

Flutter Fundamentals Bloc



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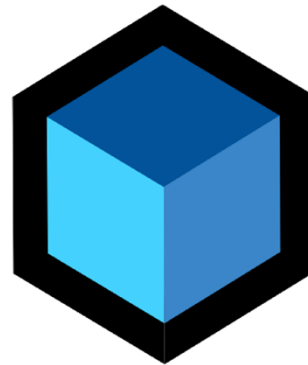
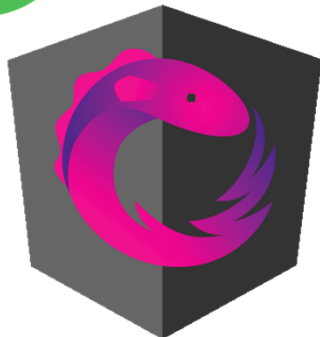
Managing State with Bloc

More ways of using *global* state in different screens in the app

What is State Management?



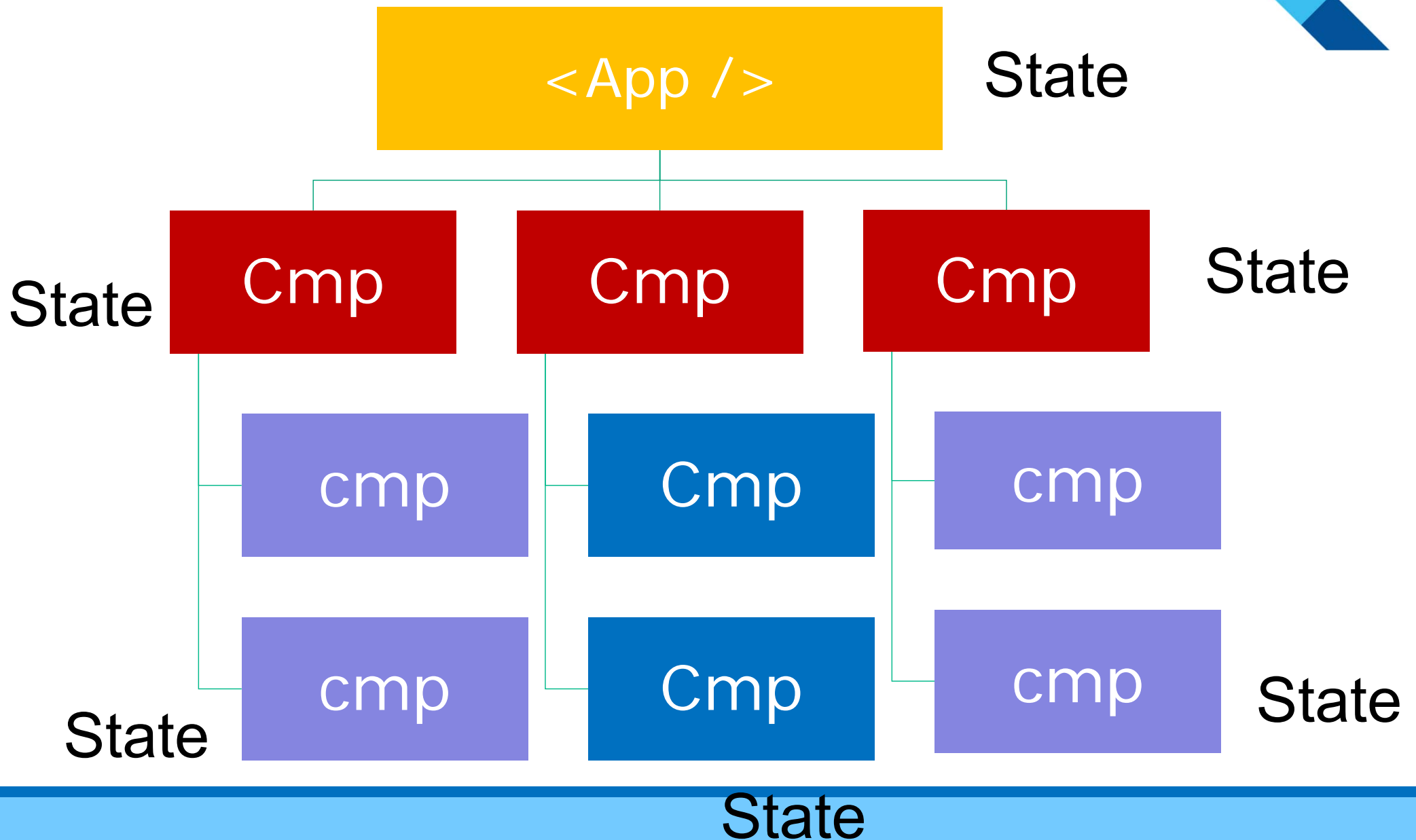
- Various **design patterns**, used for managing *state* (data in its broadest sense!) in your application.
- **Multiple solutions** possible – depends on application & framework



bloc



State management **without** a store

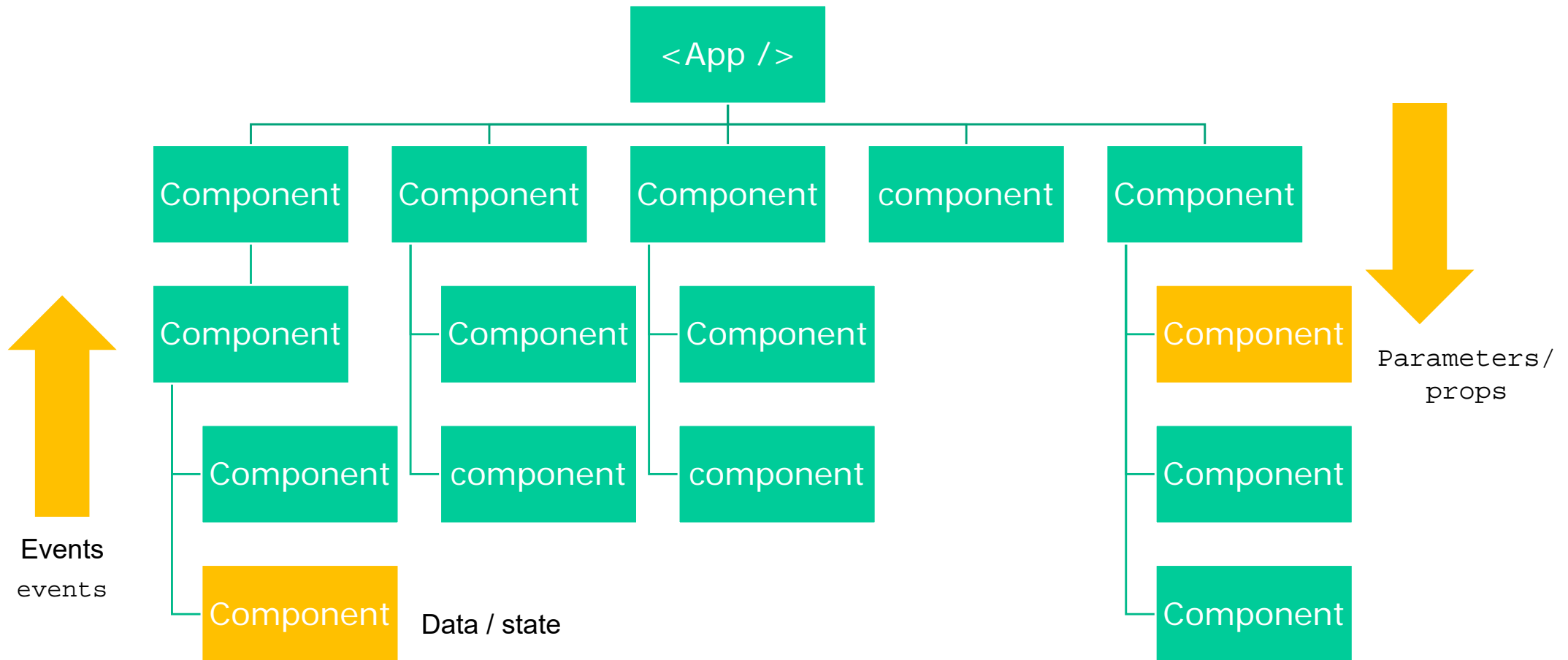


Without a State Management solution



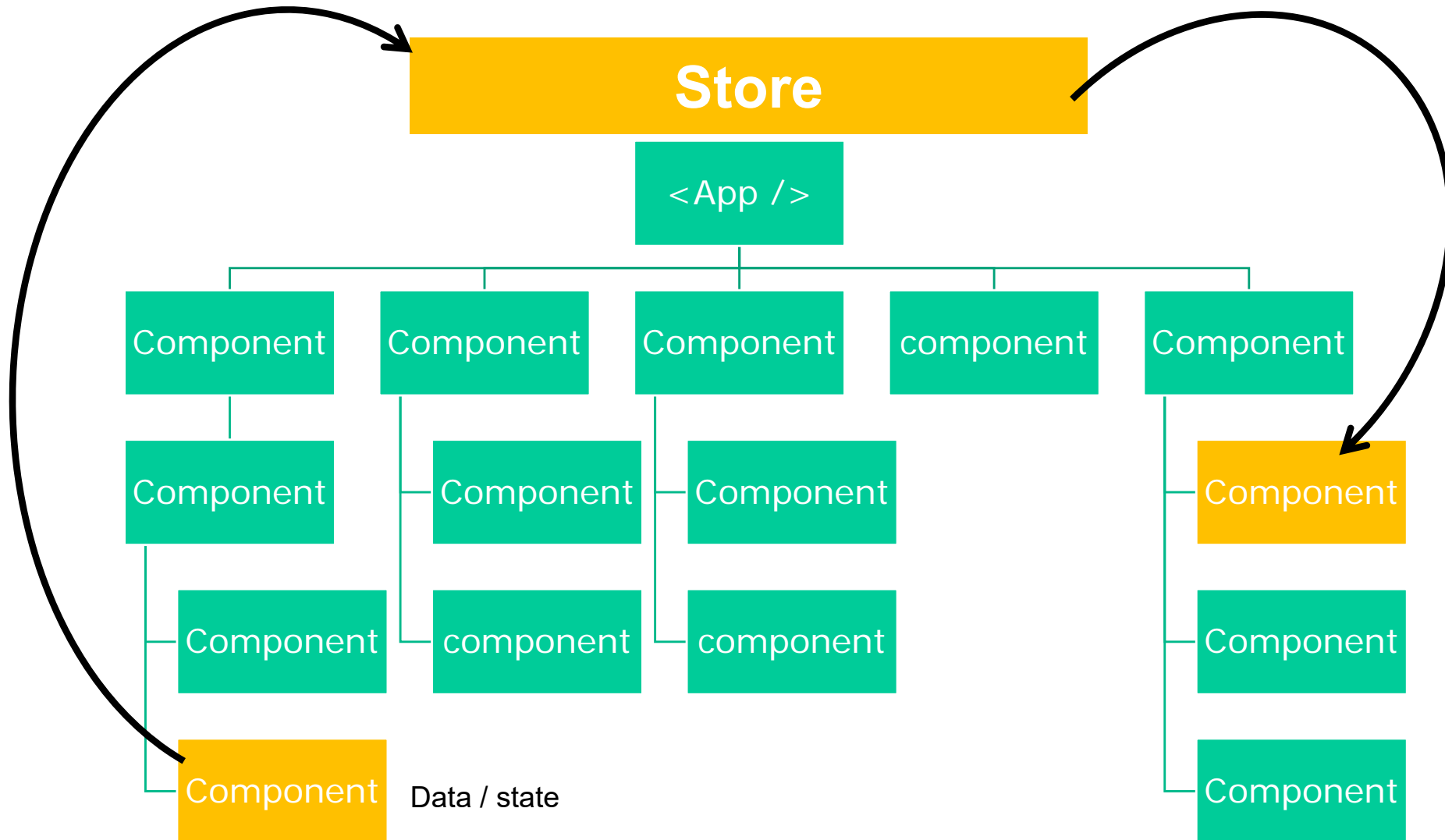
- This is not bad per se, but can lead to:
 - Confusion
 - Errors
 - Duplicating code
 - Maintenance nightmare
 - ...

Data flow in complex applications

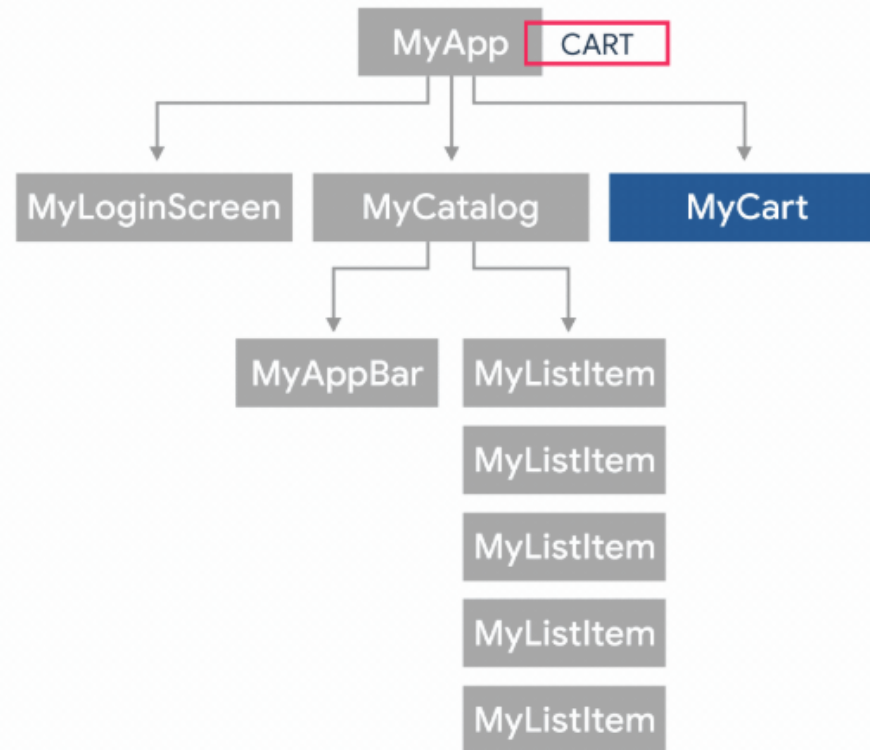


We don't want this.... Not very scalable

State management *with* a store



From the Flutter docs:



<https://docs.flutter.dev/data-and-backend/state-mgmt/intro>

Typically: **two types** of state



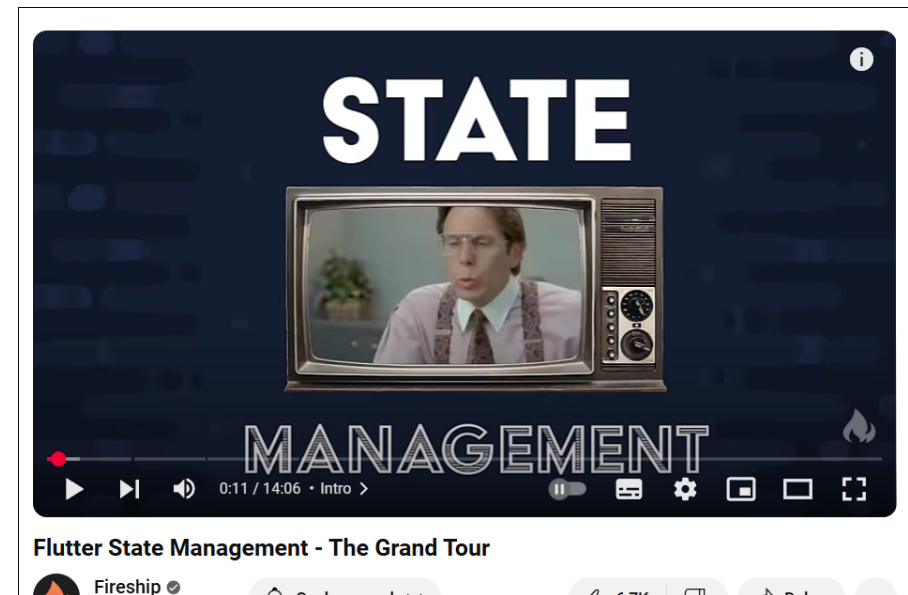
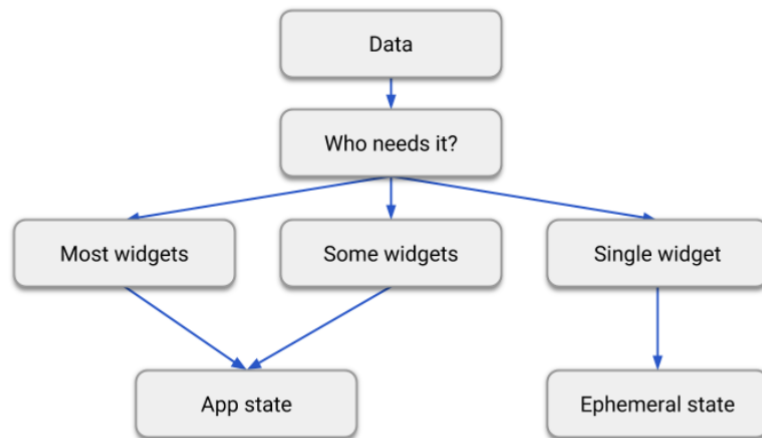
- **Local state** (= in components)
 - Also: “ephemeral state”, or “UI-state”
 - Usage: **statefull widgets**
 - Examples: current page, counter, selected tab in Navigation, etc.
- **App State** (= data in a state management solution)
 - Examples: user preferences, login state + info, shopping cart in your app, favorites/liked articles, etc.
- Various solutions possible in Flutter:
 - `Provider()`, `bloc`, `rxDart`, and (much!) more

More general info on state management:




- <https://docs.flutter.dev/data-and-backend/state-mgmt/ephemeral-vs-app>
- “Flutter State Management - The Grand Tour”,
<https://www.youtube.com/watch?v=3tm-R7ymwhc>


For that reason, take the following diagram with a large grain of salt:



Our choice: bloc



 pub.dev


Flutter Favorite


bloc 9.0.0


Published 2 months ago • [bloclibrary.dev](#) Dart 3 compatible

SDK | DART | FLUTTER | **PLATFORM** | ANDROID | IOS | LINUX | MACOS | WEB | WINDOWS

3.0K

[Readme](#) | Changelog | Example | Installing | Versions | Scores



 **bloc**

pub v9.0.0 | build passing | codecov 100% | stars 12k | flutter website | awesome flutter | flutter samples

license MIT | chat 334 online | bloc library

A predictable state management library that helps implement the BLoC (Business Logic Component) design pattern.


Learn more at [bloclibrary.dev](#)

This package is built to work with:

Publisher

[bloclibrary.dev](#)

Weekly Downloads



2024.09.04 - 2025.03.19

3.02k

LIKES

160

POINTS

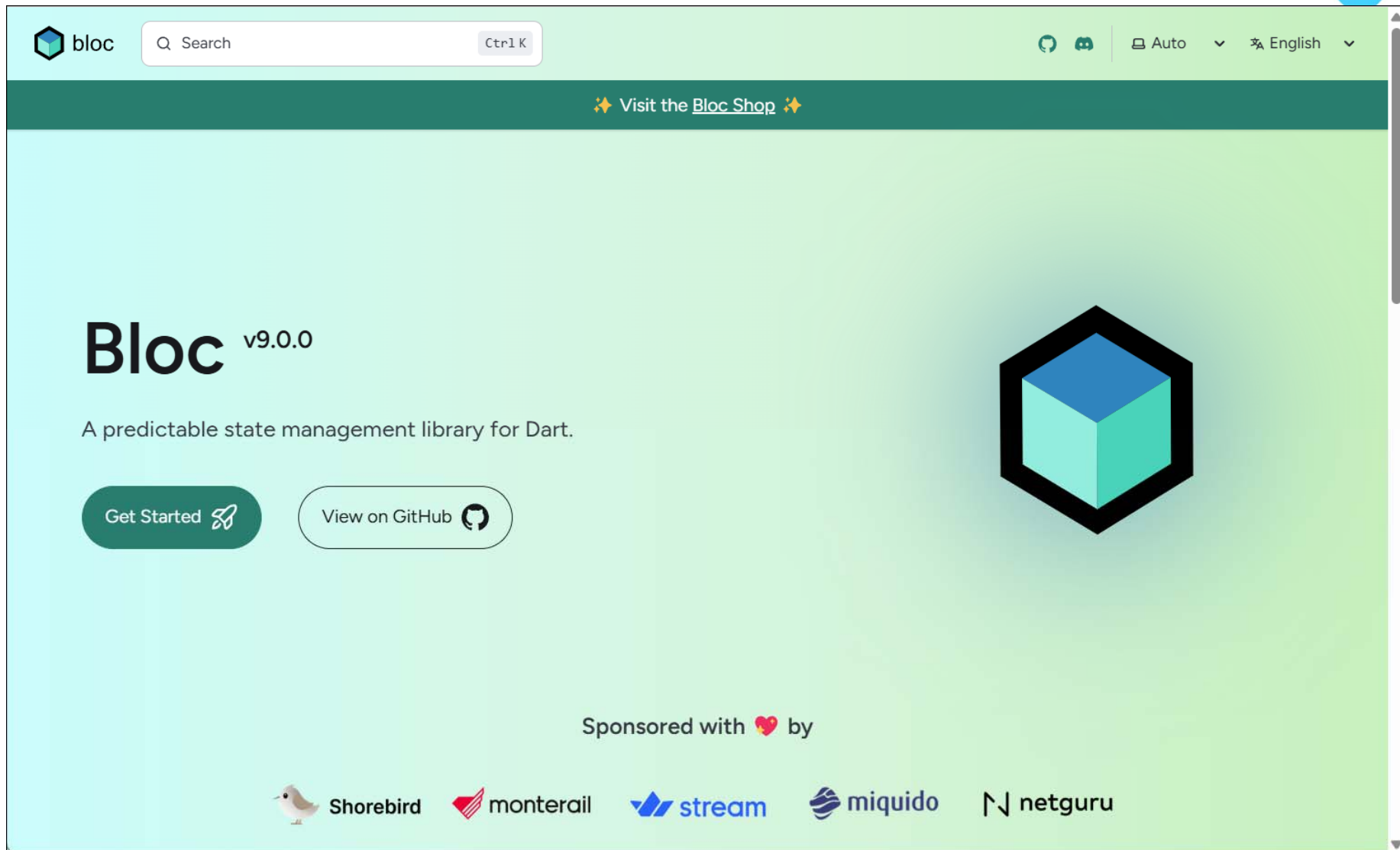
2.82M

DOWNLOADS



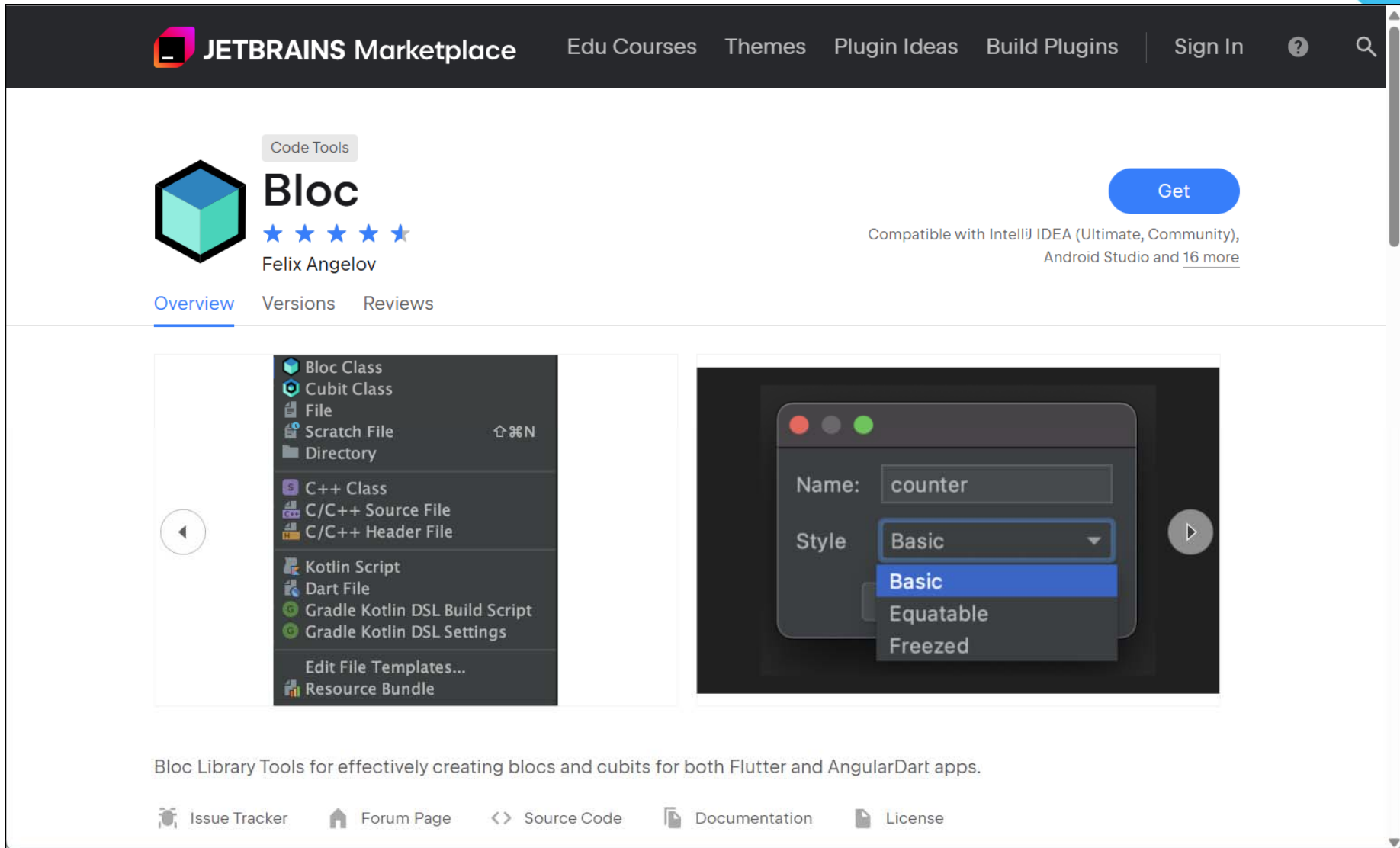
<https://pub.dev/packages/bloc>

General info on bloc



<https://bloclibrary.dev/>

Official bloc plug-in for IntelliJ



The screenshot shows the JetBrains Marketplace interface for the Bloc plugin. The top navigation bar includes links for 'Edu Courses', 'Themes', 'Plugin Ideas', 'Build Plugins', 'Sign In', and a search icon. The main header features the 'JETBRAINS Marketplace' logo and a 'Code Tools' tag. The plugin name 'Bloc' is prominently displayed with a 5-star rating and the author 'Felix Angelov'. A blue 'Get' button is visible. Below the header, there are tabs for 'Overview', 'Versions', and 'Reviews'. The main content area is divided into two sections: a file explorer on the left showing various file types like 'Bloc Class', 'Cubit Class', 'File', 'Scratch File', 'Directory', 'C++ Class', 'C/C++ Source File', 'C/C++ Header File', 'Kotlin Script', 'Dart File', 'Gradle Kotlin DSL Build Script', 'Gradle Kotlin DSL Settings', 'Edit File Templates...', and 'Resource Bundle'; and a preview window on the right showing a code editor with a 'Name: counter' field and a 'Style' dropdown menu with options 'Basic', 'Equatable', and 'Freezed'. At the bottom, there is a description: 'Bloc Library Tools for effectively creating blocs and cubits for both Flutter and AngularDart apps.' and a row of links: 'Issue Tracker', 'Forum Page', 'Source Code', 'Documentation', and 'License'.

JETBRAINS Marketplace Edu Courses Themes Plugin Ideas Build Plugins Sign In ?

Bloc Code Tools ★★★★★ Felix Angelov Get

Compatible with IntelliJ IDEA (Ultimate, Community), Android Studio and [16 more](#)

[Overview](#) [Versions](#) [Reviews](#)

Bloc Class
Cubit Class
File
Scratch File
Directory
C++ Class
C/C++ Source File
C/C++ Header File
Kotlin Script
Dart File
Gradle Kotlin DSL Build Script
Gradle Kotlin DSL Settings
Edit File Templates...
Resource Bundle

Name: counter
Style: Basic
Basic
Equatable
Freezed

Bloc Library Tools for effectively creating blocs and cubits for both Flutter and AngularDart apps.

[Issue Tracker](#) [Forum Page](#) [Source Code](#) [Documentation](#) [License](#)

Disadvantage on using state management/bloc:



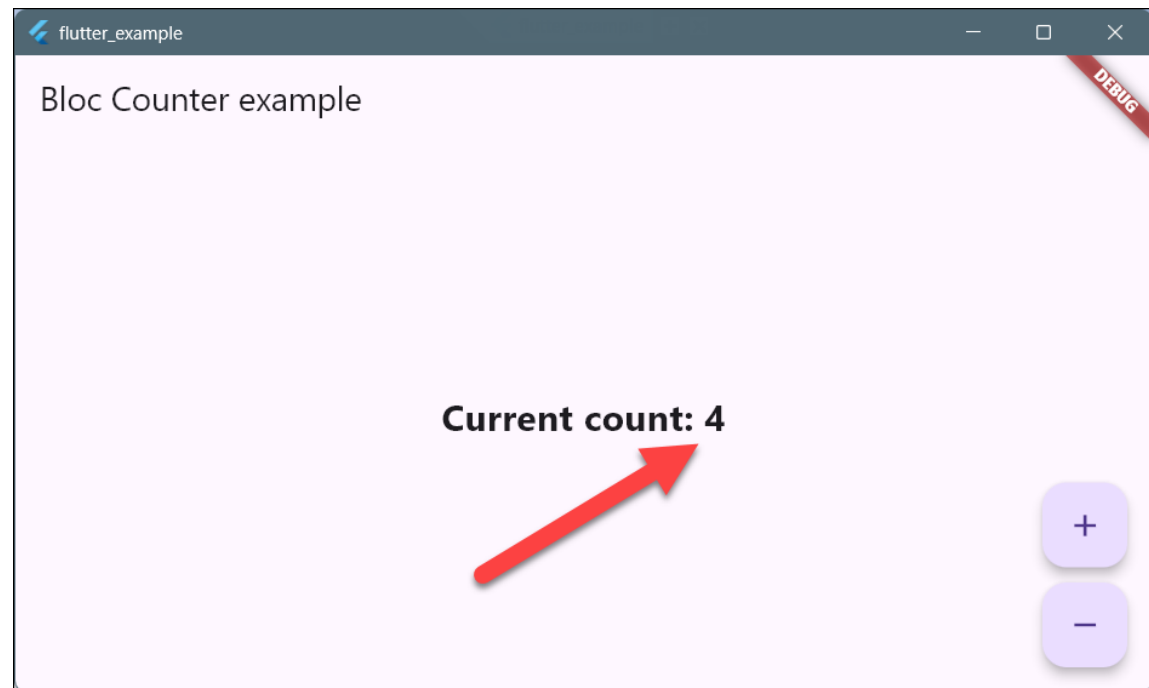
Warning:

bloc == complex stuff!

Simple example to get familiar with bloc



- Getting to [know the terminology](#)
- Simple Counter example
 - However, [counter state](#) is now in a `BlocProvider()` NOT in the widget anymore.





Lots of steps:

1. Install bloc in `pubspec.yaml`
2. Create a `(Multi)BlocProvider()`
3. Create `counter_bloc.dart`
4. Create `counter_state.dart`
5. Create `counter_event.dart`
6. Create `counter_page.dart`

Finally: show the actual state + content!

Best practice: `lowercase_plus_underscore`

example: `../examples/_400-bloc`



1. Installing bloc

- You only need to install `flutter_bloc x.x.x`
 - It will come with the default `bloc` and `cubit` packages
- `flutter pub add bloc`

```
#pubspec.yaml  
# ...  
dependencies:  
  flutter:  
    sdk: flutter  
  flutter_bloc: ^9.1.0  
  http: ^1.3.0
```



Or: add manually and run `flutter pub get`



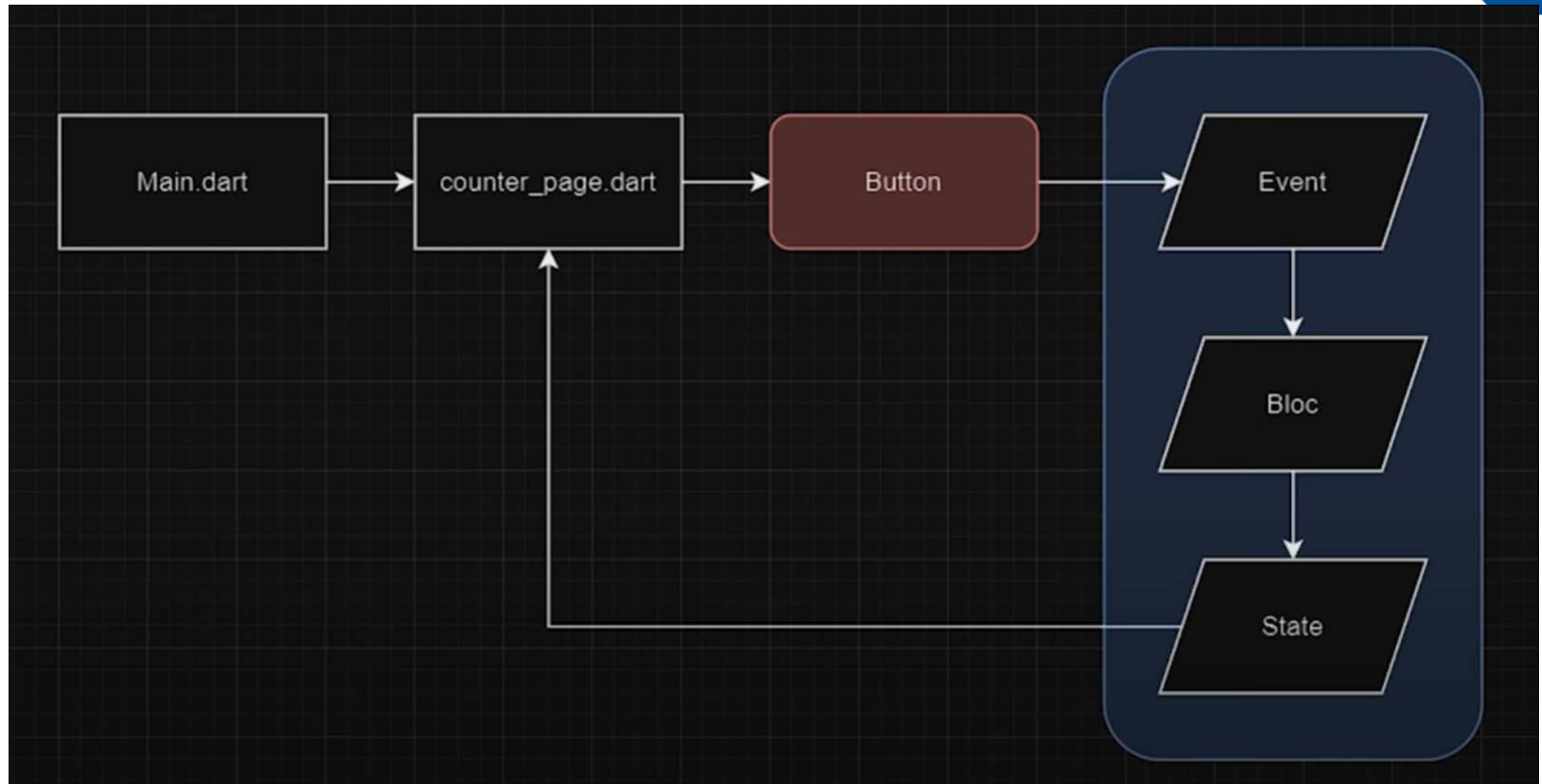
Create (Multi)BlocProvider()

- Inside `main.dart`, **wrap your pages** in a `BlocProvider()`
 - or `MultiBlocProvider()` if you have more providers – which is often the case

```
// main.dart
@override
Widget build(BuildContext context) {
  return MaterialApp(
    // 1. Using MultiBlocProvider().
    home: MultiBlocProvider(
      providers: [BlocProvider(create: (context) => CounterBloc())],
      child: const CounterPage(), // CounterPage now has acces to all state!
    ),
  );
}
```

**Will be
created!**

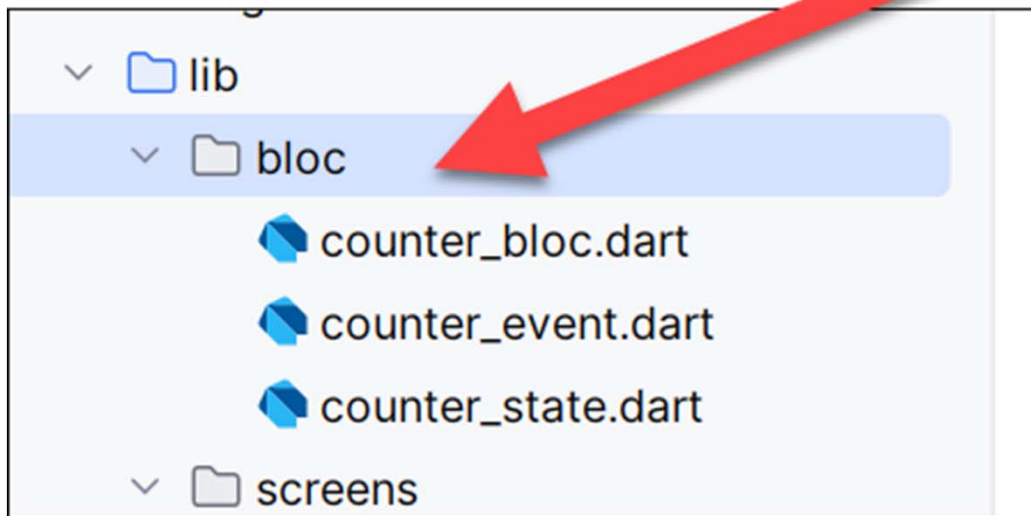
State management: one-way dataflow





Files in application

- Note that `bloc`, `event` and `state` are all inside the same rectangle
 - You need *all of them* in your app!
 - They work together to create state





2. Creating counter_bloc.dart

- Your bloc-page **LISTENS** to events and **UPDATES** the state
- It must therefore **extend** from these classes
 - They will be created in a minute!
- When an event listener kicks in, it emits an event with the **new state**.

Example bloc page



```
import 'package:flutter_bloc/flutter_bloc.dart';  
import 'counter_event.dart';  
import 'counter_state.dart';  
  
class CounterBloc extends Bloc<CounterEvent, CounterState> {  
  CounterBloc() : super(CounterState(0)) {  
    on<CounterIncrement>((event, emit) {  
      emit(  
        CounterState(state.count + 1),  
      ); // increment the counter  
    });  
    on<CounterDecrement>((event, emit) {  
      emit(  
        CounterState(state.count - 1),  
      ); // decrement the counter  
    });  
  }  
}
```

Will be
created!

Will be
created!

Event
listeners,
emit the new state



Creating counter_state.dart

- CounterState is initially very simple
- It holds *variable(s) with the state*
- Also: NO user interface!

```
class CounterState {  
  // 1. properties in our state  
  final int count;  
  
  // 2. constructor  
  CounterState(this.count);  
}
```

When an event
is triggered, this
state is updated

Creating counter_event.dart



- Also pretty simple, it holds the (names of) the events that can be fired
- They extend from an abstract (base) class, so we don't need to manually import them all

```
// using an abstract class here  
abstract class CounterEvent{}  
  
// ALL events extend from CounterEvent  
class CounterIncrement extends CounterEvent{}  
class CounterDecrement extends CounterEvent{}
```

Check for yourself: these classes are used inside `counter_bloc.dart`! To update the state.



Finally: counter_page.dart

- Use the state, by wrapping your UI in a `BlocBuilder()` widget
 - This has `access to the state` and can `emit events`
- Create a variable to emit the events.
 - `NO local state` in this widget
 - The `<CounterBloc>` is available, because in `main.dart` we wrapped the entire page in a `BlocProvider()`.

```
final counterBloc = context.read<CounterBloc>();
```

The `BlocBuilder<T>()` to use the state



```
// counter_page.dart
// ...
child: BlocBuilder<CounterBloc, CounterState>(
  builder: (context, state) {
    return Column(
      mainAxisAlignment: MainAxisAlignment.center,
      children: [
        Text(
          'Current count: ${state.count}',
          style: TextStyle(...),
        ),
      ],
    );
  },
),
```

**Show the
current state**

Updating the state by emitting events

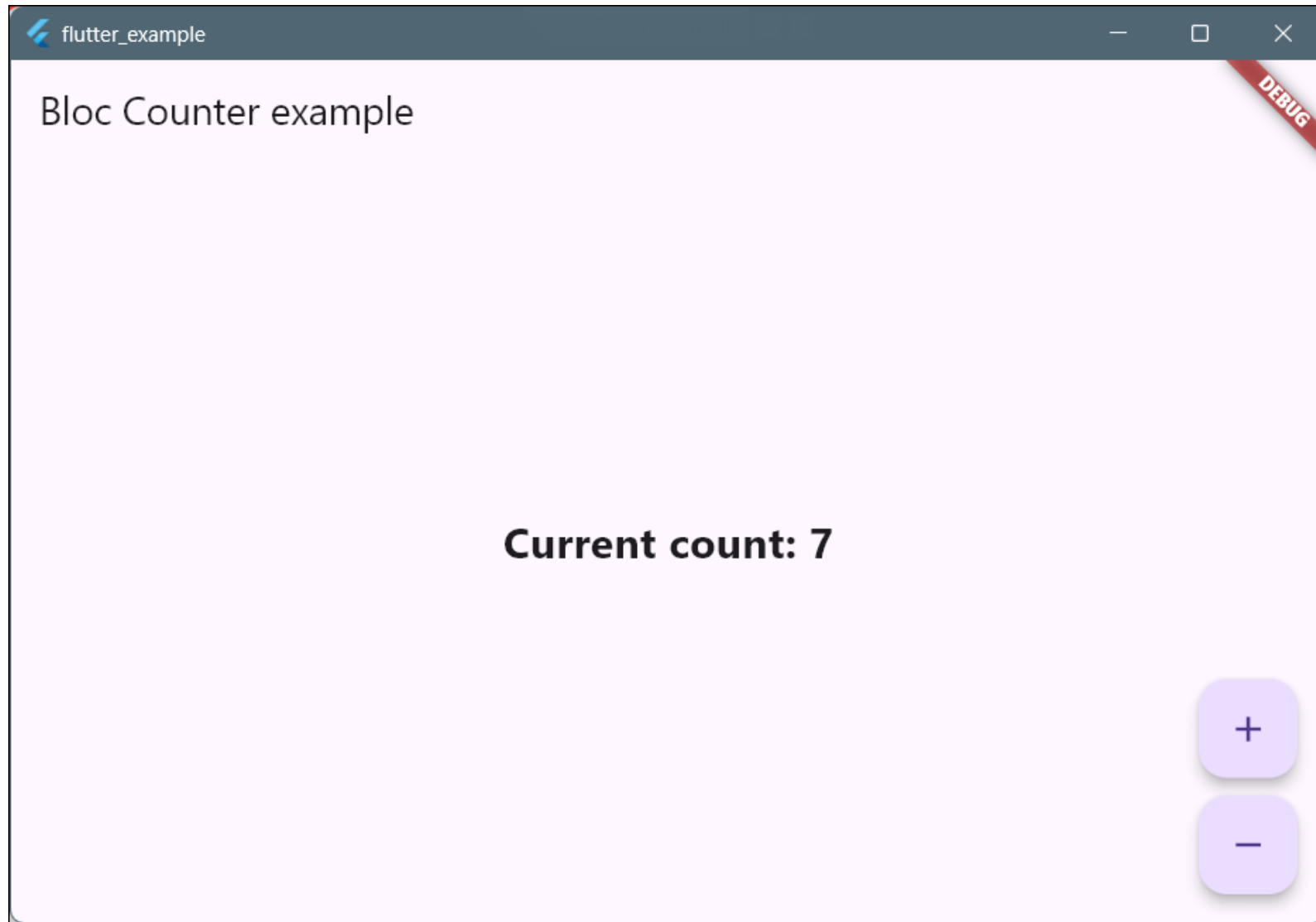


- Create buttons that emit events, for instance:

```
floatingActionButton: Column(  
  mainAxisAlignment: MainAxisAlignment.min,  
  children: [  
    FloatingActionButton(  
      onPressed: () {  
        counterBloc.add(CounterIncrement());  
      },  
      child: Icon(Icons.add),  
    ),  
    SizedBox(height: 10),  
    FloatingActionButton(  
      onPressed: () {  
        counterBloc.add(CounterDecrement());  
      },  
      child: Icon(Icons.remove),  
    ),  
  ],  
)
```

**Using the
variable created
before, to emit
events**

Final Result



../examples/_400-bloc

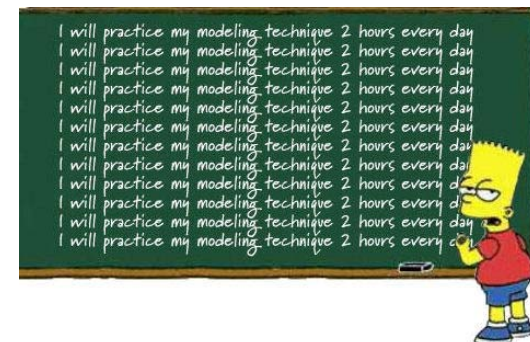
Workshop



- Enhance the example with an extra button to **reset the state**
 - Tip: look at the diagram and follow it clockwise:
 - Add event, update bloc, update state, update page, etc.
- Optional: study the example and put variables of **your own application** in bloc state
- Optional: create a screen with a `TextField()`.

Put **text in the state**, and read it in another screen/widget.

- Tip: create completely new state/bloc/pages for it!





Using state in other screens

Benefits of using the state: no more need to pass parameters around



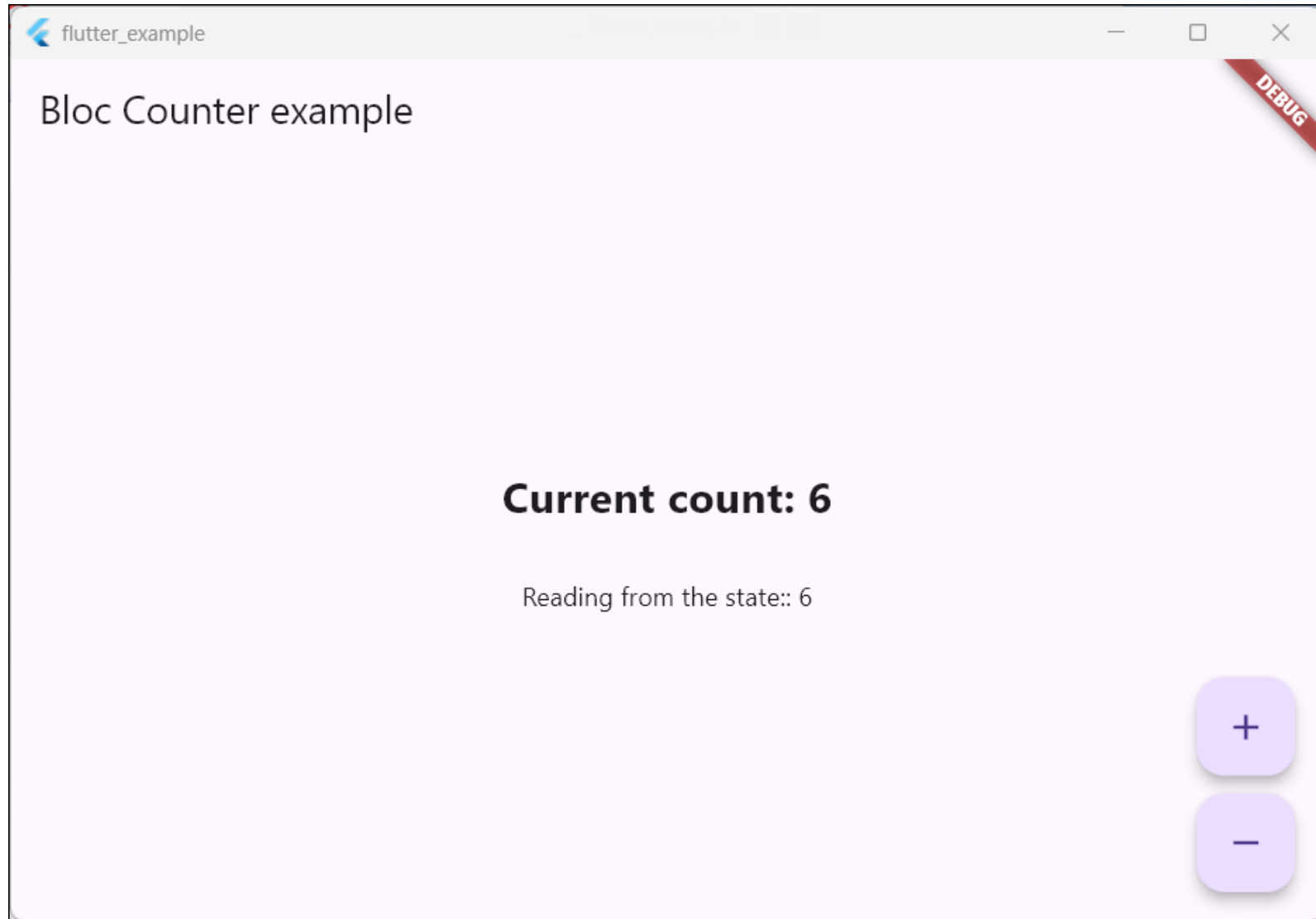
Retrieving state in other screens

- What if you want to **read the state** in other classes/widgets/screens?
- This is **relatively easy**:
 - watch a specific bloc and retrieve state

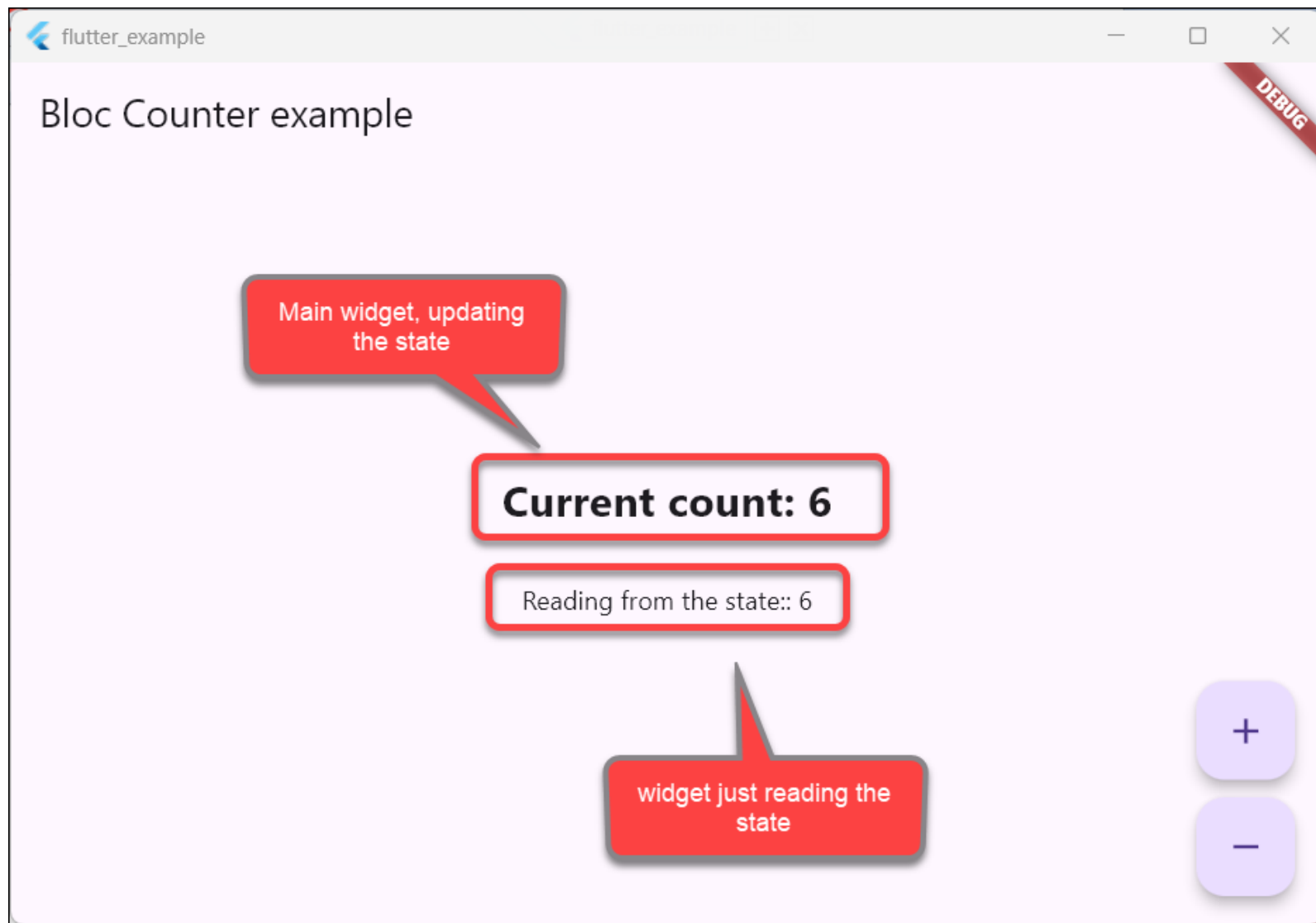
```
class _CounterPageReadState extends State<CounterPageRead> {  
  @override  
  Widget build(BuildContext context) {  
    // We just want to *retrieve* the state in this widget  
    final currentCounter = context.watch<CounterBloc>().state;  
  
    return Text('Reading from the state:: ${currentCounter.count}');  
  }  
}
```

context.watch<T>

Second widget, reading from the state



Second widget, reading from the state



Background on `context.watch`



- Using `context.watch`
 - The `context.watch<CounterBloc>()` listens to `CounterBloc` state changes.
 - Anytime the state updates, `build()` will re-trigger, so the latest value of `state.count` is displayed.

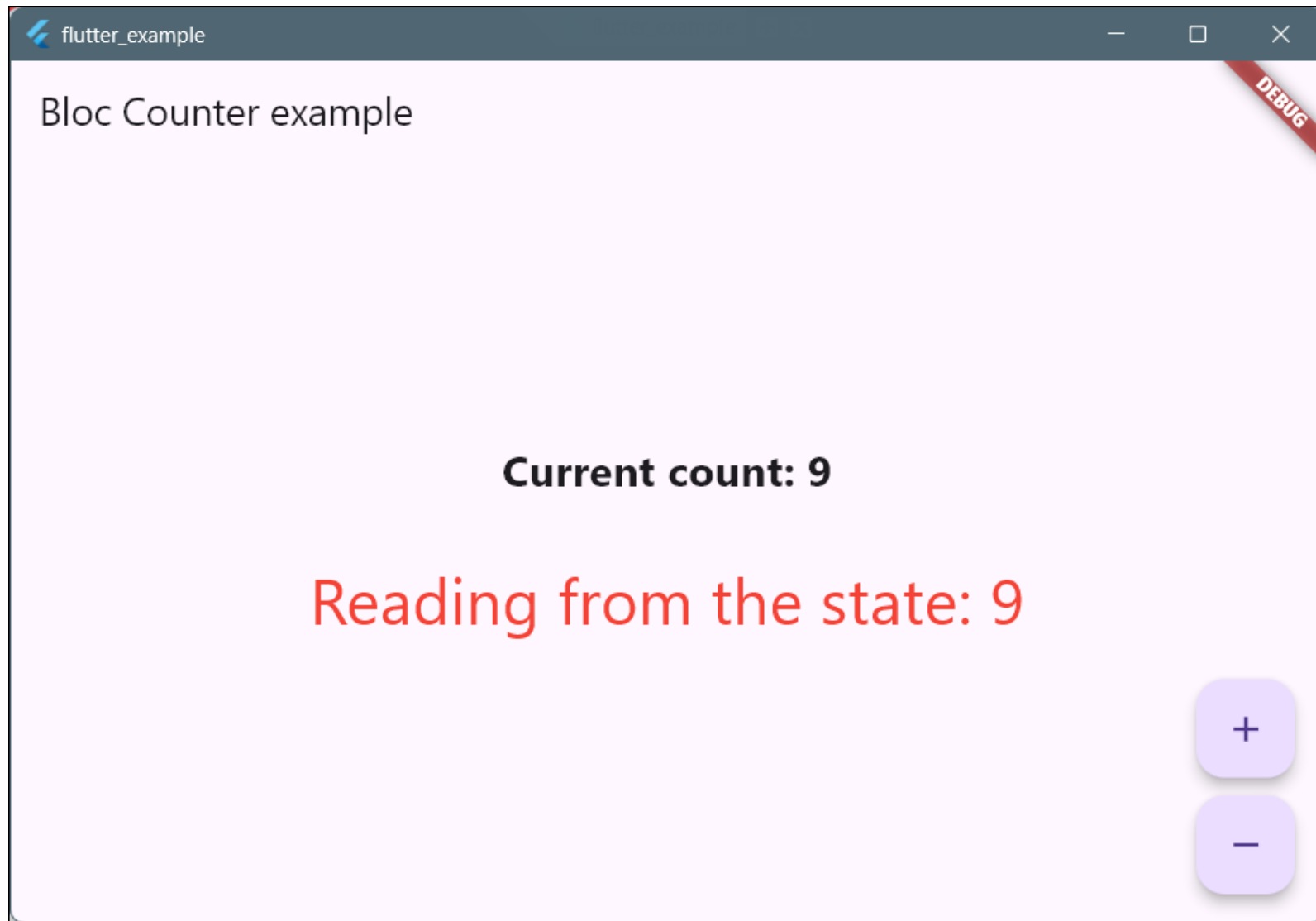
Alternative: using BlocBuilder()



- Alternative: using BlocBuilder() to wrap Text()
 - Retrieve CounterState directly inside this bloc
- More flexible, but also **more complex**/boilerplate

```
class _CounterPageReadState extends State<CounterPageRead> {  
  @override  
  Widget build(BuildContext context) {  
    return BlocBuilder<CounterBloc, CounterState>(  
      builder: (context, state) {  
        return Text(  
          'Reading from the state: ${state.count}');  
        },  
      );  
    }  
  }  
}
```

Results: visually the same



Background on BlocBuilder()



- BlocBuilder() is designed to react to **state changes** for a **specific bloc**.
 - It rebuilds only when state of CounterBloc changes.
- Use BlocBuilder() instead of context.watch?
 - If you want **finer control** over widget rebuilding or:
 - **restrict the part** of the widget tree that rebuilds on state changes, BlocBuilder() is preferred.
- **Both approaches are valid!**
 - Choose based on preference and your widget's complexity.



Adding multiple properties to the state

Sometimes you want [more than a single property](#) on your bloc



Multiple state properties

- Let's say you also want to keep track of the **total number of clicks**.
- Expand the State with a property `numClicks`;
- Remember to now use the keyword `required`

```
class CounterState {  
    // Multiple properties in our state  
    final int count;  
    final int numClicks;  
  
    CounterState({required this.count, required this.numClicks});  
}
```

Using multiple state properties

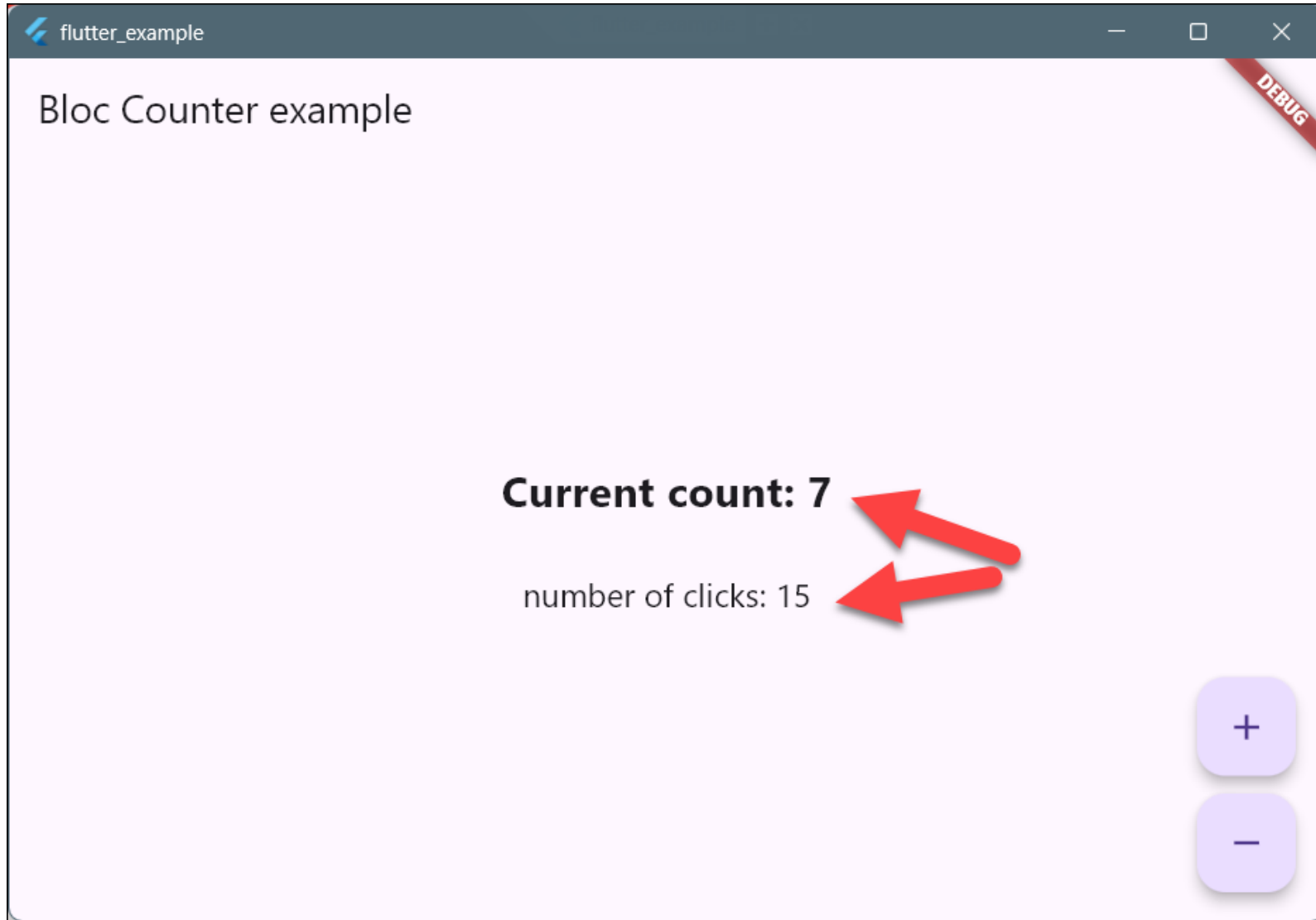


- Update the CounterBloc with **named properties** to **initialize and update** the state
- Look at the count and numClicks properties.

```
class CounterBloc extends Bloc<CounterEvent, CounterState> {  
  CounterBloc() : super(CounterState(count: 0, numClicks: 0)) {  
    on<CounterIncrement>((event, emit) {  
      emit(  
        CounterState(count: state.count + 1, numClicks: state.numClicks + 1),  
      ); // increment the counter  
    });  
    on<CounterDecrement>((event, emit) {  
      emit(  
        CounterState(count: state.count - 1, numClicks: state.numClicks + 1),  
      ); // decrement the counter  
    });  
  }  
}
```

Extra, named properties

Result

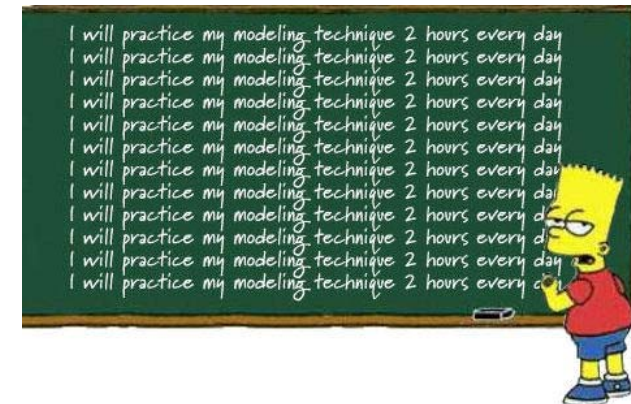


..examples/_420-multiple-properties

Workshop



- Add an **extra property** to the state (like `numClicks`) and show / update this property
- Study the example provided, or use your own app.
- Optional: create extra `BlocProvider()` with **additional state**
(so the states are *independent* of each other) and use them inside `MultiBlocProvider()`





Using payload

Sending `parameters` to set or update the state

What is payload?

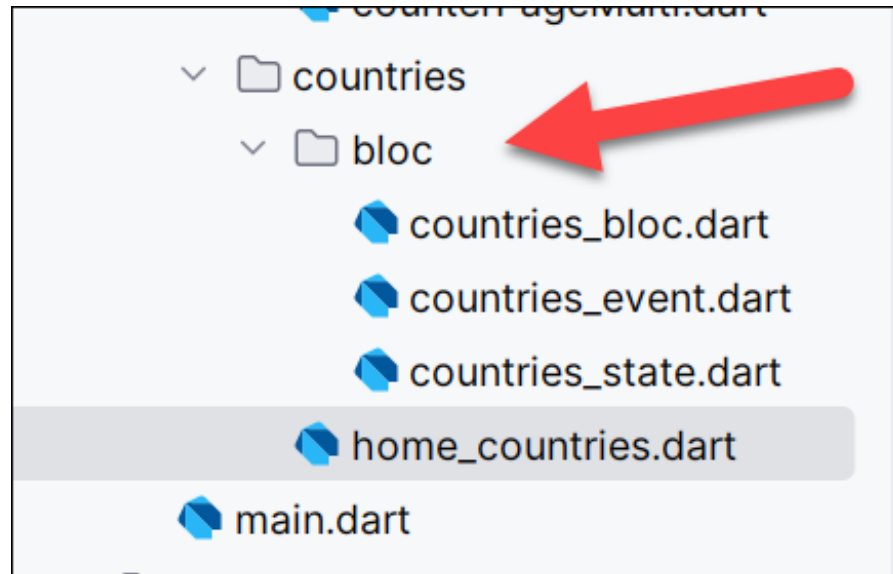


- payload is just a term
- It is **updated state** in the store, often coming from another system, or user input.
 - For instance: let's say you want to update the counter with a variable number, typed in by the user (say: 5). In this case, 5 is called the `payload`.
- Or, a realistic this scenario:
 1. On startup, we want to **retrieve a list of data** (e.g. countries)
 2. **Other components or screens** also need this data
 3. Instead of storing the data in local properties, we **put them in the state upon retrieval**, so other screens don't have to load the data again
 4. The countries (=data) are then called the `payload`

Again, multiple steps



- We cannot simply fetch the countries and pass them as a parameter to the state, or something similar
- Create `new bloc`, `event` and `state` files.



countries_bloc



- Listen for event, execute function (called `FetchCountries`)
- Emit events on
 - starting `loading` (`CountriesLoading()`),
 - loading `success` (`CountriesLoaded()`)
 - Loading `error` (`CountriesError()`)
- Events will be created in the next step!
- Don't glance at the next code, `study it!` 😊

1/3 countries_bloc.dart – multiple steps!

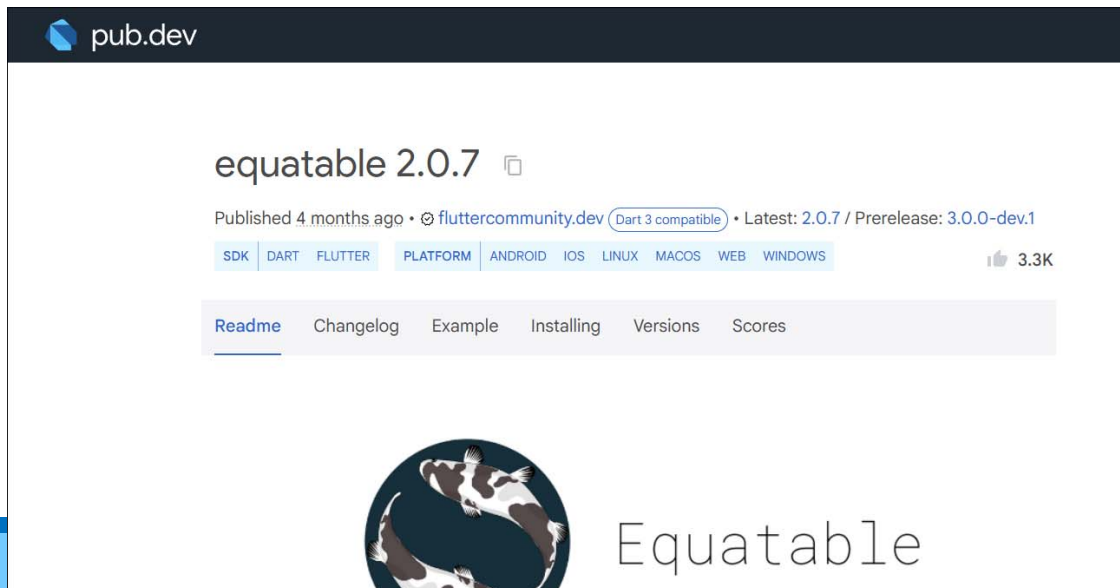
```
class CountriesBloc extends Bloc<CountriesEvent, CountriesState> {
  CountriesBloc() : super(CountriesInitial()) {
    // 1. Listen to the FetchCountries event
    on<FetchCountries>((event, emit) async {
      emit(CountriesLoading()); // emit the countries loading event.

      // 2. using the async/await notation here, therefore we can use try/catch
      try {
        final response = await http.get(Uri.parse(
          'https://restcountries.com/v3.1/all?fields=name,capital,flags'
        ));
        if(response.statusCode == 200){
          List countries = jsonDecode(response.body);
          emit(CountriesLoaded(countries)); // success. Emit CountriesLoaded()
        }
        else{
          emit(CountriesError('Failed to fetch countries')); // error. Emit error message
        }
      }
      catch(e) {
        emit(CountriesError('An error occurred: $e')); // General error: emit message
      }
    });
  }
}
```

2/3 countries_event.dart



- Notice the `extends Equatable` class
- The extra package `Equatable` does **deep comparison** of objects
 - Not only if object is the same, but also if **contents are the same!**
 - <https://pub.dev/packages/equatable>



Class `countries_event.dart`



- This class overrides the `get()` props method

*"In Dart, by default, the `==` operator compares object references, not their content. This means that two instances of the same class with identical fields are **not considered equal** unless you explicitly override the `==` operator and `hashCode`. The `equatable` package automates this process"*

```
import 'package:equatable/equatable.dart';

// CountriesEvent: our base class for events
abstract class CountriesEvent extends Equatable {
  @override
  List<Object?> get props => [];
}

// Event: fetching all countries from the API
class FetchCountries extends CountriesEvent {}
```

3/3 countries_state.dart



- Add possible events to the state
- Again, using Equatable package, see @override

```
import 'package:equatable/equatable.dart';

class CountriesState extends Equatable{
  @override
  List<Object?> get props => [];
}

// more states ...

// State property to hold the successfully fetched list of countries
class CountriesLoaded extends CountriesState {
  final List countries;

  // constructor
  CountriesLoaded(this.countries);

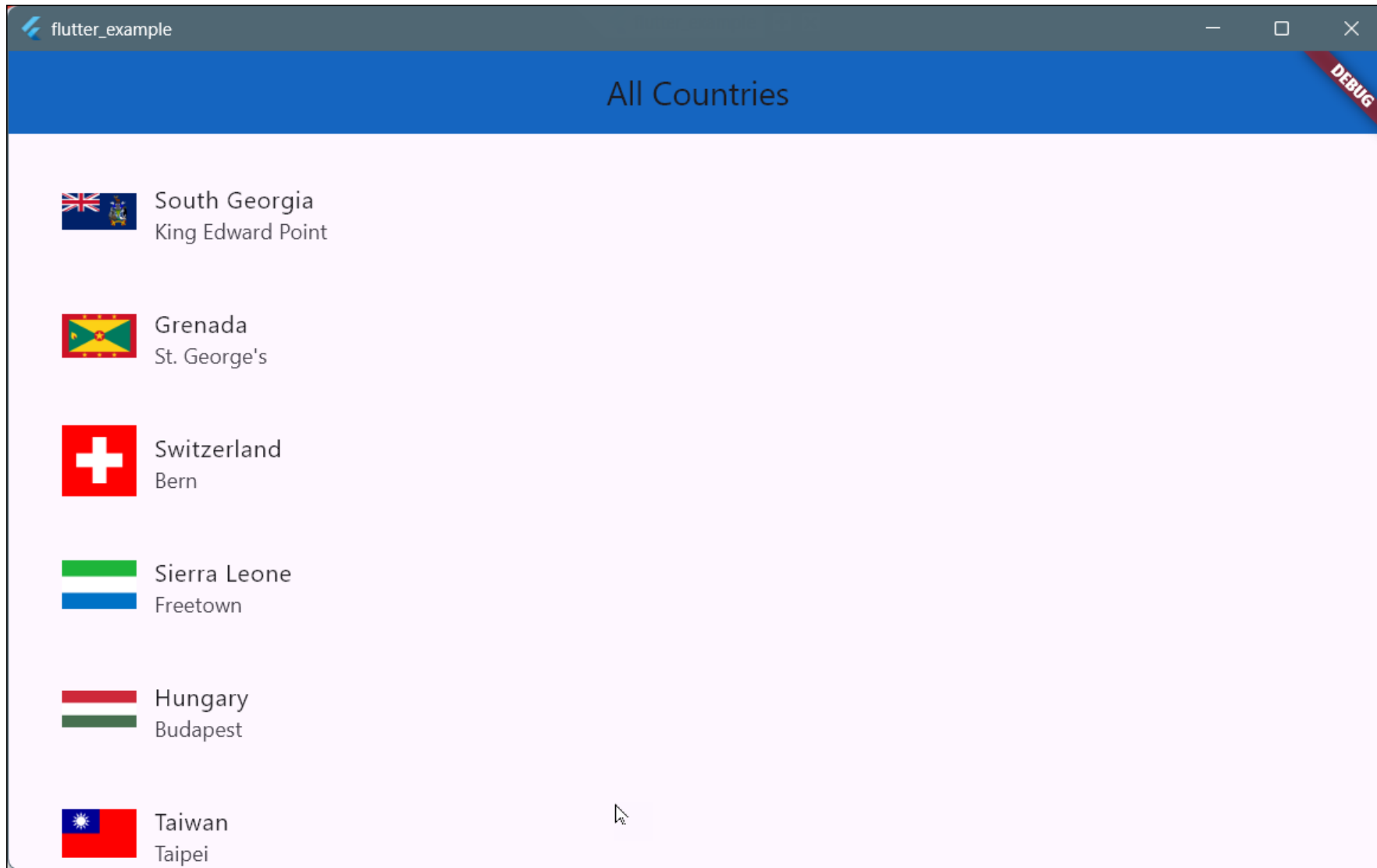
  @override
  List<Object?> get props => [countries];
}
```

Showing results, calling Event on startup



- Create the UI as normal, but instead use `BlocProvider()` to read from the state
- Use **different event types** to show different content
 - Progress indicator on `CountriesLoading`
 - List of countries on `CountriesLoaded`
 - Message on `CountriesError`
- Results are visually the same!

Results



Sample code home_countries.dart



```
body: BlocProvider(
  create:
    (context) =>
      CountriesBloc()..add(
        FetchCountries(),
      ), // Automatically fetch countries on load,
  child: BlocBuilder<CountriesBloc, CountriesState>(
    builder: (context, state) {
      if (state is CountriesLoading) {
        return Center(child: CircularProgressIndicator());
      } else if (state is CountriesLoaded) {
        return ListView.builder(...)
        ...
        ...
      }
    }
  )
)
```

_430-payload/../../home_countries.dart

Flow



- On startup, call `FetchCountries` using the `cascade` operator

- <https://dart.dev/language/operators#cascade-notation>

```
var paint =  
  Paint()  
    ..color = Colors.black  
    ..strokeCap = StrokeCap.round  
    ..strokeWidth = 5.0;
```

```
(context) =>  
  CountriesBloc()..add(  
    FetchCountries(),  
  ), // Automatically fetch, countries on load
```

The constructor, `Paint()`, returns a `Paint` object. The code that follows the `cascade` notation operates on this object, ignoring any values that might be returned.

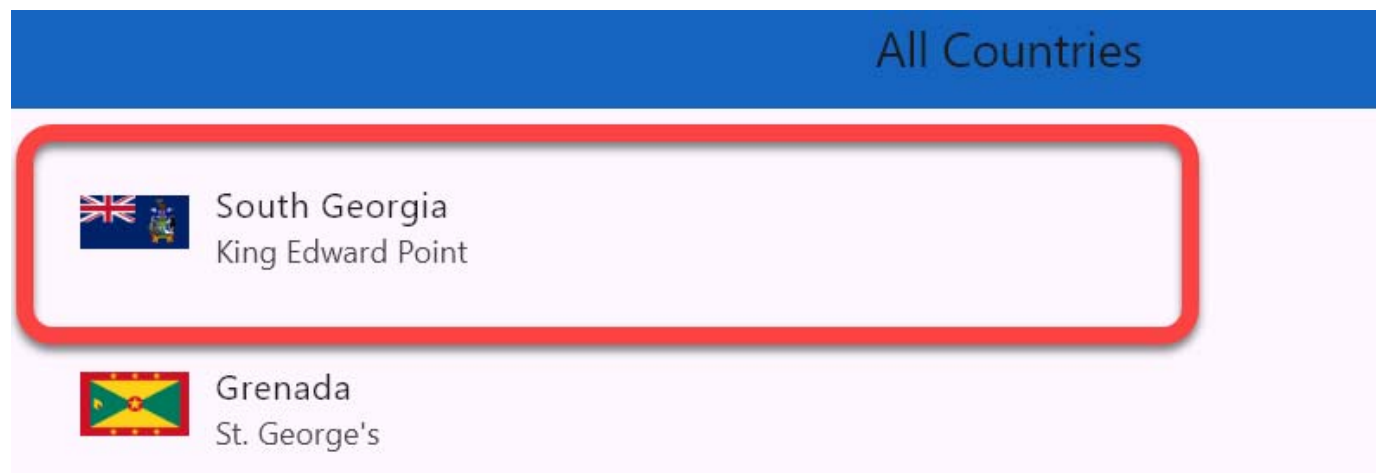
The previous example is equivalent to this code:

```
var paint = Paint();  
paint.color = Colors.black;  
paint.strokeCap = StrokeCap.round;  
paint.strokeWidth = 5.0;
```



Fetch successful?

- When fetching countries successful, create a `ListView.builder()`
- Inside the `itemBuilder()`, loop over countries, create a `ListTile()` containing the requested data



Example ListView.builder()



```
else if (state is CountriesLoaded) {
  return ListView.builder(
    itemCount: state.countries.length,
    padding: EdgeInsets.all(10.0),
    // Function to build the items in the ListView
    // See https://api.flutter.dev/flutter/widgets/ListView-class.html for more info
    itemBuilder: (BuildContext context, int index) {
      final country = state.countries[index];
      return Padding(
        padding: EdgeInsets.all(10.0),
        child: Column(
          children: <Widget>[
            ListTile(
              leading: Image.network(country['flags']['png'],),
              title: Text(country['name']['common']),
              subtitle: Text(
                country['capital']?.first ?? 'No capital found.',
              ),), ...
            ],
          ),
        ),
      );
    },
  );
}
```

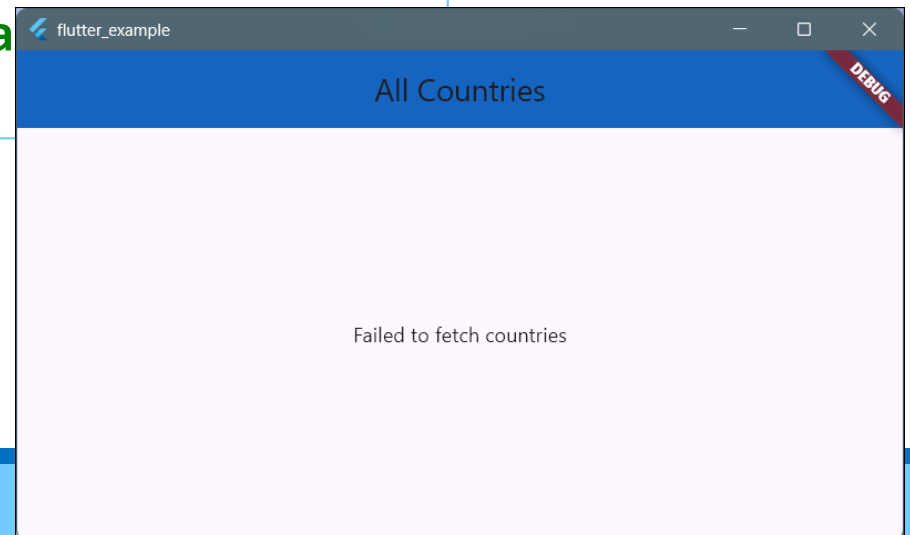
...



Fetch unsuccessful?

- If fetching was not successful,
`emit(CountriesError(...))` was thrown
- Show the error on the page

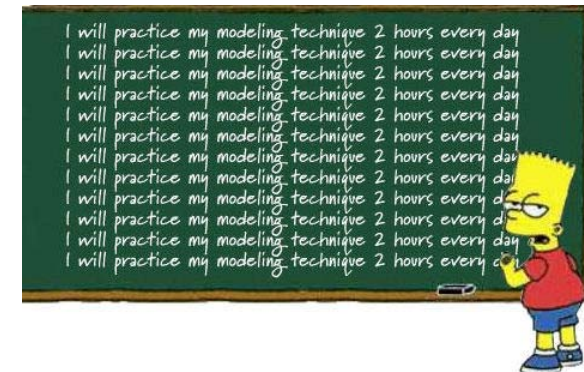
```
...  
} else if (state is CountriesError) {  
  return Center(child: Text(state.message));  
} else {  
  return Center(child: Text('No data  
{
```



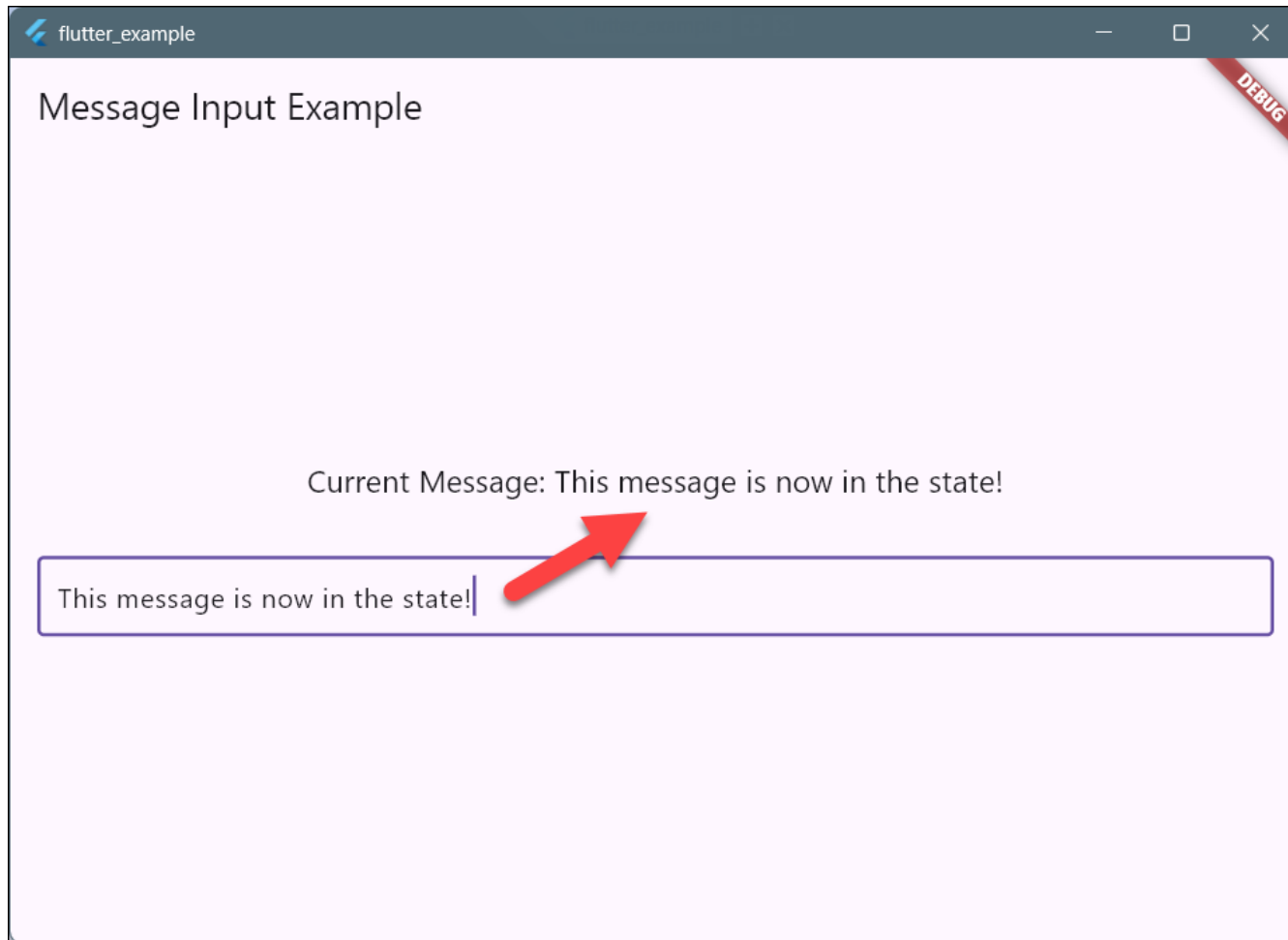
Workshop



- Create a new `message page`, with the following requirements:
 - A user can type in a message in a `TextField()`
 - The text typed in, is put in the state with a button press
 - The widget reads the text from the state
 - Another widget also reads the text from the state
- Use the structure with `page`, `event`, `state` and so on.
- A possible solution is already in `../_430-payload`, but first try it yourself!



Example output:





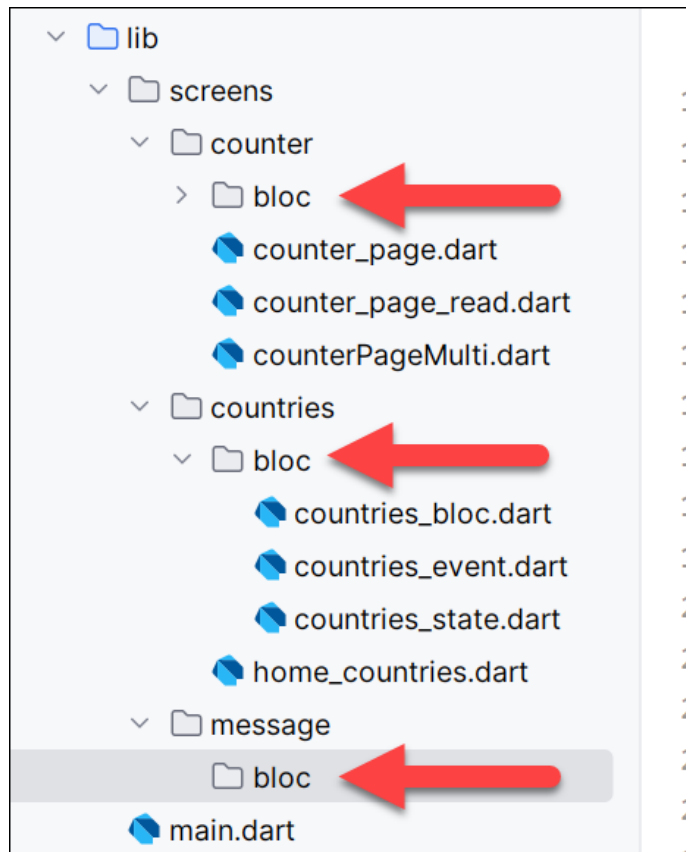
Tips on app structure

How do you structure your app using blocs?



Multiple actions – multiple bloc's

- When having multiple actions or screens, each action has its own associated bloc directory:

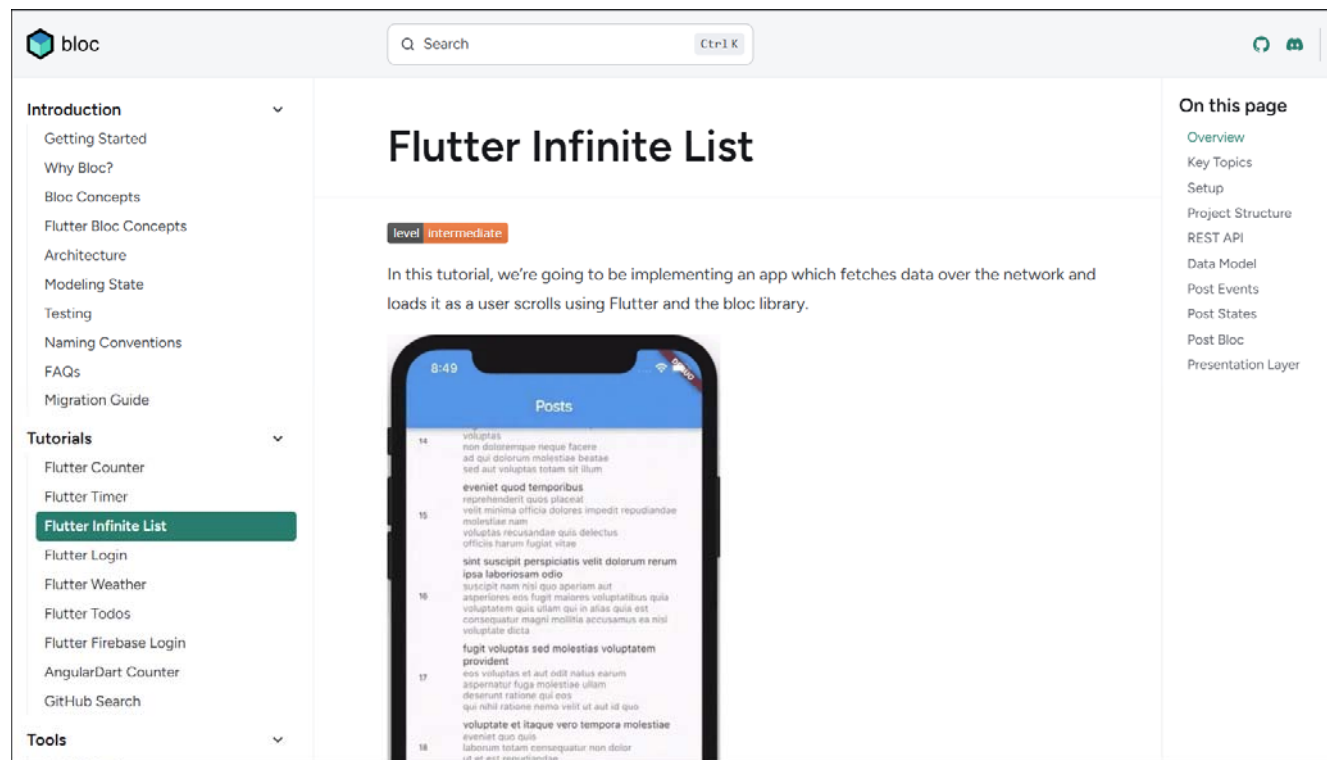


But: your mileage may vary! This is in **no way mandatory**. As long as Dart can find the imports, it is OK. **Create a structure that makes sense to YOUR application.**

More info on Bloc



- Tutorials:
 - For instance: <https://bloclibrary.dev/tutorials/flutter-infinite-list/>
 - And more! See list. Good for self studying



Article on Medium (might be behind paywall)




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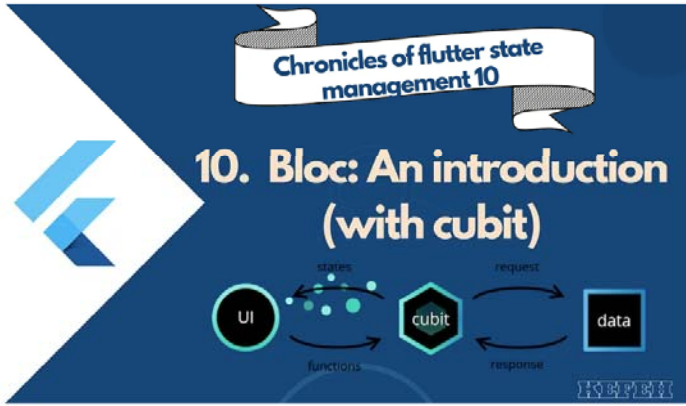
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Flutter Bloc: An introduction (with cubit)

 Kefeh Collins · [Follow](#)
Published in CodeX · 8 min read · Jun 8, 2022

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The Chronicles of Flutter state management 10.



10. Bloc: An introduction (with cubit)

Having many state management solutions in flutter is one thing I especially love about it. These different state management solutions provided, don't

<https://medium.com/codex/flutter-bloc-an-introduction-with-cubit-7eae1e740fd0>

Cubit? Comparison with Bloc



Similarities:

- Both `Bloc` and `Cubit` are part of the `flutter_bloc` package.
- Both expose a stream of states and allow you to emit new ones.
- Both integrate seamlessly with `BlocBuilder`, `BlocListener`, etc.
- Both are used for state management in Flutter apps.

Differences:

Feature	Cubit	Bloc
Complexity	Simpler	More structured, handles complex flows
API Style	Method calls emit states	Event → transition → state
Boilerplate	Minimal	More (requires events and mapping logic)
Use Case	Straightforward state changes	Complex logic with many event types
Extensibility	Less (fewer lifecycle hooks)	More (e.g., <code>onTransition</code> , <code>onError</code>)

When to use which:

- Use `Cubit` for simple, linear state changes (like a counter, toggles, UI mode switching).
- Use `Bloc` when you have complex logic, multiple events per feature, or want full control over transitions and side effects.

Can they be used interchangeably?



- Short answer: **no**
 - `Cubit` is a simplified version of `Bloc`.
 - Every `Cubit` is a `BlocBase`, but not every `Bloc` is a `Cubit`.
 - You can start with `Cubit` and upgrade to `Bloc` later if needed.
- Beginnerst tip:
 - “Start with `Cubit`. Switch to `Bloc` if you feel constrained”
- But: Maritieme IT choose `Bloc`. So go with that.