Compose modifiers

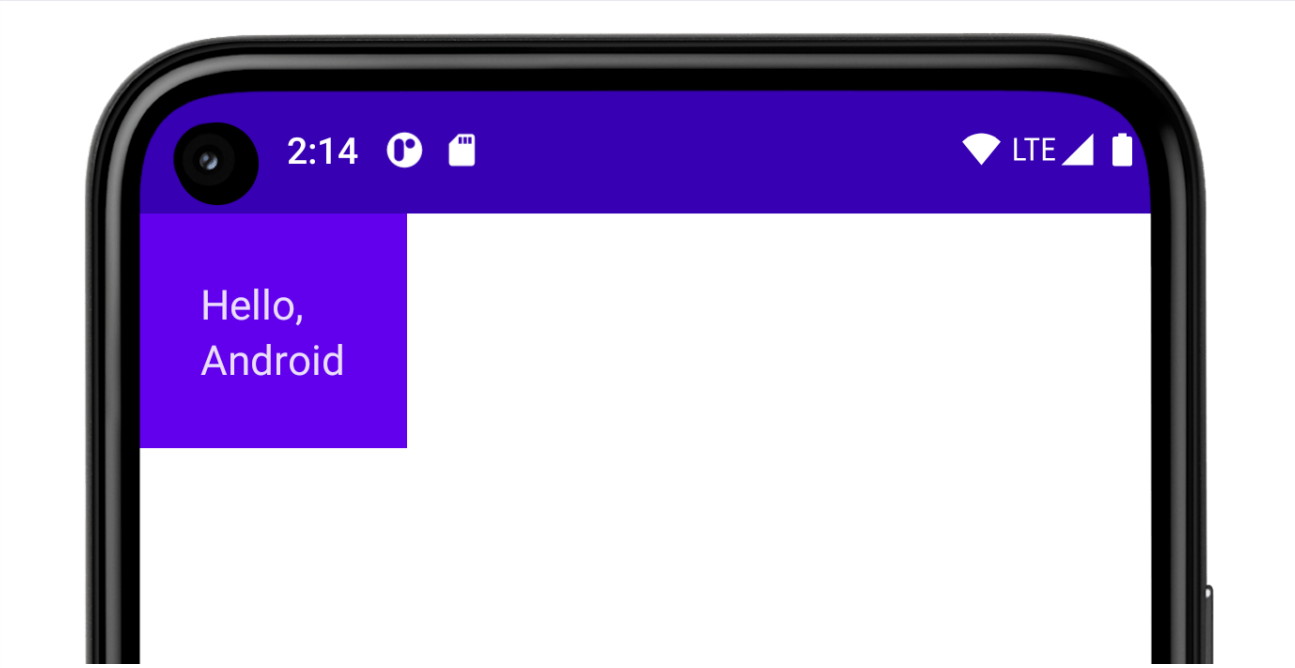
Modifiers allow you to decorate or augment a composable. Modifiers let you do these sorts of things:

- Change the composable's size, layout, behavior, and appearance
- Add information, like accessibility labels
- Process user input
- Add high-level interactions, like making an element clickable, scrollable, draggable, or zoomable

Modifiers are standard Kotlin objects. Create a modifier by calling one of the `Modifier` (/reference/kotlin/androidx/compose/ui/Modifier) class functions:

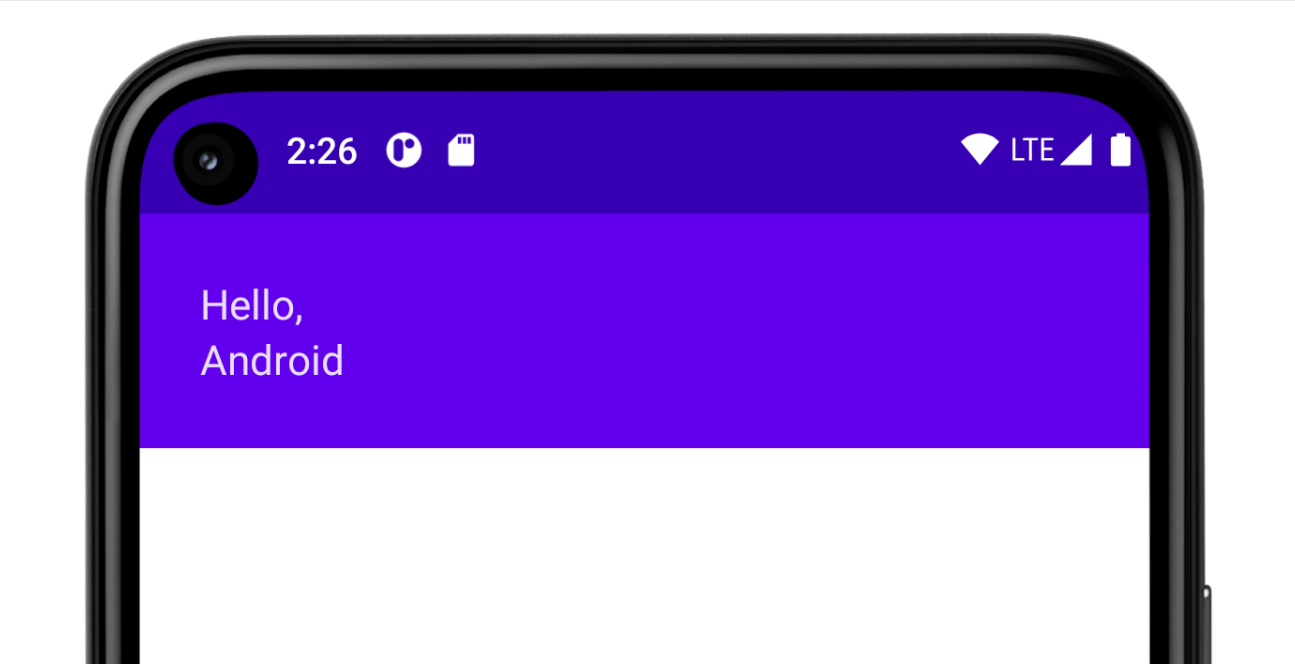
```
import androidx.compose.ui.Modifier

@Composable
private fun Greeting(name: String) {
  Column(modifier = Modifier.padding(24.dp)) {
    Text(text = "Hello,")
    Text(text = name)
  }
}
```



You can chain these functions together to compose them:

```
@Composable
private fun Greeting(name: String) {
  Column(modifier = Modifier
    .padding(24.dp)
    .fillMaxWidth()
  ) {
    Text(text = "Hello,")
    Text(text = name)
  }
}
```



In the code above, notice different modifier functions used together.

- `padding` puts space around an element.
- `fillMaxWidth` makes the composable fill the maximum width given to it from its parent.

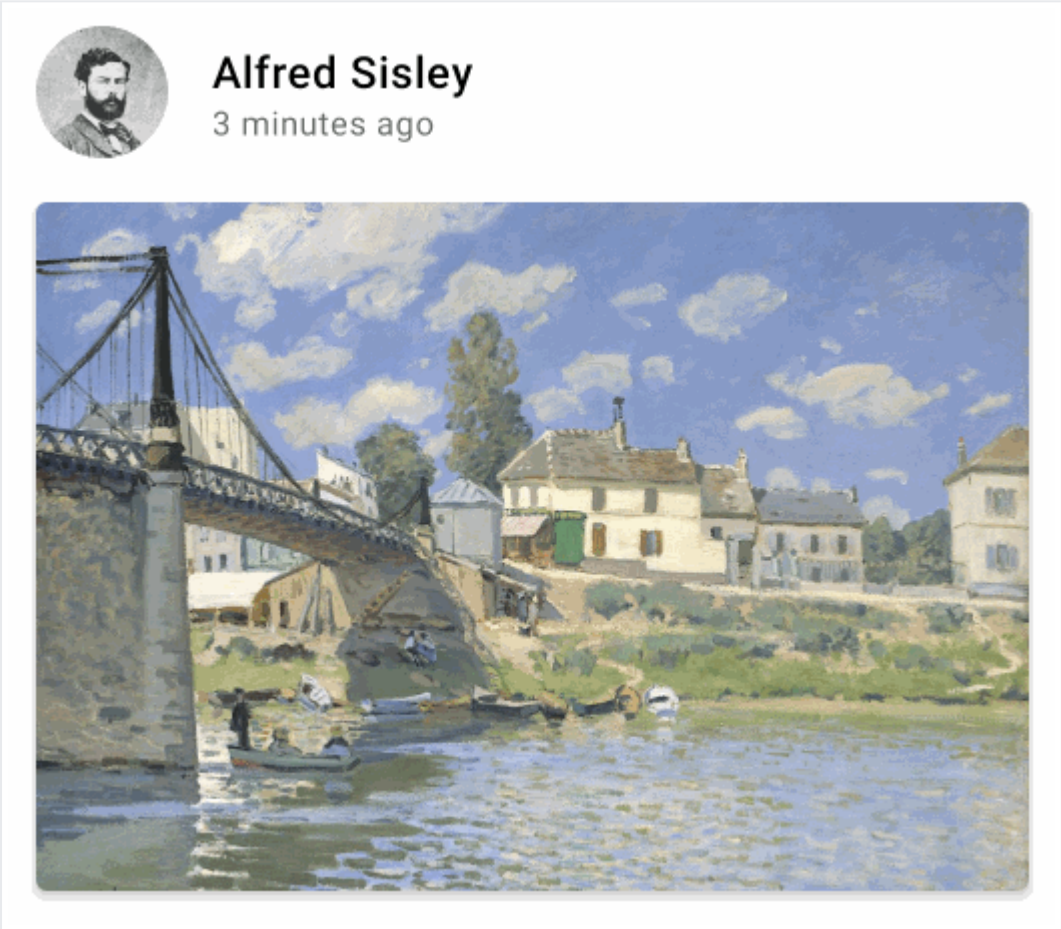
It's a best practice to have *all* of your Composables accept a `modifier` parameter, and pass that modifier to its first child that emits UI. Doing so makes your code more reusable and makes its behavior more predictable and intuitive. For more information, see the Compose API guidelines, Elements accept and respect a Modifier parameter (https://android.googlesource.com/platform/frameworks/support/+/androidx-main/compose/docs/compose-api-guidelines.md#elements-accept-and-respect-a-modifier-parameter) .

Order of modifiers matters

The order of modifier functions is **significant**. Since each function makes changes to the `Modifier`returned by the previous function, the sequence affects the final result. Let's see an example of this:

```
@Composable
fun ArtistCard(/*...*/) {
    val padding = 16.dp
    Column(
```

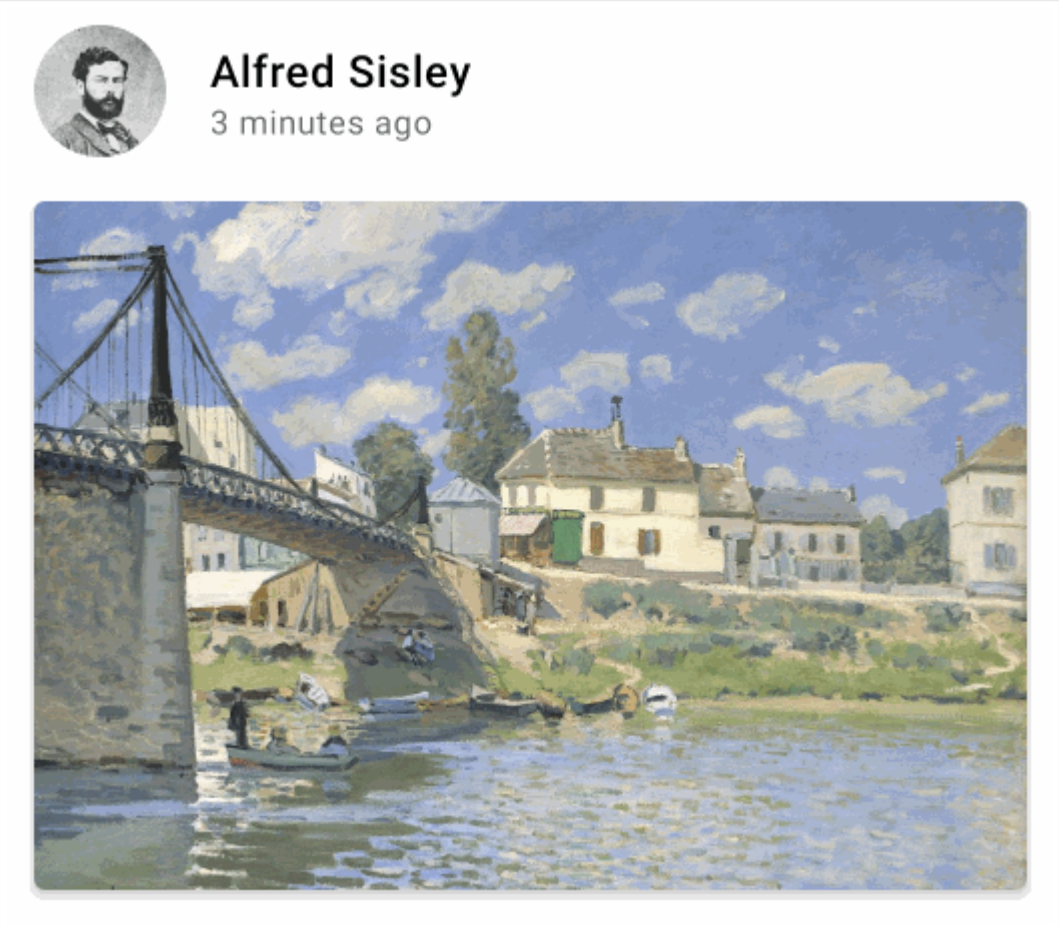
```
        Modifier
            .clickable(onClick = onClick)
            .padding(padding)
            .fillMaxWidth()
    ) {
        // rest of the implementation
    }
}
```



In the code above the whole area is clickable, including the surrounding padding, because the `padding` modifier has been applied *after* the `clickable` modifier. If the modifiers order is reversed, the space added by `padding` does not react to user input:

```
@Composable
fun ArtistCard(/*...*/) {
    val padding = 16.dp
    Column(
        Modifier
            .padding(padding)
            .clickable(onClick = onClick)
```

```
            .fillMaxWidth()
    ) {
        // rest of the implementation
    }
}
```



Note: The explicit order helps you to reason about how different modifiers will interact. Compare this to the view-based system where you had to learn the box model, that margins applied "outside" the element but padding "inside" it, and a background element would be sized accordingly. The modifier design makes this kind of behavior explicit and predictable, and gives you more control to achieve the exact behavior you want. It also explains why there is not a margin modifier but only a **`padding`** one.

Built-in modifiers

Jetpack Compose provides a list of built-in modifiers to help you decorate or augment a composable. Here are some common modifiers you'll use to adjust your layouts.

Note: Many of these modifiers are designed to help you arrange your UI's layout just the way you need it. For more information about how modifiers work in your layout, see the Compose layout basics (/jetpack/compose/layouts/basics) documentation.

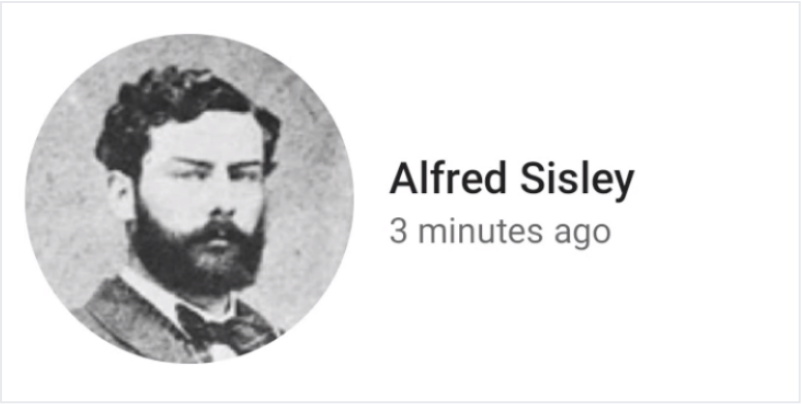
padding and size

By default, layouts provided in Compose wrap their children. However, you can set a size by using the `size` modifier:

```
@Composable
fun ArtistCard(/*...*/) {
    Row(
        modifier = Modifier.size(width = 400.dp, height = 100.dp)
    ) {
        Image(/*...*/)
        Column { /*...*/ }
    }
}
```

Note that the size you specified might not be respected if it does not satisfy the constraints coming from the layout's parent. If you require the composable size to be fixed regardless of the incoming constraints, use the `requiredSize` modifier:

```
@Composable
fun ArtistCard(/*...*/) {
    Row(
        modifier = Modifier.size(width = 400.dp, height = 100.dp)
    ) {
        Image(
            /*...*/
            modifier = Modifier.requiredSize(150.dp)
        )
        Column { /*...*/ }
    }
}
```

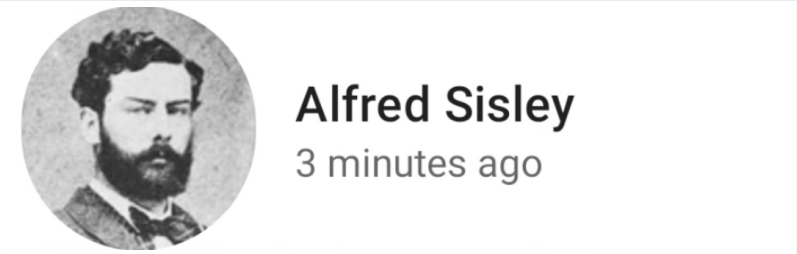


In this example, even with the parent `height` set to `100.dp`, the height of the `Image` will be `150.dp`, as the `requiredSize` modifier takes precedence.

Note: Layouts are based on constraints, and normally, the parent passes those constraints to the children. The child *should* respect the constraints. However, that might not always be what the UI requires. There are ways to bypass this child behavior. For example, you can pass modifiers like **`requiredSize`** directly to the child, overriding the constraints received by the child from the parent, or you can use a custom layout with different behavior. When a child does not respect its constraints, the layout system will hide this from the parent. The parent will see the child's **`width`** and **`height`** values as if they were coerced in the constraints provided by the parent. The layout system will then center the child within the space allocated by the parent under the assumption that the child respected the constraints. Developers can override this centering behaviour by applying **`wrapContentSize`** modifiers to the child.

If you want a child layout to fill all the available height allowed by the parent, add the `fillMaxHeight` modifier (Compose also provides `fillMaxSize` and `fillMaxWidth`):

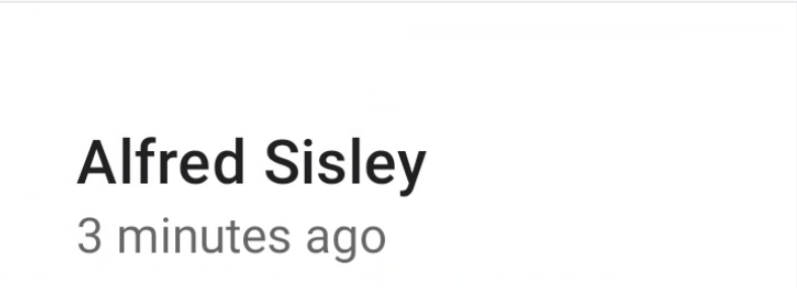
```
@Composable
fun ArtistCard(/*...*/) {
    Row(
        modifier = Modifier.size(width = 400.dp, height = 100.dp)
    ) {
        Image(
            /*...*/
            modifier = Modifier.fillMaxHeight()
        )
        Column { /*...*/ }
    }
}
```



To add padding all around an element, set a `padding` modifier.

If you want to add padding above a text baseline such that you achieve a specific distance from the top of the layout to the baseline, use the `paddingFromBaseline` modifier:

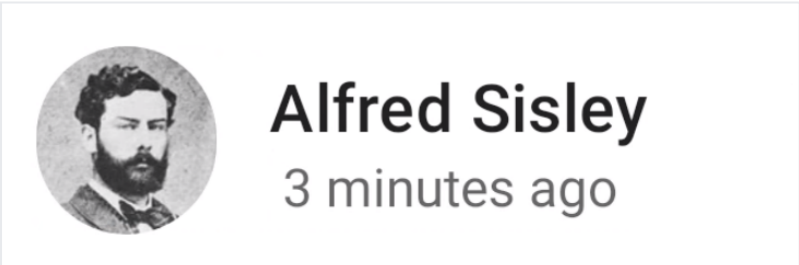
```
@Composable
fun ArtistCard(artist: Artist) {
    Row(/*...*/) {
        Column {
            Text(
                text = artist.name,
                modifier = Modifier.paddingFromBaseline(top = 50.dp)
            )
            Text(artist.lastSeenOnline)
        }
    }
}
```



Offset

To position a layout relative to its original position, add the `offset` modifier and set the offset in the **x** and **y** axis. Offsets can be positive as well as non-positive. The difference between `padding` and `offset` is that adding an `offset` to a composable does not change its measurements:

```
@Composable
fun ArtistCard(artist: Artist) {
    Row(/*...*/) {
        Column {
            Text(artist.name)
            Text(
                text = artist.lastSeenOnline,
                modifier = Modifier.offset(x = 4.dp)
            )
        }
    }
}
```



The `offset` modifier is applied horizontally according to the layout direction. In a **left-to-right** context, a positive `offset` shifts the element to the right, while in a **right-to-left** context, it shifts the element to the left. If you need to set an offset without considering layout direction, see the `absoluteOffset` (/reference/kotlin/androidx/compose/foundation/layout/package-summary#absoluteOffset(androidx.compose.ui.Modifier,androidx.compose.ui.unit.Dp,androidx.compose.ui.unit.Dp)) modifier, in which a positive offset value always shifts the element to the right.

The `offset` modifier provides two overloads - `offset` (/reference/kotlin/androidx/compose/foundation/layout/package-summary#(androidx.compose.ui.Modifier).offset(androidx.compose.ui.unit.Dp,androidx.compose.ui.unit.Dp)) that takes the offsets as parameters and `offset` (/reference/kotlin/androidx/compose/foundation/layout/package-summary#(androidx.compose.ui.Modifier).offset(kotlin.Function1)) that takes in a lambda. For more in depth information on when to use each of these and how to optimize for performance, read through the Compose performance - Defer reads as long as possible (/jetpack/compose/performance#defer-reads) section.

Type safety in Compose

In Compose, there are modifiers that only work when applied to children of certain composables. For example, if you want to make a child as big as the parent `Box` without affecting the `Box` size, use the `matchParentSize` (/reference/kotlin/androidx/compose/foundation/layout/BoxScope#(androidx.compose.ui.Modifier).matchParentSize()) modifier.

Compose enforces this type safety by means of custom scopes. For example, `matchParentSize` is only available in `BoxScope` (/reference/kotlin/androidx/compose/foundation/layout/BoxScope). Therefore, it can only be used when the child is used within a `Box`.

Note: In the Android View system, there is no type safety. Developers usually find themselves trying out different layout params to discover which ones are considered and their meaning in the context of a particular parent.

Scoped modifiers notify the parent about some information the parent should know about the child. These are also commonly referred to as *parent data modifiers*. Their internals are different from the general purpose modifiers, but from a usage perspective, these differences don't matter.

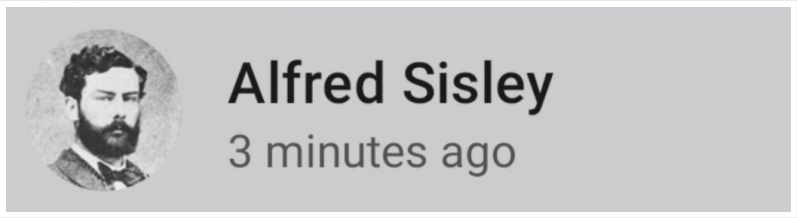
matchParentSize in Box

As mentioned above, if you want a child layout to be the same size as a parent `Box` without affecting the `Box` size, use the `matchParentSize` modifier.

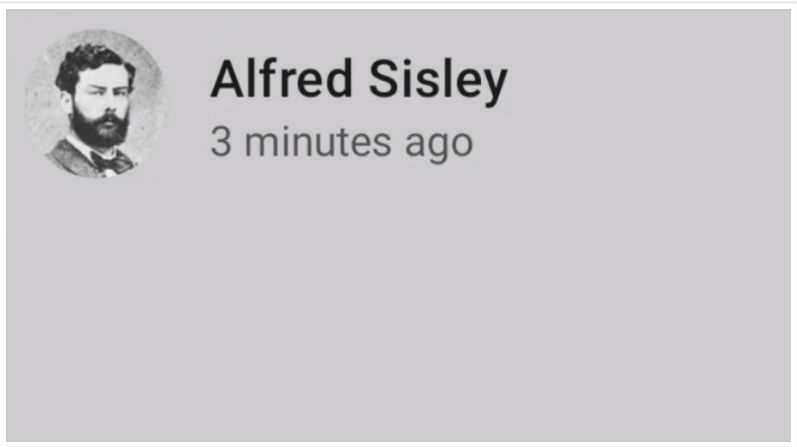
Note that `matchParentSize` is only available within a `Box` scope, meaning that it only applies to *direct* children of `Box` composables.

In the example below, the child `Spacer` takes its size from its parent `Box`, which in turn takes its size from the biggest children, `ArtistCard` in this case.

```
@Composable
fun MatchParentSizeComposable() {
    Box {
        Spacer(Modifier.matchParentSize().background(Color.LightGray))
        ArtistCard()
    }
}
```



If `fillMaxSize` were used instead of `matchParentSize`, the `Spacer` would take all the available space allowed to the parent, in turn causing the parent to expand and fill all the available space.



weight in Row and Column

As you have seen in the previous section on Padding and size (#padding-and-size), by default, a composable size is defined by the content it is wrapping. You can set a composable size to be flexible within its parent using the `weight` Modifier that is only available in `RowScope`, and `ColumnScope`.

Let's take a `Row` that contains two `Box` composables. The first box is given twice the `weight` of the second, so it's given twice the width. Since the `Row` is `210.dp` wide, the first `Box` is `140.dp` wide, and the second is `70.dp`:

```
@Composable
fun ArtistCard(/*...*/) {
    Row(
        modifier = Modifier.fillMaxWidth()
    ) {
        Image(
            /*...*/
            modifier = Modifier.weight(2f)
```

```
        )
        Column(
            modifier = Modifier.weight(1f)
        ) {
            /*...*/
        }
    }
}
```

Alfred Sisley
3 minutes ago

Extracting and reusing modifiers

Multiple modifiers can be chained together to decorate or augment a composable. This chain is created via the `Modifier` (/reference/kotlin/androidx/compose/ui/Modifier) interface which represents an ordered, immutable list of single `Modifier.Elements` (/reference/kotlin/androidx/compose/ui/Modifier.Element).

Each `Modifier.Element` represents an individual behavior, like layout, drawing and graphics behaviors, all gesture-related, focus and semantics behaviors, as well as device input events. Their ordering matters: modifier elements that are added first will be applied first.

Sometimes it can be beneficial to reuse the same modifier chain instances in multiple composables, by extracting them into variables and hoisting them into higher scopes. It can improve code readability or help improve your app's performance for a few reasons:

- The re-allocation of the modifiers won't be repeated when recomposition occurs for composables that use them
- Modifier chains could potentially be very long and complex, so reusing the same instance of a chain can alleviate the workload Compose runtime needs to do when comparing them
- This extraction promotes code cleanliness, consistency and maintainability across the codebase

Best practices for reusing modifiers

Create your own `Modifier` chains and extract them to reuse them on multiple composable components. It is completely fine to just save a modifier, as they are data-like objects:

```
val reusableModifier = Modifier
                        .fillMaxWidth()
                        .background(Color.Red)
                        .padding(12.dp)
```

Extracting and reusing modifiers when observing frequently changing state

When observing frequently changing states inside composables, like animation states or `scrollState`, there can be a significant amount of recompositions done. In this case, your modifiers will get allocated on every recomposition and potentially for every frame:

```
@Composable
fun LoadingWheelAnimation() {
    val animatedState = animateFloatAsState(...)

    LoadingWheel(
        // Creation and allocation of this modifier will happen on every fram
        modifier = Modifier
            .padding(12.dp)
            .background(Color.Gray),
        animatedState = animatedState.value
    )
}
```

Instead, you can create, extract and reuse the same instance of the modifier and pass it to the composable like this:

```
// Now, the allocation of the modifier happens here:
val reusableModifier = Modifier
            .padding(12.dp)
            .background(Color.Gray)
```

```
@Composable
fun LoadingWheelAnimation() {
    val animatedState = animateFloatAsState(...)

    LoadingWheel(
        // No allocation, as we're just reusing the same instance
        modifier = reusableModifier,
        animatedState = animatedState.value
    )
}
```

Extracting and reusing unscoped modifiers

Modifiers can be unscoped or scoped to a specific composable. In the case of unscoped modifiers, you can easily extract them outside of any composables as simple variables:

```
val reusableModifier = Modifier
    .fillMaxWidth()
    .background(Color.Red)
    .padding(12.dp)

@Composable
fun AuthorField() {
    HeaderText(
        // ...
        modifier = reusableModifier
    )
    SubtitleText(
        // ...
        modifier = reusableModifier
    )
}
```

This can be especially beneficial when combined with Lazy layouts. In most cases, you'd want all of your, potentially significant, amount of items to have the exact same modifiers:

```
val reusableItemModifier = Modifier
    .padding(bottom = 12.dp)
    .size(216.dp)
    .clip(CircleShape)
```

```
@Composable
private fun AuthorList(authors: List<Author>) {
    LazyColumn {
        items(authors) {
            AsyncImage(
                // ...
                modifier = reusableItemModifier,
            )
        }
    }
}
```

Extracting and reusing scoped modifiers

When dealing with modifiers that are scoped to certain composables, you can extract them to the highest possible level and reuse where appropriate:

```
Column(...) {
    val reusableItemModifier = Modifier
        .padding(bottom = 12.dp)
        // Align Modifier.Element requires a ColumnScope
        .align(Alignment.CenterHorizontally)
        .weight(1f)
    Text1(
        modifier = reusableItemModifier,
        // ...
    )
    Text2(
        modifier = reusableItemModifier
        // ...
    )
        // ...
 }
```

You should only be passing the extracted, scoped modifiers to the same-scoped, direct children. You can read through the section Type safety in Compose (/jetpack/compose/modifiers#type-safety) for more reference on why this matters:

```
Column(modifier = Modifier.fillMaxWidth()) {
    // Weight modifier is scoped to the Column composable
    val reusableItemModifier =  Modifier.weight(1f)

    // Weight will be properly assigned here since this Text is a direct chil
    Text(
        modifier = reusableItemModifier
        // ...
    )

    Box {
        Text(
            // Weight won't do anything here since the Text composable is not
            modifier = reusableItemModifier
            // ...
        )
    }
}
```

Further chaining of extracted modifiers

You can further chain or append your extracted modifier chains by calling the `.then()` (/reference/kotlin/androidx/compose/ui/Modifier#then(androidx.compose.ui.Modifier)) function:

```
val reusableModifier = Modifier
    .fillMaxWidth()
    .background(Color.Red)
    .padding(12.dp)

// Append to your reusableModifier
reusableModifier.clickable { … }

// Append your reusableModifier
otherModifier.then(reusableModifier)
```

Just keep in mind that the order of modifiers matters! (/jetpack/compose/modifiers#order-modifier-matters)

Learn more

We provide a full list of modifiers (/jetpack/compose/modifiers-list), with their parameters and scopes.

For more practice on how to use modifiers, you can also go through the Basic layouts in Compose codelab (/codelabs/jetpack-compose-layouts#0) or refer to the Now in Android repository (https://github.com/android/nowinandroid).

For more information on custom modifiers and how to create them, take a look at the documentation on Custom layouts - Using the layout modifier (/jetpack/compose/layouts/custom#layout-modifier).

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