCompletionListener { success ->
                if (success) {
                    println("Downloaded file successfully")
                }
            }
    }
}
```

```
downloadManager
    .downloadFile("https://.../")
    .flatMap { result ->
        fileManager.saveFile("storage/file", result)
    }
    .observe { success ->
        if (success) {
            println("Downloaded file successfully")
        }
    }
```

```
val file = downloadFile("https://.../")
val success = fileManager.saveFile("storage/file", file)

if (success) {
    println("Downloaded file successfully")
}
```


```
- downloadManager
-   .downloadFile("https://.../")
-   .flatMap { result ->
-     fileManager.saveFile("storage/file", result)
-   }
-   .observe { success ->
-     if (success) {
-       println("Downloaded file successfully")
-     }
-   }

+ downloadManager.
+     downloadFile("https://.../")
+     .flatMapLatest { state ->
+         when (state) {
+             is State.Loaded ->
+                 stateFileManager
+                     .saveFile("storage/file", state.value)
+
+           else -> state
+         }
+     }
+     .collect { state ->
+         when (state) {
+           is State.Saved ->
+               println("Downloaded file successfully")
+
+           is State.Loading ->
+               /* ... */
+         }
+     }
```


RootNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode
ChildNode

```
val downloadState = downloadManager
    .downloadFile("https://.../")
    .collectAsState(State.Downloading)

val fileState = when(downloadState) {
    is State.Loaded ->
        stateFileManager
            .saveFile("storage/file", downloadState.value)
    else -> downloadState
}

when (fileState) {
    is State.Loading -> /* ... */

    is State.Saved -> LaunchedEffect(fileState) {
        println("Downloaded file successfully")
    }
}
```

cashapp/**molecule**

Build a StateFlow stream using Jetpack Compose

25 Contributors

24 Issues

18 Discussions

2k Stars

91 Forks

Molecule

```
fun CoroutineScope.launchCounter(): StateFlow<Int> {
  return launchMolecule(mode = ContextClock) {
    var count by remember { mutableStateOf(0) }

    LaunchedEffect(Unit) {
      while (true) {
        delay(1_000)
        count++
      }
    }

    count
  }
}
```

Testing

```
@Test
fun counter() = runTest {
  moleculeFlow(RecompositionMode.Immediate) {
    Counter()
  }.test {
    assertEquals(0, awaitItem())
    assertEquals(1, awaitItem())
    assertEquals(2, awaitItem())
    cancel()
  }
}
```

cashapp/**turbine**

A testing library for kotlinx.coroutines Flow

33 Contributors

11 Issues

14 Discussions

3k Stars

113 Forks

Turbine

```
flowOf("one", "two").test {
  assertEquals("one", awaitItem())
  assertEquals("two", awaitItem())
  awaitComplete()
}
```

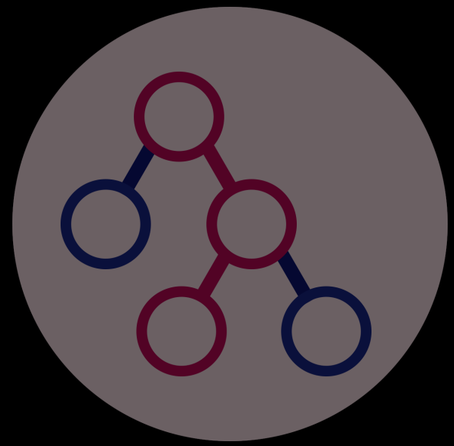
Architecture

Navigation

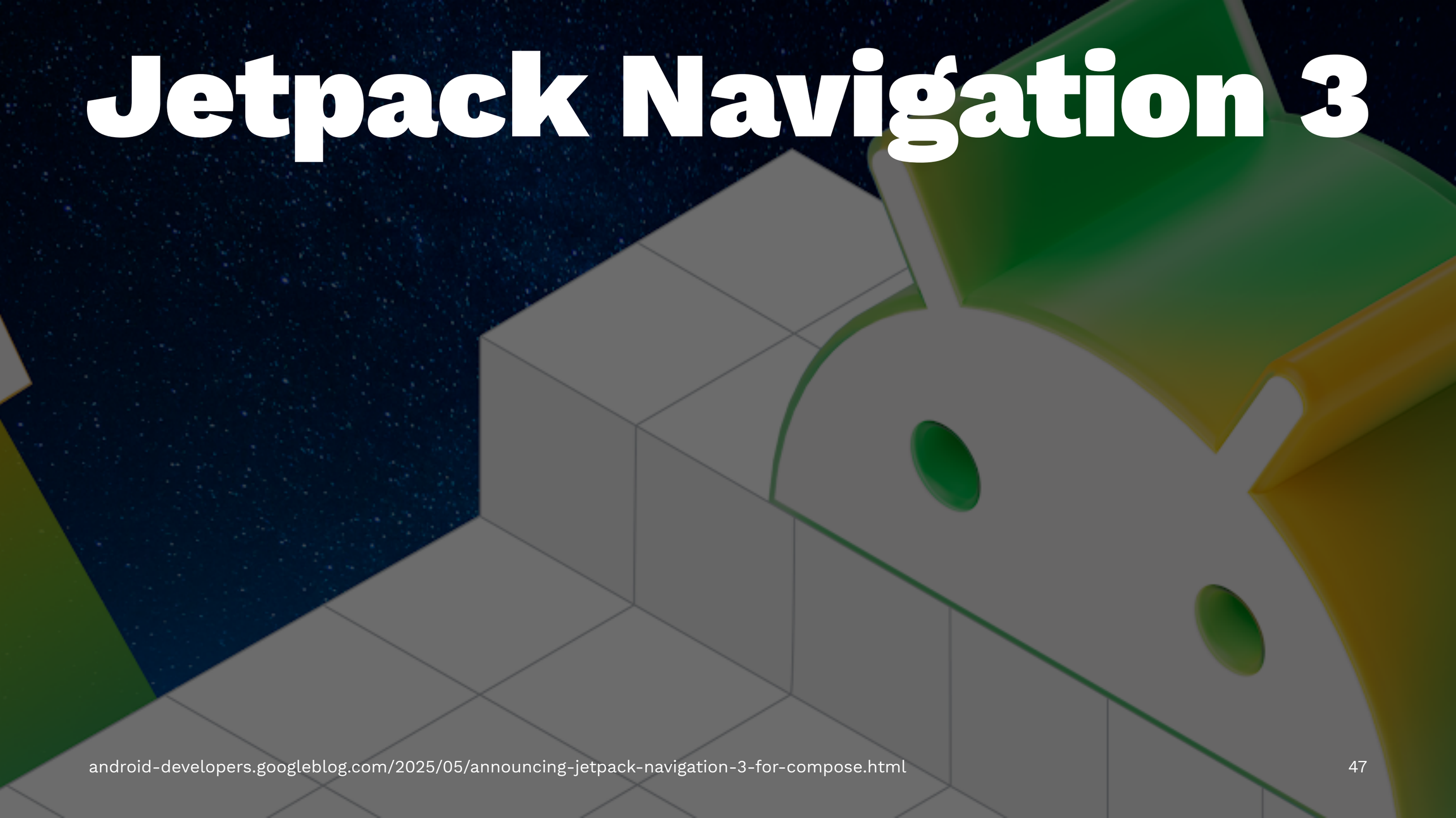
slackhq/**circuit**

⚡ A Compose-driven architecture for Kotlin and Android applications.

33 Contributors · 14 Issues · 86 Discussions · 2k Stars · 91 Forks



Jetpack Navigation 3



android-developers.googleblog.com/2025/05/announcing-jetpack-navigation-3-for-compose.html

Pre-Compose Era 

Tooling in Compose Multiplatform

Decompose & Essenty

arkivanov.github.io/Decompose

```
import com.arkivanov.decompose.ComponentContext

class DefaultRootComponent(
    componentContext: ComponentContext,
) : RootComponent, ComponentContext by componentContext {

    init {
        lifecycle... // Access the Lifecycle
        stateKeeper... // Access the StateKeeper
        instanceKeeper... // Access the InstanceKeeper
        backHandler... // Access the BackHandler
    }
}
```

adrielcafe/voyager

voyager.adriel.cafe

Voyager 🚀

```
class PostListScreen : Screen {

    @Composable
    override fun Content() {
        // ...
    }

    @Composable
    private fun PostCard(post: Post) {
        val navigator = LocalNavigator.currentOrThrow

        Card(
            modifier = Modifier.clickable {
                navigator.push(PostDetailsScreen(post.id))
            }
        ) {
            // ...
        }
    }
}
```

appyx

bumble-tech.github.io/appyx

PreCompose

github.com/Tlaster/PreCompose

cashapp/**molecule**

Build a StateFlow stream using Jetpack Compose

25 Contributors | 24 Issues | 18 Discussions | 2k Stars | 91 Forks

slackhq/**circuit**

⚡ A Compose-driven architecture for Kotlin and Android applications.

33 Contributors | 14 Issues | 86 Discussions | 2k Stars | 91 Forks

Circuit

State

```
@Parcelize
data object HomeScreen : Screen {
  data class State(
    val title: String,
  ): CircuitUiState
}
```

Circuit

Presenter

```
class HomePresenter : Presenter<HomeScreen.State> {
  @Composable
  override fun present(): HomeScreen.State {
    return HomeScreen.State("Hello World")
  }
}
```

Circuit

UI

```
@Composable
fun HomeScreen(
  state: HomeScreen.State,
  modifier: Modifier = Modifier,
) {
  Text(
    text = state.title,
    modifier = modifier,
  )
}
```

Circuit

```
val circuit = Circuit.Builder()
  .addPresenter<HomeScreen, HomeScreen.State>(HomePresenter())
  .addUi<LauncherScreen, LauncherScreen.State> { _, _ -> HomeScreen(state, modifier) }
  .build()

CircuitCompositionLocals(circuit) {
    val backStack = rememberSaveableBackStack(HomeScreen)

    NavigableCircuitContent(
        navigator = rememberCircuitNavigator(backStack),
        backStack = backStack,
    )
}
```

Circuit

Navigation

```
@Parcelize
data object HomeScreen : Screen {
  data class State(
    val title: String,
    val eventSink: (Event) -> Unit
  ): CircuitUiState

  sealed interface Event {
    data class DetailClicked(
      val id: String,
    ): Event
}
```

Circuit

Navigation

```
class HomePresenter(private val navigator: Navigator) : Presenter<HomeScreen.State> {

@Composable
  override fun present(): HomeScreen.State {
    return HomeScreen.State("Hello World") { event ->
      when (event) {
        is HomeScreen.Event.DetailClicked -> navigator.goTo(DetailScreen(event.id))
      }
    }
  }
}
```

youtube.com/watch?v=ZIr_uuN8FEw

But Why?


iOS
mac
OS

Prototyping 🚀


My CHR App
Component adapted from sinasamaki.com

no restart.


My CHR App
Component adapted from sinasamaki.com

Recomposition 🔄

Remember 

Remember 🧠

```
var path by remember { mutableStateOf("https://.../") }
val file = remember(path) {
    downloadManager.downloadFile(path)
}
```

Remember 🧠

```
var path by remember { mutableStateOf("https://.../") }
val file = rememberSaveable(path) {
    // Must be Parcelable on Android!
    downloadManager.downloadFile(path)
}
```

Circuit

`rememberRetained()`

rememberRetainedCoroutineScope()

Retaining Beyond ViewModels

Consistent State Patterns

— Hoisting, unidirectional data flow
— Shared reactive state handling

Compose Multiplatform

Material Theming

```
MaterialTheme(
    colorScheme = /* ... */,
    typography = /* ... */,
    shapes = /* ... */,
) {
    // M3 app content
}
```

alexzhirkevich/**compose-cupertino**

Compose Multiplatform UI components for iOS (Cupertino Widgets)

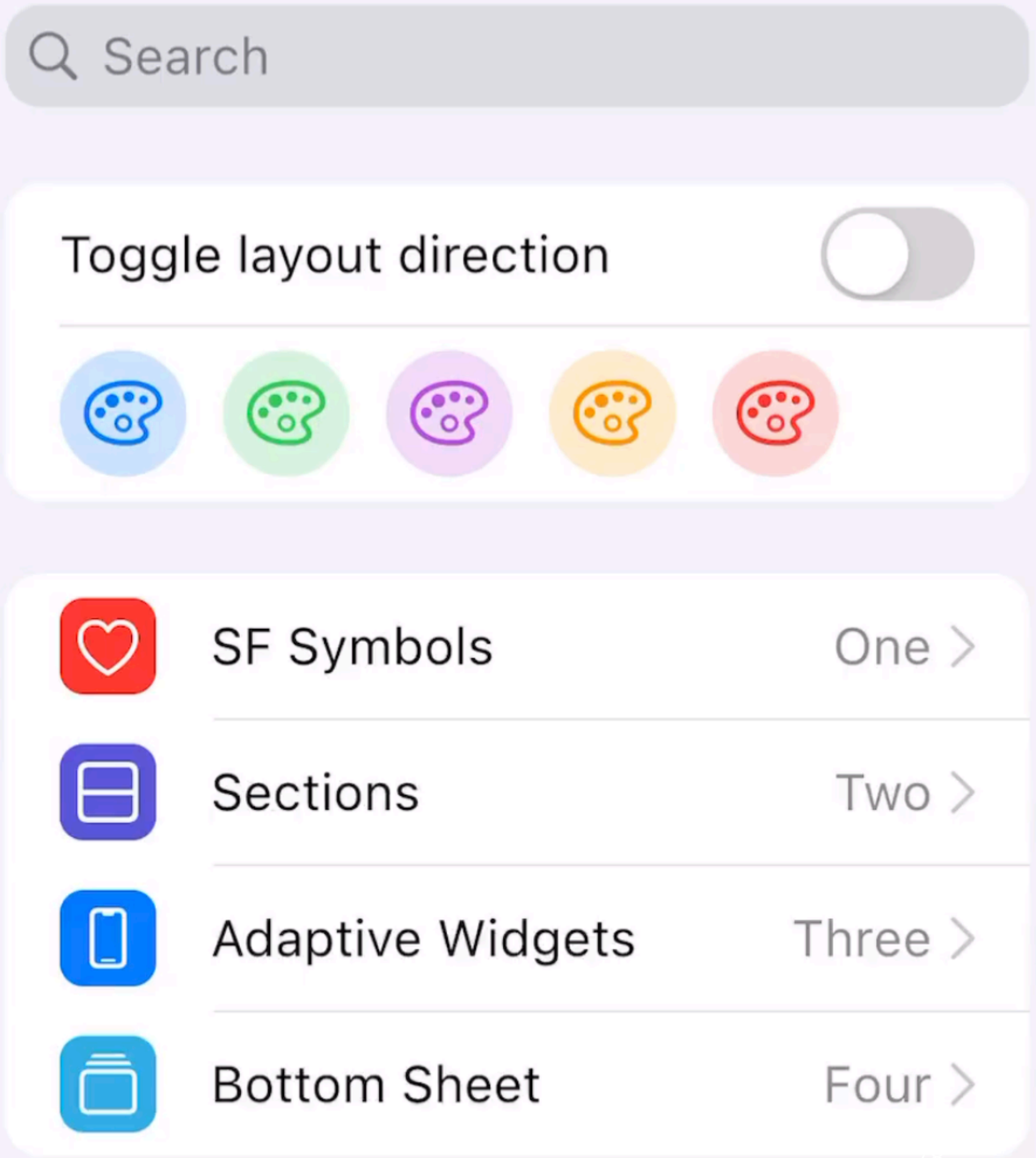
11 Contributors

0 Issues

1k Stars

52 Forks

```kotlin
@Composable
fun AppTheme(
    theme: Theme,
    content: @Composable () -> Unit
) {
    AdaptiveTheme(
        material = {
            // Tweak this for your Material design
            MaterialTheme(content = it)
        },
        cupertino = {
            // Tweak this for your iOS design
            CupertinoTheme(content = it)

        },
        target = theme,
        content = content
    )
}
```



IDE-First Experience

— JetBrains tools tightly integrated
— Live previews and navigation supported

Beyond the UI

Wrap-Up

✅ Compose is more than a UI toolkit
✅ Enables scalable, shared architecture
✅ Designed for Kotlin-first developers
✅ Multiplatform not just business logic

Thank You!

Ash Davies | ashdavies.dev

Android GDE Berlin