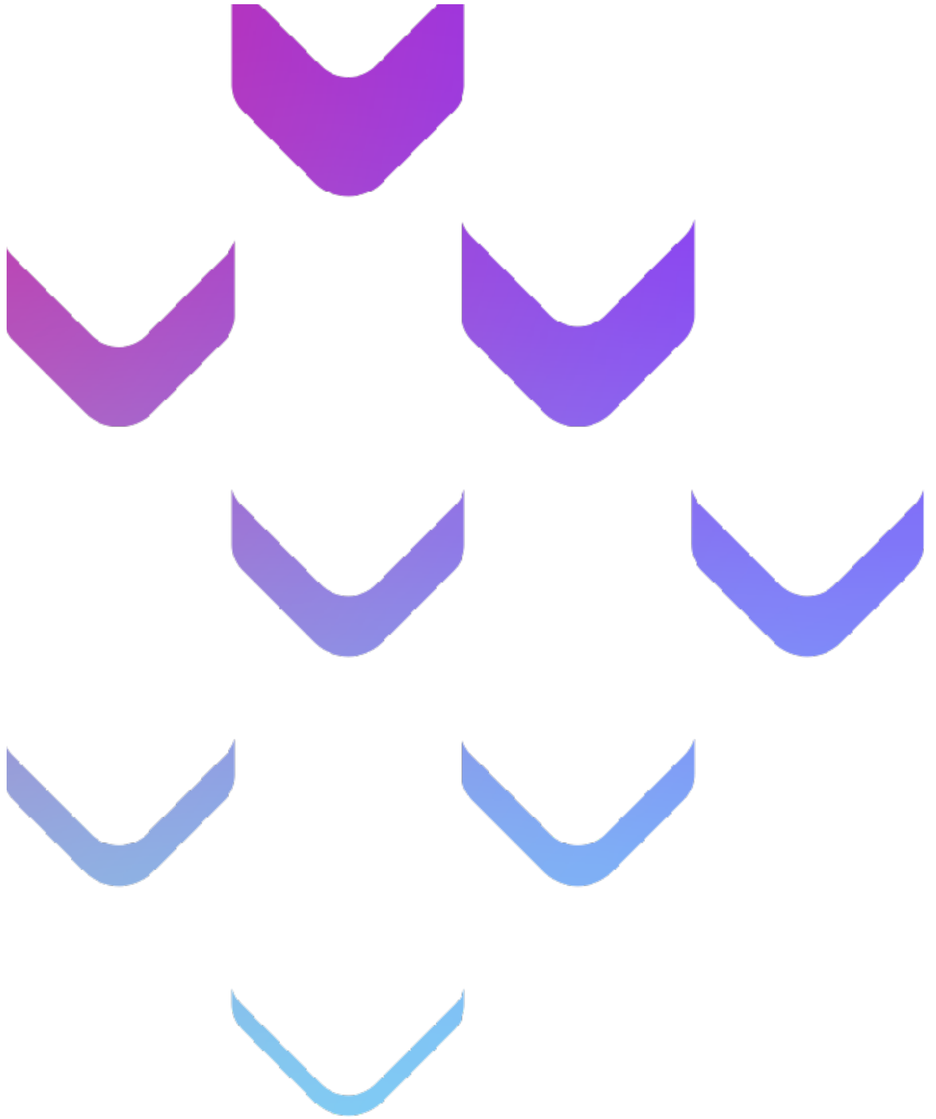
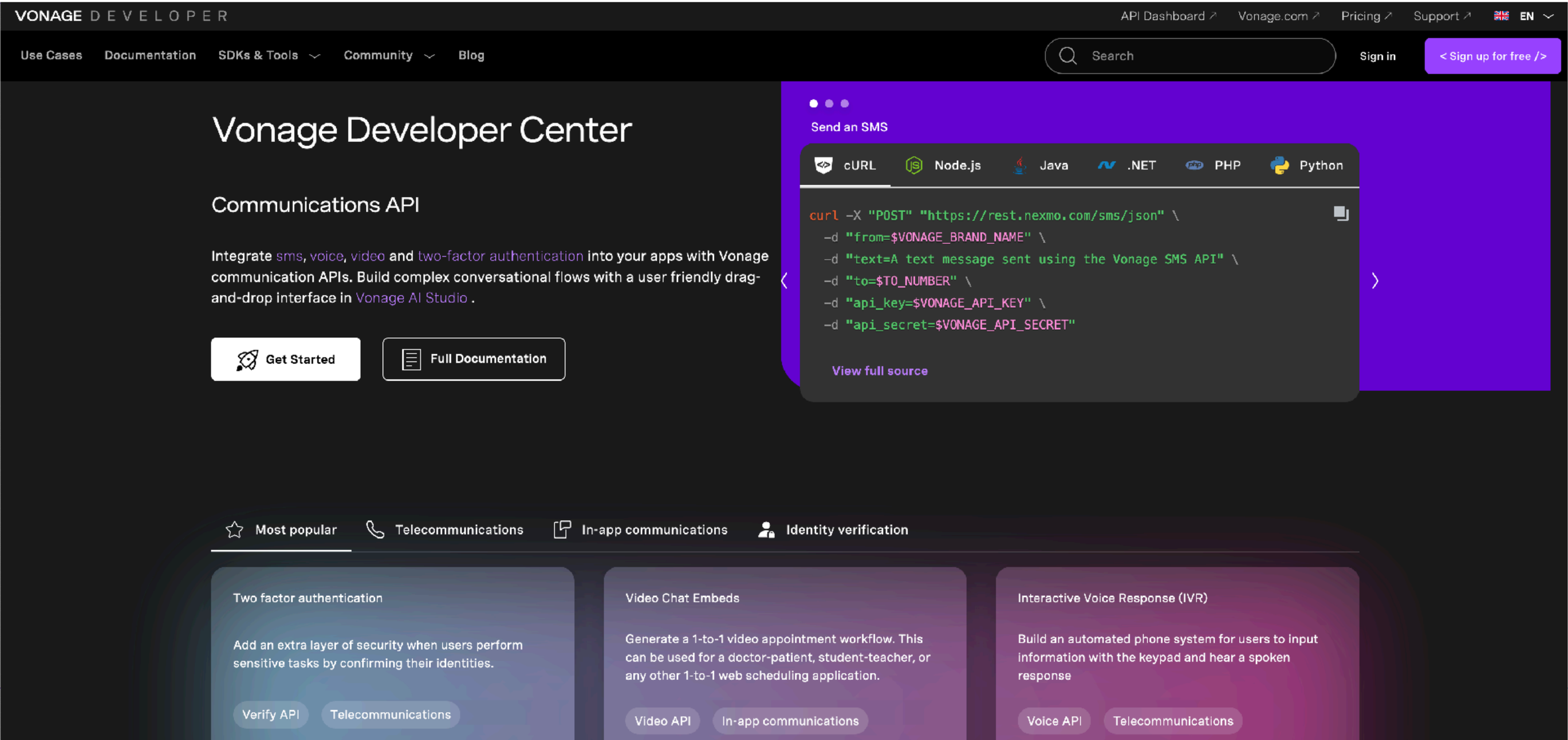
Adventures in Flutter-land



Paul Ardeleanu

Senior Manager - Developer Relations, Vonage

Vonage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Get Started
Full Documentation
Send an SMS
cURL
Node.js
Java
.NET
PHP
Python
curl -X "POST" "https://rest.nexmo.com/sms/json" \
-d "from=$VONAGE_BRAND_NAME" \
-d "text=A text message sent using the Vonage SMS API" \
-d "to=$TO_NUMBER" \
-d "api_key=$VONAGE_API_KEY" \
-d "api_secret=$VONAGE_API_SECRET"
View full source
Most popular
Telecommunications
In-app communications
Identity verification
Two factor authentication
Add an extra layer of security when users perform sensitive tasks by confirming their identities.
Verify API
Telecommunications
Video Chat Embeds
Generate a 1-to-1 video appointment workflow. This can be used for a doctor-patient, student-teacher, or any other 1-to-1 web scheduling application.
Video API
In-app communications
Interactive Voice Response (IVR)
Build an automated phone system for users to input information with the keypad and hear a spoken response
Voice API
Telecommunications

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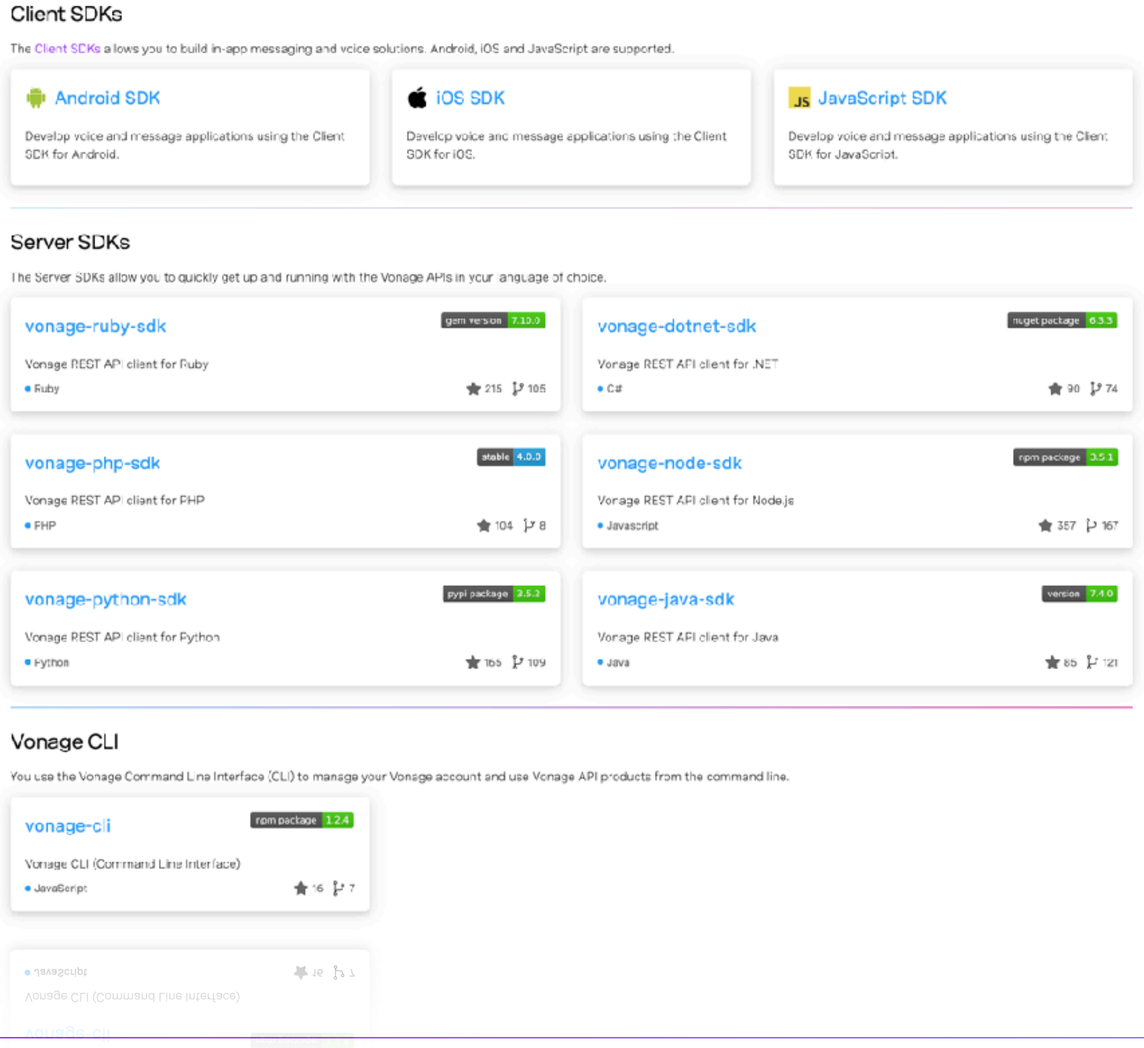

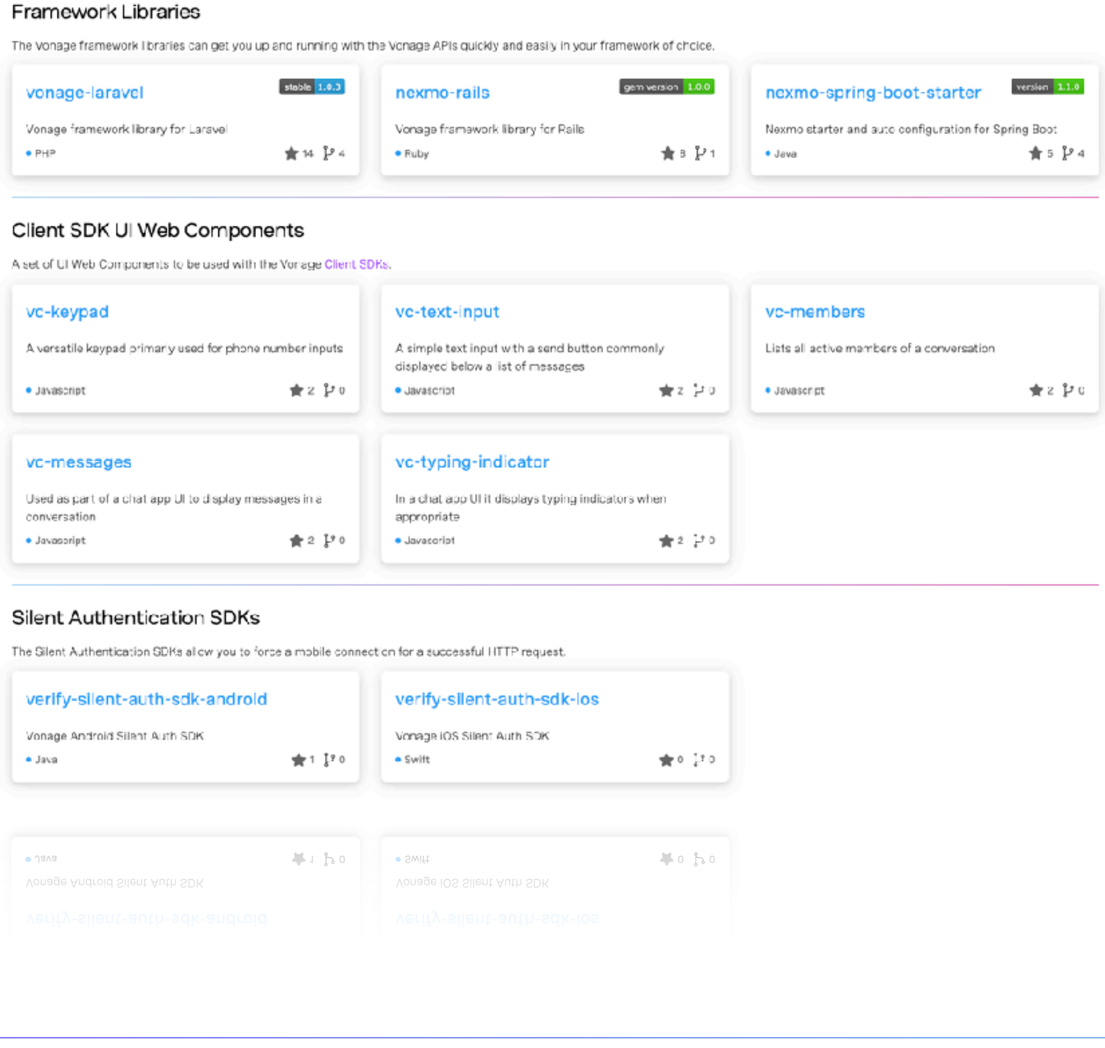

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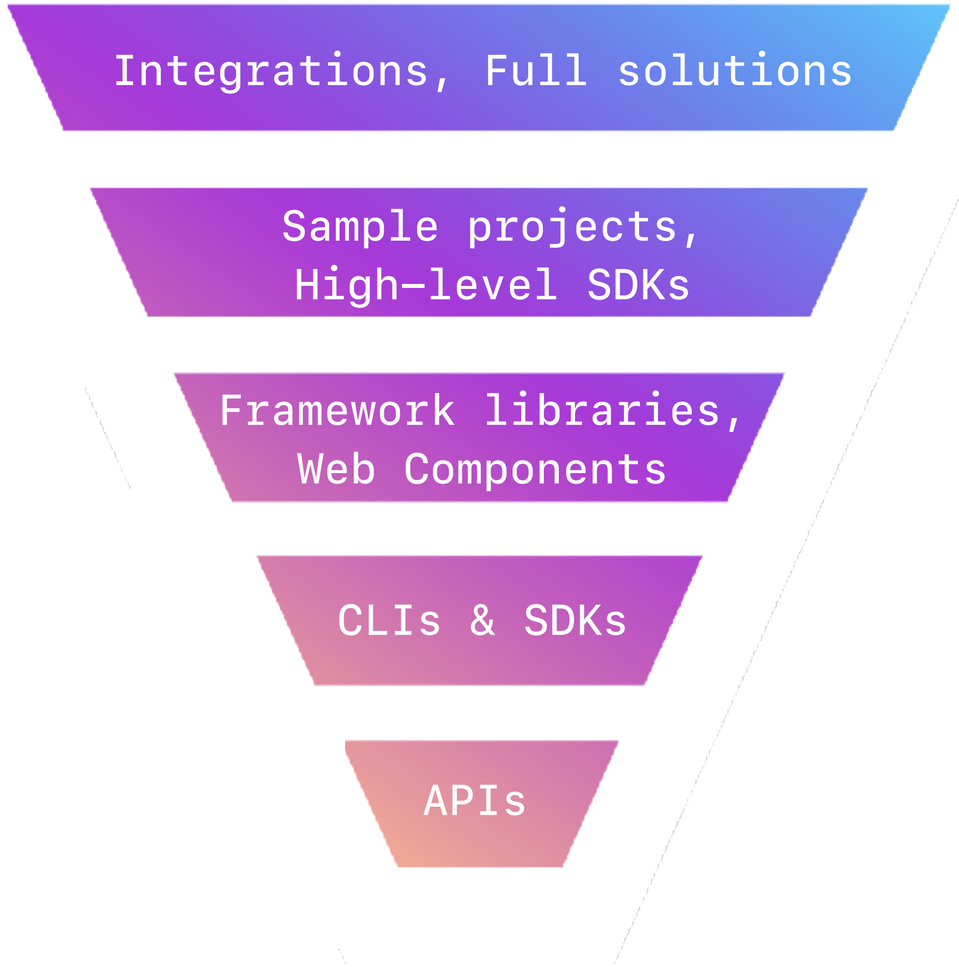
Ease of use



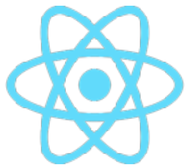
Complexity /
Effort

Holistic Tooling









Why Cross-Platform Mobile Development

1. Cost Savings
   - write once, deploy on multiple platforms
   - familiar technology stack
   - large developer pool

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4. Fast development
5. Consistent UX

Flutter

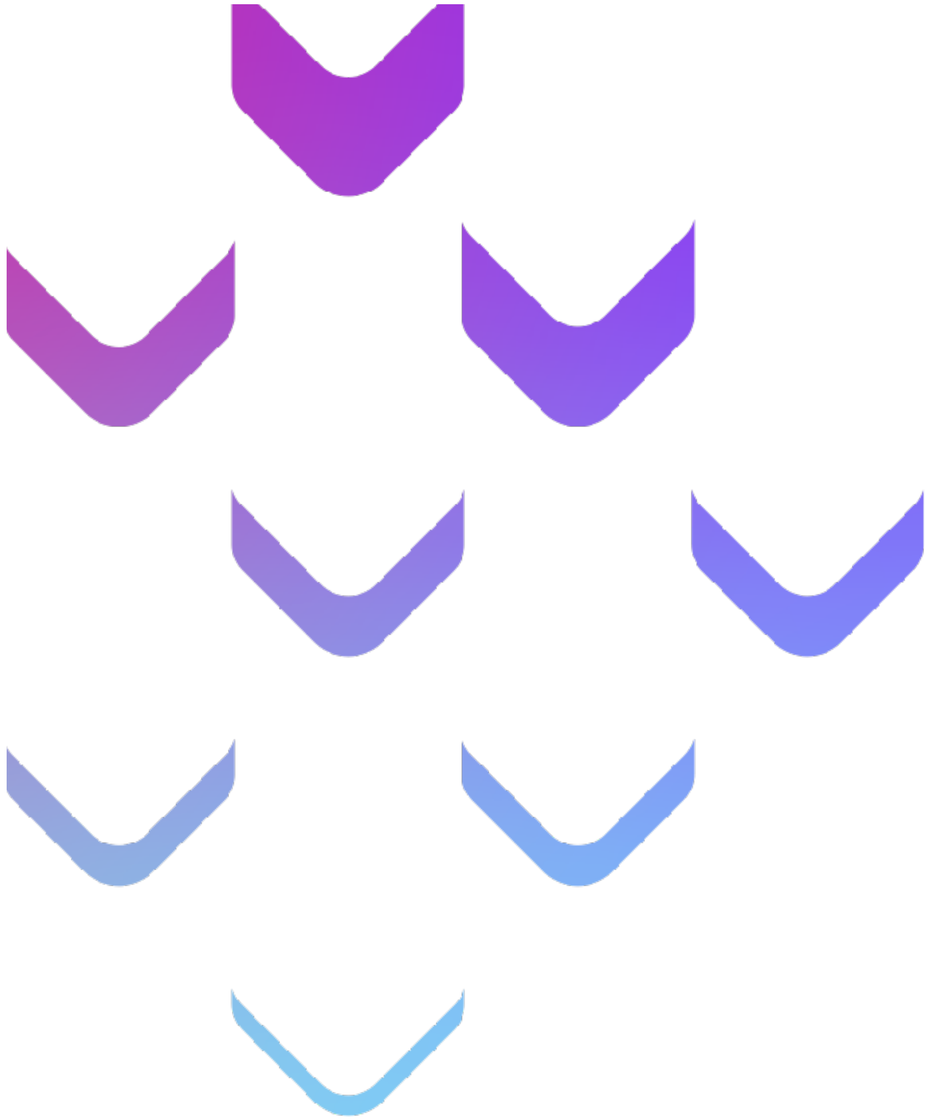
What

- open-source from Google
- using Dart
- natively compiled
- cross platform (mobile & desktop)
- fast UI composition (widgets)

Why

- single codebase
- "fast" development cycle
- hot reloading
- Material Design
- "ideal" for MVPs & startups

Dart



Dart

```
% brew tap dart-lang/dart
% brew install dart
% brew info dart
```

```
% dart --version
Dart SDK version: 3.0.4 (stable) (Wed Jun 7 14:55:32 2023 +0000) on
"macos_arm64"
```

```
% which dart
/Users/paul/development/flutter/bin/dart

% dart --version
Dart SDK version: 3.0.3 (stable) (Wed May 31 15:35:05 2023 +0000) on
"macos_arm64"
```

Hello World

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

```
% dart hello_world.dart
Hello World
```

Type Safety

```dart
void main() {
  var name = 'DevTalks';

  name = 2023;
}
```

```
% dart vars.dart
vars.dart:4:10: Error: A value of type 'int' can't be assigned to a variable of type 'String'.
```

```dart
void main() {
  var name = 'DevTalks';
  int year = 2023;

  print(name.runtimeType);
  print(year.runtimeType);
}
```

```
% dart vars.dart
String
int
```

Object-Oriented

```dart
var name = 'DevTalks';
name.length;
name.toLowerCase();

var year = 2023;
year.isOdd;
year.toString();
```

Class-Based

```
class Event {
  String name;
  DateTime date;
  Event(this.name, this.date);
}
```

```
devTalks = Event('DevTalks', DateTime(2023, 6, 21));
```

(sound) Null Safety

```dart
var name = 'DevTalks';
name = null;
```

```
Error: The value 'null' can't
be assigned to a variable of
type 'String' because 'String'
is not nullable.
```

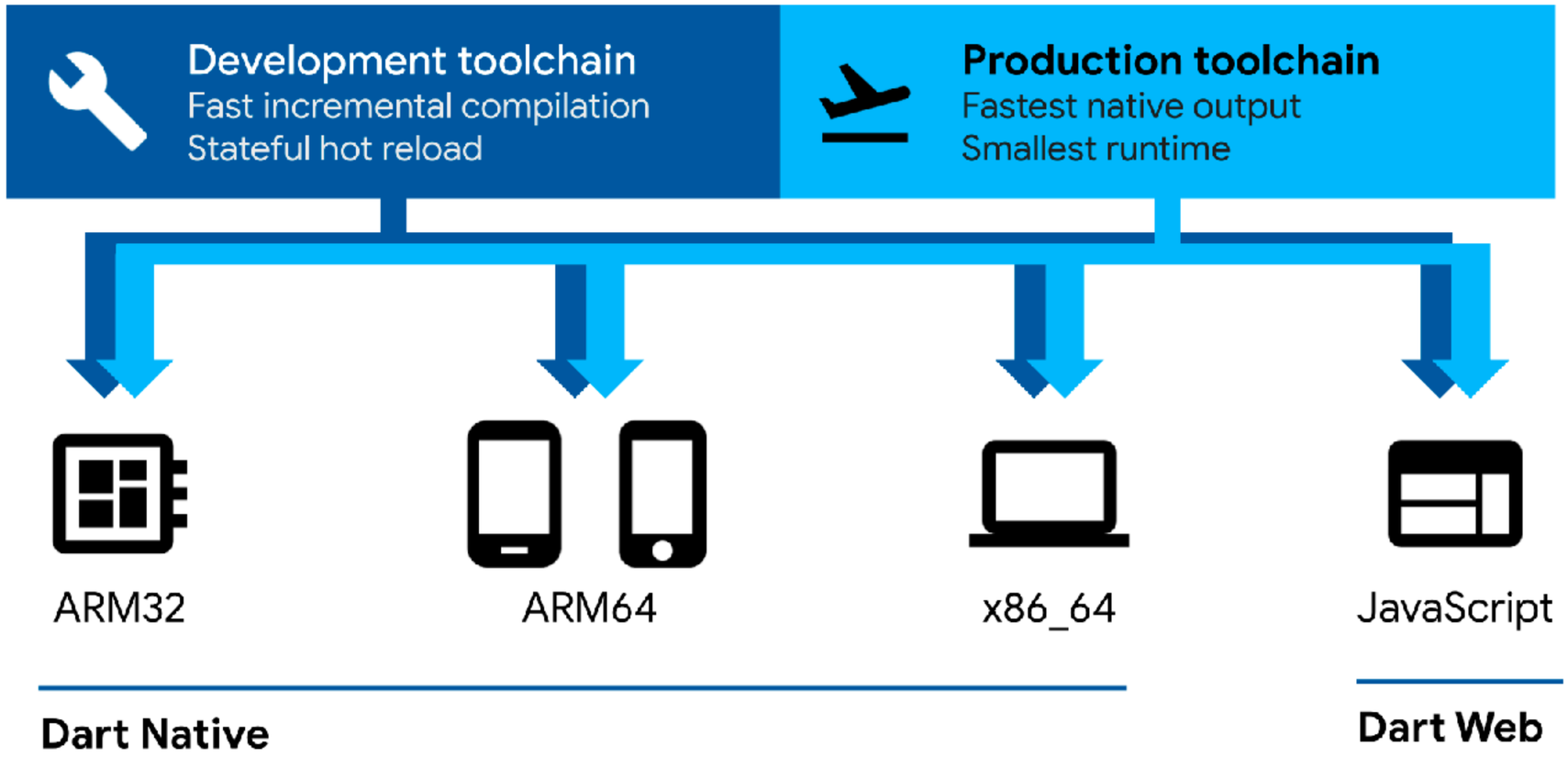
```dart
String? name = 'DevTalks';
name = null;
```

Core Libraries

```
{"DevTalks 2023":{"name":"DevTalks
2023","date":"2023-06-21T00:00:00.
000Z"},"DevTalks 2022":
{"name":"DevTalks
2022","date":"2022-03-08T00:00:00.
000Z"}}
```

```dart
import 'dart:convert';

class Event {
  String name;
  DateTime date;
  Event(this.name, this.date);
}

void main() {
  var events = [
    Event('DevTalks23', DateTime(2023, 6, 21)),
    Event('DevTalks22', DateTime(2022, 3, 8))
  ];

  var eventsMap = Map.fromIterable(events,
    key: (e) => e.name,
    value: (e) => {
      'name': e.name,
      'date': e.date.toIso8601String() }
  );

  var eventsJson = json.encode(eventsMap);
  print(eventsJson);
}
```

Why Dart


Development toolchain
Fast incremental compilation
Stateful hot reload
Production toolchain
Fastest native output
Smallest runtime
ARM32
ARM64
x86_64
JavaScript
Dart Native
Dart Web

Compile JS

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

```
% ls -al
total 8
drwxr-xr-x   3 paul  staff    96B Jun 12 15:34 ./
drwxr-xr-x  10 paul  staff   320B Jun 12 15:34 ../
-rw-r--r--   1 paul  staff    41B Jun 12 15:35 hello_world.dart

% dart compile js hello_world.dart
Info: Compiling with sound null safety.
Compiled 9,714,468 characters Dart to 98,143 characters
JavaScript in 0.36 seconds using 197.016 MB of memory

% ls -al
total 296
drwxr-xr-x   6 paul  staff   192B Jun 12 15:35 ./
drwxr-xr-x  10 paul  staff   320B Jun 12 15:34 ../
-rw-r--r--   1 paul  staff    41B Jun 12 15:35 hello_world.dart
-rw-r--r--   1 paul  staff    96K Jun 12 15:35 out.js
-rw-r--r--   1 paul  staff    10K Jun 12 15:35 out.js.deps
-rw-r--r--   1 paul  staff    35K Jun 12 15:35 out.js.map
```

Compile JS

```
% dart compile js -O4 hello_world.dart

Info: Compiling with sound null safety.
Compiled 9,714,468 characters Dart to 5,314 characters
JavaScript in 0.32 seconds using 191.031 MB of memory


% dart compile js -O0 hello_world.dart

Info: Compiling with sound null safety.
Compiled 9,714,468 characters Dart to 322,291 characters
JavaScript in 0.44 seconds using 204.391 MB of memory
```

Compile macOS

```
% dart compile exe --target-os=macos hello_world.dart

 Info: Compiling with sound null safety.
 Generated: .../DevTalks/dart/hello_world/hello_world.exe

% ./hello_world.exe

 Hello, World!

% ls -al

 total 8896
 drwxr-xr-x   4 paul  staff   128B Jun 12 22:10 ./
 drwxr-xr-x  10 paul  staff   320B Jun 12 15:34 ../
 -rw-r--r--   1 paul  staff    41B Jun 12 15:35 hello_world.dart
 -rwxr-xr-x   1 paul  staff   4.3M Jun 12 22:10 hello_world.exe*
```

macOS Swift Equivalent

```
print('Hello, World!');
```

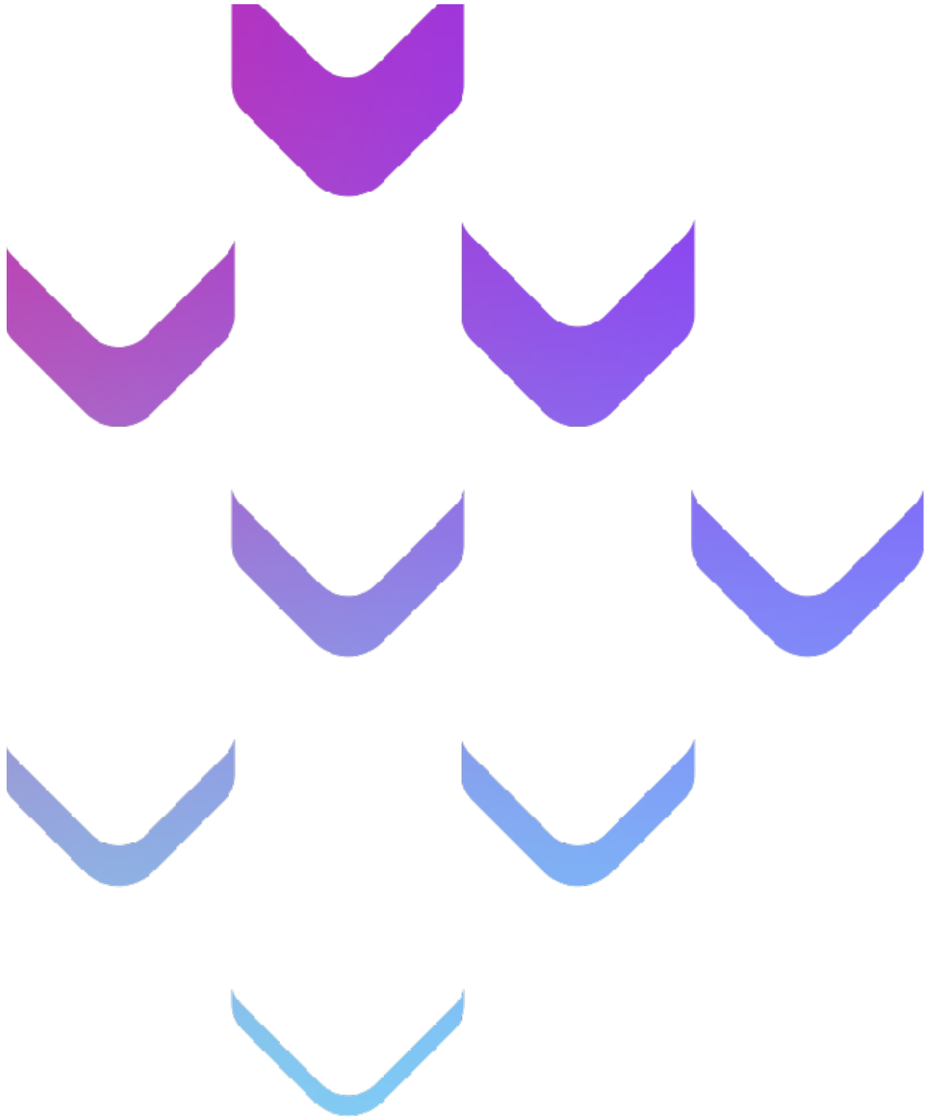
```
% swiftc hello_world.swift

% ./hello_world
 Hello World

% ls -al
total 8976
drwxr-xr-x   6 paul  staff   192B Jun 12 22:36 ./
drwxr-xr-x  11 paul  staff   352B Jun 12 22:17 ../
-rwxr-xr-x   1 paul  staff    33K Jun 12 22:35 hello_world*
-rw-r--r--   1 paul  staff    41B Jun 12 15:35 hello_world.dart
-rwxr-xr-x   1 paul  staff   4.3M Jun 12 22:10 hello_world.exe*
-rw-r--r--   1 paul  staff    23B Jun 12 22:16 hello_world.swift
```

time -l

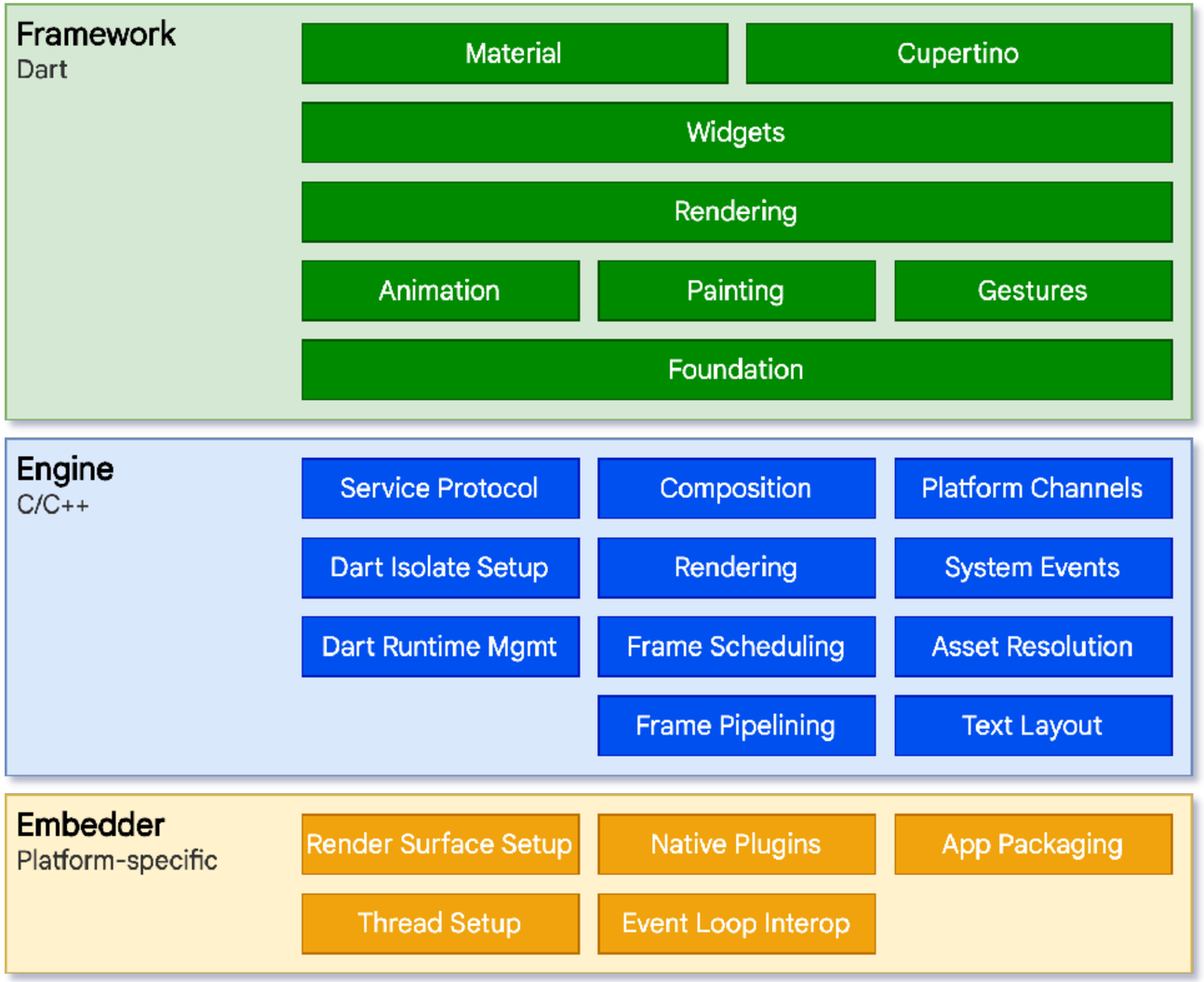
```
        0.03 real         0.00 user         0.01 sys
    22282240  maximum resident set size
           0  average shared memory size
           0  average unshared data size
           0  average unshared stack size
        1845  page reclaims
         127  page faults
           0  swaps
           0  block input operations
           0  block output operations
           0  messages sent
           0  messages received
           0  signals received
           6  voluntary context switches
         168  involuntary context switches
    77934586  instructions retired
    42313001  cycles elapsed
    11224448  peak memory footprint
```

```
        0.00 real         0.00 user         0.00 sys
     1261568  maximum resident set size
           0  average shared memory size
           0  average unshared data size
           0  average unshared stack size
         184  page reclaims
           5  page faults
           0  swaps
           0  block input operations
           0  block output operations
           0  messages sent
           0  messages received
           0  signals received
           0  voluntary context switches
           5  involuntary context switches
     7432972  instructions retired
     4873472  cycles elapsed
      934400  peak memory footprint
```

Flutter



Architecture



Design Architecture

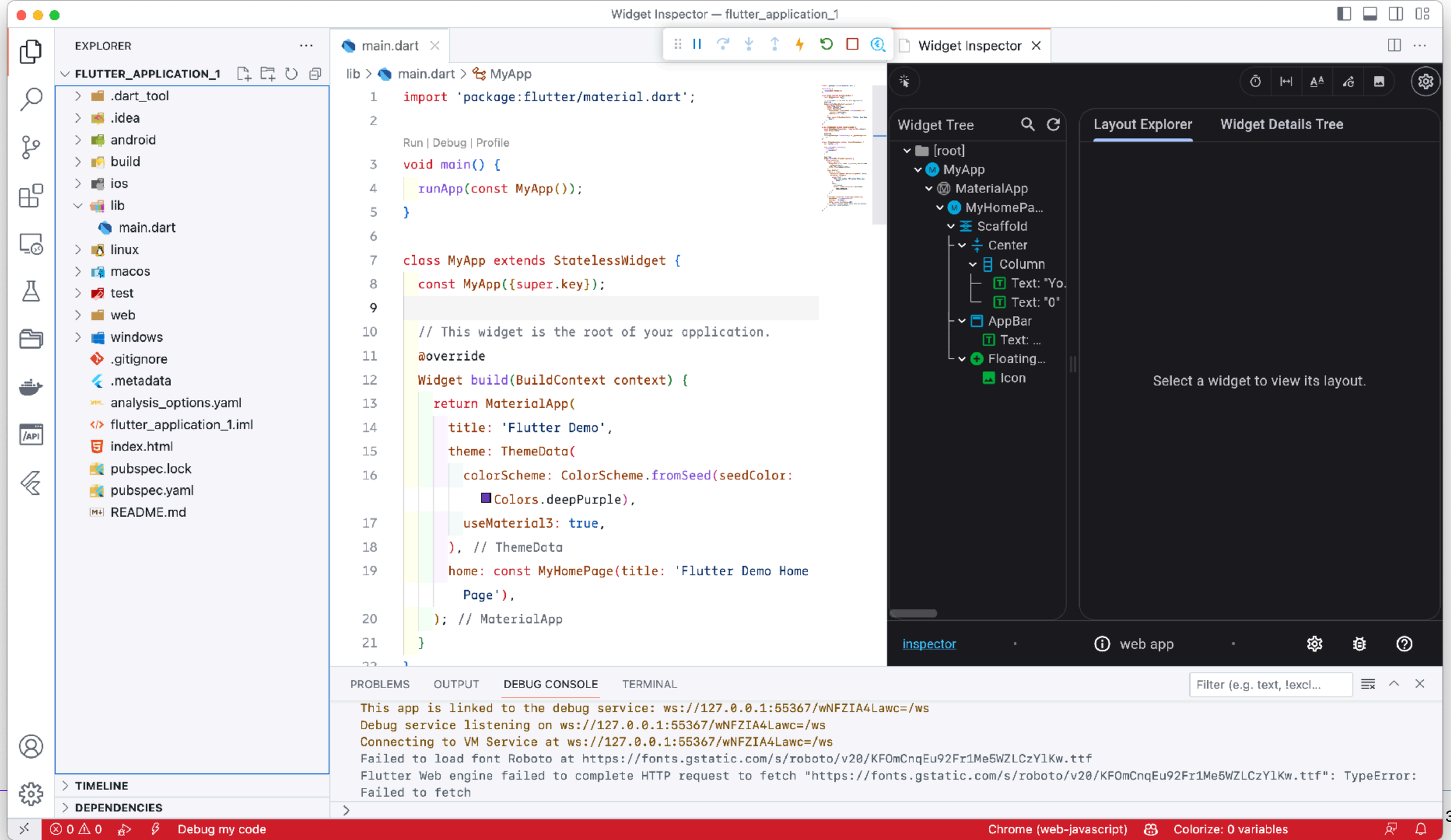
Widgets

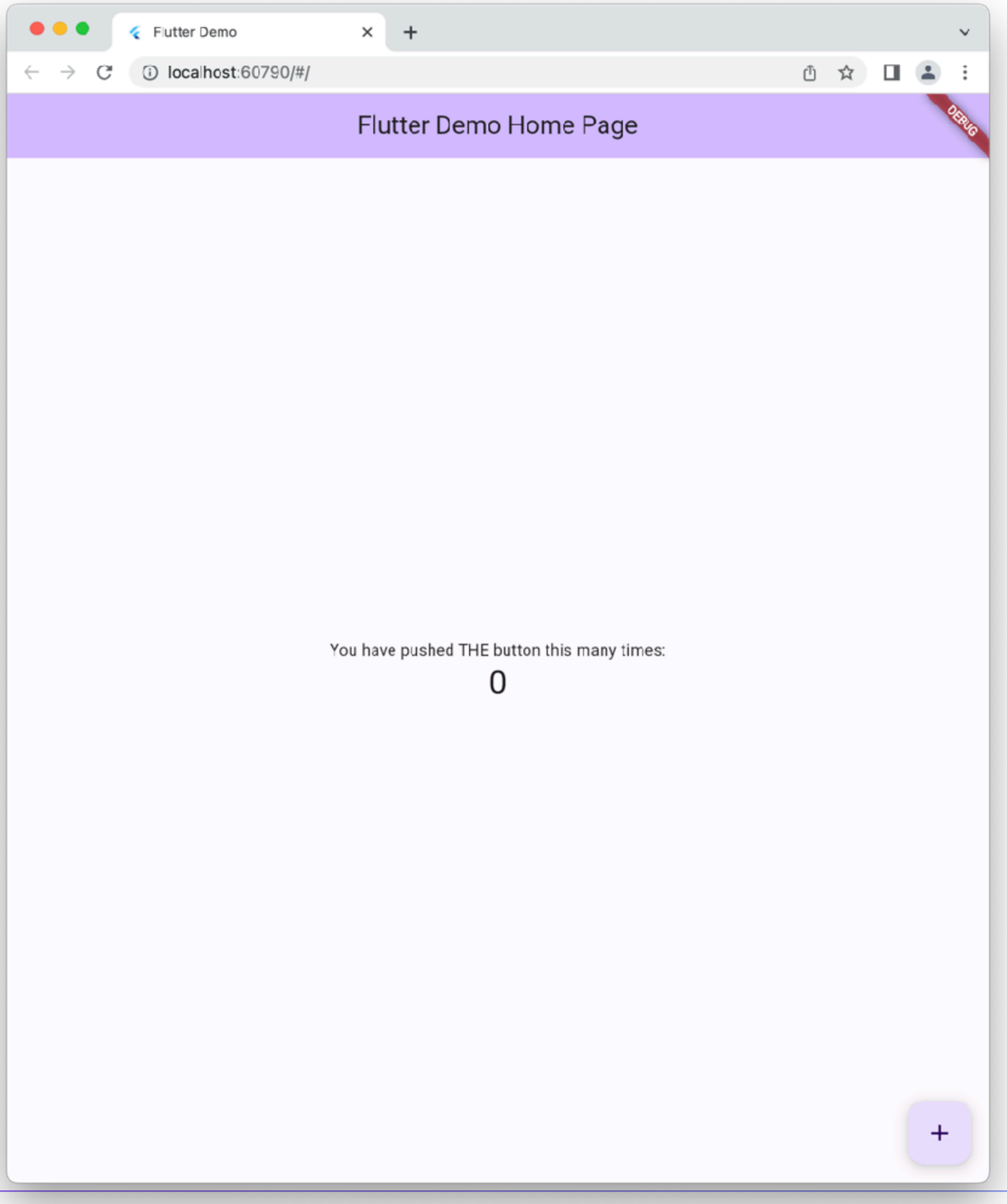
- building blocks
- interface, layout, behaviour
- tree structure
- pre-built & custom
- Material Design & Cupertino

Widgets

main.dart

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

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


Widget Inspector — flutter_application_1
EXPLORER
FLUTTER_APPLICATION_1
.dart_tool
.idea
android
build
ios
lib
main.dart
linux
macos
test
web
windows
.gitignore
.metadata
analysis_options.yaml
flutter_application_1.iml
index.html
pubspec.lock
pubspec.yaml
README.md
TIMELINE
DEPENDENCIES
main.dart
Widget Inspector
lib > main.dart > MyApp
1 import 'package:flutter/material.dart';
2
Run | Debug | Profile
3 void main() {
4 runApp(const MyApp());
5 }
6
7 class MyApp extends StatelessWidget {
8 const MyApp({super.key});
9
10 // This widget is the root of your application.
11 @override
12 Widget build(BuildContext context) {
13 return MaterialApp(
14 title: 'Flutter Demo',
15 theme: ThemeData(
16 colorScheme: ColorScheme.fromSeed(seedColor:
Colors.deepPurple),
17 useMaterial3: true,
18), // ThemeData
19 home: const MyHomePage(title: 'Flutter Demo Home
Page'),
20); // MaterialApp
21 }
Widget Tree
Layout Explorer
Widget Details Tree
[root]
MyApp
MaterialApp
MyHomePa...
Scaffold
Center
Column
Text: "Yo.
Text: "0"
AppBar
Text: ...
Floating...
Icon
Select a widget to view its layout.
inspector
web app
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
Filter (e.g. text, !excl...
This app is linked to the debug service: ws://127.0.0.1:55367/wNFZIA4Lawc=/ws
Debug service listening on ws://127.0.0.1:55367/wNFZIA4Lawc=/ws
Connecting to VM Service at ws://127.0.0.1:55367/wNFZIA4Lawc=/ws
Failed to load font Roboto at https://fonts.gstatic.com/s/roboto/v20/KFOmCnqEu92Fr1Me5WZLCzYlKw.ttf
Flutter Web engine failed to complete HTTP request to fetch "https://fonts.gstatic.com/s/roboto/v20/KFOmCnqEu92Fr1Me5WZLCzYlKw.ttf": TypeError:
Failed to fetch
Debug my code
Chrome (web-javascript)
Colorize: 0 variables

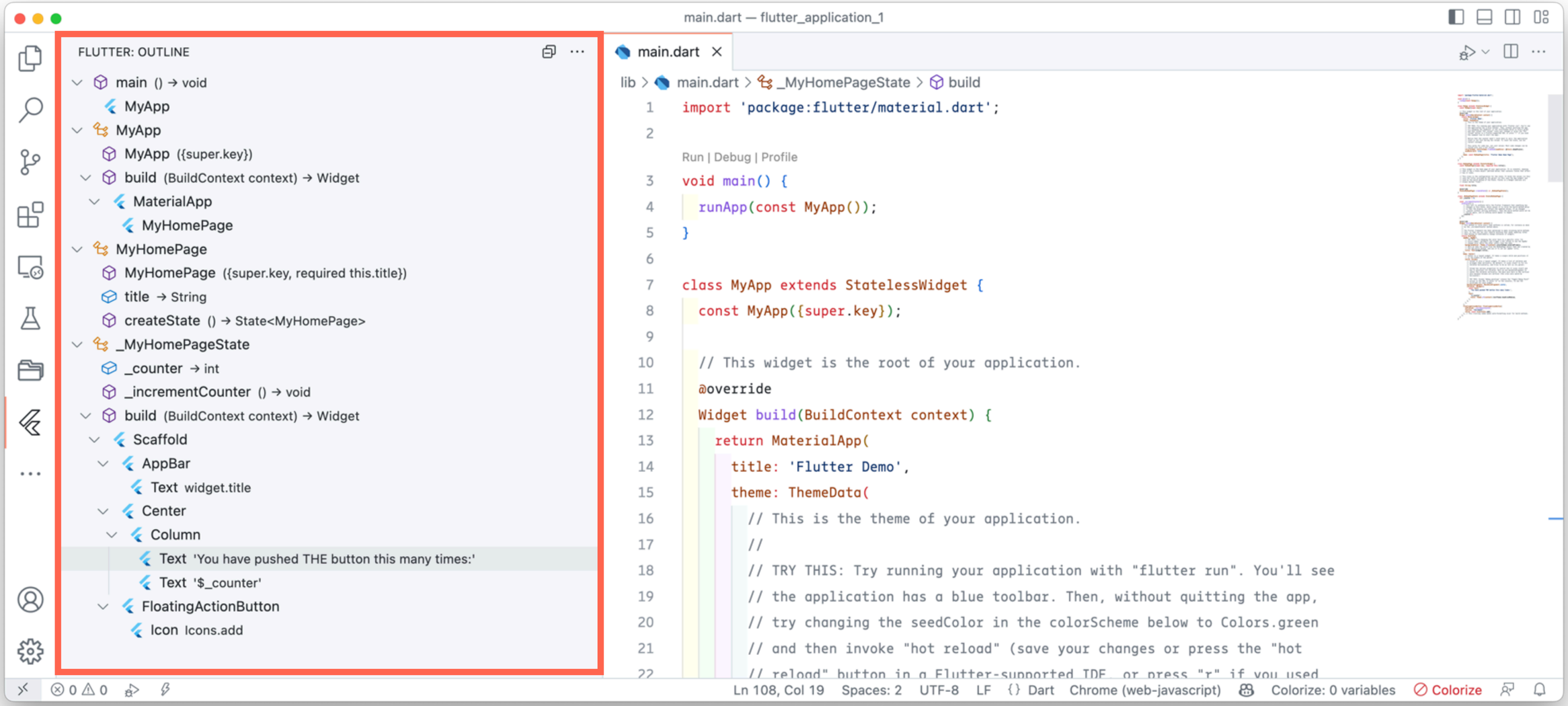

Flutter Demo
localhost:60790/#/
Flutter Demo Home Page
DEBUG
You have pushed THE button this many times:
0
+

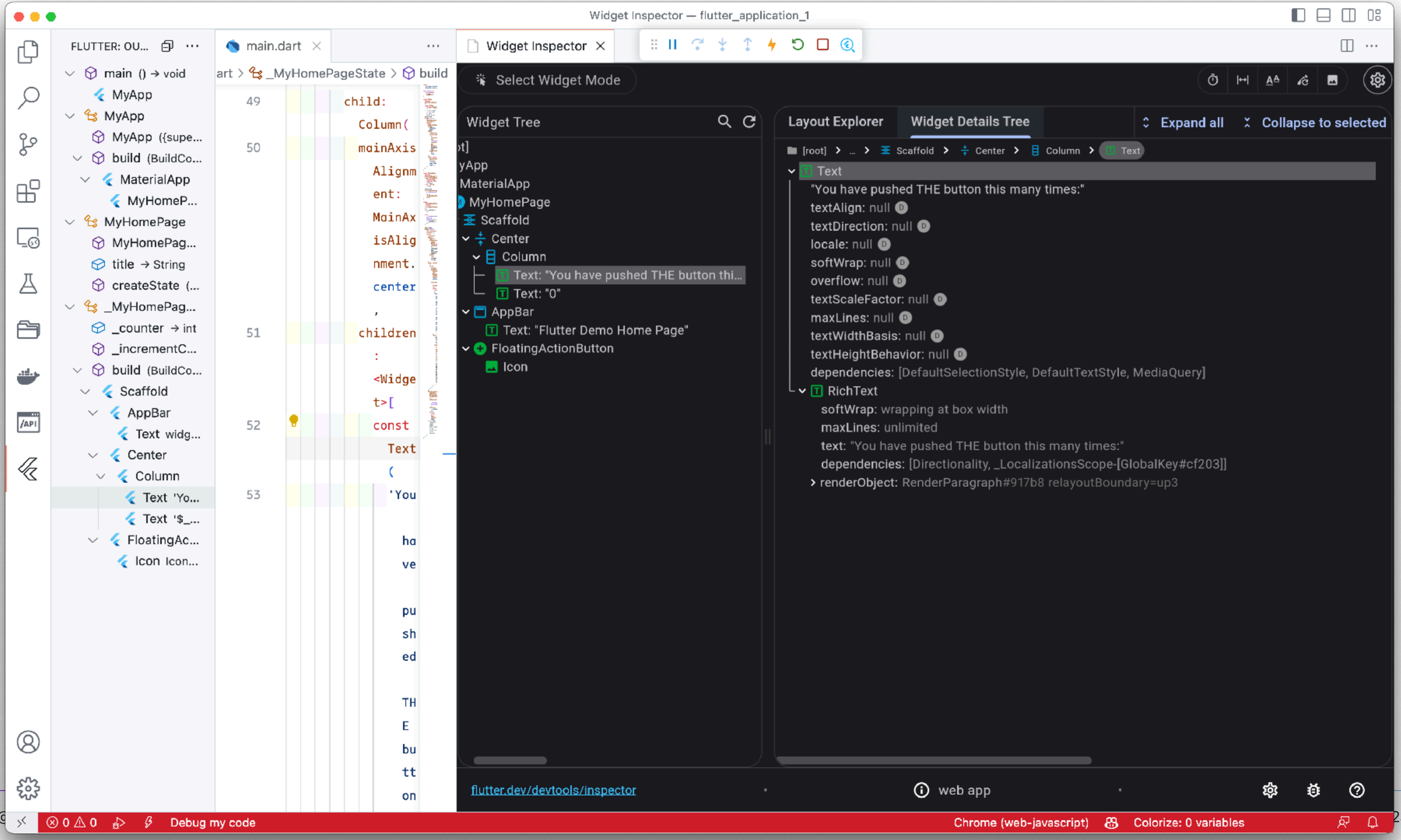
```dart
void main() {
  runApp(const MyApp());
}
```

```dart
class MyApp extends StatelessWidget {
  const MyApp({super.key});
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      title: 'Flutter Demo',
      theme: ThemeData(
        colorScheme: ColorScheme.fromSeed(seedColor: Colors.deepPurple),
        useMaterial3: true,
      ),
      home: const MyHomePage(title: 'Flutter Demo Home Page'),
    );
  }
}
```

```dart
class MyHomePage extends StatefulWidget {
  const MyHomePage({super.key, required this.title});
  final String title;

  @override
  State<MyHomePage> createState() => _MyHomePageState();
}
```

Widgets tree




Widget Inspector — flutter_application_1
FLUTTER: OU...
main.dart
Widget Inspector
Select Widget Mode
Widget Tree
Layout Explorer
Widget Details Tree
Expand all
Collapse to selected
[root] > ... > Scaffold > Center > Column > Text
Text
"You have pushed THE button this many times:"
textAlign: null
textDirection: null
locale: null
softWrap: null
overflow: null
textScaleFactor: null
maxLines: null
textWidthBasis: null
textHeightBehavior: null
dependencies: [DefaultSelectionStyle, DefaultTextStyle, MediaQuery]
RichText
softWrap: wrapping at box width
maxLines: unlimited
text: "You have pushed THE button this many times:"
dependencies: [Directionality, _LocalizationsScope-[GlobalKey#cf203]]
renderObject: RenderParagraph#917b8 relayoutBoundary=up3
MyApp
MaterialApp
MyHomePage
Scaffold
Center
Column
Text: "You have pushed THE button thi...
Text: "0"
AppBar
Text: "Flutter Demo Home Page"
FloatingActionButton
Icon
flutter.dev/devtools/inspector
web app
Debug my code
Chrome (web-javascript)
Colorize: 0 variables

Rafactoring

```
41  @override
42  Widget build(BuildContext context) {
43    return Scaffold(
44      appBar: AppBar(
45        backgroundColor: Theme.of(context).colorScheme.inversePrimary,
46        title: Text(widget.title),
47      ), // AppBar
48      body: Center(
49        child: C
50          mainAx                                    ent.center,
51          childr
52            cons
53              'Y                                    his many times:',
54            ),
55            Text(
56              '$
57              st                                    Theme.headlineMedium,
58            ),
59          ], //
60        ), // C
61      ), // Cent
62      floatingAc                                    utton(
63        onPresse
64        tooltip:
65        child: const Icon(Icons.add),
66      ), // This trailing comma makes auto-formatting nicer for build method
67    ); // Scaffold
68  }
69  }
```

Extract...
- Extract Method
- Extract Local Variable
- Extract Widget

More Actions...
- Wrap with widget...
- Wrap with Builder
- Wrap with Column
- Wrap with Container
- Wrap with Padding
- Wrap with Row
- Wrap with SizedBox
- Wrap with StreamBuilder
- Swap with parent
- Remove this widget

Command Palette... ⇧⌘P

```
41  @override
42  Widget build(BuildContext context) {
43    return Scaffold(
44      appBar: AppBar(
45        backgroundColor: Theme.of(context).colorScheme.inversePrimary,
46        title: Text(widget.title),
47      ), // AppBar
48      body: Padding(
49        padding: const EdgeInsets.all(8.0),
50        child: Center(
51          child: Column(
52            mainAxisAlignment: MainAxisAlignment.center,
53            children: <Widget>[
54              const Text(
55                'You have pushed THE button this many times:',
56              ), // Text
57              Text(
58                '$_counter',
59                style: Theme.of(context).textTheme.headlineMedium,
60              ), // Text
61            ], // <Widget>[]
62          ), // Column
63        ), // Center
64      ), // Padding
65      floatingActionButton: FloatingActionButton(
66        onPressed: _incrementCounter,
67        tooltip: 'Increment',
68        child: const Icon(Icons.add),
69      ), // This trailing comma makes auto-formatting nicer for build methods. // FloatingActionButton
```

Design Architecture

Widgets

- building blocks
- interface, layout, behaviour
- tree structure
- pre-built & composition
- Material Design & Cupertino

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Widgets

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State Management

- Stateless widgets
- Stateful widgets

Design Architecture

Widgets

- building blocks
- interface, layout, behaviour
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State Management

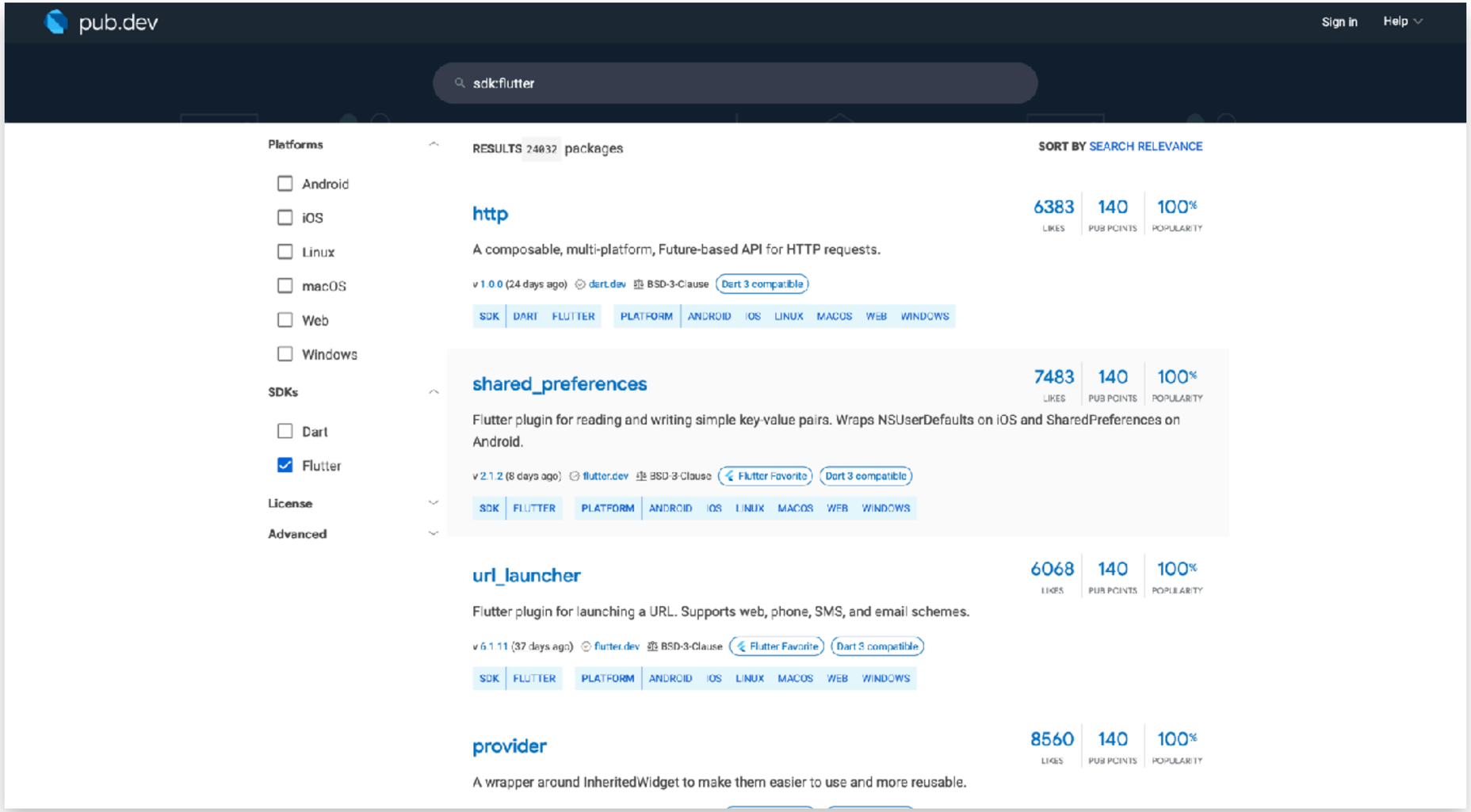
- Stateless widgets
- Stateful widgets

Hot Reload

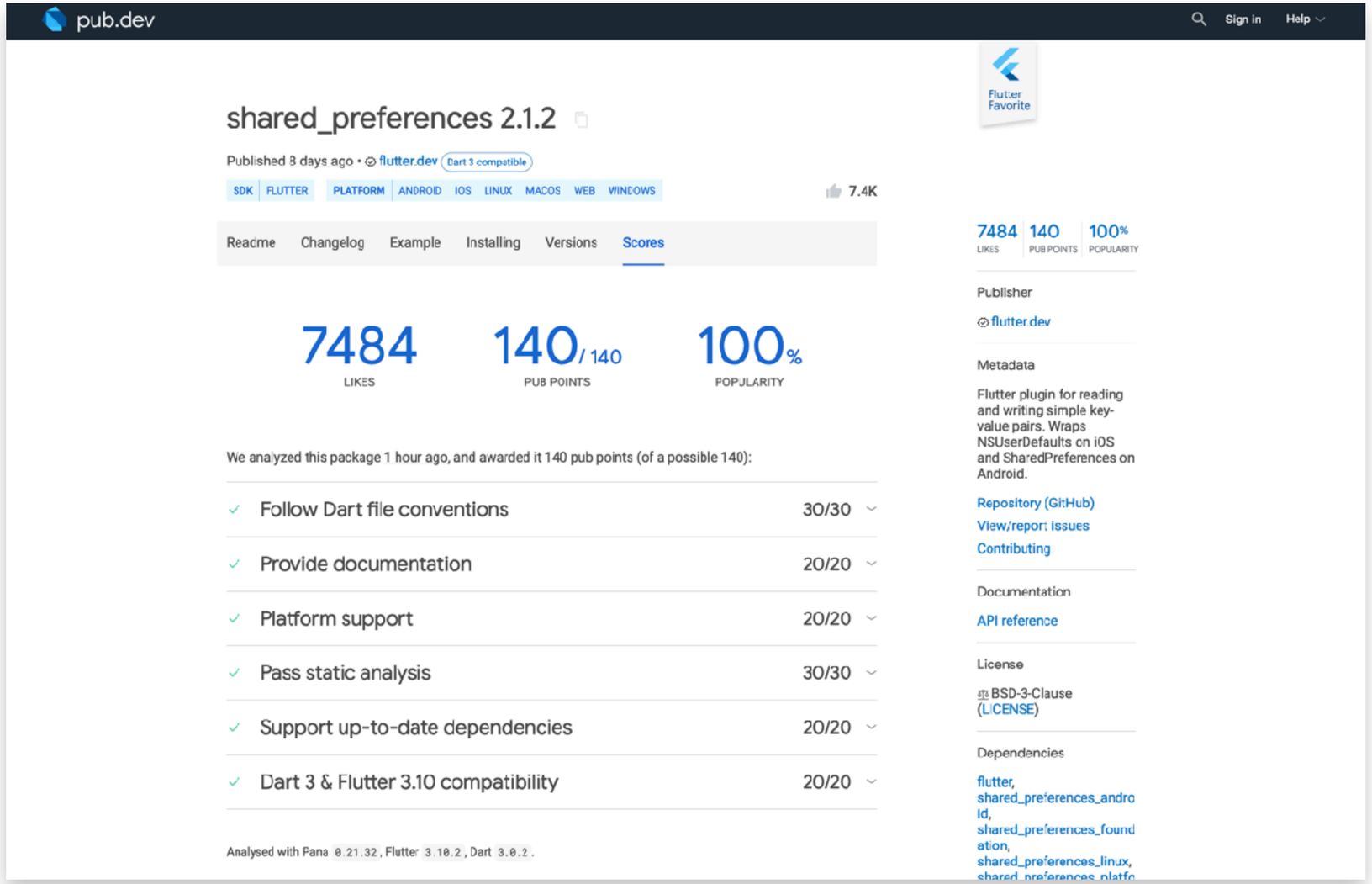
flutter create

```
% flutter create --help

Create a new Flutter project.

If run on a project that already exists, this will repair the project, recreating any files that are missing.

Global options:
-h, --help                  Print this usage information.
-v, --verbose               Noisy logging, including all shell commands executed.
                            If used with "--help", shows hidden options. If used with "flutter doctor", shows additional
                            diagnostic information. (Use "-vv" to force verbose logging in those cases.)
-d, --device-id             Target device id or name (prefixes allowed).
    --version               Reports the version of this tool.
    --suppress-analytics    Suppress analytics reporting for the current CLI invocation.
    --disable-telemetry     Disable telemetry reporting when this command runs.

Usage: flutter create <output directory>
-h, --help                    Print this usage information.
    --[no-]pub                Whether to run "flutter pub get" after the project has been created.
                              (defaults to on)
    --[no-]offline            When "flutter pub get" is run by the create command, this indicates whether to run it in
                              offline mode or not. In offline mode, it will need to have all dependencies already
                              available in the pub cache to succeed.
    --[no-]overwrite          When performing operations, overwrite existing files.
    --description             The description to use for your new Flutter project. This string ends up in the
                              pubspec.yaml file.
                              (defaults to "A new Flutter project.")
    --org                     The organization responsible for your new Flutter project, in reverse domain name notation.
                              This string is used in Java package names and as prefix in the iOS bundle identifier.
```

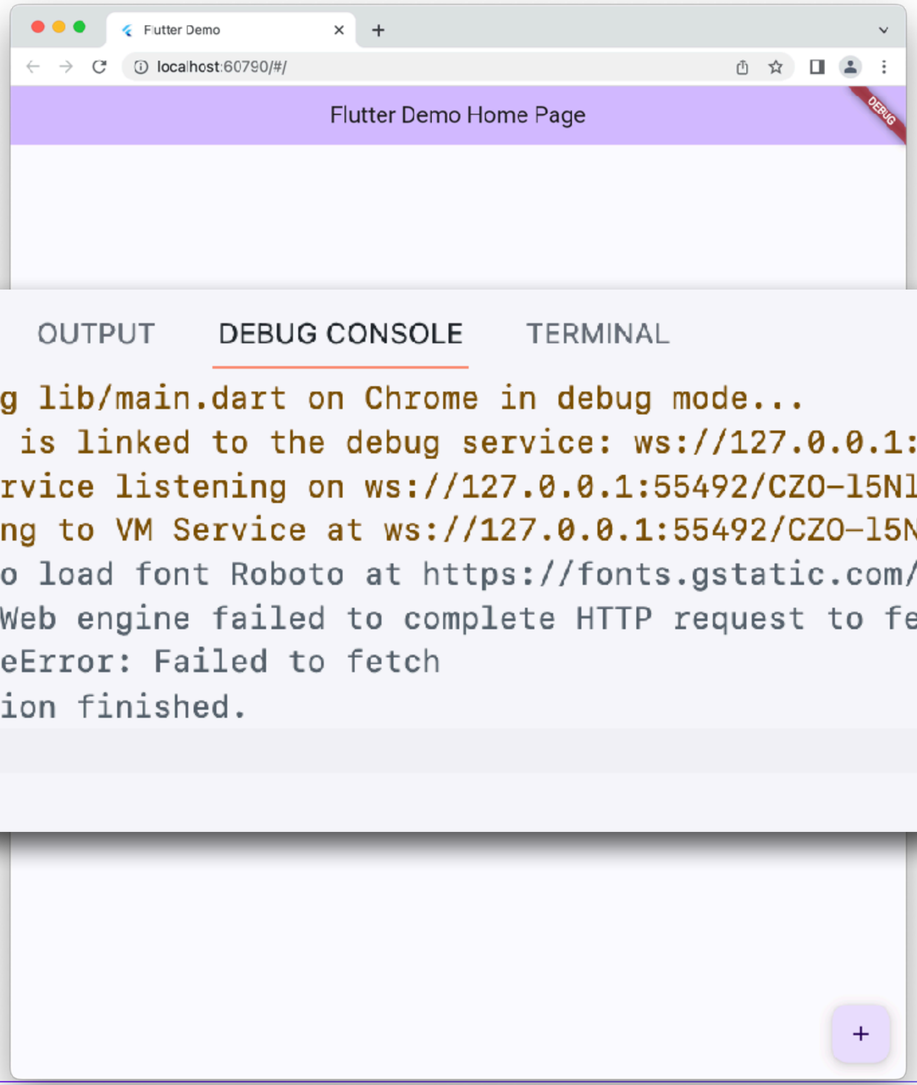
pub.dev

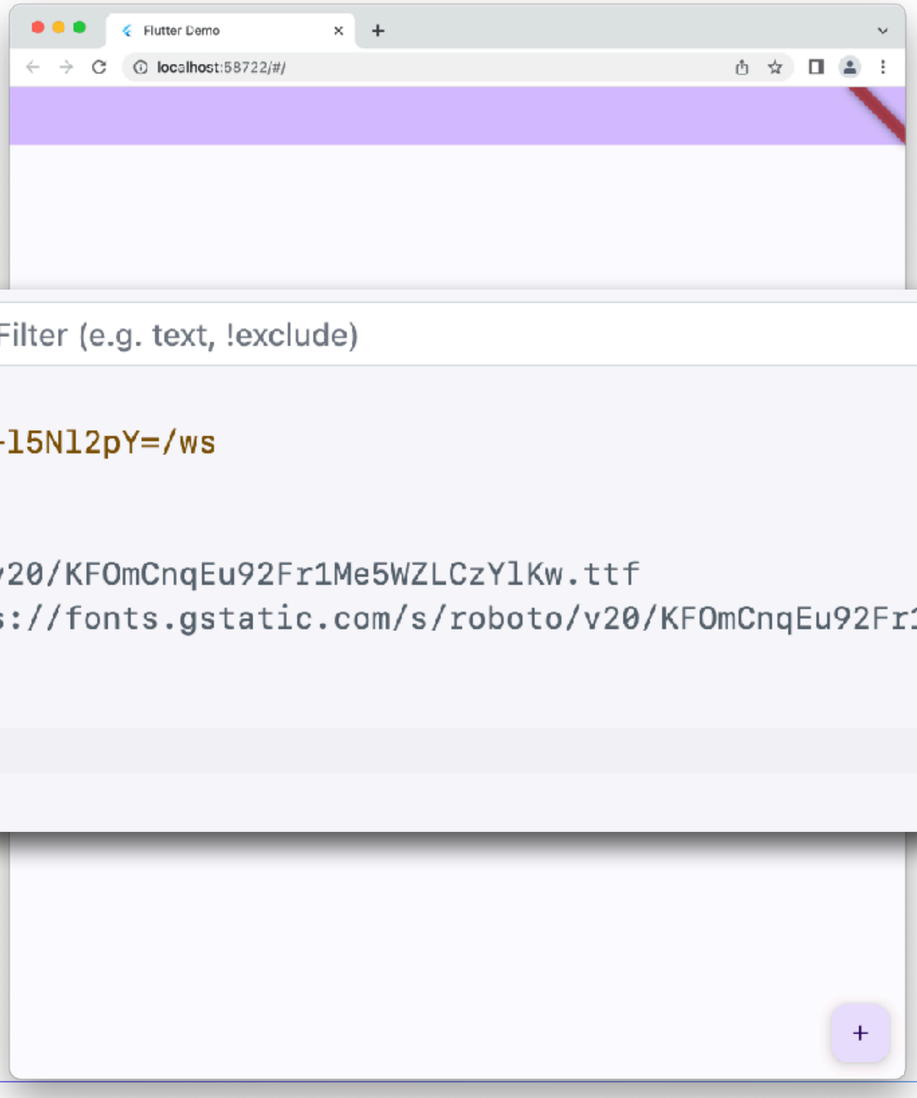

pub.dev
Sign in
Help
sdk:flutter
Platforms
Android
iOS
Linux
macOS
Web
Windows
SDKs
Dart
Flutter
License
Advanced
RESULTS 24032 packages
SORT BY SEARCH RELEVANCE
http
6383 LIKES
140 PUB POINTS
100% POPULARITY
A composable, multi-platform, Future-based API for HTTP requests.
v 1.0.0 (24 days ago) dart.dev BSD-3-Clause Dart 3 compatible
SDK DART FLUTTER PLATFORM ANDROID IOS LINUX MACOS WEB WINDOWS
shared_preferences
7483 LIKES
140 PUB POINTS
100% POPULARITY
Flutter plugin for reading and writing simple key-value pairs. Wraps NSUserDefaults on iOS and SharedPreferences on Android.
v 2.1.2 (8 days ago) flutter.dev BSD-3-Clause Flutter Favorite Dart 3 compatible
SDK FLUTTER PLATFORM ANDROID IOS LINUX MACOS WEB WINDOWS
url_launcher
6068 LIKES
140 PUB POINTS
100% POPULARITY
Flutter plugin for launching a URL. Supports web, phone, SMS, and email schemes.
v 6.1.11 (37 days ago) flutter.dev BSD-3-Clause Flutter Favorite Dart 3 compatible
SDK FLUTTER PLATFORM ANDROID IOS LINUX MACOS WEB WINDOWS
provider
8560 LIKES
140 PUB POINTS
100% POPULARITY
A wrapper around InheritedWidget to make them easier to use and more reusable.

pub.dev Scores



Connectivity requirement



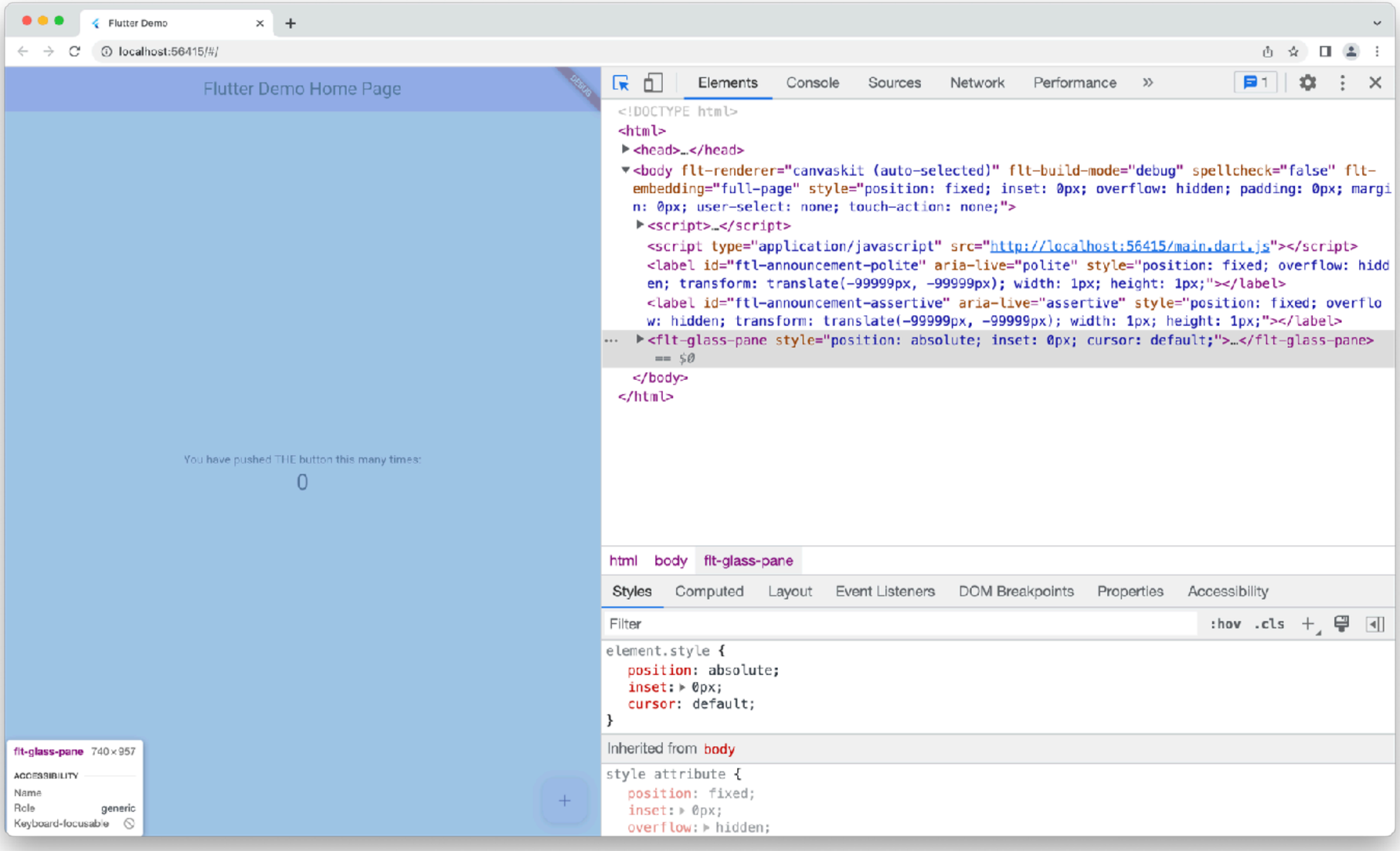


PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

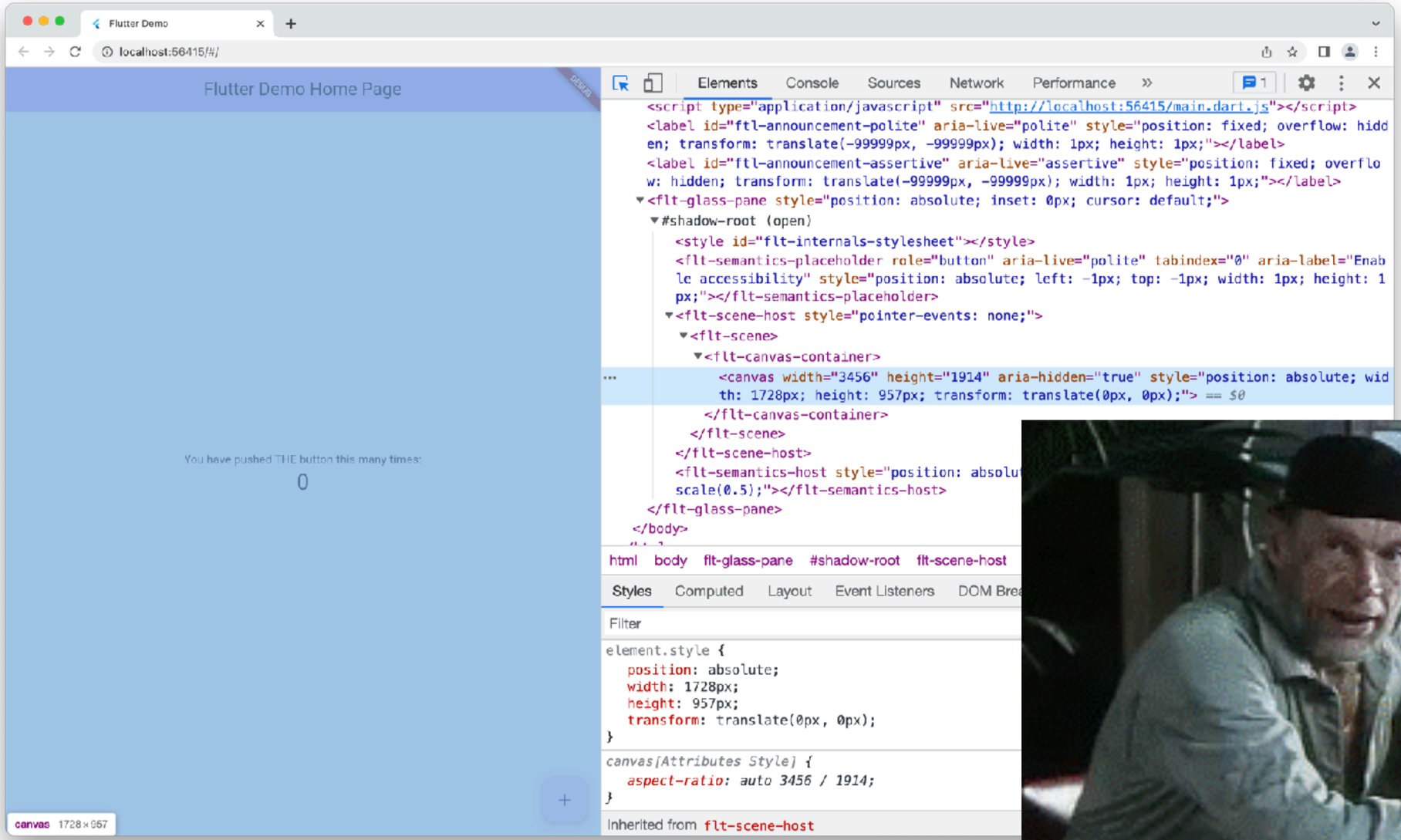
Filter (e.g. text, !exclude)

```
Launching lib/main.dart on Chrome in debug mode...                                main.dart:1
This app is linked to the debug service: ws://127.0.0.1:55492/CZO-l5Nl2pY=/ws
Debug service listening on ws://127.0.0.1:55492/CZO-l5Nl2pY=/ws
Connecting to VM Service at ws://127.0.0.1:55492/CZO-l5Nl2pY=/ws
Failed to load font Roboto at https://fonts.gstatic.com/s/roboto/v20/KFOmCnqEu92Fr1Me5WZLCzYlKw.ttf
Flutter Web engine failed to complete HTTP request to fetch "https://fonts.gstatic.com/s/roboto/v20/KFOmCnqEu92Fr1Me5WZLCzYlKw.t
tf": TypeError: Failed to fetch
Application finished.
Exited
```

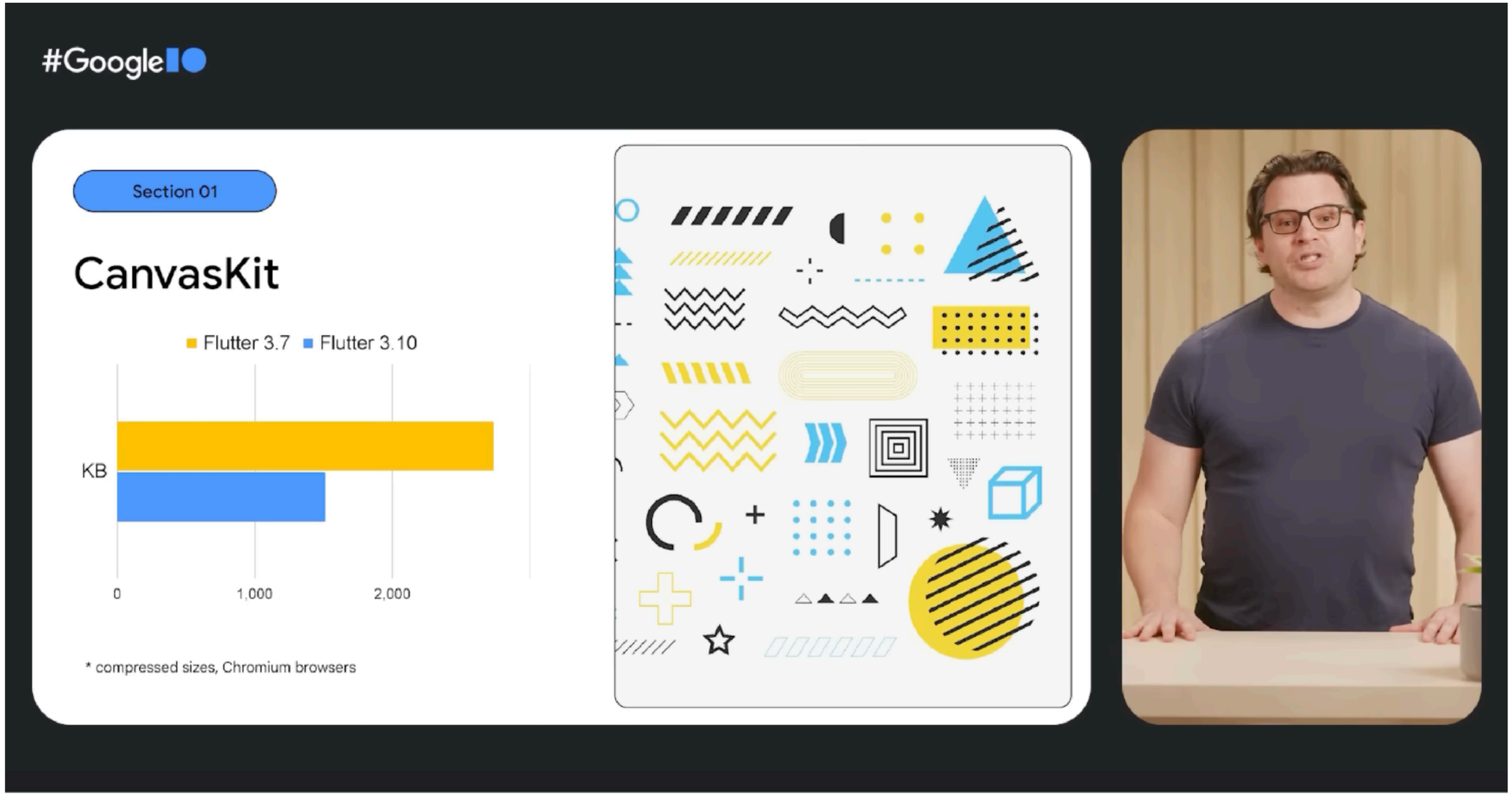
Web-ish


Flutter Demo
localhost:56415/#/
Flutter Demo Home Page
You have pushed THE button this many times:
0
flt-glass-pane 740 × 957
ACCESSIBILITY
Name
Role generic
Keyboard-focusable
Elements
Console
Sources
Network
Performance
<!DOCTYPE html>
<html>
<head>…</head>
<body flt-renderer="canvaskit (auto-selected)" flt-build-mode="debug" spellcheck="false" flt-embedding="full-page" style="position: fixed; inset: 0px; overflow: hidden; padding: 0px; margin: 0px; user-select: none; touch-action: none;">
<script>…</script>
<script type="application/javascript" src="http://localhost:56415/main.dart.js"></script>
<label id="flt-announcement-polite" aria-live="polite" style="position: fixed; overflow: hidden; transform: translate(-99999px, -99999px); width: 1px; height: 1px;"></label>
<label id="flt-announcement-assertive" aria-live="assertive" style="position: fixed; overflow: hidden; transform: translate(-99999px, -99999px); width: 1px; height: 1px;"></label>
<flt-glass-pane style="position: absolute; inset: 0px; cursor: default;">…</flt-glass-pane>
== $0
</body>
</html>
html body flt-glass-pane
Styles
Computed
Layout
Event Listeners
DOM Breakpoints
Properties
Accessibility
Filter
:hov .cls
element.style {
position: absolute;
inset: ▸ 0px;
cursor: default;
}
Inherited from body
style attribute {
position: fixed;
inset: ▸ 0px;
overflow: ▸ hidden;

Web-ish


Flutter Demo
localhost:56415/#/
Flutter Demo Home Page
You have pushed THE button this many times:
0
canvas 1728 × 957
Elements
Console
Sources
Network
Performance
<script type="application/javascript" src="http://localhost:56415/main.dart.js"></script>
<label id="flt-announcement-polite" aria-live="polite" style="position: fixed; overflow: hidden; transform: translate(-99999px, -99999px); width: 1px; height: 1px;"></label>
<label id="flt-announcement-assertive" aria-live="assertive" style="position: fixed; overflow: hidden; transform: translate(-99999px, -99999px); width: 1px; height: 1px;"></label>
<flt-glass-pane style="position: absolute; inset: 0px; cursor: default;">
#shadow-root (open)
<style id="flt-internals-stylesheet"></style>
<flt-semantics-placeholder role="button" aria-live="polite" tabindex="0" aria-label="Enable accessibility" style="position: absolute; left: -1px; top: -1px; width: 1px; height: 1px;"></flt-semantics-placeholder>
<flt-scene-host style="pointer-events: none;">
<flt-scene>
<flt-canvas-container>
<canvas width="3456" height="1914" aria-hidden="true" style="position: absolute; width: 1728px; height: 957px; transform: translate(0px, 0px);"> == $0
</flt-canvas-container>
</flt-scene>
</flt-scene-host>
<flt-semantics-host style="position: absolu
scale(0.5);"></flt-semantics-host>
</flt-glass-pane>
</body>
html body flt-glass-pane #shadow-root flt-scene-host
Styles
Computed
Layout
Event Listeners
Filter
element.style {
position: absolute;
width: 1728px;
height: 957px;
transform: translate(0px, 0px);
}
canvas[Attributes Style] {
aspect-ratio: auto 3456 / 1914;
}
Inherited from flt-scene-host

CanvasKit in 3.10



CanvasKit in 3.10

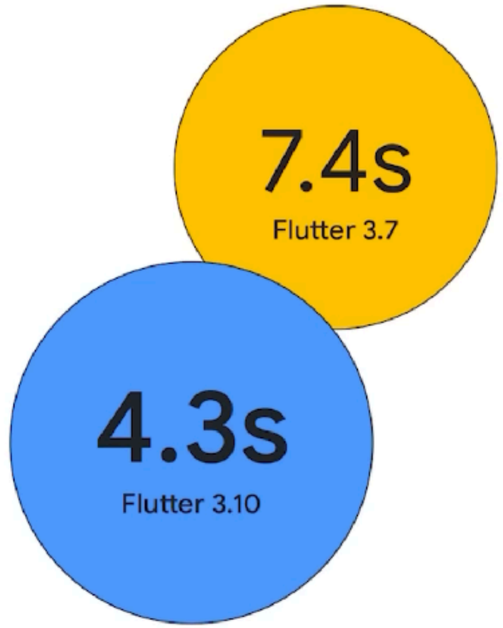
#Google I/O

Section 01

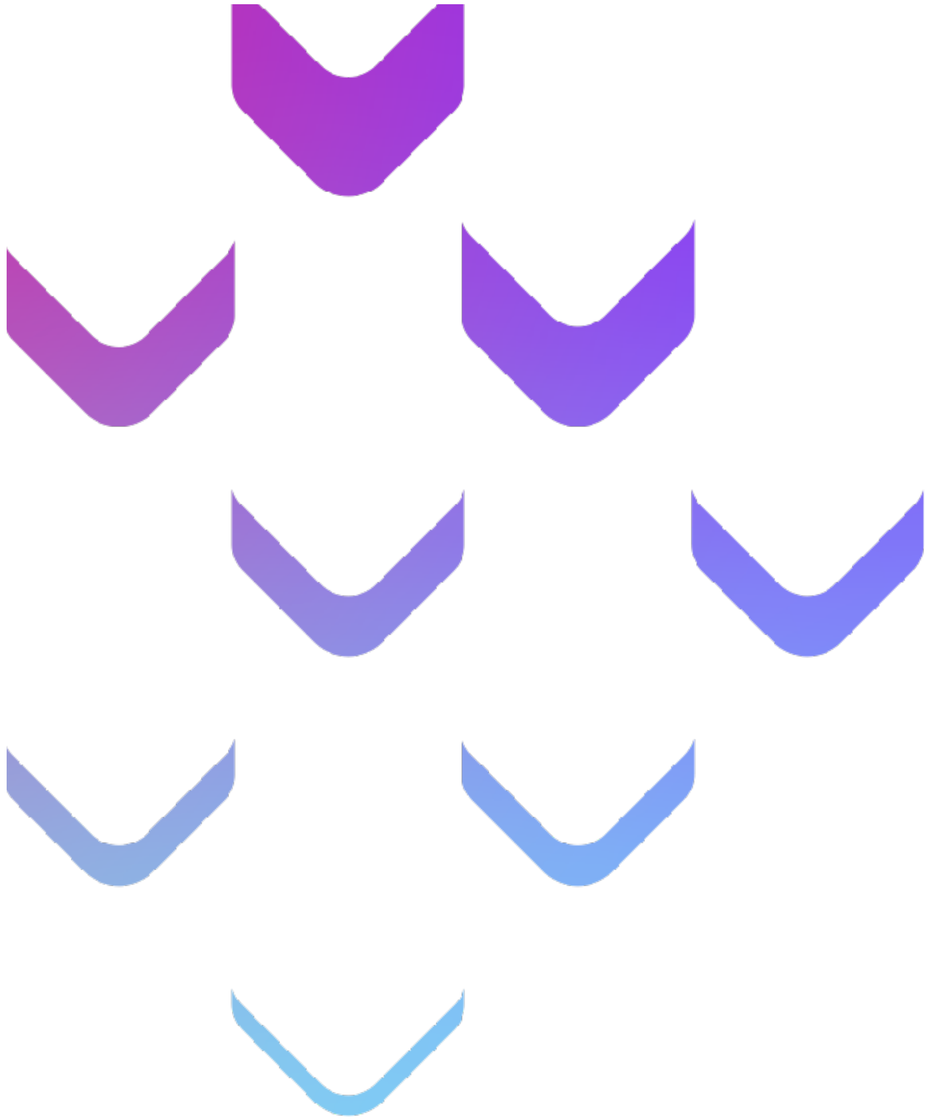
Flutter counter app

42% faster load

*simulated cable connection

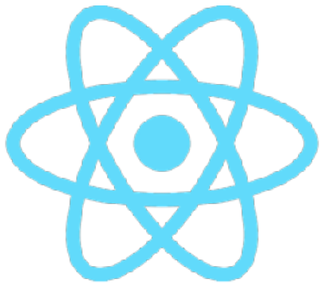


Flutter vs.



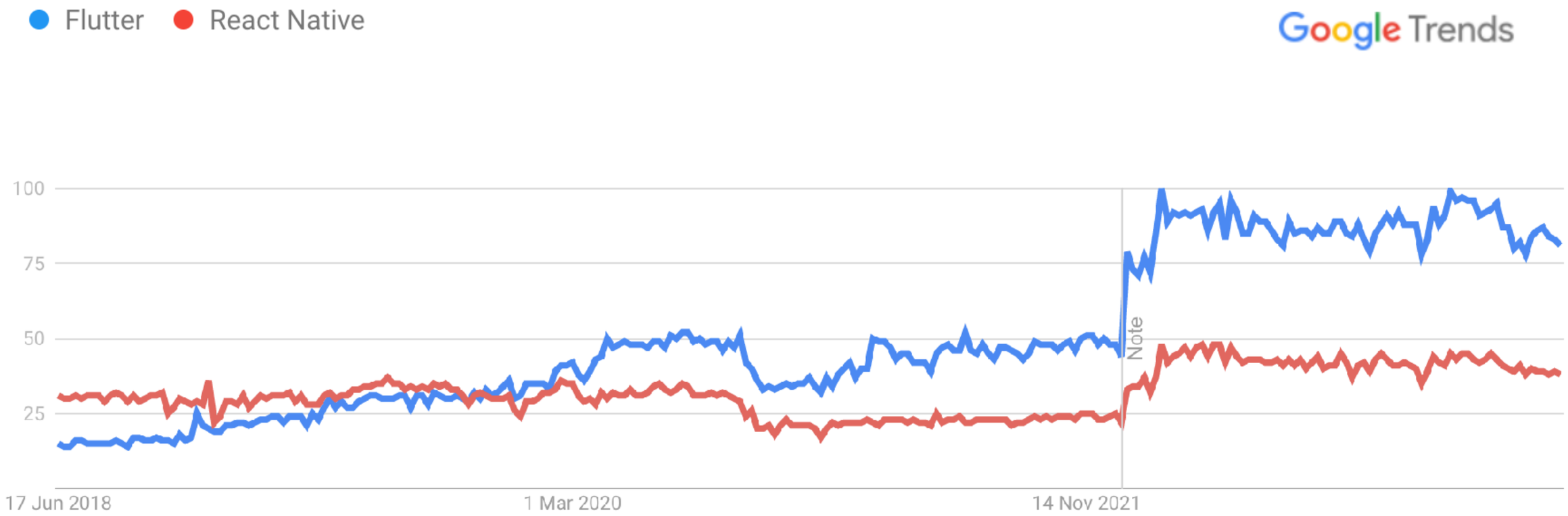
Flutter vs React Native

- open-source from Google
- new programming language
- very good tooling (hot reloading)
- decent community
- excellent documentation
- enforced unified UI (widgets)
- questionable long term support



- open-source from Meta
- familiar language and methods
- good tooling
- amazing ecosystem
- good documentation
- uses OS' UI methodologies
- here to stay

Flutter vs React Native

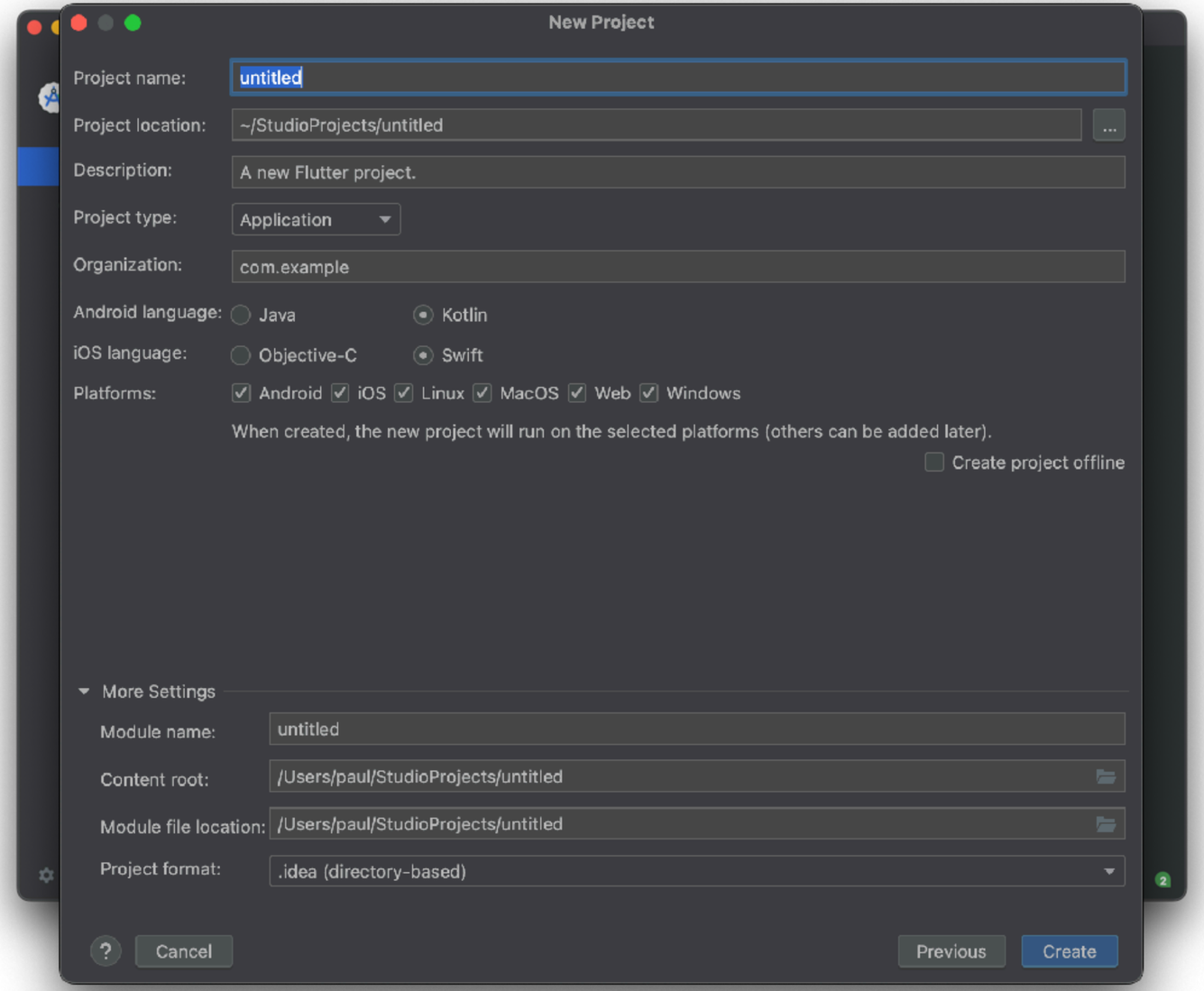


Flutter vs KMP

- uses Dart
- very good tooling (hot reloading)
- decent community
- excellent documentation
- enforced unified UI (widgets)
- questionable long term support

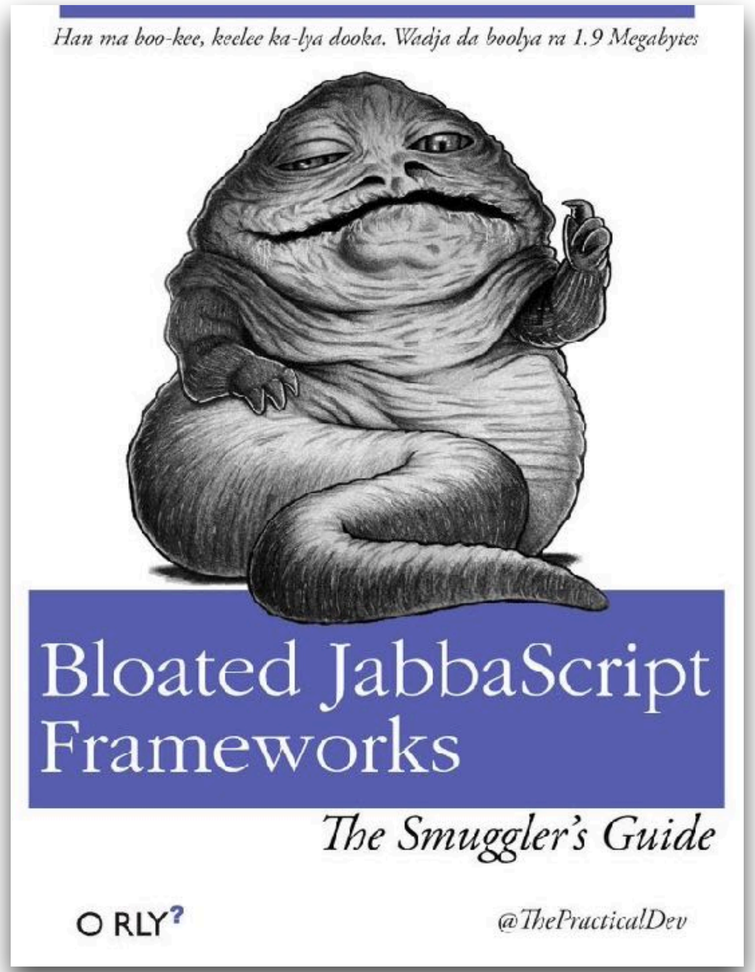
- uses Kotlin
- good tooling
- slightly smaller community
- steeper learning curve
- native UI
- better performance

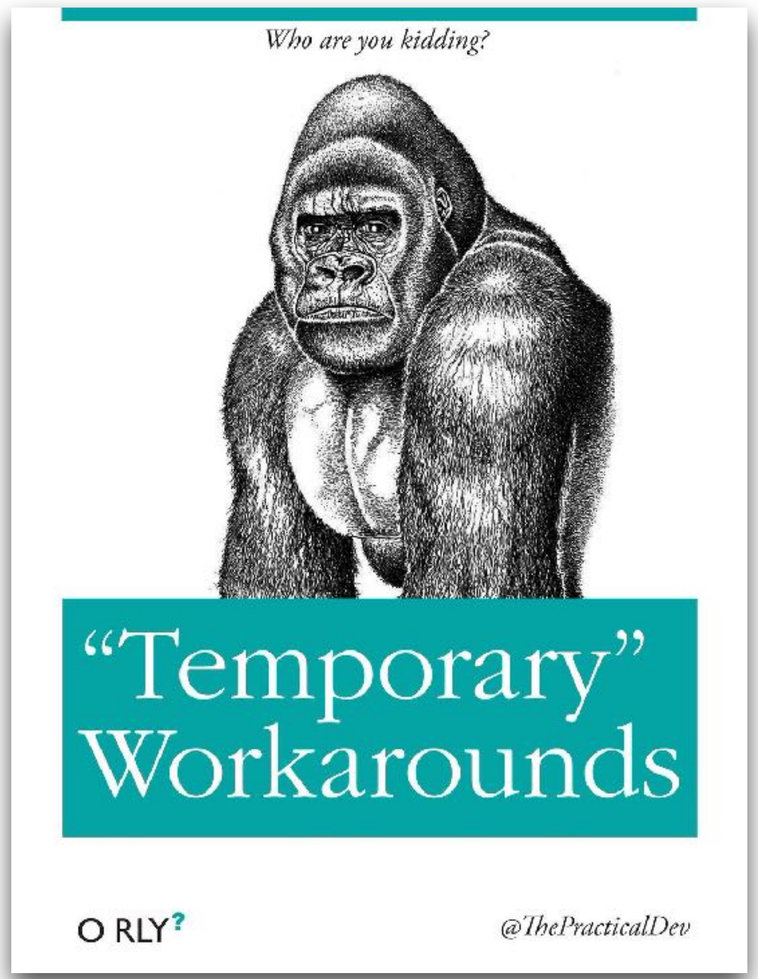
Android Studio - first class citizen

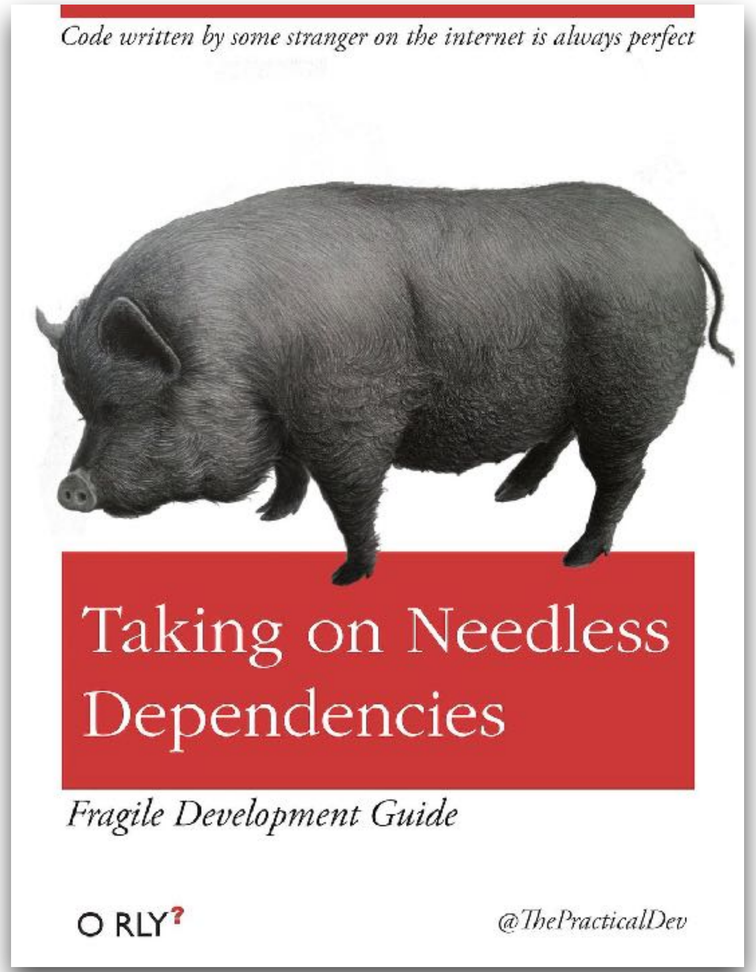


Flutter vs KMP

Warning... Triggering!







Warning... Triggering!

Why not...

- provide a Web App only
- use Swift for iOS and Kotlin for Android
- use Kotlin Multiplatform

Flutter

Why you should use it

- single codebase
- cross platform (mobile & desktop)
- "fast" development cycle (hot reloading)
- natively compiled *
- "ideal" for MVPs & startups

Why you should NOT use it

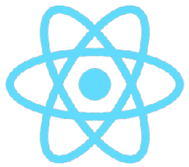
- native will always be faster
- native will always have best UX
- accessibility suffers
- confusing developer journey
- more expensive on the long run
- are you sure you need it?!

Are we still, wanting Flutter?

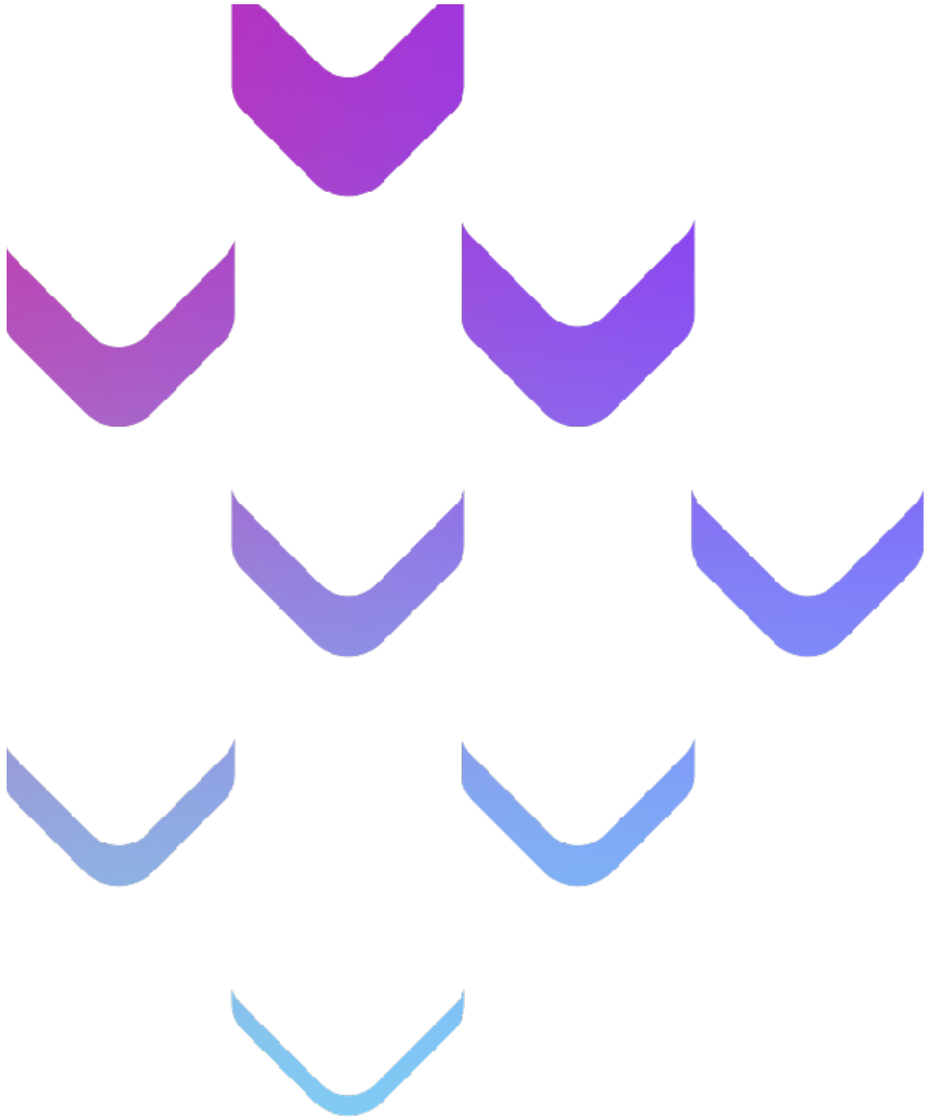








THANK YOU!



Adventures in Flutter-land

Paul Ardeleanu

Senior Manager - Developer Relations, Vonage

twitter.com/pardel