FROM REACT TO

JETPACK COMPOSE

STEPHEN WHITE

CADEC 2021.01.27 | CALLISTAENTERPRISE.SE

CALLISTA

AGENDA

- What, Why, When
- React Mindset
- Thinking in Compose
- Thinking in React
- Applying React to Compose
- Conclusions

WHAT

WHAT IS JETPACK COMPOSE

- Jetpack Compose is a modern toolkit for building native Android UI.
- Built on Kotlin
- Declarative programming model
- You declare the layout/ look and feel
- As State Changes your UI automatically updates
- Recomposition - Algorithm
- And then there's Android Studio

DOWNLOAD THE CANARY!

https://developer.android.com/jetpack/compose/setup

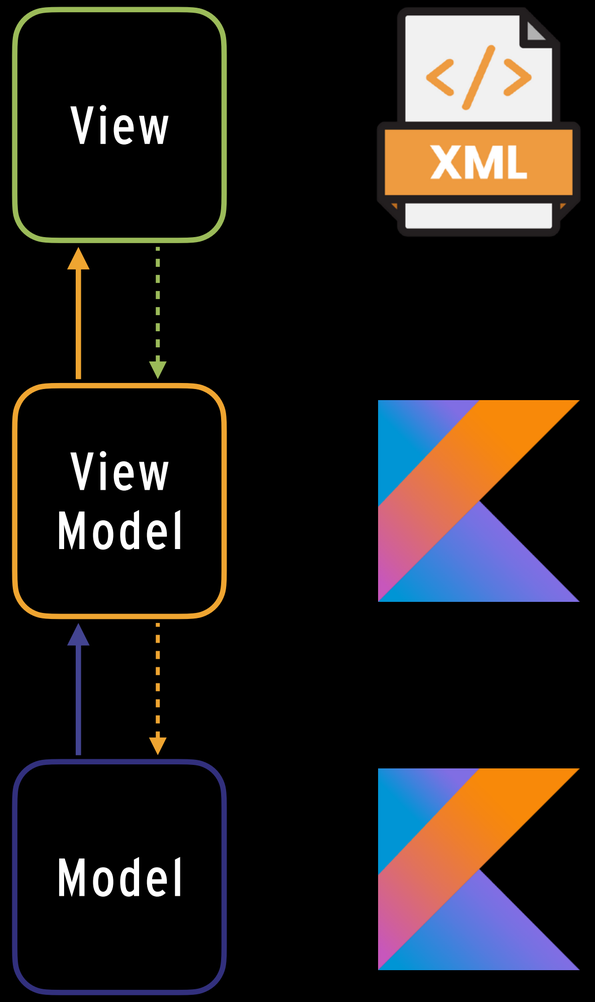
WHY

WHY JETPACK COMPOSE

- React!
- Challenge React Native
- Declarative UI
- Faster iterations
- Improved Testability
- Improved Code Reasonability
- Minimise complexity and cost of change
- Draw from a huge community of React developers

WHY JETPACK COMPOSE - MVVM

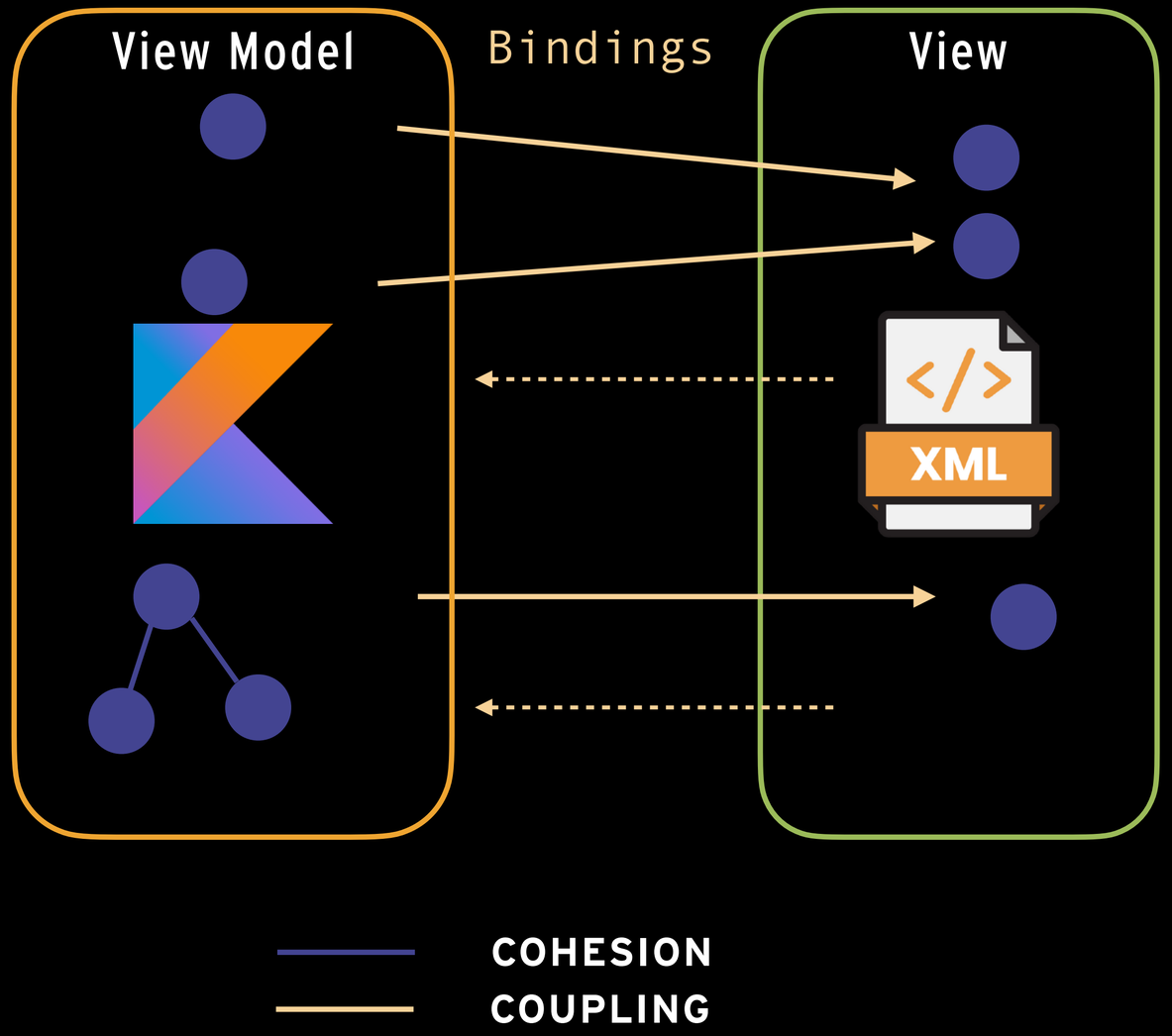
- - View - XML
  - UI of the application, observes data from the View Model
- View Model - Kotlin
  - Link between the View and the model.
- Model - Kotlin
  - Data of the application, can't talk directly to a view



TWO WAY DATA BINDINGS

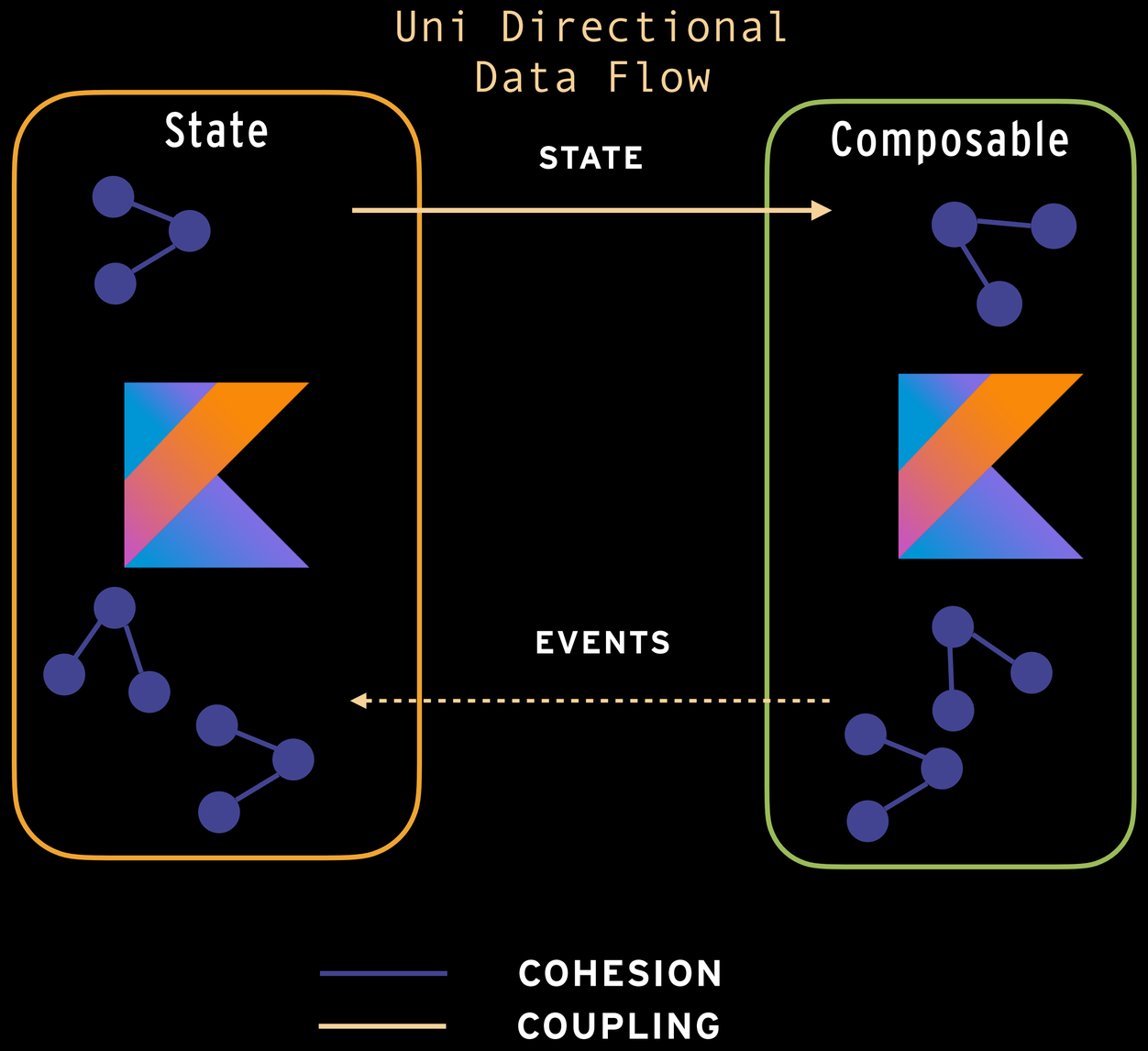
WHY - COUPLING / COHESION

- Coupling
- Cohesion
- Goal is for low *coupling* and high *cohesion*



WHY - LOW COUPLING, HIGH COHESION

- Increased Cohesion
- Logic in the Composable
- Theming in the Composable
- Leads to :
  - Code Clarity
  - Testability
  - Faster iterations
  - Minimise complexity and cost of change



SEPERATION WAS AN ILLUSION ...

WHEN

WHEN - 2018

- Jetpack launched at Googles 2018 I/0 Developer conference
- Jetpack Compose launched at Googles 2019 I/0 Developer conference
- Alphas appeared in 2020 now on 1.0.0-alpha09
  - Version 1.0.0-alpha09 - December 16, 2020
  - Version 1.0.0-alpha08 - December 2, 2020
  - Version 1.0.0-alpha07 - November 11, 2020
  - Version 1.0.0-alpha01 - August 26, 2020
  - Version 0.1.0-dev15 - July 22, 2020

https://developer.android.com/jetpack/androidx/releases/compose-animation#1.0.0-alpha09

WHEN - 2018 - LELAND RICHARDSON

> With high comply times in the existing native codebases you always need to write hundreds of lines of code before you can press “built”. React Native enables an entirely different style of development where you get really quick feedback and this is very powerful.
>
> LELAND RICHARDSON, AIRBNB

- React Native, Air BnB
- Creator of Enzyme
- Hugely popular and influential in the React Community
- Left Air BnB pretty much when they decided to ditch react native and started at Google
- Driving force behind JetPack compose
- Main link between Compose and React

`mindk – the-best-react-native-apps`

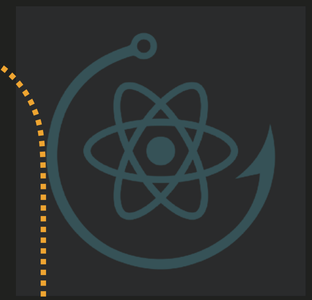
REACT MINDSET

REACT MINDSET

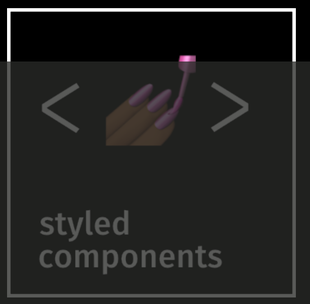
STATE

TE

```
const Counter: React.FC<ICounter> = ({ id }) => {
  const [count, setCount] = useState(0);
  useEffect(() => {
    if (count > 5) {
      setCount(0);
    }
  }, [count]);
  return (
    <Button
      onPress={() => setCount(count + 1)}
      testID={`counter-${id}`}
      styles={{ backgroundColor: colors[count] }}
    >
      Counter : {count}
    </Button>
  );
};
```



EFFECTS



STYLING

UI IS A VISUAL REPRESENTATION OF STATE

THINKING IN COMPOSE

UI IS A VISUAL REPRESENTATION OF STATE

COMPOSE MINDSET

- Declarative
- Preview
  - Interact
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition

```
@Composable
fun CounterButton(id: String, modifier: Modifier = Modifier) {
  val (count, setCount) = remember { mutableStateOf(0) }
  Row(
    modifier = modifier.padding(4.dp)

  ) {
    OutlinedButton(
      onClick = { setCount(count + 1) },
      border = BorderStroke(1.dp, MaterialTheme.colors.primary),
      shape = RoundedCornerShape(50),
      modifier = modifier.semantics { testTag = "Counter-$id" }
    ) {
      Text(text = "Count : $count")
    }
  }
}
```

COMPOSE MINDSET

- Declarative
- Preview
  - Interact
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition

```
@Composable
fun CounterButton(id: String, modifier: Modifier = Modifier) {
  val (count, setCount) = remember { mutableStateOf(0) }
  Row(
    modifier = modifier.padding(4.dp)

  ) {
    OutlinedButton(
      onClick = { setCount(count + 1) },
      border = BorderStroke(1.dp, MaterialTheme.colors.primary),
      shape = RoundedCornerShape(50),
      modifier = modifier.semantics { testTag = "Counter-$id" }
    ) {
      Text(text = "Count : $count")
    }
  }
}
```

PREVIEW

COMPOSE MINDSET

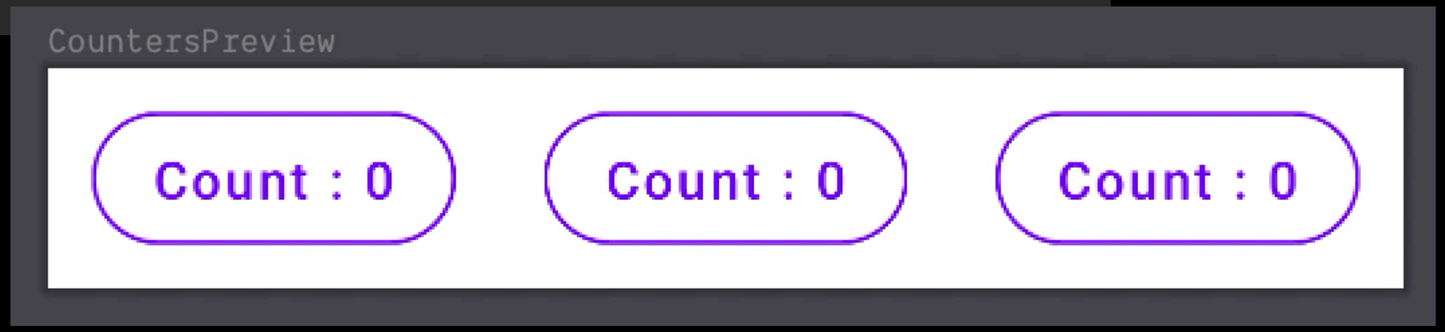
- Declarative
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition

```
@Composable
fun CounterButtons(modifier: Modifier = Modifier) {
  Row(modifier = modifier
    .background(
      color = MaterialTheme.colors.surface)) {
    CounterButton(id = "1")
    CounterButton(id = "2")
    CounterButton(id = "3")
  }
}

@Preview
@Composable
fun CounterButtonsPreview() {
  CounterButtons()
}
```

COMPOSE MINDSET

- Declarative
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition

```
@Composable
fun Counters(modifier: Modifier = Modifier) {
  val (count1, setCount1) = remember { mutableStateOf(0) }
  Row() {
    Counter(id = "1", count = count1, setCount = setCount1)
    Counter(id = "2", count = count1, setCount = setCount1)
    Counter(id = "3", count = count1, setCount = setCount1)
  }
}

@Composable
fun Counter(id: String, count: Int, setCount: (count: Int) -> Unit, modifier: Modifier = Modifier) {
  Row(
    modifier =
    modifier.padding(4.dp).background(color = MaterialTheme.colors.surface).padding(8.dp)

  ) {
    OutlinedButton(
      onClick = { setCount(count + 1) },
      border = BorderStroke(1.dp, MaterialTheme.colors.primary),
      shape = RoundedCornerShape(50), //50% percent,
      modifier = modifier.semantics { testTag = "Counter-$id" }
    ) {
      Text(text = "Count : $count")
    }
  }
}
```



COMPOSE MINDSET

- Declarative
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition


```
@Composable
fun CounterButtonScale(id: String, modifier: Modifier = Modifier) {
  val (count, setCount) = remember { mutableStateOf(0) }
  val (scale, setScale) = remember { mutableStateOf(1.0f) }
  val animatedScale = animate(scale, TweenSpec(300))
  onCommit(count, {
   if (count > 2) {
     setScale(1.0f)
     setCount(0)
   } else if (count > 0) {
     setScale(scale - 0.1f)
   }
  })
  Row(
    modifier = modifier.padding(4.dp)
  ) {
    OutlinedButton(
      onClick = { setCount(count + 1) },
      border = BorderStroke(1.dp,
        if (count < 5)
          colors[count]
        else
          MaterialTheme.colors.primary),
      shape = RoundedCornerShape(50),
      modifier = modifier.scale(animatedScale)
    ) {
      Text(text = "Count : $count")
    }
  }
}
```

Effect

Inline logic

COMPOSE MINDSET

- Declarative
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition

- Should we call the functions ourselves?
- Is everything redrawn?

- No!
- Runs in Parallel!

```
@Composable
fun Counters(modifier: Modifier = Modifier) {
  val (count1, setCount1) = remember { mutableStateOf(0) }
  Row() {
3   Counter(id = "1", count = count1, setCount = setCount1)
1   Counter(id = "2", count = count1, setCount = setCount1)
2   Counter(id = "3", count = count1, setCount = setCount1)
  }
}
```

COMPOSE MINDSET

- Declarative
- Composable Functions
- Data Down, Events Up
- Dynamic Content / Logic
- Recomposition
- Test

```
@Composable
fun CounterButton(id: String, modifier: Modifier = Modifier) {
  Row(
    modifier = modifier.padding(4.dp)
  ) {
    OutlinedButton(
          ...
      modifier = modifier.semantics { testTag = "Counter-$id" }
    )
  }
}
```

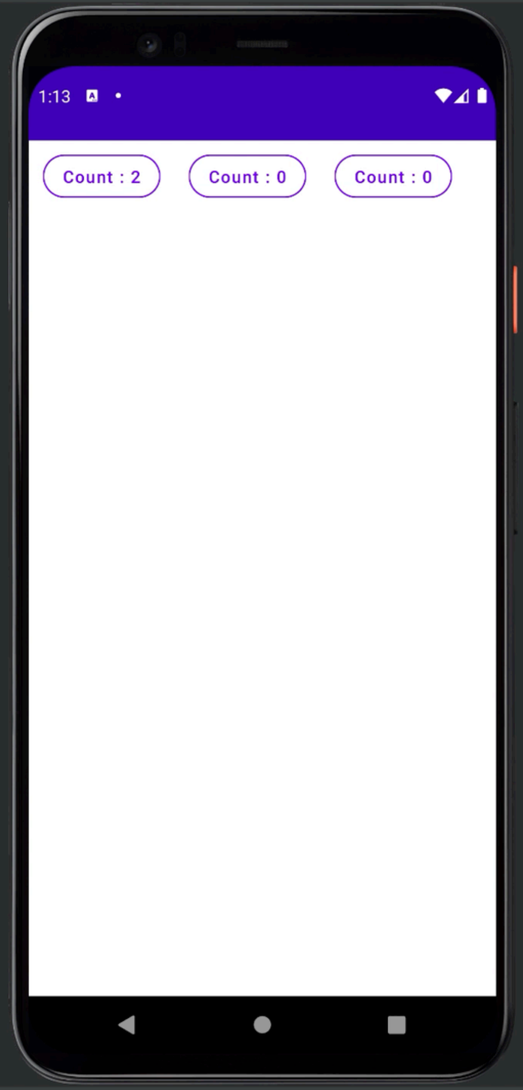
```
@RunWith(JUnit4::class)
class CounterKtTest {

  @get:Rule
  val composeTestRule = createAndroidComposeRule<CounterActivity>()

  @Test
  fun testCounter() {
    composeTestRule.setContent {
      Counters()
    }
    composeTestRule.onNodeWithTag("Counter-1").assertTextEquals("Count : 0")
    composeTestRule.onNodeWithTag("Counter-1").performClick()
    composeTestRule.onNodeWithTag("Counter-1").assertTextEquals("Count : 1")
    composeTestRule.onNodeWithTag("Counter-1").performClick()
    composeTestRule.onNodeWithTag("Counter-1").assertTextEquals("Count : 2")
  }
}
```

Counter.kt | CounterKtTest.kt | CounterActivity.kt | FlickrRow.kt | FlickrPhotoRow.kt | Theme.kt | Color.kt

Code | Split | Design

```
1  package com.sw.mobile.flickrbrowser
2
3  import ...
12
13 @RunWith(JUnit4::class)
14 class CounterKtTest {
15
16   @get:Rule
17   val composeTestRule = createAndroidComposeRule<CounterActivity>()
18
19   @Test
20   fun testCounter() {
21     composeTestRule.setContent {
22       Counters()
23     }
24     composeTestRule.onNodeWithTag( testTag: "Counter-1").assertTextEquals("Count : 0")
25     composeTestRule.onNodeWithTag( testTag: "Counter-1").performClick();
26     composeTestRule.onNodeWithTag( testTag: "Counter-1").assertTextEquals("Count : 1")
27     composeTestRule.onNodeWithTag( testTag: "Counter-1").performClick();
28     composeTestRule.onNodeWithTag( testTag: "Counter-1").assertTextEquals("Count : 2")
29   }
30 }
```

Emulator: Pixel 5



Run: CounterKtTest | Counters

Status | 0 passed | 1 tests

Filter tests:

Tests	Duration	Pixel_5
Test Results	6 s	0/1
CounterKtTest	6 s	0/1
testCounter	6 s	

Launch succeeded

Test Results

```
Install successfully finished in 873 ms.
Running tests

$ adb shell am instrument -w -m    -e debug false -e class 'com.sw.mobile.flickrbrowser.CounterKtTest' com.sw.m
Connected to process 1245[illegible]device 'emulator-5554'.
```

TV

THINKING IN REACT

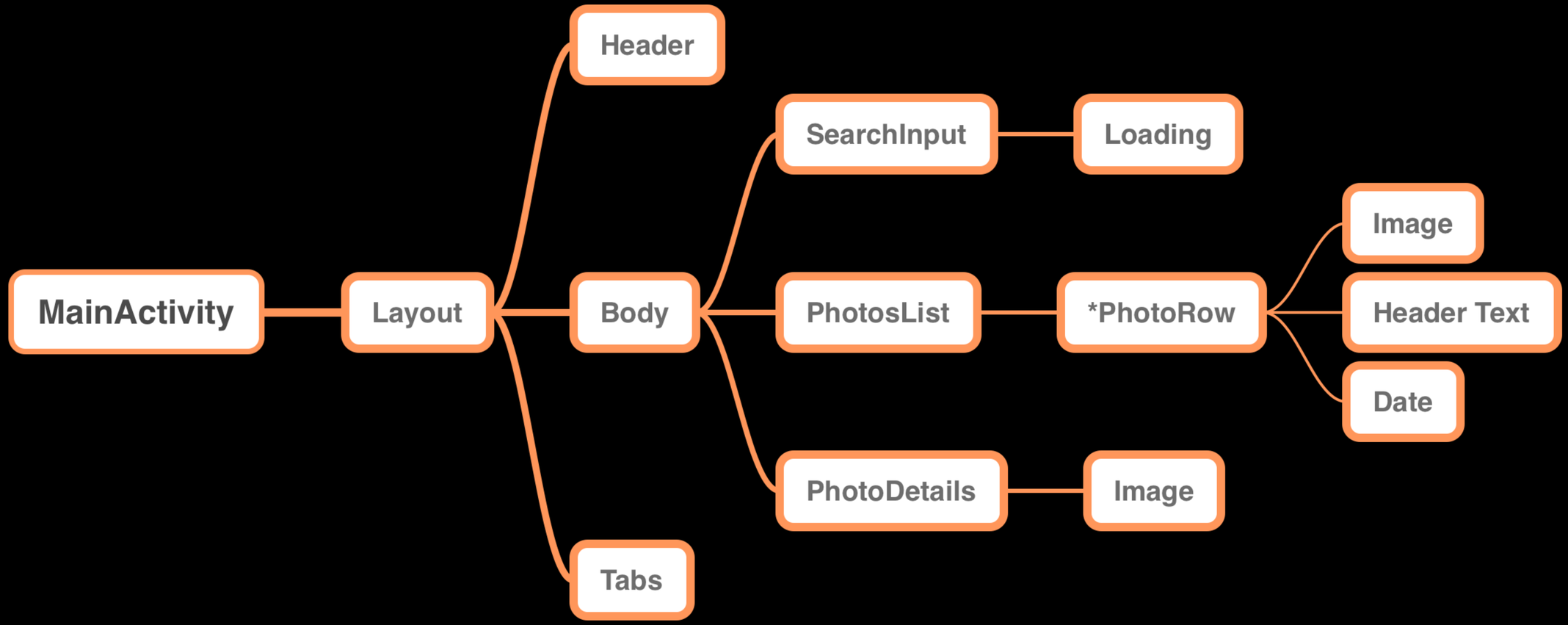
THINKING IN REACT

- Start with a mock, UI and Data
- Break UI in a component Hierarchy
- Build a static version in React
- Identify The minimal Representation Of UI State
- Identify where the state should live (Data down)
- An Inverse Data Flow, top level component passes callbacks to child components to mutate the state.

https://reactjs.org/docs/thinking-in-react.html

THINKING IN REACT

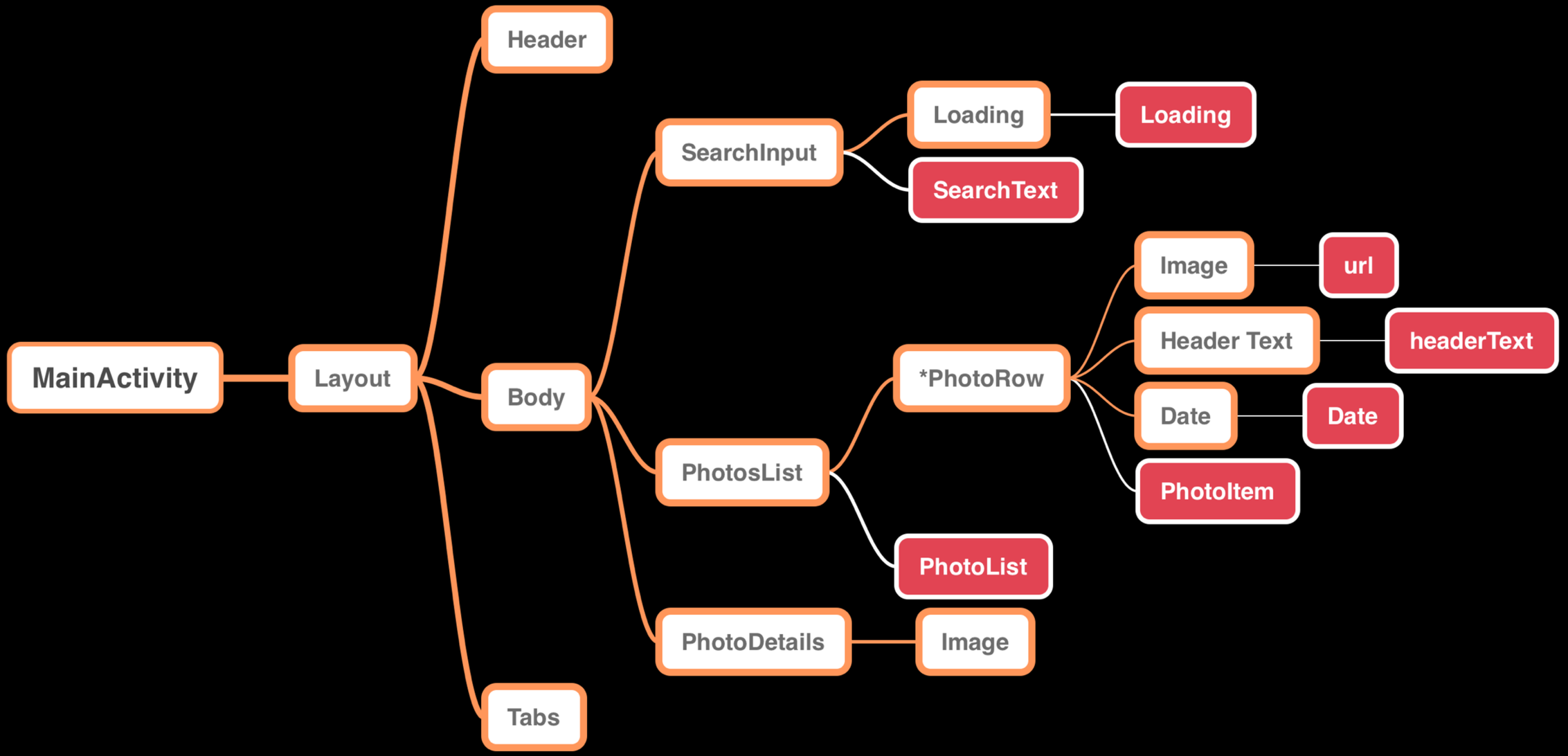
- Start with a mock, UI and Data
- Break UI in a component Hierarchy
- Build a static version in React



THINKING IN REACT

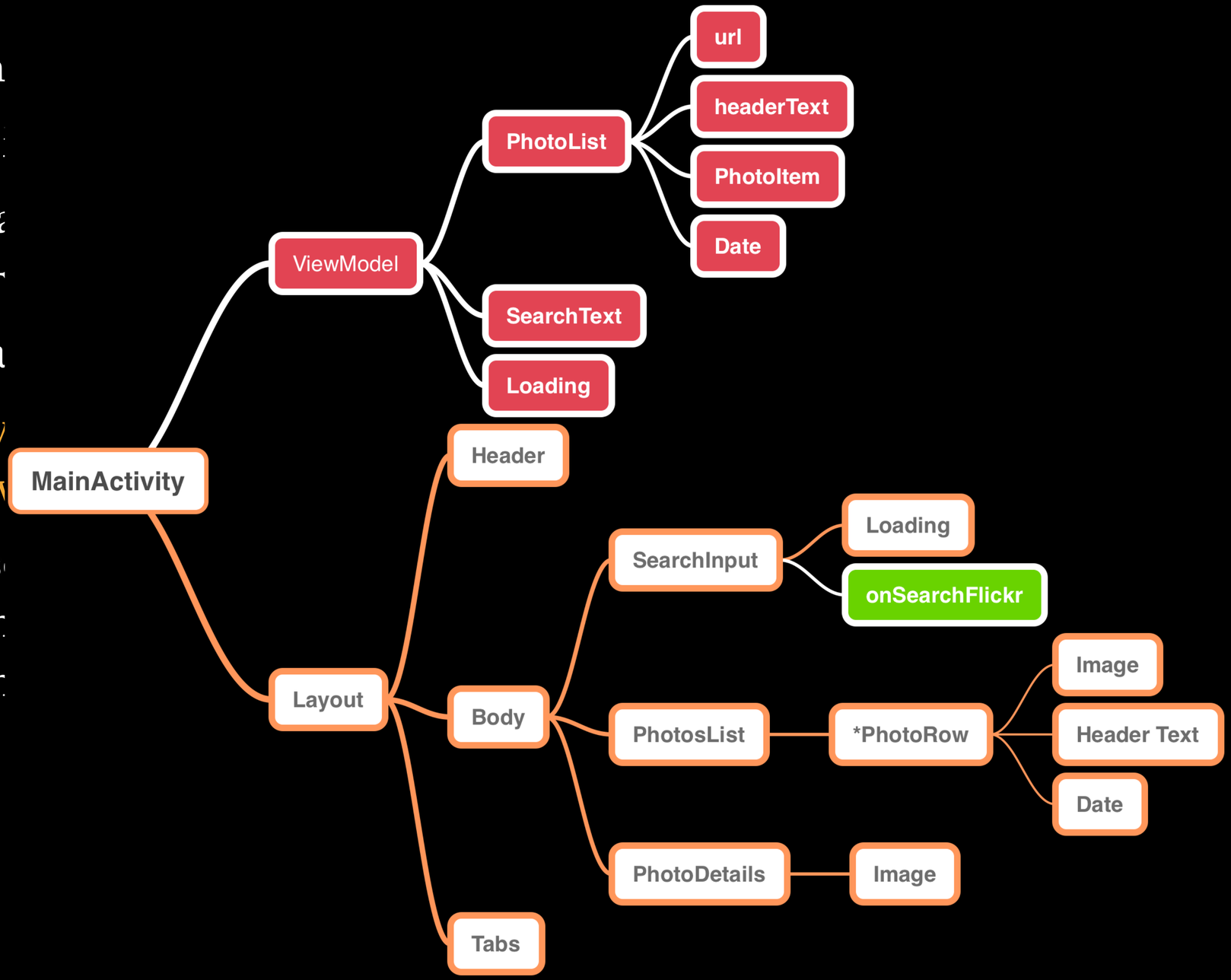
- Start with a mock, UI and Data
- Break UI in a component Hierarchy
- Build a static version in Compose
- Identify The minimal Representation Of UI State
- Identify where the state should live (Data down)
- An Inverse Data Flow, top level component passes callbacks to child components to mutate the state.

THINKING IN REACT - IDENTIFY THE MINIMAL REPRESENTATION OF UI STATE



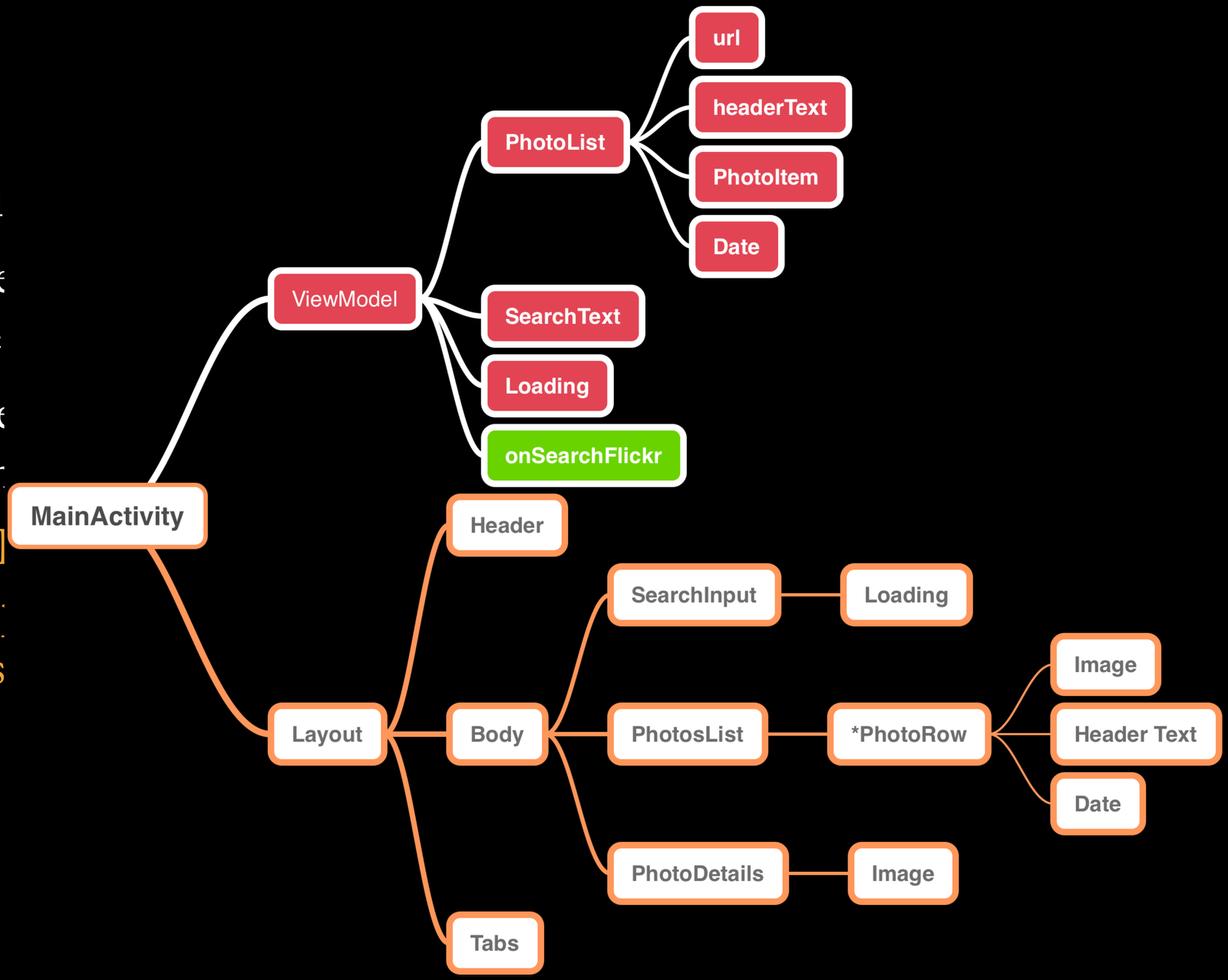
THINKING IN REACT - IDENTIFY WHERE THE STATE SHOULD LIVE (DATA DOWN)

- Start with
- Break UI
- Build a sta
- Identify T
  Of UI Sta
- Identify w
  (Data dov
- An Invers
  componer
  componer

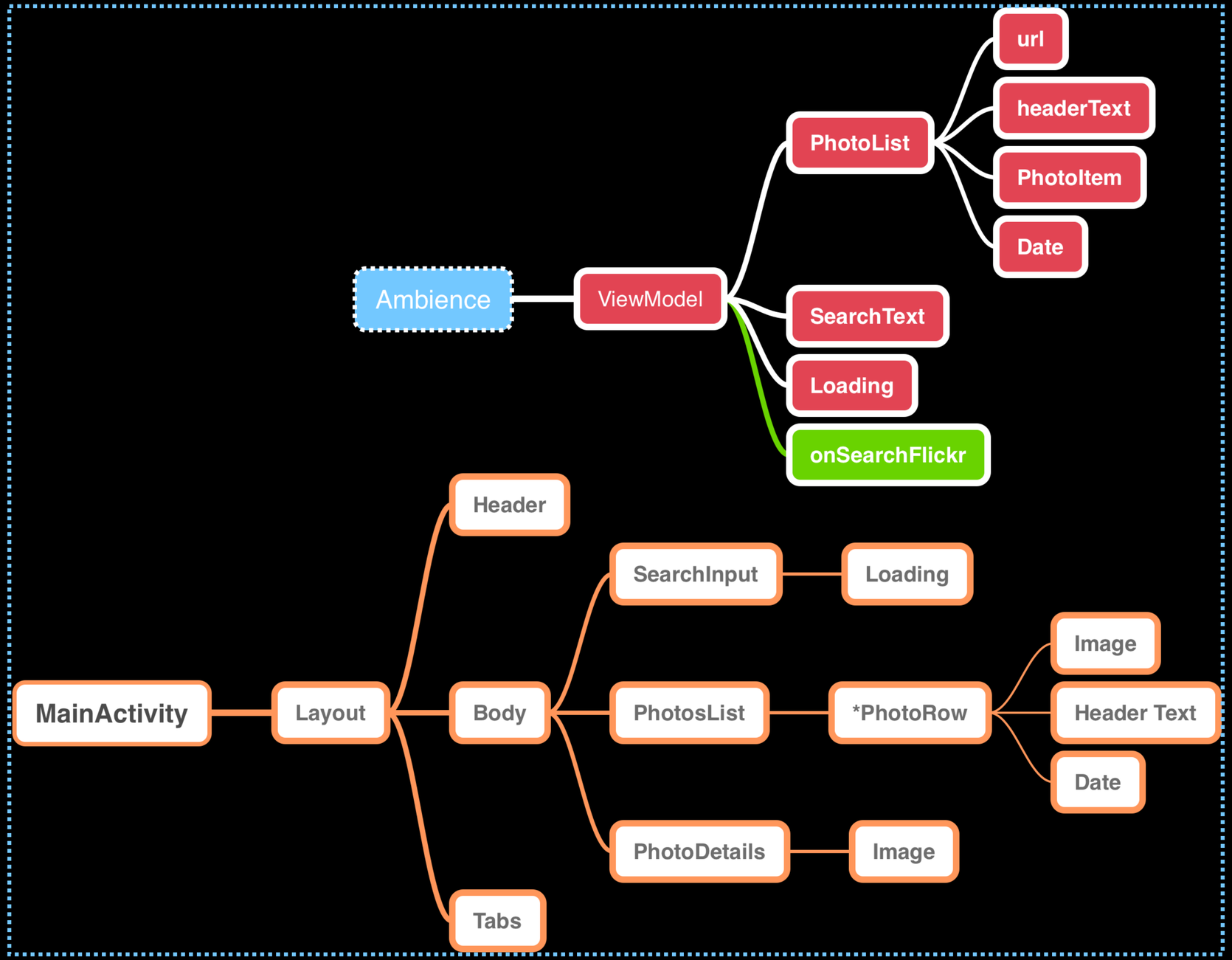


THINKING IN REACT - CALLBACKS

- Start with a
- Break UI in
- Build a stati
- Identify The Of UI State
- Identify whe (Data dowr
- An Inverse I component components

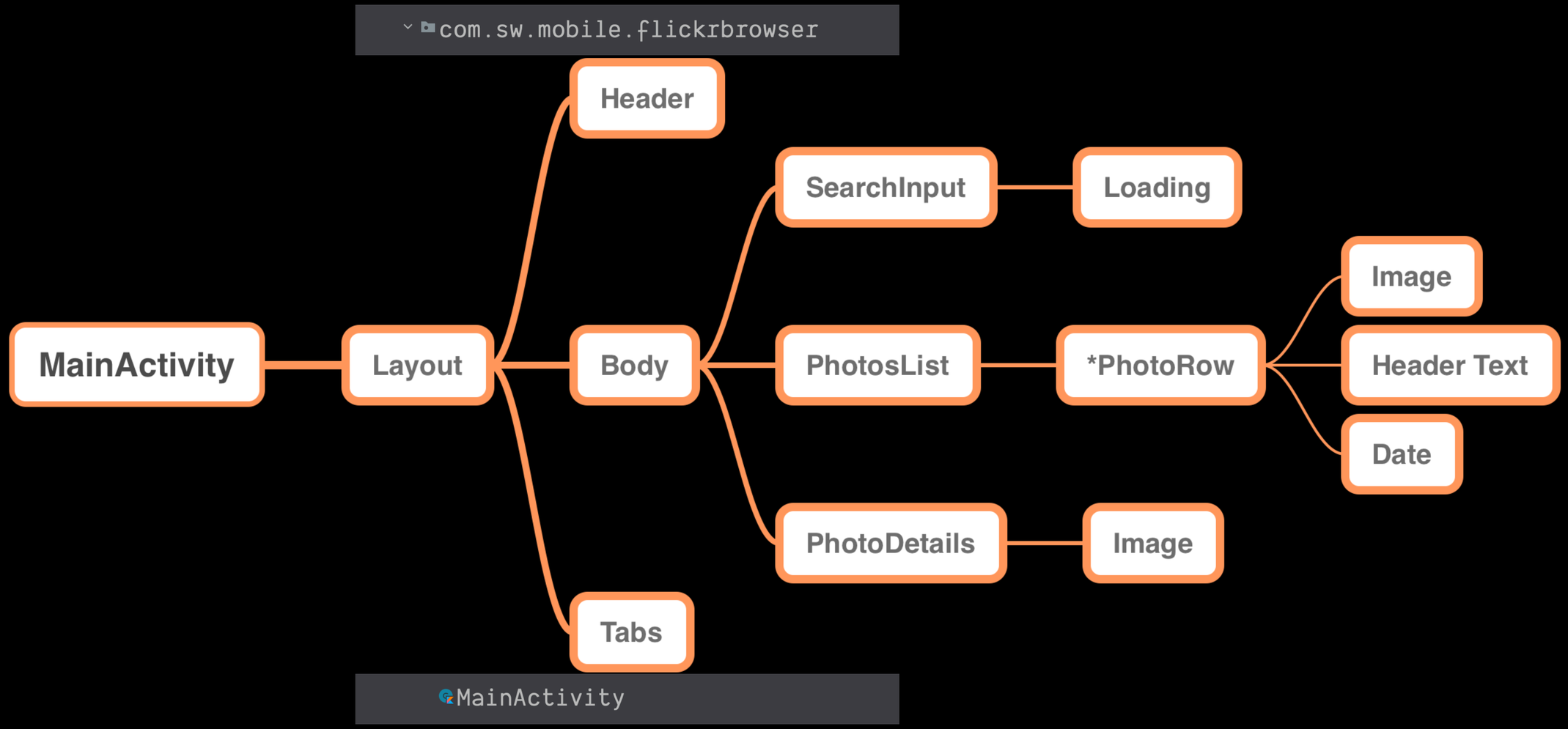


THINKING IN REACT - IDENTIFY WHERE THE STATE SHOULD LIVE (DATA AROUND)



APPLYING REACT TO COMPOSE

APPLYING REACT IN COMPOSE

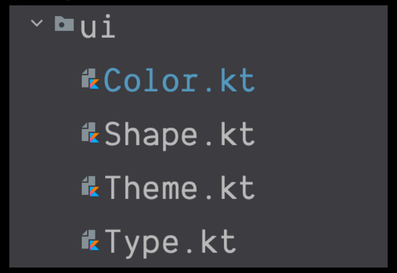


APPLYING REACT IN COMPOSE - THEME

```
class MainActivity : AppCompatActivity() {
    val flickrViewModel by viewModels<FlickrViewModel>()
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContent {
            FlickrBrowserTheme {
                Providers(AmbientFlickrSearch provides flickrViewModel) {
                    LayoutFlickr(
                    )
                }
                onActive(callback = { flickrViewModel.onSearchFlickr("rocket") })
            }
        }
    }
}
```

APPLYING REACT IN COMPOSE - THEME

ui/



Color.kt

```
val Orange700 = Color(0xFFFFA000)
val Orange800 = Color(0xFFFF8F00)
val Orange900 = Color(0xFFFF6F00)

val Orange200 = Color(0xFFFFE082)
val Orange300 = Color(0xFFFFE082)

val LightColors = lightColors(
    primary = Orange700,
    primaryVariant = Orange900,
    onPrimary = Color.White,
    secondary = Orange700,
    secondaryVariant = Orange200,
    onSecondary = Color.White,
    error = Orange800
)
val DarkColors = darkColors(
    primary = Orange300,
    primaryVariant = Orange700,
    onPrimary = Color.Black,
    secondary = Orange300,
    onSecondary = Color.White,
    error = Orange200
)
```

Shape.kt

```
val shapes = Shapes(
    small = RoundedCornerShape(4.dp),
    medium = RoundedCornerShape(4.dp),
    large = RoundedCornerShape(0.dp)
)
```

Type.kt

```
private val Dank = fontFamily(
    font(R.font.dankmono_italic, style = FontStyle.
    font(R.font.dankmono_regular),
)

val FlickrTypography = Typography(
    h4 = TextStyle(
        fontFamily = Dank,
        fontWeight = FontWeight.W600,
        fontSize = 30.sp
    ),
    h5 = TextStyle(
        fontFamily = Dank,
        fontWeight = FontWeight.W600,
        fontSize = 24.sp
    ),
    h6 = TextStyle(
        fontFamily = Dank,
        fontWeight = FontWeight.W600,
        fontSize = 20.sp
    ),
    subtitle1 = TextStyle(
        fontFamily = Dank,
        fontWeight = FontWeight.W600,
```

Theme.kt

```
@Composable
fun FlickrbrowserTheme(
    darkTheme: Boolean = isSystemInDarkTheme(),
    content: @Composable () -> Unit) {
    MaterialTheme(
        colors = if (darkTheme) DarkColors else LightColors,
        typography = FlickrTypography,
        shapes = FlickrShapes,
        content = content
    )
}
```

APPLYING REACT IN COMPOSE - VIEW MODEL - STATE/HANDLERS

```
class FlickrViewModel : ViewModel() {
    var photos by mutableStateOf(PhotosResponse())
    var searchText by mutableStateOf("")
        private set
    var loading by mutableStateOf(false)

    fun onSearchFlickr(value: String) {
        loading = true
        viewModelScope.launch {
            photos = getApi().search(tags = "spacex", text = value)
        }
        loading = false
    }
}

val AmbientFlickrSearch = ambientOf<FlickrViewModel>()
```

APPLYING REACT IN COMPOSE - MODEL - IN ACTIVITY

```
class MainActivity : AppCompatActivity() {
    val flickrViewModel by viewModels<FlickrViewModel>()
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContent {
            FlickrbrowserTheme {
                Providers(AmbientFlickrSearch provides flickrViewModel) {
                    LayoutFlickr(
                    )
                }
                onActive(callback = { flickrViewModel.onSearchFlickr("rocket") })
            }
        }
    }
}
```

APPLYING REACT IN COMPOSE - ON ACTIVE

```
class MainActivity : AppCompatActivity() {
    val flickrViewModel by viewModels<FlickrViewModel>()
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContent {
            FlickrbrowserTheme {
                Providers(AmbientFlickrSearch provides flickrViewModel) {
                    LayoutFlickr(
                    )
                }
                onActive(callback = { flickrViewModel.onSearchFlickr("rocket") })
            }
        }
    }
}
```

SEARCH INPUT - DATA FLOW

```
@Composable
fun SearchInputTextContainer() {
  val flickrViewModel = AmbientFlickrSearch.current
  SearchInputText(
    searchText = flickrViewModel.searchText,
    loading = flickrViewModel.loading,
    onSearchFlickr = flickrViewModel::onSearchFlickr
  )
}
```

6

```
class FlickrViewModelMock(_searchText: String = "") :
  FlickrViewModel(_searchText, _photos = _photosRes      eMocks) {
  override fun onSearchFlickr(value: String) {
    if (value.length < 3) return
    loading = true
    searchJob = viewModelScope.launch {
      delay(500)
      photos = getApi().search(tag = "spacex", text = value)
      loading = false
    }
  }
}
```

3 4 5 8

```
@Composable
fun SearchInputText(
  modifier: Modifier = Modifier,
  searchText: String = "",
  loading: Boolean,
  onSearchFlickr: (text: String) -> Unit,
  onImeAction: () -> Unit = {},
) {
  var textVal by savedInstanceState      earchText }
  onCommit(textVal, {
    onSearchFlickr(textVal)
  })
  Row(modifier = modifier.fillMaxWidth().background(MaterialTheme.colors.surface)) {
    OutlinedTextField(
      value = textVal,
      onValueChange = {
        textVal = it
      },
      activeColor = MaterialTheme.colors.primary,
      inactiveColor = MaterialTheme.colors.secondary,
      keyboardOptions = KeyboardOptions(imeAction = ImeAction.Done),
      onImeActionPerformed = { action, softKeyboardController ->
        if (action == ImeAction.Done) {
          onImeAction()
          softKeyboardController?.hideSoftwareKeyboard()
        }
      },
      trailingIcon = {
        if (loading)
          Icon(
            Icons.Filled.Cake,
            modifier = modifier.testTag ("icon-loading")
          )
        else
          Icon(
            Icons.Outlined.Cake,
            modifier = modifier.testTag ("icon-not-loading")
          )
      },
      modifier = modifier.fillMaxWidth().padding(8.dp).testTag("search-input")
    )
  }
}
```

1 2 7 9

CALLISTA

```
class SearchInputTextContainerKtTest {

  @get:Rule
  val composeTestRule = createComposeRule()

  @Test
  fun searchInputTextNotLoading() {
    val flickrViewModel = FlickrViewModelMock(_searchText = "")
    composeTestRule.setContent {
      FlickrbrowserTheme {
        Providers( ...values: AmbientFlickrSearch provides flickrViewModel) {
          SearchInputTextContainer()
        }
      }
    }
    composeTestRule.onNodeWithTag( testTag: "search-input").assertTextEquals("")
    composeTestRule.onNodeWithTag( testTag: "icon-not-loading", useUnmergedTree = true).assertExists()
    composeTestRule.onNodeWithTag( testTag: "search-input").performTextInput( text: "Space")
    composeTestRule.onNodeWithTag( testTag: "search-input").assertTextEquals("Space")
    composeTestRule.onNodeWithTag( testTag: "icon-loading", useUnmergedTree = true).assertExists()
    // should revert to not loading

    composeTestRule.onNodeWithTag( testTag: "icon-not-loading", useUnmergedTree = true).assertDoesNotExist()
    Thread.sleep( millis: 2000)
  }
}
```

SearchInputTextConta...

atus | 1 passed | 1 tests, 10 s 122 ms

lter tests:

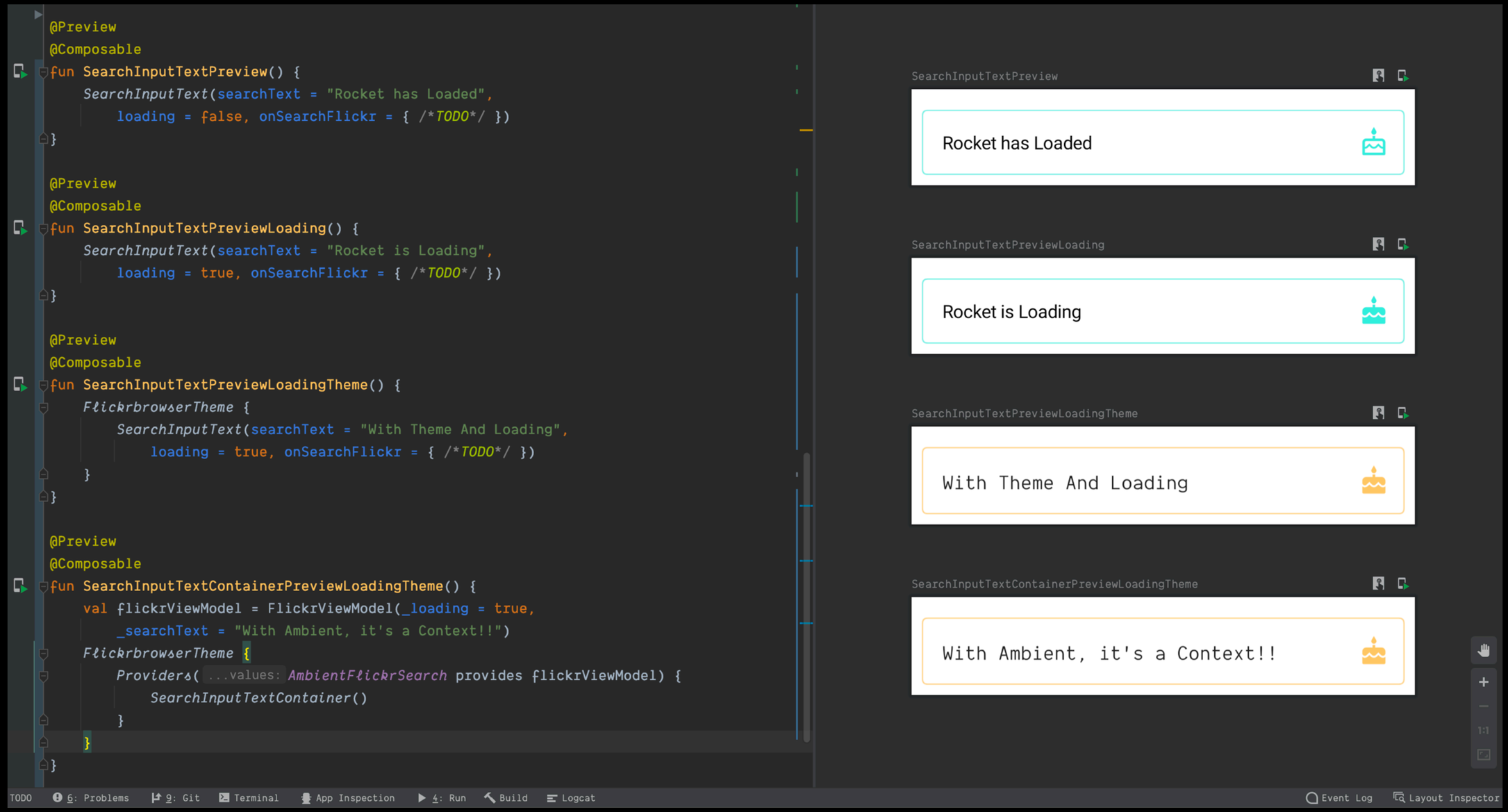
sts	Duration	Pixel_5
Test Results	7 s	1/1
SearchInputTextContainerKtTest	7 s	1/1
searchInputTextNotLoading		

Tests Passed
1 passed

Test Results

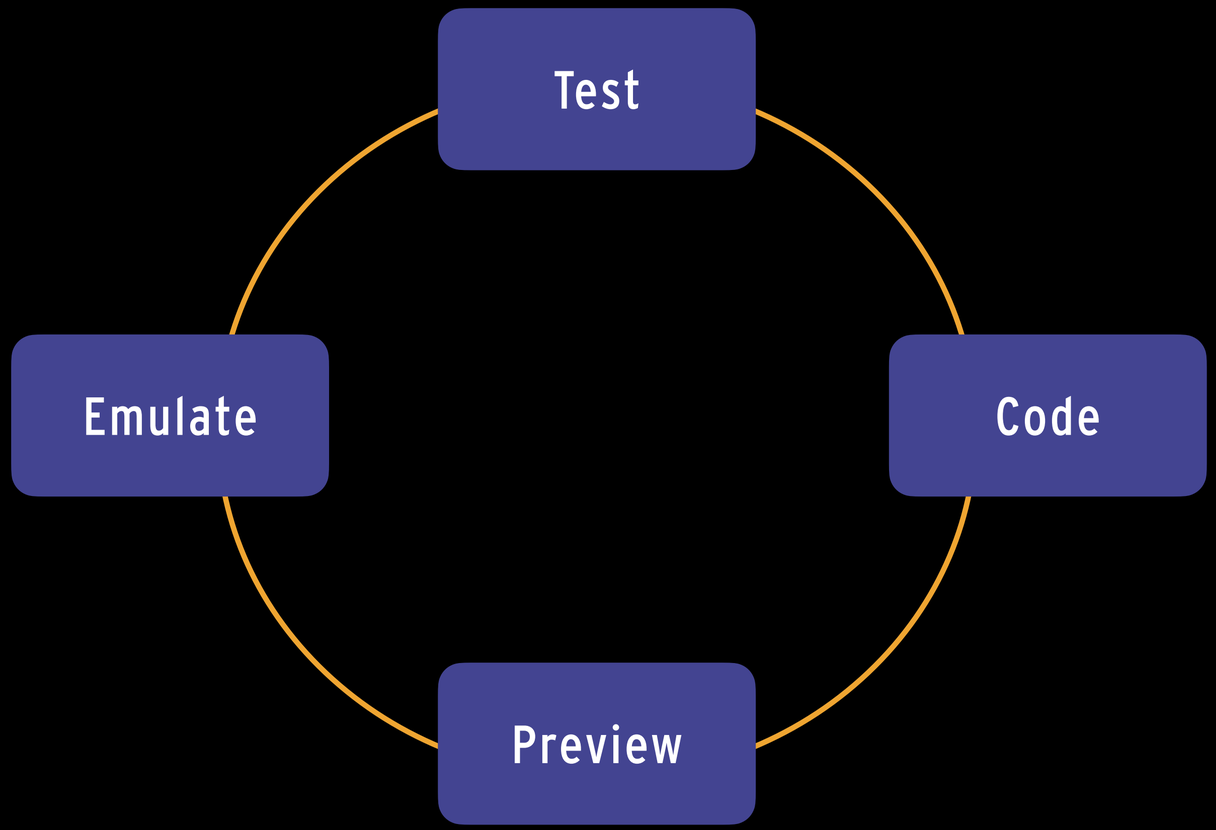
```
Install successfully finished in 508 ms.
Running tests

$ adb shell am instrument -w -m    -e debug false -e class 'com.sw.mobile.flickrbrowser.composables.SearchIn
Connected to process 24021 on device 'Pixel_5 [emulator-5554]'.
```

SEARCH BOX - PREVIEW

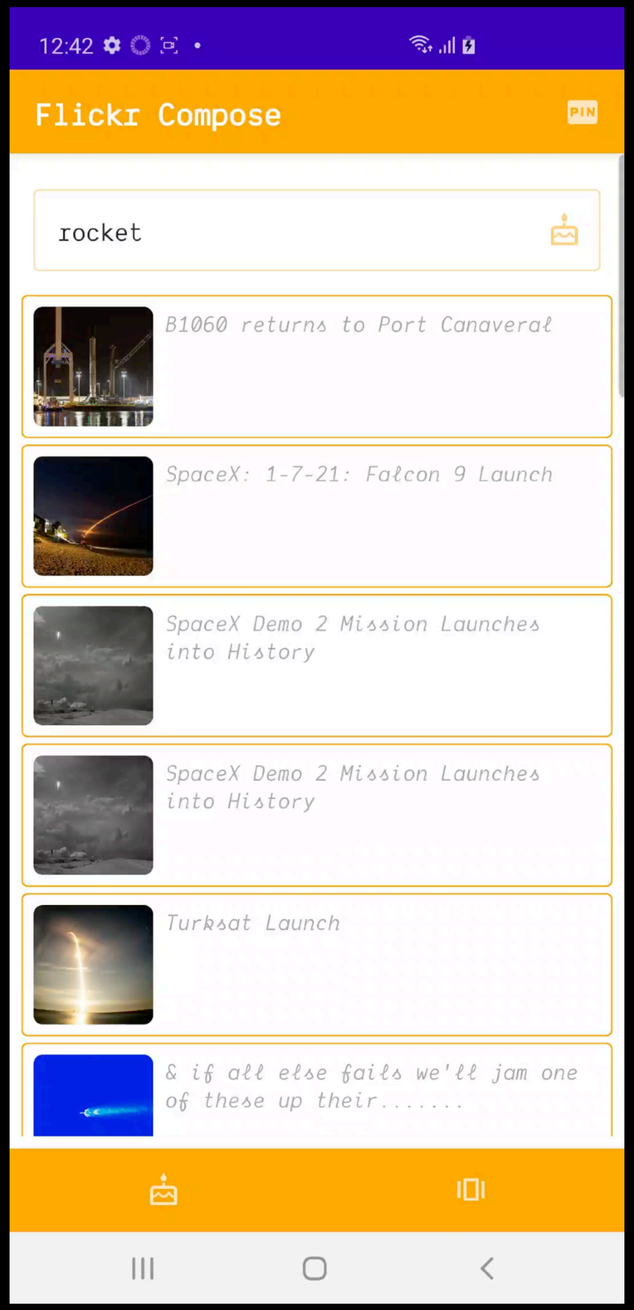


CALLISTA

DEVELOPMENT CYCLE



FLICKR BROWSER



CONCLUSIONS

CONCLUSIONS

- Nailed it!
  - React Developer Adoption!
- Kotlin!
- DX
- Animation api
- Theming

- Compilation is slower in comparison to React Natives JS metro bundler
- Complete list of hook to Compose comparison on

- `https://github.com/callistaenterprise/cadec-2021-compose`

END