Build an app with an adaptive layout

1. Introduction

In the previous codelab, you started transforming the Reply app to be adaptive by using window size classes and implementing dynamic navigation. These features are an important foundation and the first step to building apps for all screen sizes. If you missed Build an adaptive app with dynamic navigation codelab, you are strongly encouraged to go back and start there.

In this codelab, you'll build on a concept you learned to further implement adaptive layout in your app. The adaptive layout that you'll implement is part of canonical layouts - a set of commonly-used patterns for large screen displays. You'll also learn about more tooling and testing techniques to help you to quickly build robust apps.

Prerequisites

- Completion of the Build an adaptive app with dynamic navigation codelab
- Familiar with Kotlin programming, including classes, functions and conditionals
- Familiar with `ViewModel` classes
- Familiar with `Composable` functions
- Experience building layouts with Jetpack Compose
- Experience running apps on a device or emulator
- Experience using `WindowSizeClass` API

What you'll learn

- How to create a list-view pattern adaptive layout using Jetpack Compose
- How to create previews for different screen sizes
- How to test code for multiple screen sizes

What you'll build

- You will continue updating the Reply app to be adaptive for all screen sizes.
- The finished app will look like this:

What you'll need

- A computer with internet access, a web browser, and Android Studio

- Access to GitHub

Download the starter code

To get started, download the starter code:

https://github.com/google-developer-training/basic-android-kotlin-compose-training-reply-app/archive/refs/heads/nav-update.zip

Alternatively, you can clone the GitHub repository for the code:

```
$ git clone
https://github.com/google-developer-training/basic-android-
kotlin-compose-training-reply-app.git
$ cd basic-android-kotlin-compose-training-reply-app
$ git checkout nav-update
```

Note: The starter code is in the `nav-update` branch of the downloaded repository.

You can browse the starter code in the Reply GitHub repository.

https://github.com/google-developer-training/basic-android-kotlin-compose-training-reply-app/tree/nav-update

2. Previews for different screen sizes

Create previews for different screen sizes

In the Build an adaptive app with dynamic navigation codelab, you learned to use preview composables to help your development process. For an adaptive app, it is the best practice to create multiple previews to show the app on different screen sizes. With multiple previews, you can see your changes on all screen sizes at once. Moreover, the previews also serve as documentation for other developers who review your code to see that your app is compatible with different screen sizes.

Previously, you only had a single preview that supported the compact screen. You'll add more previews next.

To add previews for medium and expanded screens, complete the following steps:

1. Add a preview for medium screens by setting a medium `widthDp` value in the `Preview` annotation parameter and specifying `WindowWidthSizeClass.Medium` value as the parameter for the `ReplyApp` composable.

MainActivity.kt

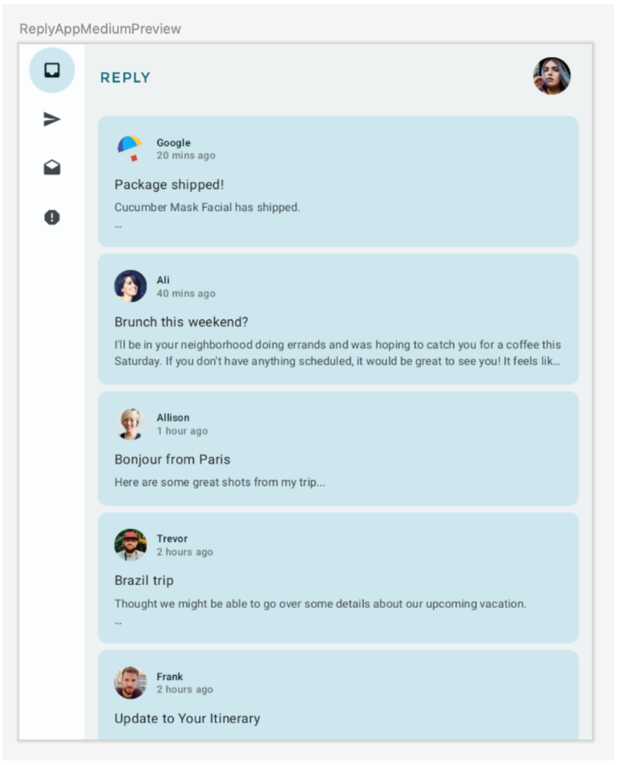
```
@Preview(showBackground = true, widthDp = 700)
@Composable
fun ReplyAppMediumPreview() {
    ReplyTheme {
        Surface {
            ReplyApp(windowSize = WindowWidthSizeClass.Medium)
        }
    }
}
```

2. Add another preview for expanded screens by setting a large `widthDp` value in the `Preview` annotation parameter and specifying `WindowWidthSizeClass.Expanded` value as the parameter for the `ReplyApp` composable.

MainActivity.kt

```
@Preview(showBackground = true, widthDp = 1000)
@Composable
fun ReplyAppExpandedPreview() {
    ReplyTheme {
        Surface {
            ReplyApp(windowSize =
WindowWidthSizeClass.Expanded)
        }
    }
}
```

3. Build the preview to view the following:


ReplyAppMediumPreview

REPLY

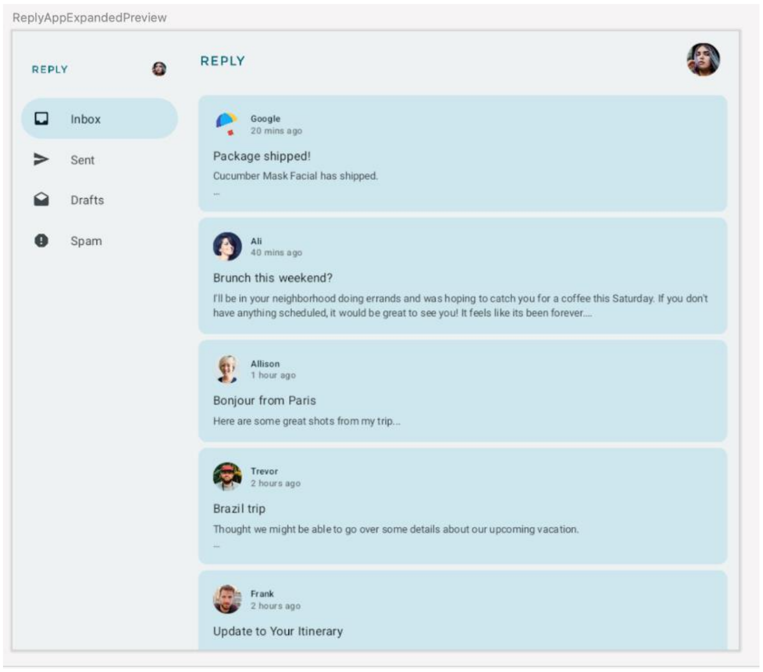
Google
20 mins ago
Package shipped!
Cucumber Mask Facial has shipped.
...

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels lik...

Allison
1 hour ago
Bonjour from Paris
Here are some great shots from my trip...

Trevor
2 hours ago
Brazil trip
Thought we might be able to go over some details about our upcoming vacation.
...

Frank
2 hours ago
Update to Your Itinerary


ReplyAppExpandedPreview

REPLY

Inbox
Sent
Drafts
Spam

REPLY

Google
20 mins ago
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...

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels like its been forever...

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1 hour ago
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2 hours ago
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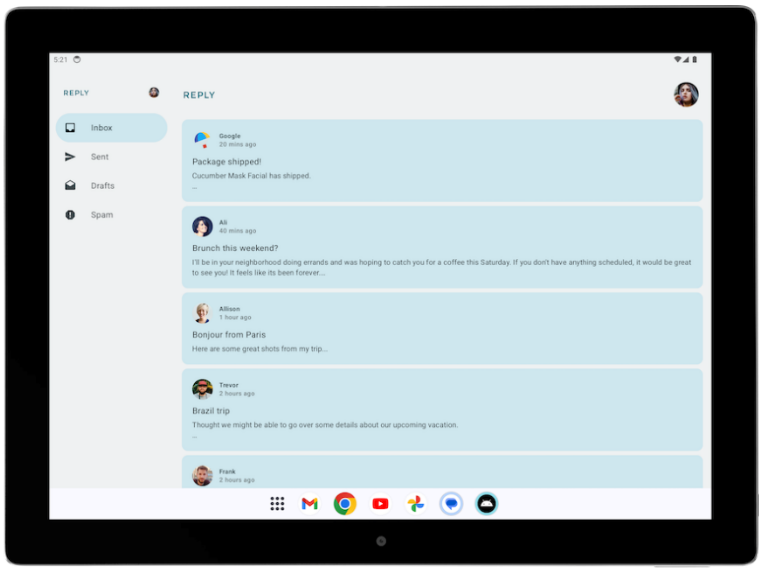
3. Implement adaptive content layout

Introduction to list-detail view

You may notice that in the expanded screens, the content looks stretched out and doesn't make good use of the available screen real estate.



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Frank
2 hours ago

You can improve this layout by applying one of the canonical layouts (https://m3.material.io/foundations/adaptive-design/canonical-layouts). Canonical layouts are large screen compositions that serve as starting points for design and implementation. You can use the three available layouts to guide how you organize common elements in an app, list-view, supporting panel, and feed. Each layout considers common use cases and components to address expectations and user needs for how apps adapt across screen sizes and breakpoints.

For the Reply app, let's implement the *list-detail view*, as it is best for browsing content and quickly seeing details. With a list-detail view layout, you'll create another pane next to the email list screen to display the email details. This layout allows you to use the available screen to show more information to the user and make your app more productive.

Implement list-detail view

To implement a list-detail view for expanded screens, complete the following steps:

1. To represent different types of content layout, on `WindowStateUtils.kt`, create a new `Enum` class for different content types. Use the `LIST_AND_DETAIL` value for when the expanded screen is in use and `LIST_ONLY` otherwise.

WindowStateUtils.kt

```
enum class ReplyContentType {
    LIST_ONLY, LIST_AND_DETAIL
}
```

2. Declare the `contentType` variable on `ReplyApp.kt` and assign the appropriate `contentType` for various window sizes to help determine the appropriate content type selection, depending on the screen size.

ReplyApp.kt

```
import com.example.reply.ui.utils.ReplyContentType

    val navigationType: ReplyNavigationType
    val contentType: ReplyContentType

    when (windowSize) {
        WindowWidthSizeClass.Compact -> {
            ...
            contentType = ReplyContentType.LIST_ONLY
        }
        WindowWidthSizeClass.Medium -> {
            ...
            contentType = ReplyContentType.LIST_ONLY
        }
        WindowWidthSizeClass.Expanded -> {
            ...
            contentType = ReplyContentType.LIST_AND_DETAIL
        }
        else -> {
            ...
            contentType = ReplyContentType.LIST_ONLY
        }
    }
```

Next, you can use the `contentType` value to create different branching for layouts in the `ReplyAppContent` composable.

3. In `ReplyHomeScreen.kt`, add `contentType` as the parameter to the `ReplyHomeScreen` composable.

ReplyHomeScreen.kt

```
@OptIn(ExperimentalMaterial3Api::class)
@Composable
fun ReplyHomeScreen(
    navigationType: ReplyNavigationType,
    contentType: ReplyContentType,
    replyUiState: ReplyUiState,
    onTabPressed: (MailboxType) -> Unit,
    onEmailCardPressed: (Email) -> Unit,
    onDetailScreenBackPressed: () -> Unit,
    modifier: Modifier = Modifier
) {
```

4. Pass the `contentType` value to the `ReplyHomeScreen` composable.

ReplyApp.kt

```
    ReplyHomeScreen(
        navigationType = navigationType,
        contentType = contentType,
        replyUiState = replyUiState,
        onTabPressed = { mailboxType: MailboxType ->
            viewModel.updateCurrentMailbox(mailboxType =
mailboxType)
            viewModel.resetHomeScreenStates()
        },
        onEmailCardPressed = { email: Email ->
            viewModel.updateDetailsScreenStates(
                email = email
            )
        },
        onDetailScreenBackPressed = {
            viewModel.resetHomeScreenStates()
        },
        modifier = modifier
    )
```

5. Add the `contentType` as a parameter for the `ReplyAppContent` composable.

ReplyHomeScreen.kt

```
@Composable
private fun ReplyAppContent(
    navigationType: ReplyNavigationType,
    contentType: ReplyContentType,
    replyUiState: ReplyUiState,
    onTabPressed: ((MailboxType) -> Unit),
    onEmailCardPressed: (Email) -> Unit,
    navigationItemContentList: List<NavigationItemContent>,
    modifier: Modifier = Modifier
) {
```

6. Pass the `contentType` value to the two `ReplyAppContent` composables.

ReplyHomeScreen.kt

```
            ReplyAppContent(
                navigationType = navigationType,
                contentType = contentType,
                replyUiState = replyUiState,
                onTabPressed = onTabPressed,
                onEmailCardPressed = onEmailCardPressed,
                navigationItemContentList =
navigationItemContentList,
                modifier = modifier
            )
        }
    } else {
        if (replyUiState.isShowingHomepage) {
            ReplyAppContent(
                navigationType = navigationType,
                contentType = contentType,
                replyUiState = replyUiState,
                onTabPressed = onTabPressed,
                onEmailCardPressed = onEmailCardPressed,
                navigationItemContentList =
navigationItemContentList,
                modifier = modifier
            )
        } else {
            ReplyDetailsScreen(
                replyUiState = replyUiState,
                isFullScreen = true,
                onBackButtonClicked =
onDetailScreenBackPressed,
                modifier = modifier
            )
        }
    }
```

Let's display either the full list and detail screen when the `contentType` is `LIST_AND_DETAIL` or the list only email content when the `contentType` is `LIST_ONLY`.

7. In `ReplyHomeScreen.kt`, add an `if/else` statement on the `ReplyAppContent` composable to display the `ReplyListAndDetailContent` composable when the `contentType` value is `LIST_AND_DETAIL` and display the `ReplyListOnlyContent` composable on the `else` branch.

ReplyHomeScreen.kt

```
        Column(
            modifier = modifier
                .fillMaxSize()
                .background(MaterialTheme.colorScheme.inverseO
nSurface)
        ) {
            if (contentType ==
ReplyContentType.LIST_AND_DETAIL) {
```

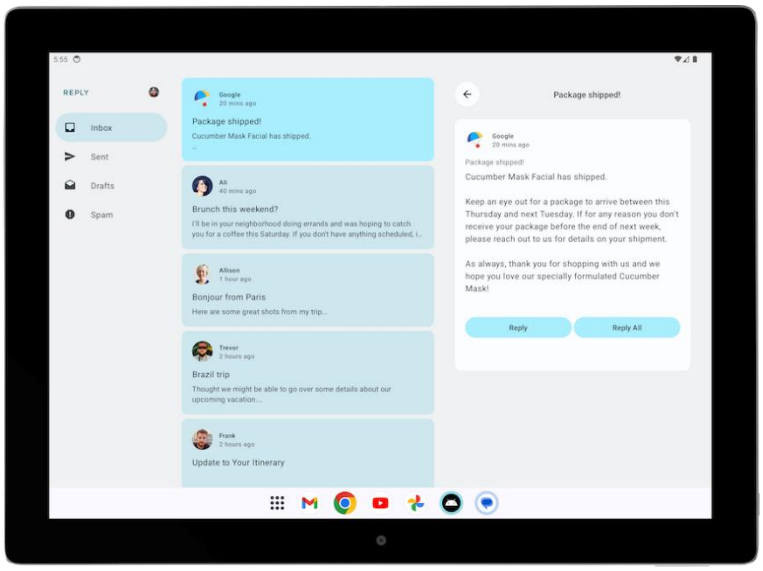
```
                ReplyListAndDetailContent(
                    replyUiState = replyUiState,
                    onEmailCardPressed = onEmailCardPressed,
                    modifier = Modifier.weight(1f)
                )
            } else {
                ReplyListOnlyContent(
                    replyUiState = replyUiState,
                    onEmailCardPressed = onEmailCardPressed,
                    modifier = Modifier.weight(1f)
                        .padding(
                            horizontal =
dimensionResource(R.dimen.email_list_only_horizontal_padding)
                        )
                )
            }
            AnimatedVisibility(visible = navigationType ==
ReplyNavigationType.BOTTOM_NAVIGATION) {
                ReplyBottomNavigationBar(
                    currentTab = replyUiState.currentMailbox,
                    onTabPressed = onTabPressed,
                    navigationItemContentList =
navigationItemContentList
                )
            }
        }
```

8. Remove the `replyUiState.isShowingHomepage` condition to show a permanent navigation drawer, as the user doesn't need to navigate to the details view if they are using the expanded view.

ReplyHomeScreen.kt

```
    if (navigationType ==
ReplyNavigationType.PERMANENT_NAVIGATION_DRAWER) {
        PermanentNavigationDrawer(
            drawerContent = {
                PermanentDrawerSheet(Modifier.width(dimensionR
esource(R.dimen.drawer_width))) {
                    NavigationDrawerContent(
                        selectedDestination =
replyUiState.currentMailbox,
                        onTabPressed = onTabPressed,
                        navigationItemContentList =
navigationItemContentList,
                        modifier = Modifier
                            .wrapContentWidth()
                            .fillMaxHeight()
                            .background(MaterialTheme.colorSch
eme.inverseOnSurface)
                                  .padding(dimensionResource(R.dimen
.drawer_padding_content))
                        )
                   }
              }
         ) {
```

9. Run your app on the tablet mode to see the screen below:



Google
20 mins ago
Package shipped!
Cucumber Mask Facial has shipped.
...

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, i...

Allison
1 hour ago
Bonjour from Paris
Here are some great shots from my trip...

Trevor
2 hours ago
Brazil trip
Thought we might be able to go over some details about our upcoming vacation...

Frank
2 hours ago
Update to Your Itinerary

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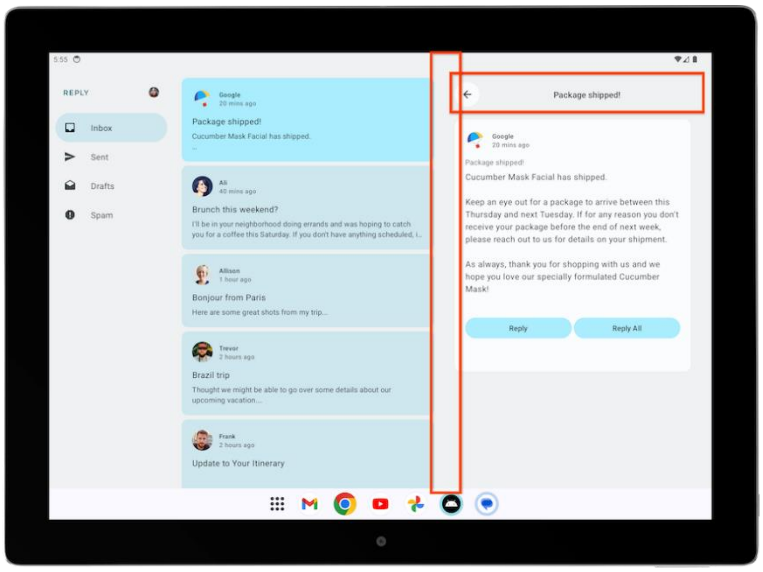
As always, thank you for shopping with us and we hope you love our specially formulated Cucumber Mask!

Improve UI elements for list-detail view

Currently, your app displays a details pane on the home screen for the expanded screens.



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However, the screen contains extraneous elements, such as the back button, the subject header, and additional paddings, as it was designed for a standalone details screen. You can improve this next with a simple adjustment.

To improve the details screen for expanded view, complete the following steps:

10. In `ReplyDetailsScreen.kt`, add an `isFullScreen` variable as a `Boolean` parameter to the `ReplyDetailsScreen` composable.

This addition lets you differentiate the composable when you use it as a standalone and when you use it inside the home screen.

ReplyDetailsScreen.kt

```
@Composable
fun ReplyDetailsScreen(
    replyUiState: ReplyUiState,
    onBackPressed: () -> Unit,
    modifier: Modifier = Modifier,
    isFullScreen: Boolean = false
) {
```

11. Inside the `ReplyDetailsScreen` composable, wrap the `ReplyDetailsScreenTopBar` composable with an if statement so that it only displays when the app is full screen.

ReplyDetailsScreen.kt

```
    LazyColumn(
        modifier = modifier
            .fillMaxSize()
            .background(color =
MaterialTheme.colorScheme.inverseOnSurface)
            .padding(top =
dimensionResource(R.dimen.detail_card_list_padding_top))
    ) {
        item {
            if (isFullScreen) {
                ReplyDetailsScreenTopBar(
                    onBackPressed,
                    replyUiState,
                    Modifier
                        .fillMaxWidth()
                        .padding(bottom =
dimensionResource(R.dimen.detail_topbar_padding_bottom))
                    )
                )
            }
```

You can now add padding. Padding required for the `ReplyEmailDetailsCard` composable differs depending on whether or not you use it as a full screen. When you use `ReplyEmailDetailsCard` with other composables in the expanded screen, there's additional padding from other composables.

12. Pass the `isFullScreen` value to the `ReplyEmailDetailsCard` composable. Pass a modifier with a horizontal padding of `R.dimen.detail_card_outer_padding_horizontal` if the screen is fullscreen and pass a modifier with an end padding of `R.dimen.detail_card_outer_padding_horizontal` otherwise.

ReplyDetailsScreen.kt

```
        item {
            if (isFullScreen) {
                ReplyDetailsScreenTopBar(
                    onBackPressed,
                    replyUiState,
                    Modifier
                        .fillMaxWidth()
                        .padding(bottom =
dimensionResource(R.dimen.detail_topbar_padding_bottom))
                    )
                )
            }
            ReplyEmailDetailsCard(
                email = replyUiState.currentSelectedEmail,
                mailboxType = replyUiState.currentMailbox,
                isFullScreen = isFullScreen,
                modifier = if (isFullScreen) {
                    Modifier.padding(horizontal =
dimensionResource(R.dimen.detail_card_outer_padding_horizontal
))
                } else {
                    Modifier.padding(end =
dimensionResource(R.dimen.detail_card_outer_padding_horizontal
))
                }
            )
        }
```

13. Add an `isFullScreen` value as a parameter to the `ReplyEmailDetailsCard` composable.

ReplyDetailsScreen.kt

```
@OptIn(ExperimentalMaterial3Api::class)
@Composable
private fun ReplyEmailDetailsCard(
    email: Email,
    mailboxType: MailboxType,
    modifier: Modifier = Modifier,
    isFullScreen: Boolean = false
) {
```

14. Inside the `ReplyEmailDetailsCard` composable, only show the email subject text when the app is not in full screen, as the full screen layout already displays the email subject as the header. If it is full screen, add a spacer with height of `R.dimen.detail_content_padding_top`.

ReplyDetailsScreen.kt

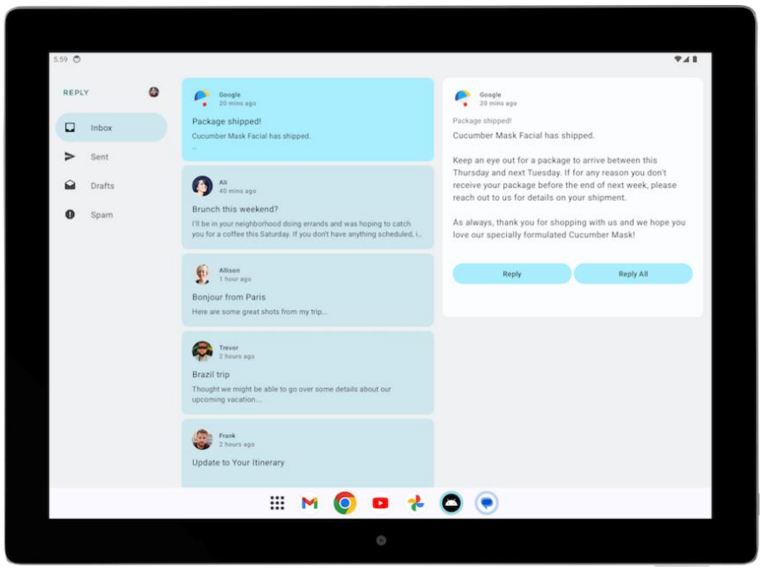
```
Column(
    modifier = Modifier
        .fillMaxWidth()
        .padding(dimensionResource(R.dimen.detail_card_inner_p
adding))
) {
    DetailsScreenHeader(
        email,
        Modifier.fillMaxWidth()
    )
    if (isFullScreen) {
        Spacer(modifier =
Modifier.height(dimensionResource(R.dimen.detail_content_paddi
ng_top)))
    } else {
        Text(
            text = stringResource(email.subject),
            style = MaterialTheme.typography.bodyMedium,
            color = MaterialTheme.colorScheme.outline,
            modifier = Modifier.padding(
                top =
dimensionResource(R.dimen.detail_content_padding_top),
                bottom =
dimensionResource(R.dimen.detail_expanded_subject_body_spacing
)
            ),
        )
    }
    Text(
        text = stringResource(email.body),
        style = MaterialTheme.typography.bodyLarge,
        color = MaterialTheme.colorScheme.onSurfaceVariant,
    )
    DetailsScreenButtonBar(mailboxType, displayToast)
}
```

15. In `ReplyHomeScreen.kt`, inside the `ReplyHomeScreen` composable, pass a `true` value for the `isFullScreen` parameter when creating the `ReplyDetailsScreen` composable as a standalone.

ReplyHomeScreen.kt

```
        } else {
            ReplyDetailsScreen(
                replyUiState = replyUiState,
                isFullScreen = true,
                onBackPressed = onDetailScreenBackPressed,
                modifier = modifier
            )
        }
```

16. Run the app on the tablet mode and see the following layout:



Google
20 mins ago
Package shipped!
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...

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, i...

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1 hour ago
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Adjust back handling for list-detail view

With the expanded screens, you do not need to navigate to the `ReplyDetailsScreen` at all. Instead, you want the app to close when the user selects the back button. As such, we should adjust the back handler.

Modify the back handler by passing the `activity.finish()` function as the `onBackPressed` parameter of the `ReplyDetailsScreen` composable inside the `ReplyListAndDetailContent` composable.

ReplyHomeContent.kt

```
import android.app.Activity
import androidx.compose.ui.platform.LocalContext
        val activity = LocalContext.current as Activity
        ReplyDetailsScreen(
            replyUiState = replyUiState,
            modifier = Modifier.weight(1f),
            onBackPressed = { activity.finish() }
        )
```

4. Verify for different screen sizes

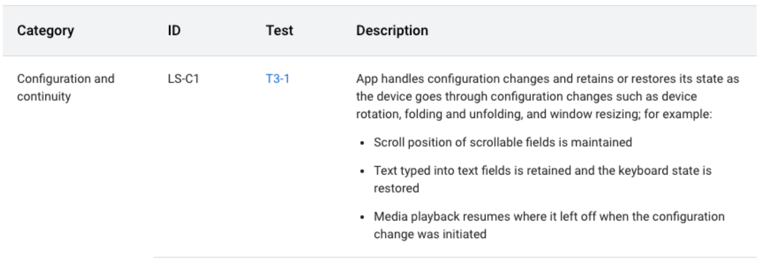
Large screen app quality guideline

To build a great and consistent experience for Android users, it is important to build and test your app with quality in mind. You can refer to the Core app quality guidelines (https://developer.android.com/docs/quality-guidelines/core-app-quality) to determine how to improve your app quality.

To build a great quality app for all form factors, review the Large screen app quality (https://developer.android.com/docs/quality-guidelines/large-screen-app-quality) guidelines. Your app must also meet the Tier 3 - Large screen ready requirements (https://developer.android.com/docs/quality-guidelines/large-screen-app-quality#large_screen_ready).

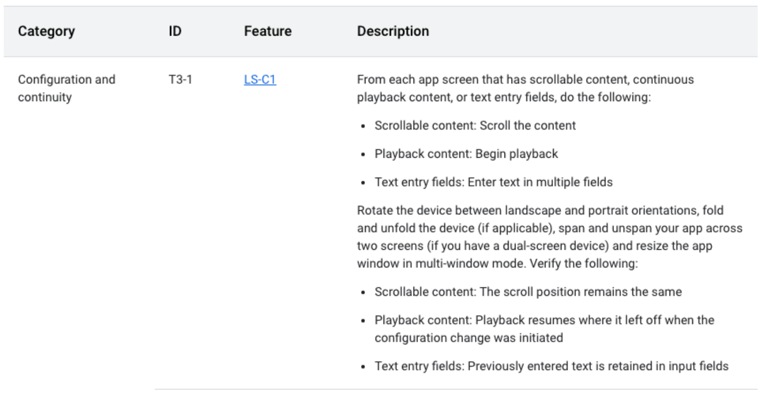
Manually test your app for large screen readiness

The app quality guidelines provide test device recommendations and procedures to check your app quality. Let's take a look at a test example relevant to the Reply app.



Category	ID	Test	Description
Configuration and continuity	LS-C1	T3-1	App handles configuration changes and retains or restores its state as the device goes through configuration changes such as device rotation, folding and unfolding, and window resizing; for example: • Scroll position of scrollable fields is maintained • Text typed into text fields is retained and the keyboard state is restored • Media playback resumes where it left off when the configuration change was initiated

The above app quality guideline requires the app to retain or restore its state after configuration changes. The guideline also provides instructions about how to test apps, as shown in the following figure:

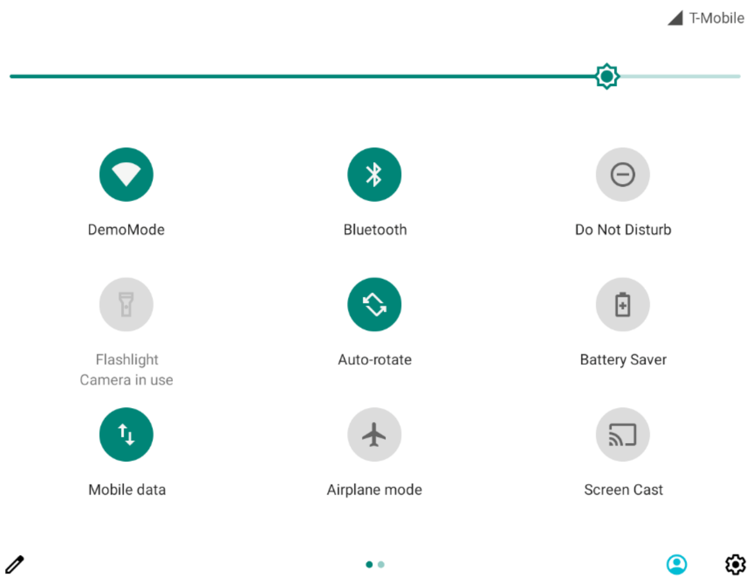


Category	ID	Feature	Description
Configuration and continuity	T3-1	LS-C1	From each app screen that has scrollable content, continuous playback content, or text entry fields, do the following: • Scrollable content: Scroll the content • Playback content: Begin playback • Text entry fields: Enter text in multiple fields Rotate the device between landscape and portrait orientations, fold and unfold the device (if applicable), span and unspan your app across two screens (if you have a dual-screen device) and resize the app window in multi-window mode. Verify the following: • Scrollable content: The scroll position remains the same • Playback content: Playback resumes where it left off when the configuration change was initiated • Text entry fields: Previously entered text is retained in input fields

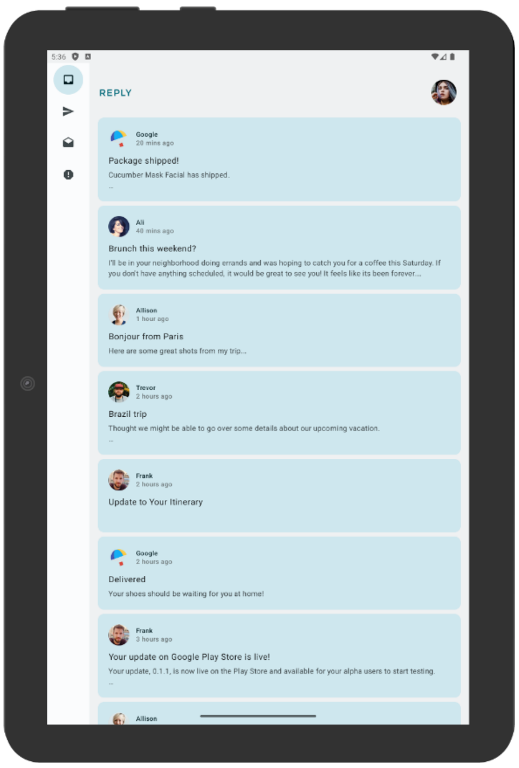
To manually test the Reply app for configuration continuity, complete the following steps:

1. Run the Reply app on a medium-sized device or, if you are using the resizable emulator, in unfolded foldable mode.

2. Ensure that **Auto rotate** on the emulator is set to on.



3. Scroll down the email list.



Google
20 mins ago
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--

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels like its been forever....

Allison
1 hour ago
Bonjour from Paris
Here are some great shots from my trip...

Trevor
2 hours ago
Brazil trip
Thought we might be able to go over some details about our upcoming vacation.
--

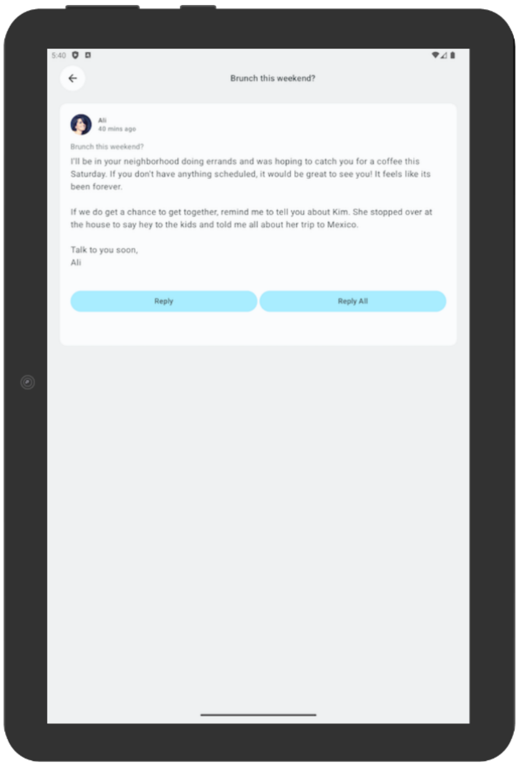
Frank
2 hours ago
Update to Your Itinerary

Google
2 hours ago
Delivered
Your shoes should be waiting for you at home!

Frank
3 hours ago
Your update on Google Play Store is live!
Your update, 0.1.1, is now live on the Play Store and available for your alpha users to start testing.
--

Allison

4. Click on an email card. For example, open the email from **Ali**.



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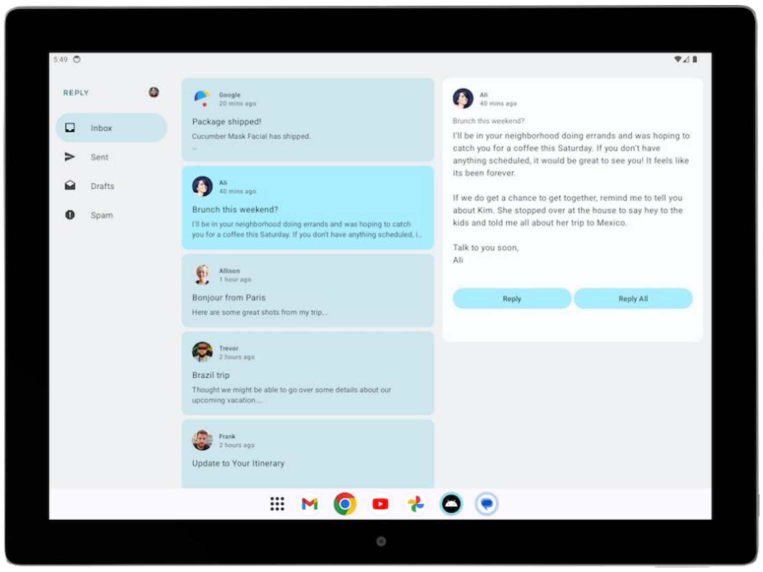
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels like its been forever.

If we do get a chance to get together, remind me to tell you about Kim. She stopped over at the house to say hey to the kids and told me all about her trip to Mexico.

Talk to you soon,
Ali

5. Rotate the device to check that the selected email is still consistent with the email selected in portrait orientation. In this example, an email from Ali is still shown.



Google
20 mins ago
Package shipped!
Cucumber Mask Facial has shipped.
...

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, i...

Allison
1 hour ago
Bonjour from Paris
Here are some great shots from my trip...

Trevor
2 hours ago
Brazil trip
Thought we might be able to go over some details about our upcoming vacation...

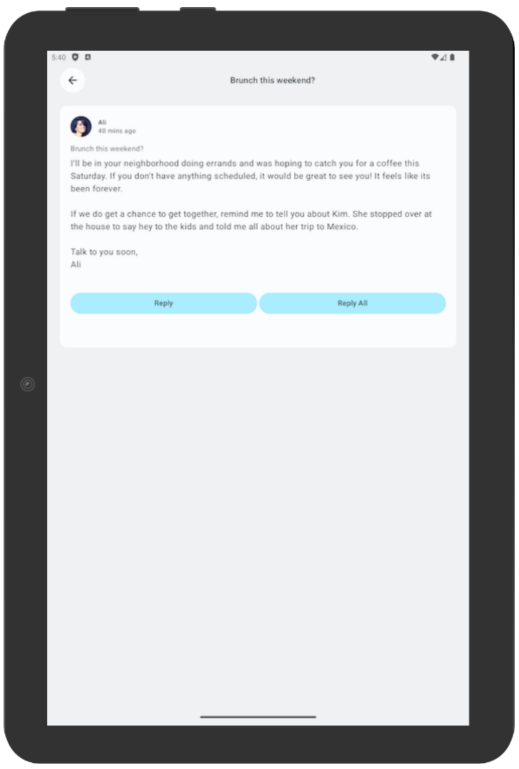
Frank
2 hours ago
Update to Your Itinerary

Ali
40 mins ago
Brunch this weekend?
I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels like its been forever.

If we do get a chance to get together, remind me to tell you about Kim. She stopped over at the house to say hey to the kids and told me all about her trip to Mexico.

Talk to you soon,
Ali

6. Rotate back to portrait orientation to check that the app still displays the same email.



Ali
40 mins ago

Brunch this weekend?

I'll be in your neighborhood doing errands and was hoping to catch you for a coffee this Saturday. If you don't have anything scheduled, it would be great to see you! It feels like its been forever.

If we do get a chance to get together, remind me to tell you about Kim. She stopped over at the house to say hey to the kids and told me all about her trip to Mexico.

Talk to you soon,
Ali

5. Add automated test for adaptive apps

Configure test for the compact screen size

In the Test the Cupcake App codelab, you learned to create UI tests. Now let's learn how to create specific tests for different screen sizes.

In the Reply app, you use different navigation elements for different screen sizes. For example, you expect to see a permanent navigation drawer when the user sees the expanded screen. It is useful to create tests to verify the existence of various navigation elements, such as the bottom navigation, navigation rail, and navigation drawer for different screen sizes.

To create a test to verify the existence of a bottom navigation element in a compact screen, complete the following steps:

1. In the test directory, create a new Kotlin class called `ReplyAppTest.kt`.
2. In `ReplyAppTest` class, create a test rule using `createAndroidComposeRule` and passing `ComponentActivity` as the type parameter. `ComponentActivity` is used to access an empty activity instead of the `MainActivity`.

ReplyAppTest.kt

```
class ReplyAppTest {

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

To differentiate between navigation elements in the screens, add a `testTag` in the `ReplyBottomNavigationBar` composable.

3. Define a string resource for **Navigation Bottom**.

strings.xml

```
<resources>
    <string name="navigation_bottom">Navigation
Bottom</string>
</resources>
```

4. Add the string name as the `testTag` argument for the `Modifier`'s `testTag` method in the `ReplyBottomNavigationBar` composable.

ReplyHomeScreen.kt

```
val bottomNavigationContentDescription =
stringResource(R.string.navigation_bottom)
ReplyBottomNavigationBar(
    ...
    modifier = Modifier
        .fillMaxWidth()
        .testTag(bottomNavigationContentDescription)
)
```

5. In the `ReplyAppTest` class, create a test function to test for a compact size screen. Set the content of the `composeTestRule` with the `ReplyApp` composable and pass the `WindowWidthSizeClass.Compact` as the `windowSize` argument.

Note: Adding a composable that accepts `WindowWidthSizeClass` as an argument is a good practice to make testable code.

ReplyAppTest.kt

```
    @Test
    fun compactDevice_verifyUsingBottomNavigation() {
        // Set up compact window
        composeTestRule.setContent {
            ReplyApp(
                windowSize = WindowWidthSizeClass.Compact
            )
        }
    }
```

6. Assert that the bottom navigation element exists with the test tag. Call the extension function `onNodeWithTagForStringId` on the `composeTestRule` and pass the navigation bottom string and call the `assertExists()` method.

ReplyAppTest.kt

```
    @Test
    fun compactDevice_verifyUsingBottomNavigation() {
        // Set up compact window
        composeTestRule.setContent {
            ReplyApp(
                windowSize = WindowWidthSizeClass.Compact
            )
        }
        // Bottom navigation is displayed
        composeTestRule.onNodeWithTagForStringId(
            R.string.navigation_bottom
        ).assertExists()
    }
```

7. Run the test and verify that it passes.

Configure test for the medium and expanded screen sizes

Now that you successfully created a test for the compact screen, let's create corresponding tests for medium and expanded screens.

To create tests to verify the existence of a navigation rail and permanent navigation drawer for medium and expanded screens, complete the following steps:

1. Define a string resource for the Navigation Rail to be used as a test tag later.

strings.xml

```
<resources>
    <string name="navigation_rail">Navigation Rail</string>
</resources>
```

2. Pass the string as the test tag through the `Modifier` in the `PermanentNavigationDrawer` composable.

ReplyHomeScreen.kt

```
    val navigationDrawerContentDescription =
stringResource(R.string.navigation_drawer)
        PermanentNavigationDrawer(
...
modifier =
Modifier.testTag(navigationDrawerContentDescription)
)
```

3. Pass the string as the test tag through the `Modifier` in `ReplyNavigationRail` composable.

ReplyHomeScreen.kt

```
val navigationRailContentDescription =
stringResource(R.string.navigation_rail)
ReplyNavigationRail(
    ...
    modifier = Modifier
        .testTag(navigationRailContentDescription)
)
```

4. Add a test to verify that a navigation rail element exists in the medium screens.

ReplyAppTest.kt

```
@Test
fun mediumDevice_verifyUsingNavigationRail() {
    // Set up medium window
    composeTestRule.setContent {
        ReplyApp(
            windowSize = WindowWidthSizeClass.Medium
        )
    }
    // Navigation rail is displayed
    composeTestRule.onNodeWithTagForStringId(
        R.string.navigation_rail
    ).assertExists()
}
```

5. Add a test to verify that a navigation drawer element exists in the expanded screens.

ReplyAppTest.kt

```
@Test
fun expandedDevice_verifyUsingNavigationDrawer() {
    // Set up expanded window
    composeTestRule.setContent {
        ReplyApp(
            windowSize = WindowWidthSizeClass.Expanded
        )
    }
    // Navigation drawer is displayed
    composeTestRule.onNodeWithTagForStringId(
        R.string.navigation_drawer
    ).assertExists()
}
```

6. Use a tablet emulator or a resizable emulator in Tablet mode to run the test.
7. Run all the tests and verify that they pass.

Test for a configuration change in a compact screen

A configuration change is a common occurrence that happens in your app lifecycle. For example, when you change orientation from portrait to landscape, a configuration change occurs. When a configuration change occurs, it is important to test that your app retains its state. Next, you'll create tests, which simulate a configuration change, to test that your app retains its state in a compact screen.

To test for a configuration change in the compact screen:

1. In the test directory, create a new Kotlin class called `ReplyAppStateRestorationTest.kt`.
2. In the `ReplyAppStateRestorationTest` class, create a test rule using `createAndroidComposeRule` and passing `ComponentActivity` as the type parameter.

ReplyAppStateRestorationTest.kt

```
class ReplyAppStateRestorationTest {

    /**
     * Note: To access to an empty activity, the code uses
ComponentActivity instead of
     * MainActivity.
     */
    @get:Rule
    val composeTestRule =
createAndroidComposeRule<ComponentActivity>()
}
```

3. Create a test function to verify that an email is still selected in the compact screen after a configuration change.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {

}
```

To test for a configuration change, you need to use `StateRestorationTester`.

4. Setup `stateRestorationTester` by passing the `composeTestRule` as an argument to `StateRestorationTester`.
5. Use `setContent()` with the `ReplyApp` composable and pass the `WindowWidthSizeClass.Compact` as the `windowSize` argument.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    // Setup compact window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Compact) }

}
```

6. Verify that a third email is displayed in the app. Use the `assertIsDisplayed()` method on the `composeTestRule`, which looks for the text of the third email.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    // Setup compact window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Compact) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertIsDisplayed()
}
```

7. Navigate to the email's details screen by clicking on the email subject. Use the `performClick()` method to navigate.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    // Setup compact window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Compact) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertIsDisplayed()

    // Open detailed page
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
    ).performClick()
}
```

8. Verify that the third email is displayed in the details screen. Assert the existence of the back button to confirm that the app is in the details screen, and verify that the third email's text is displayed.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    ...
    // Open detailed page
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
    ).performClick()

    // Verify that it shows the detailed screen for the
correct email
    composeTestRule.onNodeWithContentDescriptionForStringId(
        R.string.navigation_back
    ).assertExists()
    composeTestRule.onNodeWithText(
}
```

9. Simulate a config change using `stateRestorationTester.emulateSavedInstanceStateRestore()`.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    ...
    // Verify that it shows the detailed screen for the
correct email
    composeTestRule.onNodeWithContentDescriptionForStringId(
        R.string.navigation_back
    ).assertExists()
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertExists()

    // Simulate a config change
    stateRestorationTester.emulateSavedInstanceStateRestore()
}
```

10. Verify again that the third email is displayed in the details screen. Assert the existence of the back button to confirm that the app is in the details screen, and verify that the third email's text is displayed.

ReplyAppStateRestorationTest.kt

```
@Test
fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
    // Setup compact window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Compact) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertIsDisplayed()

    // Open detailed page
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
```

```
    ).performClick()

    // Verify that it shows the detailed screen for the
correct email
    composeTestRule.onNodeWithContentDescriptionForStringId(
        R.string.navigation_back
    ).assertExists()
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertExists()

    // Simulate a config change
    stateRestorationTester.emulateSavedInstanceStateRestore()

    // Verify that it still shows the detailed screen for the
same email
    composeTestRule.onNodeWithContentDescriptionForStringId(
        R.string.navigation_back
    ).assertExists()
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertExists()
}
```

11. Run the test with a phone emulator or resizable emulator in Phone mode.
12. Verify that the test passes.

Test for a configuration change in the expanded screen

To test for a configuration change in the expanded screen by simulating a configuration change and passing the appropriate `WindowWidthSizeClass`, complete the following steps:

1. Create a test function to verify that an email is still selected in the details screen after a configuration change.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{

}
```

To test for a configuration change, you need to use `StateRestorationTester`.

2. Setup `stateRestorationTester` by passing the `composeTestRule` as an argument to `StateRestorationTester`.
3. Use `setContent()` with the `ReplyApp` composable and pass `WindowWidthSizeClass.Expanded` as the `windowSize` argument.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    // Setup expanded window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Expanded) }
}
```

4. Verify that a third email is displayed in the app. Use the `assertIsDisplayed()` method on the `composeTestRule`, which looks for the text of the third email.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    // Setup expanded window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Expanded) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertIsDisplayed()
}
```

5. Select the third email on the details screen. Use the `performClick()` method to select the email.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    // Setup expanded window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Expanded) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
    ).assertIsDisplayed()

    // Select third email
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
    ).performClick()
    ...
}
```

6. Verify that the details screen displays the third email by using the `testTag` on the details screen and looking for text on its children. This approach makes sure that you can find the text in the details section and not in the email list.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    ...
    // Select third email
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
    ).performClick()

    // Verify that third email is displayed on the details
screen
    composeTestRule.onNodeWithTagForStringId(R.string.details_
screen).onChildren()
        .assertAny(hasAnyDescendant(hasText(
            composeTestRule.activity.getString(LocalEmailsData
Provider.allEmails[2].body)))
        )
...
}
```

7. Simulate a configuration change using `stateRestorationTester.emulateSavedInstanceStateRestore()`.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    ...
    // Verify that third email is displayed on the details
screen
    composeTestRule.onNodeWithTagForStringId(R.string.details_
screen).onChildren()
        .assertAny(hasAnyDescendant(hasText(
            composeTestRule.activity.getString(LocalEmailsData
Provider.allEmails[2].body)))
        )

    // Simulate a config change
    stateRestorationTester.emulateSavedInstanceStateRestore()
    ...
}
```

8. Verify again that the details screen displays the third email after a configuration change.

ReplyAppStateRestorationTest.kt

```
@Test
fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
    // Setup expanded window
    val stateRestorationTester =
StateRestorationTester(composeTestRule)
    stateRestorationTester.setContent { ReplyApp(windowSize =
WindowWidthSizeClass.Expanded) }

    // Given third email is displayed
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].body)
```

```
    ).assertIsDisplayed()

    // Select third email
    composeTestRule.onNodeWithText(
        composeTestRule.activity.getString(LocalEmailsDataProv
ider.allEmails[2].subject)
    ).performClick()

    // Verify that third email is displayed on the details
screen
    composeTestRule.onNodeWithTagForStringId(R.string.details_
screen).onChildren()
        .assertAny(hasAnyDescendant(hasText(
            composeTestRule.activity.getString(LocalEmailsData
Provider.allEmails[2].body)))
        )

    // Simulate a config change
    stateRestorationTester.emulateSavedInstanceStateRestore()

    // Verify that third email is still displayed on the
details screen
    composeTestRule.onNodeWithTagForStringId(R.string.details_
screen).onChildren()
        .assertAny(hasAnyDescendant(hasText(
            composeTestRule.activity.getString(LocalEmailsData
Provider.allEmails[2].body)))
        )
}
```

9. Run the test with a tablet emulator or resizable emulator in Tablet mode.
10. Verify that the test passes.

Use annotations to group test for different screen sizes

You might realize from the previous tests that some tests fail when they are run on devices with an incompatible screen size. While you can run the test one by one using an appropriate device, this approach might not scale when you have many test cases.

To solve this problem, you can create annotations to denote the screen sizes that the test can run on, and configure the annotated test for the appropriate devices.

To run a test based on screen sizes, complete the following steps:

1. In the test directory, create `TestAnnotations.kt`, which contains three annotation classes: `TestCompactWidth`, `TestMediumWidth`, `TestExpandedWidth`.

TestAnnotations.kt

```
annotation class TestCompactWidth
annotation class TestMediumWidth
annotation class TestExpandedWidth
```

2. Use the annotations on the test functions for compact tests by putting the `TestCompactWidth` annotation after the test annotation for a compact test in `ReplyAppTest` and `ReplyAppStateRestorationTest`.

ReplyAppTest.kt

```
    @Test
    @TestCompactWidth
    fun compactDevice_verifyUsingBottomNavigation() {
```

ReplyAppStateRestorationTest.kt

```
    @Test
    @TestCompactWidth
    fun
compactDevice_selectedEmailEmailRetained_afterConfigChange() {
```

3. Use the annotations on the test functions for medium tests by putting the `TestMediumWidth` annotation after the test annotation for a medium test in `ReplyAppTest`.

ReplyAppTest.kt

```
    @Test
    @TestMediumWidth
    fun mediumDevice_verifyUsingNavigationRail() {
```

4. Use the annotations on the test functions for expanded tests by putting the `TestExpandedWidth` annotation after the test annotation for an expanded test in `ReplyAppTest` and `ReplyAppStateRestorationTest`.

ReplyAppTest.kt

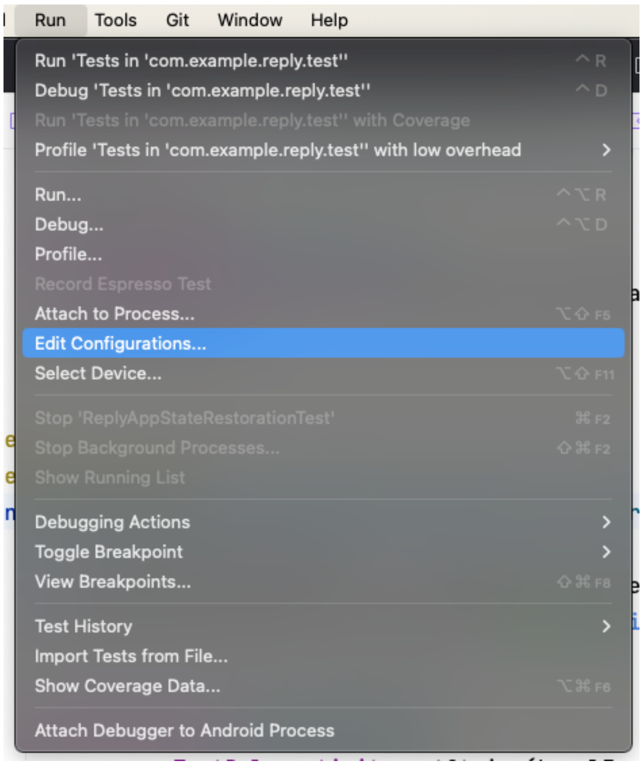
```
    @Test
    @TestExpandedWidth
    fun expandedDevice_verifyUsingNavigationDrawer() {
```

ReplyAppStateRestorationTest.kt

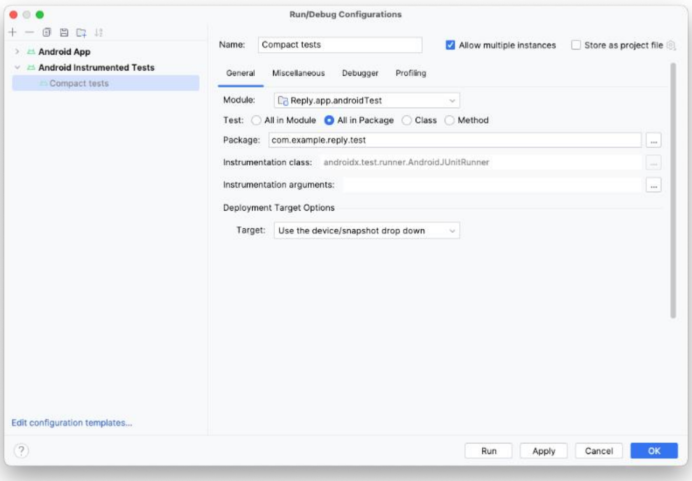
```
    @Test
    @TestExpandedWidth
    fun
expandedDevice_selectedEmailEmailRetained_afterConfigChange()
{
```

To ensure success, configure the test to only run tests that are annotated with `TestCompactWidth`.

5. In the Android Studio, select **Run** > **Edit Configurations...**

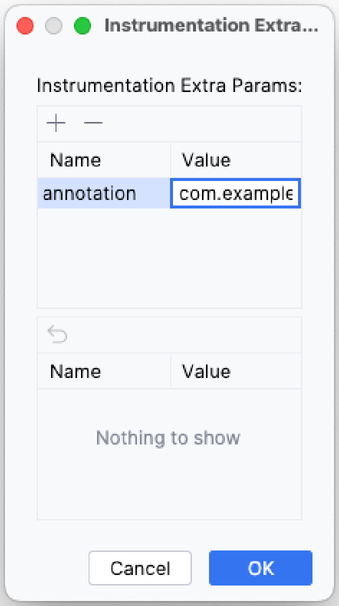

Run
Tools
Git
Window
Help
Run 'Tests in 'com.example.reply.test''
Debug 'Tests in 'com.example.reply.test''
Run 'Tests in 'com.example.reply.test'' with Coverage
Profile 'Tests in 'com.example.reply.test'' with low overhead
Run...
Debug...
Profile...
Record Espresso Test
Attach to Process...
Edit Configurations...
Select Device...
Stop 'ReplyAppStateRestorationTest'
Stop Background Processes...
Show Running List
Debugging Actions
Toggle Breakpoint
View Breakpoints...
Test History
Import Tests from File...
Show Coverage Data...
Attach Debugger to Android Process

6. Rename the test as **Compact tests**, and select to run the test **All in Package**.



Name: Compact tests
[✓] Allow multiple instances
[ ] Store as project file
Module: Reply.app.androidTest
Test: All in Module [✓ All in Package] Class Method
Package: com.example.reply.test
Instrumentation class: androidx.test.runner.AndroidJUnitRunner
Instrumentation arguments:
Deployment Target Options
Target: Use the device/snapshot drop down

7. Click the three dots (...) to the right of the **Instrumentation arguments** field.
8. Click the plus (+) button and add the extra parameters: **annotation** with the value **com.example.reply.test.TestCompactWidth**.

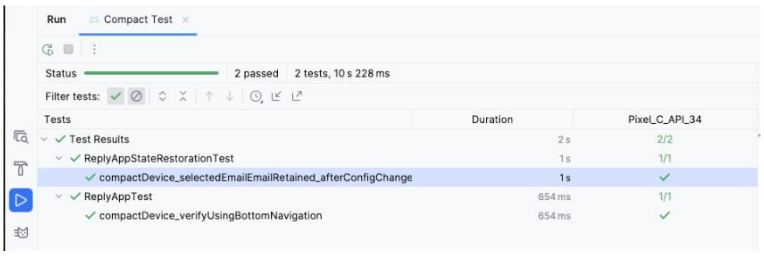


Name	Value
annotation	com.example

Name	Value

Nothing to show

9. Run the tests with a compact emulator.
10. Check that only compact tests were run.



Status 2 passed 2 tests, 10 s 228 ms

Tests	Duration	Pixel_C_API_34
✓ Test Results	2 s	2/2
✓ ReplyAppStateRestorationTest	1 s	1/1
✓ compactDevice_selectedEmailEmailRetained_afterConfigChange	1 s	✓
✓ ReplyAppTest	654 ms	1/1
✓ compactDevice_verifyUsingBottomNavigation	654 ms	✓

11. Repeat the steps for medium and expanded screens.

6. Get the solution code

To download the code for the finished codelab, use the following git command:

```
$ git clone https://github.com/google-developer-
training/basic-android-kotlin-compose-training-reply-app.git
```

Alternatively, you can download the repository as a zip file, unzip it, and open it in Android Studio.

https://github.com/google-developer-training/basic-android-kotlin-compose-training-reply-app/archive/refs/heads/main.zip

Note: The solution code is in the main branch of the downloaded repository.

If you want to see the solution code, view it on GitHub.

https://github.com/google-developer-training/basic-android-kotlin-compose-training-reply-app

7. Conclusion

Congratulations! You made the Reply app adaptive for all screen sizes by implementing an adaptive layout. You also learned to speed up your development using previews and maintaining your app quality using various testing methods.

Don't forget to share your work on social media with #AndroidBasics!

Learn more

Build adaptive layouts	https://developer.android.com/develop/ui/compose/layouts/adaptive/
Support different screen sizes	https://developer.android.com/develop/ui/compose/layouts/adaptive/support-different-screen-sizes
Design for large screens	https://m3.material.io/foundations/adaptive-design/large-screens/layout-anatomy
Jetnews for every screen	https://medium.com/androiddevelopers/jetnews-for-every-screen-4d8e7927752
Multipreview annotations	https://developer.android.com/jetpack/compose/tooling#preview-multipreview