Flutter plugin intellij

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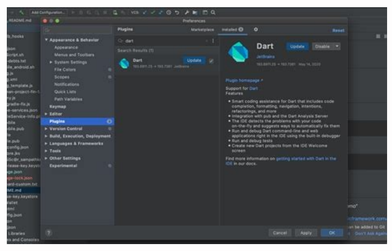

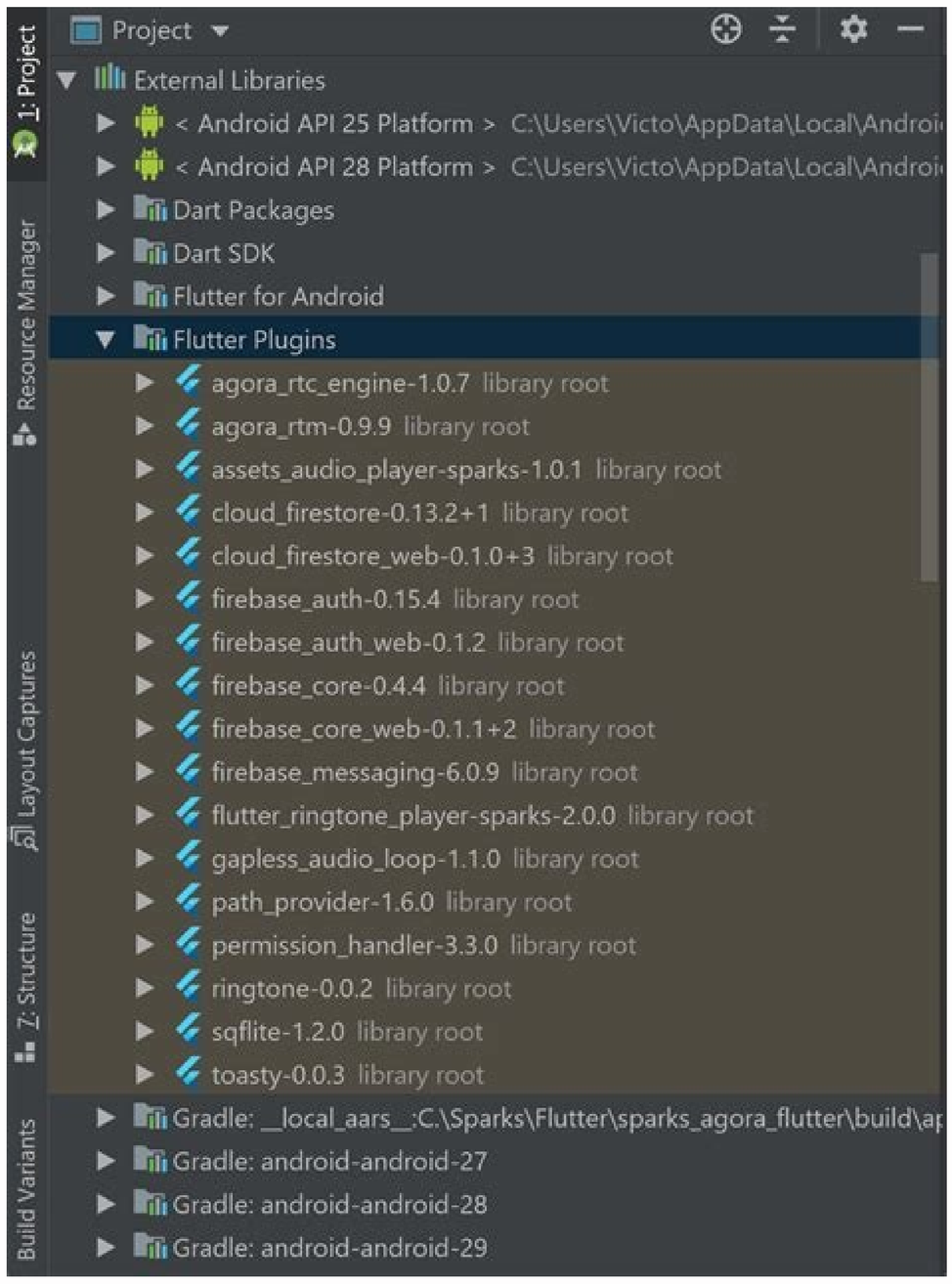

If you’re new to Flutter development then you must be cribbing about the nested structures, how hard it is to add or remove widgets from the middle of the code or how hard it is to find where one widget ends and another begins. Then, you spend your whole day matching opening brackets to their closing ones, or at least trying to. You’re not alone, we’ve all been there. It took time for us to figure out the shortcuts, but maybe you won’t have to go through that because I’m at your service; and I’ve curated all those shortcuts that allow for faster and smoother development in Flutter.PS. All of these shortcuts work for Android Studio and IntelliJ in Windows. Are you coming from iOS? Maybe this article will help.Don’t like reading? You can watch the video below that has both Mac and Windows shortcuts and a lot more bonus tips. Creating a new Stateless or Stateful widgetGuess what? You don’t have to manually write your widget classes and override the build functions. The IDE can do it for you!Just type stless to create a Stateless Widget like this:Or stful to create Stateful widget:What if you already created a Stateless Widget and added lots of children, but then realized you’re going to need a State after all? Should you make a new StatefulWidgetand then manually transfer all of your code over to it? You don’t have to!You can just place your cursor on the StatelessWidget, press Alt + Enter or Option + Return and click on Convert to StatefulWidget . All the boilerplate code will be created for you, automatically.Yay!More magical things you can do with Alt+Enter | Option+ReturnThis is the magic wand you use for faster development in Flutter. You can click on any widget , press Alt + Enter or Option+Return and see what options you have for that particular widget . I.E.:Add a Padding Around a WidgetLet’s say you have a widget that’s not a Container, so it doesn’t have a padding property. You want to give some padding but you’re afraid of messing up your widget structure. With our magic wand, you can add your Padding without messing anything up:Just tap the magical command (based on your OS), on the widget that needs a padding around it, and click on Add Padding And now you can modify the default padding to be whatever you want.Center a WidgetThis isn’t anything too extraordinary. It just centers your widget in the available space. This does not work inside a Column or Row.Wrap with a Container, Column, Row or any other WidgetYou can use the same approach to wrap your widget with a Container . So now, the newContainer becomes your Widget’s parent.Or, you can even wrap multiple widgets with a Column or Row in just one click!Or wrap them with any other widget:You can even wrap them with a StreamBuilder if you have the latest version of the Flutter plugin. Thanks Bhavik Makwana for telling me about it.Don’t like a widget? Remove it with the Magic Wand.Yes, removing a widget is just as easy as adding a new one.Easily copy-paste or cut-paste a line of codeYou can easily cut/copy a line of code, just by keeping your cursor anywhere on the line, and pressing Ctrl+X or Ctrl+C and paste it like you normally do (Ctrl+V). Or for iOS, same can be done with Command+X , Command+C & Command+VCtrl+XCtrl+CThanks to Sanal Kv who taught me this in the comments. :)See the Source Code for Your WidgetThat’s the best thing about an open source framework. If you want to know what’s going on behind the scenes of an amazing widget or a class, then you can just put your cursor on it and press Ctrl + B or Command+B. It will act as a link, taking you straight to your Widget’s source code where you can read everything about it. Flutter also uses comments to explain a lot of its code, making for great documentation.Check Your Widget’s Properties Without Leaving the File or TabIf you want to check what amazing things your widget can do without leaving your file and digging into the docs, just press Ctrl+Shift+I or Option+SpaceBar to get a quick look at the Widget’s constructor.Quickly Select an Entire WidgetA lot of times we need to extract/remove an entire widget and we try to manually select them:If it is a really large widget, then figuring out which closing bracket belongs to which Widget can be pretty confusing and we don’t want to mess up our entire structure.At times like these, I like to use this super helpful shortcut.Just click on the widget you want to extract and press Ctrl+W. The entire Widget is selected for you without your cursor moving an inch.Fix the Code StructureSometimes your code will just be a mess. Kind of like this:For people like me who get a little of OCD looking at code that doesn’t have proper indentation, this can be a nightmare.Now, most IDEs have this feature, (though may not be the same key combination). Just press Ctrl+Alt+L to fix your indentation and reformat code.SmoothSee an Outline of Your UIMost of our Widgets don’t have just one child in their tree. They have trees of children that have their own children and plenty more. If your Widget has children nested as little as four deep, then it can get pretty hard to understand the structure of the code just by scrolling through it. Thankfully, we have Flutter Outline to come to our rescue!You can find Flutter Outline on the extreme right of your IDE; it’s one of the vertical tabs and is located just above the Flutter Inspector. When you open it up, it looks like this:Now, you can clearly see which Widget is where, how they’re arranged within the UI and which widgets have other children widgets. Easy peasy!Extract code into a methodFlutter Outline is a pretty useful tool. You can do most of the things you did with Alt + Enter, like wrap with a Column and Center a Widget, but there are even more awesome things available under the Flutter Outline tab! One of them is the Extract Method button.Fourth button hereIf you feel like you’re writing a Widget that’s getting too long and should probably be a custom Widget, then instead of manually shifting the code into a metho, you can just use this tool to do the magic for you!Move Widget Up and DownAnother crazy thing you can do with Flutter Outline is if you have multiple children in a widget, you can easily rearrange their order:You can also move just one line up or down by pressing Shift+Alt+Up / Down Thanks to Filip Hracek for this tip.Refactor RenamingThis is a pretty basic tool that most IDE’s have. This lets you rename a method, Widget, class or file name and it makes sure that references to it are renamed as well. Just use Shift + F6 and type in the new name:Remove Unused ImportsSo you’re working on a project and you imported lots of files, but over time your code gets optimized more and more. Eventually, you might not need a lot of those imports anymore. Now you are ready to push your code to production, but you need to clean it up and remove all those unused imports. Maybe you normally remove them manually, but since I’m here to make your life easier, here’s a pretty-pretty keyboard combination:Ctrl+Alt+OI can’t remember anything, PoojaAnd if you are like Filip Hracek here who sometimes forgets his shortcuts, we have this important magic spell for you. Just Ctrl+Shift+A and type in the shortcut you need.That’s all the shortcuts I know for now. Be sure to check back often for more tips, tricks, and other great stuff!For everyone looking for the VSCode version of this article, here’s one by Ganesh .s.p.For the Spanish readers, translation by CarlosMillanGet your copy of “How to stand out in Flutter developer interviews?” — guide and portfolio tipsDid I miss a fabulous life-saving shortcut? Comment below!My articles are free, but you know you can press the clap button 50 times? The higher you go, the more it motivates me to write more stuff for you!Feeling super generous? Buy me a cupcake. Hello World, I am Pooja Bhaumik. A creative developer and a logical designer. You can find me on Linkedin or stalk me on GitHub or maybe follow me on Twitter? If that’s too social for you, just drop a mail to hi@poojabhaumik.com if you wish to talk tech with me.Have a nice fluttery day! Welcome to the "How to write a Flutter plugin" codelab! Just what is a plugin? A plugin is a piece of software that adds capabilities to your app. For example, you might want your mobile app to interact with the camera on your device. Plugins are an important part of the Flutter ecosystem. You should first check pub.dev to see if the plugin you need already exists. The authors of the Flutter SDK, as well as members of the Flutter community, have written many plugins and published them to pub.dev to share them with the community. In particular, you should check out the Flutter Favorite packages and plugins. The Flutter Favorite Favorites tag identifies plugins that you should first consider when building your apps. Note: This is an advanced topic and is not intended for Flutter beginners. Some Flutter developers may never write a plugin. Flutter makes it easy for users to interact with cross-platform Dart libraries, but sometimes it's ideal to interact with platform-specific code. For example, you might want to communicate with a database that doesn't have a Dart library written for it. Flutter provides a mechanism for authoring plugins that allows you to communicate with platform-specific code and also allows you to publish your plugins on pub.dev so that others can use them. In this codelab, you'll learn how to author your own plugins for iOS and Android. You'll implement a simple music plugin that processes audio on the host platform, and then you'll make an example app that uses your plugin to make a music keyboard. Here are screenshots of the final app: What you learn How to write a Flutter plugin for iOS and Android. How to create an API for your plugin. How to write an app that uses your plugin. How to publish your plugin so that others can use it. I'm new to the topic, and I want a good overview. I know something about this topic, but I want a refresher. I'm looking for example code to use in my project. I'm looking for an explanation of something specific. You need two pieces of software to complete this lab: the Flutter SDK and an editor. You can use your preferred editor, such as Android Studio or IntelliJ with the Flutter and Dart plugins installed, or Visual Studio Code with the Dart Code and Flutter extensions. Some of the tooling for plugin development recently changed, so this codelab assumes v1.15.19 or later of the Flutter SDK. You can check your version with the following command: $ flutter doctor You can run the codelab by using any of the following devices: Flutter ships with templates for plugins that make it easy to get started. When you generate the plugin template, you can specify which language you want to use. The default is Swift for iOS and Kotlin for Android. For this codelab, you use Objective-C and Java. Run the following commands in your working directory to create the plugin template: $ flutter create --template=plugin --org com.example --platforms=android,ios -a java -i objc plugin_codelab $ cd plugin_codelab $ cd example $ flutter pub upgrade $ dart migrate --apply-changes These commands generate the following directory structure: plugin_codelab ├── CHANGELOG.md ├── LICENSE ├── README.md ├── android │ ├── build.gradle │ ├── gradle │ │ └── wrapper │ │ └── gradle-wrapper.properties │ ├── gradle.properties │ ├── local.properties │ ├── plugin_codelab_android.iml │ ├── settings.gradle │ └── src │ └── main │ ├── AndroidManifest.xml │ └── java │ └── com │ └── example │ └── plugin_codelab │ └── PluginCodelabPlugin.java ├── example │ ├── README.md │ ├── android │ ├── build │ │ └── ios │ │ └── Runner.build │ │ └── Release-iphoneos │ │ └── Runner.build │ │ └── dgph │ ├── ios │ ├── lib │ │ └── main.dart │ ├── plugin_codelab_example.iml │ ├── pubspec.lock │ ├── pubspec.yaml │ └── test │ └── widget_test.dart ├── ios │ ├── Assets │ ├── Classes │ │ ├── PluginCodelabPlugin.h │ │ └── PluginCodelabPlugin.m │ └── plugin_codelab.podspec ├── lib │ └── plugin_codelab.dart ├── plugin_codelab.iml ├── pubspec.lock ├── pubspec.yaml └── test └── plugin_codelab_test.dart Here is a description of some important files: pubspec.yaml—The YAML file that defines your plugin. It specifies the plugin's name, dependencies, version, supported operating systems, and so on. This is used on your plugin's pub.dev page. CHANGELOG.md—Any time that you want to publish a new version of a plugin you must update this markdown file to indicate the changes in the new version. README.md—This markdown file shows up on the front page of the plugin's pub.dev listing. It should describe, in detail, what the plugin is and how to use it. lib/plugin_codelab.dart—The Dart code that implements the frontend to your plugin. Plugin clients have access to the public classes and functions in this directory. android/src/main/java/com/example/plugin_codelab/PluginCodelabPlugin.java—The native Java code that implements the Android feature described in plugin_codelab.dart. ios/Classes/PluginCodelabPlugin.m—The Objective-C code that implements the iOS feature described in plugin_codelab.dart. (There is a matching header file as well.) example/—This directory contains a client of your plugin. While developing your plugin, you edit this file to see your plugin in action. example/lib/main.dart—The Dart code that exercises your plugin. You build the example UI here. Run the examples on your iOS or Android device with the following instructions: $ cd plugin_codelab/example $ flutter run You should see something like this: Check out the generated code for the plugin's frontend: lib/plugin_codelab.dart class PluginCodelab { static const MethodChannel _channel = const MethodChannel('plugin_codelab'); static Future get platformVersion async { final String version = await _channel.invokeMethod('getPlatformVersion'); return version; } } Observations PluginCodelab is the class that users of your plugin invoke. This class creates a MethodChannel that allows the Dart code to communicate with the host platform. The plugin's API has only one method, the property getter platformVersion. When someone calls this getter in Dart, the MethodChannel invokes the getPlatformVersion() method and asynchronously waits for a String to be returned. It's up to the platform-specific code to interpret the meaning of the getPlatformVersion message, and you'll see that later. Note about MethodChannels The constructor for MethodChannel has two more optional parameters, the codec and the binaryMessenger. The default values are usually fine, but the codec decides how the parameters to invoke are encoded, and that codec should match the codec in the platform-specific code so that it can decode the messages. The binaryMessenger is associated with a specific Flutter engine, so, when you have more than one Flutter engine, this helps to wire up the channels correctly between the plugin and the engine. example/lib/main.dart Future initPlatformState() async { String platformVersion; // Platform messages may fail, so we use a try/catch PlatformException. try { platformVersion = await PluginCodelab.platformVersion; } on PlatformException { platformVersion = 'Failed to get platform version.'; } // If the widget was removed from the tree while the asynchronous platform // message was in flight, we want to discard the reply rather than calling // setState to update our non-existent appearance. if (!mounted) return; setState(() { _platformVersion = platformVersion; }); } Observations This is a client of the plugin. This code calls the getter defined in lib/plugin_codelab.dart. Notice that the call is wrapped in a try-block. If the platform-specific code for iOS returns a FlutterError, or an exception is thrown in Java, then it gets resurfaced on the Dart side. Why is communication with a plugin asynchronous? Flutter's Dart code executes on a different thread than platform code (in Flutter engine nomenclature these are the UI thread and the platform thread, respectively). The serialized messages are sent from Dart's thread, to the platform thread, and back for the result. ios/Classes/PluginCodelabPlugin.m + (void)registerWithRegistrar:(NSObject*)registrar { FlutterMethodChannel* channel = [FlutterMethodChannel methodChannelWithName:@"plugin_codelab" binaryMessenger:[registrar messenger]]; PluginCodelabPlugin* instance = [[PluginCodelabPlugin alloc] init]; [registrar addMethodCallDelegate:instance channel:channel]; } Observations This initialization code is called when a new engine is set up. This code generates a channel for communicating with the plugin. Notice that the channel name specified here must match the name defined in lib/plugin_codelab.dart. Setting itself up as the methodCallDelegate means that the created instance receives messages that are associated with the provided binary messenger. ios/Classes/PluginCodelabPlugin.m - (void)handleMethodCall:(FlutterMethodCall*)call result:(FlutterResult)result { if ([@"getPlatformVersion" isEqualToString:call.method]) { result([@"iOS " stringByAppendingString:[[UIDevice currentDevice] systemVersion]]); } else { result(FlutterMethodNotImplemented); } } Observations android/src/main/java/com/example/plugin_codelab/PluginCodelabPlugin.java @Override public void onAttachedToEngine(@NonNull FlutterPluginBinding flutterPluginBinding) { channel = new MethodChannel(flutterPluginBinding.getBinaryMessenger(), "plugin_codelab"); channel.setMethodCallHandler(this); } Observations This Java code

implements getPlatformVersion() for Android. android/src/main/java/com/example/plugin_codelab/PluginCodelabPlugin.java @Override public void onMethodCall(@NonNull MethodCall call, @NonNull Result result) { if (call.method.equals("getPlatformVersion")) { result.success("Android " + android.os.Build.VERSION.RELEASE); } else { result.notImplemented(); } } Observations This Java code handles messages sent from Dart. Notice that this code is similar in form to the iOS plugin, but has some subtle differences. Now, you provide the platform-specific implementations for a synthesizer that makes sounds when pressing keys on the keyboard. You can think of this code as the library you will surface to Flutter. Often, when making a plugin, you already have a defined platform API that you'll work from, as in this case. You now have two separate implementations of the same functionality, one for iOS and one for Android. You need to get these compiling as part of your app so that the plugin can call into it. Add to iOS Add the following files to your project: ios/Classes/FLRSynth.h ios/Classes/FLRSynth.c By placing these files in the ios/Classes location, they will compile as part of the iOS build for your plugin. You can look at ios/plugin_codelab.podspec to see that, by default, it uses globs to define which sources to compile. All you need to do is put the files in the right location. Add to Android Add the following file to your project: android/src/main/java/com/example/plugin_codelab/Synth.java By placing this Java file in the android/src/main/java/com/example location, it will compile as part of the Android build for your plugin. You can look at the Gradle build system to see that you only need to place the file in the correct directory to get it to compile. Synthesizer interface explanation The synthesizer interface is similar on iOS and Android, and consists of four methods: class Synthesizer { void start(); void stop(); int keyDown(int key); int keyUp(int key); } The keyUp() and keyDown() methods represent the events sent when a key on the musical keyboard is pressed down and released. The key argument represents which key is being pressed or released. It's an enumeration of all the keys on the musical keyboard. The MIDI standard defines an enumeration for those keys, where 60 is the value for Middle C and increments one for every black or white key (semitone). Your plugin uses this definition. The next step in making a plugin is thinking about what sort of information you want to send back and forth between Flutter and the host platform. If you're trying to represent a library that already has an API defined, you can make your life easy, and mimic that interface. In this codelab, we provide the synthesizer code for each platform, so you can mimic its interface in the Dart code: lib/plugin_codelab.dart import 'dart:async'; import 'package:flutter/services.dart'; class PluginCodelab { static const MethodChannel _channel = const MethodChannel('plugin_codelab'); static Future get platformVersion async { final String? version = await _channel.invokeMethod('getPlatformVersion'); return version; } static Future onKeyDown(int key) async { final int? numNotesOn = await _channel.invokeMethod('onKeyDown', [key]); return numNotesOn; } static Future onKeyUp(int key) async { final int? numNotesOn = await _channel.invokeMethod('onKeyUp', [key]); return numNotesOn; } } Notice that the second parameter to invokeMethod() lists the parameters that are sent to the method call. Now you have platform-specific libraries for making sound and Dart code that controls that code, but they aren't hooked up. If you call any of these Dart methods now, they result in "Not Implemented" exceptions because you haven't implemented the host side in the plugin. That's the next step. Hooking things up on iOS First, modify the plugin to create and start a synthesizer instance: ios/Classes/PluginCodelabPlugin.m @implementation PluginCodelabPlugin { int _numKeysDown; FLRSynthRef _synth; } - (instancetype)init { self = [super init]; if (self) { _synth = FLRSynthCreate(); FLRSynthStart(_synth); } return self; } - (void)dealloc { FLRSynthDestroy(_synth); } Next, start handling messages sent over the channel: - (void)handleMethodCall:(FlutterMethodCall *)call result:(FlutterResult)result { if ([@"getPlatformVersion" isEqualToString:call.method]) { result([@"iOS " stringByAppendingString:[[UIDevice currentDevice] systemVersion]]); } else if ([@"onKeyDown" isEqualToString:call.method]) { FLRSynthKeyDown(_synth, [call.arguments[0] intValue]); _numKeysDown += 1; result(@(_numKeysDown)); } else if ([@"onKeyUp" isEqualToString:call.method]) { FLRSynthKeyUp(_synth, [call.arguments[0] intValue]); _numKeysDown -= 1; result(@(_numKeysDown)); } else { result(FlutterMethodNotImplemented); } } Notice that the code now looks for the onKeyDown and onKeyUp messages as well. In order to get the key argument, pull it from call.arguments. The returned value is boxed as an NSNumber (described in the Platform channels documentation), so convert it with intValue. See the completed file, PluginCodelabPlugin.m. Hooking things up on Android First, modify the plugin to create and start a synthesizer instance: android/src/main/java/com/example/plugin_codelab/PluginCodelabPlugin.java public class PluginCodelabPlugin implements FlutterPlugin, MethodCallHandler { private MethodChannel channel; private Synth synth; private static final String channelName = "plugin_codelab"; private static void setup(PluginCodelabPlugin plugin, BinaryMessenger binaryMessenger) { plugin.channel = new MethodChannel(binaryMessenger, channelName); plugin.channel.setMethodCallHandler(plugin); plugin.synth = new Synth(); plugin.synth.start(); } @Override public void onAttachedToEngine(@NonNull FlutterPluginBinding flutterPluginBinding) { setup(this, flutterPluginBinding.getBinaryMessenger()); } Next, start handling messages sent over the channel: @Override public void onMethodCall(@NonNull MethodCall call, @NonNull Result result) { if (call.method.equals("getPlatformVersion")) { result.success("Android " + android.os.Build.VERSION.RELEASE); } else if (call.method.equals("onKeyDown")) { try { ArrayList arguments = (ArrayList) call.arguments; int numKeysDown = synth.keyDown((Integer) arguments.get(0)); result.success(numKeysDown); } catch (Exception ex) { result.error("1", ex.getMessage(), ex.getStackTrace()); } } else if (call.method.equals("onKeyUp")) { try { ArrayList arguments = (ArrayList) call.arguments; int numKeysDown = synth.keyUp((Integer) arguments.get(0)); result.success(numKeysDown); } catch (Exception ex) { result.error("1", ex.getMessage(), ex.getStackTrace()); } } else { result.notImplemented(); } } Similar to iOS, the code now looks for the onKeyDown and onKeyUp messages. Use arguments.get() to extract the key value here, as well. Make sure that, on Android, your plugin handles any exceptions that might arise. See the completed file, PluginCodelabPlugin.java. Now that the plugin implements all of the plumbing, you probably want to see it in action. For that, you implement a simple keyboard UI example app: example/lib/main.dart import 'package:flutter/material.dart'; import 'dart:async'; import 'package:flutter/services.dart'; import 'package:plugin_codelab/plugin_codelab.dart'; enum _KeyType { Black, White } void main() { WidgetsFlutterBinding.ensureInitialized(); SystemChrome.setPreferredOrientations([DeviceOrientation.landscapeRight]) .then((_) { runApp(new MyApp()); }); } class MyApp extends StatefulWidget { @override _MyAppState createState() => _MyAppState(); } class _MyAppState extends State { String? _platformVersion = 'Unknown'; @override void initState() { super.initState(); initPlatformState(); } // Platform messages are asynchronous, so we initialize in an async method. Future initPlatformState() async { String? platformVersion; try { platformVersion = await PluginCodelab.platformVersion; } on PlatformException { platformVersion = 'Failed to get platform version.'; } if (!mounted) return; setState(() { _platformVersion = platformVersion; }); } void _onKeyDown(int key) { print("key down:$key"); PluginCodelab.onKeyDown(key).then((value) => print(value)); } void _onKeyUp(int key) { print("key up:$key"); PluginCodelab.onKeyUp(key).then((value) => print(value)); } Widget _makeKey({@required _KeyType keyType, @required int key}) { return AnimatedContainer(height: 200, width: 44, duration: Duration(seconds: 2), curve: Curves.easeIn, child: Material(color: keyType == _KeyType.White ? Colors.white : Color.fromARGB(255, 60, 60, 80), child: InkWell(onTap: () => _onKeyUp(key), onTapDown: (details) => _onKeyDown(key), onTapCancel: () => _onKeyUp(key),),),); } @override Widget build(BuildContext context) { return MaterialApp(home: Scaffold(backgroundColor: Color.fromARGB(255, 250, 30, 0), body: Center(child: Column(mainAxisAlignment: MainAxisAlignment.spaceEvenly, children: [Text('Running on: $_platformVersion'), Row(mainAxisAlignment: MainAxisAlignment.spaceEvenly, children: [_makeKey(keyType: _KeyType.White, key: 60), _makeKey(keyType: _KeyType.Black, key: 61), _makeKey(keyType: _KeyType.White, key: 62), _makeKey(keyType: _KeyType.Black, key: 63), _makeKey(keyType: _KeyType.White, key: 64), _makeKey(keyType: _KeyType.White, key: 65), _makeKey(keyType: _KeyType.Black, key: 66), _makeKey(keyType: _KeyType.White, key: 67), _makeKey(keyType: _KeyType.Black, key: 68), _makeKey(keyType: _KeyType.White, key: 69), _makeKey(keyType: _KeyType.Black, key: 70), _makeKey(keyType: _KeyType.White, key: 71),],)],),),); } } Notice the following: You must import 'package:plugin_codelab/plugin_codelab.dart' in order to use the plugin. The dependency of the example on the plugin is defined in example/pubspec.yaml, which makes this work. In main(), the orientation is forced to be landscape so that the whole keyboard can fit on the screen. The _onKeyDown() and _onKeyUp() methods are both clients of the plugin API designed in previous steps. The code uses InkWell, which are just interactive rectangles, to draw the individual keys. Run the app to see your functioning music keyboard: cd example flutter run It should look like this: Congratulations! You successfully created a Flutter plugin for iOS and Android, and you have a nifty musical keyboard to jam on. The completed project can be downloaded from for comparison. Next steps Add end-to-end testing. The Flutter team provides a library to create end-to-end integration tests called e2e. Publish to pub.dev. After you create a plugin, you may want to share it online so that others can use it. You can find the full documentation on publishing your plugin to pub.dev in Developing plugin packages. Extend the synthesizer For fun, if you want to play around with the synthesizer and improve it, here are some next steps you might consider: Right now the synthesizer generates a sine wave. How about generating a saw wave? Did you notice the popping sounds when you press and release a key? That's due to the oscillator abruptly turning on and off. Usually synthesizers remedy that with amplitude envelopes. Right now you can only play one key at a time. That's called monophonic. Real pianos are polyphonic. 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