CS 528
Ubiquitous and Mobile Computing
Tech Talk: Flutter

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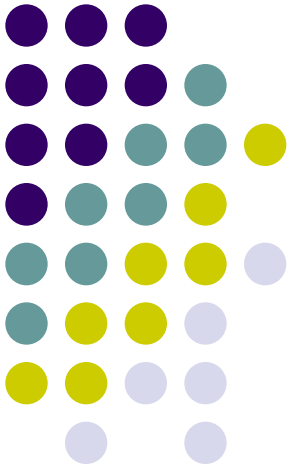
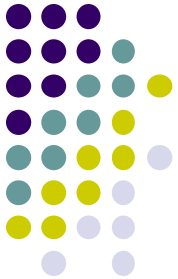
WPI





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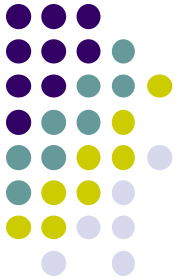
Background



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

Dart Platform

Flutter apps are written in **Dart language** and make use of the language's advanced features

Flutter Engine

Written primarily in C++, provides **low level rendering** support using Google's graphics library

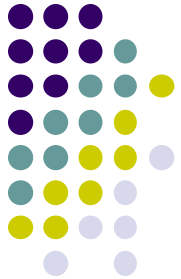
Foundation Library

Written in Dart, provides basic **classes and functions** which are used to construct applications

Design Widgets

Material Design widgets implement Google's design language, and **Cupertino widgets** implement iOS design

Specific Problems & Use Case



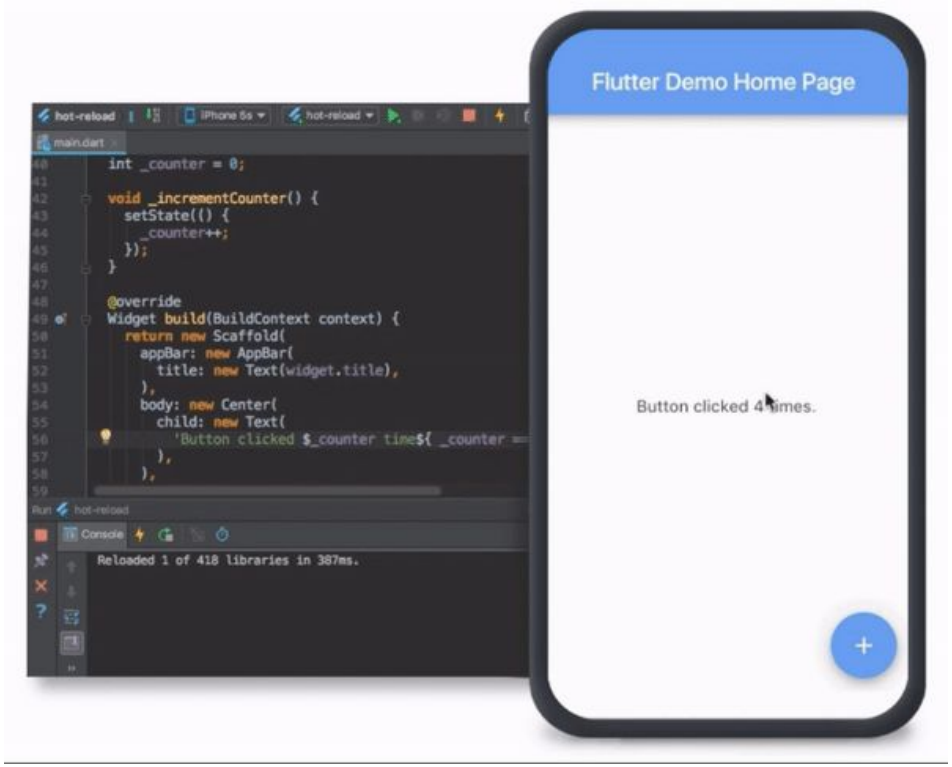
- Fast Development
- Expressive, Beautiful UIs
- Native Performance

Specific Problems & Use Case

Fast Development

Expressive, Beautiful UIs

Native Performance



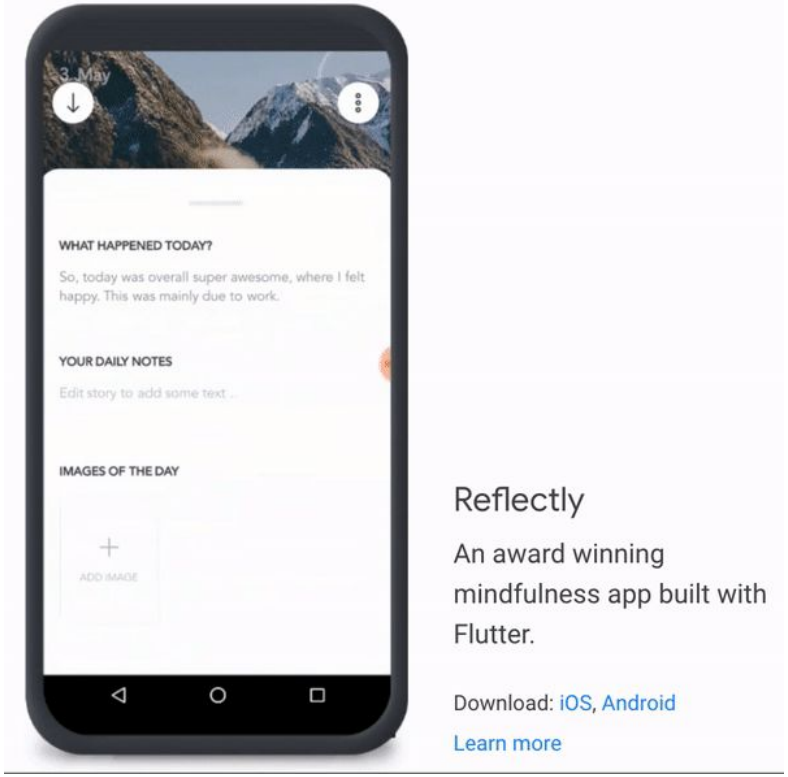
Flutter's ***hot reload*** helps you quickly and easily experiment, build UIs, add features, and fix bugs faster.

Specific Problems & Use Case

Fast Development

Expressive, Beautiful UIs

Native Performance



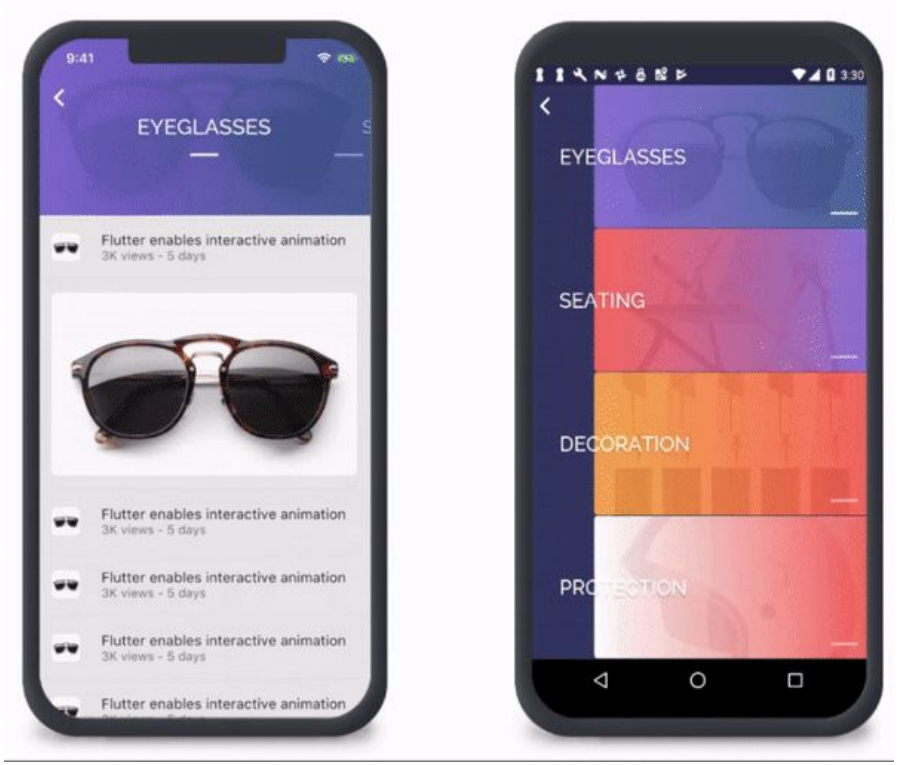
Flutter's built-in beautiful ***Material Design*** and Cupertino (iOS-flavor) widgets, rich motion APIs, smooth natural scrolling, and platform awareness.

Specific Problems & Use Case

Fast Development

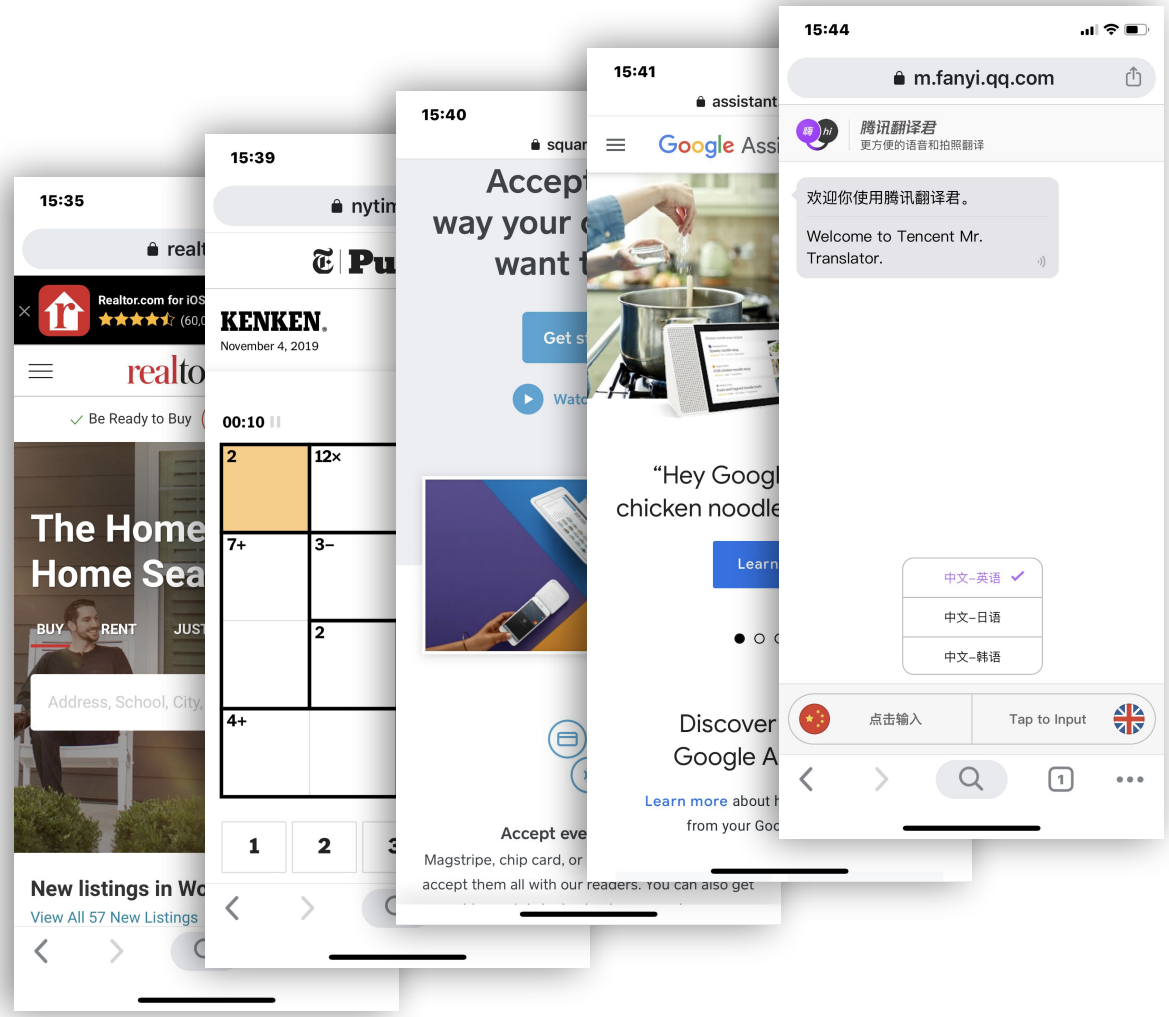
Expressive, Beautiful UIs

Native Performance



Flutter's ***widgets*** incorporate all critical platform differences such as scrolling, navigation, icons and fonts to provide full native performance on both iOS and Android.

Real World Examples



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Google

How it Works

Platform | Engine | Framework | Rendering Pipeline

Starting at the platform level

Flutter provides a **Shell**, that hosts the **Dart VM.**

Shell gives access to the native platform APIs.

Shell hosts the establishing platform and relevant canvas.

How it Works

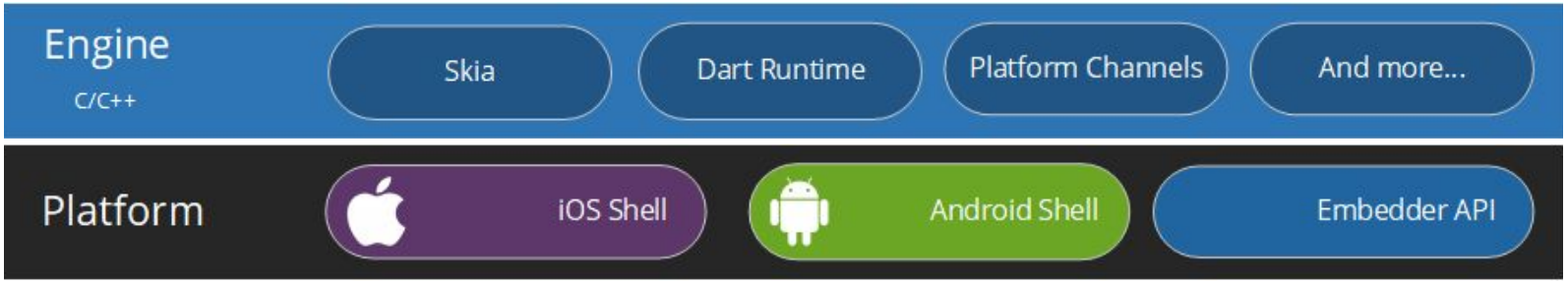
Platform | **Engine** | Framework | Rendering Pipeline

The engine is the next layer up

Provides Dart Runtime

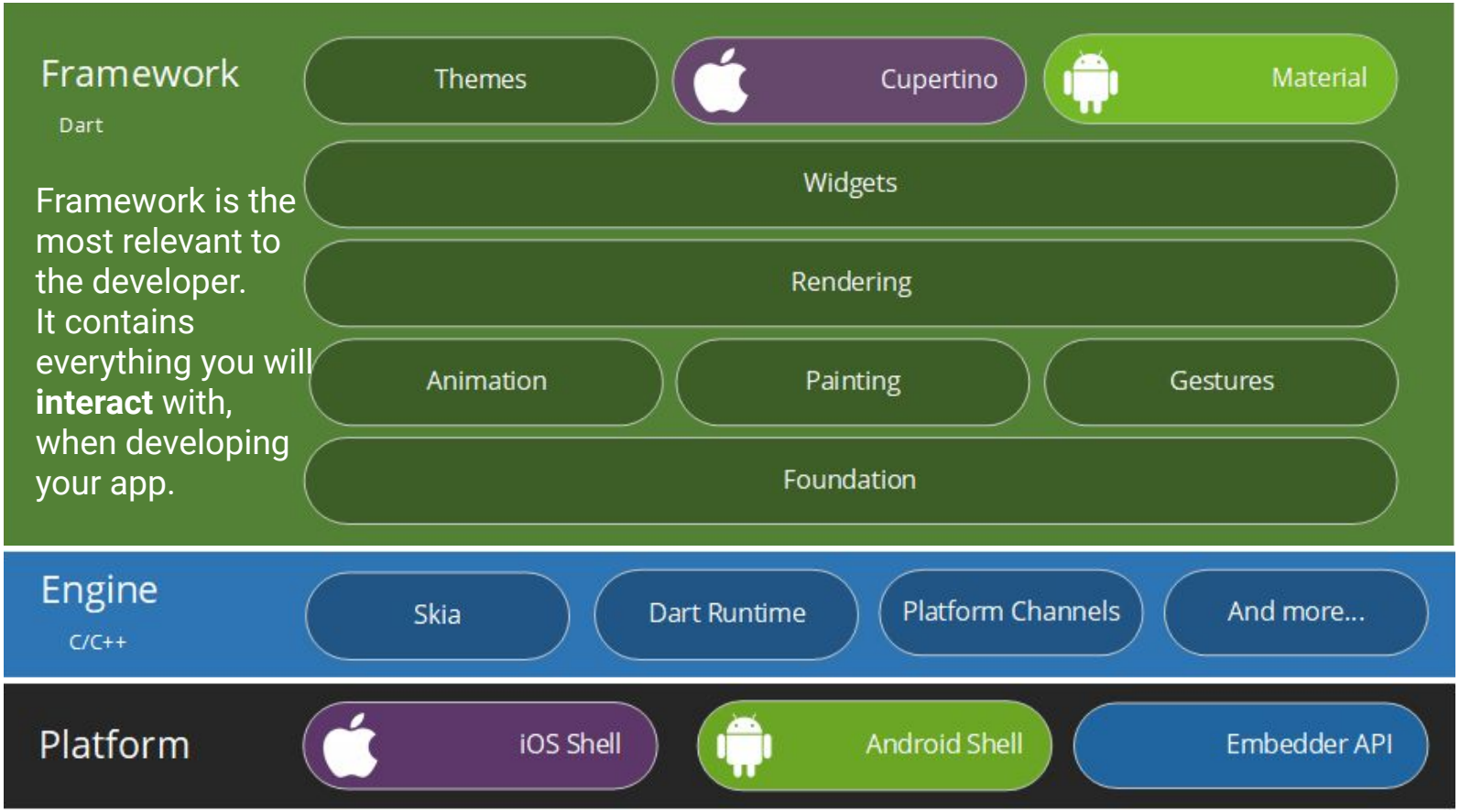
Provides Skia

Provides Platform Channels



How it Works

Platform | Engine | **Framework** | Rendering Pipeline

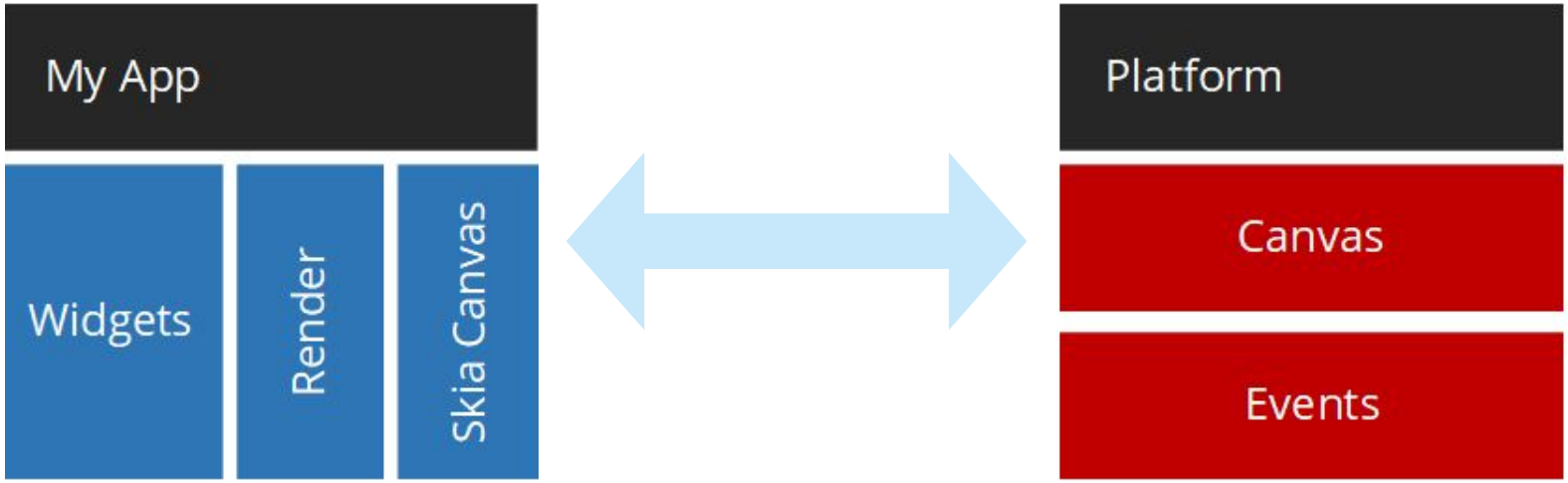


Framework is the most relevant to the developer. It contains everything you will **interact** with, when developing your app.

How it Works

Platform | Engine | Framework | **Rendering Pipeline**

Flutter works more like a gaming engine.
The UI is built and rendered on a Skia Canvas as it changes.
Flutter updates the UI at 60fps, and uses the GPU for most of the work.



App is composed of Widgets, that are rendered onto a Skia canvas.

The platform shows the canvas, and sends events back as required.

Code Snippet

Dart

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

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

class MyApp extends StatelessWidget {
 // This widget is the root of your application.
 @override
 Widget build(BuildContext context) {
   return MaterialApp(
     title: 'Flutter Demo',
     theme: ThemeData(
       // This is the theme of your application.
       //
       // Try running your application with "flutter run". You'll see the
       // application has a blue toolbar. Then, without quitting the app, try
       // changing the primarySwatch below to Colors.green and then invoke
       // "hot reload" (press "r" in the console where you ran "flutter run",
       // or simply save your changes to "hot reload" in a Flutter IDE).
       // Notice that the counter didn't reset back to zero; the application
       // is not restarted.
       primarySwatch: Colors.blue,
     ),
     home: MyHomePage(title: 'Flutter Demo Home Page'),
   );
 }
}

class MyHomePage extends StatefulWidget {
 MyHomePage({Key key, this.title}) : super(key: key);

 // This widget is the home page of your application. It is stateful, meaning
 // that it has a State object (defined below) that contains fields that affect
 // how it looks.

 // This class is the configuration for the state. It holds the values (in this
 // case the title) provided by the parent (in this case the App widget) and
 // used by the build method of the State. Fields in a Widget subclass are
 // always marked "final".

 final String title;

 @override
 _MyHomePageState createState() => _MyHomePageState();
}
```

Code Snippet

Dart

```
class _MyHomePageState extends
State<MyHomePage> {
 int _counter = 0;

 void _incrementCounter() {
   setState(() {
     _counter++;
   });
 }

 @override
 Widget build(BuildContext context) {
   // This method is rerun every time setState is called,
for instance as done
   // by the _incrementCounter method above.
   return Scaffold(
     appBar: AppBar(
       // Here we take the value from the MyHomePage
object that was created by
       // the App.build method, and use it to set our
appbar title.
       title: Text(widget.title),
     ),
     body: Center(
       // Center is a layout widget. It takes a single child
and positions it
       // in the middle of the parent.
       child: Column(
         // Column is also a layout widget. It takes a list of
children and
         // arranges them vertically. By default, it sizes
itself to fit its
         // children horizontally, and tries to be as tall as its
parent.
         mainAxisAlignment: MainAxisAlignment.center,
         children: <Widget>[
           Text(
             'You have pushed the button this many
times:',
           ),
           Text(
             '$_counter',
             style: Theme.of(context).textTheme.display1,
           ),
         ],
       ),
     ),
     floatingActionButton: FloatingActionButton(
       onPressed: _incrementCounter,
       tooltip: 'Increment',
       child: Icon(Icons.add),
     ), // This trailing comma makes auto-formatting nicer
for build methods.
   );
 }
}
```

Android Studio Demo