Flutter设计、实现与演进

一个开发者的观察、实践与思考

Flutter Forward Extended

自我介绍

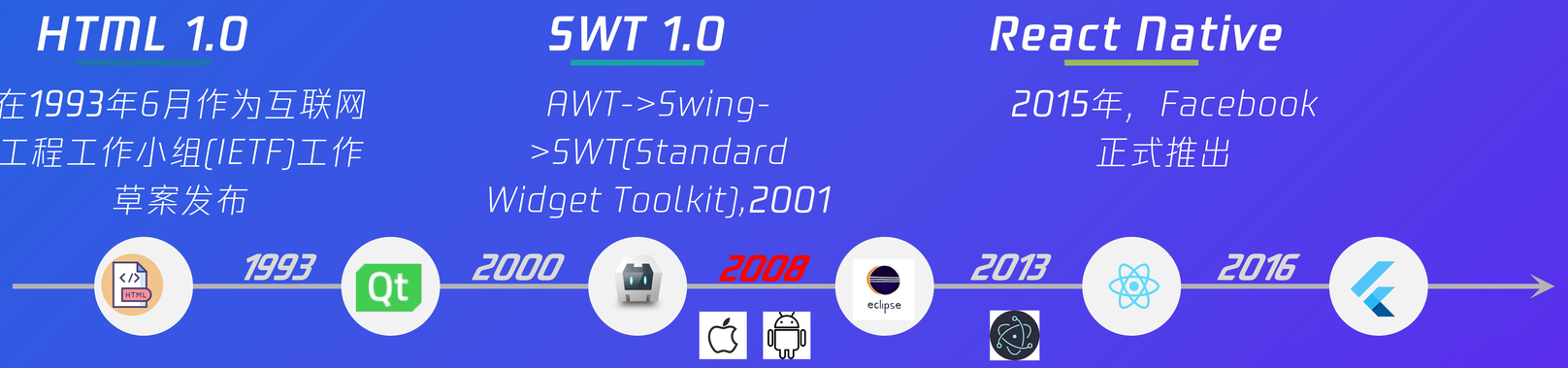
赵 裕

- 腾讯 - 客户端开发工程师
- 著有《Flutter内核源码剖析》，博客：vimerzhao.top
- 腾讯学堂讲师：《Flutter源码导读》、《软件Bug的排查与解决》

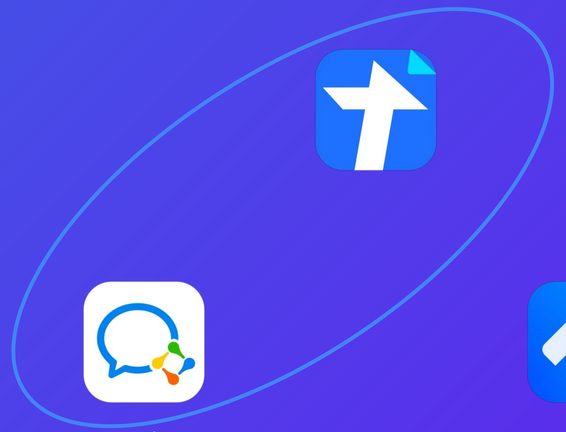
分享大纲

- Part1 开场介绍
- Part2 设计思考
- Part3 实现细节
- Part4 演进梳理
- Part5 QA交流

跨平台的历史 - 技术视角


HTML 1.0
在1993年6月作为互联网工程工作小组(IETF)工作草案发布
1993
QT 1.0
On 20 May 1995 Troll Tech publicly released Qt 0.90 for X11/Linux with the source code under the Qt Free Edition License
2000
SWT 1.0
AWT->Swing->SWT(Standard Widget Toolkit),2001
2008
PhoneGap
2009年前后，最早出现于iOS
2013
React Native
2015年，Facebook正式推出
2016
Flutter
2018年，Flutter1.0发布

跨平台的历史 - 产品视角

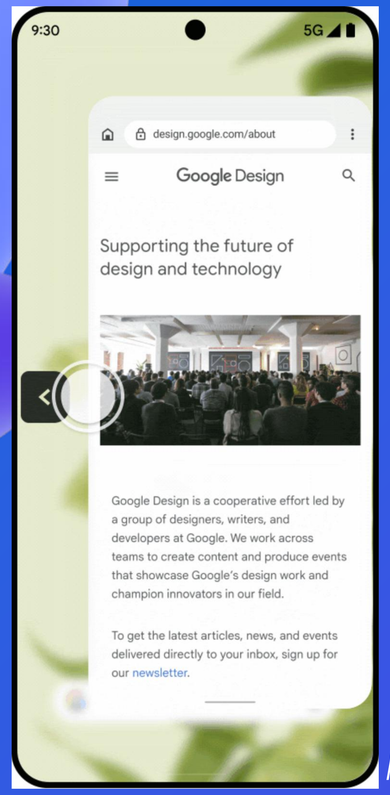


Use Flutter

移动时代

移动+PC+Web

跨平台的思考：是否存在彻底的跨平台



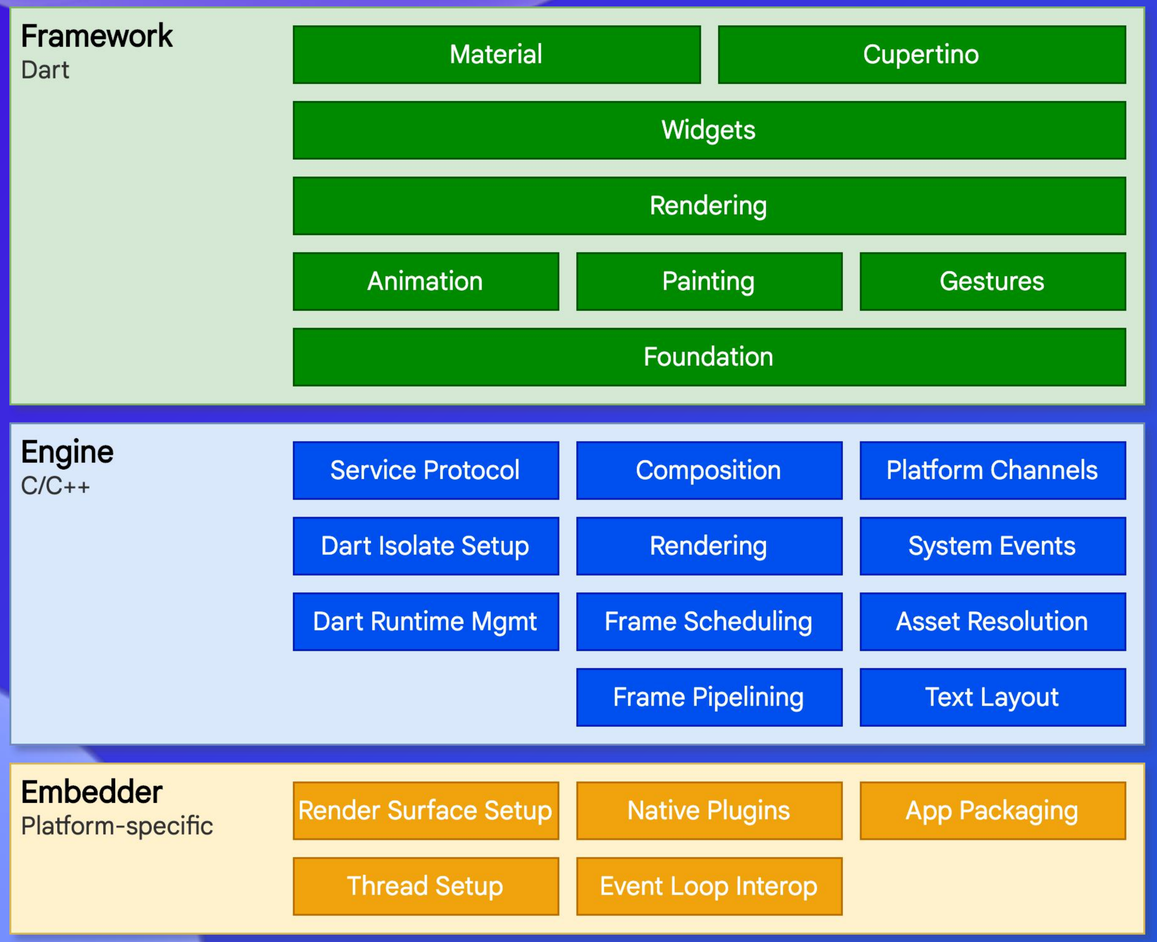
Predictive Back Gesture

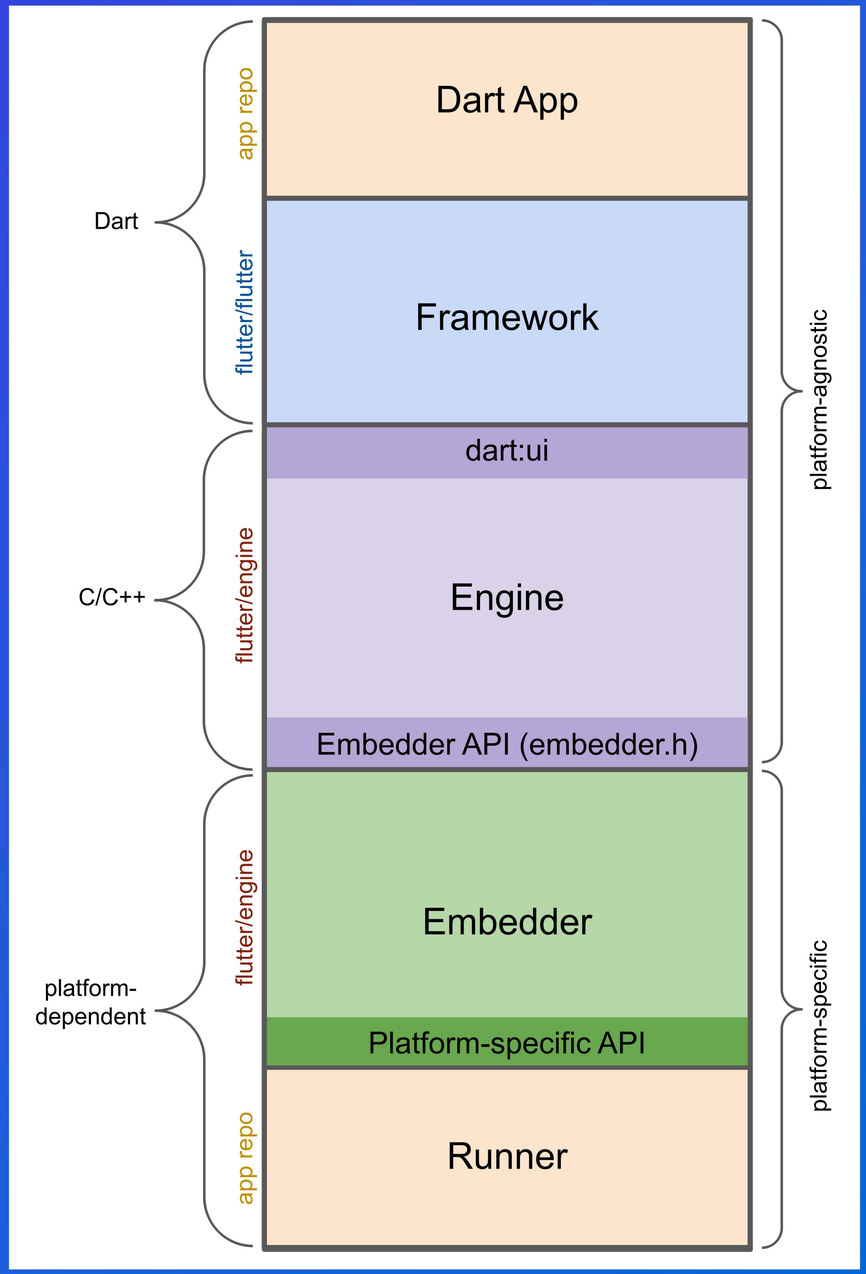
Android QQ

PC QQ

Android & iOS　　Mobile & PC

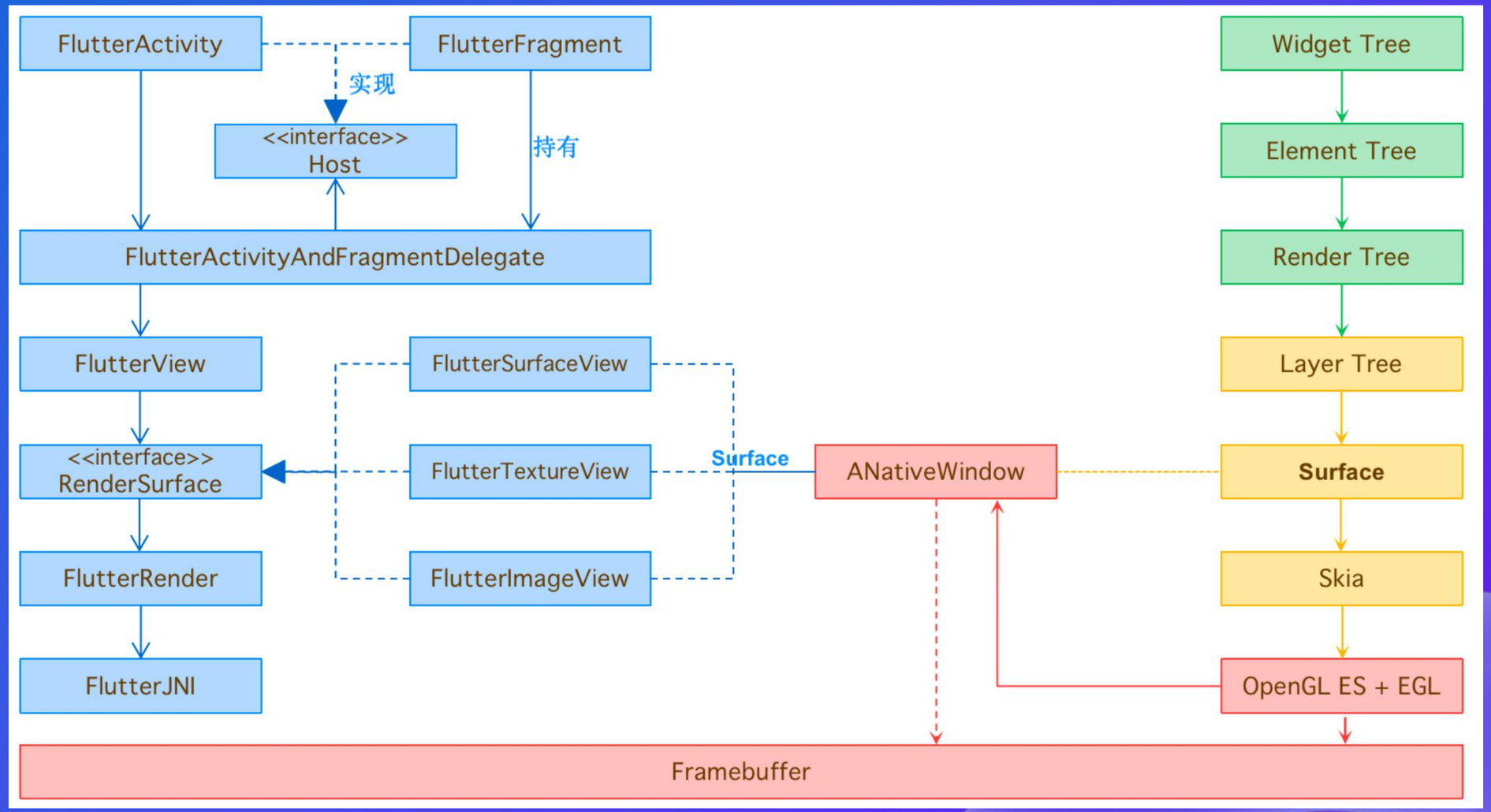
Flutter设计浅析

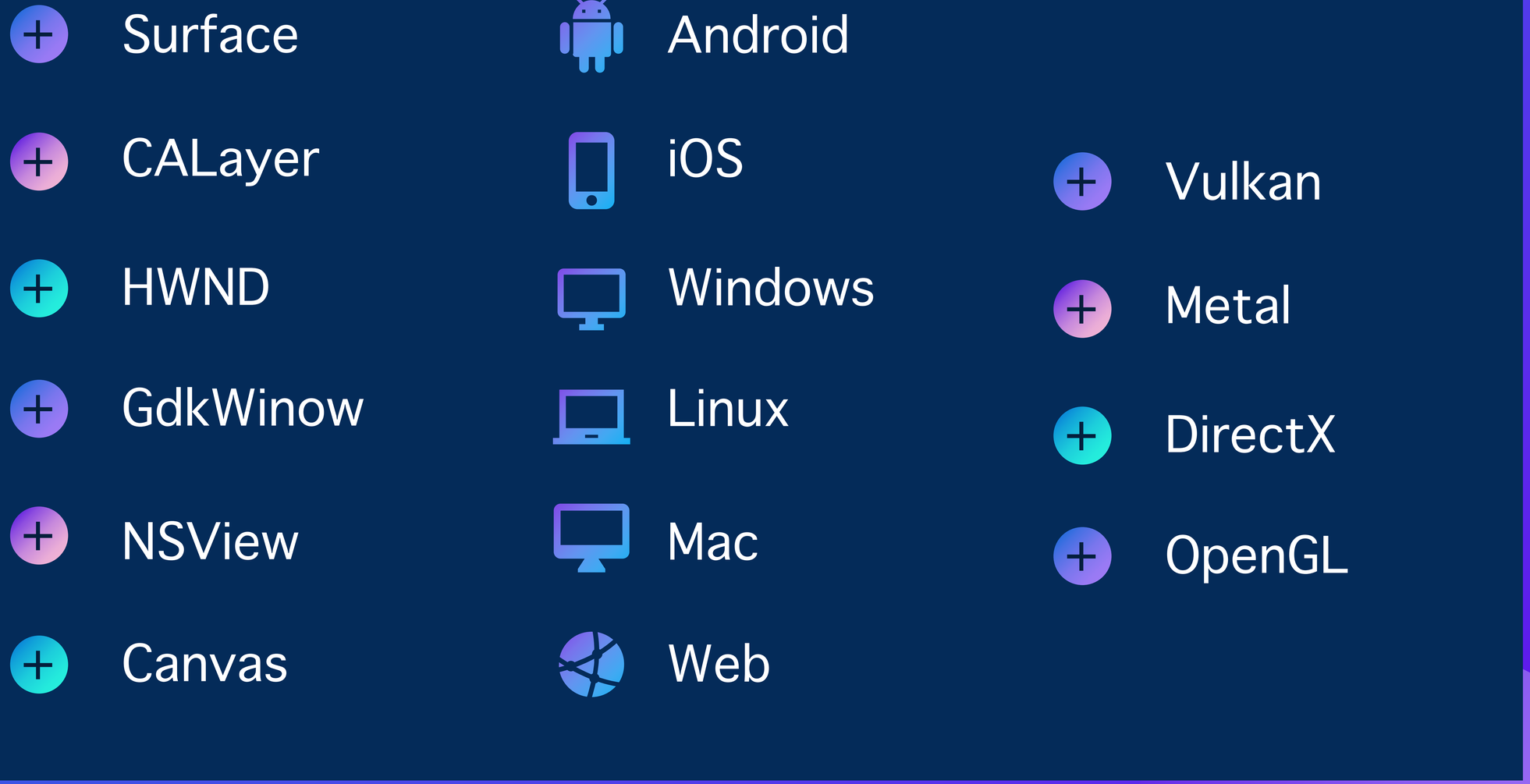




设计 → 实现

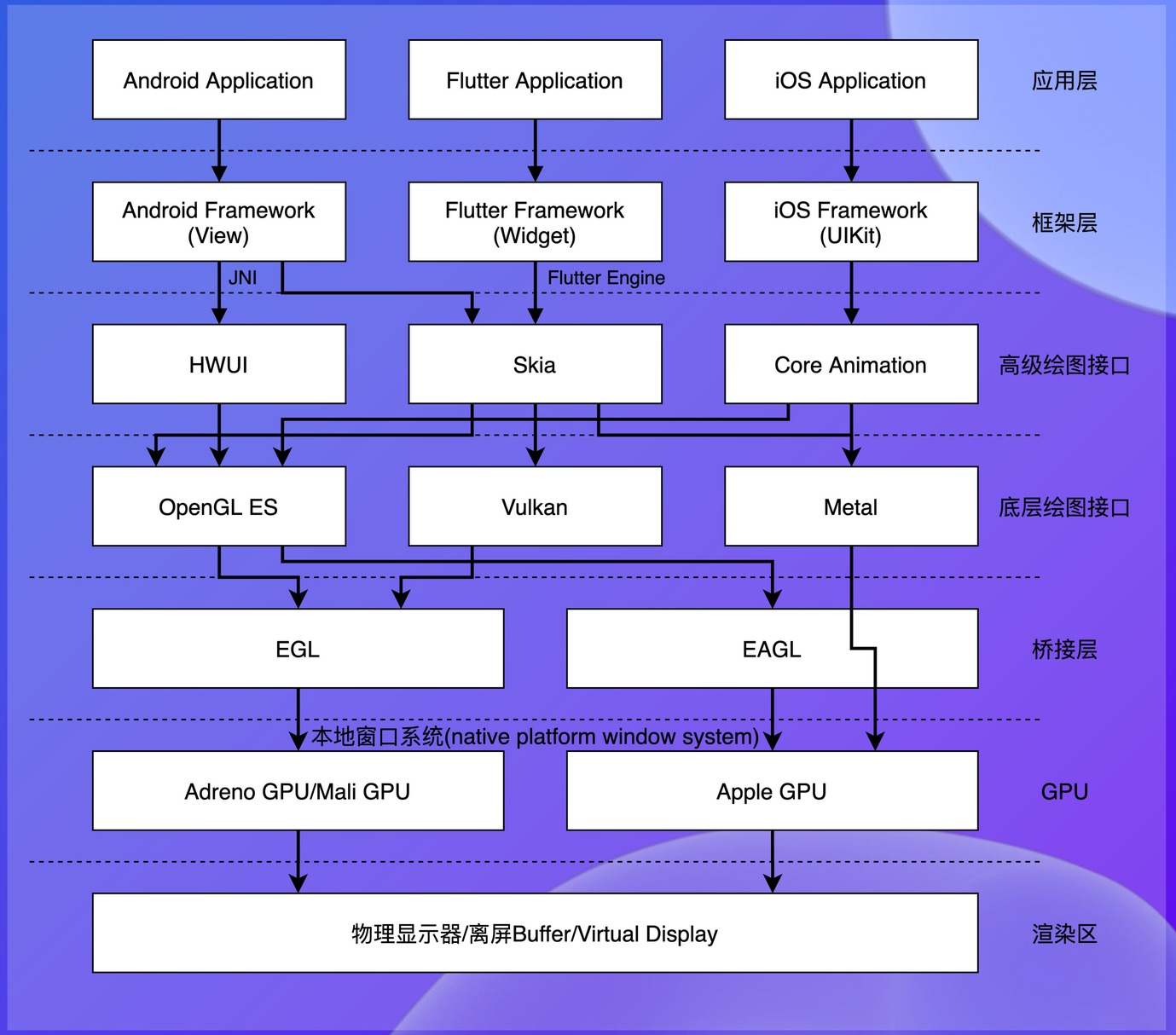
Overview


FlutterActivity
FlutterFragment
实现
<<interface>>
Host
持有
FlutterActivityAndFragmentDelegate
FlutterView
FlutterSurfaceView
<<interface>>
RenderSurface
FlutterTextureView
Surface
ANativeWindow
FlutterRender
FlutterImageView
FlutterJNI
Framebuffer
Widget Tree
Element Tree
Render Tree
Layer Tree
Surface
Skia
OpenGL ES + EGL


Surface
CALayer
HWND
GdkWinow
NSView
Canvas
Android
iOS
Windows
Linux
Mac
Web
Vulkan
Metal
DirectX
OpenGL

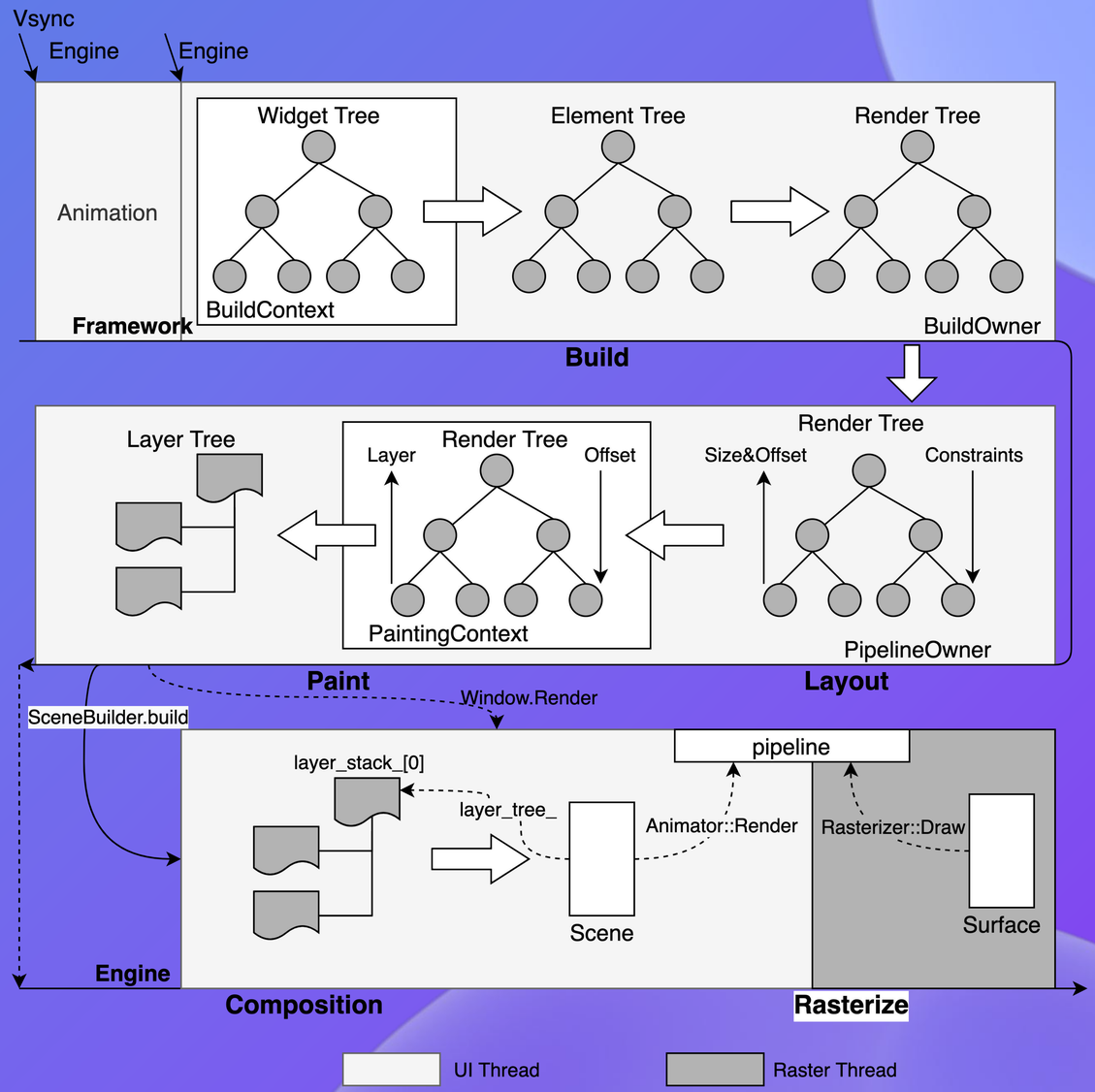
渲染体系

- 用户面向哪一层？
- 业务开发者面向哪一层？
- 系统厂商有何影响？



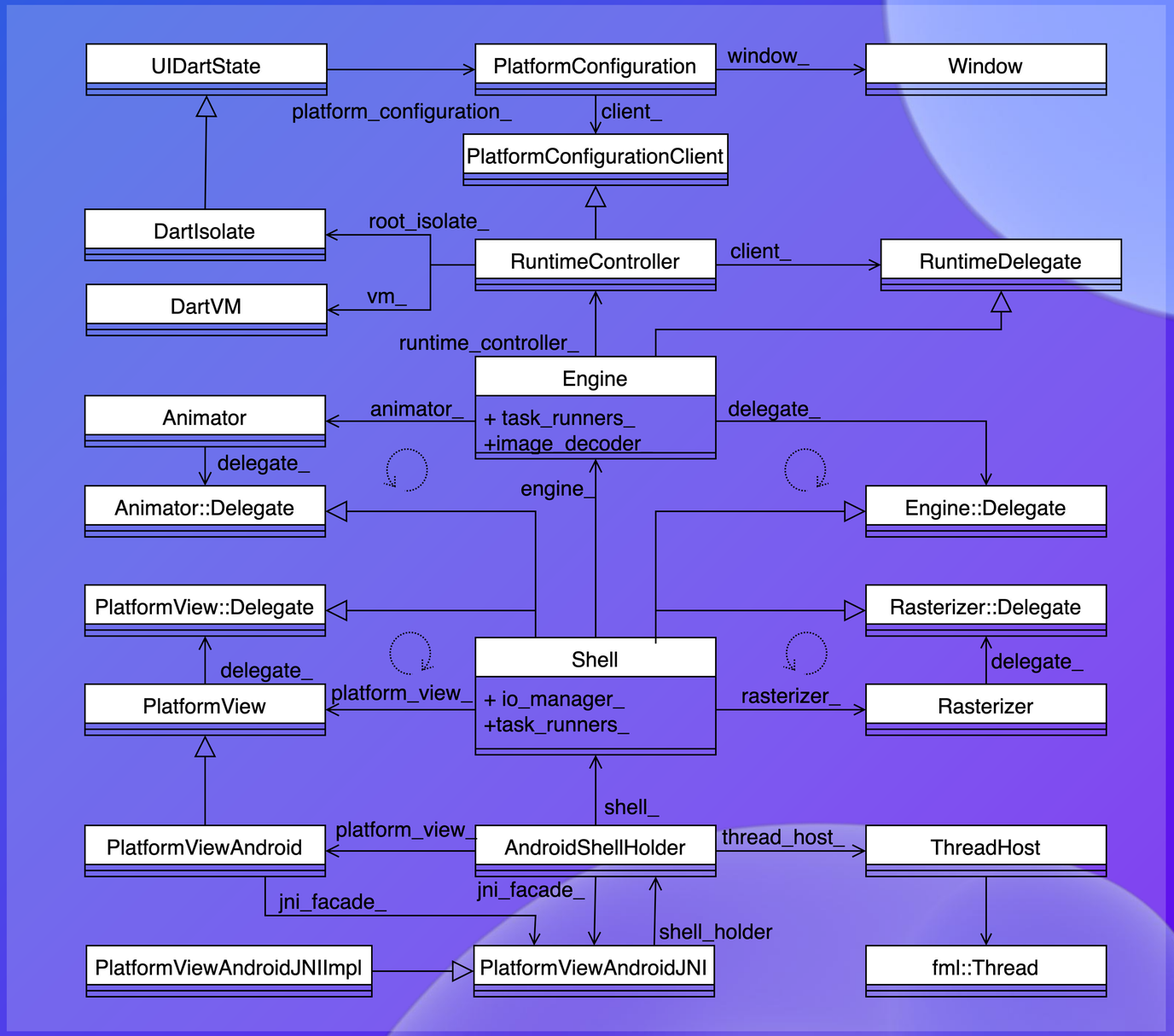
渲染管线

- 渲染管线的作用是什么？
- 生产者、消费者分别是谁？
- Flutter的渲染有哪些优化？



Engine的具体实现

- Engine的主要职责是什么？
- 涉及哪些线程？
- Framework如何与平台通信？

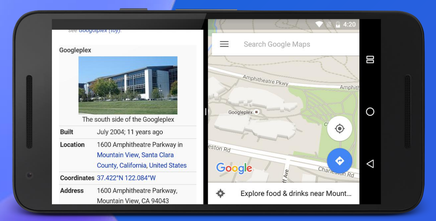


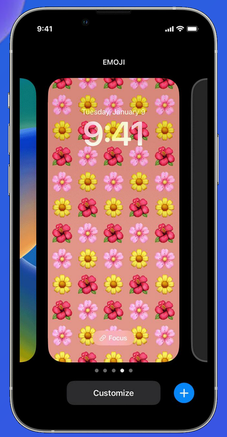
实现 → 演进

Roadmap

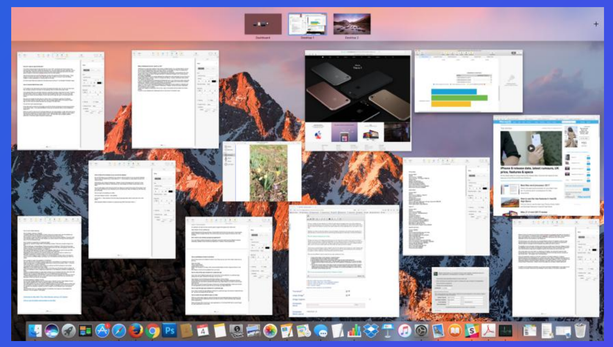
- 2018：1.0发布，Android&iOS持续完善
- 2020：专注质量提升，Web和桌面平台的支持
- 2021：2.0发布，正式支持Web。
- 2022：3.0发布，支持Windows/Mac/OSLinux。开始彻底解决Jank 。
  DisplayList + Impeller逐步替代旧有渲染体系。
- 2023：全平台 & 渲染 & 开发者诉求

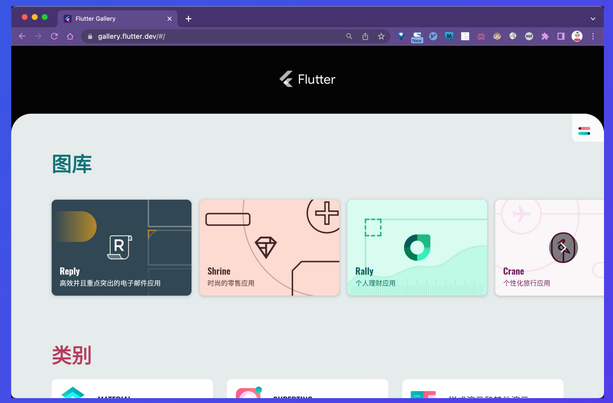
一些挑战

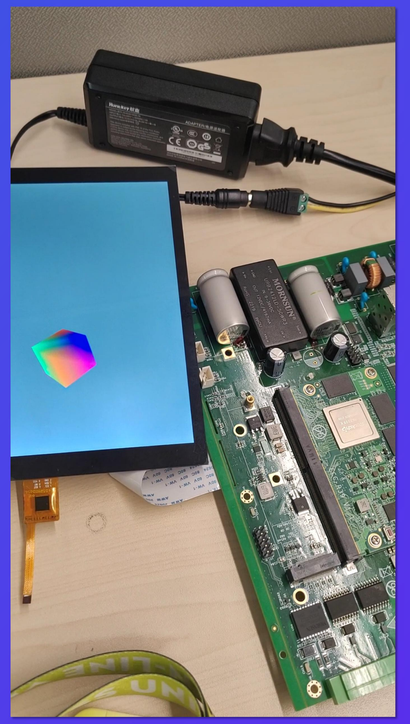




Android&iOS







PC & Web & Embedded

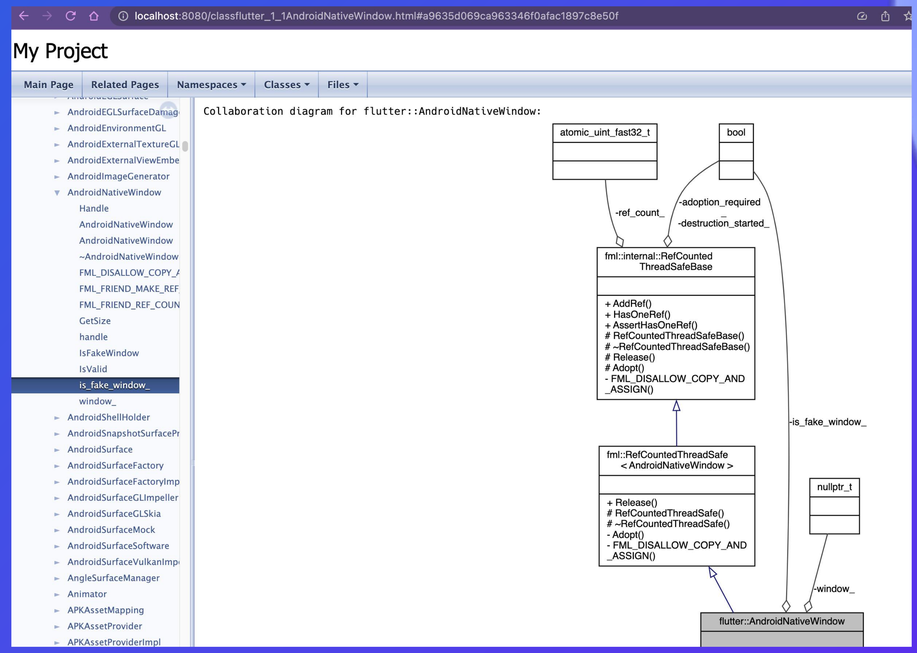
- 更复杂的渲染宿主〔窗口〕
- 更复杂的输入系统〔触摸屏、鼠标、键盘、触摸板、手写笔……〕
- 定制的能力，如PC的多窗口、Web的SEO支持
- 更多样化的渲染后端和环境

番外

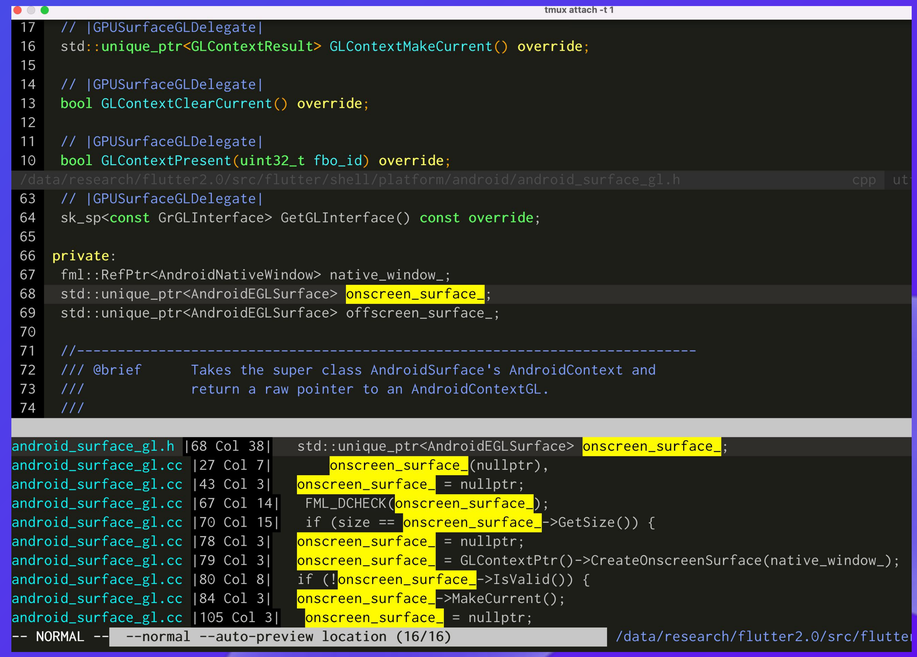
Flutter源码学习技巧

实践

领域　　工具



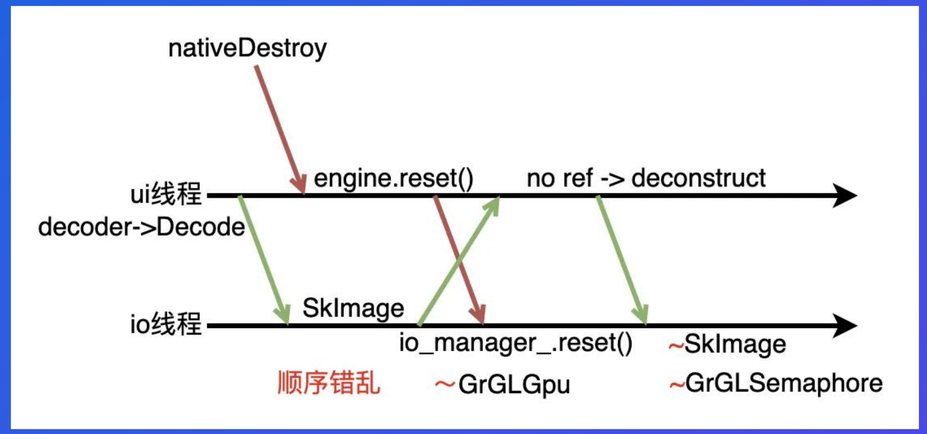
doxygen



code index

Flutter Forward Extended

跨平台开发的Bug斗争案例



https://github.com/flutter/flutter/issues/87895

https://github.com/flutter/flutter/issues/35078

THANK YOU!

Flutter Forward