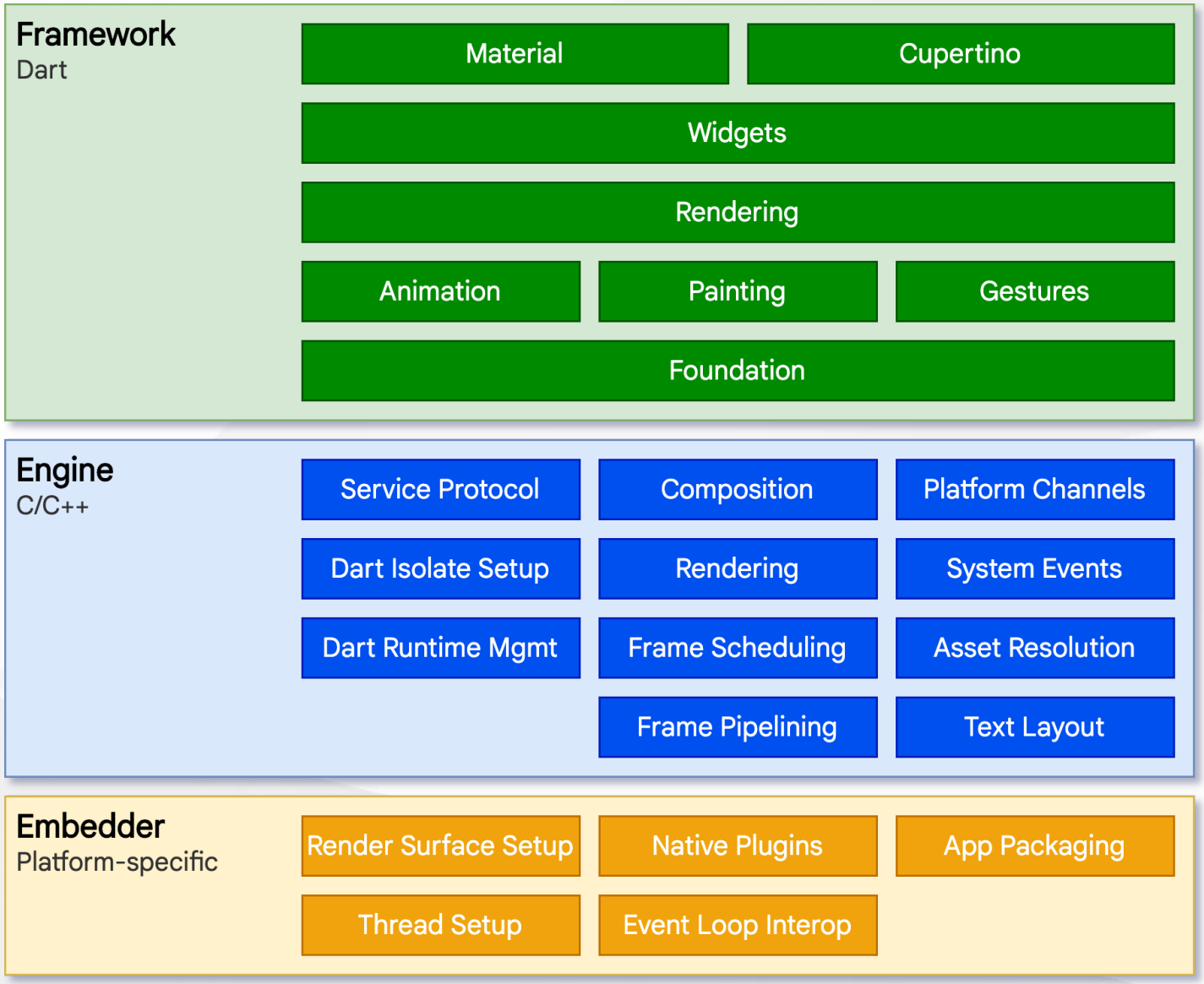
Made by **Google**

1. What is Flutter?

Flutter is `Google's UI toolkit` for building beautiful, natively compiled applications for `mobile`, `web`, `desktop`, and `embedded` devices from a single codebase.

1.1. Architectural layers



https://flutter.dev/docs/resources/architectural-overview

1.2. Get started

Get started now?

https://flutter.dev/docs/get-started/install

Coming from another platform?

Docs:

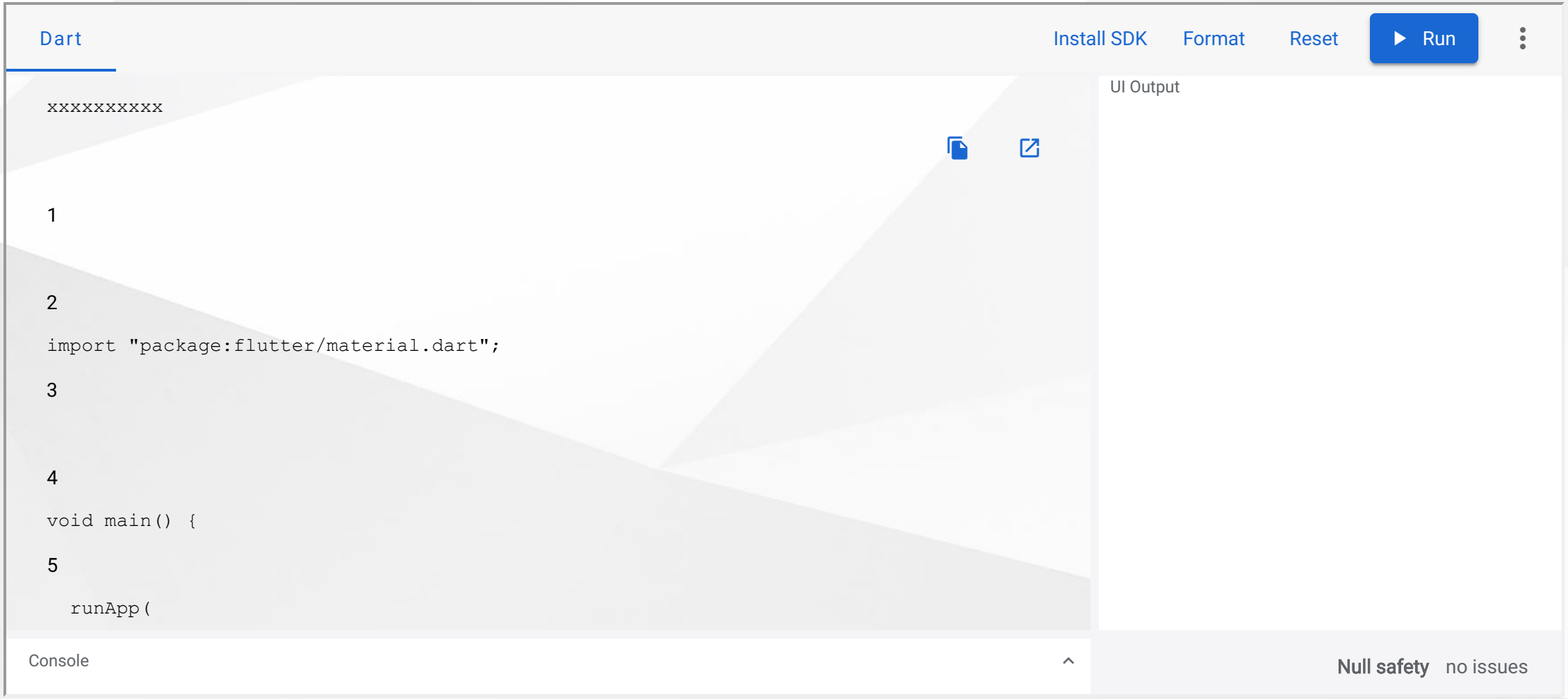
iOS, Android, Web, React Native and Xamarin.

1.3. Try Flutter in your browser

```
import "package:flutter/material.dart";

void main() {
  runApp(
    const Center(
      child: Text(
        "Hello World!!!",
        textDirection: TextDirection.ltr,
      ),
    ),
  );
}
```

1.3. Try Flutter in your browser



https://dartpad.dev/embed-flutter.html?theme=&null_safety=true&id=9677a59dba30af792ba6d129b8a58f63

1.4. Who's using Flutter?

Organizations around the world are building apps with Flutter.

*	*	*
		
		

1.4. Who's using Flutter?

See what's being created:

https://flutter.dev/showcase

2. User Interface

- 2.1. Introduction to widgets
- 2.2. Building layouts
- 2.3. Adding interactivity
- 2.4. Assets & images
- 2.5. Navigation & routing
- 2.6. Animations
- 2.7. Advanced UI
- 2.8. Widget catalog

2.1. Introduction to widgets

- Flutter `Widgets` are inspired by React `Components`
- Rendered by their current configuration (or BuildContext) and state
- When state changes, it rebuilds
- the framework diffs against the previous description in order to determine the minimal changes needed

2.1. Introduction to widgets

- `Everything` is a `Widget`
  - But don’t put everything in one Widget!
- References: https://romain-rastel.medium.com/everything-is-a-widget-but-dont-put-everything-in-a-widget-32f89b5c8bdb

> Everything Should Be Made as Simple as Possible, But Not Simpler

2.1. Introduction to widgets

Basic widgets:

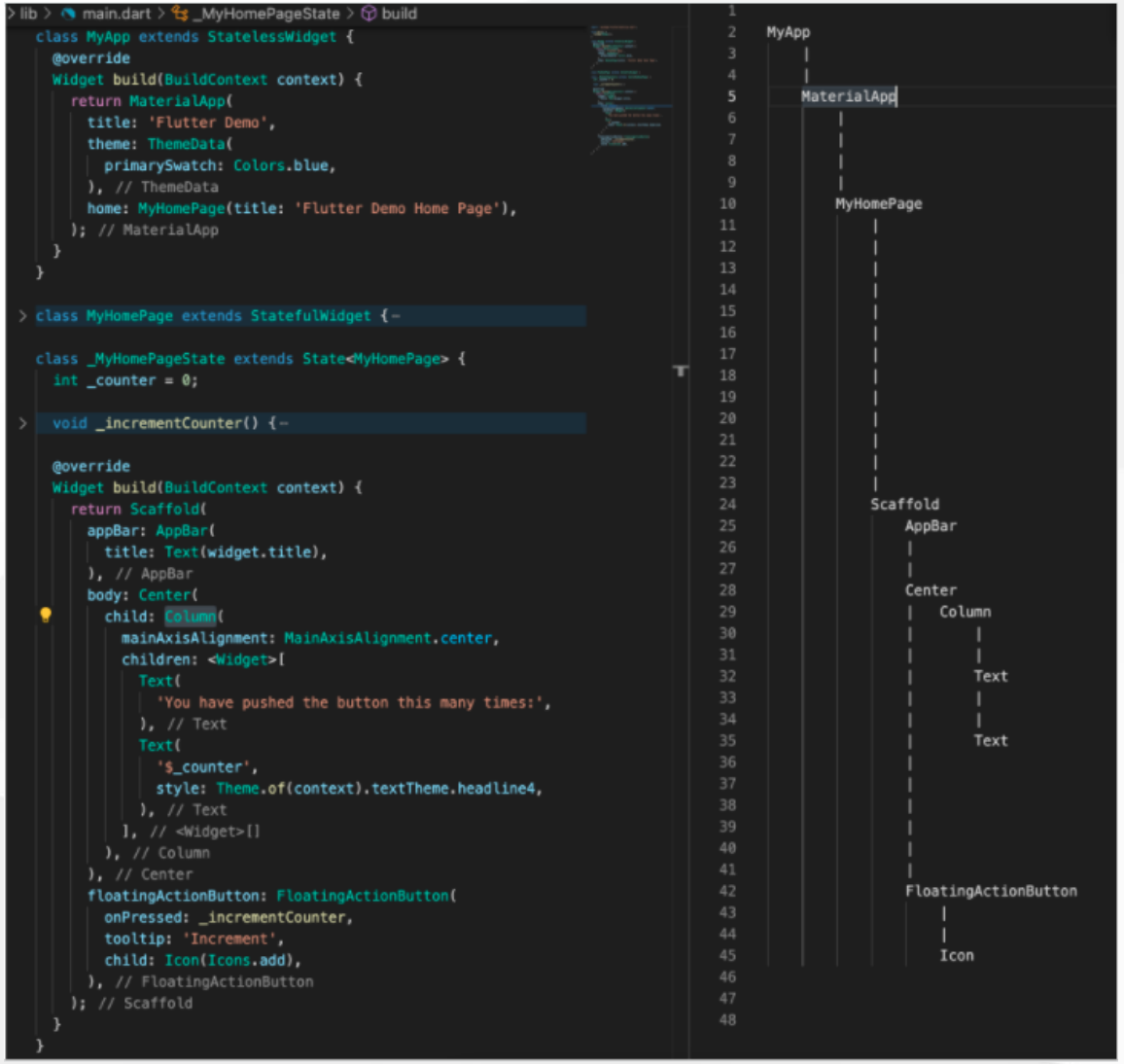
- Text - create a run of styled text within your application.
- Row, Column are flex widgets
- Stack - place widgets on top of each other in paint order.
- Container - create a rectangular visual element, decorated with a background, a border, or a shadow; also have margins, padding, and constraints applied to its size, ...

... more widgets from there: https://api.flutter.dev/flutter/widgets/widgets-library.html

2.1. Introduction to widgets

Notion of Widgets tree

Widgets are organized in tree structure(s).

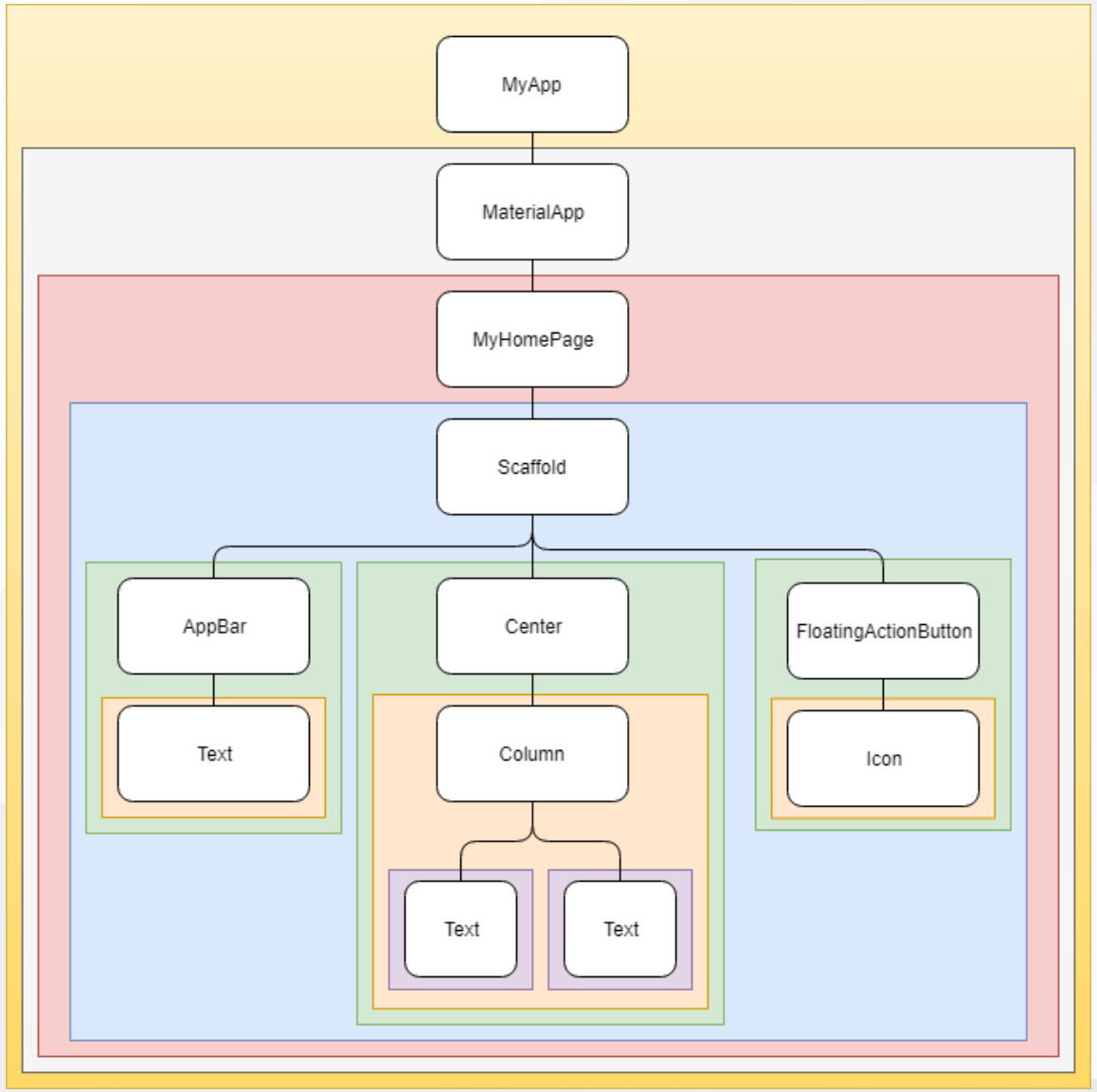


2.1. Introduction to widgets

Notion of Context or BuildContext

Location of a Widget within the tree structure

A context only belongs to one widget.



https://www.didierboelens.com/2018/06/widget-state-context-inheritedwidget/

2.1. Introduction to widgets

Stateful and stateless widgets (1)

StatelessWidget	StatefulWidget
Examples: - Icon - IconButton - Text	Examples: - Checkbox - Radio - Slider - InkWell - Form - TextField
Super-class: StatelessWidget	Super-class: StatefulWidget

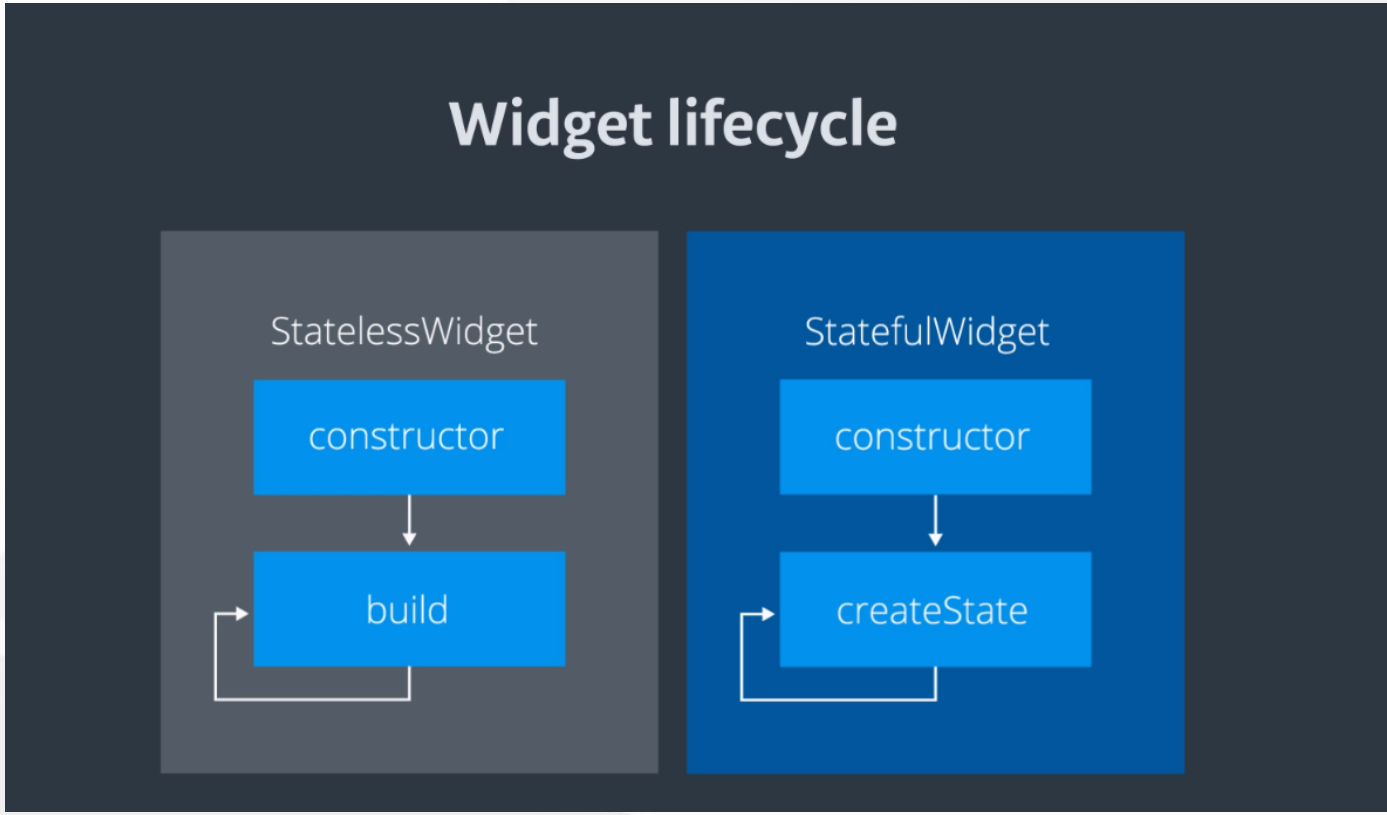
2.1. Introduction to widgets

Stateful and stateless widgets (2)

StatelessWidget	StatefulWidget
Not have to care the state	There are some inner data held and may vary during the lifetime of this widget - called a State

2.1. Introduction to widgets

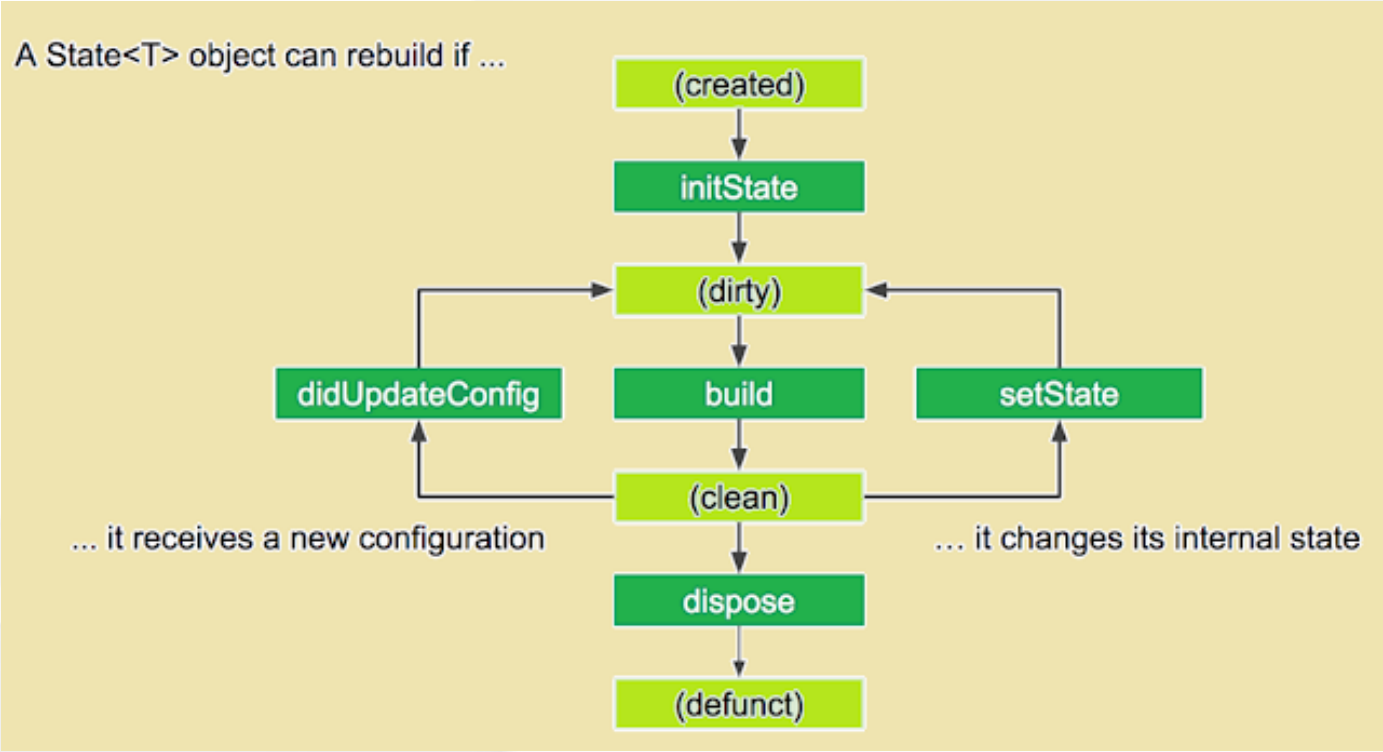
Widget's Lifecycle (1)



2.1. Introduction to widgets

Widget's Lifecycle (2)

The life cycle of the StatefulWidget



https://www.developerlibs.com/2019/12/flutter-lifecycle-widgets.html

2.1. Introduction to widgets

Notion of State

A State defines the `behavioural` part of a StatefulWidget instance.

It holds information aimed at interacting / interferring with the Widget in terms of:

- behaviour
- layout

> Any changes which is applied to a State forces the Widget to rebuild.

2.1. Introduction to widgets

Relation between a State and a Context

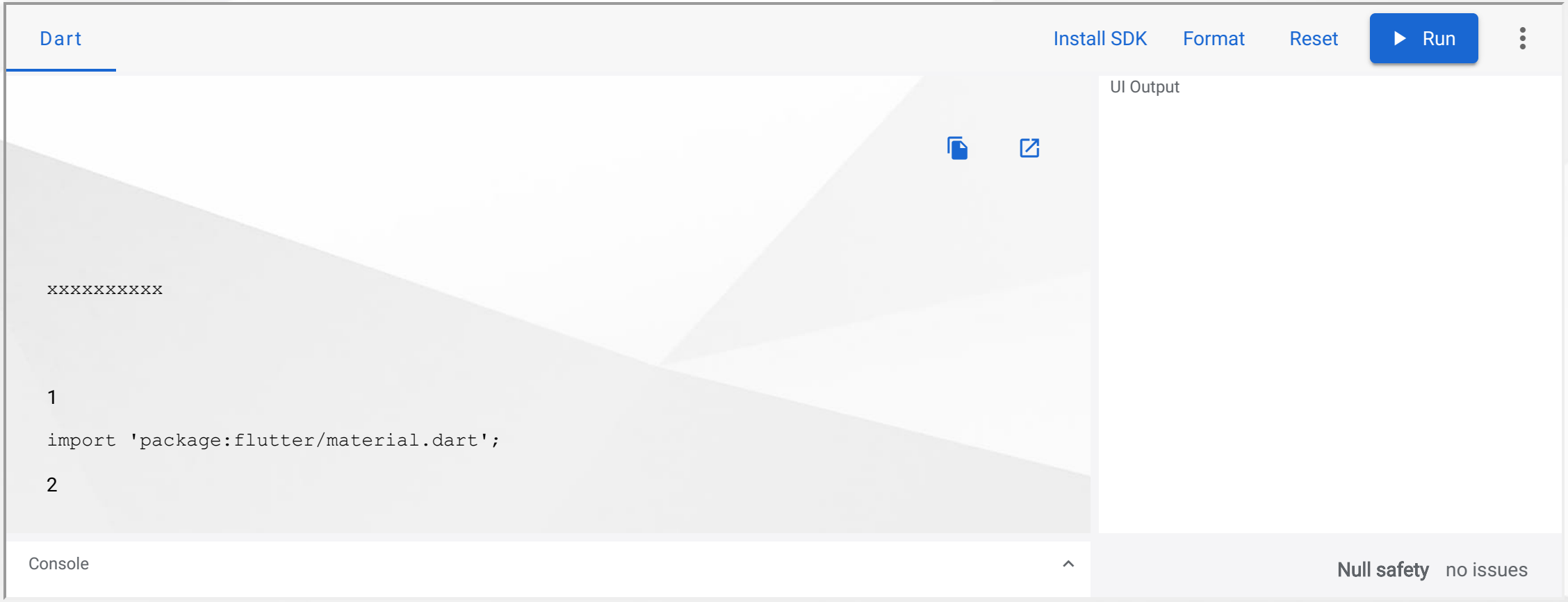
For Stateful widgets, a `State` is associated with a `Context`. This association is permanent and the `State` object will never change its context.

Even if the Widget Context can be moved around the tree structure, the State will remain associated with that context.

When a State is associated with a Context, the State is considered as mounted.

2.1. Introduction to widgets

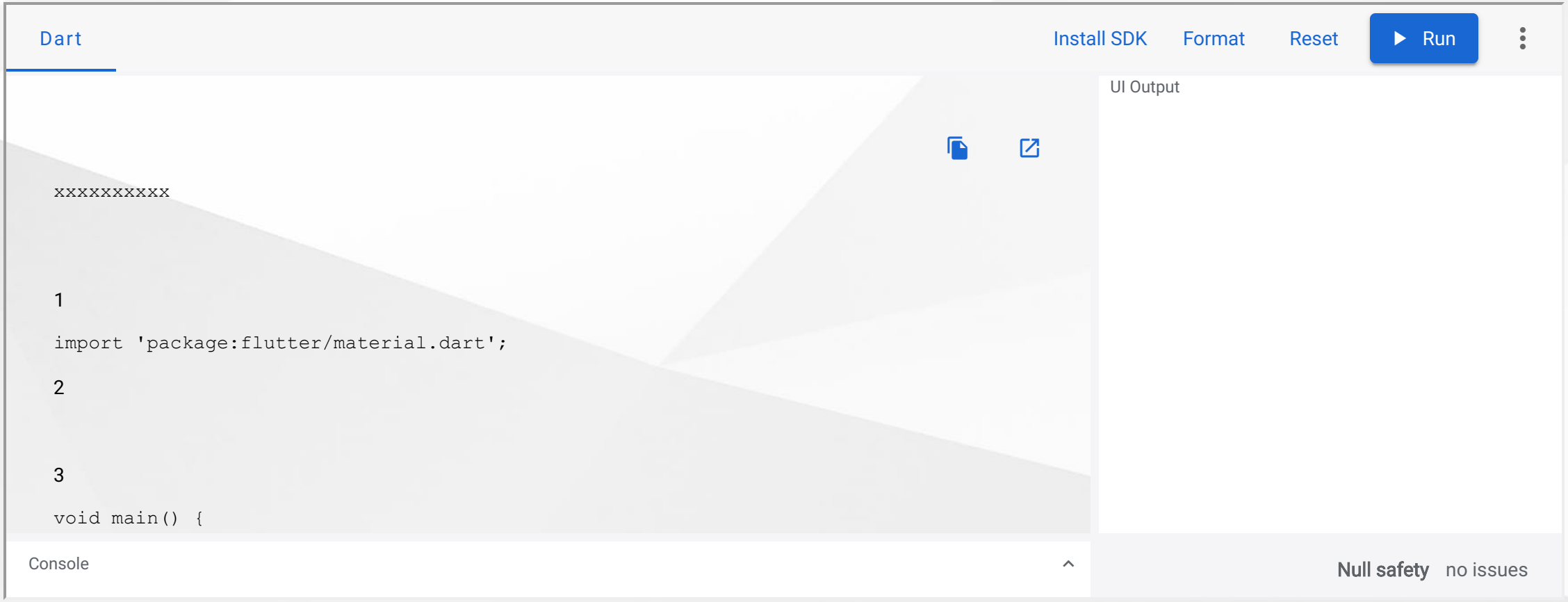
Standard Code of A StatelessWidget



https://dartpad.dev/embed-flutter.html?theme=&null_safety=true&id=e84496279c4f535c42613d827029aad4

2.1. Introduction to widgets

Standard Code of A StatefulWidget



https://dartpad.dev/embed-flutter.html?theme=&null_safety=true&id=48be1c817d6f84f1cb39f06975bccfc5

2.1. Introduction to widgets

Keys

- Use `keys` to control which widgets are `rebuilds`
- For example in builds a list items in ListView:
  - Without `keys` , the item is rebuilt even if it is no longer visible in viewport.
  - By assigning each entry in the list a “semantic” key, only the items visible in the view will be rebuilds.

For more information, see the Key API.

2.1. Introduction to widgets

Global keys

- To uniquely identify child widgets.
- Must be globally unique across the entire widget hierarchy.
- Can be used to retrieve the state associated with a widget.

For more information, see the GlobalKey API.

2.2. Building layouts

- Layouts in Flutter
- Tutorial
- Creating adaptive and responsive apps
- Understanding constraints
- Box constraints

2.2.1 Layouts in Flutter

Example (1)

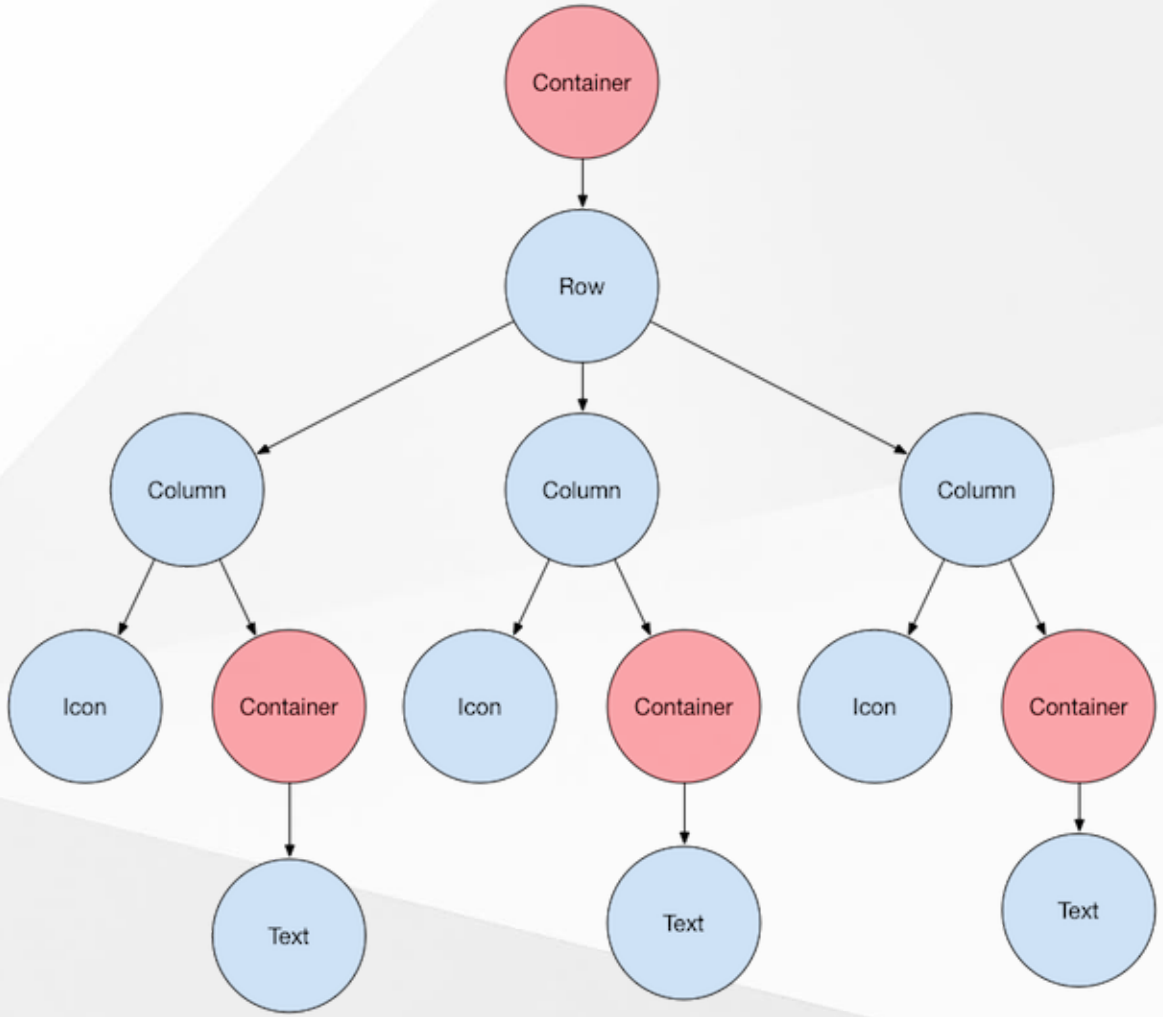
Design	Visual Layout
	

https://flutter.dev/docs/development/ui/layout

2.2.1 Layouts in Flutter

Example (2)

Widgets Tree



https://flutter.dev/docs/development/ui/layout

2.2.1 Layouts in Flutter

Design Languages libaries built-in:

- Material - Google Material Design
- Cupertino - iOS Design Language

2.2.1 Layouts in Flutter

Common layout widgets:

Standard widgets

- Container: Adds padding, margins, borders, background color, or other decorations to a widget.
- GridView: Lays widgets out as a scrollable grid.
- ListView: Lays widgets out as a scrollable list.
- Stack: Overlaps a widget on top of another.

https://flutter.dev/docs/development/ui/layout#common-layout-widgets

2.2.1 Layouts in Flutter

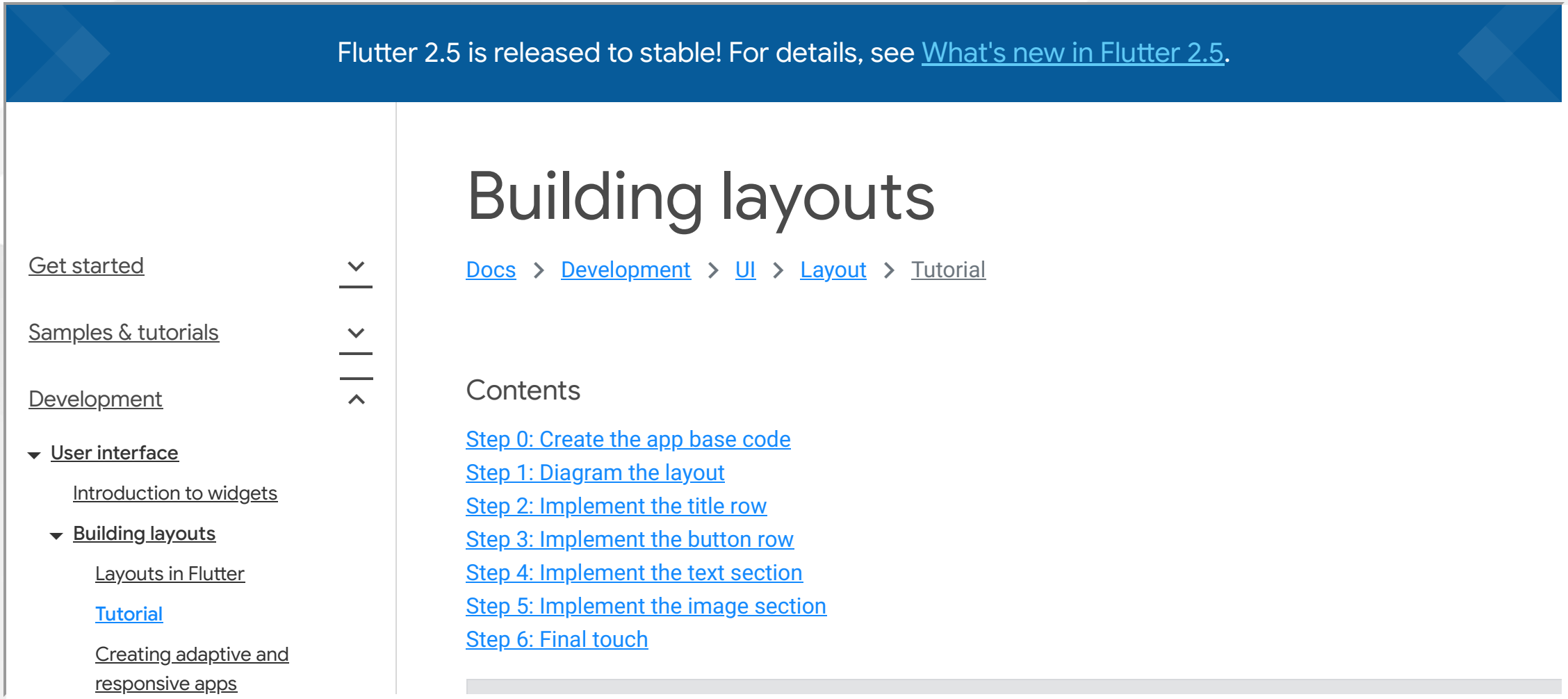
Common layout widgets:

Material widgets

- Card: Organizes related info into a box with rounded corners and a drop shadow.
- ListTile: Organizes up to 3 lines of text, and optional leading and trailing icons, into a row.

https://flutter.dev/docs/development/ui/layout#common-layout-widgets

2.2.2 Tutorial



https://flutter.dev/docs/development/ui/layout/tutorial

2.2.3 Creating adaptive and responsive apps

Difference between Adaptive and Responsive app

- Adaptive and responsive can be viewed as separate dimensions of an app
- Responsive
  - Typically, a responsive app has had its layout tuned for the available screen size...
  - Create a responsive app
- Adaptive
  - Adapting an app to run on different device types, such as mobile and desktop, requires dealing with mouse and keyboard input, ...
  - Building adaptive apps

https://flutter.dev/docs/development/ui/layout/adaptive-responsive

2.2.3 Understanding constraints

Flutter 2.5 is released to stable! For details, see What's new in Flutter 2.5.

Get started

Samples & tutorials

Development

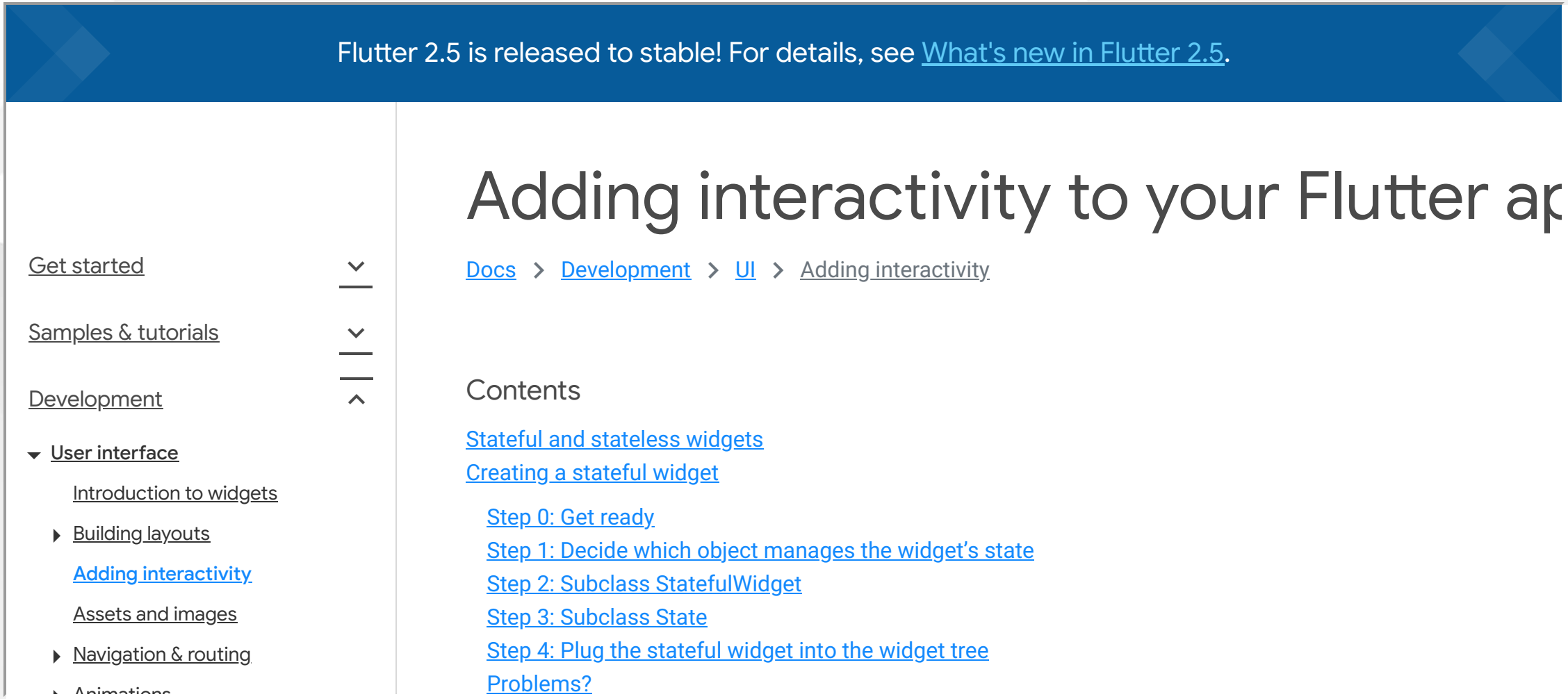
- User interface
  - Introduction to widgets
  - Building layouts
    - Layouts in Flutter
    - Tutorial
    - Creating adaptive and responsive apps

Understanding constraints

Docs > Development > UI > Layout > Understanding constraints

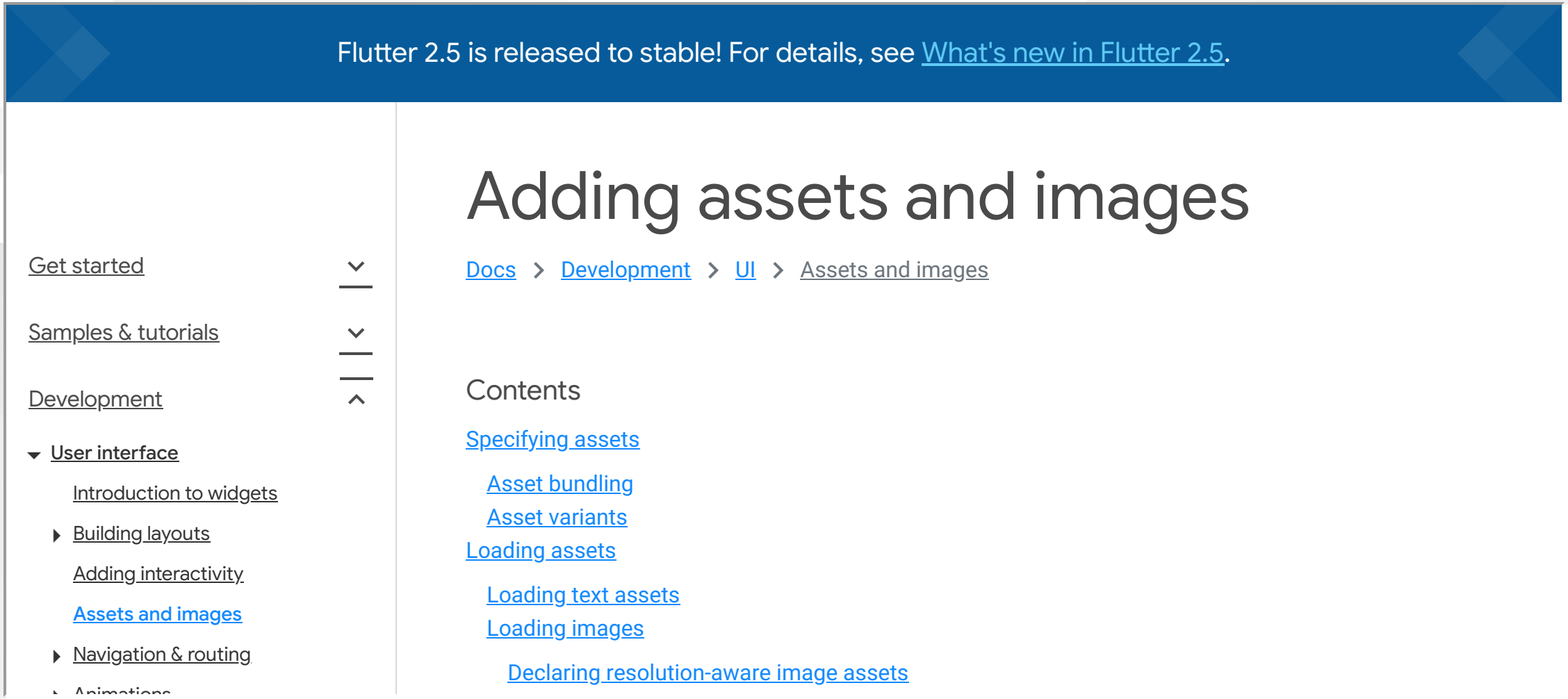
https://flutter.dev/docs/development/ui/layout/constraints

2.3. Adding interactivity



https://flutter.dev/docs/development/ui/interactive

2.4. Adding assets and images



https://flutter.dev/docs/development/ui/assets-and-images

2.5. Navigation and routing (1)

Two approaches:

- Imperative approach, Navigation v1.0
  - see the Navigation recipes
  - Or using Fluro package
- Declarative approach, Navigation v2.0
  - Learning Flutter's new navigation and routing system
  - Alternate packages:
    - vrouter
    - beamer (not stable)

https://flutter.dev/docs/development/ui/layout/adaptive-responsive

2.5. Navigation and routing (2)

Deep linking:

- Examples:
  - `http://flutterbooksample.com/book/1`
  - `customscheme://flutterbooksample.com/book/1`

URL strategy on the web

- Hash (default)
  For example, `flutterexample.dev/#/path/to/screen`.
- Path
  For example, `flutterexample.dev/path/to/screen`.

https://flutter.dev/docs/development/ui/layout/adaptive-responsive

2.5. Navigation and routing (3)

Fluro

- Simple route navigation
- Function handlers (map to a function instead of a route)
- Wildcard parameter matching
- Querystring parameter parsing
- Common transitions built-in
- Simple custom transition creation
- Follows stable Flutter channel
- Null-safety

https://pub.dev/packages/fluro

2.5. Navigation and routing (4)

VRouter (for reference only)

- Automated web url handling
- Nesting routes
- Transition
- Advanced url naming
- Reacting to route changing
- Customizable pop events
- And much more...

https://pub.dev/packages/vrouter

2.6. Animations

Approaches:

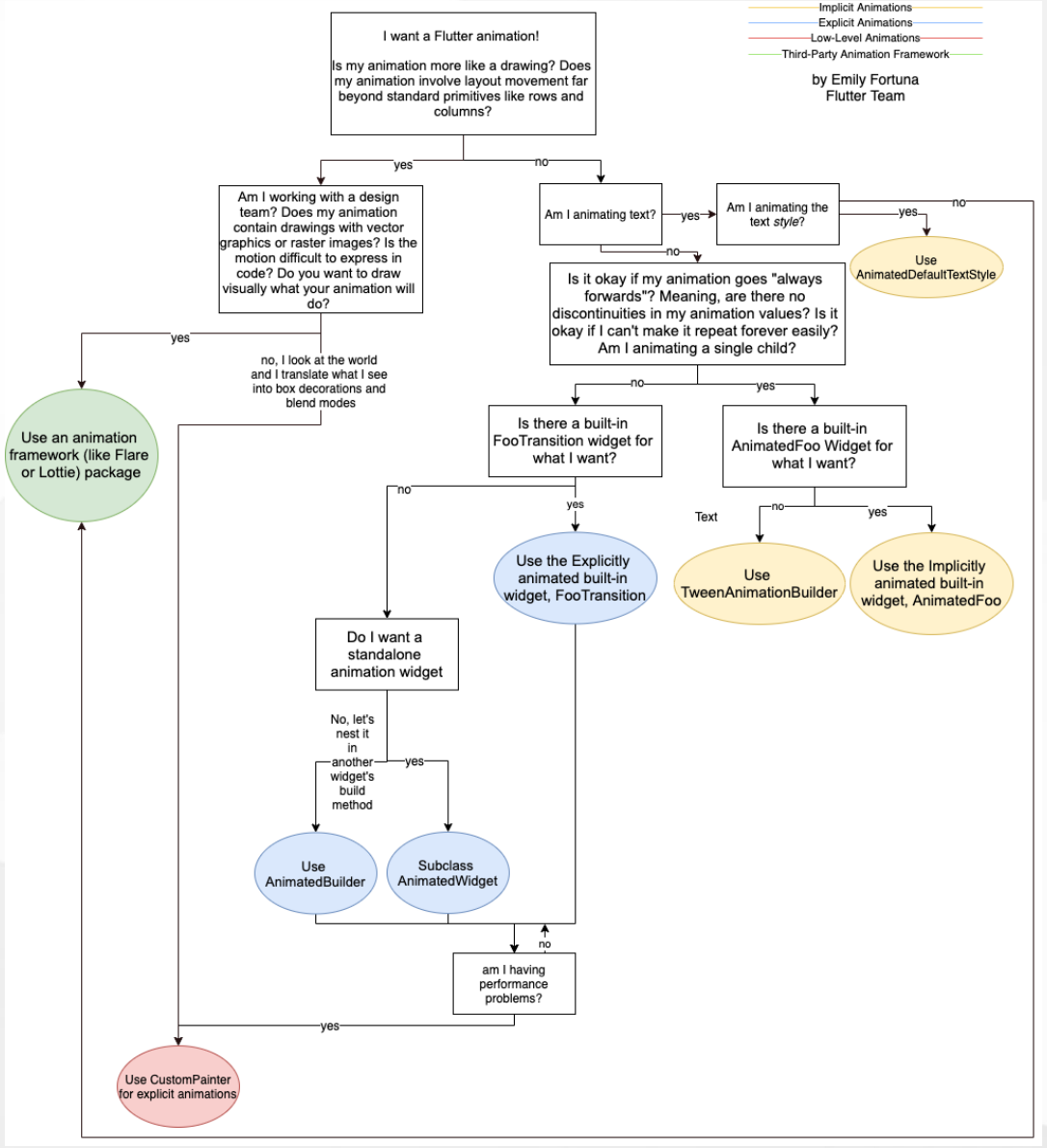
- Implicit Animations
- Explicit Animations
- Low-Level Animation
  - draw it with canvas via CustomPainter
- Third-party animation framework
  - flare_flutter
  - lottie

https://flutter.dev/docs/development/ui/animations#choosing-an-approach

2.6. Animations

Full picture: Click here

Video: How to choose which Flutter Animation Widget is right for you?



https://flutter.dev/docs/development/ui/animations#choosing-an-approach

2.6. Animations

Common animation patterns

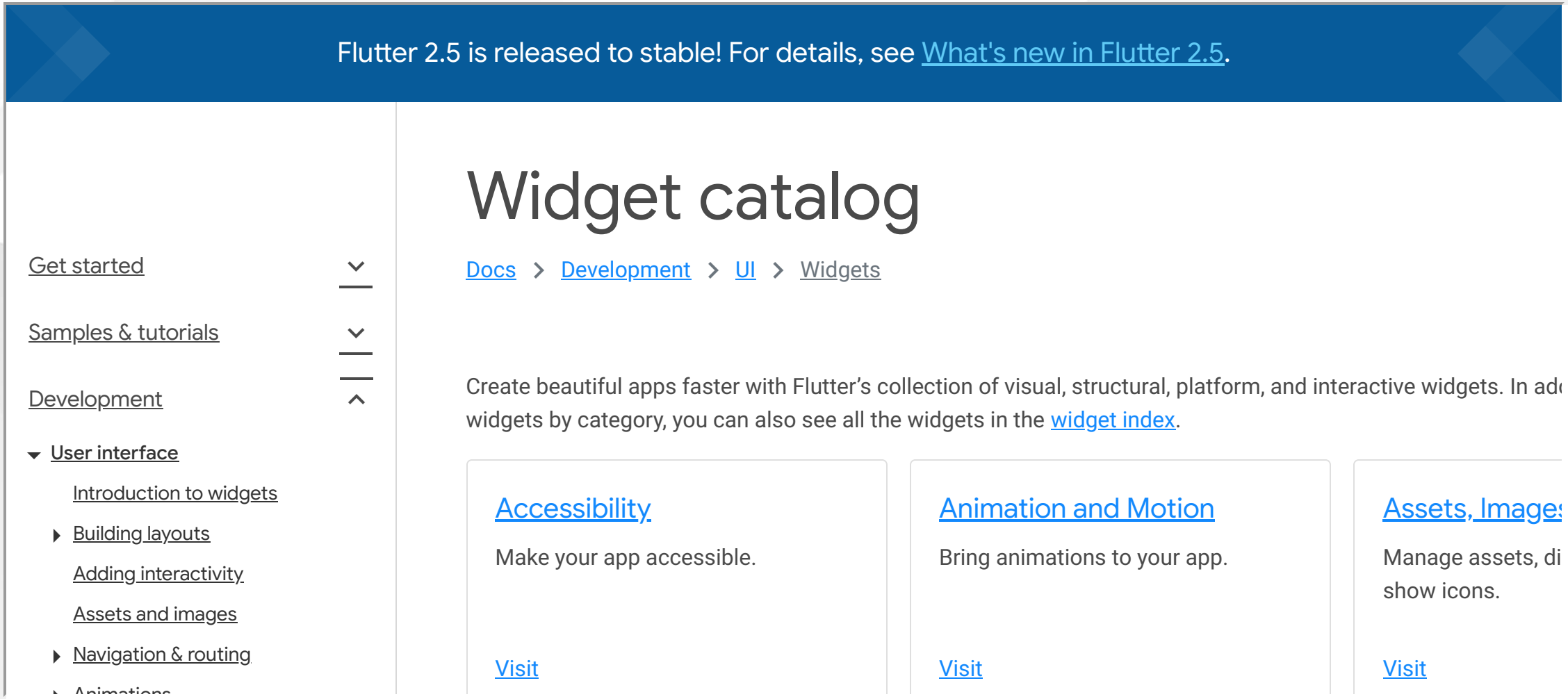
- Animated list or grid
- Shared element transition
  - Shared element transitions between routes (pages)
  - Hero animations
- Staggered animation
  - Animations that are broken into smaller motions, where some of the motion is delayed.
  - The smaller animations might be sequential, or might partially or completely overlap.

https://flutter.dev/docs/development/ui/animations#choosing-an-approach

2.7. Advanced UI

- Using Actions and Shortcuts
- Gestures
- Slivers
- Splash screens

2.8. Widget catalog



https://flutter.dev/docs/development/ui/widgets

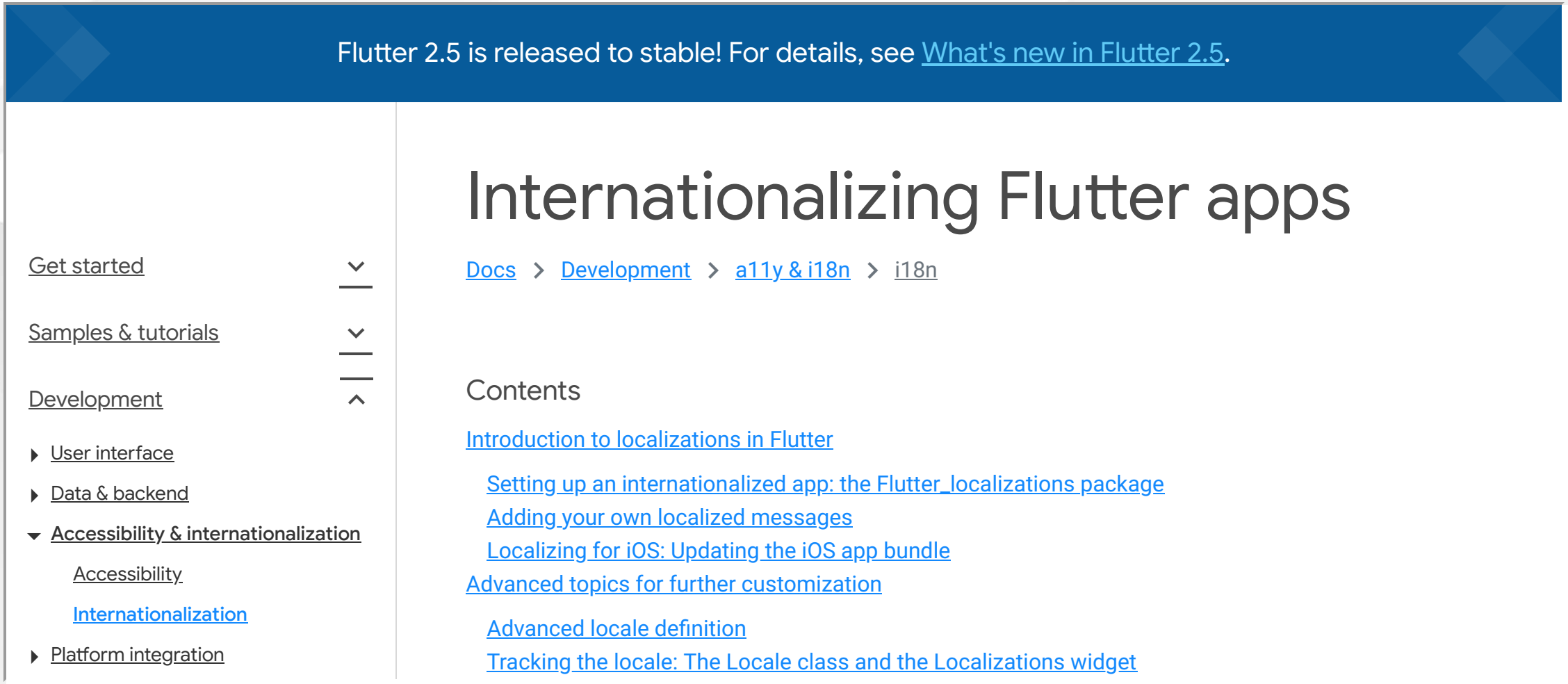
3. State management

- 3.1. Introduction
- 3.2. Think declaratively
- 3.3. Ephemeral vs app state
- 3.4. Simple app state management
- 3.5. Options
- 3.6. Riverpod

4. Data & Networking

- 3.1. Cross-platform http networking
- 3.2. Networking cookbook
- 3.3. JSON and serialization
- 3.4. OpenAPI and generate Data Provider
- 3.5. Firebase

5. Internationalization



https://flutter.dev/docs/development/accessibility-and-localization/internationalization

Other References and ebooks (1)

- Flutter Complete Reference
  - Offical website: https://fluttercompletereference.com/
  - Full version
  - Preview version
- Performance & optimization
  - App Size
  - Deferred components
- Platform-specific behaviors and adaptations

Other References and ebooks (2)

- Widget index
- API reference
- flutter CLI reference
- Package site
- FAQ

Thank you