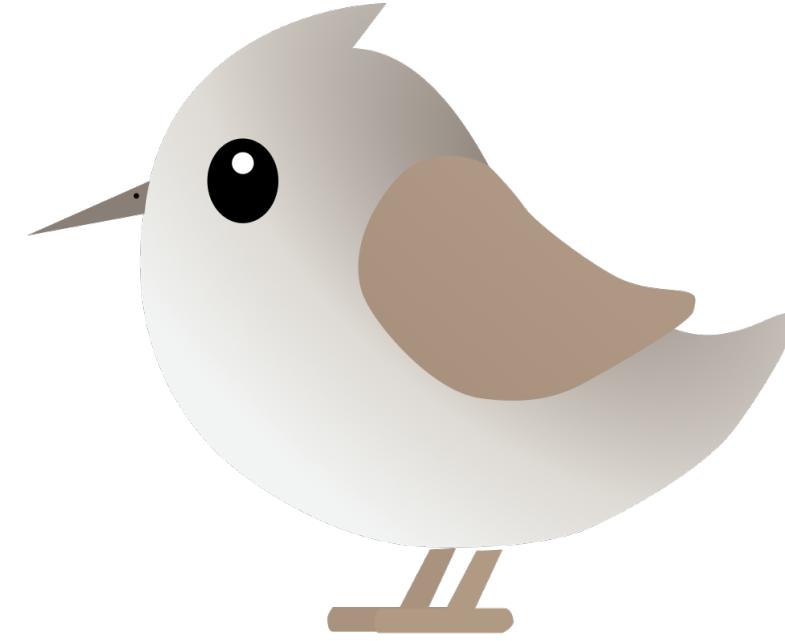


Shorebird: Code Push for Flutter



By: Felix Angelov & Kevin Millikin

👋 Hello



Felix Angelov
felangel · he/him

software engineer by day, software
engineer by night.

[Edit profile](#)

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7.7k followers · 63 following

@shorebirdtech

Chicago

felangel / README.md

Hi there 👋

I'm a software engineer at [Shorebird](#) in Chicago, IL 🇺🇸

- 👉 I'm currently working on [BrickHub](#)
- ⭐ I maintain the [bloc library](#)
- ☕ I'm learning how to make latte art
- 💡 I'm looking to collaborate on open source projects
- 💬 Ask me about [Flutter](#) and [Dart](#).
- 😄 Pronouns: he/him/his
- ⚡ Fun fact: I have a pet bunny named Coco 🐰

Open Source Projects

bloc
A predictable state management library that helps implement the BLoC design pattern

Dart ⭐ 10.9k ⚡ 3.3k

bloc.js
A predictable state management library that helps implement the BLoC design pattern in JavaScript

TypeScript ⭐ 183 ⚡ 25

equatable
A Dart package that helps to implement value based equality without needing to explicitly override == and hashCode.

Dart ⭐ 829 ⚡ 95

mason
Tools which allow developers to create and consume reusable templates called bricks.

Dart ⭐ 812 ⚡ 82



Kevin Millikin
kmillikin

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32 followers · 1 following

Followed by [munificent](#)

@shorebird.dev

Milwaukee

Popular repositories

nullAwareOperators
Forked from gbracha/nullAwareOperators

v8-git-mirror
Forked from v8/v8

Proposal for null-aware operators in Dart

The official mirror of the V8 Git repository from <https://chromium.googlesource.com/v8/v8.git>

C++

angular
Forked from angular/angular

flutter
Forked from flutter/flutter

TypeScript

Framework for building high-performance, high-fidelity iOS and Android apps.

Dart

sdk
Forked from asgerf/sdk

markdown-here
Forked from adam-p/markdown-here

Temporary codebase

Google Chrome, Firefox, and Thunderbird extension that lets you write email in Markdown and render it before sending.

JavaScript

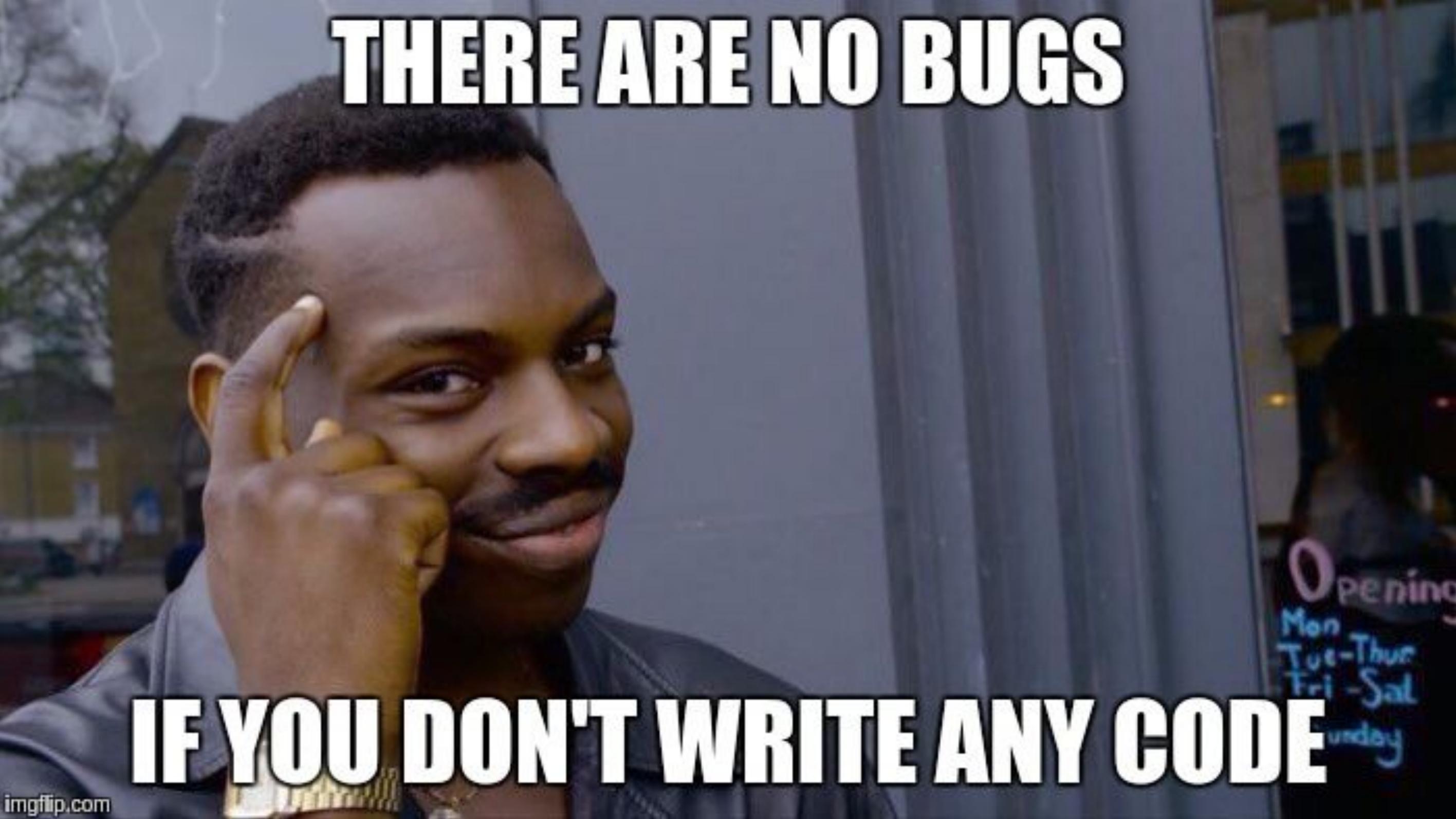


Flutter Gives Us Superpowers

- Dart
- Hot Reload
- Mobile (iOS + Android)
- Desktop (MacOS, Linux, Windows)
- Declarative UI
- Plugins
- Developer Tools

**There's only one
problem....**

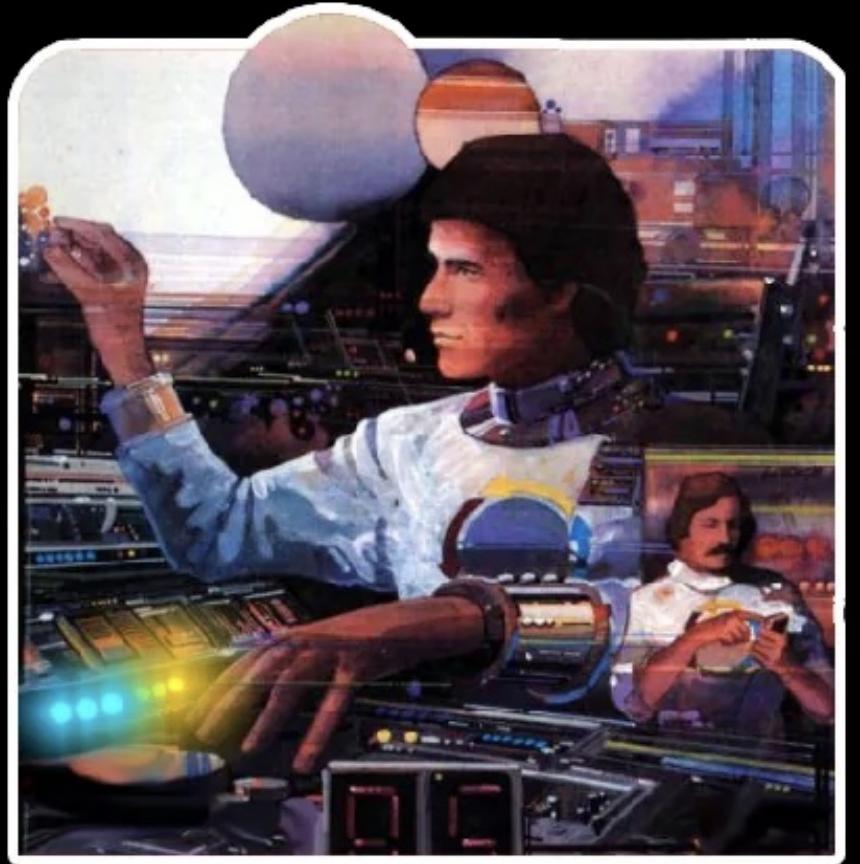




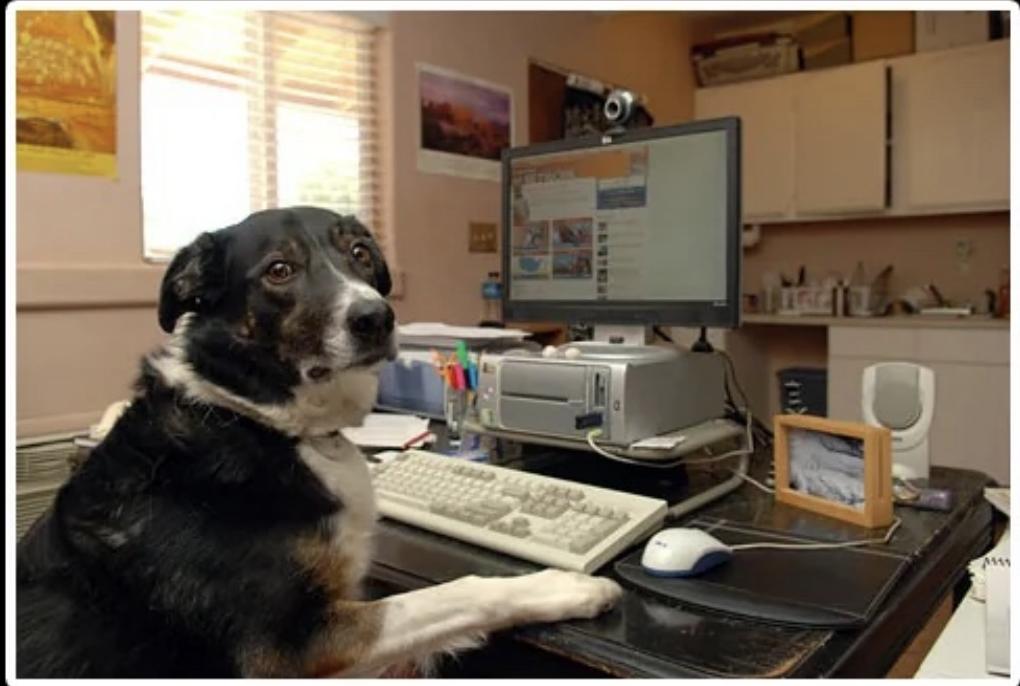
THERE ARE NO BUGS

IF YOU DON'T WRITE ANY CODE

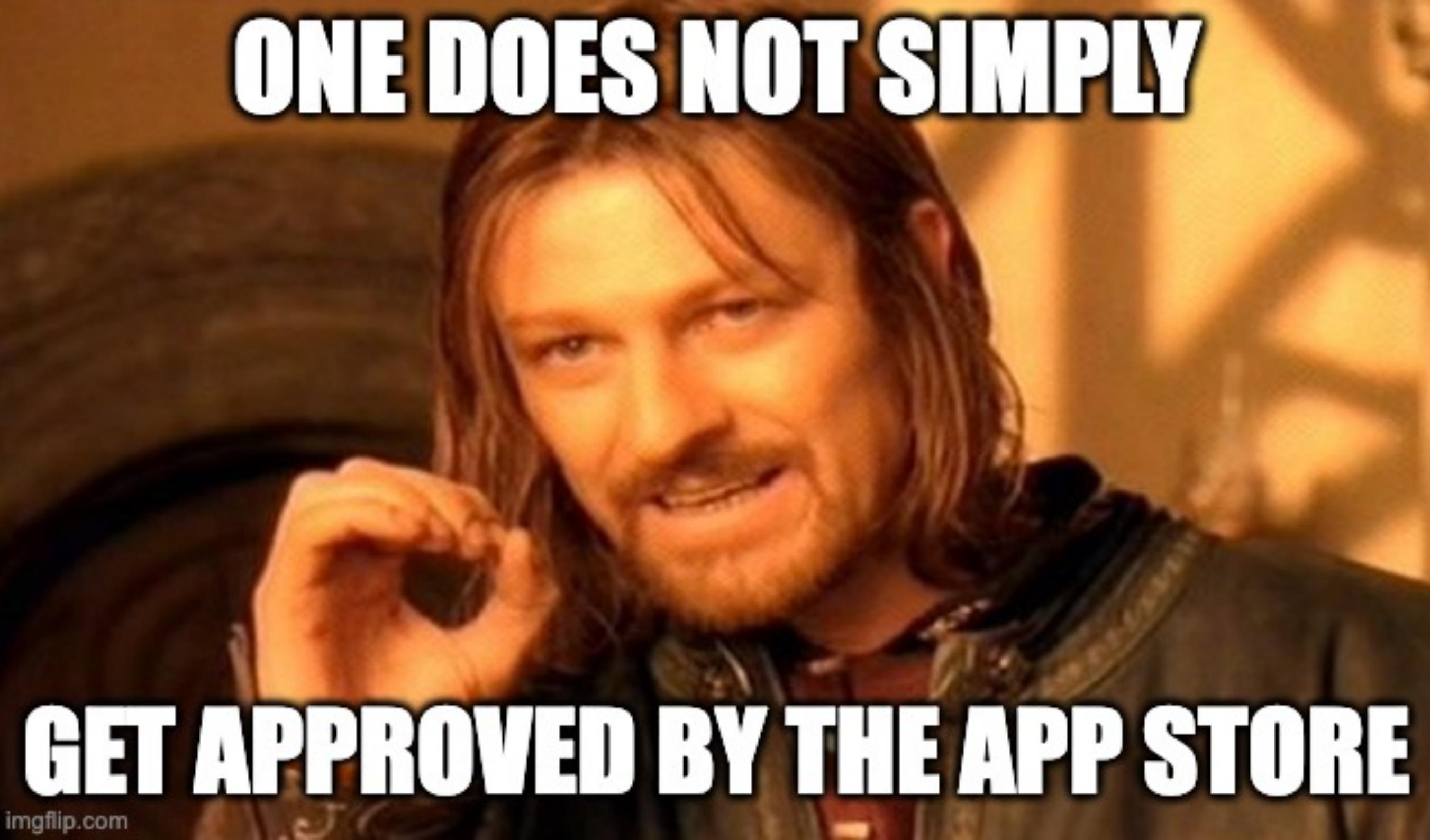
imgflip.com



Building apps



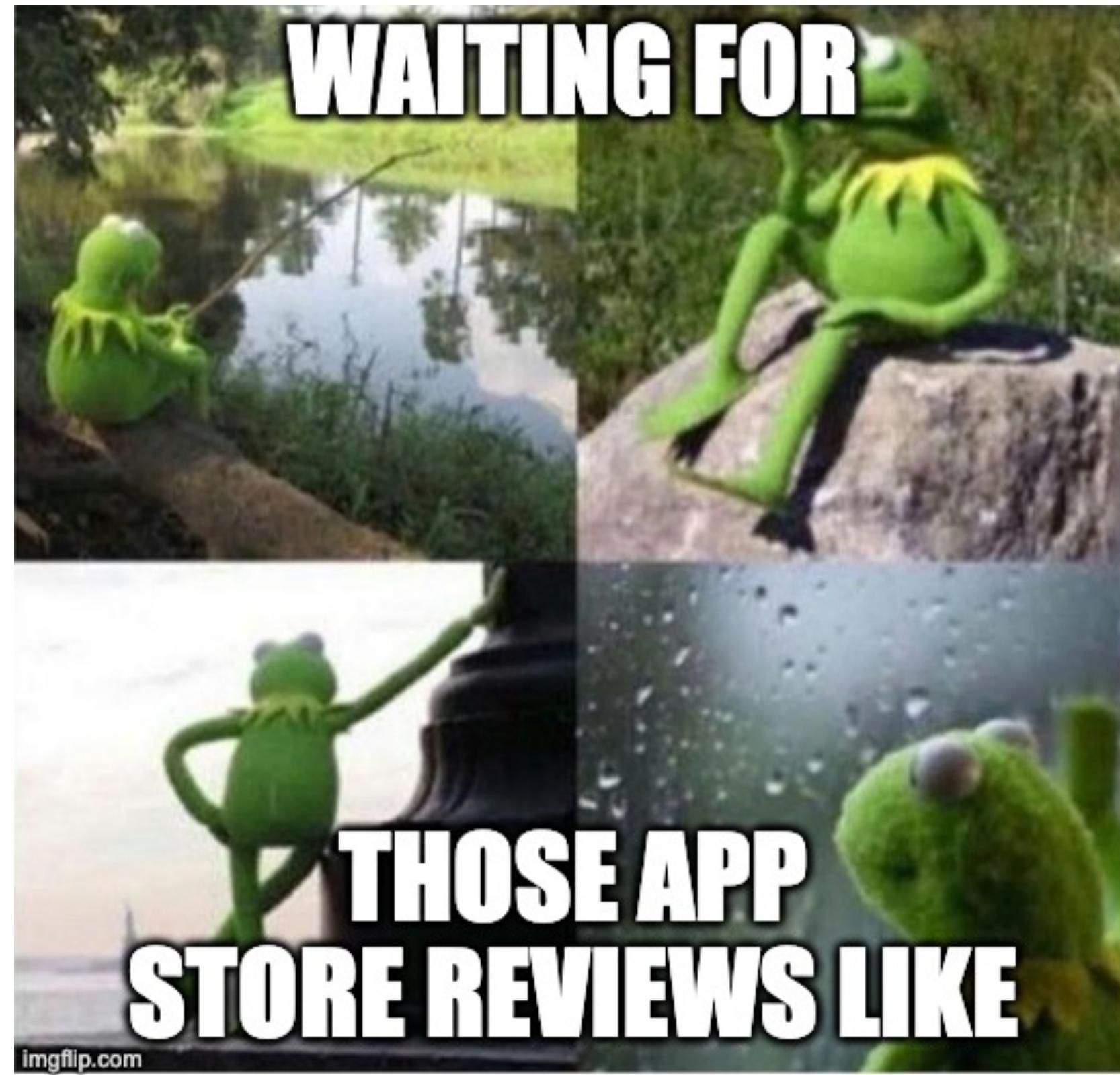
Submitting to the stores



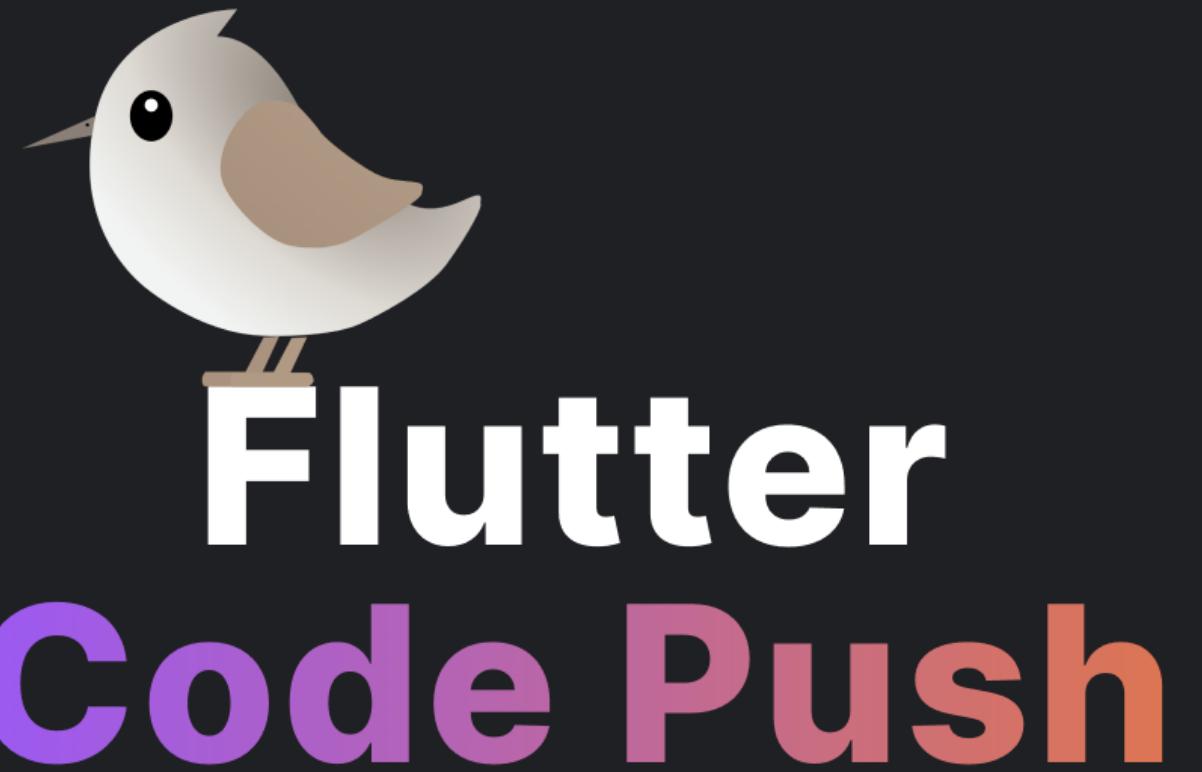
ONE DOES NOT SIMPLY

GET APPROVED BY THE APP STORE

imgflip.com



imgflip.com



shorebird.dev

● 11,484 Open ✓ 74,720 Closed

Author ▾

Label ▾

Assignee ▾

Sort ▾

● **Code Push / Hot Update / out of band updates**

276  1.14k

a: production

c: new feature

customer: crowd

dependency: dart

engine

P3

team-engine

triaged-engine

#14330 opened on Jan 29, 2018 by eseidelGoogle



Shorebird Code Push

- ⚡ Hot Restart in Production
- ✨ Change Any Dart Code
- ⏳ Deliver Over-The-Air Updates Instantly
- 🧠 Seamless Integration
- 💰 Try For Free

Get Started: <https://shorebird.dev>



imgflip.com



Demo





Recap

- 🐦 Integrate Shorebird
 - Sign up at <https://console.shorebird.dev>
 - Install Shorebird CLI
 - Run `shorebird init`
- 📦 Created a Release
 - `shorebird release android`
 - `shorebird release ios-alpha`
- 🧩 Created a Patch
 - `shorebird patch android`
 - `shorebird patch ios-alpha`

The screenshot shows the Shorebird Console homepage. At the top right are 'Docs' and 'FE' buttons. The main heading is 'Welcome to Shorebird' with a hand icon. Below it says 'Please follow the steps below to get started with Shorebird'. A numbered list starts with '1. Install the Shorebird CLI' with a box icon. Sub-sections for 'MacOS/Linux' and 'Windows' provide terminal and PowerShell commands respectively.

Welcome to Shorebird 🙌

Please follow the steps below to get started with Shorebird 🚀

1. Install the Shorebird CLI 📦

MacOS/Linux

Open a terminal and run:

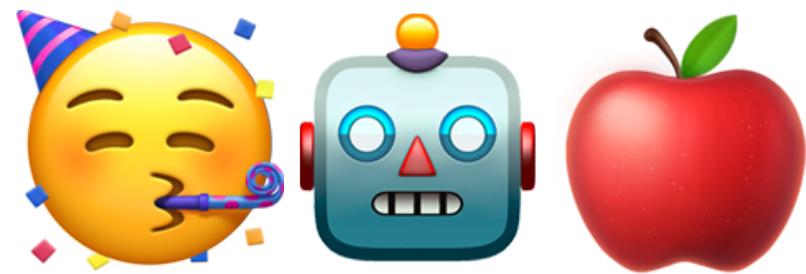
```
curl --proto '=https' --tlsv1.2 https://raw.githubusercontent.com/shorebirdtech/installer/master/install.sh | sh
```

Windows

Open PowerShell and run:

```
Set-ExecutionPolicy RemoteSigned -scope CurrentUser # Needed to execute remote scripts
iwr -UseBasicParsing 'https://raw.githubusercontent.com/shorebirdtech/installer/master/install.ps1' | iex
```

Android & iOS





Highlights

-  Android 
-  iOS  (alpha)
-  Flavors 
-  Add-To-App 
-  CI Integration  (GitHub, Codemagic)
-  Multiple Flutter Versions 
-  Asset Support  (coming soon)

ios Code Push

- A technical challenge
- Patched code is not executable
- App Store T&Cs
- Technical barriers in the OS

Shorebird solution: an interpreter to run patched code

Good News / Bad News

- Modify the Dart VM's ARM64 simulator
- The iOS alpha works
- The interpreter is up to 120x slower

We need a mixed CPU/interpreter mode

Challenge #1: It Doesn't Exist

- Normal Dart VM runs all code on the CPU
- Dart VM w/simulator runs
 - C++ on the host CPU (Dart runtime, Flutter, extensions)
 - Dart in the target CPU simulator

Challenge #1: It Doesn't Exist

- Shorebird's modified Dart VM will run in mixed mode
 - host and target are the same
 - C++ and most Dart on the host CPU
 - some Dart on the simulated CPU

FTSE

From Wikipedia, the free encyclopedia

The **fundamental theorem of software engineering (FTSE)** is a term originated by [Andrew Koenig](#) to describe a remark by [Butler Lampson](#)^[1] attributed to [David J. Wheeler](#):^[2]

"We can solve any problem by introducing an extra level of [indirection](#)."

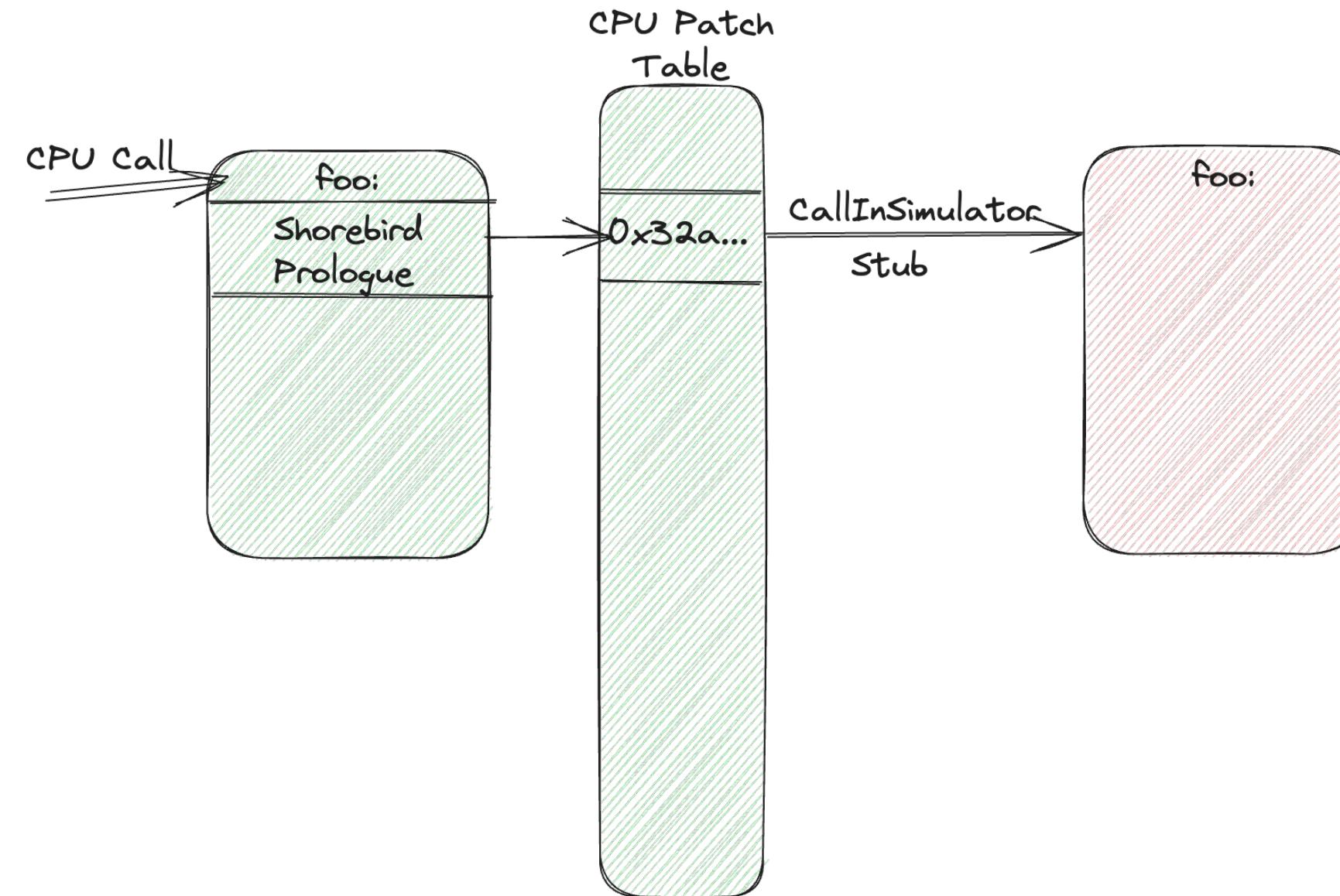
Dart threads have a state bit: currently using CPU or simulator

Challenge #2: *How to Switch*

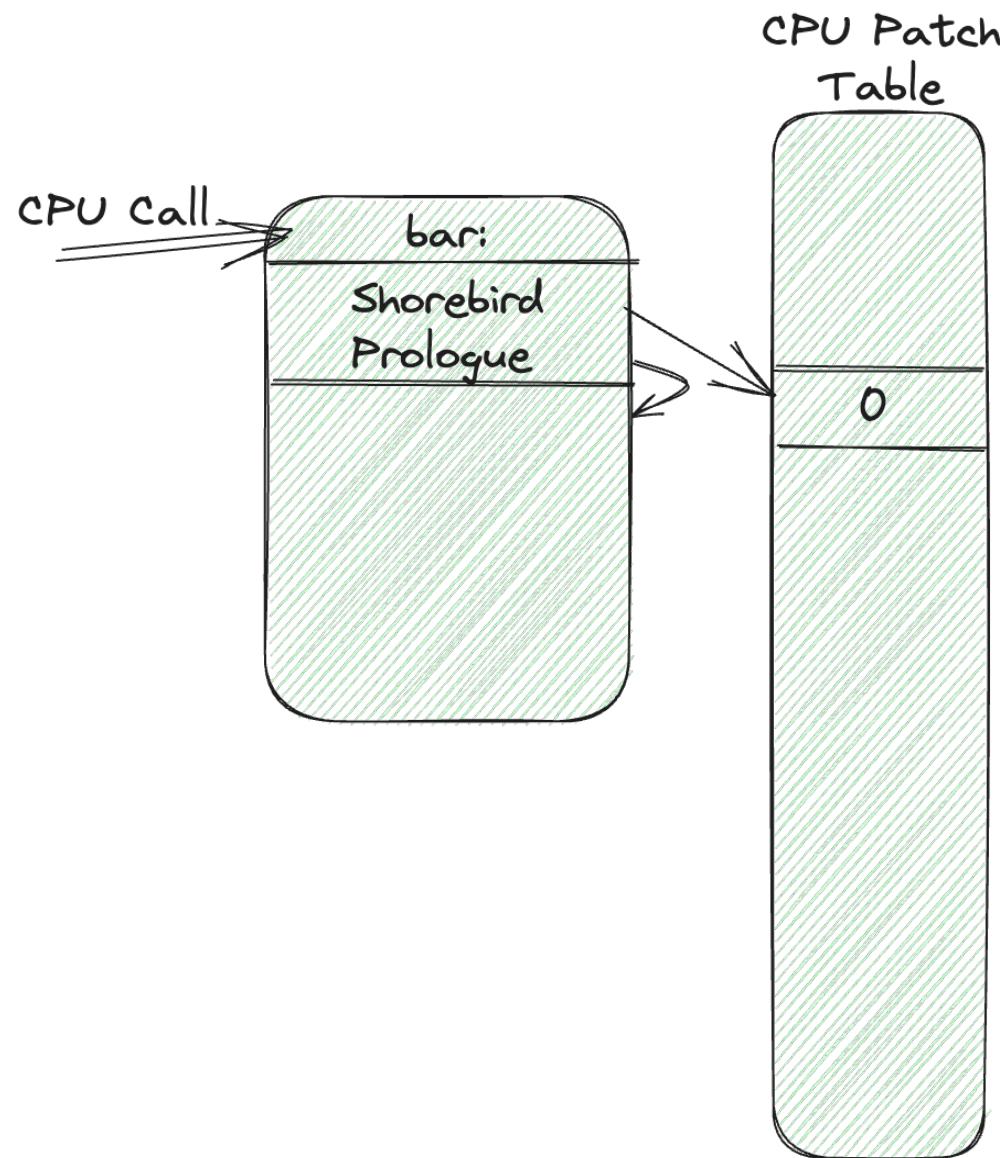
- A level of indirection at call boundaries
- Choose how to run the called code

We made the code objects themselves "self-transitioning"

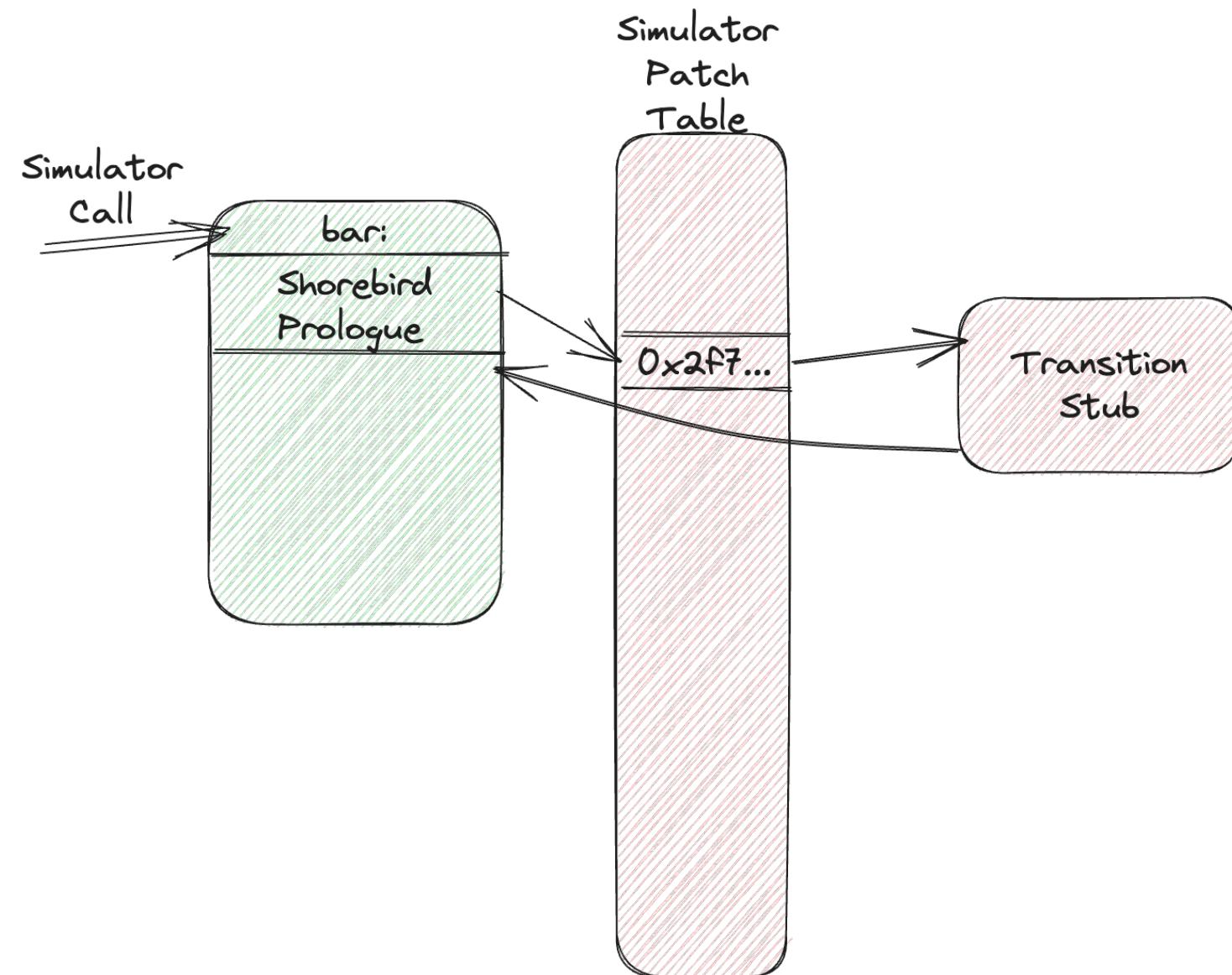
Patched Code: CPU to Simulator



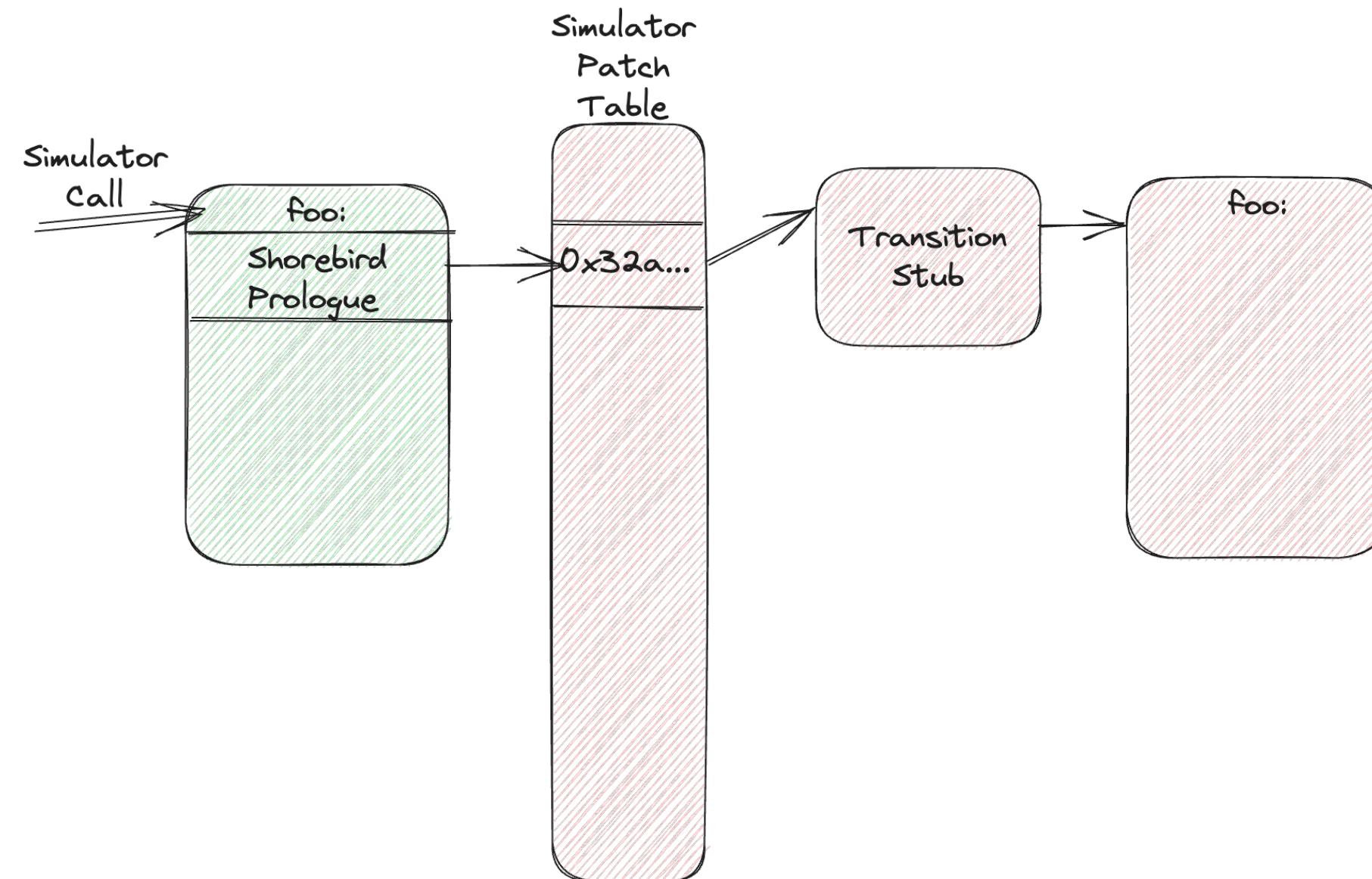
Unpatched Code: Stays on the CPU



Unpatched Code: Simulator to CPU



Patched Code: Stays in the Simulator



Challenge #3: C++ Code

- Normal Dart VM calls C++ through a stub
- All code runs on the target arch
- Simulator calls an invalid instruction through a stub
- Runs C++ code on the host arch

Neither of these will work for mixed mode

Solution: a level of indirection to the stub

Challenge #4: Exception Handling

- Normal Dart VM finds a handler in the stack
- Unwinds down to the handler and runs the handler
- Simulator finds a handler in the stack
- Unwinds *both* stacks and simulates the handler

Mixed mode needs to handle both possibilities



Current Limitations

- 😴 iOS Runs ~100x Slower (100% Interpreted)
- 🎈 iOS Patch Sizes Are Large (No Diffing)
- 📄 Flutter Versions >=3.10.0
- 🐾 Stable Channel Only
- 📱 Mobile Platforms Only



How Does Shorebird Work?

- 🏍️ Custom Flutter engine that includes Shorebird updater
- 🎯 Custom Dart compiler + Custom Dart interpreter
- ☁️ Compiled binaries hosted on our servers
 - 🙅 We never see your source code
 - ⚡ Optional Dart bindings to interact with the updater
 - `package:shorebird_code_push`



Layers

Shorebird Cloud

Shorebird CLI

Shorebird Flutter

Shorebird Engine

Shorebird Updater

Shorebird Dart



Drop-In Replacement

```
# Flutter CLI  
$ flutter build appbundle --release  
$ flutter build ipa --release
```

```
# Shorebird CLI  
$ shorebird release android  
$ shorebird release ios-alpha
```



You Are In Control

shorebird_code_push

Check for and download Shorebird code push updates from your app.

v 1.1.0 (47 days ago) shorebird.dev MIT

[SDK](#) | [DART](#) [FLUTTER](#) [PLATFORM](#) | [ANDROID](#) [IOS](#) [LINUX](#) [MACOS](#) [WEB](#) [WINDOWS](#)

```
// Create an instance of the ShorebirdCodePush class
final shorebirdCodePush = ShorebirdCodePush();

// Get the current patch version, or null if no patch is installed.
final currentPatchversion = await shorebirdCodePush.currentPatchVersion();

// Check whether a patch is available to install.
final isUpdateAvailable = await shorebirdCodePush.isNewPatchAvailableForDownload();

// Download a new patch.
await shorebirdCodePush.downloadUpdateIfAvailable();
```



Continuous Integration

```
# Generate a CI Token  
$ shorebird login:ci
```

```
steps:  
  - name: 📚 Git Checkout  
    uses: actions/checkout@v3  
  
  - name: 🐦 Setup Shorebird  
    uses: shorebirdtech/setup-shorebird@v0  
    with:  
      flutter-version: 3.13.2  
  
  - name: 🛠 Patch Android  
    run: shorebird patch android --force  
    env:  
      SHOREBIRD_TOKEN: ${{ secrets.SHOREBIRD_TOKEN }}  
  
  - name: 🍎 Patch iOS  
    run: shorebird patch ios-alpha --force  
    env:  
      SHOREBIRD_TOKEN: ${{ secrets.SHOREBIRD_TOKEN }}
```



Safe For Stores

Play Store

"An app ... may not modify, replace, or update itself using any method other than Google Play's update mechanism." ... "This restriction does not apply to code that runs in a virtual machine or an interpreter"

Shorebird uses the Dart Virtual Machine. Similar to how other apps use JavaScript or Lua.

App Store

3.2.2. "Application may not download or install executable code. Interpreted code may be downloaded..."

Shorebird uses a custom Dart interpreter on iOS to both comply with store guidelines and provide excellent performance.

Join the flock

Deliver instant updates to your users with pricing that scales as you grow.

Hobby

\$0 / month

For small apps and demos.

- ✓ Unlimited apps
- ✓ 1 developer
- ✓ 5K patch installs/month
- ✓ Community support

[Get Started](#)

Team

\$20 / month

For apps that can scale.

- ✓ Unlimited apps
- ✓ Unlimited developers
- ✓ 50K patch installs/month ⓘ
- ✓ Discord & email support

[Get Started](#)

Enterprise

Custom

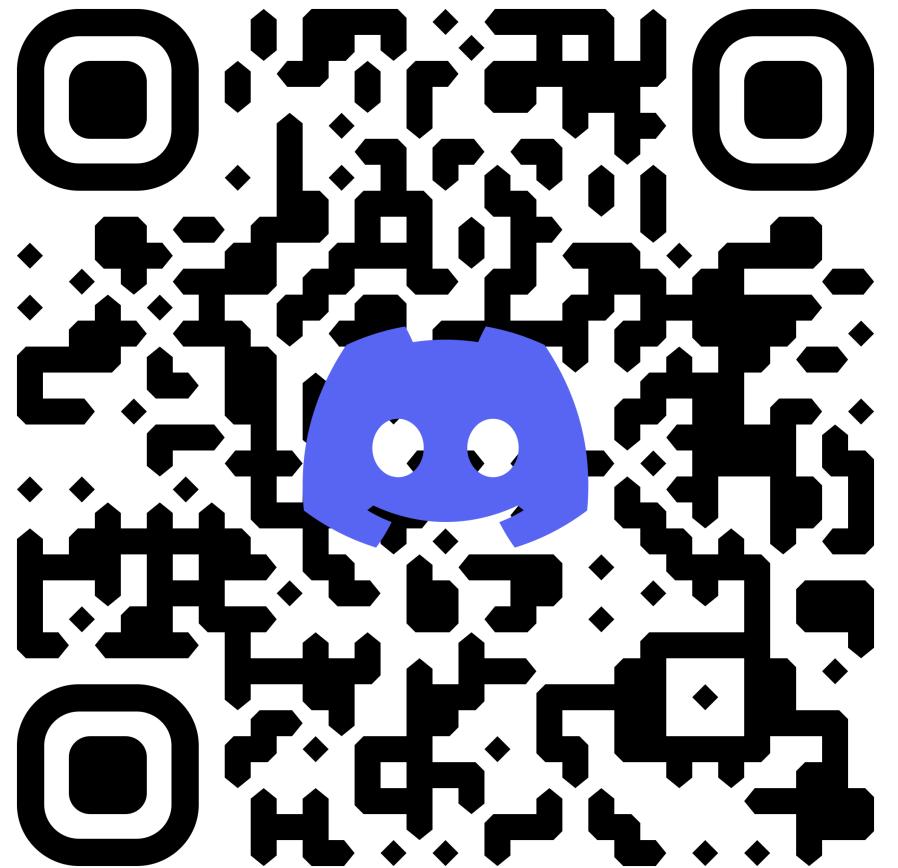
For 1M+ user apps.

- ✓ Unlimited apps
- ✓ Unlimited developers
- ✓ High volume discounts
- ✓ Private Support

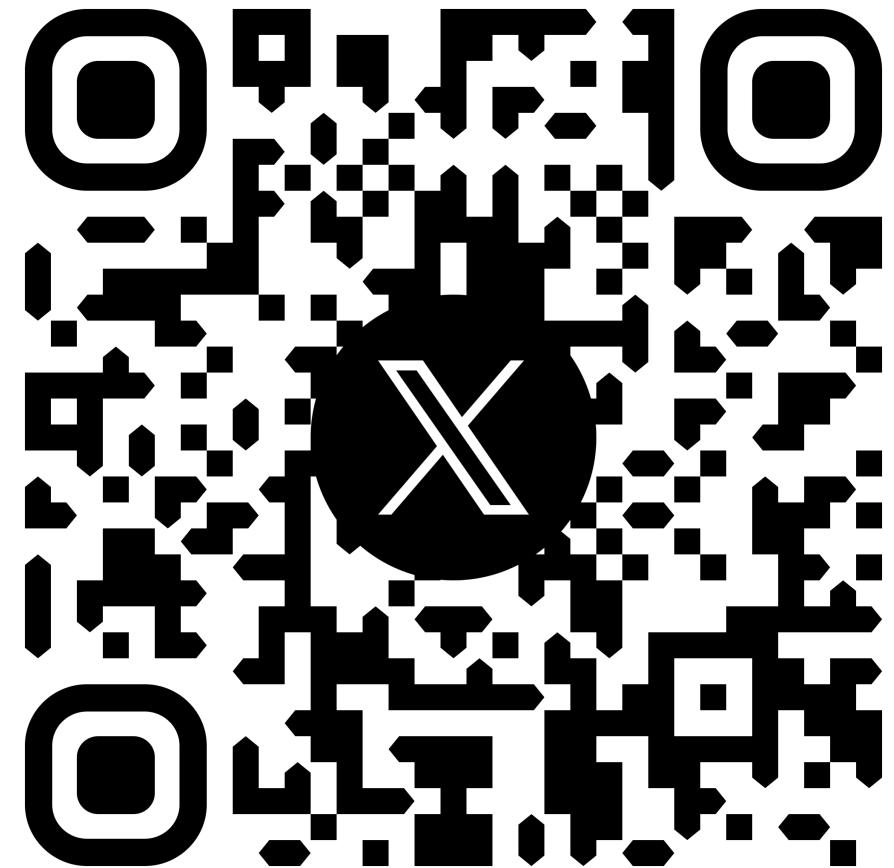
[Schedule a call](#)



Chat With Us



<https://discord.gg/shorebird>
@shorebirddev



Thank You!

