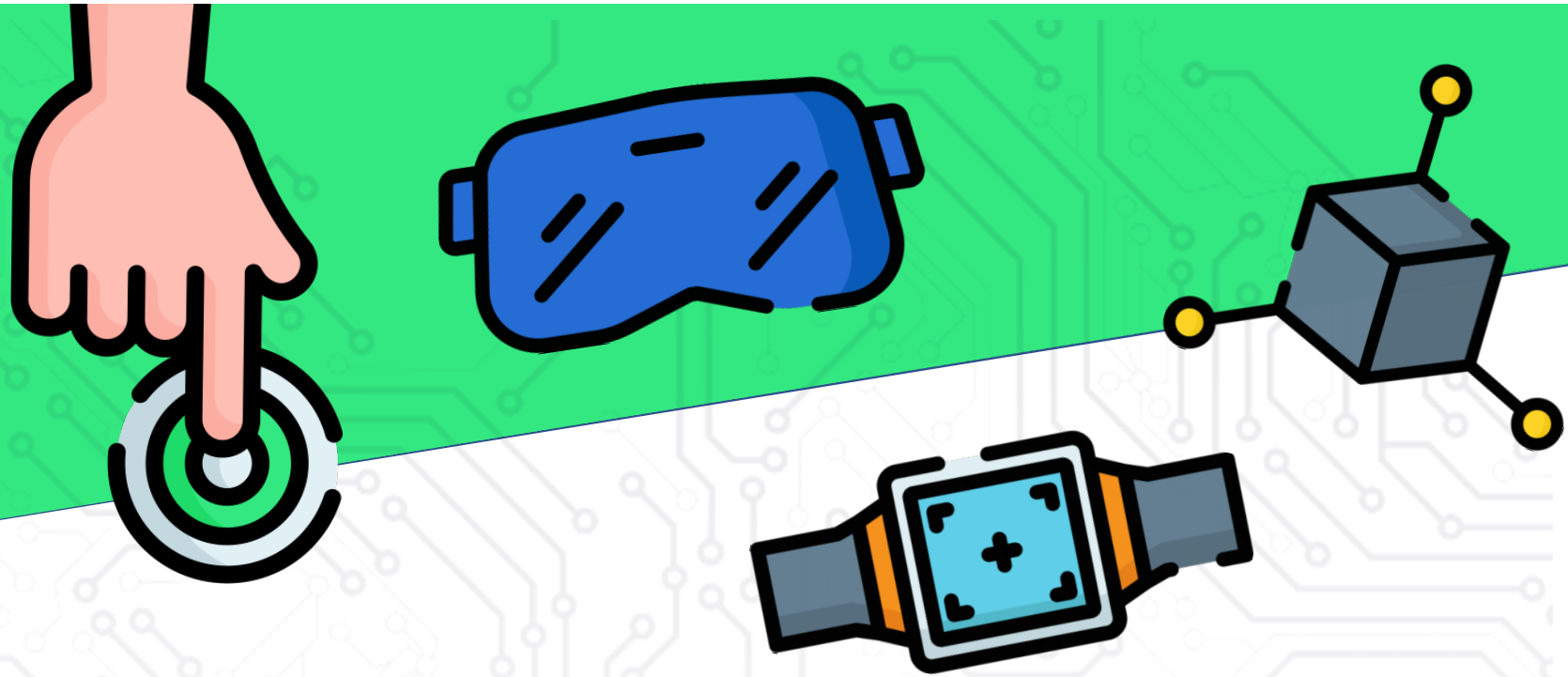
CLIENT
TECHNOLOGY
DAYS



Flutter Workshop

Denise & Dominic & Oliver & Stefan

Speakers

Oliver Gepp

Lead Software Architect

Focus iOS

FG Mobile Camp & Education

Denise Scherzinger

Professional Software Engineer

Focus Mobile

FG Mobile Camp & Education

Stefan Diegas

Professional Software Engineer

Focus Android

FG Mobile Camp

Dominic Mülhaupt

Advanced Software Engineer

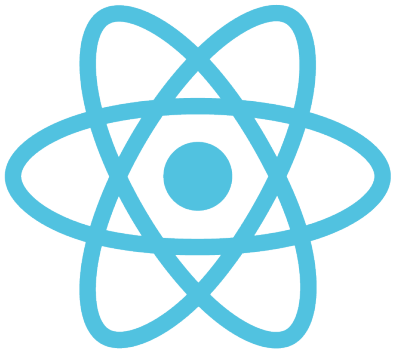
Focus Mobile

FG Mobile Camp

Agenda

- Flutter Introduction
- Dart
- Widgets
- Navigation
- State Management
- REST

Flutter



React Native

ionic

Xamarin

NativeScript

Onsen UI

PhoneGap

What is Flutter?

- Native Apps for iOS & Android
- Web & Desktop are coming
- Open-Source, backed by Google
- Alpha Release: Mid 2017
- Stable Release: End 2018

What is Dart?

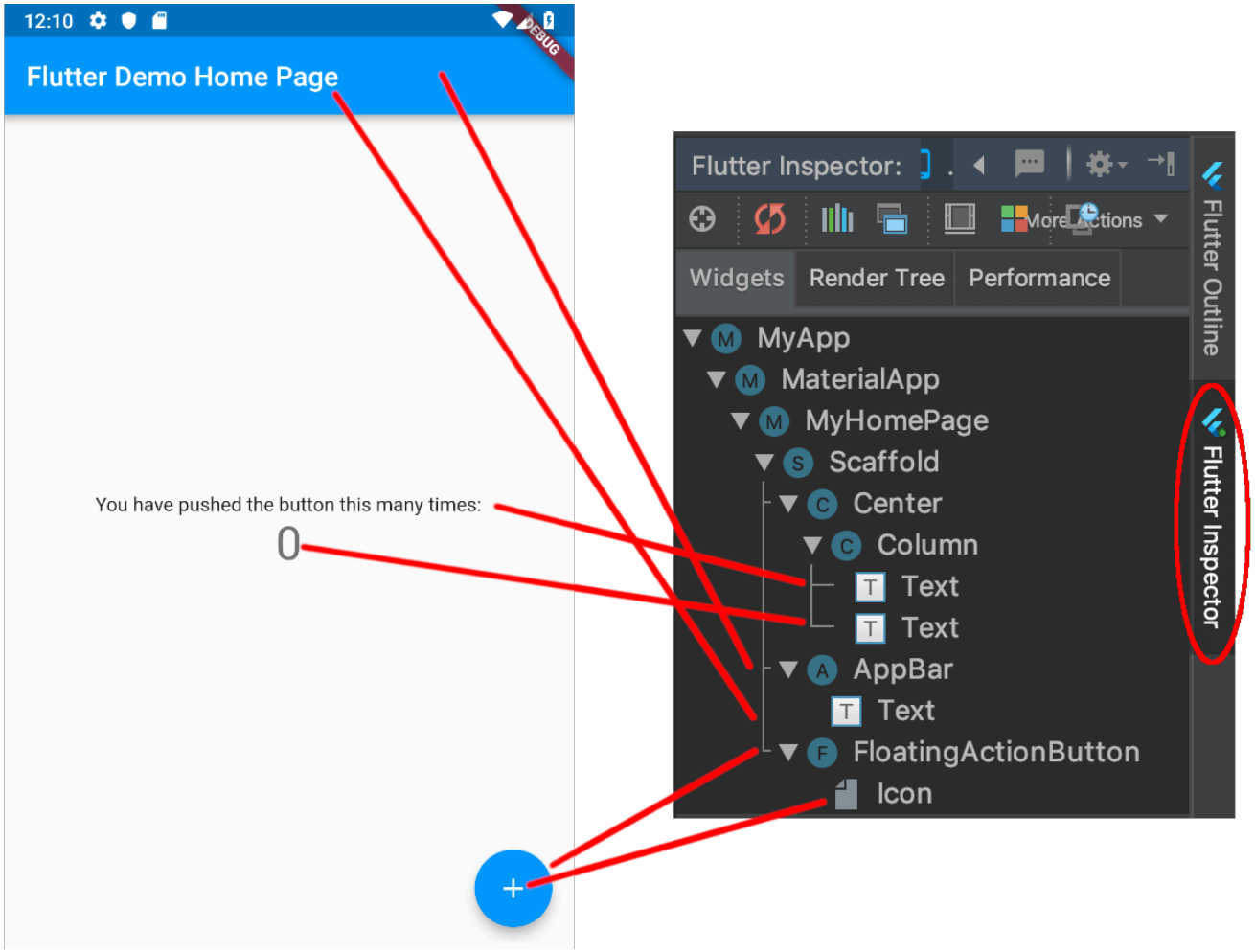
Dart

- Object-oriented
- Optimized for UI
- Open-Source, backed by Google
- Supports JIT & AOT compilation

How do I build the interface?

```dart
@override
Widget build(BuildContext context) {
    return MaterialApp(
        home: Scaffold(
            appBar: AppBar(
                title: Text("Exploring Widgets"),
            ),
            body: myWidget(),
        ),
    );
}
```

Everything is a Widget



Hot Reloading!

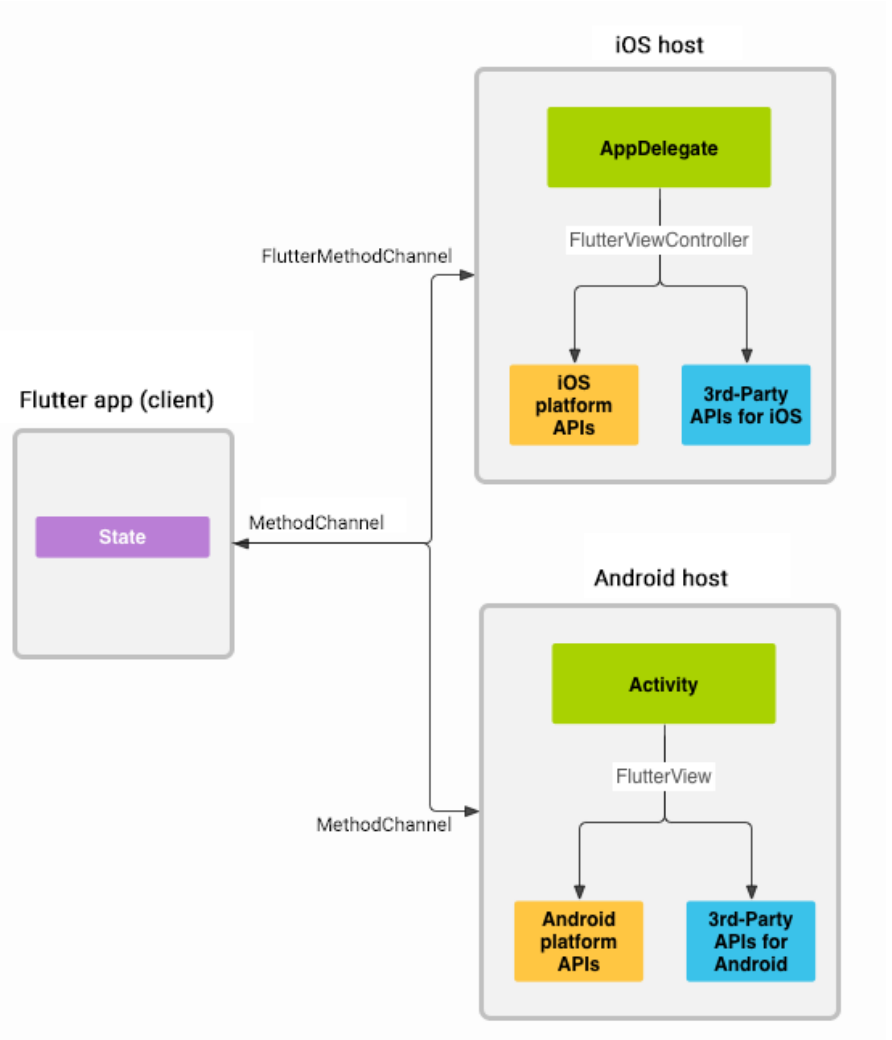
How is Flutter native?

UI

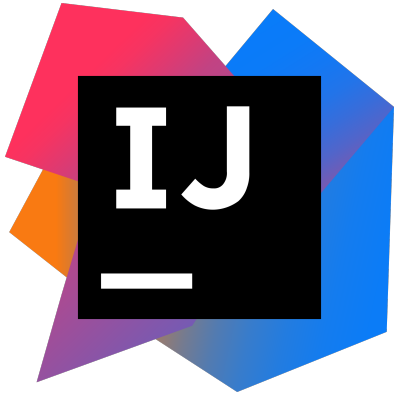
- Rendering using Skia
- No OEM Widgets
  - Look is independent of OS version

Services

- Basic API provided by Flutter
- Integrating APIs is easy
  - Client sends a message
  - Host listens for messages and executes native code



What tools can I use?



Flutter Dev Tools

Dart Editor + `flutter` CLI

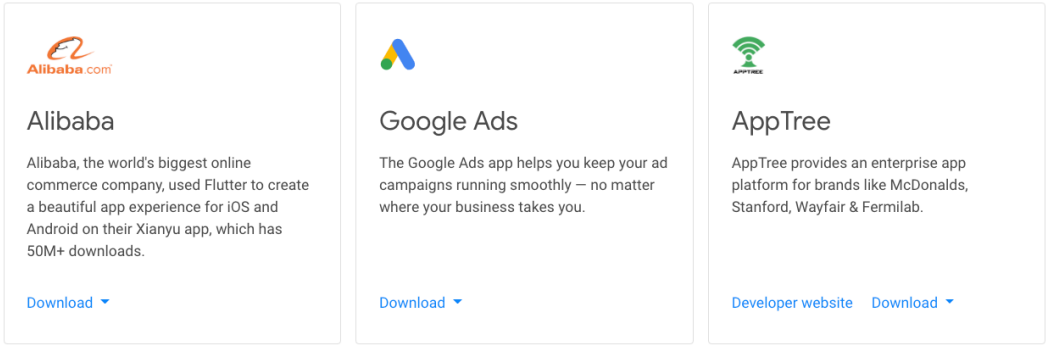
Is Flutter production-ready?

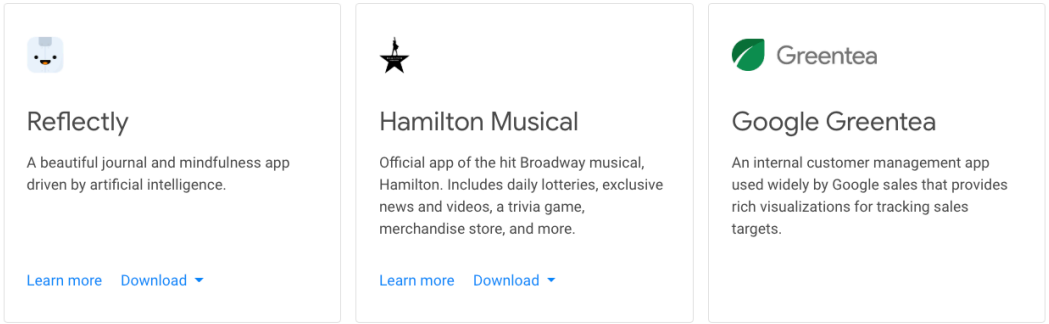
Yes!

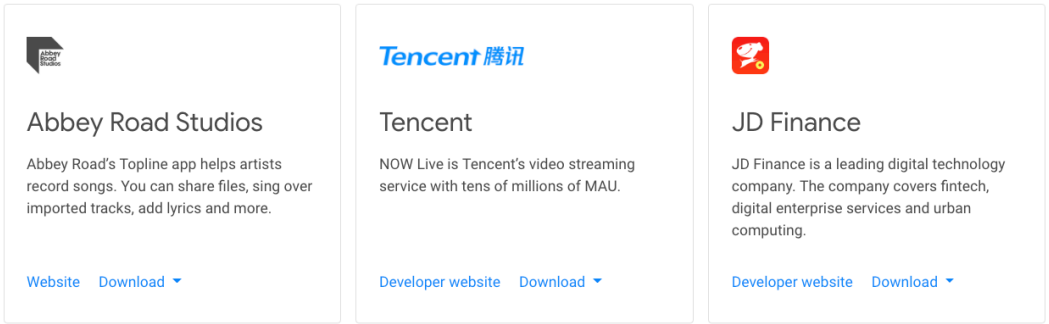
But…

- Ecosystem smaller, however growing fast
- Dart is new to most developers
- Some cute and some nasty bugs
- New minor version every ~1 month

Showcase


Alibaba
Alibaba, the world's biggest online commerce company, used Flutter to create a beautiful app experience for iOS and Android on their Xianyu app, which has 50M+ downloads.
Download
Google Ads
The Google Ads app helps you keep your ad campaigns running smoothly — no matter where your business takes you.
Download
AppTree
AppTree provides an enterprise app platform for brands like McDonalds, Stanford, Wayfair & Fermilab.
Developer website
Download


Reflectly
A beautiful journal and mindfulness app driven by artificial intelligence.
Learn more
Download
Hamilton Musical
Official app of the hit Broadway musical, Hamilton. Includes daily lotteries, exclusive news and videos, a trivia game, merchandise store, and more.
Learn more
Download
Greentea
Google Greentea
An internal customer management app used widely by Google sales that provides rich visualizations for tracking sales targets.


Abbey Road Studios
Abbey Road's Topline app helps artists record songs. You can share files, sing over imported tracks, add lyrics and more.
Website
Download
Tencent 腾讯
Tencent
NOW Live is Tencent's video streaming service with tens of millions of MAU.
Developer website
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JD Finance
JD Finance is a leading digital technology company. The company covers fintech, digital enterprise services and urban computing.
Developer website
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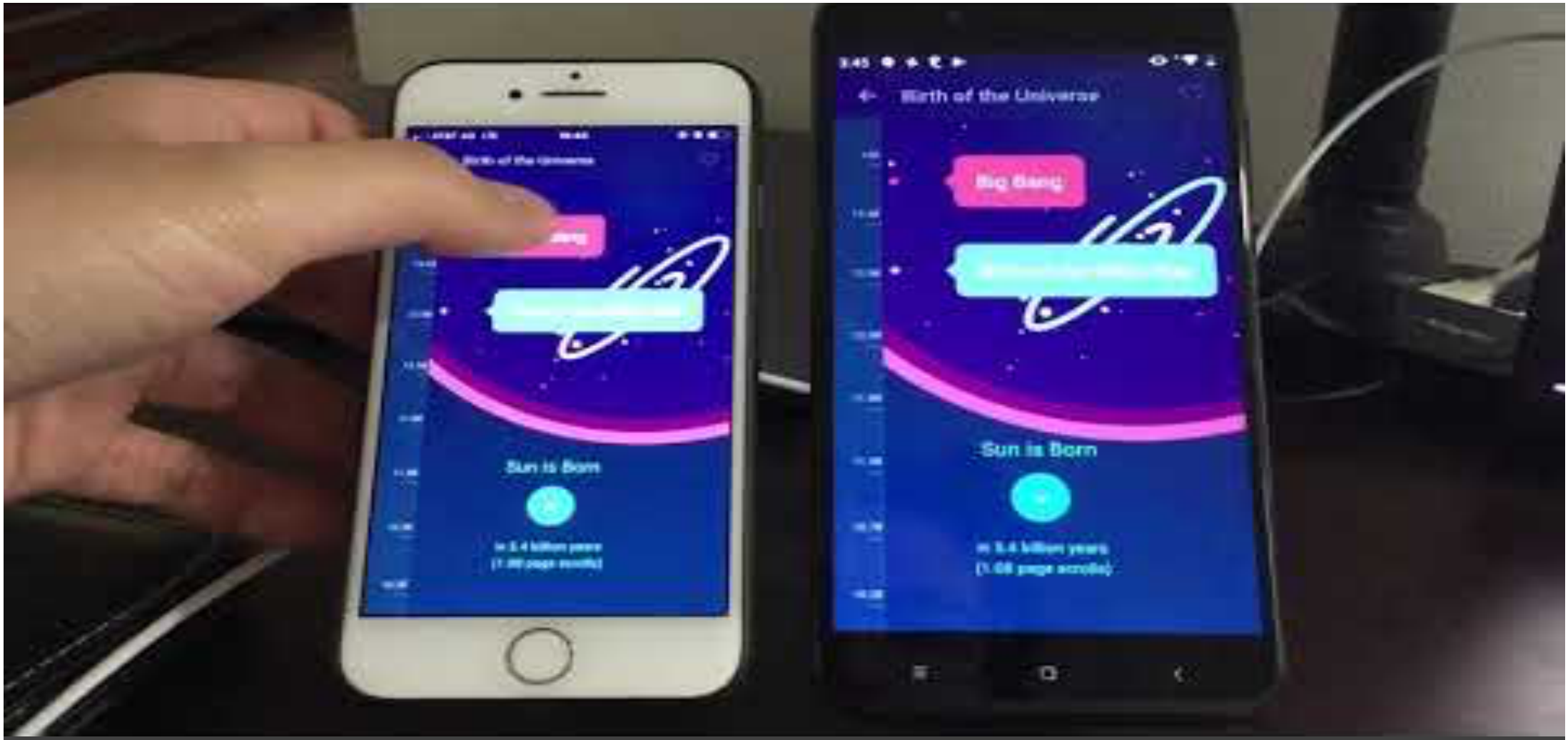


The History of Everything

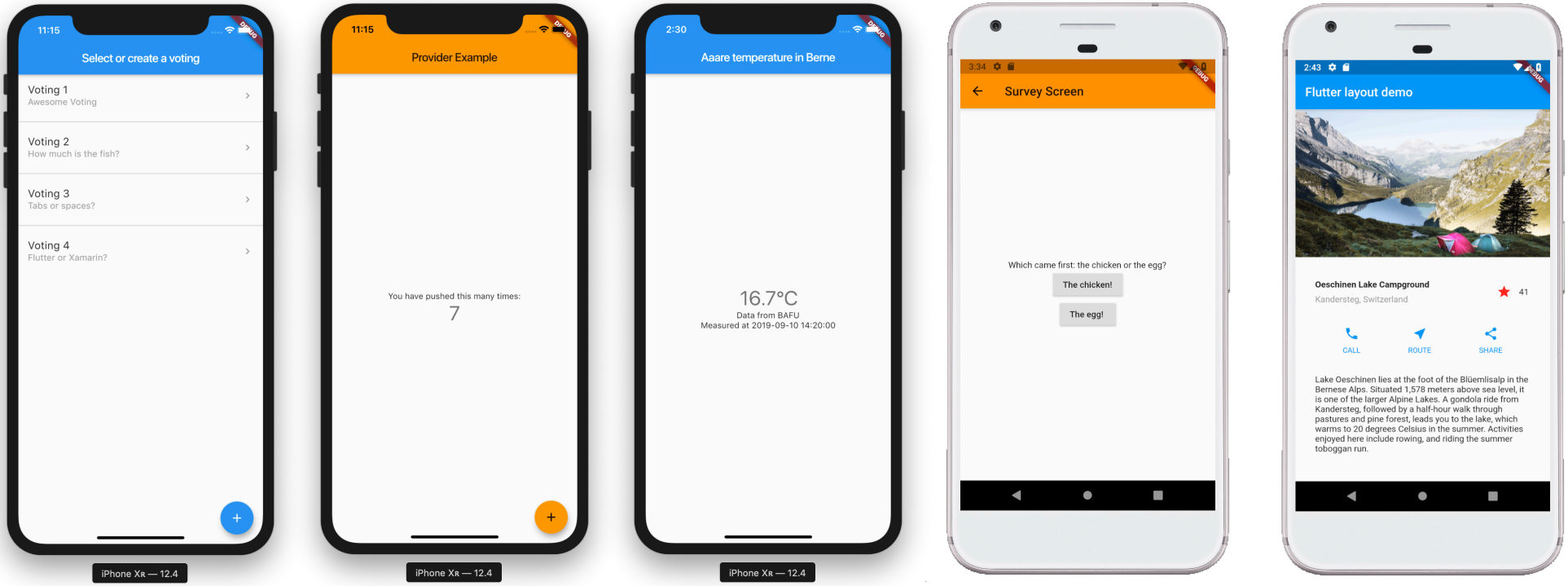
Download on the App Store

GET IT ON Google Play

When can we actually start coding?

Hands-On

Git Repo: https://github.com/dominicmh/flutter_workshop/



Dart

Dart

- Dart SDK comes with standalone Dart VM

```
$ dart main.dart
```

- Package manager: Pub (https://pub.dev/)

- DartPad: run Dart code in browser https://dartpad.dartlang.org/

Dart

- Strongly typed language, supports type inference
- All data types are objects and inherit from *Object* class
  → default value is *null*
- Only single inheritance, but multiple interfaces can be implemented
- Abstraction possible with abstract classes and interfaces

Dart

- Entry point: main() method
- No private/public keywords, _ is used instead
- String interpolation and string concatenation with adjacent string literals

```dart
class Tweet {
  String _username;
  String _content;

  Tweet(this._username, this._content);

  printTweet() {
    print('--- Tweet ---'
        '\n Username: $_username'
        '\n Content: $_content');
  }
}

main() {
  Tweet tweet = new Tweet("trumpet", "I am great!");
  tweet.printTweet();
}

```

Dart

- Shorthand constructor without body

- Named constructors can be used to implement multiple constructors

  → provides namespace to constructor instead of parameter count

```dart
class Point {
  num x, y;

  // Shorthand constructor
  Point(this.x, this.y);

  // Named constructor
  Point.origin() {
    x = 0;
    y = 0;
  }
}
```

Dart

- Cascade notation (..) can be used to make a sequence of operations on the same object (method calls, accessing fields, …)
- It invokes the method, discards the result and instead returns the instance each time

```
querySelector('#confirm')
  ..text = 'Confirm'
  ..classes.add('important')
  ..onClick.listen((e) => window.alert('Confirmed!'));
```

```
var button = querySelector('#confirm');
button.text = 'Confirm';
button.classes.add('important');
button.onClick.listen((e) => window.alert('Confirmed!'));
```

Dart

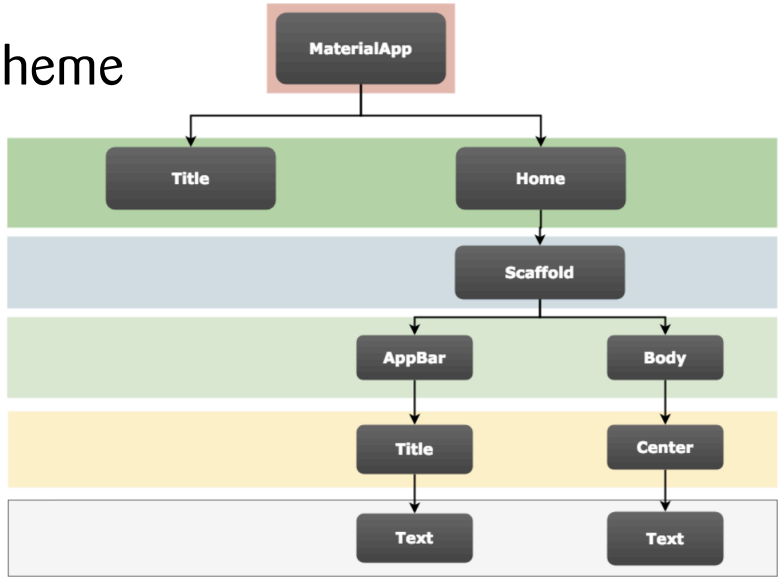
- Optional parameters (either positional or named)

```dart
// named optional parameters, with @required annotation
Scrollbar({Key key, @required Widget child})

// positional optional parameters, with default value
readFile(String name, [String mode, String charset = 'utf-8']) {...}
```

Widgets

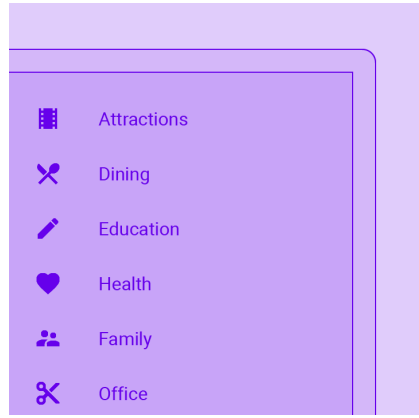
Widgets

- Widgets are basic building blocks of a flutter app
- Each widget is a mutable declaration of part of user interface
- Everything is a widget
  - Structural elements like button, menu
  - Stylistic elements that propagate a font or color scheme
  - Layout related elements like padding
  - ...
  - Or a composition of existing widgets

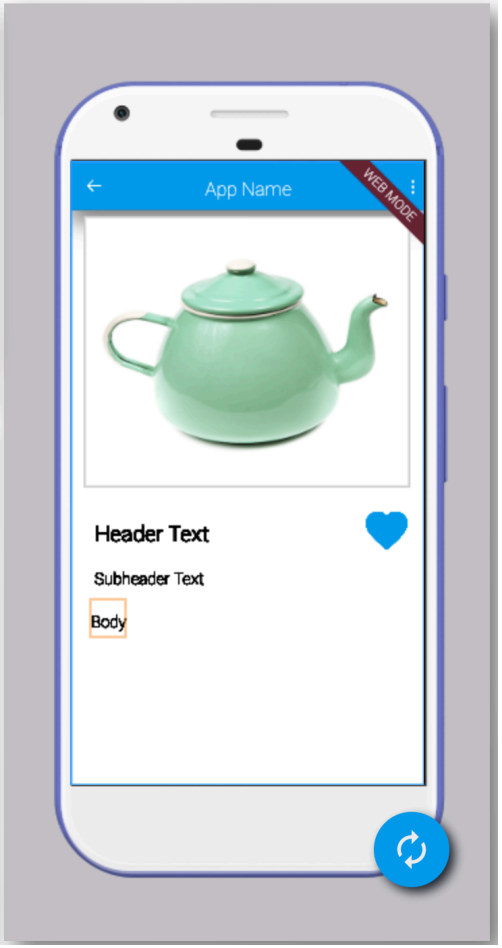


Catalogue

- There are Widgets for almost everything
  - Accessibility
  - Animation and Motion
  - Assets, Images and Icons
  - Async
  - Input
  - Interaction Models
  - Layouts
  - Painting
  - Scrolling
  - Styling
  - And more …
- https://flutter.dev/docs/development/ui/widgets



Exercise 1



- Navigate to http://mutisya.com
- By drag and drop try to create this News App on the left
- Have a look at the generated Code

Time: 10 minutes

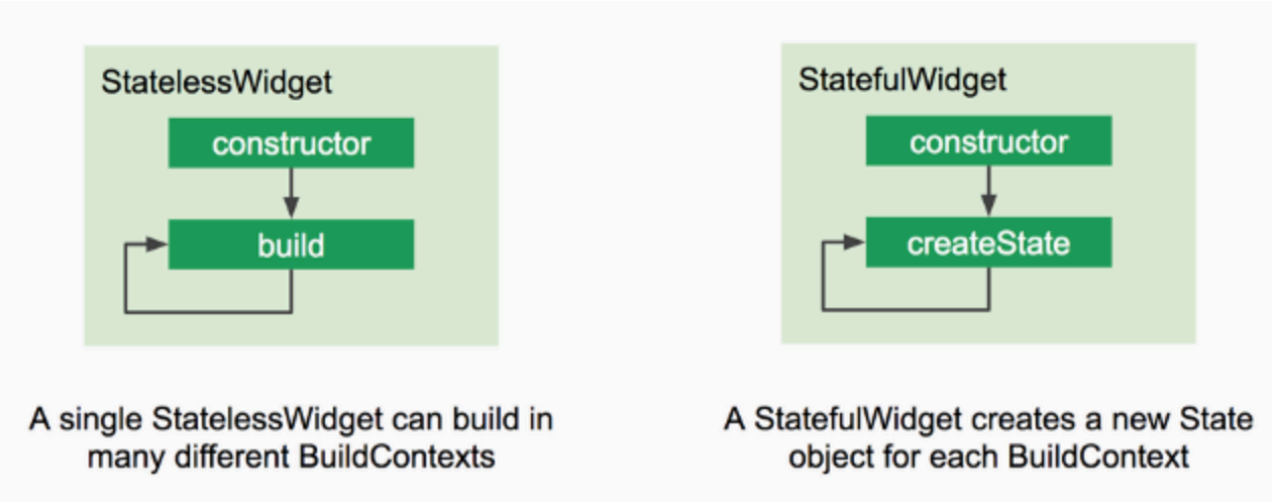
Solution

```
@override
Widget build(BuildContext context) {
  return new Scaffold(
    appBar: new AppBar(
      title: new Text('App Name'),
      ),
    body:
      new Center(
        child:
          new Column(
            mainAxisAlignment: MainAxisAlignment.start,
            mainAxisSize: MainAxisSize.min,
            crossAxisAlignment: CrossAxisAlignment.center,
            children: <Widget>[
              new Image.asset(
                'images/name.jpg',
                width: 240.0,
                height: 200.0,
                ),

              new Expanded(
                child:
                  new Column(
                    mainAxisAlignment: MainAxisAlignment.start,
                    mainAxisSize: MainAxisSize.min,
                    crossAxisAlignment: CrossAxisAlignment.center,
                    children: <Widget>[
                      new Row(
                        mainAxisAlignment: MainAxisAlignment.start,
                        mainAxisSize: MainAxisSize.min,
                        crossAxisAlignment: CrossAxisAlignment.baseline,
                        children: <Widget>[
                          new Expanded(
                            child:
                              new Column(
                                mainAxisAlignment: MainAxisAlignment.start,
                                mainAxisSize: MainAxisSize.min,
                                crossAxisAlignment: CrossAxisAlignment.start,
                                children: <Widget>[
                                  new Text(
                                  "Header Text",
                                    style: new TextStyle(fontSize:16.0,
                                    color: const Color(0xFF000000),
                                    fontWeight: FontWeight.w300,
                                    fontFamily: "Roboto")
                                  ),
```

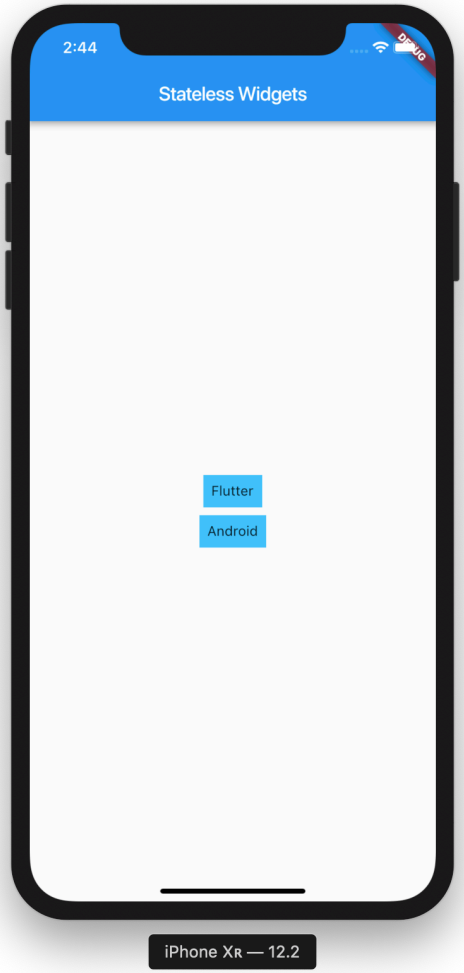
- Many Column and Row Widgets -> important in Flutter
- Uncommon structure of the Code

Stateless Widgets

- A stateless widget is a widget that is composed of children and doesn't contain any mutual state
- The *build(…)* function is only called once
- Can't track data over time, or trigger rebuild on their own



Example




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

void main() {
  runApp(new DemoApp());
}

class DemoApp extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      title: 'Learning Flutter',
      home: Scaffold(
        appBar: AppBar(
          title: Text('Stateless Widgets'),
        ),
        body: Center(
          child: Column(
            mainAxisAlignment: MainAxisAlignment.center,
            children: [
              DecoratedBox(
                decoration: BoxDecoration(color: Colors.lightBlueAccent),
                child: Padding(
                  padding: const EdgeInsets.all(8.0),
                  child: Text('Flutter'),
                ),
              ),
              SizedBox(height: 8.0),
              DecoratedBox(
                decoration: BoxDecoration(color: Colors.lightBlueAccent),
                child: Padding(
                  padding: const EdgeInsets.all(8.0),
                  child: Text('Android'),
                ),
              ),
            ],
          ),
        ),
      ),
    );
  }
}
```

Exercise 2

- Read the code from last page carefully and understand its concept.
- Eleminate duplicated code and create a new Stateless Widget ”TechnologyName” that takes two arguments for name of technology and background color.
- Time is limited, so only build it in your head ☺.
- Compare your solution with the one on the next page

Time: 5 minutes

Solution:

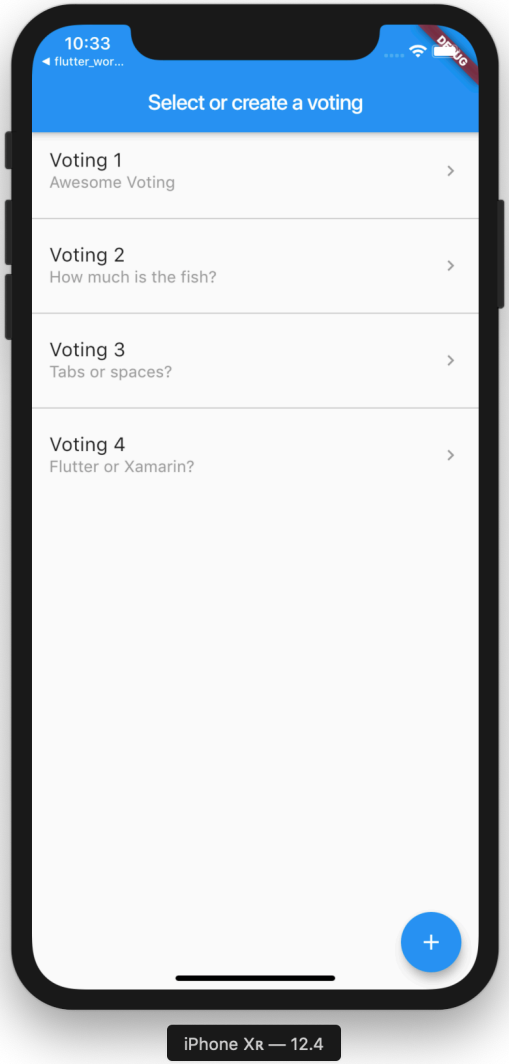
```dart
import 'package:flutter/material.dart';

class TechnologyName extends StatelessWidget {
  final String name;
  final MaterialAccentColor backgroundColor;

  const TechnologyName(this.name, this.backgroundColor);

  @override
  Widget build(BuildContext context) {
    return DecoratedBox(
      decoration: BoxDecoration(color: backgroundColor),
      child: Padding(
        padding: const EdgeInsets.all(8.0),
        child: Text(name),
      ),
    );
  }
}
```

```dart
import 'package:flutter/material.dart';
import 'technology_name.dart';

void main() {
  runApp(new DemoApp());
}

class DemoApp extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      title: 'Learning Flutter',
      home: Scaffold(
        appBar: AppBar(
          title: Text('Stateless Widgets'),
        ),
        body: Center(
          child: Column(
            mainAxisAlignment: MainAxisAlignment.center,
            children: [
              TechnologyName('Flutter', Colors.orangeAccent),
              SizedBox(height: 8.0),
              TechnologyName('Android', Colors.blueAccent)
            ],
          ),
        ),
      ),
    );
  }
}
```

Exercise 3

- Build the UI on the right ☺
  - Checkout code here
  - Add a FloatingActionButton and call existing function on tap
  - Add VotingListPage widget that is already part of the project as the body of the Scaffold widget
  - Add missing code in VotingListPage widget. Data is provided by existing VotingModel class
  - Solution can be found here

Time: 15 minutes



Stateful Widgets

- A stateful widget is a widget that is composed of children and has a mutual state
  - Mutual state: Properties that change over time like the string value of a textfield.
- Can track data over time, or trigger rebuild on their own
- When the widget's state changes, the state object calls *setState(…),* telling the framework to redraw the widget.

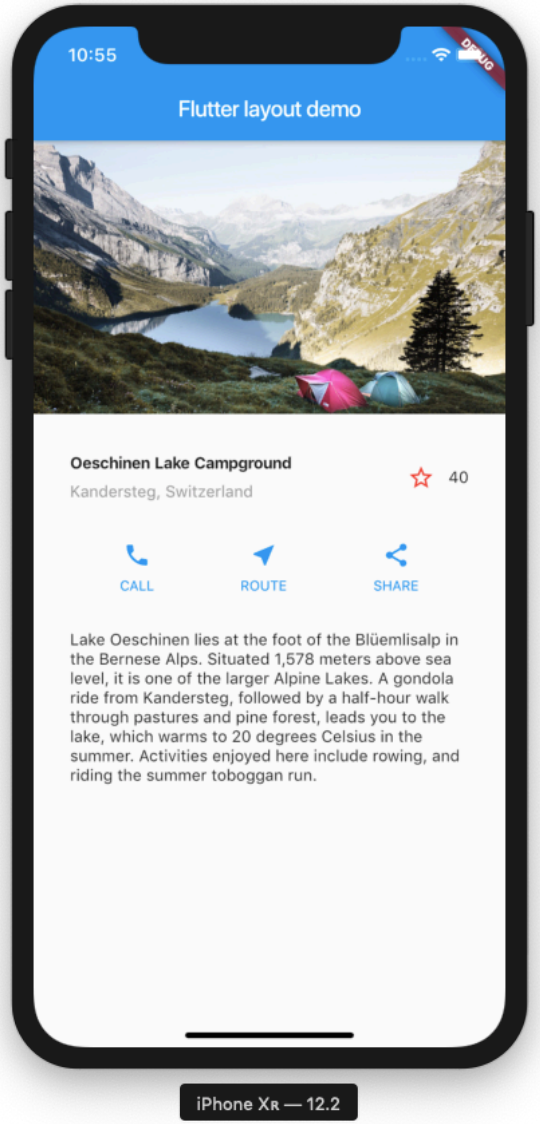
Basic Syntax

```
class FavoriteWidget extends StatefulWidget {
  @override
  _FavoriteWidgetState createState() => _FavoriteWidgetState();
}

class _FavoriteWidgetState extends State<FavoriteWidget> {

  bool _isFavorite = true;

  void _toggleFavorite() {

  }

  @override
  Widget build(BuildContext context) {
    return Row(

    );
  }

}
```

Exercise 4

- Replacing Stateless Widgets
  - Checkout code here
  - Replace two stateless widgets – the solid red star and the counter next to it with one stateful widget
  - First of all create a subclass of StatefulWidget that defines the Widget
  - Then create a Subclass of State
  - Solution can be found here

Time: 15 minutes



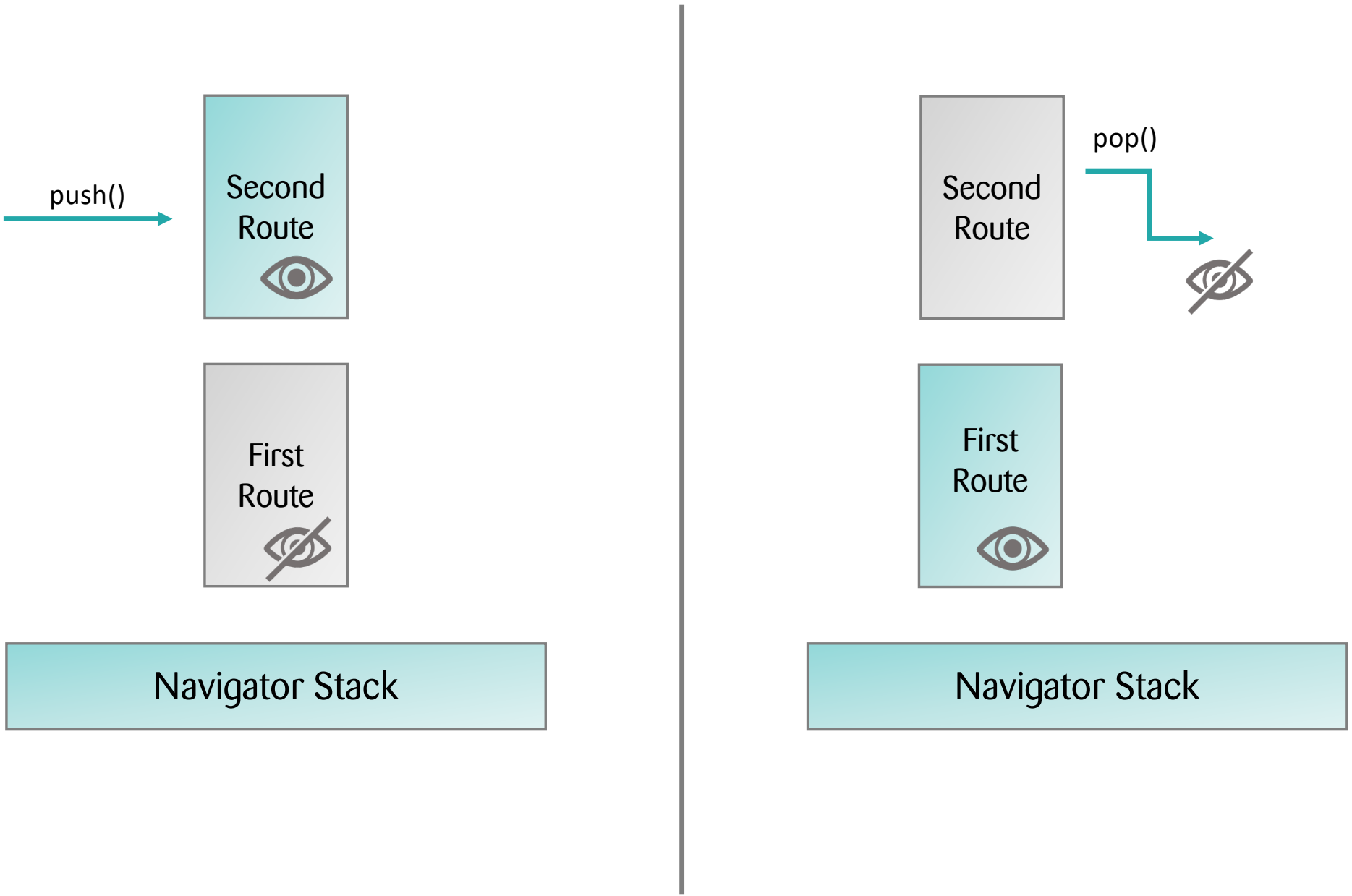
Navigation

Navigation

Activity

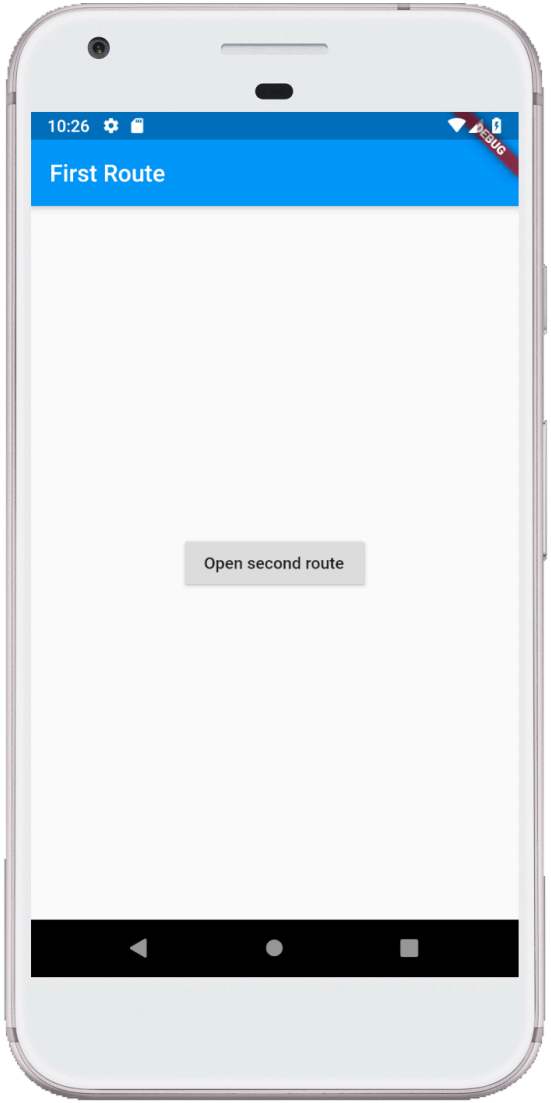
ViewController

- Screens and pages are called *Routes*
- Managed using *Navigator* widget
- *Navigator* handles stack (*Overlay*) of *Route* objects and provides methods for managing the stack
- Most recent pages are visually placed on top of older ones


push()
Second Route
First Route
Navigator Stack
pop()
Second Route
First Route
Navigator Stack

Exercise 5

- Go to Navigation/Exercise1/Task
- Use the Navigator widget to switch between FirstRoute and SecondRoute



Time: 5 minutes

Navigation

```
Navigator.push(
            context,
            MaterialPageRoute(builder: (context) => SecondRoute()),
          );
```

Problem: Duplicated code, routing logic distributed throughout code base

Solution: Using **named routes**, encapsulating routing logic

Navigation

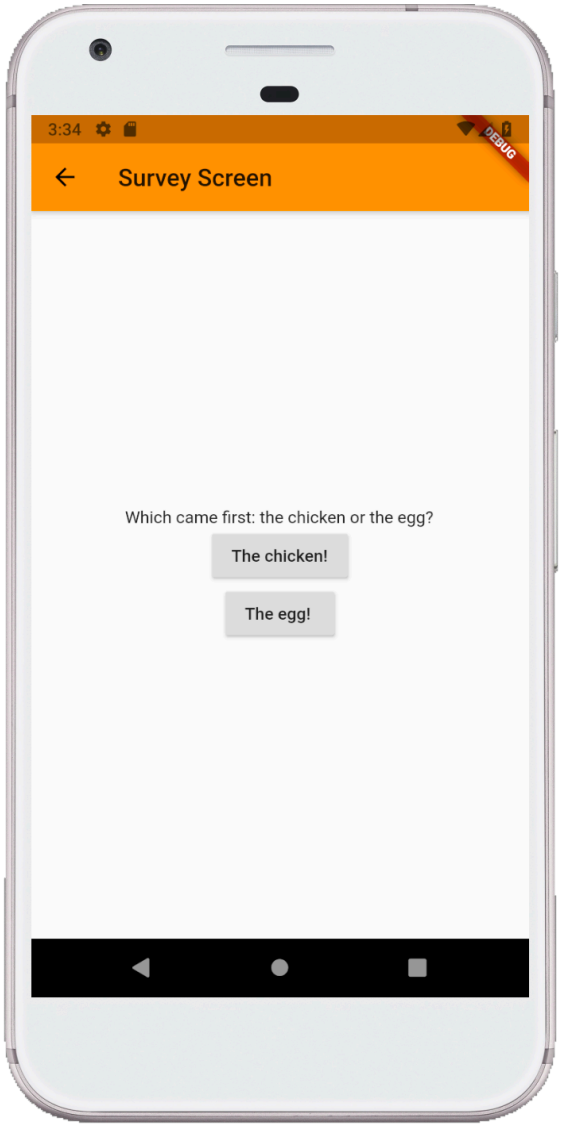
- Define route table (*routes* property) in MaterialApp
- Set *initialRoute* instead of *home*
- Navigate to routes using Navigator.pushNamed()

```
MaterialApp(
  initialRoute: '/',
  routes: {
    // When navigating to the "/" route, build the FirstScreen widget.
    '/': (context) => FirstScreen(),
    // When navigating to the "/second" route, build the SecondScreen widget.
    '/second': (context) => SecondScreen(),
  },
);
```

```
// Within the 'FirstScreen' widget
onPressed: () {
  Navigator.pushNamed(context, '/second');
}
```

Exercise 6

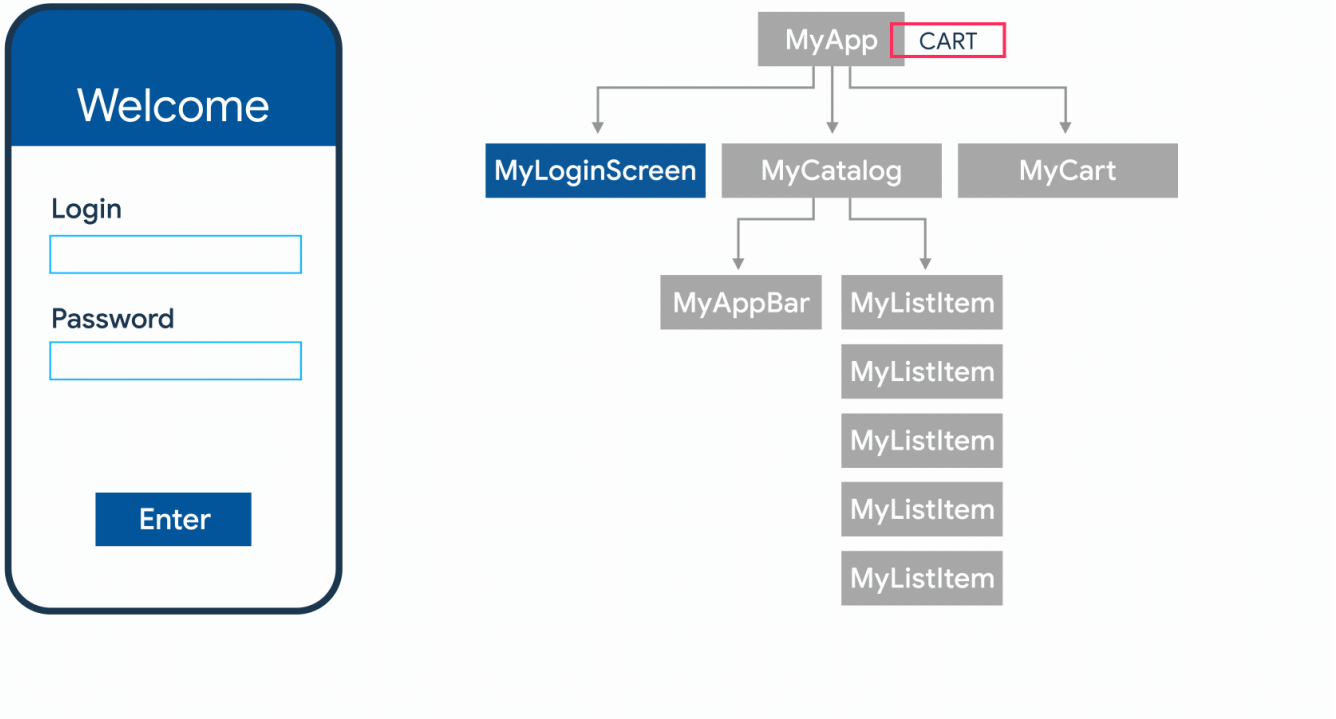
- Go to Navigation/Exercise2/Task
- Use named routes to navigate from HomeScreen to SurveyScreen
- Display result from SurveyScreen in Dialog



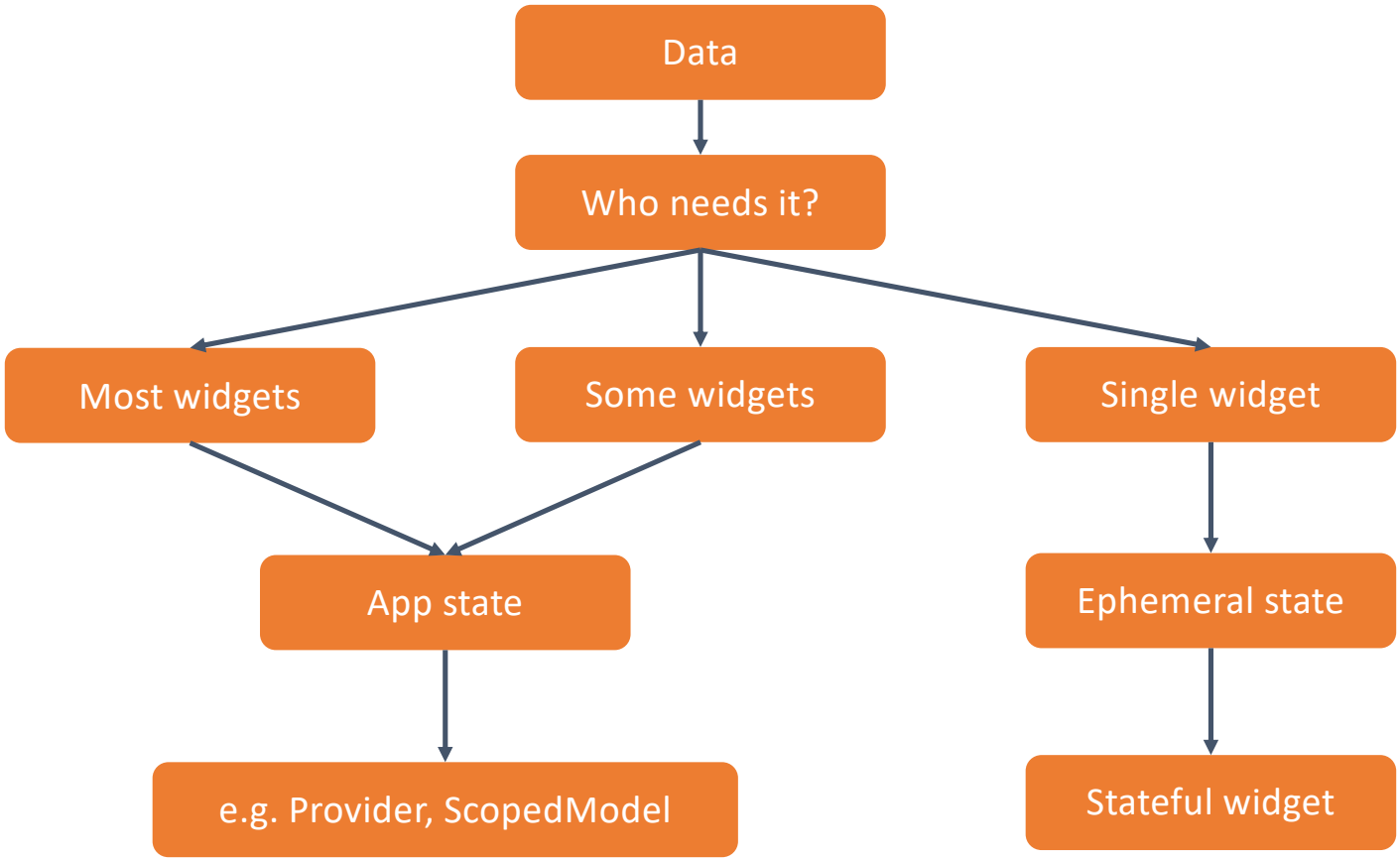
Time: 15 minutes

State Management

State Management



App state versus widget state



Provider

- A mixture between dependency injection and state management, built with widgets for widgets.
- With Provider you get
  - forced uni-directional data-flow
  - testability/composability
  - robustness, as it is harder to forget to handle the update scenario of a model/widget
- https://pub.dev/packages/provider

Exercise 7

- Read article in flutter documentation about state management
- Change flutter project in folder *Statemanagement* from a stateful widget to a stateless widget that uses a provider
  - See existing code for further details

Time: 20 minutes

REST

HTTP Theory

- Most apps are fetching data from the internet, luckily Flutter provides a http package ☺

HTTP Basics 1

- To use HTTP Calls we need to import the http package

```
dependencies:
    http: <latest_version>
```

- Make a network Request

```
Future<http.Response> fetchComment() {
    return http.get('https://jsonplaceholder.typicode.com/comments/1');
}
```

HTTP Basics 2

- Create a Comment class

```
class Comment {
 final int userId;
 final int id;
 final String title;
 final String body;

 Comment({this.userId, this.id, this.title, this.body});

 factory Comment.formJson(Map<String, dynamic> json) {
   return Comment(
     userId: json['userId'],
     id: json['id'],
     title: json['title'],
     body: json['body'],
   );
 }
}
```

HTTP Basics 3

- Convert the HTTP Response to a Comment Object

```
Future<Comment> fetchComment() async {
    final response =
        await http.get('https://jsonplaceholder.typicode.com/comments/1');

    if (response.statusCode == 200) {
      // If server returns an OK response, parse the JSON.
      return Comment.formJson(json.decode(response.body));
    } else {
      // If that response was not OK, throw an error.
      throw Exception('Failed to load Comment');
    }
}
```

HTTP Basics 4

- Fetch the data and display it on screen, for example with FutureBuilder

```
FutureBuilder<Comment>(
    future: fetchComment(),
    builder: (context, snapshot) {
      if (snapshot.hasData) {
        return Text(snapshot.data.title);
      } else if (snapshot.hasError) {
        return Text("${snapshot.error}");
      }

      //By default, show a loading spinner.
      return CircularProgressIndicator();
    },
);
```

Exercise 8

- Let's check the temperature of the Aare
  - Checkout code here
  - Check the AareService, there are multiple comments guiding you through the task
  - Solution can be found here

Time: 15 minutes