

Navigation in a Multiplatform World

Choosing the Right Framework for your App

Droidcon NYC - September '24 

Ash Davies - SumUp

Android & Kotlin GDE Berlin

ashdavies.dev



Project timeline



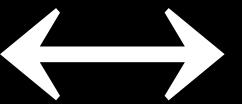


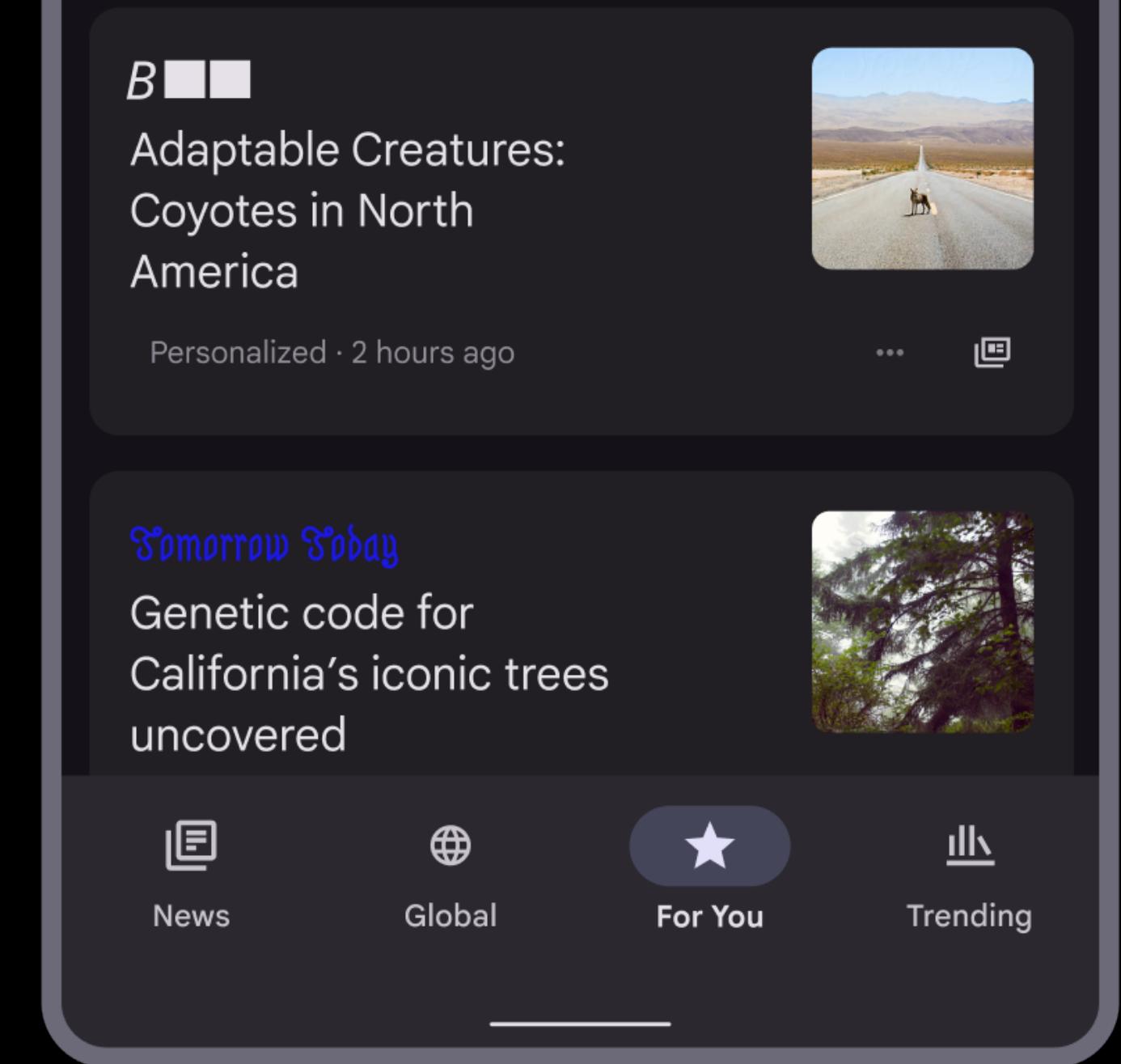
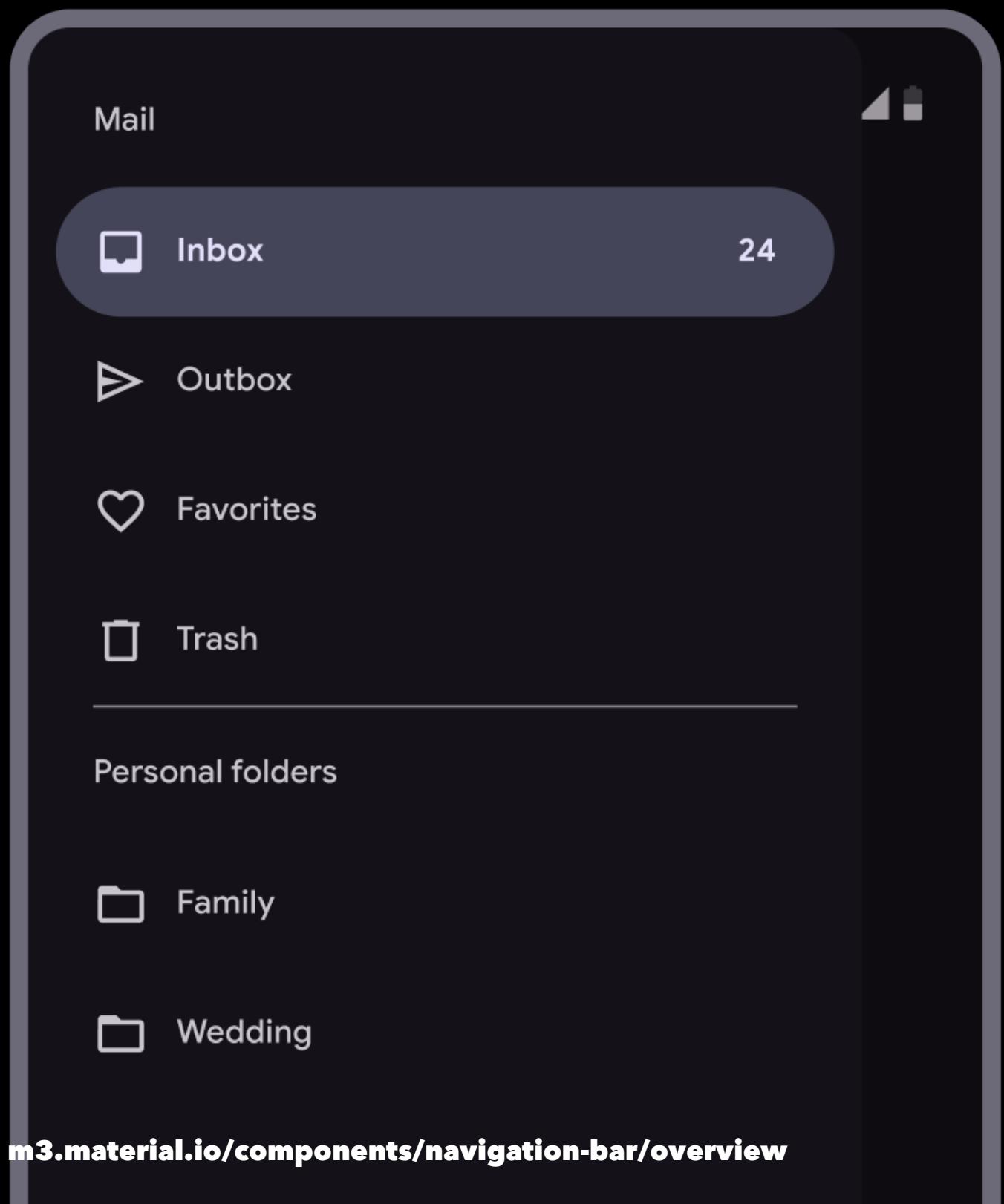
```
val history = ArrayDeque<Screen>()
```

```
history.addLast(ForwardScreen)
```

```
history.removeLast()
```





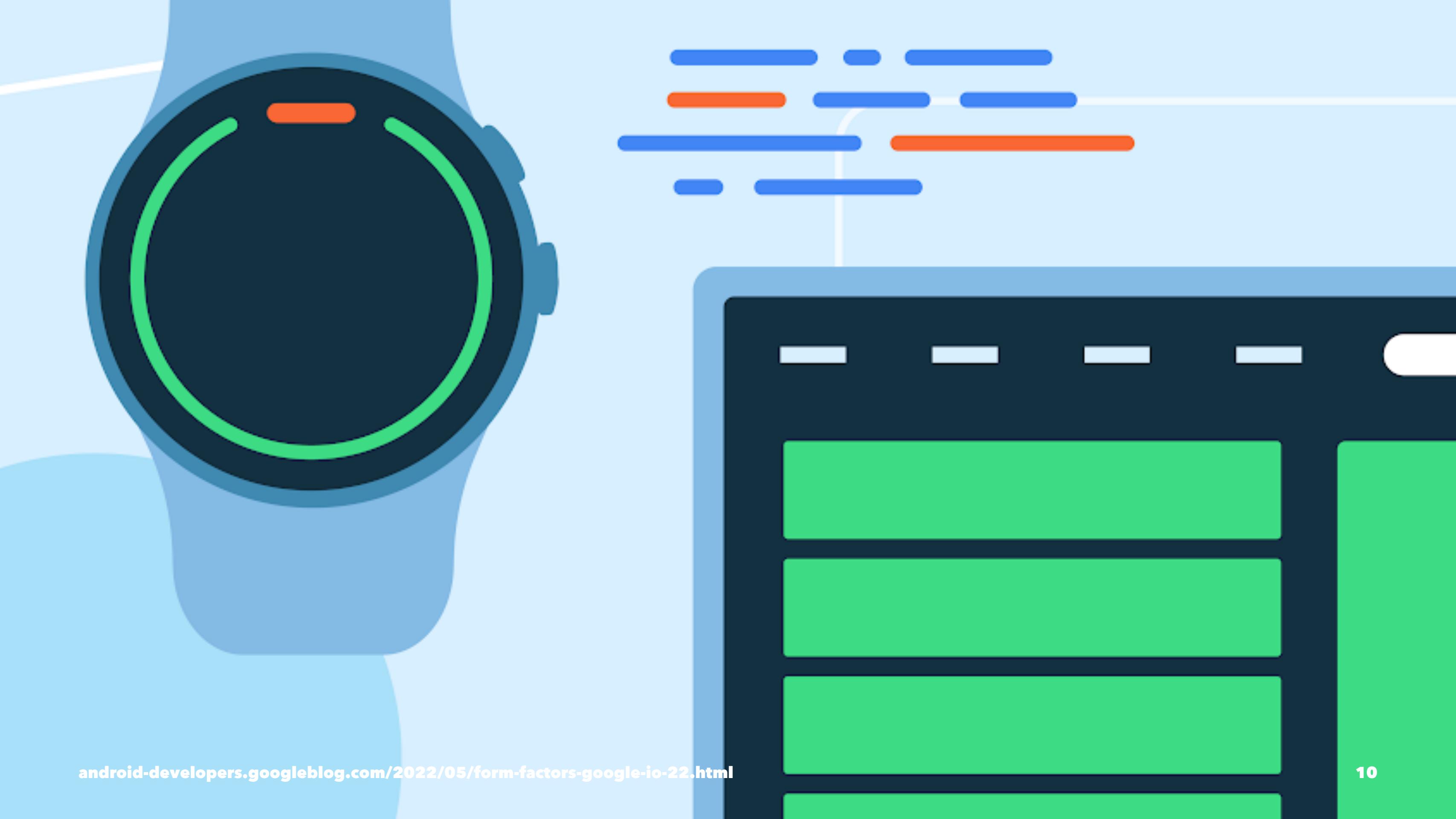




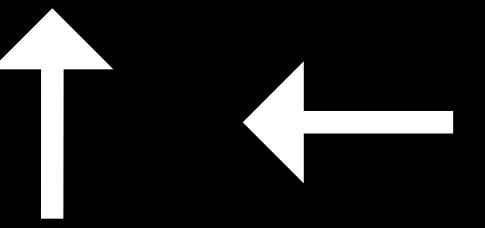
Hanan toiminta - Tap operation

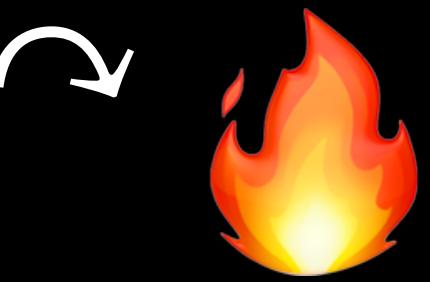


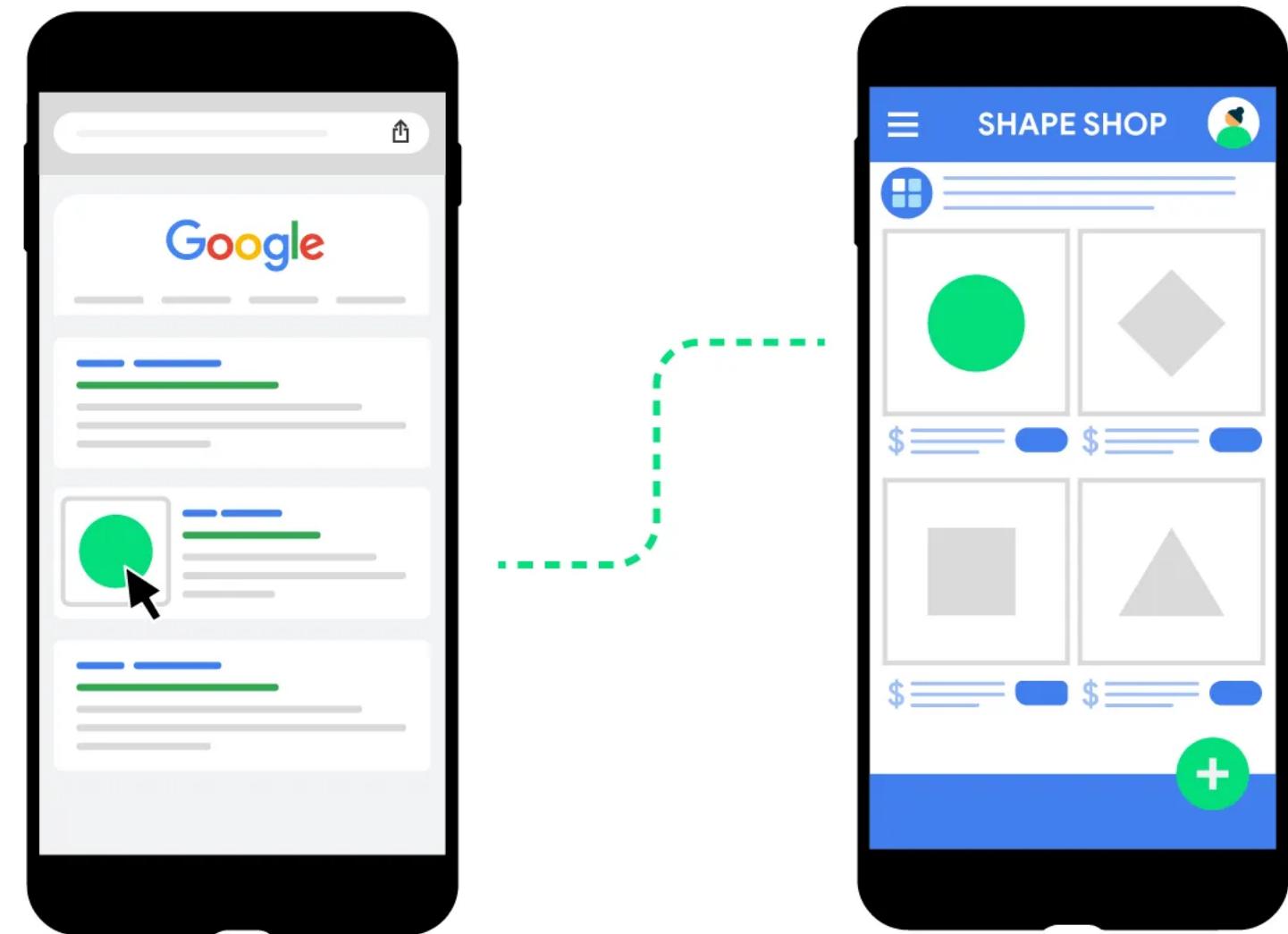














✖ Migrating

Move existing activity logic to fragment

- FragmentBindings -> ActivityBindings
- onCreate() -> onCreateView()
- onViewCreated()
- getViewLifecycleOwner()

@ashdavies

BERLIN

ashdavies.dev/talks/navigation-and-the-single-activity-berlin

***"Once we have gotten in to this entry-point to your UI,
we really don't care how you organise the flow inside."***

– Dianne Hackborn, Android Framework team, 2016

Jetpack Navigation



Fragments

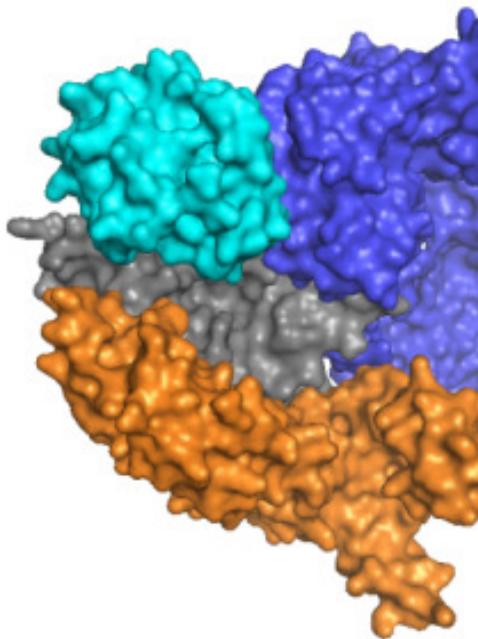
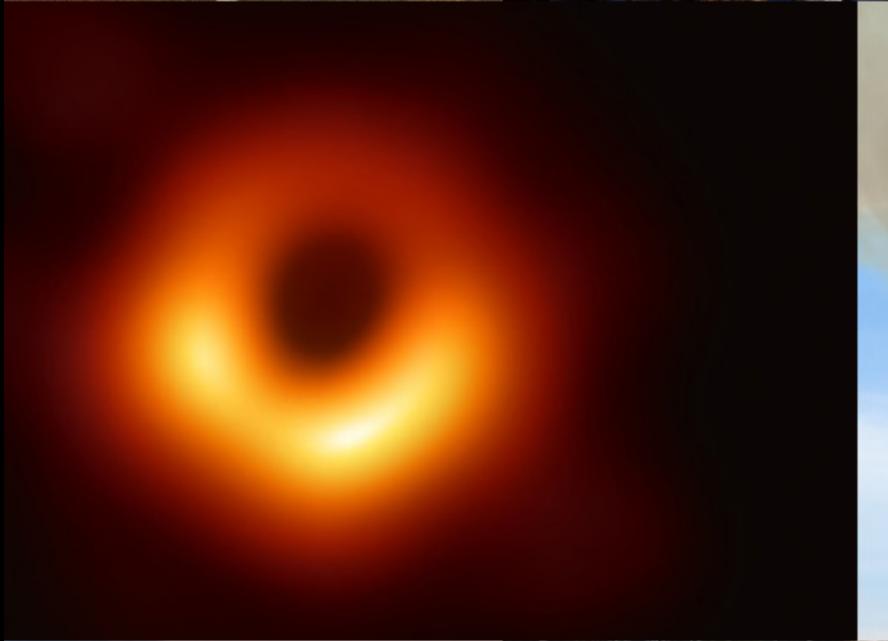
flow_step_one_dest

Step One

NAVIGATE NEXT STEP

Fragment Destinations

2019

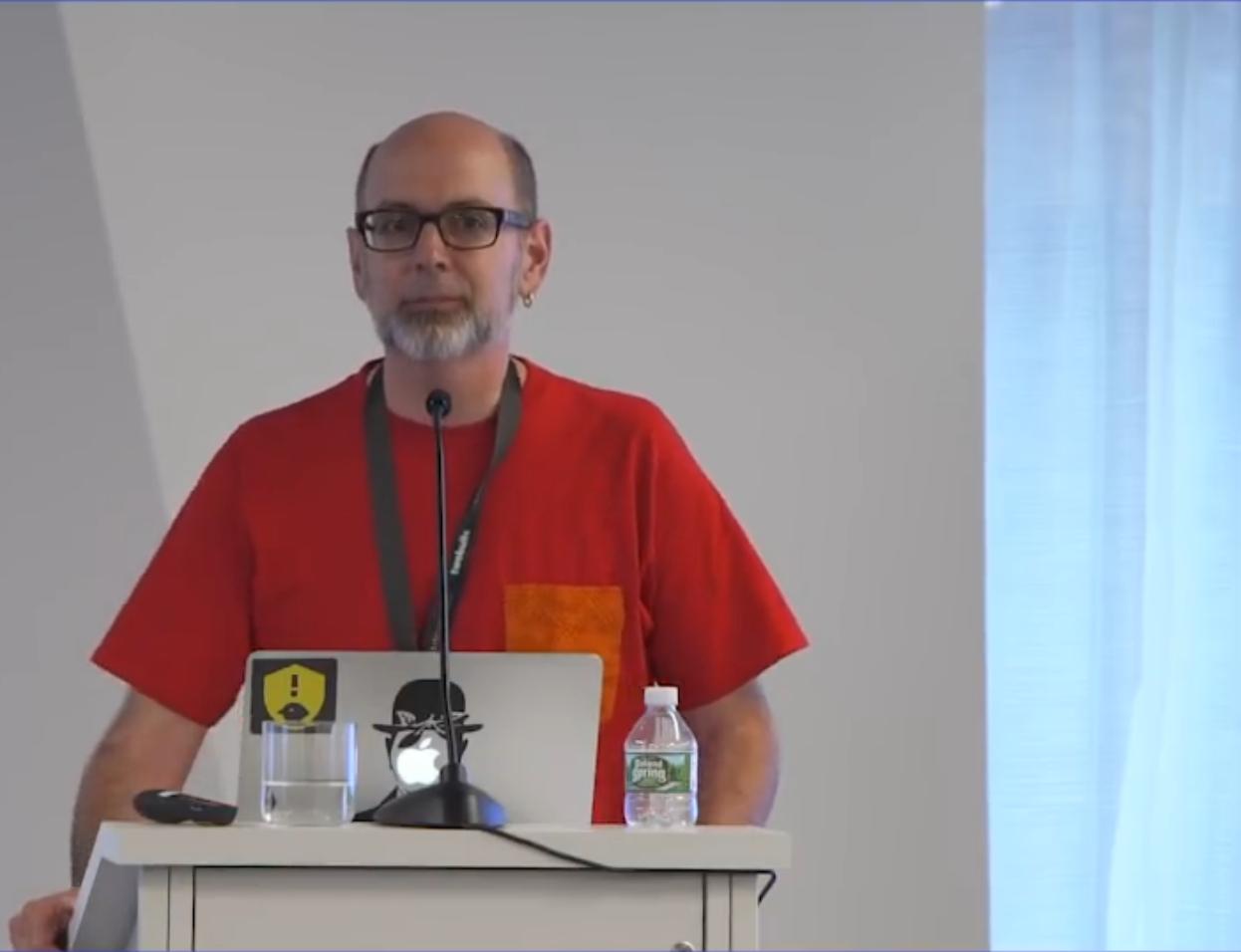


mortar & flow

github.com/square/mortar

.droidconNYC

September 25-26 2017



reacting to code sprawl

Reactive Workflows

Ray Ryan



square/workflow

square.github.io/workflow

Why should I use this?

You work at Square ^_(ツ)_/^-

uber/ribs

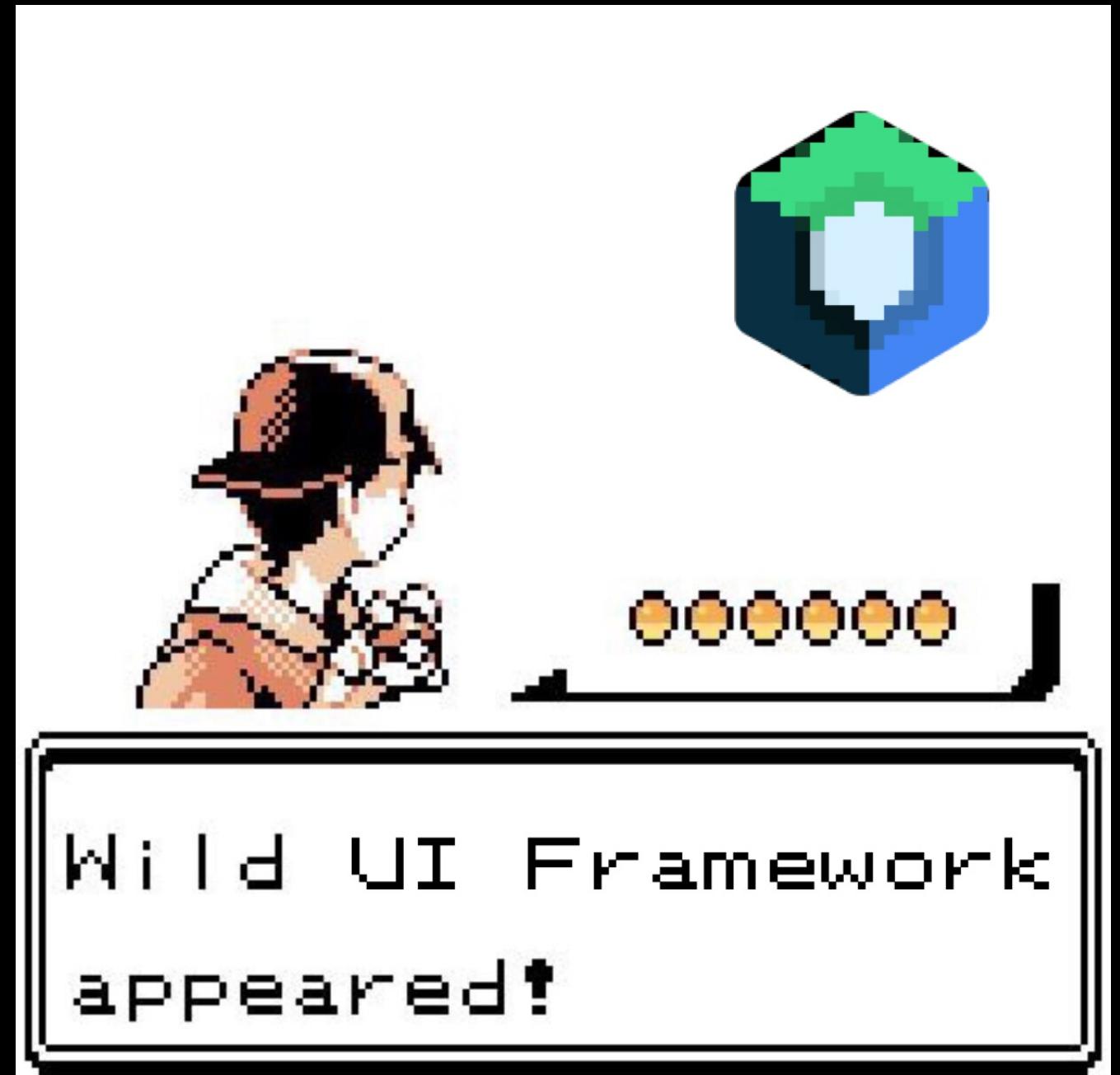
github.com/uber/RIBs



Moving On...

Compose UI

[github.com/androidx/
androidx/tree/androidx-
main/compose/ui](https://github.com/androidx/androidx/tree/androidx-main/compose/ui)



Compose UI

- Declarative UI Framework
- Open Source Kotlin

Obligatory Notice

Compose != Compose UI

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

Jetpack Navigation Compose

v2.4.0 (2021)

- Build a navigation graph with a @Composable Kotlin DSL
- Compose viewModel() scoped to navigation destination
- Destination level scope for rememberSaveable()
- Automatic back handling support

Jetpack Navigation Compose < v2.8.0

```
private const val HOME_ROUTE = "home"

NavHost(
    navController = navController,
    startDestination = HOME_ROUTE,
) {
    composable(route = HOME_ROUTE) {
        HomeScreen(
            onBackClick = navController::popBackStack,
            /* ... */
        )
    }
}
```

Jetpack Navigation Compose < v2.8.0

```
private const val DETAIL_ID_KEY = "detailId"
private const val DETAIL_ROUTE = "detail"

NavHost(
    navController = navController,
    startDestination = DETAIL_ROUTE,
) {
    composable(
        route = DETAIL_ROUTE,
        arguments = listOf(
            navArgument(DETAIL_ID_KEY) {
                type = NavType.StringType
                defaultValue = null
                nullable = true
            }
        )
    ) {
        DetailScreen(/* ... */)
    }
}
```

Jetpack Navigation Compose < v2.8.0

```
private const val DETAIL_ID_KEY = "detailId"

fun NavController.navigateToDelete(detailId: String) {
    navigate("detail?${DETAIL_ID_KEY}=$detailId")
}

savedStateHandle.getStateFlow(DETAIL_ID_KEY, null)
```

Jetpack Navigation Compose v2.8.0 (04.09.2024)

```
@Serializable  
data class DetailRoute(val id: String)  
  
NavHost(  
    navController = navController,  
    startDestination = "detail",  
) {  
    composable<DetailRoute> {  
        DetailScreen(/* ... */)  
    }  
}  
  
val route = savedStateHandle.toRoute<DetailRoute>()
```



Navigation in a Multiplatform World

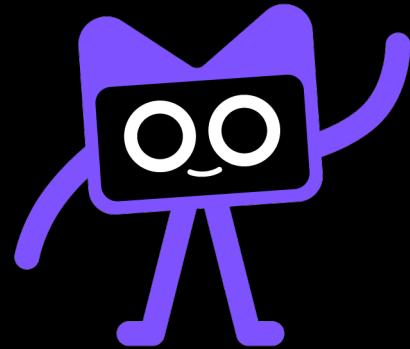
Choosing the Right Framework for your App

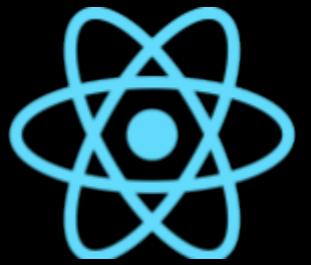
Android Only Basic Navigation

by Some Dude

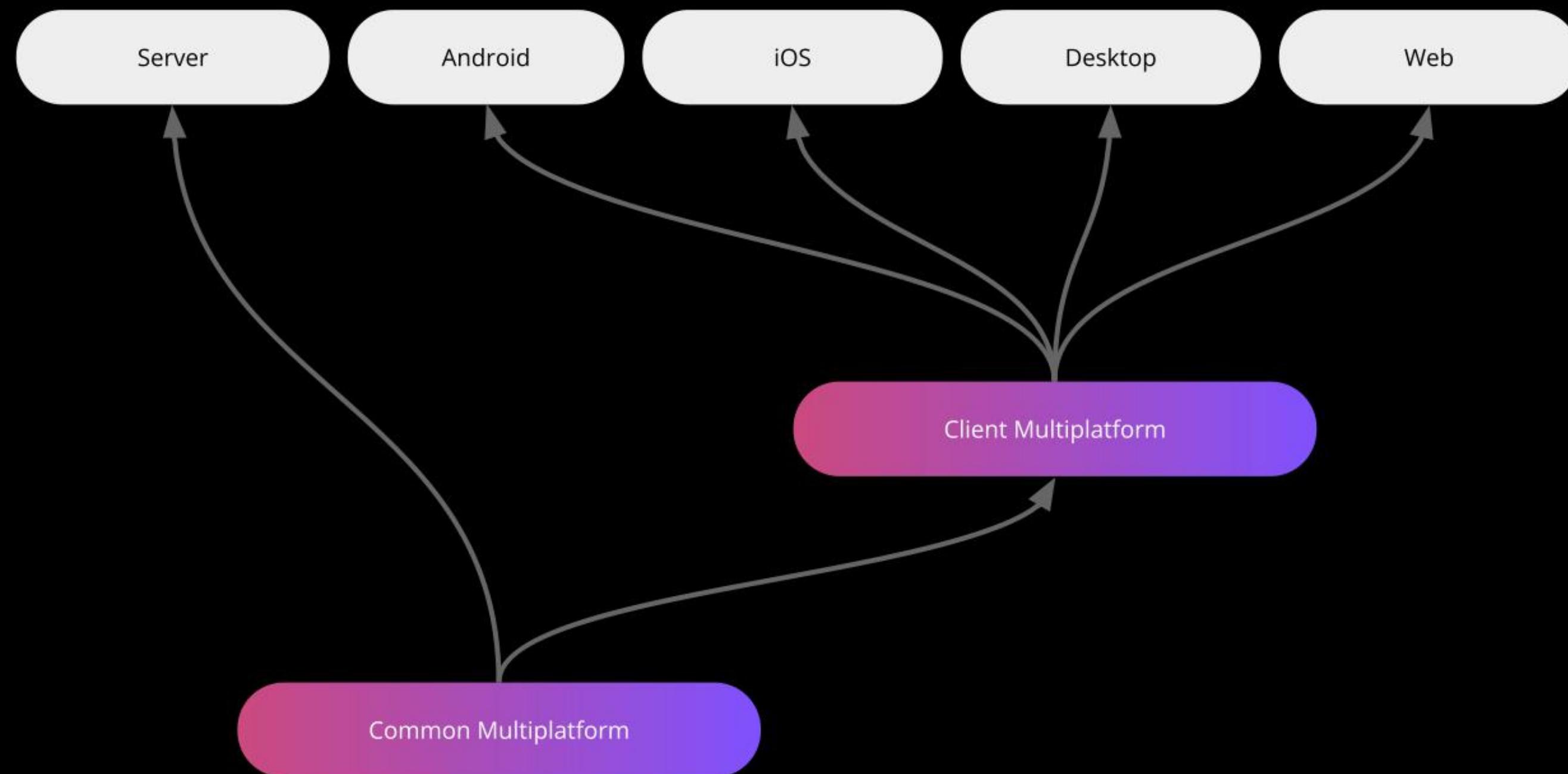
Kotlin Multiplatform

Stable (1.9.20)

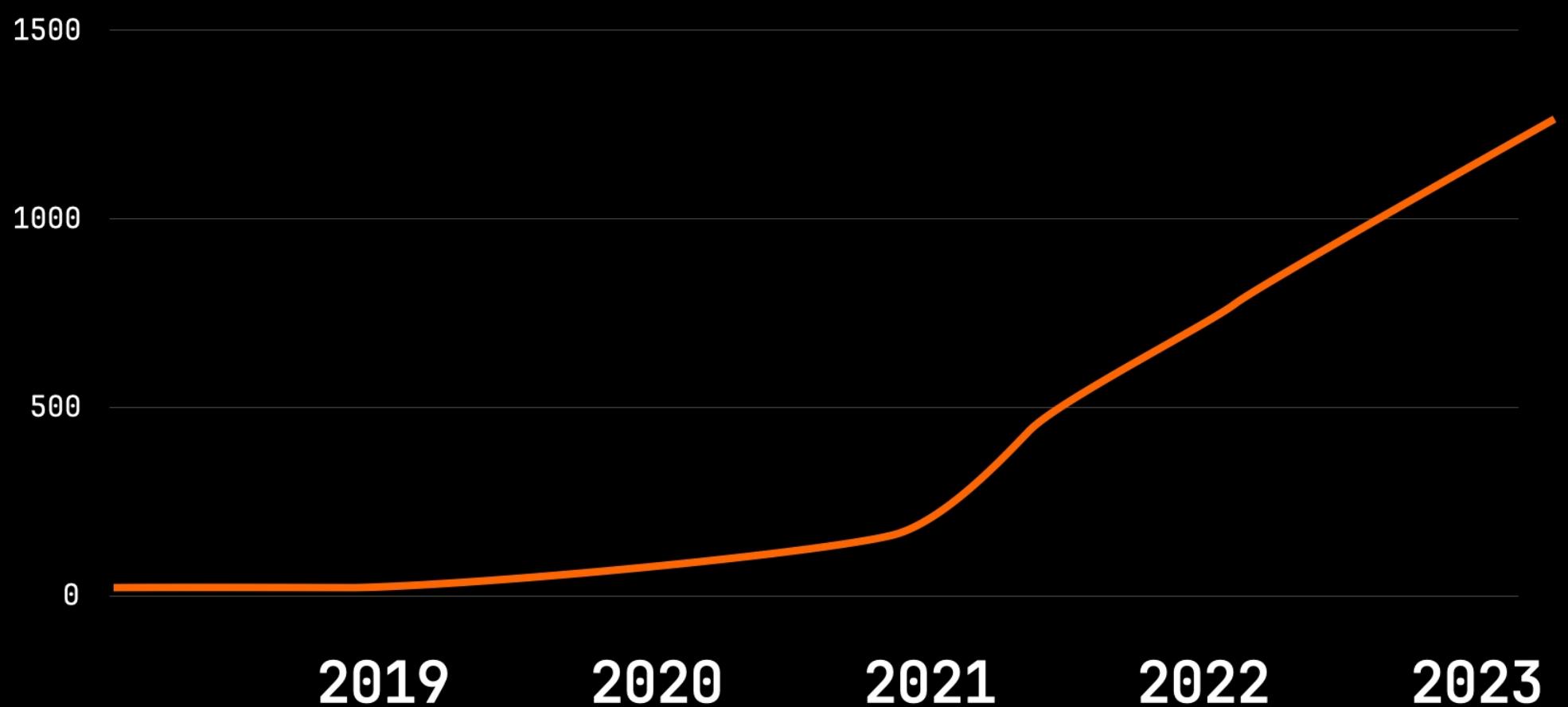








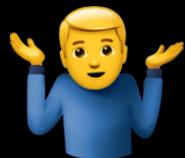
Multiplatform Libraries by Year





Maven Group ID	Latest Update	Stable Release	Alpha Release
annotation	04.09.2024	1.8.2	1.9.0-alpha03
collection	04.09.2024	1.4.3	1.5.0-alpha01
datastore	01.05.2024	1.1.1	-
lifecycle	04.09.2024	2.8.5	2.9.0-alpha02
paging	07.08.2024	3.3.2	-
room	21.08.2024	2.6.1	2.7.0-alpha07
sqlite	21.08.2024	2.4.0	2.5.0-alpha07

```
kotlin {  
    sourceSets.commonMain.dependencies {  
        implementation("androidx.lifecycle:lifecycle-viewmodel-ktx:2.8.5")  
    }  
}  
  
// Backed by ViewModelImpl  
public expect abstract class ViewModel
```



Multiplatform Architecture

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
    }
}
```

```
class RootComponent(context: ComponentContext) : Root, ComponentContext {
    private val navigation = StackNavigation<Config>()
    override val childStack = childStack(/* ... */)

    fun createChild(config: Config, context: ComponentContext): Child = when (config) {
        is Config.List -> Child.List(itemList(context))
        is Config.Details -> /* ... */
    }

    private fun itemList(context: ComponentContext): ItemList =
        ItemListComponent(context) { navigation.push(Config.Details(itemId = it)) }
}

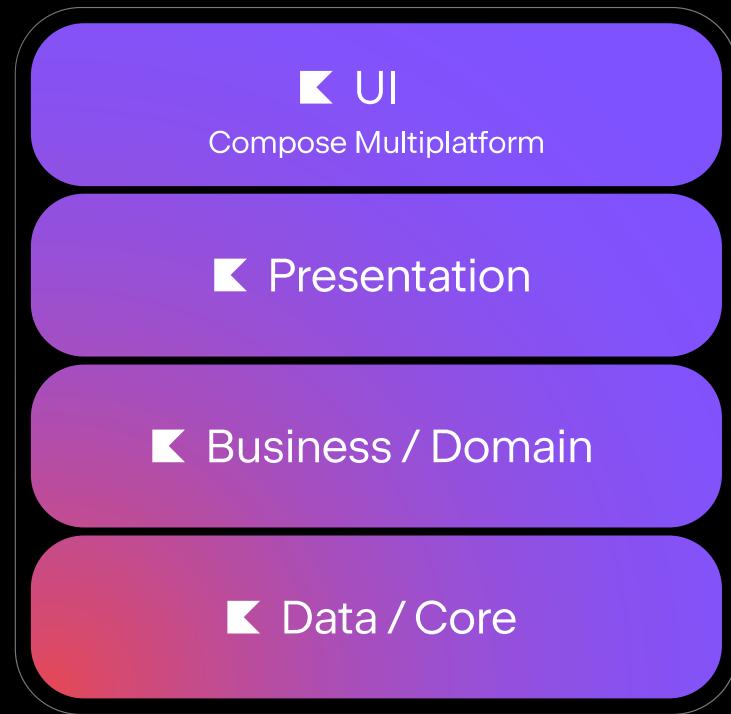
private sealed class Config : Parcelable {
    @Parcelize object List : Config()
    @Parcelize data class Details(val itemId: Long) : Config()
}
```

Decompose

- com.arkivanov.decompose:extensions-compose
- com.arkivanov.decompose:extensions-android
- com.arkivanov.essenty:state-keeper

Compose Multiplatform

v1.0 | 2021



Platform	Stability level
Android	Stable
iOS	Stable
Desktop (JVM)	Stable
Server-side (JVM)	Stable
Web based on Kotlin/Wasm	Alpha
Web based on Kotlin/JS	Stable
watchOS	Best effort
tvOS	Best effort

Compose Multiplatform

1.6.11

1.6.10

1.6.2

...

Jetpack Compose

1.6.7

1.6.7

1.6.4

The screenshot shows a GitHub repository page for `JetBrains/compose-multiplatform-core`. The repository is public and was forked from `androidx/androidx`. It has 659 branches and 663 tags. The `jb-main` branch is selected. A message indicates it is 3993 commits ahead of and 13404 commits behind `androidx/androidx:androidx-main`. The repository's purpose is described as a development environment for Android Jetpack extension libraries under the `androidx` namespace, synchronized with the primary development branch on AOSP. Key contributors include ASalavei, who made a commit to fix keyboard closing while scrolling. Other recent commits include disabling iOS PR checks, fixing code style imports, and running tests via IDEA configuration. The repository has 427 stars, 17 watchers, and 72 forks.

GitHub - JetBrains/compose-
github.com/JetBrains/compose-multiplatform-core

Product Solutions Resources Open Source Enterprise Pricing

Notifications Fork 72 Star 427

Code Pull requests 34 Actions Projects Security Insights

jb-main 659 Branches 663 Tags Go to file Code

This branch is 3993 commits ahead of, 13404 commits behind `androidx/androidx:androidx-main`.

ASalavei Fix keyboard closing while scrollin... 8619c0a · 2 days ago 182,738 Commits

.github Disable iOS PR checks with GitHub Acti... 2 months ago

.idea CodeStyle. Use single name import (#6... last year

.run Fix running tests via IDEA configuration ... 3 months ago

activity Fix wrongly committed files because of t... 8 months ago

annotation Snap annotation-1.8.0-alpha02 6 months ago

appactions Fix wrongly committed files because of t... 8 months ago

appcompat Fix wrongly committed files because of t... 8 months ago

About

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

[android.googlesource.com/platform/fr...](#)

Readme Apache-2.0 license Activity Custom properties

427 stars 17 watching 72 forks Report repository

```
kotlin {  
    sourceSets.commonMain.dependencies {  
        implementation("org.jetbrains.androidx.navigation:navigation-compose:2.8.0-alpha10")  
    }  
}  
  
@Serializable  
data object HomeRoute  
  
NavHost(navController, HomeRoute) {  
    composable<HomeRoute> {  
        HomeScreen()  
    }  
}  
  
val route = savedStateHandle.toRoute<HomeRoute>()
```

The screenshot shows a web browser window with the following details:

- Title Bar:** Navigation and routing | Kotlin
- Address Bar:** jetbrains.com/help/kotlin-multiplatform-dev/compose-navigation-routing.html#setup
- Page Header:** JET BRAINS Kotlin Multiplatform Development
- Left Sidebar (Navigation):**
 - Get started
 - Kotlin Multiplatform overview
 - What's new in Kotlin Multiplatform
 - Set up an environment
 - Create an app with shared logic and native UI
 - Create an app with shared logic and UI
 - Make your app multiplatform
 - Develop with Kotlin Multiplatform
 - Test your multiplatform app
 - Publish your application
 - Samples
 - Compose Multiplatform UI framework
 - Why Compose Multiplatform ↗
 - Multiplatform resources
 - Lifecycle
 - Common ViewModel
 - Navigation and routing
 - Drag-and-drop operations
 - Testing Compose Multiplatform UI
 - iOS-specific features
 - Android-specific components
 - Desktop-specific components
 - Compose Multiplatform for web ↗
 - Compose compiler
 - Compatibility and versions
 - Releases ↗
- Page Content:**
 - Section Header:** Navigation and routing
 - Text:** Compose Multiplatform UI framework / Navigation and routing
 - Text:** Last modified: 28 August 2024
 - Warning Box:** **⚠** The navigation library is currently Experimental. You're welcome to try it in your Compose Multiplatform projects. We would appreciate your feedback in YouTrack ↗.
 - Text:** Navigation is a key part of UI applications that allows users to move between different application screens. Compose Multiplatform adopts the Jetpack Compose approach to navigation ↗.
 - Section Header:** Setup
 - Text:** To use the navigation library, add the following dependency to your commonMain source set:
 - Code Block:**

```
kotlin {  
    // ...  
    sourceSets {  
        // ...  
        commonMain.dependencies {  
            // ...  
            implementation("org.jetbrains.androidx.navigation:navigation-  
        }  
        // ...  
    }  
}
```
- Right Sidebar (Navigation):**
 - Navigation and routing
 - Setup
 - Sample project
 - Limitations
 - Third-party alternatives

Compose Multiplatform Migration

- Change artifact coordinates
- Do nothing
- Profit

*The early bird gets the
worm ... but the second
mouse gets the cheese*

Reactive Architecture

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

Architecture

Callbacks

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

Architecture

Observables

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

Architecture

Coroutines

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

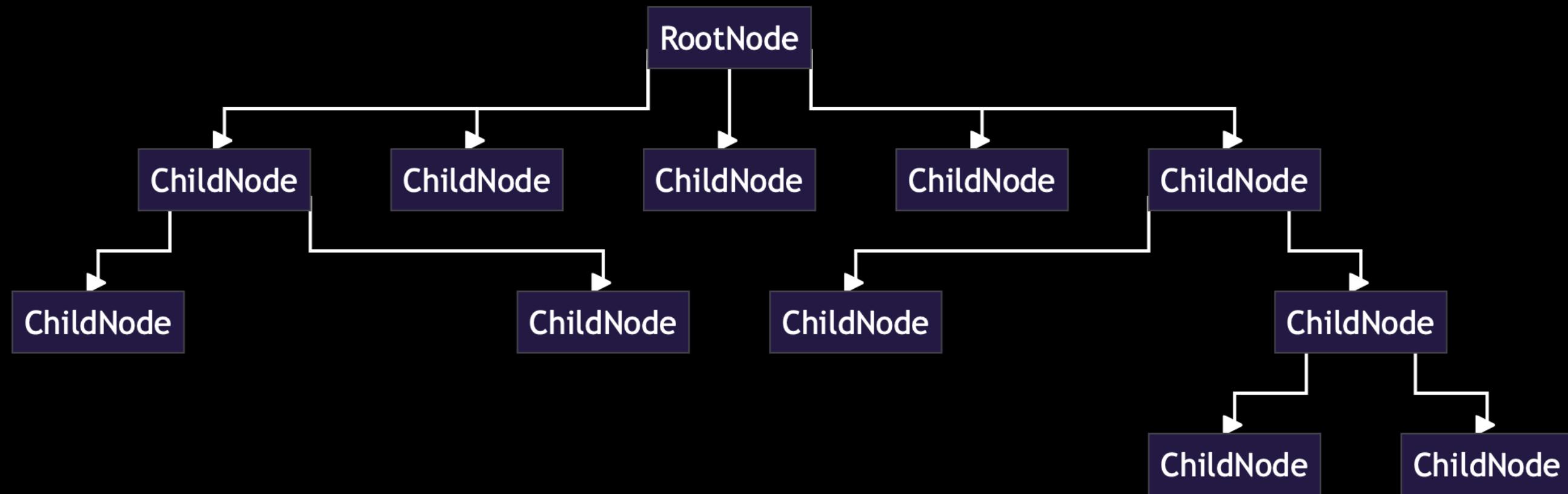
Architecture

Coroutines (Again)

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

Architecture

Compose



Architecture

Compose

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

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

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

cashapp/molecule

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
    }
}
```

Demystifying Molecule

Droidcon NYC 2022

```
@SuppressLint("DEPRECATION")
class CallbackLoginPresenter(
    private val service: SessionService,
    private val goTo: (Screen) -> Unit,
    var onModel: (LoginUiModel) -> Unit = {},
    var task: AsyncTask<Submit, Void, LoginResult>? = null
) {
    ...
    fun stop() {
        task?.cancel(true)
    }
    fun onEvent(event: LoginUiEvent) {
        when (event) {
            is Submit -> task = LoginAsyncTask()
            .also { it.execute(event) }
        }
    }
    ...
}
```

Role of Architecture

Pre-Compose Era

slackhq/circuit

github.com/slackhq/circuit

Circuit

- Supports most supported KMP platforms
- Compose first architecture
- Presenter & UI separation
- Unidirectional Data Flow

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))  
            }  
        }  
    }  
}
```



KotlinConf '23

MODERN COMPOSE ARCHITECTURE WITH CIRCUIT

Zac Sweers

Kieran Elliott



CircuitX

- com.slack.circuit:circuitx-android
- com.slack.circuit:circuitx-effects
- com.slack.circuit:circuitx-gesture-navigation
- com.slack.circuit:circuitx-overlays

rememberRetained()

Circuit

Examples

- **Chris Banes: Tivi**

github.com/chrisbanes/tivi

- **Zac Sweers: CatchUp**

github.com/ZacSweers/CatchUp

- **Zac Sweers: FieldSpottr**

github.com/zacsweers/fieldspottr

- **Ash Davies: Playground**

github.com/ashdavies/playground.ashdavies.dev

Full Disclosure

Bias

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))
            }
        ) {
            // ...
        }
    }
}
```

Voyager



```
interface ParcelableScreen : Screen, Parcelable

// Compile
@Parcelize
data class Post(/*...*/) : Parcelable

@Parcelize
data class ValidScreen(
    val post: Post
) : ParcelableScreen {
    // ...
}

// Not compile
data class Post(/*...*/)

@Parcelize
data class ValidScreen(
    val post: Post
) : ParcelableScreen {
    // ...
}
```

appyx

bumble-tech.github.io/appyx

PreCompose

github.com/Tlaster/PreCompose

Comparison

	androidx	circuit	decompose	voyager	workflow
Compose 1st	✗	✓	✗	✓	✗
Documented*	✗	✓	✓	✓	✗
Easy-To-Use**	✓	✓	✗	✓	✗
Awesome**	✗	✓	✗	✗	✗
Built by Square	✗	✗	✗	✗	✓

* Documentation exists, but is outdated or hard to find

** From my perspective

Thank You!

Ash Davies - SumUp

Android / Kotlin GDE Berlin

ashdavies.dev

Don't Forget to Vote! 🇺🇸 🐴