

FLUTTER

FUNDAMENTAL

Flutter Course 2021

Null-safety compliance

Caspian Consultancy Services

Modules

Fundamental 2021

- Introduction
- Setup & Softwares
- Flutter Project Structure
- What are Widgets?
- Useful Widgets
- State Management
- Creating Layout
- Creating Responsive Design
- Creating Buttons & DialogBox
- Creating Navigation & Passing Parameter
- Arrays, ListView & ListView Builder

Modules

Fundamental 2021

- FutureBuilder & StreamBuilder
- JSON, REST API & Flutter
- Persistent data with SQLite
- How to build your APK, AAB or IPA

Introduction

What is Flutter?

Flutter is an **open-source UI** software development kit created by Google.

It is used to develop cross platform applications for **Android, iOS, Linux, MacOS, Windows, Google Fuchsia**, and the **web** from a single codebase.

Setup & Softwares

Development Softwares

We need to install:

- Visual Studio Code
- Flutter|Dart Plugins
- Android Studio + AVD (Emulator)
- Xcode | Xcode CLI (If you use Mac)
- Chrome Browser (If you develop web)
- Visual Studio 2019 + UWP + Desktop Dev w/ C++
(If you develop Windows 10)

Setup & Softwares

Development Softwares

For Linux, we need to install:

- Clang,
- CMake,
- GTK,
- Ninja build
- Pkg-config

Or via Snapd

Setup & Softwares

We need these Softwares

Some Helpful Flutter Packages:

- Awesome Flutter Snippets
- Bracket Pair Colorizer
- Flutter Widget Wrap

Visual Studio Guide Preference:

- Settings > guide > Dart: Preview flutter UI
Guides & Custom Tracking (On)

Setup & Softwares

We need these Softwares

Some Additional Softwares for Design & Prototyping:

- Adobe Photoshop or Illustrator
- Adobe XD

Online Tools:

- FlutterFlow.io
- Applcon.co

Create a New Project

Cli, VSC or Android Studio

This training will use Visual Studio Code:

1. Visual Studio Code

> View > Command Palette... > Flutter: New Application Project

2. Terminal or CMD

> flutter create yourProjectName

Flutter Project Structure

Understanding Files & Directory

The screenshot shows a Flutter project structure in a code editor. The left pane is the Explorer view, showing the directory tree:

- CONVEXBOTTOMBARDEMO (root)
 - .dart_tool
 - .idea
 - android
 - build
 - ios
 - lib
 - main.dart
 - page0.dart
 - page1.dart
 - page2.dart
 - page3.dart
 - page4.dart
 - macos
 - test
 - web
 - .gitignore
 - .metadata
 - .packages
 - convexbottombarde...
 - pubspec.lock
 - pubspec.yaml
 - README.md

Red arrows point from the following labels to specific parts of the project structure:

- Additional dart Tools → .dart_tool
- Android Project → android
- Apk, AAB or IPA → build
- iOS Project → ios
- Our dart code Files → lib/main.dart
- depends on your MacOS | Windows → macos
- Test Files (Optional) → test
- Web → web
- Dependencies Requirements → pubspec.yaml

The right pane shows the main.dart file content:

```
26 class _HomeState
27   int _currentind
28
29   List pages = [P
30
31   @override
32   Widget build(Bu
33     return Scaffo
34     body: pag
35     └── bottomNav
36       style
37       backg
38       items
39       Tab
40     ]
```

What are Widgets?

To understand Flutter, We need to understand Widgets

- Everything is a Widget
- OOP - Object Oriented Programming
- There are 2 types of Widgets:
 - Stateless Widgets
 - Stateful Widgets
 - Inherited Widgets (derived)

Widgets?

Stateless vs Stateful

- Stateless widgets are immutable, meaning that their properties can't change—all values are final.
- Stateful widgets maintain state that might change during the lifetime of the widget. Implementing a stateful widget requires at least two classes:
 - i) a StatefulWidget class that creates an instance of
 - ii) a State class. The StatefulWidget class is, itself, immutable, but the State class persists over the lifetime of the widget.
- Inherited Widget a special kind of widget that defines a context at the root of a sub-tree.

Stateless Widget

A Widget with no State!

Stateless Widget:

- Single Class
- No State

```
1 import 'package:flutter/material.dart';
2
3 class ThirdScreen extends StatelessWidget {
4   @override
5   Widget build(BuildContext context) {
6     return Scaffold(
7       appBar: AppBar(
8         title: Text("Screen 3"),
9       ), // AppBar
10      body: Center(
11        child: RaisedButton(
12          child: Text('Go back Screen 1'),
13          onPressed: () {
14            //Guna ne utk balik ke screen 1
15            Navigator.of(context).pushNamedAndRemoveUntil('/screen1',
16            (Route<dynamic> route) => false);
17            //----
18          },
19          ), // RaisedButton
20        ), // Center
21      ); // Scaffold
22    }
23  }
24
```

Stateful Widget

A Widget with State!

Stateful Widget:

- 2 Classes: State & UI
- Has State

The UI class

A **stateful widget** is dynamic. The user can interact with a stateful widget (by typing into a form, or moving a slider, for example), or it changes over time (perhaps a data feed causes the UI to update).

Checkbox, Radio, Slider, InkWell, Form, and TextField are examples of stateful widgets, which subclass StatefulWidget.

The State class
Create State

```
1 import 'package:flutter/material.dart';
2 import 'secondscreen.dart';
3
4 class FirstScreen extends StatefulWidget {
5   @override
6   _FirstScreenState createState() => new _FirstScreenState();
7 }
8
9
10 class _FirstScreenState extends State<FirstScreen> {
11   var _textController = new TextEditingController();
12
13   @override
14   Widget build(BuildContext context) {
15     return Scaffold(
16       appBar: AppBar(
17         title: Text('Screen 1'),
18       ), // AppBar
19       body: new ListView(
20         children: <Widget>[
21           new ListTile(title: new TextField(controller: _textController,)),
22           new ListTile(title: new RaisedButton(
23             child: new Text("Next"),
24             onPressed: () {
25               //do something when pressed
26
27               //original kaedah just navigate
28               //Navigator.of(context).push(route);
29
30               // Kaedah 1
31               //var route = new MaterialPageRoute(builder: (BuildContext context)
32
33               //Kaedah 2
34               Navigator.push(context, MaterialPageRoute(builder:(context) => new S
35             );
36           }
37         ), // RaisedButton // ListTile
38       );
39     }
40   }
41 }
```

Useful or Common Widgets

A Widget with State!

Widget with single root, **child**:

- Container
- Buttons - ElevatedButton, OutlinedButton, TextButton
- Card
- SingleChildScrollView

Widgets with multiple, **children**:

- Column
- Row
- ListView
- Stack
- Wrap

State Management

For Managing State in Widgets

When do we need to use:

- Change of state, something change - value, color, shape
- Need to pass data from one widget to another
- Useful in Stateful widget & Inherited widget
- Inherited widget passing value

State Management

For Managing State in Stateful Widgets

Some State Management used in Flutter:

- SetState
- Provider
- GetX
- RiverPod
- Redux
- Fish-Redux
- BLoC/Rx
- MobX
- GetIt
- Binder
- States-rebuilder

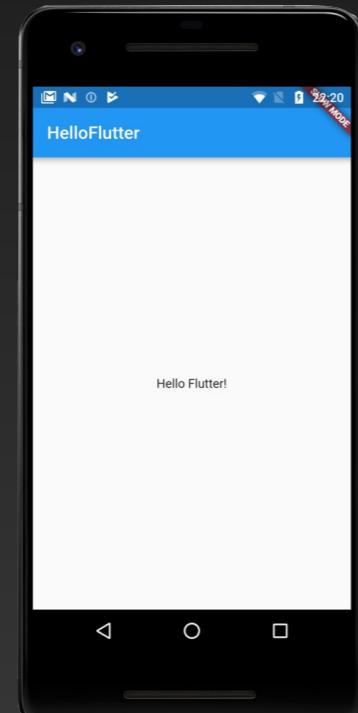
More info: <https://flutter.dev/docs/development/data-and-backend/state-mgmt/options>

Layout

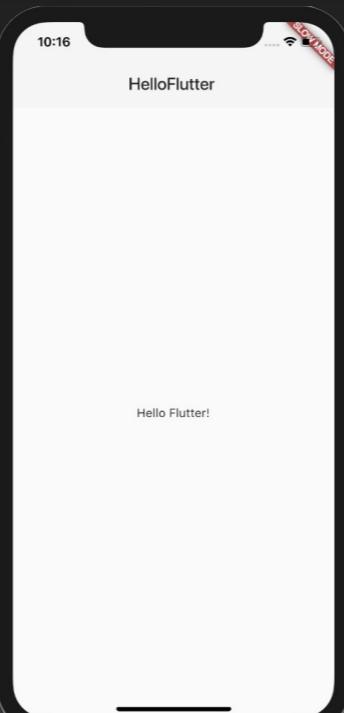
Creating Layout

Ui design in Flutter

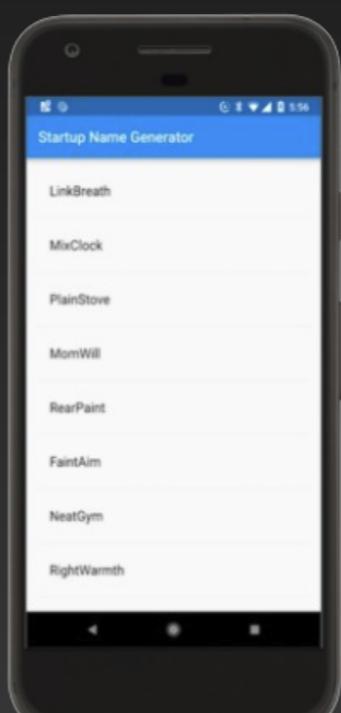
- Flutter using Material Design in Android & Using ‘Cupertino’ Design in iOS.
- Slight differences in rendering UIs.
- Not all designs can be same.



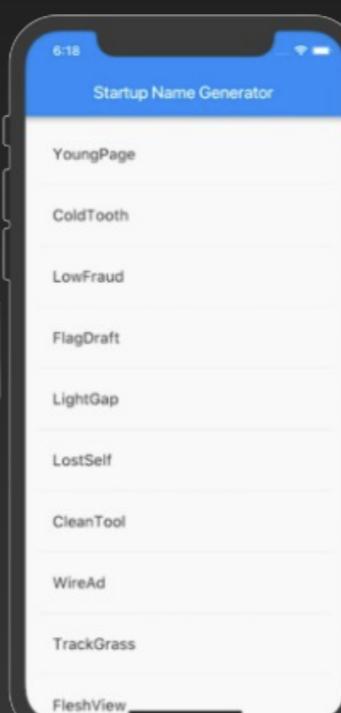
Material



Cupertino



Material



Cupertino

Flutter Layout & UI Elements

Basic Layout makes up of widgets

Container
Row
Column
Stack



**Layout
elements**

Image
Text
Icon
Buttons



UI elements

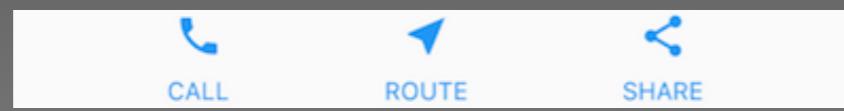
REMEMBER:

- Widgets are used for both layout and UI elements.
- Compose simple widgets to build complex widgets.

Flutter Layout

Step by Step

Final UI



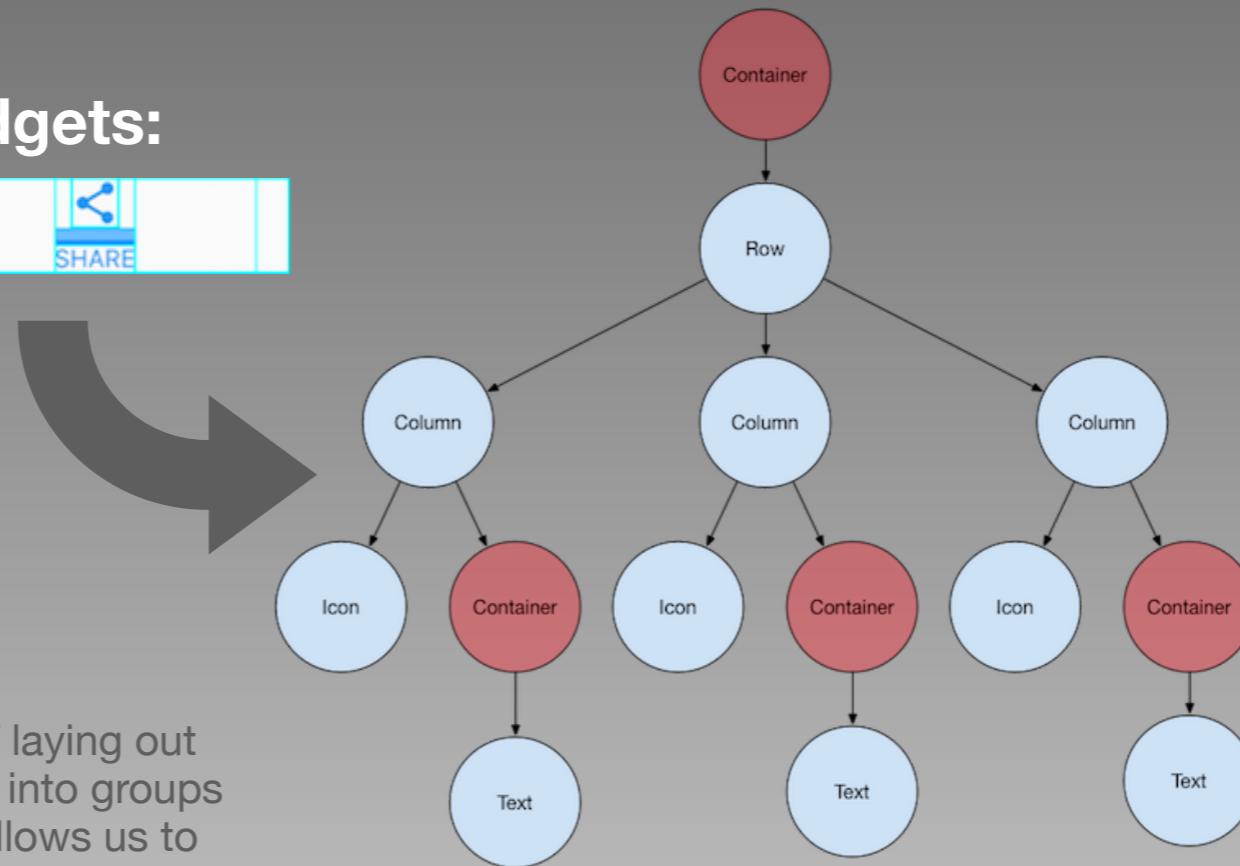
Made up of Widgets:



**Understand This
in Container,
Row, Column
& Widgets**

In Flutter, a common way of laying out widgets is composing them into groups of columns and row—this allows us to easily layout our components in a vertical / horizontal manner. When you wish to layout components in a **Horizontal** manner, then you will use a **Row** and for **Vertical** layout you will use a **Column**. There is also a Stack Widget for overlapping content

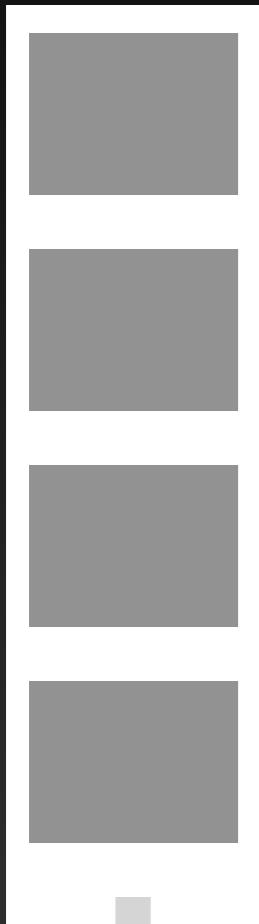
When you code it in Flutter



Layout Widgets

Column & Row | Stack

Column()

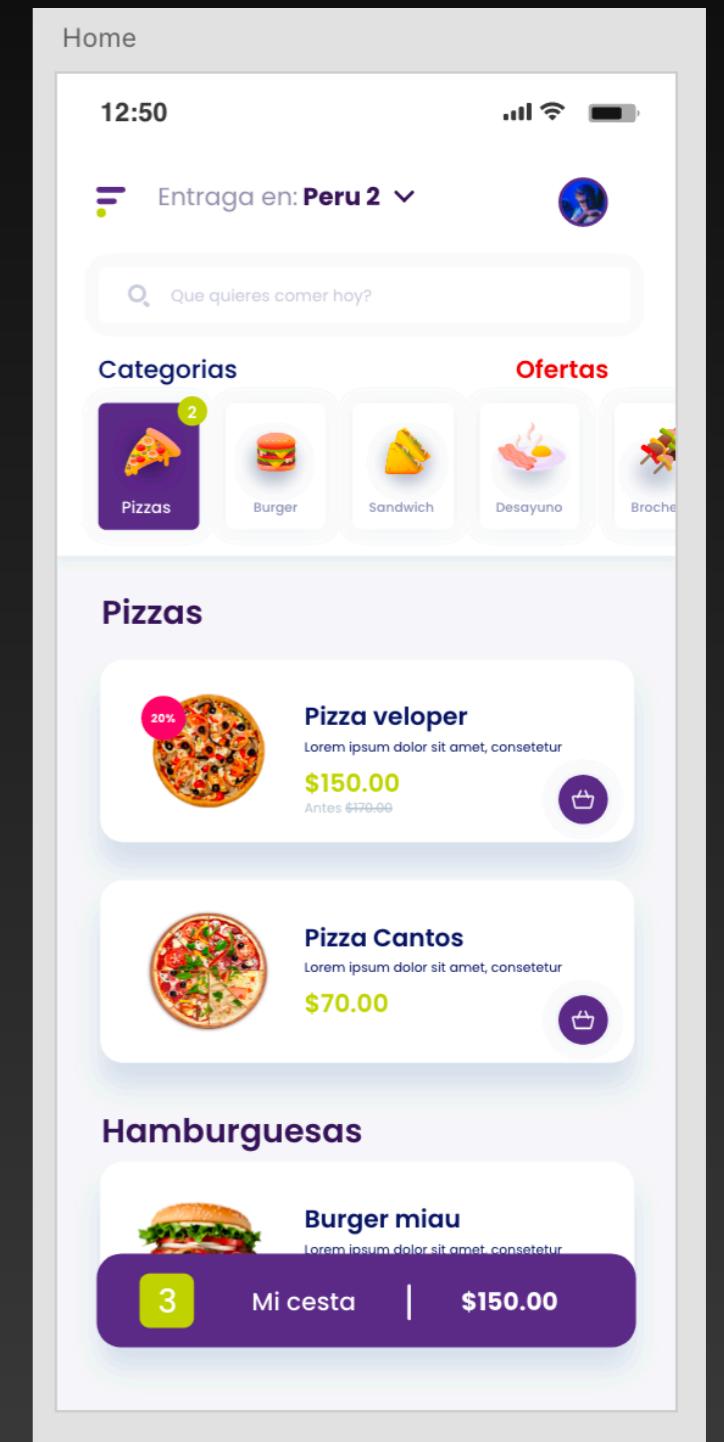


Row()



Try Imagining your design
in Columns & Rows

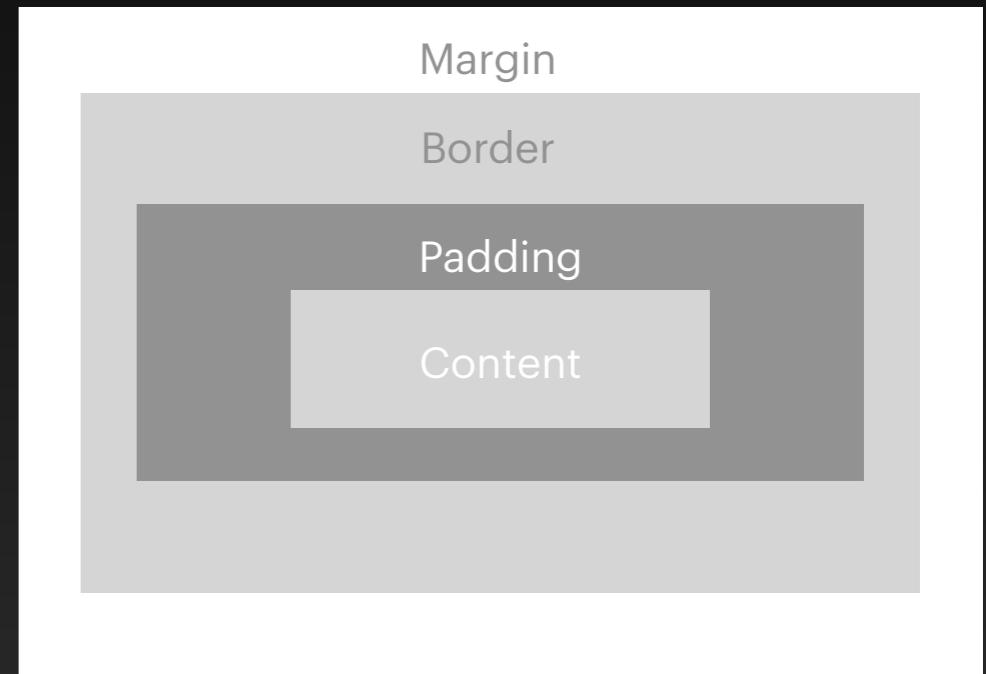
Stack() For Overlapping



Container Widget

The Anatomy of Container Widget

- You can embed other Widgets in a Container to make them compartmentalised.
- Container is Optional
- Add padding, margins, borders
- Change background color or image
- Contains a single child widget, but that child can be a Row, Column, or even the root of a widget tree



Other Layout Widgets

Commonly used Widgets

Other widgets used in layout:

- **GridView**: Lays widgets out as a scrollable grid.
- **ListView**: Lays widgets out as a scrollable list.
- **Stack**: Overlaps a widget on top of another.
- **TabBar**:
- **NavigationBottomBar**:

Creating Responsive Layout

Layout that responds to size of screen

- **LayoutBuilder**

Builds a widget tree that can depend on the parent widget's size.

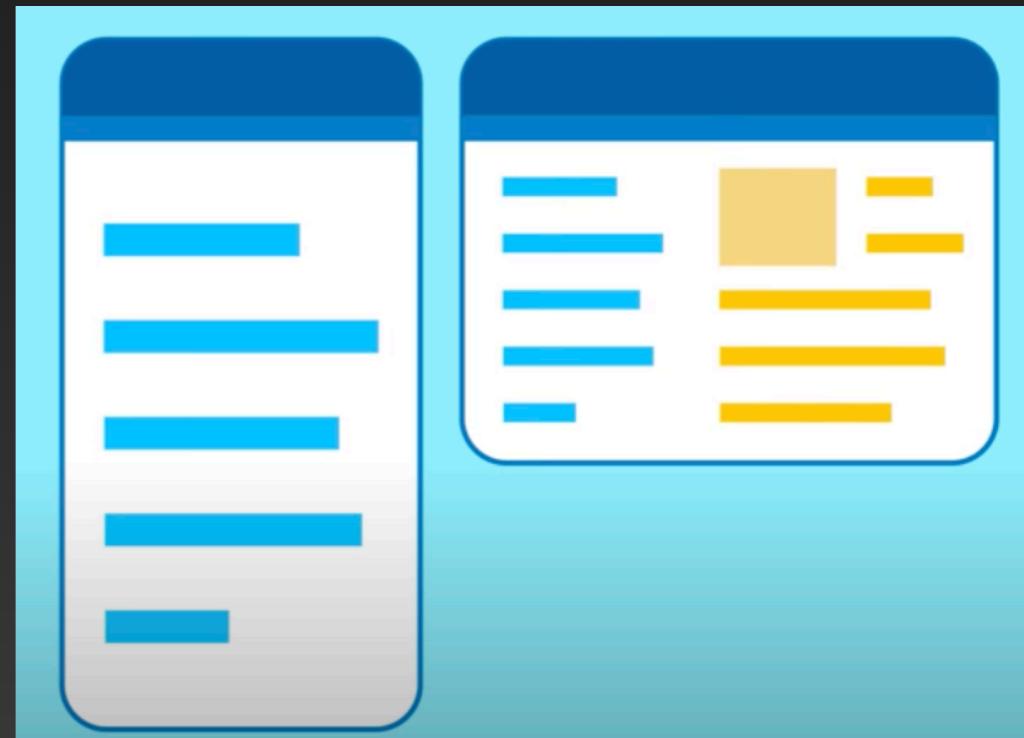
- **MediaQuery**

Use the MediaQuery.of(context) method in your build functions

```
Widget build(BuildContext context) {  
  return LayoutBuilder(  
    builder: (context, constraints) {  
      if (constraints.maxWidth < 600) {  
        return MyOneColumnLayout();  
      } else {  
        return MyTwoColumnLayout();  
      }  
    },  
  );  
}
```

Example:

```
widthX = MediaQuery.of(context).size.width();
```



Creating Responsive Layout

Other Useful widgets & classes

- AspectRatio
- CustomSingleChildLayout
- CustomMultiChildLayout
- FittedBox
- FractionallySizedBox
- MediaQueryData
- OrientationBuilder

Creating Layout

Creating basic Layout

Steps to create basic layout in Flutter:

1. Start with a design for your mobile app
2. Prototype your mobile app
3. Export all assets
4. Code in Dart/Flutter

Creating Layout

Beginning your Layout

You'll need a UI Design & Prototyping tool such as
Adobe XD, Figma or SketchApp

This training will use Adobe XD, It's FREE.

Using XD to Create Layout

Visual Design to Create Layout

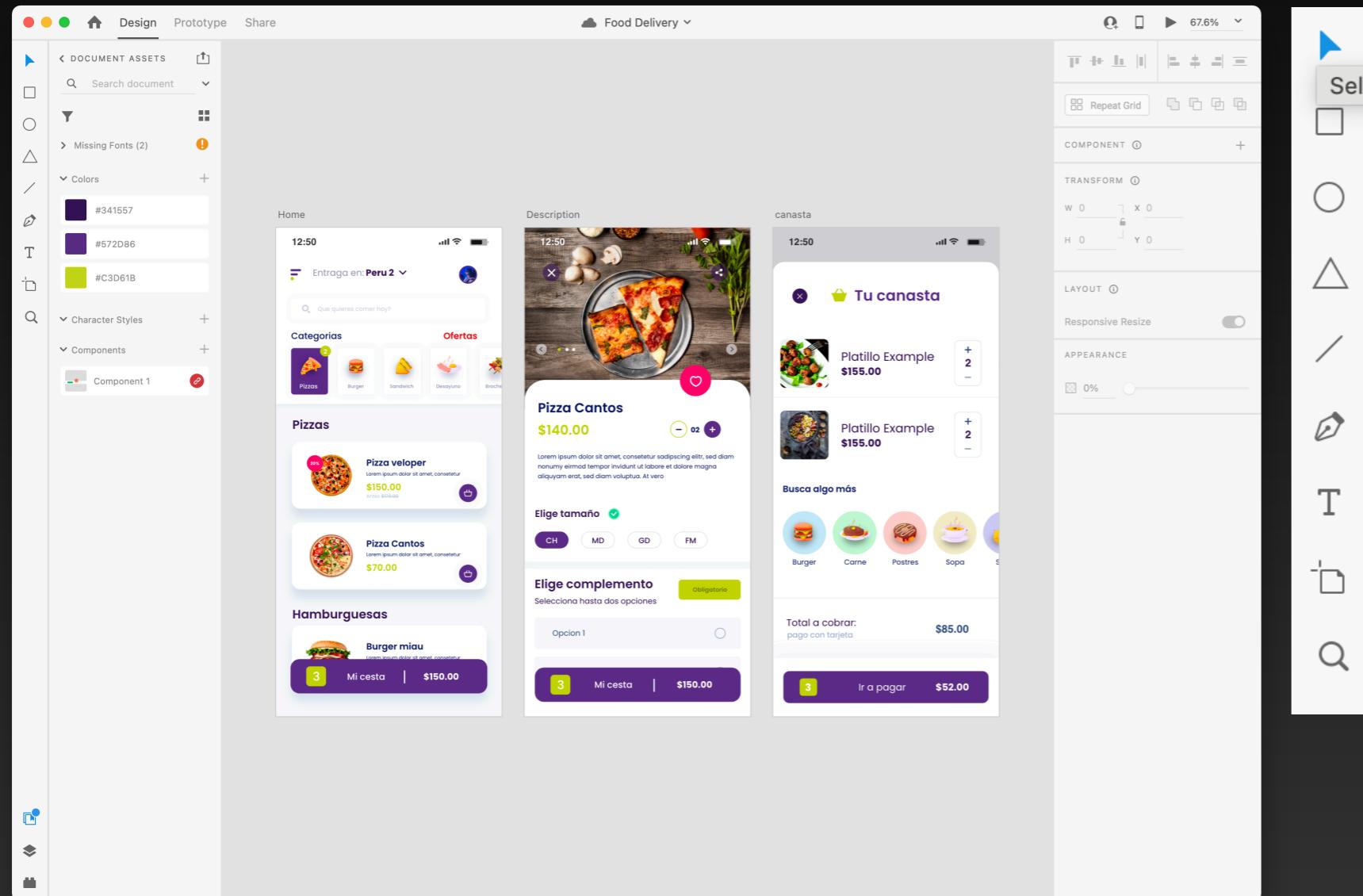
Adobe XD needs additional plugins to be effective

Adobe XD plugins that you'll need:

- Stock Images
- Flutter Export
- Lorem Ipsum
- XD to Flutter

Start the Design

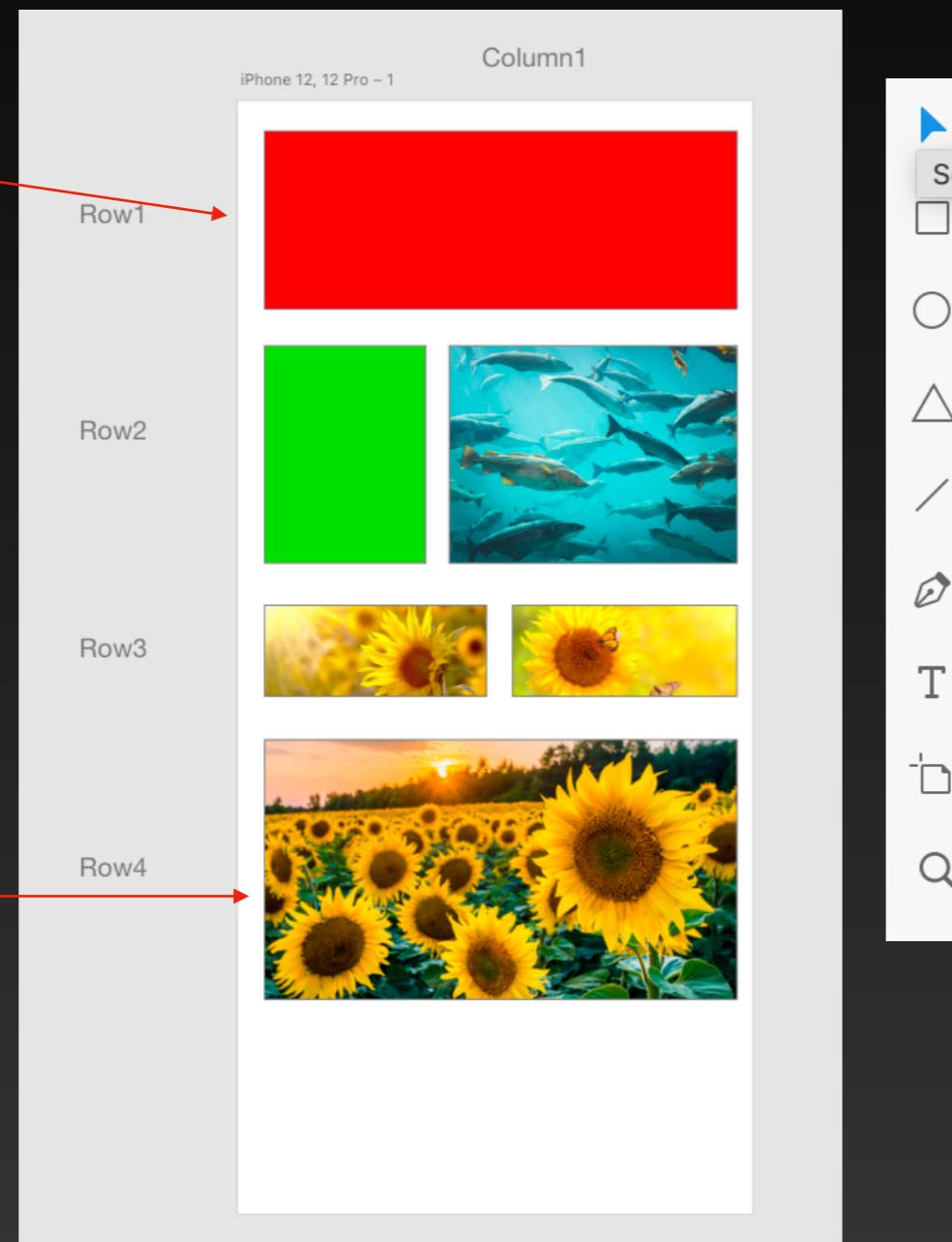
Start with a design



Simply Design using available Tools on XD

Creating Basic In XD Create Primitives shapes

Primitives Shapes like
Rectangles with colors



Replace Shapes with
Images later



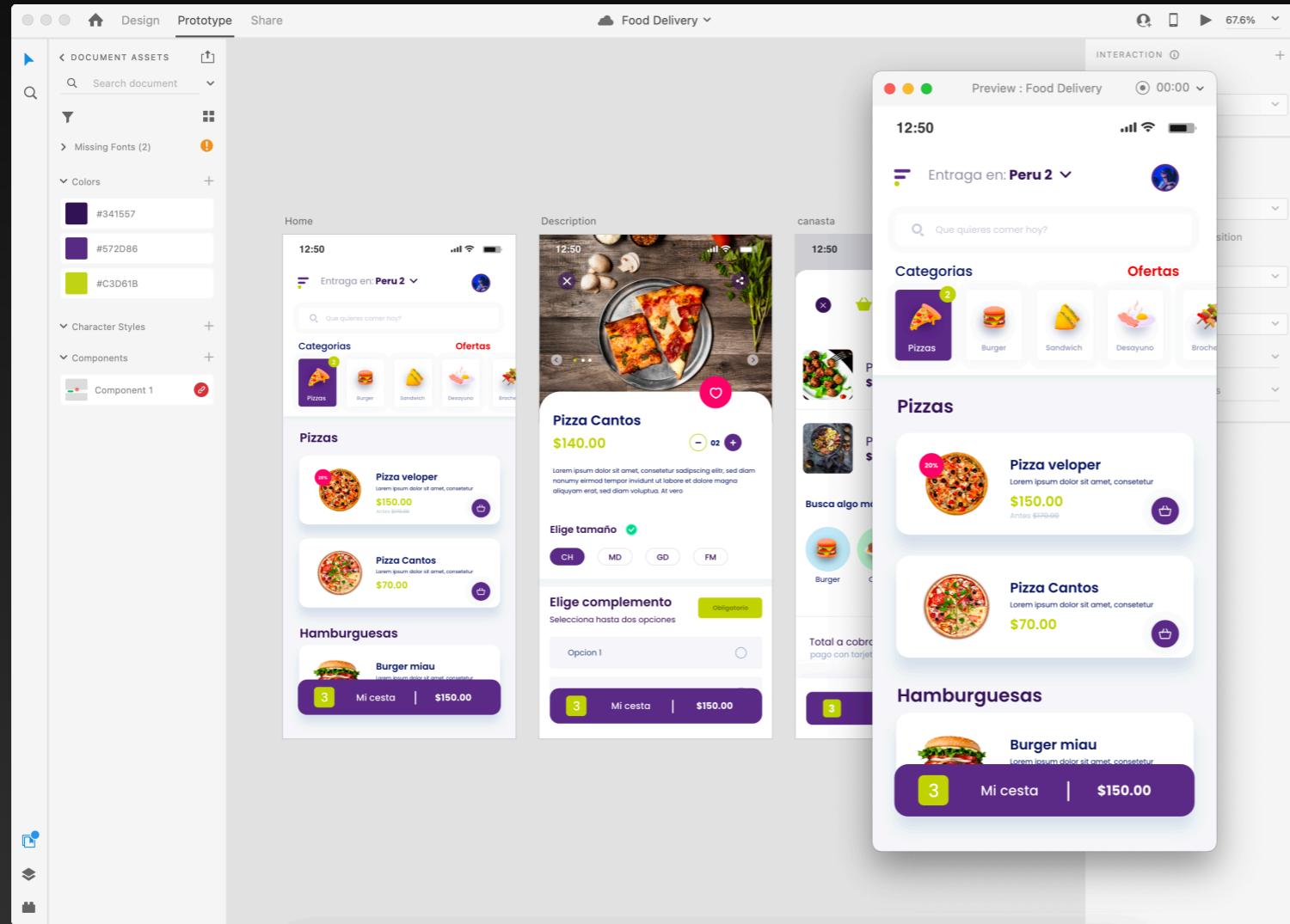
Simply Design using
available Tools on XD

Using XD to Create Layout

Visual Design to Create Layout

After Creating Basic Shapes, Code in Visual Studio
Code using Column, Row, Stack, Container & Other
widgets.

Creating Layout Prototype with working flow

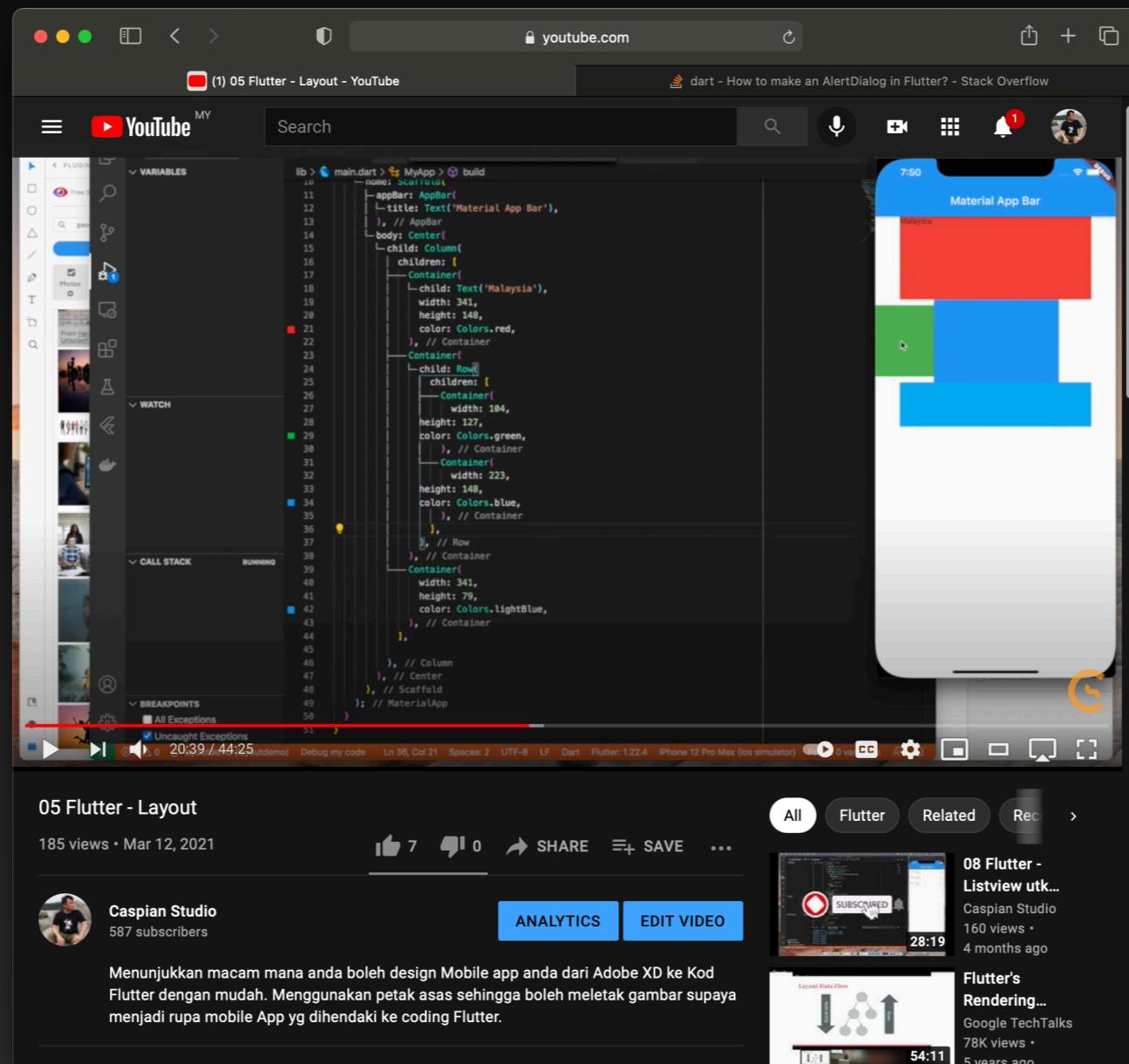


Can Preview on:

- Desktop
- Mobile App

Let's do Layout

Video how to do layout



Refer on: https://www.youtube.com/watch?v=pHqJcDev8nM?sub_confirmation=1

Interactivity

Creating Buttons

Making Interactivity

So many button options:

- ElevatedButton (Previously RaisedButton)
- OutlinedButton
- TextButton (Prev FlatButton)
- FloatingButton
- PopupMenuItem
- IconButton
- InkWell, can create your own buttons too

Basic Code Buttons

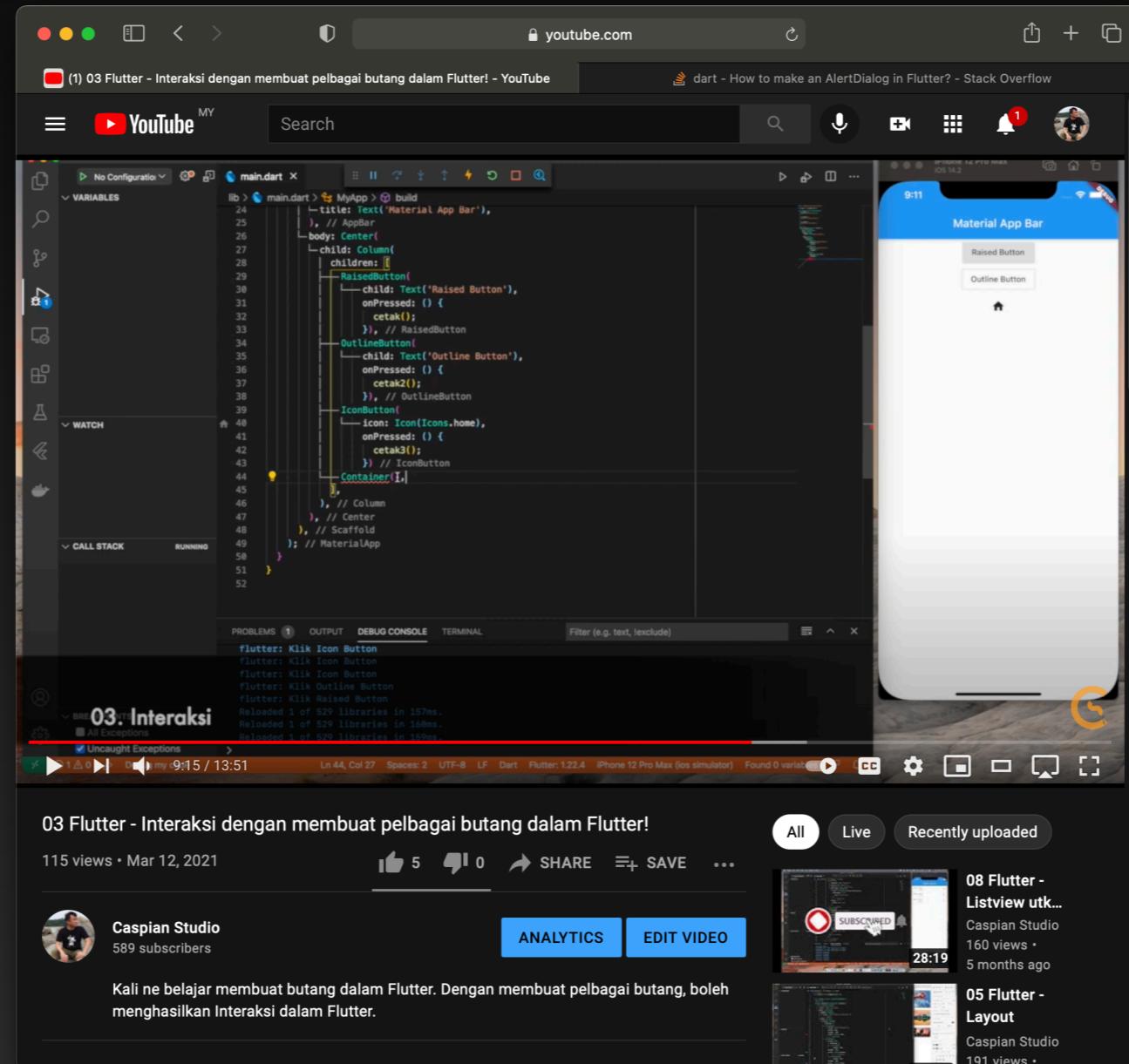
They are all the similar codes

- A button has consisted of a text or an icon
- We can design a button UI using different shapes, colours, animations and behaviours.
- Button also can contain it 's child widgets for different usages.
- Buttons will have:

```
ElevatedButton(  
    onPressed: () {  
        //code inside  
    },  
    child: Text('My Button'),  
)
```

Let's Code

Video how to do Interactivity with Buttons



Refer on: https://www.youtube.com/watch?v=EkBdAiNvTTO?sub_confirmation=1

Creating DialogBoxes

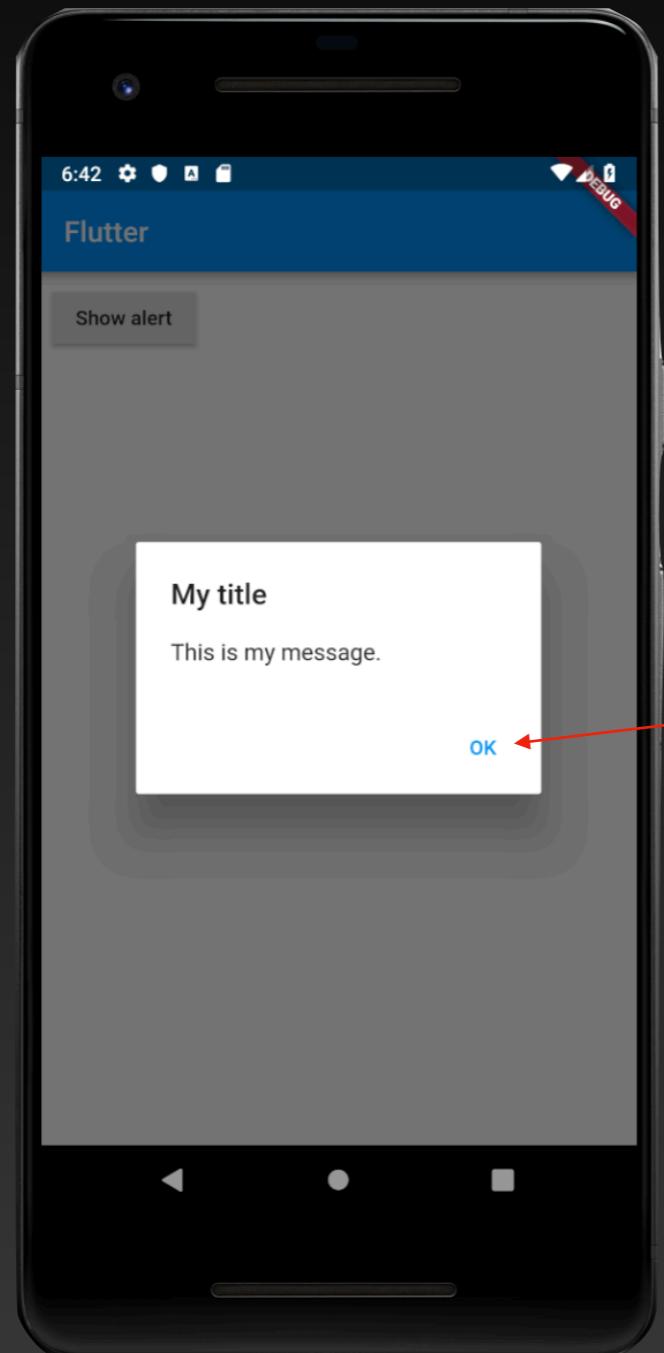
Those AlertDialog & Popup DialogBox

2 Types of AlertDialogs:

- Android
- Cupertino

Code for AlertDialog

Those AlertDialog & Popup DialogBox



```
showAlertDialog(BuildContext context) {  
  
    // set up the button  
    Widget okButton = TextButton(  
        child: Text("OK"),  
        onPressed: () { },  
    );  
  
    // set up the AlertDialog  
    AlertDialog alert = AlertDialog(  
        title: Text("My title"),  
        content: Text("This is my message."),  
        actions: [  
            okButton,  
        ],  
    );  
  
    // show the dialog  
    showDialog(  
        context: context,  
        builder: (BuildContext context) {  
            return alert;  
        },  
    );  
}
```

Navigation

Creating Navigation

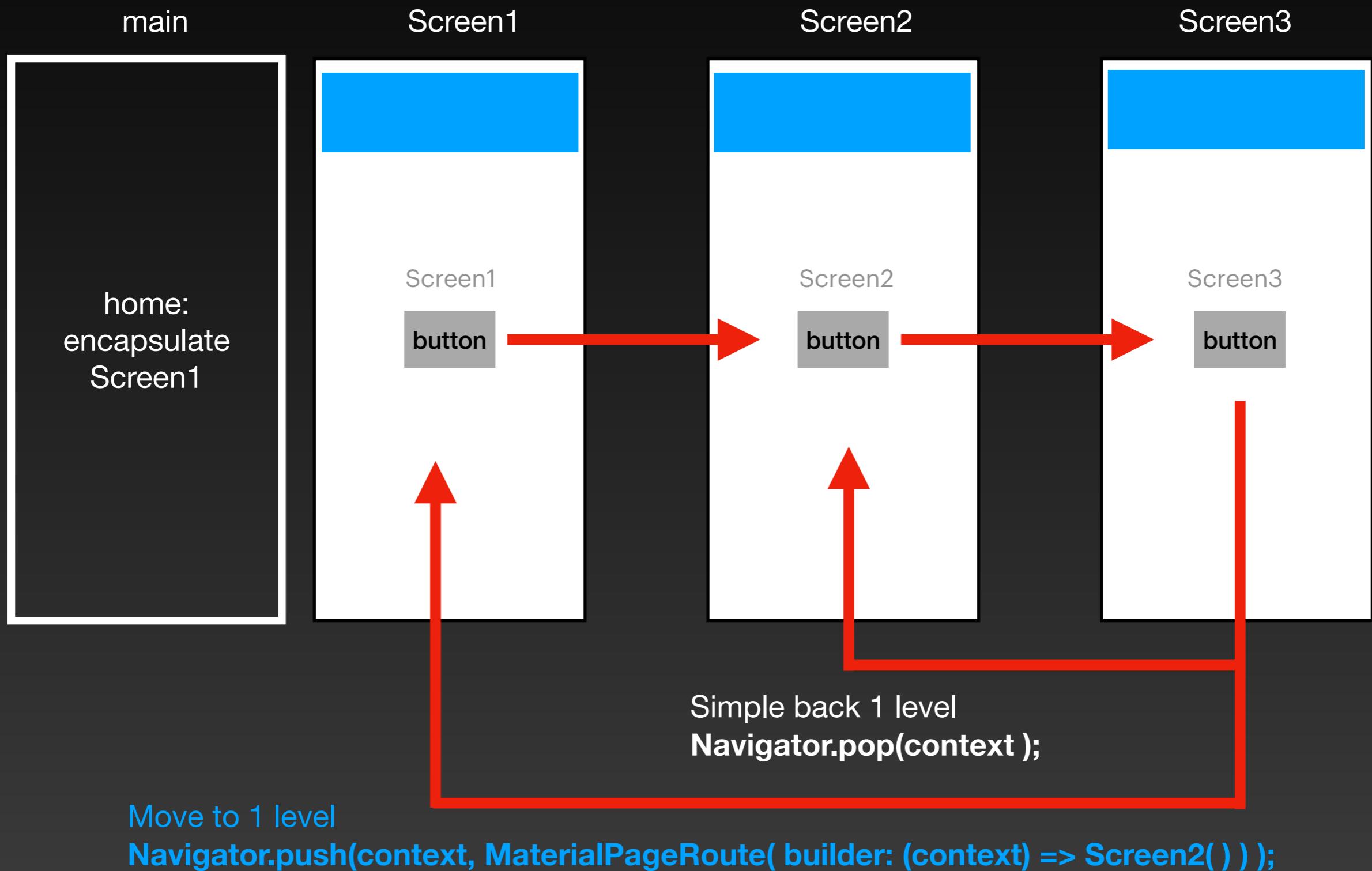
Navigate from one View to Another

It's Easy to create Navigation:

- To create a View, You create a new Class
- To create multiple Views, you create many Classes
- To navigate, you use Routes
- Use Navigator class

Creating Navigation

Navigate from one View to Another



Navigators

Navigate Code

To Move Forward use:

- Navigator.push(context, route) or
- Navigator.pushNamed(context, routename)

To Move Back use:

- Navigator.pop(context)

Note: There are many variations, choose which suits your requirement

Passing Parameters

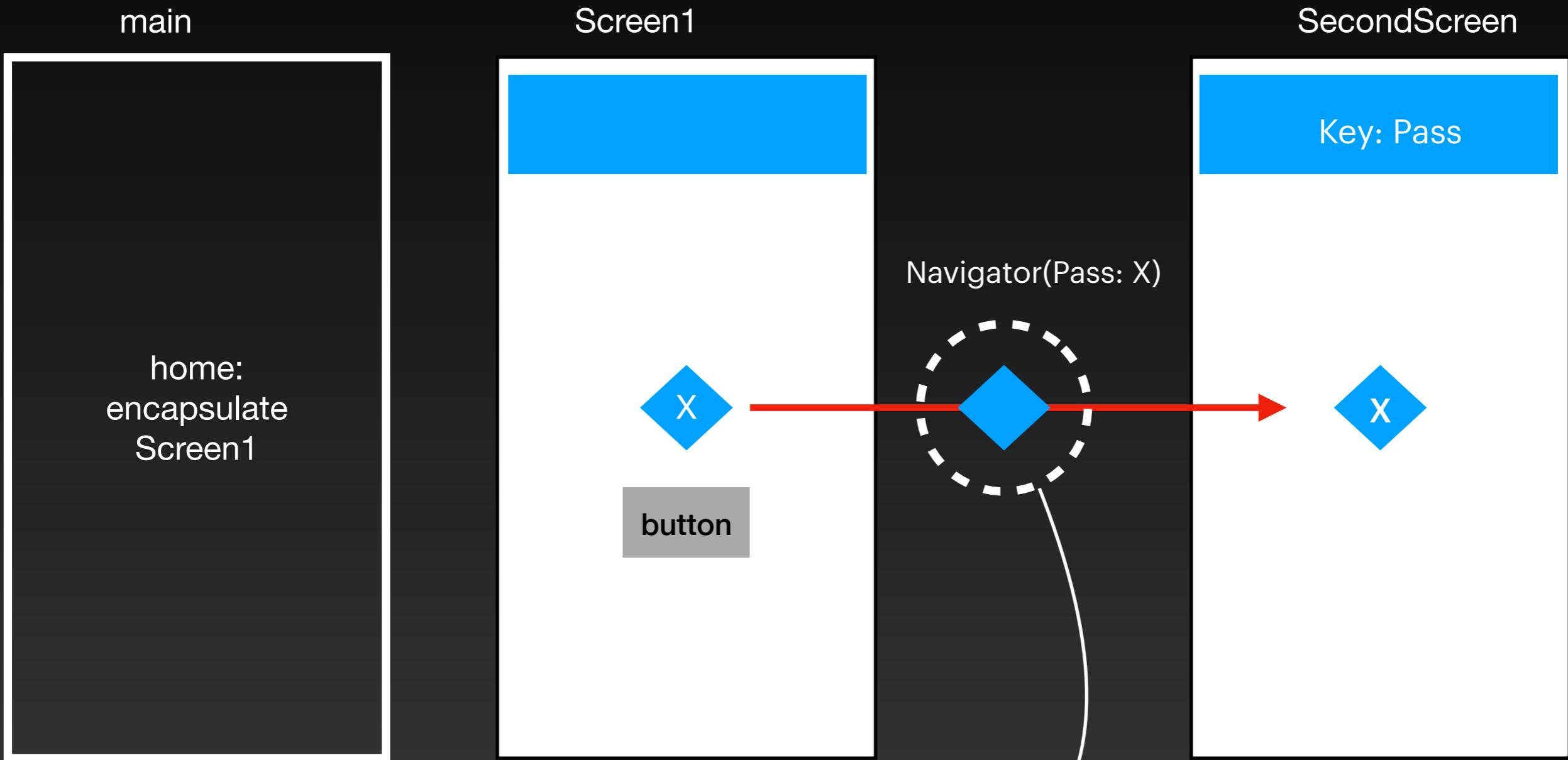
Navigate & Passing Data

It's Easy to pass data while Navigating:

- Create a parameter or argument to pass in Navigator or Route
- Create a class Key to receive parameter passed
- Show the parameter

Passing Parameters

The Way Passing Data is done

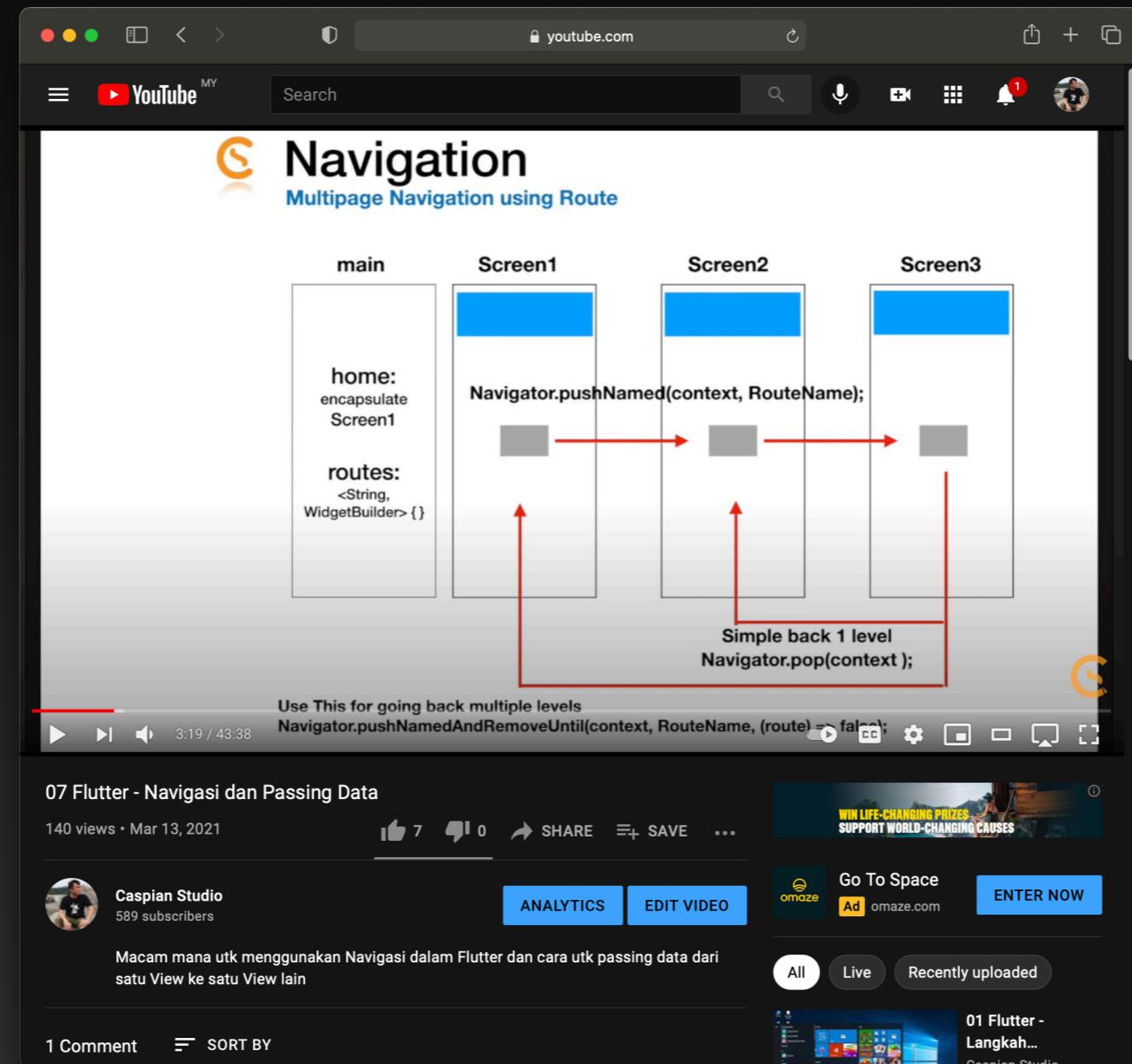


Passing single data, Can use Parameter or Argument: Pass

For passing multiple data, then create a Class and define the data as a Class Object

Let's Navigate & Pass Data

Video how to do Navigation & Passing Parameter



Refer on: https://www.youtube.com/watch?v=8EZkpyoufeU?sub_confirmation=1

If we have many Data

Array

When you have many Data

Use List as an array:

- List<type> array = [item, item, item...];
- Add(item)
- RemoveAt(index)
- Can use Dismissible widget if you want animated list when deleting (do ListView first).

ListView

Creating a ListView manually

You create manually:

```
ListView(  
  children: <Widget>[  
    ListTile(  
      leading: Icon(Icons.map),  
      title: Text('Map'),  
    ),  
    ListTile(  
      leading: Icon(Icons.photo_album),  
      title: Text('Album'),  
    ),  
    ListTile(  
      leading: Icon(Icons.phone),  
      title: Text('Phone'),  
    ),  
  ],  
);
```

Refer to <https://flutter.dev/docs/cookbook/lists>

ListView Builder

Creating a ListView Dynamically

You create using a Builder:

```
ListView.builder(  
    itemCount: items.length,  
    itemBuilder: (context, index) {  
        return ListTile(  
            title: Text(items[index]),  
        );  
    },  
)
```

Refer to <https://flutter.dev/docs/cookbook/lists>

FutureBuilder & StreamBuilder

Understanding these 2 Builders

- FutureBuilder for single event
- StreamBuilder for multiple events
- Async & Await



Future Builder

Understanding Future

```
FutureBuilder(  
    future: http.get('http://awesome.data')  
    builder: (context, snapshot) {  
        if (snapshot.connectionState ==  
            ConnectionState.done) {  
            return AwesomeData(snapshot.data);  
        } else {  
            return CircularProgressIndicator();  
        }  
    }  
}
```

Future Builder

Understanding Future

FutureBuilder is a Widget that will help you to execute some asynchronous function and based on that function's result your UI will update.

Why you will use FutureBuilder?

- If you want to render widget after async task then use it.
- Handle loading process by simply using ConnectionState.waiting
- Don't need any custom error controller. Can handle error simply dataSnapshot.error != null

Future Builder

Understanding Future

When using FutureBuilder widget we need to check for future state i.e future is resolved or not and so on. There are various State as follows:

- **ConnectionState.none**: It means that the future is null and initialValue is used as defaultValue.
- **ConnectionState.active**: It means the future is not null but it is not resolved yet.
- **ConnectionState.waiting**: It means the future is being resolved, and we will get the result soon enough.
- **ConnectionState.done**: It means that the future has been resolved.

Stream Builder

Understanding Stream

The StreamBuilder that can listen to exposed streams (continuous flow of data) and return widgets and capture snapshots of received stream data. We will deal with Stream in Firebase training.

The stream builder takes 3 arguments:

- initial:
- stream:
- builder:
which can convert elements of the stream into widgets

JSON, REST API & Flutter

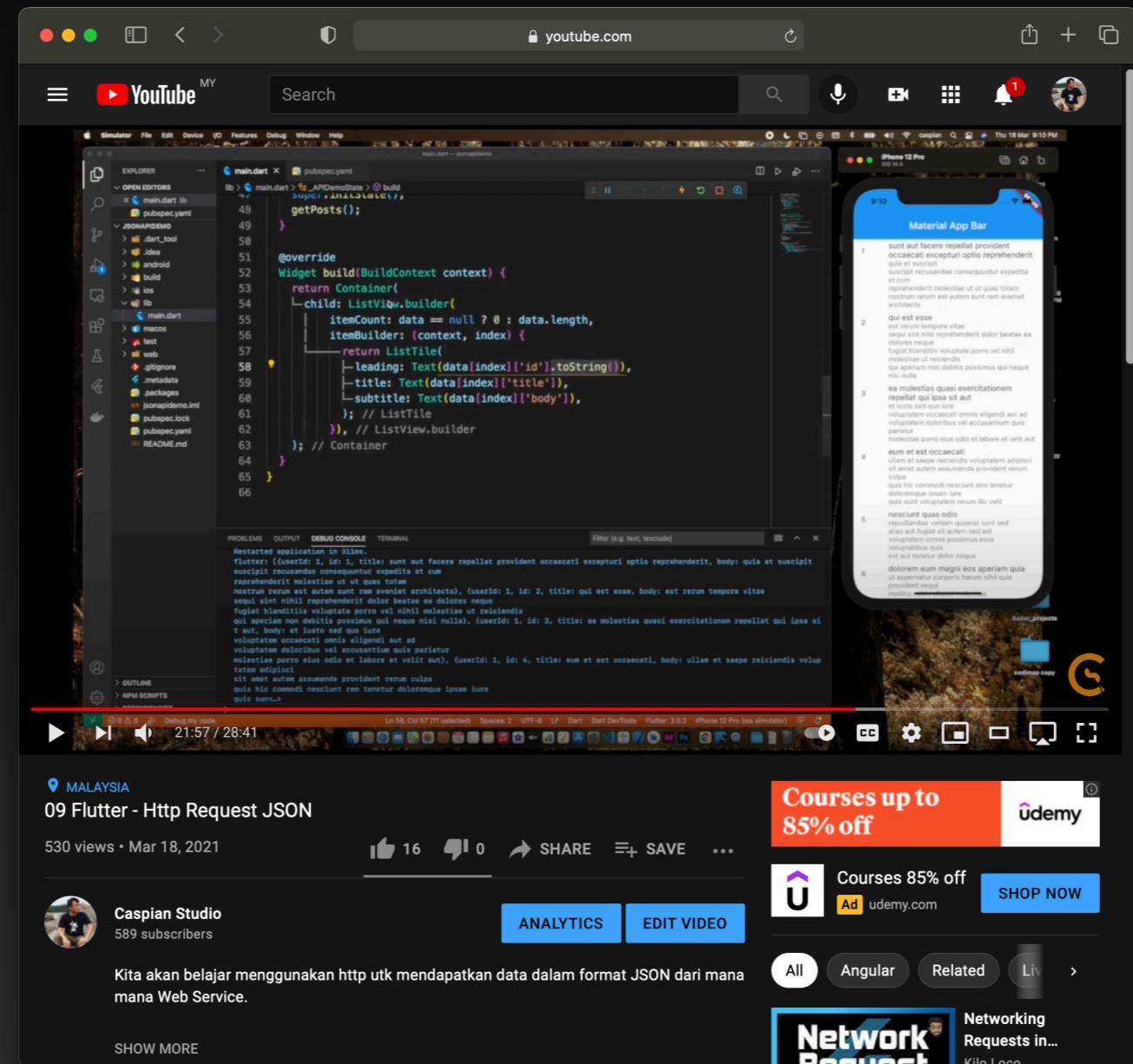
Getting Data from the Internet via API

Steps:

- Install **http** package in **pub.dev**
- Get JSON as the data source
- Do a conversion
- Use **FutureBuilder** or **StreamBuilder**

JSON, REST API & Flutter

Video how it's done



Refer to https://www.youtube.com/watch?v=jH8l-VvLffk?sub_confirmation=1

Local Data Sqlite

SQLite

How to use Sqlite in Flutter

Flutter apps can make use of the SQLite databases via the **sqflite** package available on pub.dev.

If you are new to SQLite and SQL statements, review the SQLite Tutorial to learn the basics first.

Steps:

- Add the **sqflite** dependencies in pubspec.yaml
- Define the data model.
- Open the database.
- Create the model table.
- Do CRUD - Create, Read, Update, Delete

SQLite

Our end Product

The screenshot displays a development environment with two main components: an IDE and a mobile emulator.

IDE (Visual Studio Code):

- File Structure:** Shows files like `home.dart`, `main.dart`, and `platform_channel`.
- Code Editor:** The `home.dart` file contains Dart code for a `FutureBuilder` widget. It checks if data is available in a snapshot and returns a `ListView.builder` with `ListTile` items for each user. If no data is available, it shows a `CircularProgressIndicator`. It also includes a floating action button (FAB) for adding new data.
- Terminal:** Shows the command `caspian@Caspian-MacBook-Pro bomba_sqlite % |`.

Mobile Emulator:

- Screen Content:** The app title is "Sqlite Database Demo". The screen lists users with their names and emails:
 - John john@gmail.com
 - David david@gmail.com
 - Abu abu@gmail.com
 - Ali ali@gmail.com
 - John john@gmail.com
 - David david@gmail.com
 - Abu abu@gmail.com
 - Ali ali@gmail.com
- Emulator UI:** Shows a navigation bar with icons for power, volume, and camera. A blue circular button with a plus sign is at the bottom right.

Build App

How to build APK, AAB or IPA

Using Flutter Cli on your Terminal or Console

Just type in the Terminal:

`flutter build apk` or

`flutter build aab` or

`Flutter build ipa` or

`Flutter build web` or

`Flutter build windows`

You can also compile in:

Android Studio for Android apps

Xcode for iOS Apps

Submission Criteria

Checklists

Android:

- Paid Developer ID
- Valid keystore for your App
- All Icons & Graphics
- Version & App ID

iOS:

- Paid Apple Developer ID
- All Icons & Graphics
- Version & App ID

How to Create Your Own Icons

For Beginners to create Android & iOS Icons

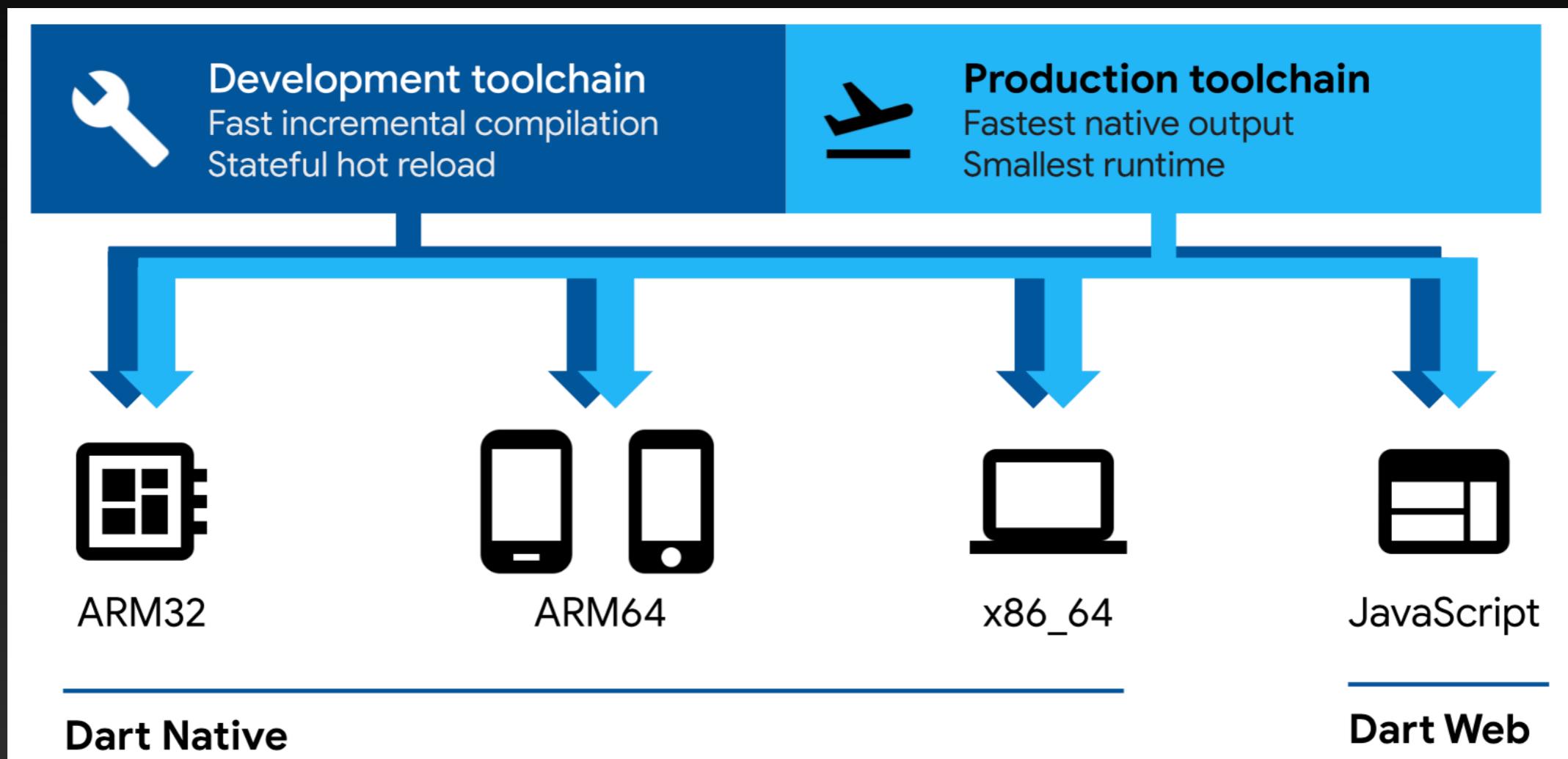
The screenshot shows the homepage of the App Icon Generator. At the top, there are navigation tabs: "App Icon Generator" (selected), "App Icon" (highlighted in blue), "Image Sets", "Desktop App" (with a "NEW" badge), "Donate", and a share icon. The main area is titled "App icon Generator" and instructs users to "Drag or select an app icon image (1024x1024) to generate different app icon sizes for all platforms". A dashed box indicates where to upload an image, featuring a blue camera icon. Below this, there are two sections: "iOS and macOS" and "Android". Under "iOS and macOS", four options are checked: "iPhone - 11 different sizes and files", "iPad - 13 different sizes and files", "watchOS - 8 different sizes and files", and "macOS - 11 different sizes and files". Under "Android", one option is checked: "Android - 4 different sizes and files". A file name input field contains "ic_launcher.png". Below it is a link to "Change file name for all generated Android images". At the bottom is a large "Generate" button with a download icon and a blue speech bubble icon.

Goto: <https://appicon.co>

Dart Language

What is Dart Language?

Platforms: Dart Native & Dart Web



Dart Native & Dart Web

Under the hood

Native platform:

For apps targeting mobile and desktop devices, Dart includes both a Dart VM with just-in-time (JIT) compilation and an ahead-of-time (AOT) compiler for producing machine code.

Web platform:

For apps targeting the web, Dart includes both a development time compiler (`dartdevc`) and a production time compiler (`dart2js`). Both compilers translate Dart into JavaScript.

Important Concepts

You need to know

- Everything you can place in a variable is an object, and every object is an instance of a class.
- Dart is strongly typed, type annotations are optional.
- If you enable null safety, variables can't contain null unless you say they can. You can make a variable nullable by putting a question mark (?) at the end of its type. If you know that an expression never evaluates to null but Dart disagrees, you can add ! to assert that it isn't null (and to throw an exception if it is).
- Dart supports generic types, like List<int> (a list of integers) or List<Object> (a list of objects of any type).
- Dart supports top-level functions (such as main()), as well as functions tied to a class or object (static and instance methods, respectively). You can also create functions within functions (nested or local functions).
- Similarly, Dart supports top-level variables, as well as variables tied to a class or object (static and instance variables). Instance variables are sometimes known as fields or properties.
- Dart doesn't have the keywords public, protected, and private. If an identifier starts with an underscore (_), it's private to its library.
- Dart has both expressions (which have runtime values) and statements (which don't). For example, the conditional expression condition ? expr1 : expr2 has a value of expr1 or expr2. Compare that to an if-else statement, which has no value.
- Dart tools can report two kinds of problems: warnings and errors.

Dart Libraries

Dart has a rich set of core libraries

- **dart:core**
Built-in types, collections, and other core functionality. This library is automatically imported into every Dart program.
- **dart:collection**
Richer collection types such as queues, linked lists, hashmaps, and binary trees
- **dart:convert**
Encoders and decoders for converting between different data representations, including JSON and UTF-8.
- **dart:io**
File, socket, HTTP, and other I/O support for non-web applications
- **dart:async**
Support for asynchronous programming, with classes such as Future and Stream
- **dart:typed_data**
Lists that efficiently handle fixed-sized data (for example, unsigned 8-byte integers) and SIMD numeric types
- **dart:math**
Mathematical constants and functions, plus a random number generator
- **dart:isolate**
Concurrent programming using isolates — independent workers that are similar to threads but don't share memory, communicating only through messages
- **dart:HTML**
HTML elements and other resources for web-based applications that need to interact with the browser and the Document Object Model (DOM)
- **Supplementary packages** such as characters, intl, http, crypto, markdown, XML, Windows Integration, SQLite, compression

Sound null safety

types in your code are non-nullable by default

- The Dart language now supports sound null safety!
- Dart Version 2.12 and above
- Meaning that variables can't contain null unless you say they can
- You can make a variable nullable by putting a question mark (?) at the end of its type. If you know that an expression never evaluates to null but Dart disagrees, you can add (!) to assert that it isn't null

Learn Dart

Learning Dart is easy

- Similar to C, Javascript or Java
- Single Inheritance. Instead use Mixins
- Goto dart.dev website

Hello Dart

Learning Dart is easy

Hello World

Every app must have a main() function. To display text on the console, you can use print() function:

```
void main() {  
  print('Hello, World!');  
}
```

Variables

Even in type-safe Dart code, most variables don't need explicit types, thanks to type inference:

```
var name = 'Voyager I';  
var year = 1977;  
var antennaDiameter = 3.7;  
var flybyObjects = ['Jupiter', 'Saturn', 'Uranus', 'Neptune'];  
var image = {  
  'tags': ['saturn'],  
  'url': '//path/to/saturn.jpg'  
};
```

Dart Types

Learning Dart is easy

Build-In Types

The Dart language has special support for the following types:

- numbers
- strings
- booleans
- lists (also known as arrays)
- sets
- maps
- runes (for expressing Unicode characters in a string)
- symbols

Numbers

The Dart language has 2 flavors:

- int
- double

Control flow Statements

Dart supports the usual flow statements

```
if (year >= 2001) {  
    print('21st century');  
} else if (year >= 1901) {  
    print('20th century');  
}  
  
for (var object in flybyObjects) {  
    print(object);  
}  
  
for (int month = 1; month <= 12; month++) {  
    print(month);  
}  
  
while (year < 2016) {  
    year += 1;  
}
```

Also in a widget, the conditional expression condition ? expr1 : expr2 has a value of expr1 or expr2. Compare that to an if-else statement

Example:

```
itemCount: data == null ? 0 : data.length,
```

Functions

Dart functions is similar to C/C++

```
int fibonacci(int n) {  
    if (n == 0 || n == 1) return n;  
    return fibonacci(n - 1) + fibonacci(n - 2);  
  
}  
  
var result = fibonacci(20);
```

A shorthand => (arrow) syntax is handy for functions that contain a single statement. This syntax is especially useful when passing anonymous functions as arguments:

```
void main() {  
    runApp(new MyApp());  
}
```

Normally

```
void main() => runApp(new MyApp());
```

shorthand

Async Await Future

Dart functions is similar to C/C++

Async

async and await help make asynchronous code easy to read. Use Future< > in front of a function that uses async

```
Future<void> createDescriptions(Iterable<String> objects) async {
  for (var object in objects) {
    try {
      var file = File('$object.txt');
      if (await file.exists()) {
        var modified = await file.lastModified();
        print(
          'File for $object already exists. It was modified on $modified.');
        continue;
      }
      await file.create();
      await file.writeAsString('Start describing $object in this file.');
    } on IOException catch (e) {
      print('Cannot create description for $object: $e');
    }
  }
}
```

Async Await Future

Dart functions is similar to C/C++

Async*

Use `async*` to give a nice, readable way to build streams. Stream means data is continuous streaming. Use the word `Stream<>` in front of a function that does streaming.

```
Stream<String> report(Spacecraft craft, Iterable<String> objects) async* {
  for (var object in objects) {
    await Future.delayed(oneSecond);
    yield '${craft.name} flies by $object';
  }
}
```

Static, Final, Const

Similar but no quite the same

- "static", "final", and "const" mean entirely distinct things in Dart:
- "static" means a member is available on the class itself instead of on instances of the class. That's all it means, and it isn't used for anything else.
- "final" means single-assignment: a final variable or field **must** have an initializer. Once assigned a value, a final variable's value cannot be changed. final modifies **variables**.
- “const” means that the object's entire deep state can be determined entirely at compile time and that the object will be frozen and completely immutable.

Late

Sometime you don't need it yet

late

Late variables this means that we can have non-nullables instance fields that are initialized later: Accessing value before it is initialized will throw a runtime error in null-safety

In other word, late runs “lazily”, which means it is not run at all until it is referenced the first time. That’s fine if you don’t specify an initial value

Drag & Drop

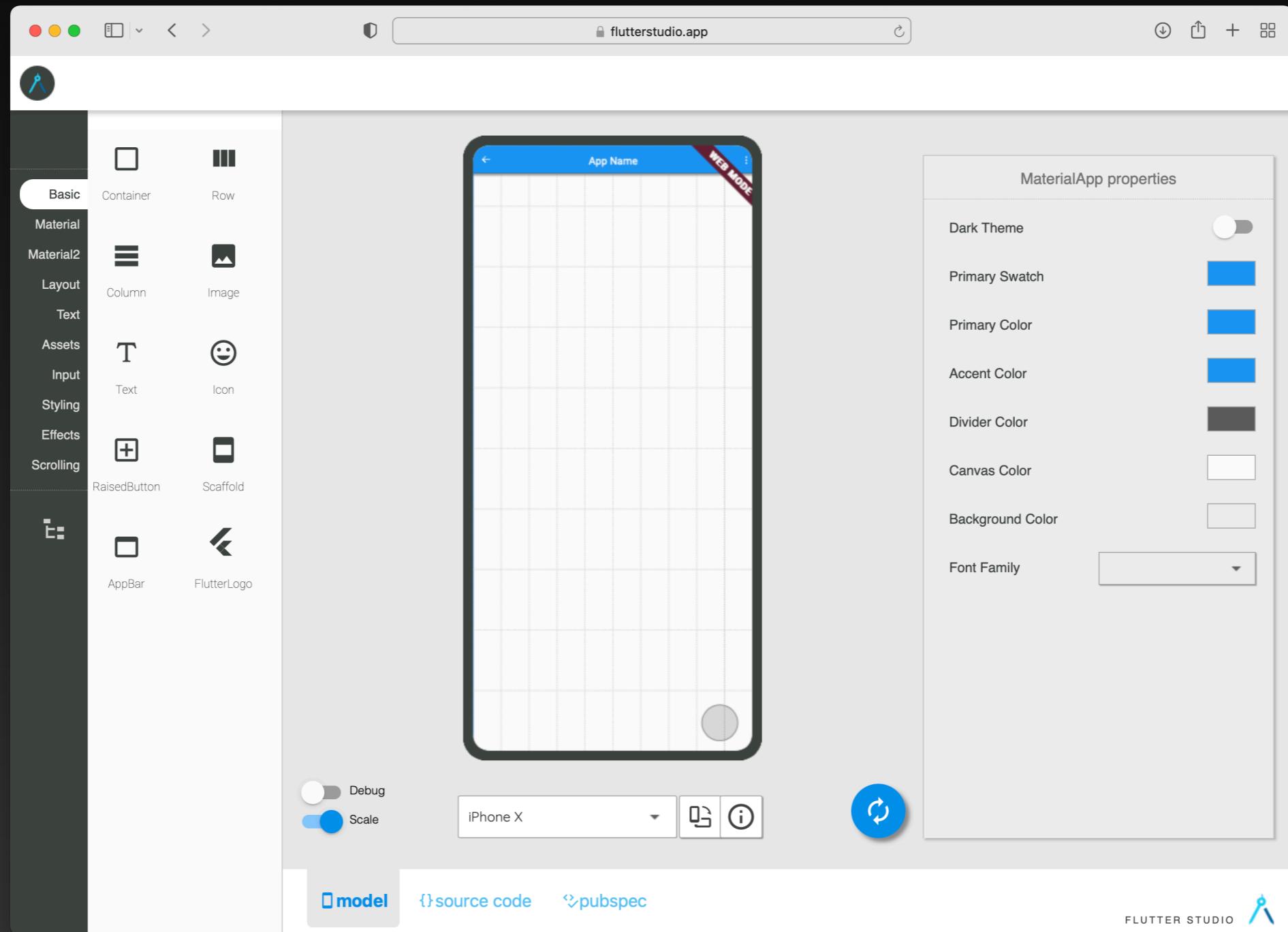
Tools for Flutter

Sometime you need help

There are a few good tools to help you in Flutter mobile apps development. These are a few tools...

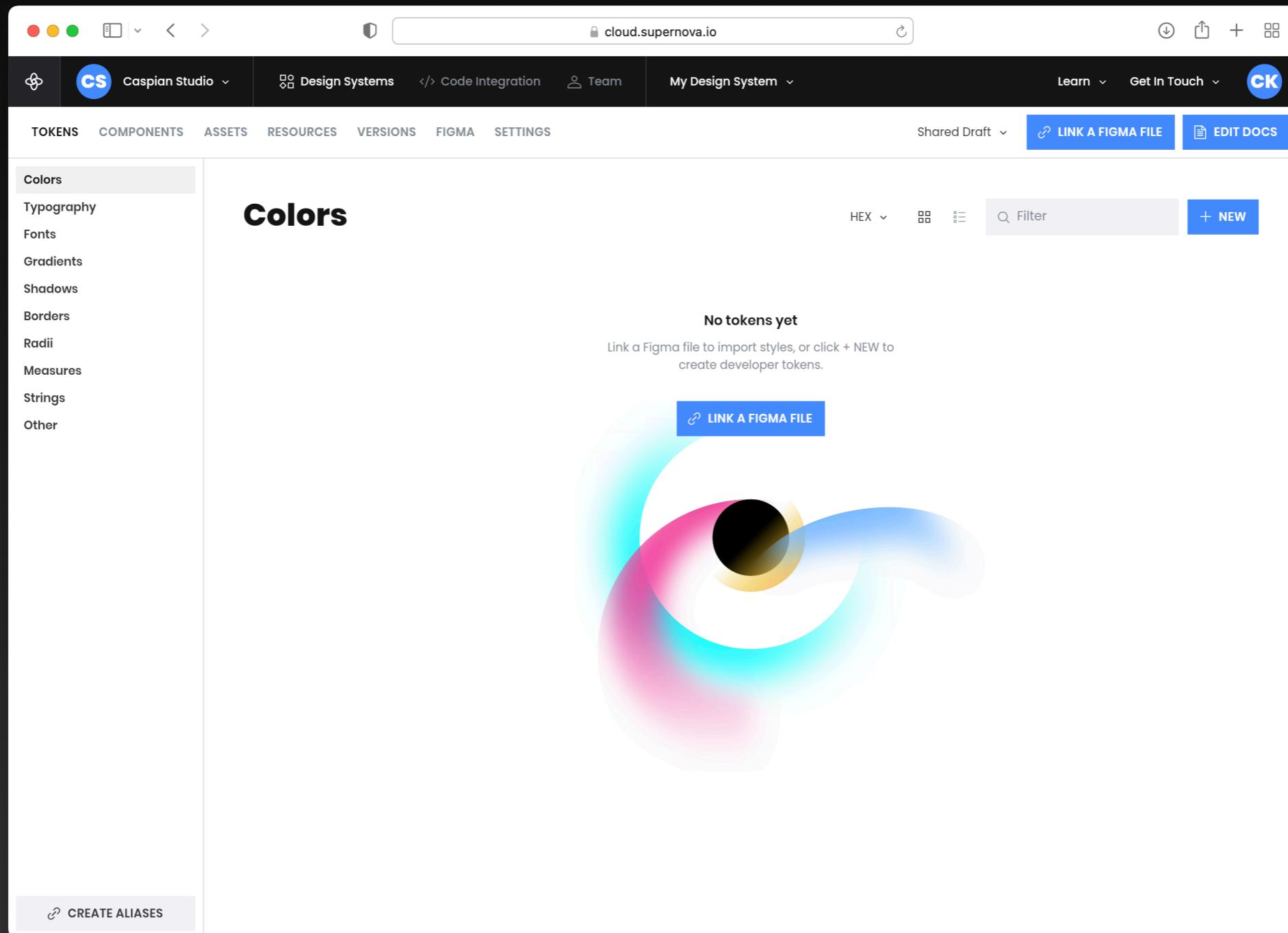
FlutterStudio

No-Code Tool



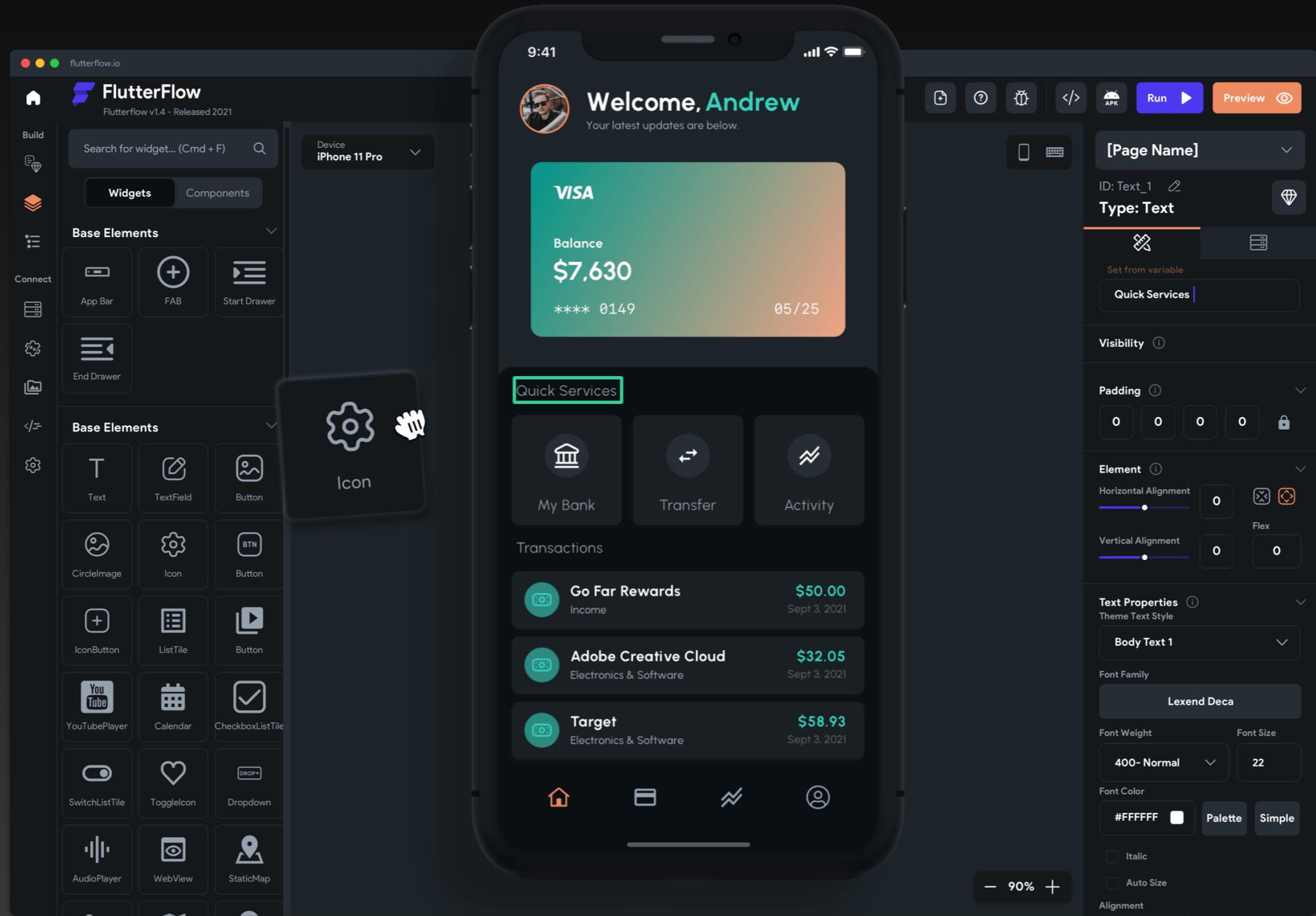
Supernova

From Prototyping to Code



FlutterFlow

No-Code Tool



FlutterFlow

No-Code Tool

We have Training on FlutterFlow

Contact: Caspian Consultancy Services