Psychoinformatics & Neuroinformatics

Week 8

Smartphones

by Tsung-Ren (Tren) Huang 黃從仁

Why bother smartphone development

Most traffic comes from mobile devices

You want your samples to be representative

We carry smartphones everywhere

This allows us to do experience/active sampling

Smartphones have many sensors

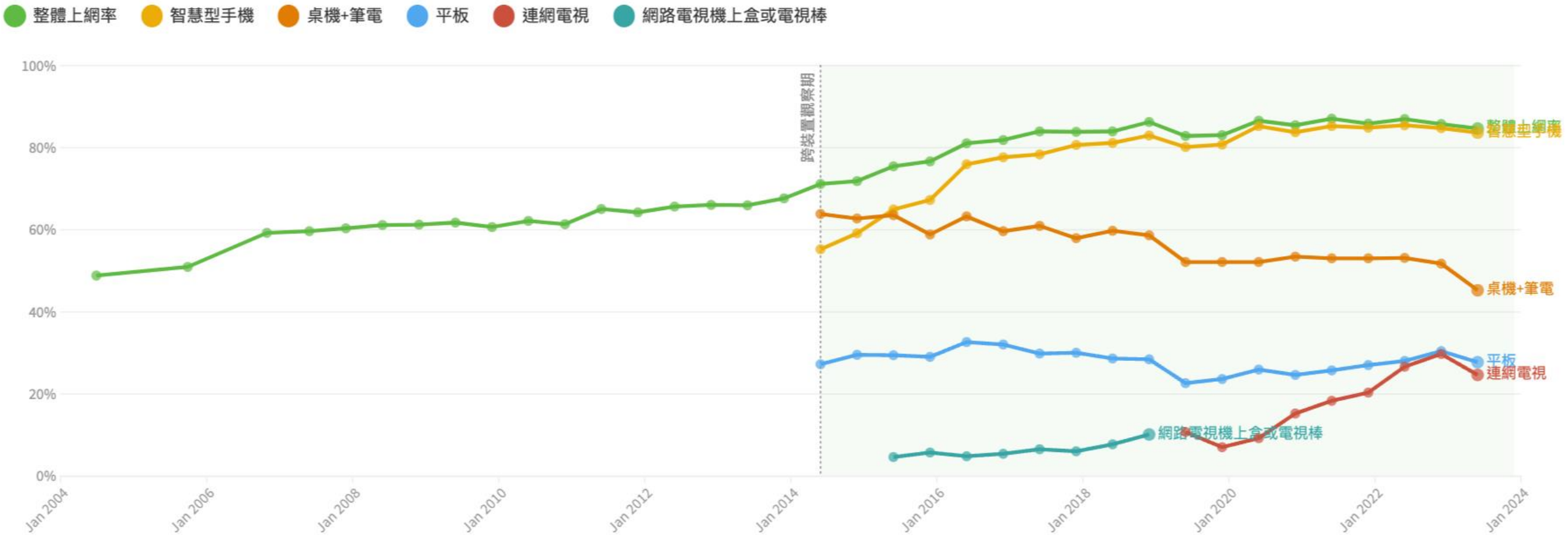
This allows us to do passive sampling

Smartphone Penetration Rate

2004 - 2023

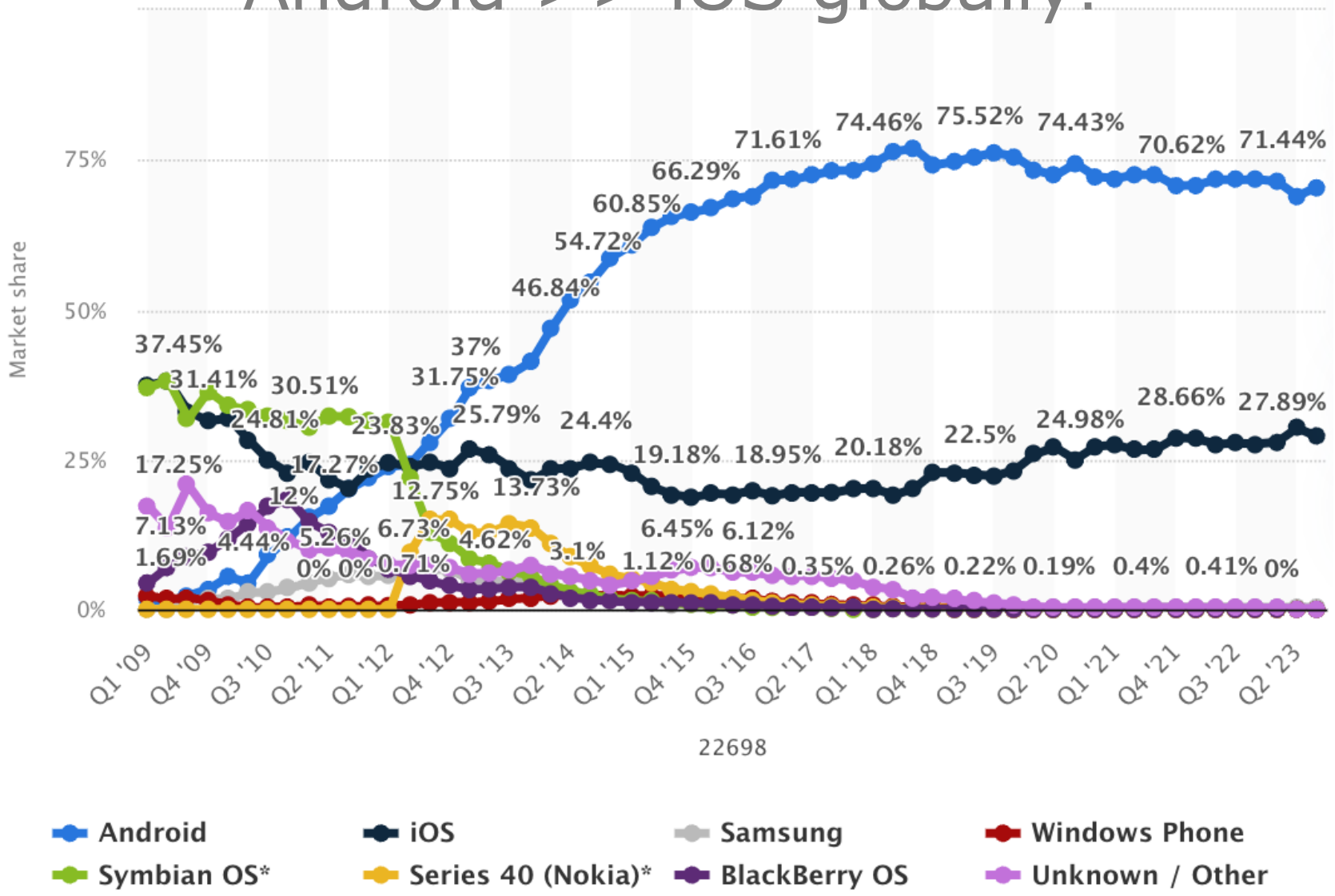
台灣上網率追蹤調查

80~90% of Taiwanese are online!



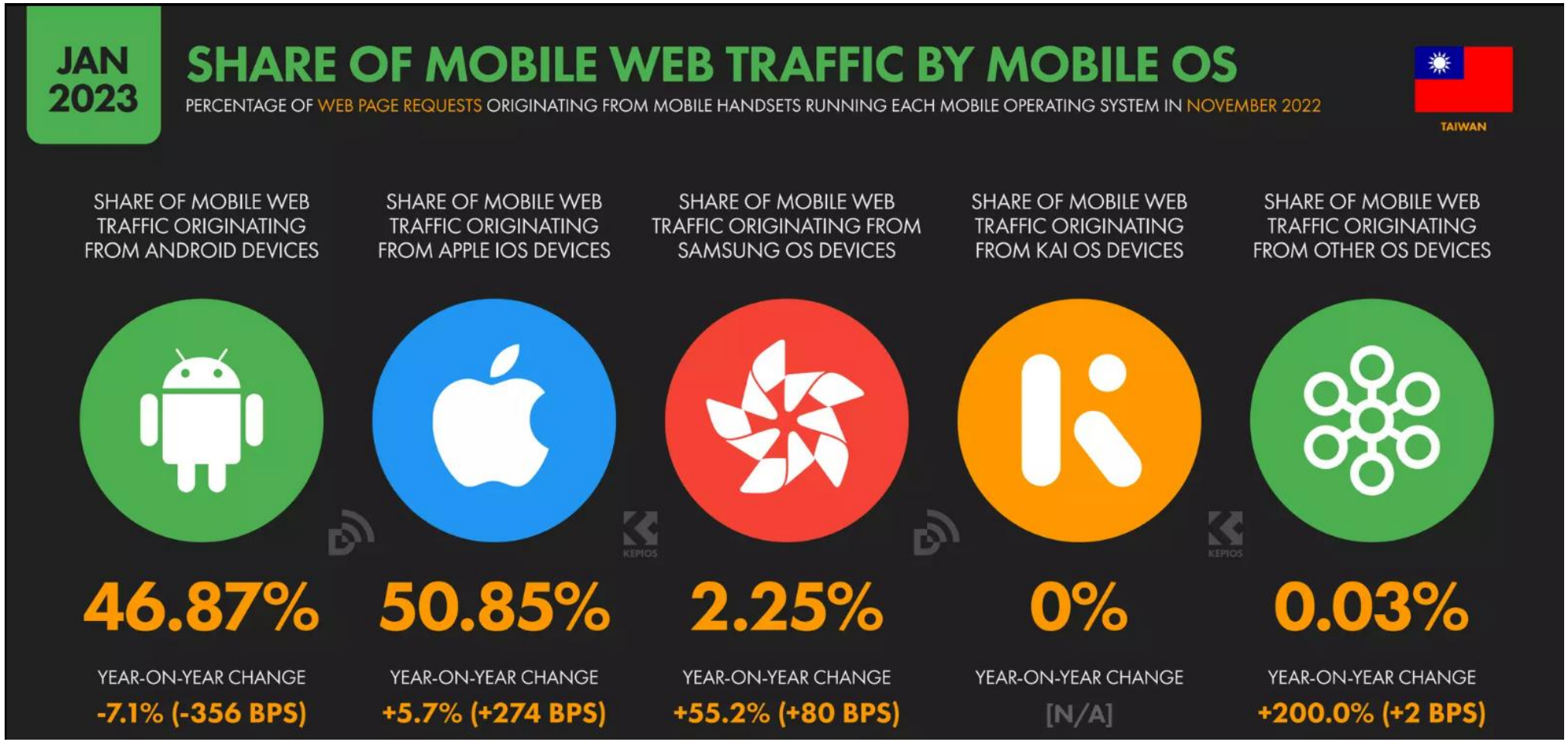
Android/iOS Penetration Rates (1/2)

Android >> iOS globally!



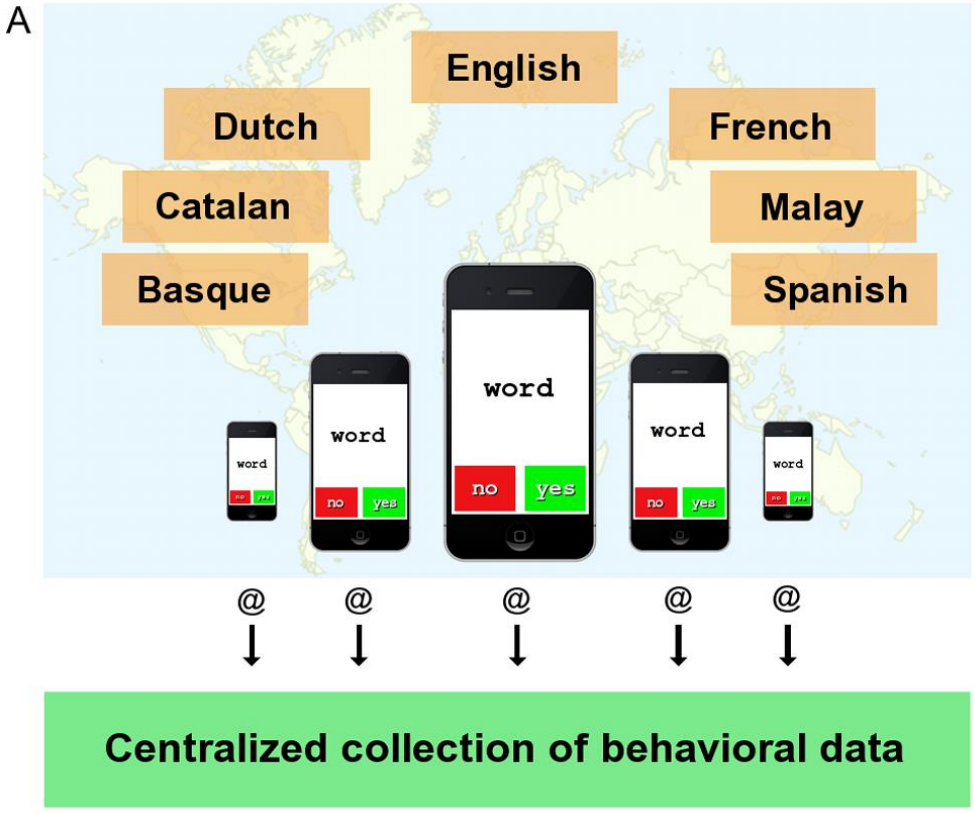
Android/iOS Penetration Rates (2/2)

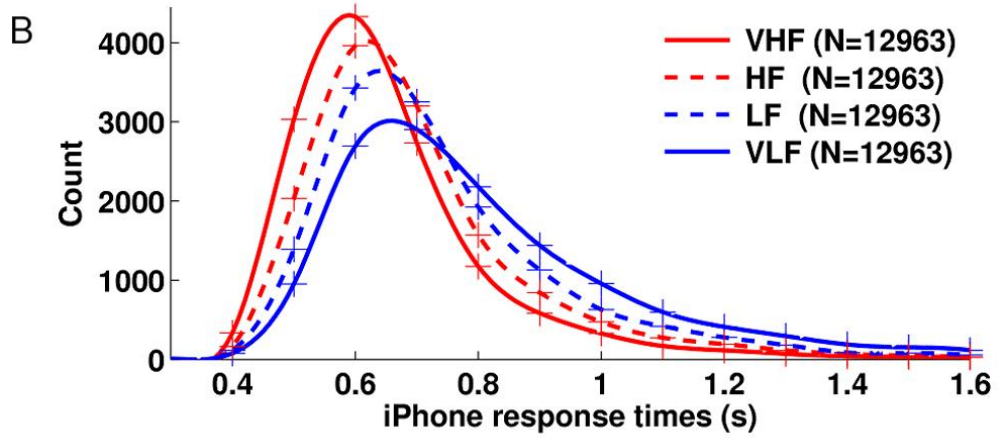
iOS > Android in Taiwan!

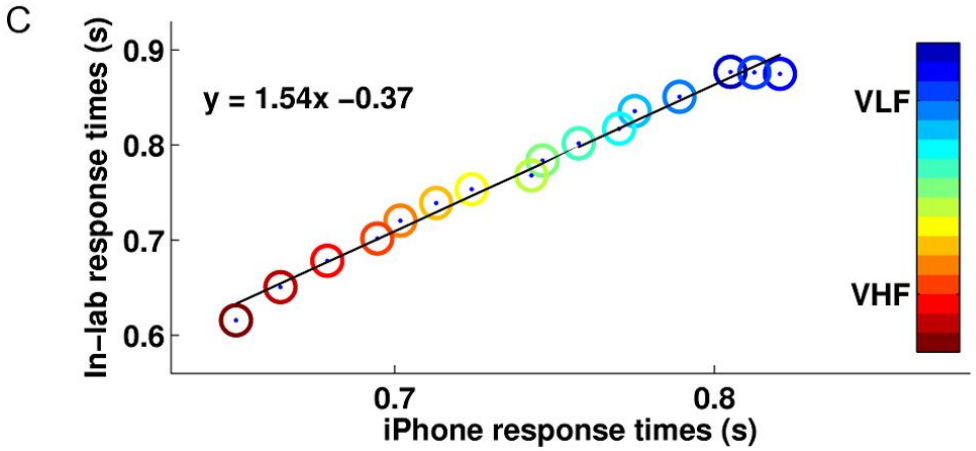


Validity/Reliability of Smartphone Data

Take Lexical Decision Task for an example

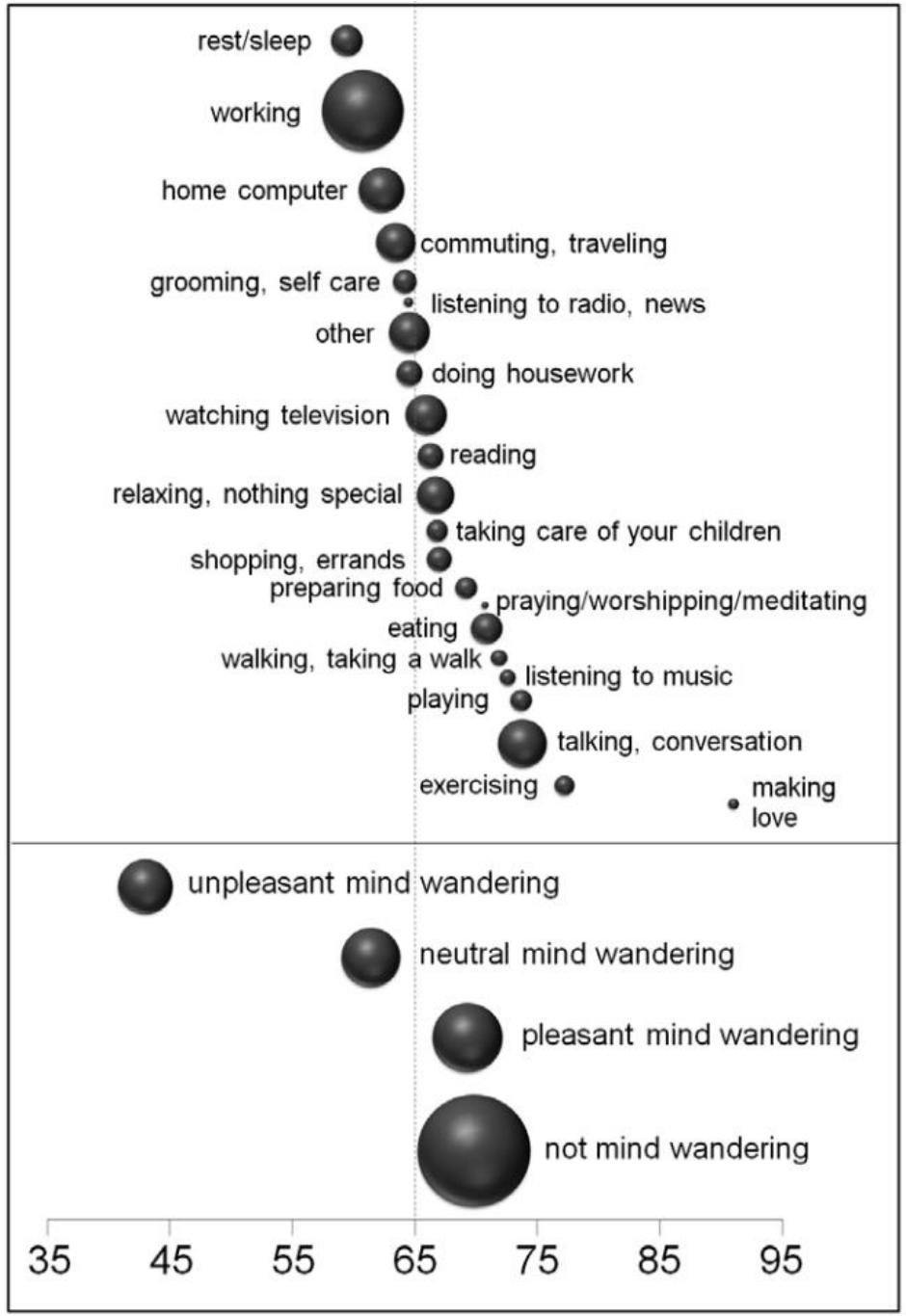




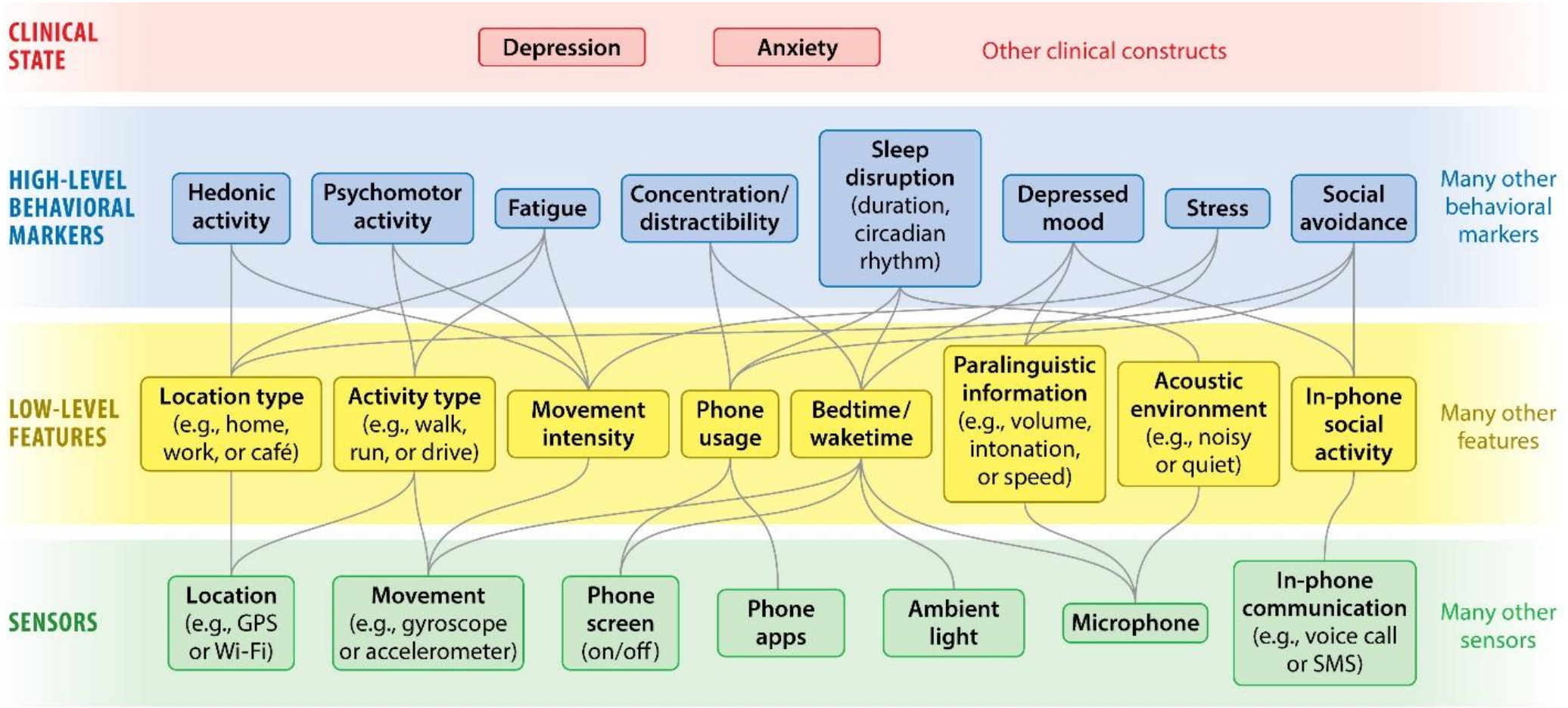


Active/Experience Sampling

Killingsworth & Dilbert, 2010, *Science*



Passive Sampling: Sensors



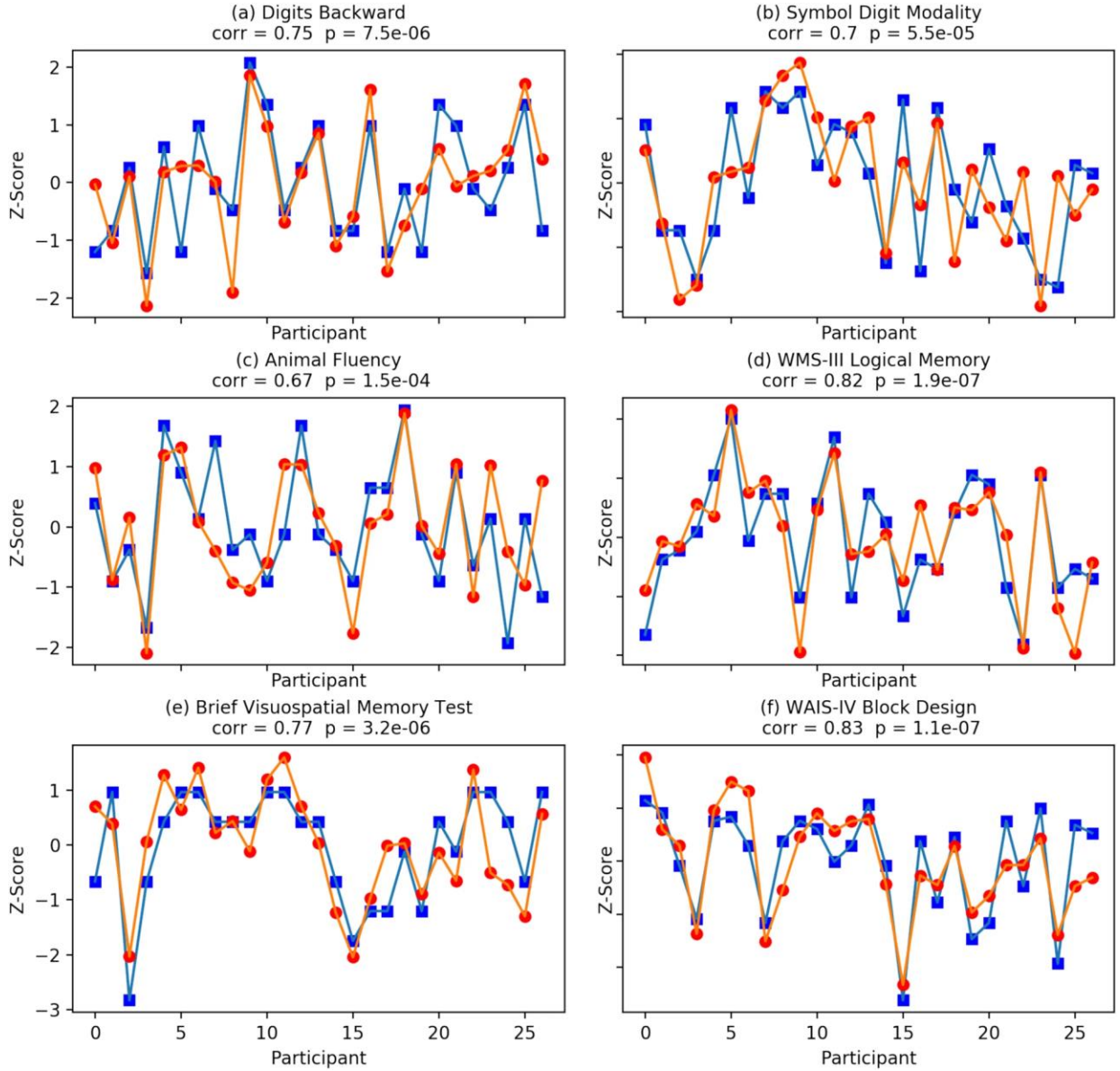
Mohr et al., 2017

Passive Sampling: Digital Phenotyping

Sample	Year	Location	Duration	Age range (years)	Sample size (*N*)		Estimated average number (SD) of words spoken per day	
					Women	Men	Women	Men
1	2004	USA	7 days	18–29	56	56	18,443 (7460)	16,576 (7871)
2	2003	USA	4 days	17–23	42	37	14,297 (6441)	14,060 (9065)
3	2003	Mexico	4 days	17–25	31	20	14,704 (6215)	15,022 (7864)
4	2001	USA	2 days	17–22	47	49	16,177 (7520)	16,569 (9108)
5	2001	USA	10 days	18–26	7	4	15,761 (8985)	24,051 (10,211)
6	1998	USA	4 days	17–23	27	20	16,496 (7914)	12,867 (8343)
					Weighted average		16,215 (7301)	15,669 (8633)

Mehl et al., 2007, *Science*

Passive Sampling: Digital Phenotyping



Developing Apps for Experience Sampling

Or just use LINE or Telegram

Behavior Research Methods
https://doi.org/10.3758/s13428-023-02194-2

ESMira: A decentralized open-source application for collecting experience sampling data

David Lewetz[1] · Stefan Stieger[1]

Accepted: 7 July 2023

Google Play

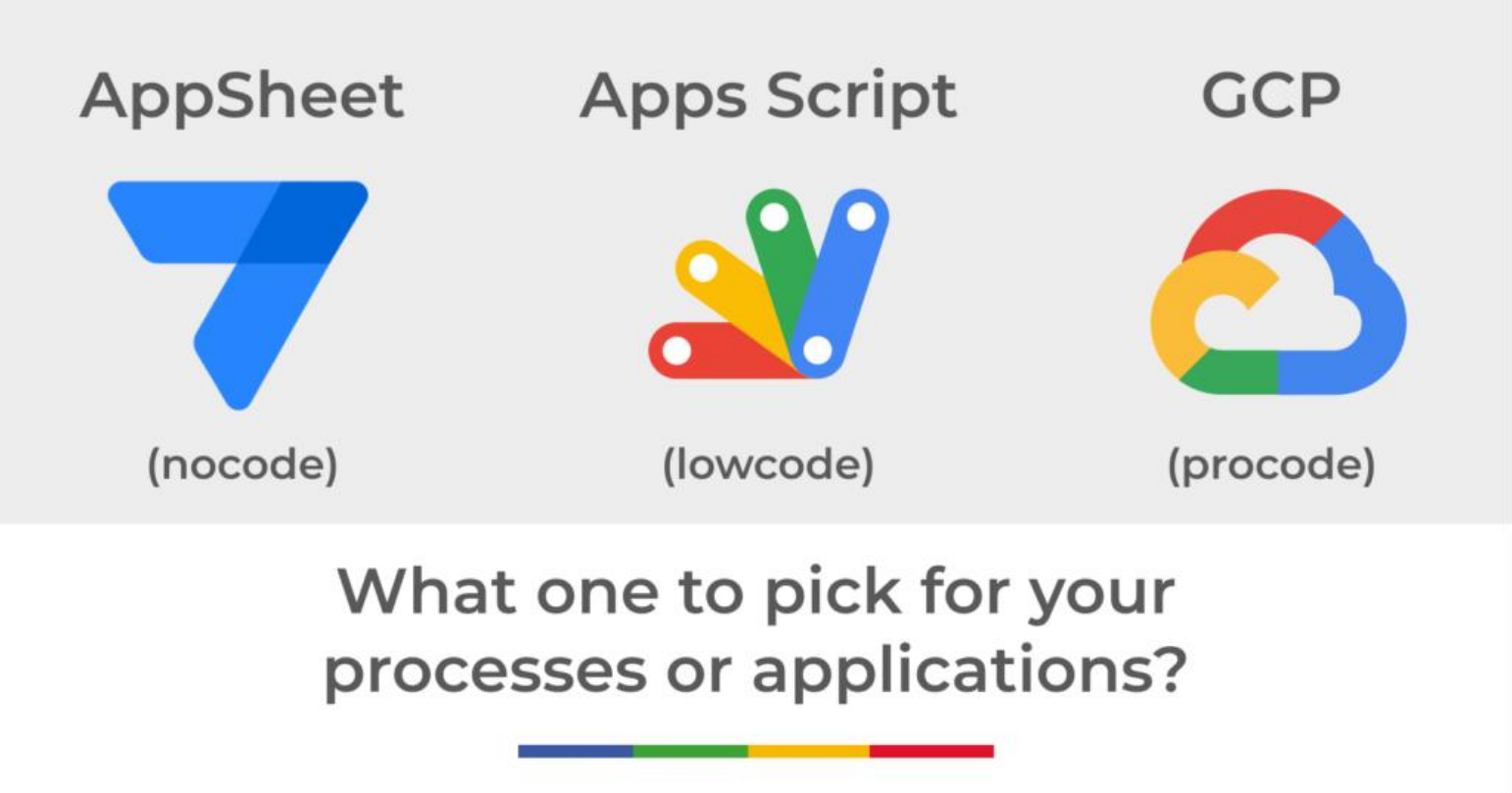
Games Apps

ESMira

Jodli Development

Developing General Apps

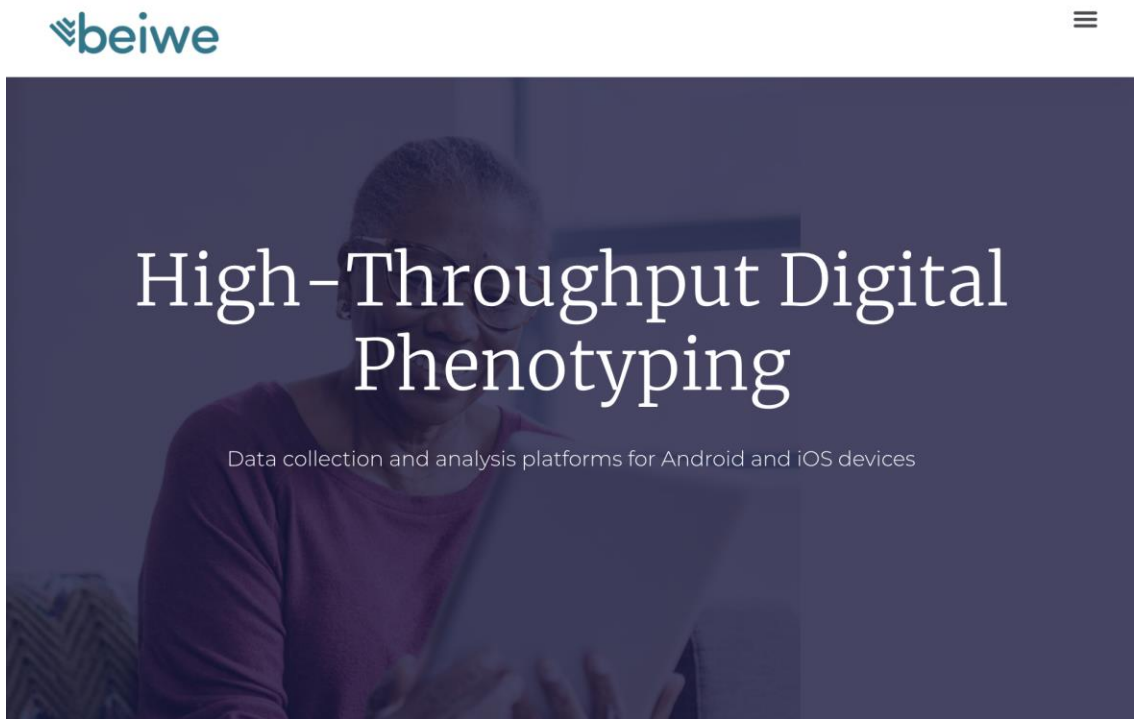
Here are the Google solutions:



Here is a short tutorial for AppSheet.

Developing Apps for Digital Phenotyping

More platforms are developed



carp_mobile_sensing 1.3.4

Published 5 days ago • cachet.dk Dart 3 compatible

PLATFORM ANDROID IOS

19

Readme Changelog Example Installing Versions Scores

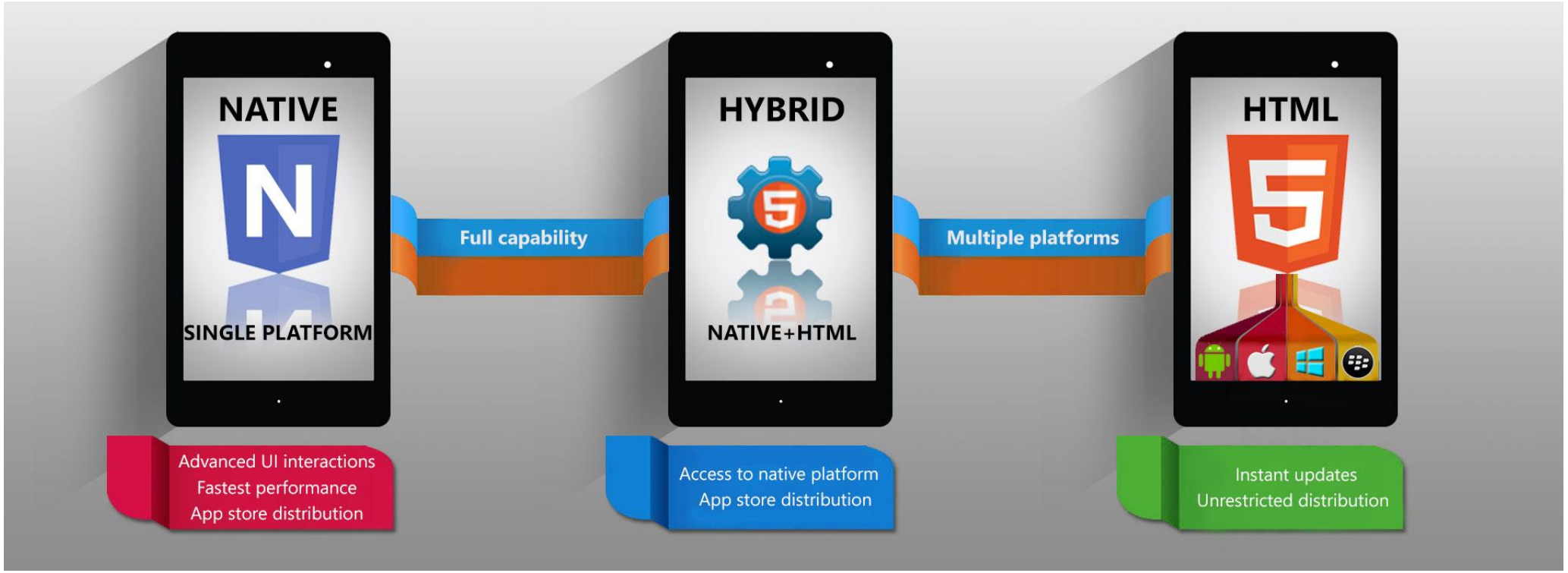
CARP Mobile Sensing Framework in Flutter

pub v1.3.4 pub points 140/140 stars 72 license MIT arXiv 2006.11904

This library contains the core Flutter package for the CARP Mobile Sensing (CAMS) framework. Supports cross-platform (iOS and Android) mobile sensing.

For an overview of all CAMS packages, see CARP Mobile Sensing in Flutter. For documentation on how to use CAMS, see the CAMS wiki.

Types of Smartphone Apps



Web App: HTML5+CSS3+Javascript+PWA

Hybrid App: Webview+Cordova/Capacitor (Javascript)

Compiled App: React Native (JS) vs. Flutter (Dart)

Native App: Android SDK (Java/Kotlin) + Xcode (Objective C)

Goals for today

Developing Progressive Web Apps (PWA)

Lighthouse, workbox, & pwa-asset-generator

Developing Hybrid Apps

Cordova & Capacitor

Developing Compiled Apps

React Native

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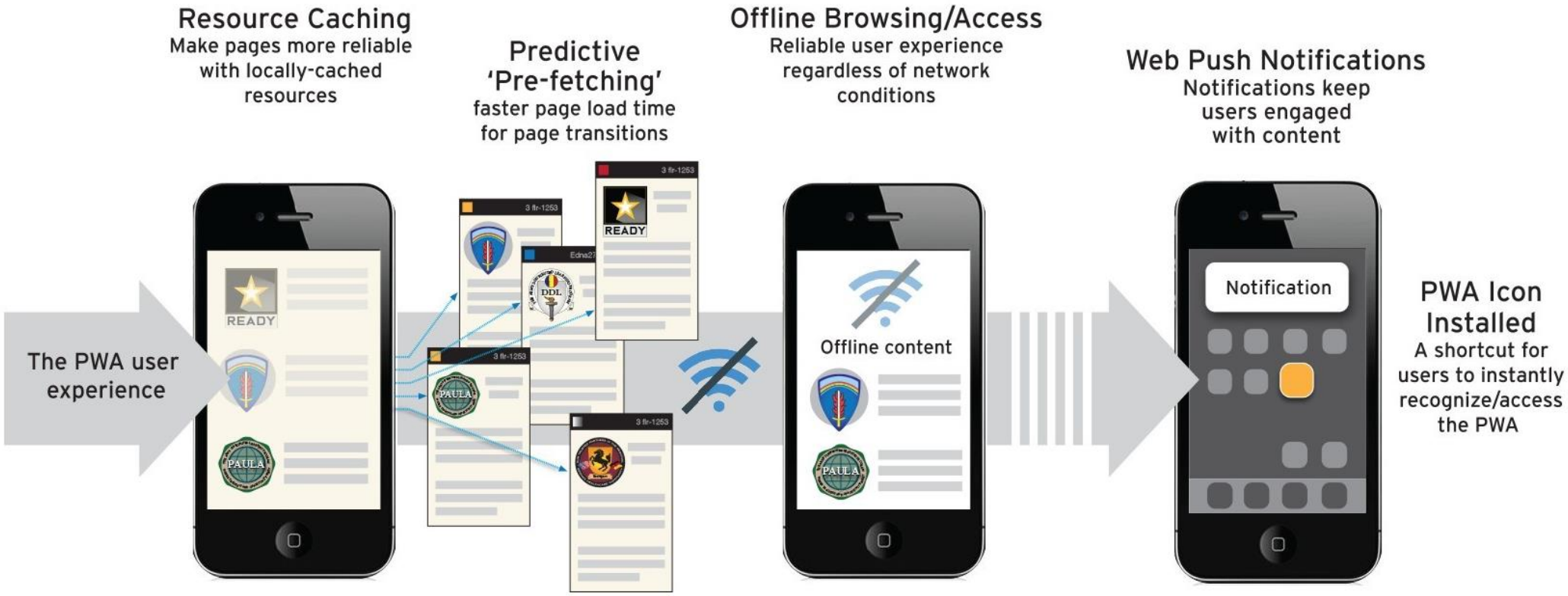
Progressive Web Apps: Better UX



SIX REASONS PWAS ARE BECOMING THE APP OF CHOICE:

No. 1 PWAs Load instantly on any device or browser

No. 2 PWAs respond quickly to user interaction and queries

No. 3 Mobile Friendly and intuitive; works on ALL devices

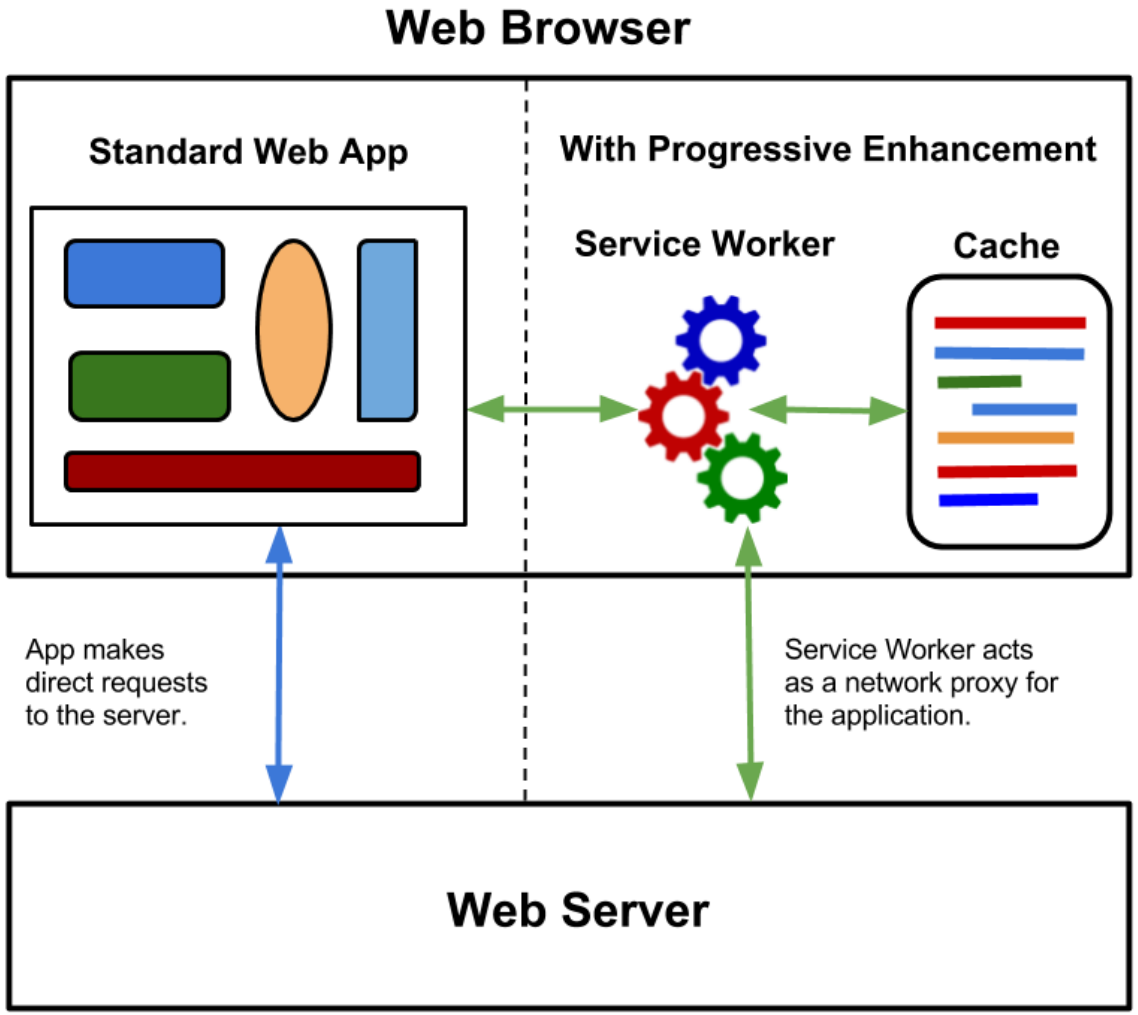
No. 4 PWAs provide a seamless user experience - even during low or no network

No. 5 Allows users to subscribe to useful push notifications

No. 6 Option is available to add to the end users homescreen

Progressive Web Apps: Mechanisms

Useful tools: lighthouse & workbox



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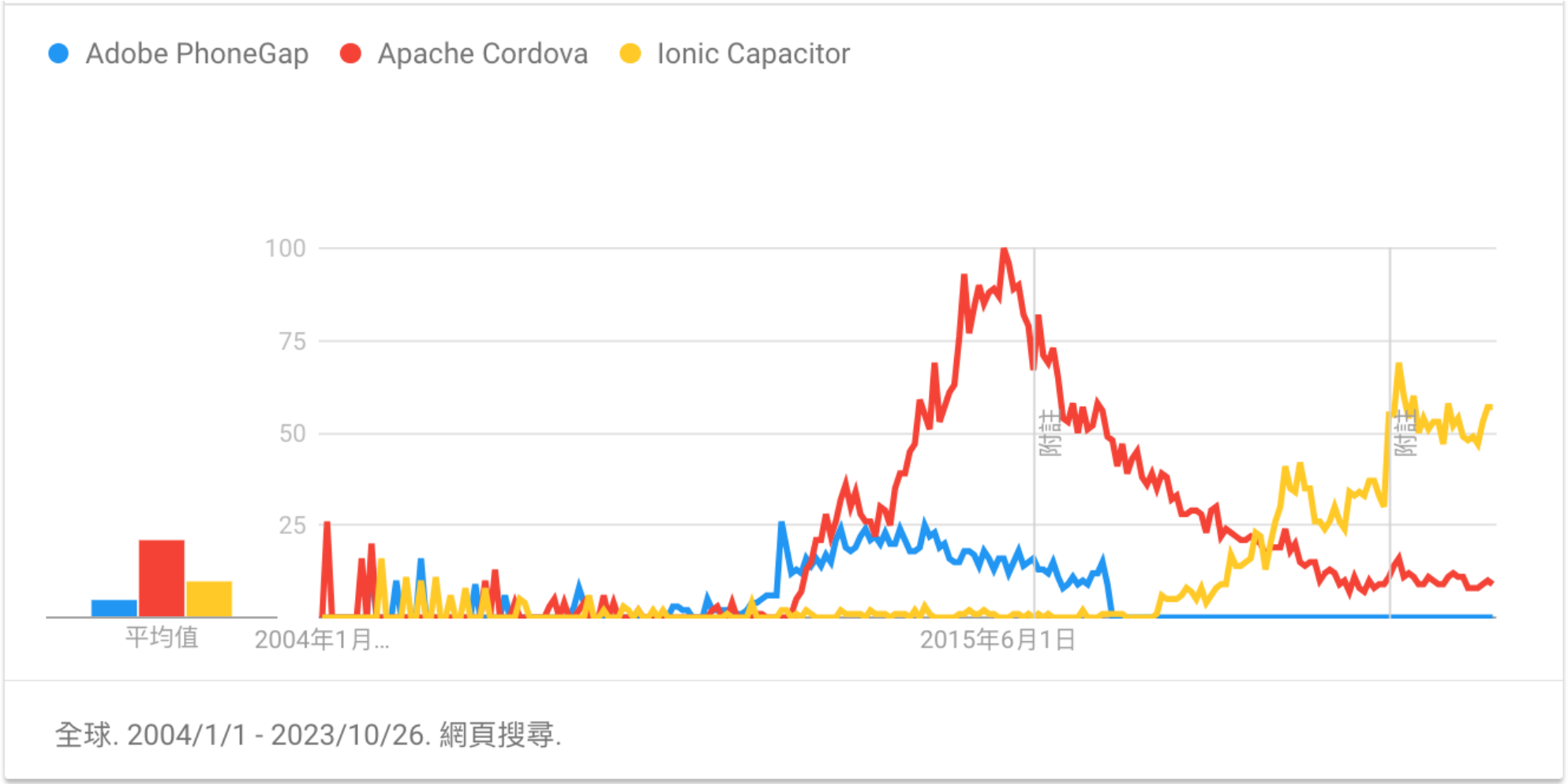
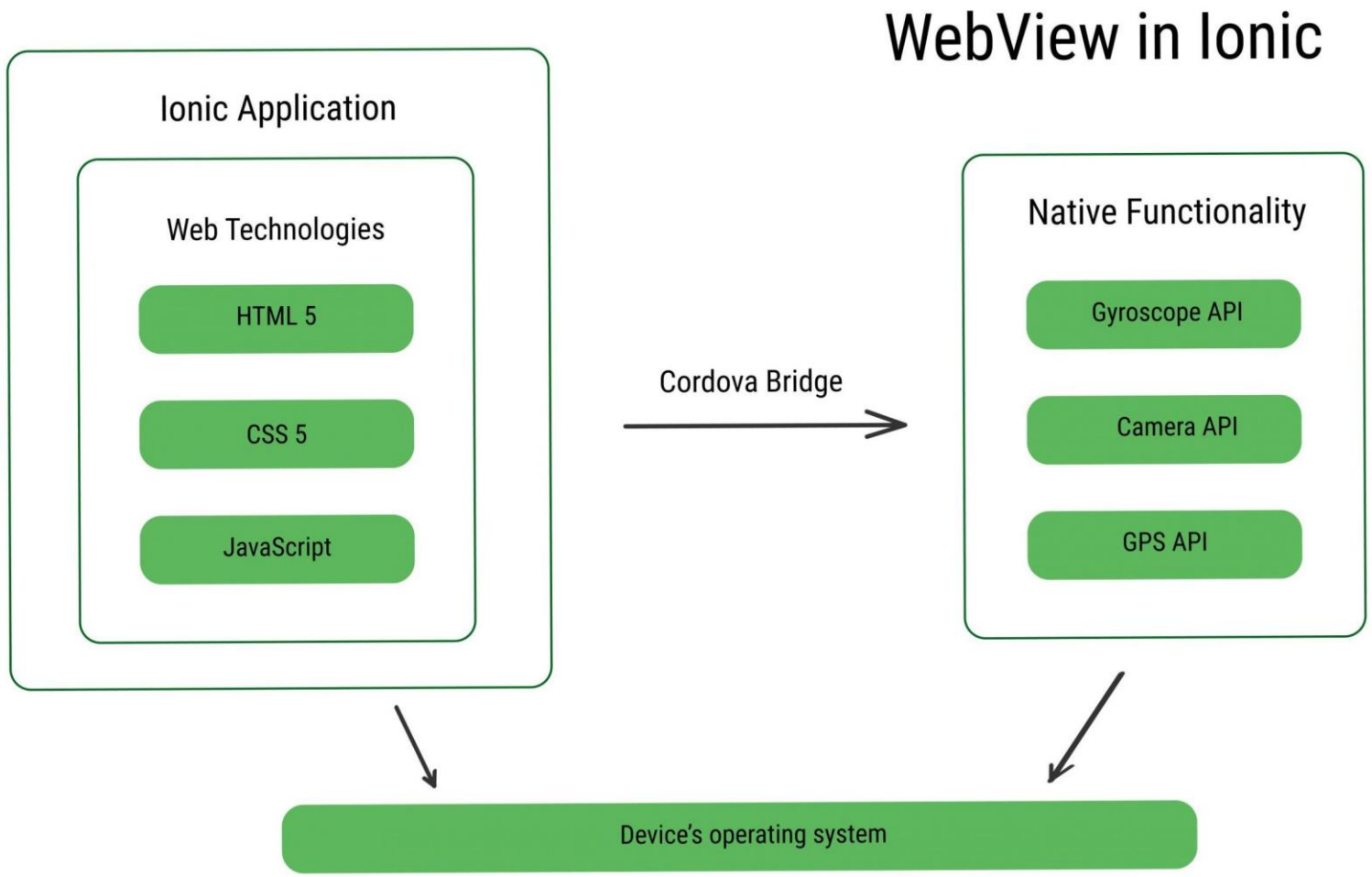
Tools for Developing Hybrid Apps

PhoneGap→Cordova→Capacitor



Capacitor by Ionic

Best tutorial @ Official website

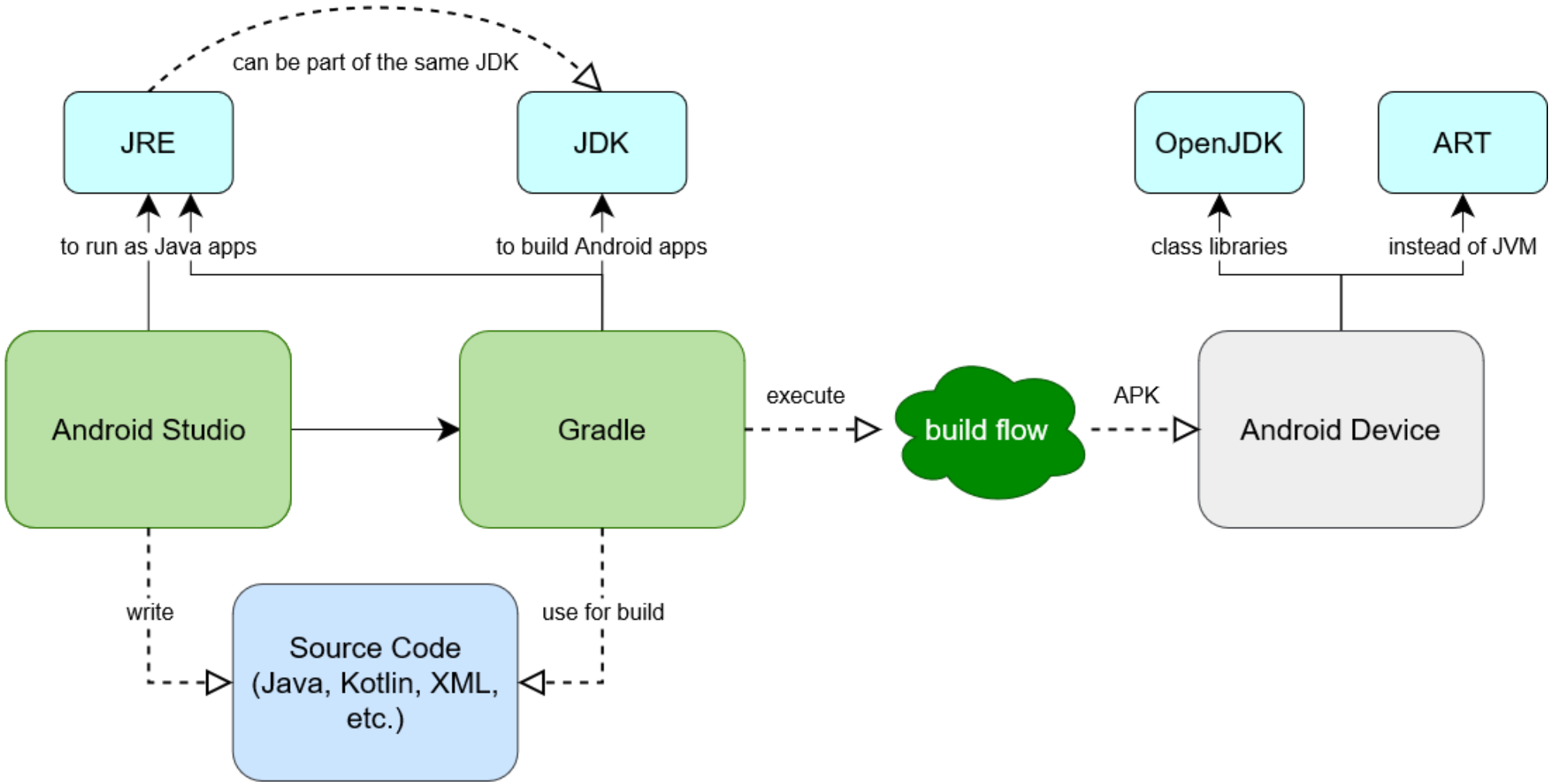


List of Official Plugins

- Action Sheet
- App Launcher
- App
- Background Runner
- Browser
- Camera
- Clipboard
- Cookies
- Device
- Dialog
- Filesystem
- Geolocation
- Google Maps
- Haptics
- Http
- Keyboard
- Local Notifications
- Motion
- Network
- Preferences
- Push Notifications
- Screen Orientation
- Screen Reader
- Share
- Splash Screen
- Status Bar
- Text Zoom
- Toast
- Watch

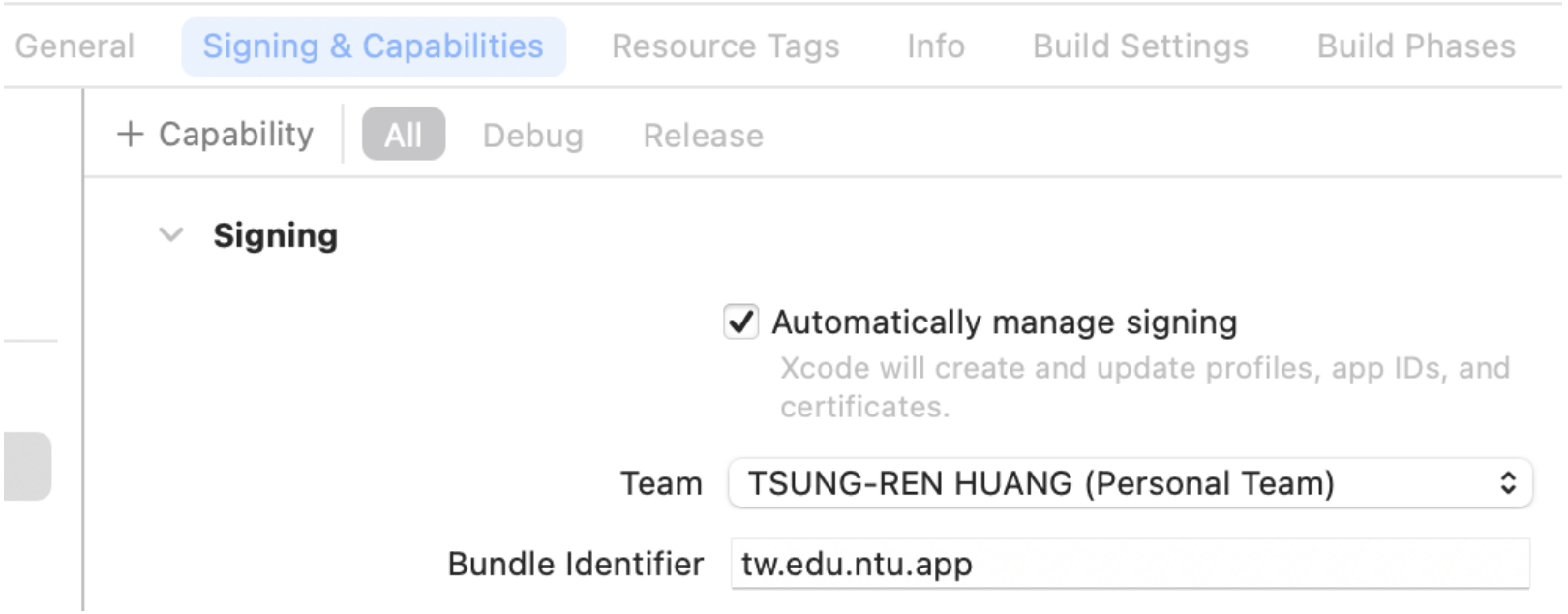
Port Capacitor Apps to Android

You need to install Android Studio first



Port Capacitor Apps to iOS

Besides having a Mac to install XCode…



```
<key>NSPhotoLibraryUsageDescription</key>
<string>Photo Library Access Warning</string>
<key>NSPhotoLibraryAddUsageDescription</key>
<string>This app requires access to the photo library.</string>
<key>NSCameraUsageDescription</key>
<string>Camera Access Warning</string>
```

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Developing Hybrid Apps

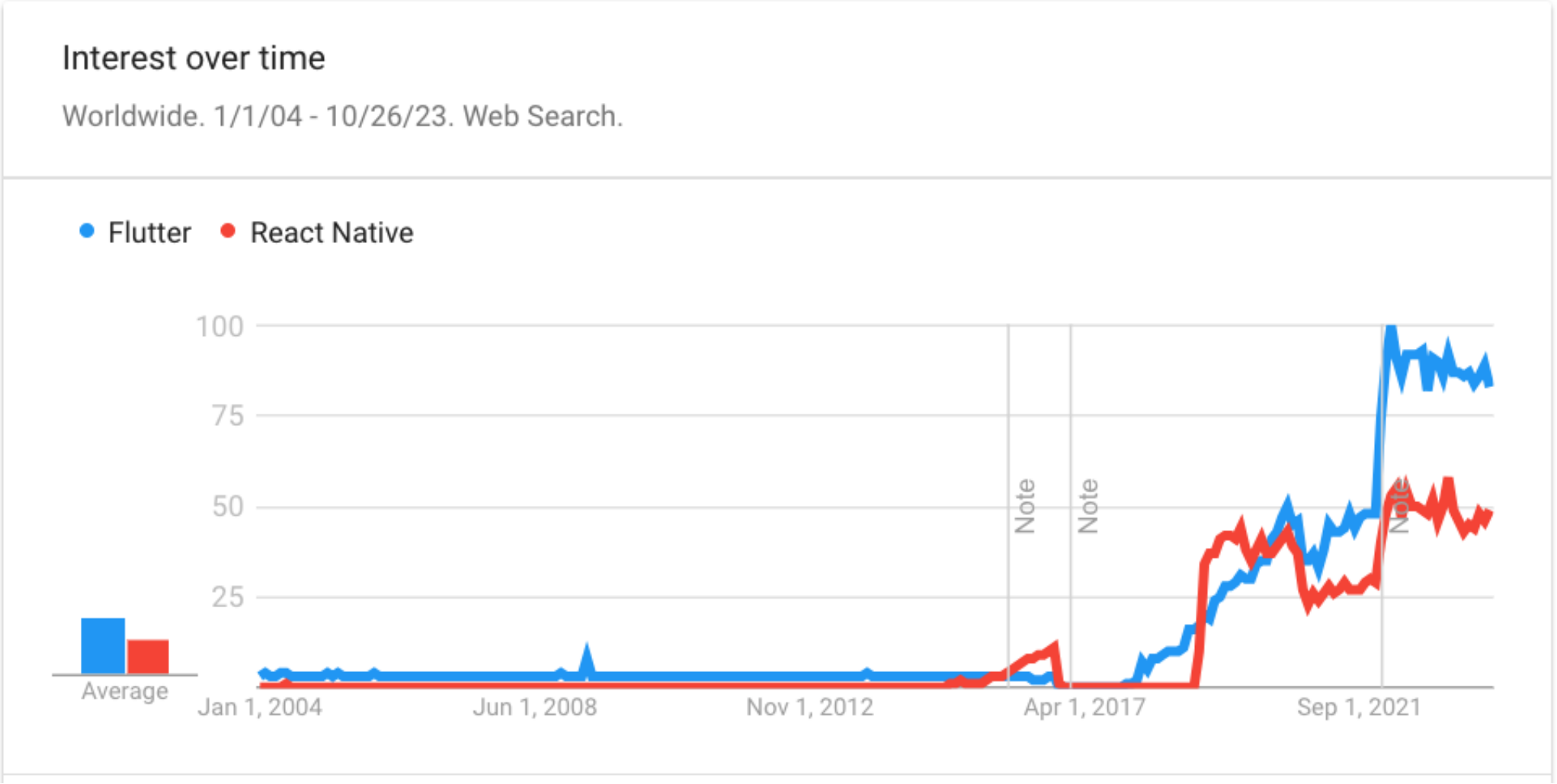
Cordova & Capacitor

Developing Compiled Apps

React Native

Tools for Developing Native Apps

Flutter is actually the hotter one



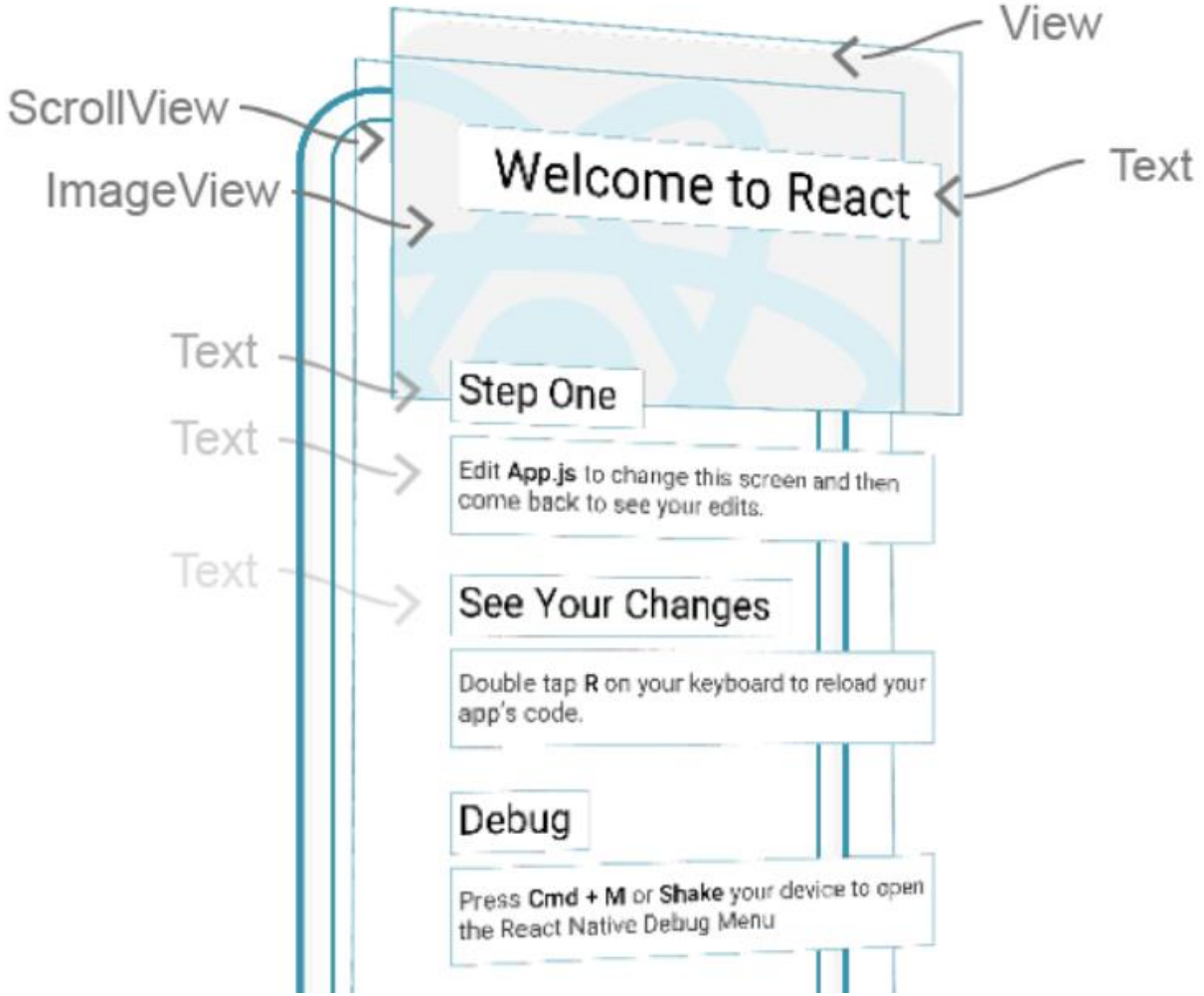
React Native vs. Flutter

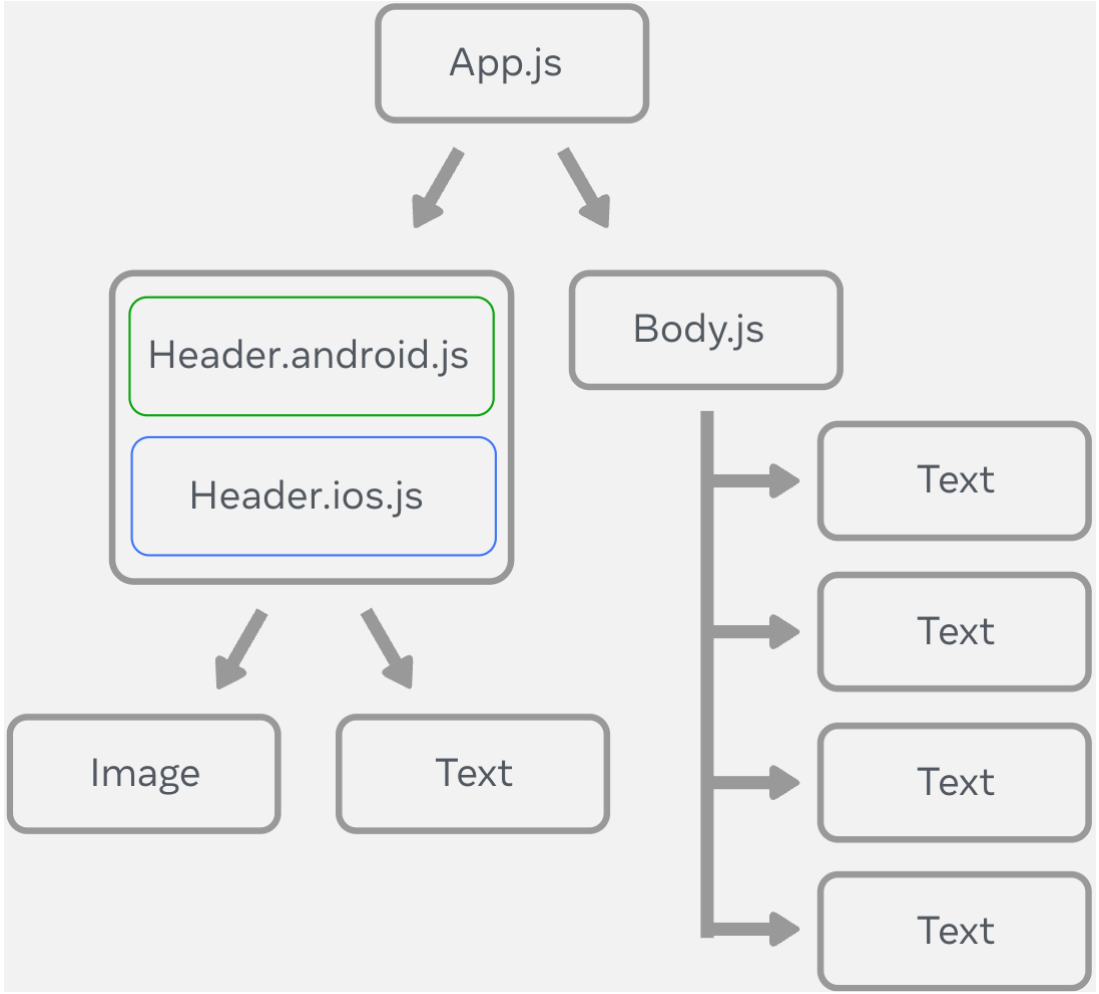
We irrationally choose React Native for edu. purposes

Parameters	React Native	Flutter
Launch Date	March 2015	May 2017
Developers	Facebook	Google
Programming Language	JavaScript	Dart
Framework Libraries	Third-party libraries	In-built app components
Native Experience	Good	Superior
Hot Reload	Good	Superior
Documentation	Up-to-date but not accurate	Precise and up-to-date

React Native: Reusable Components

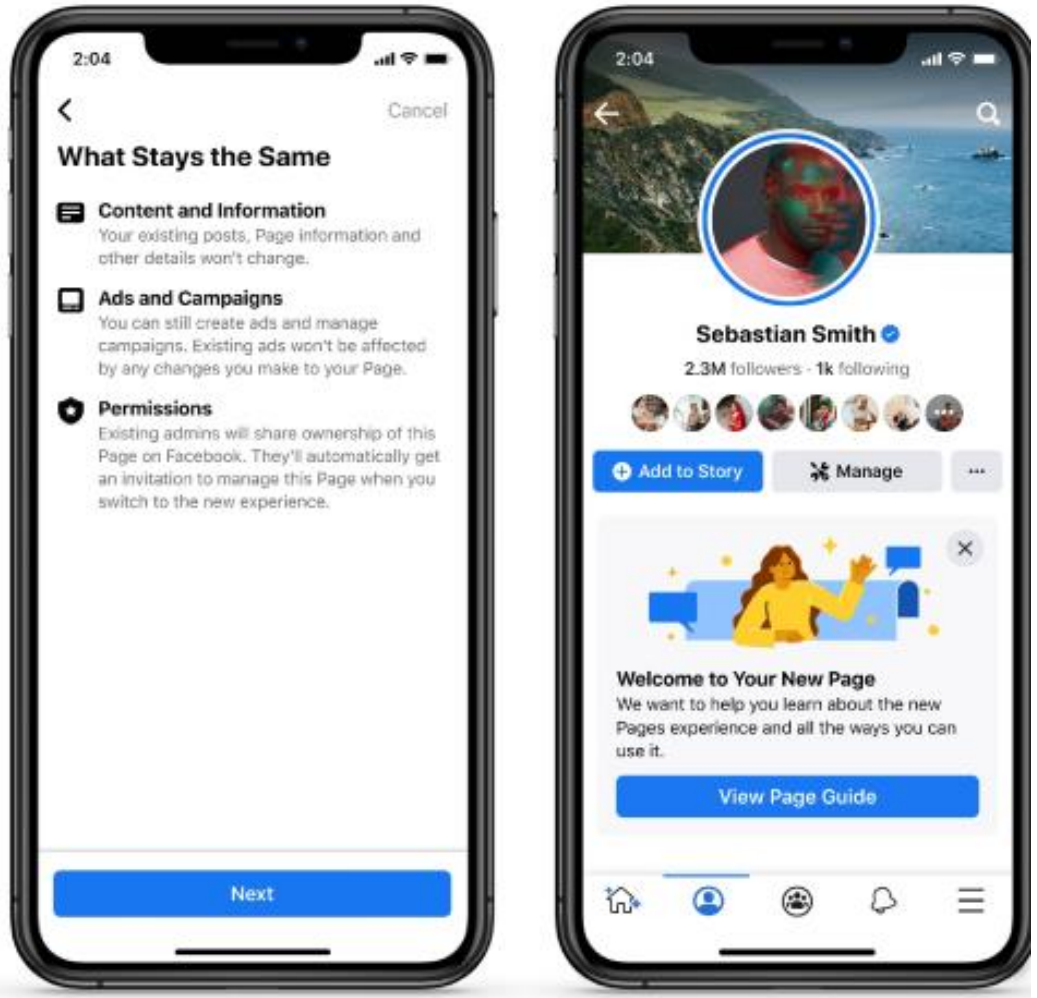
Best tutorial @ Official website

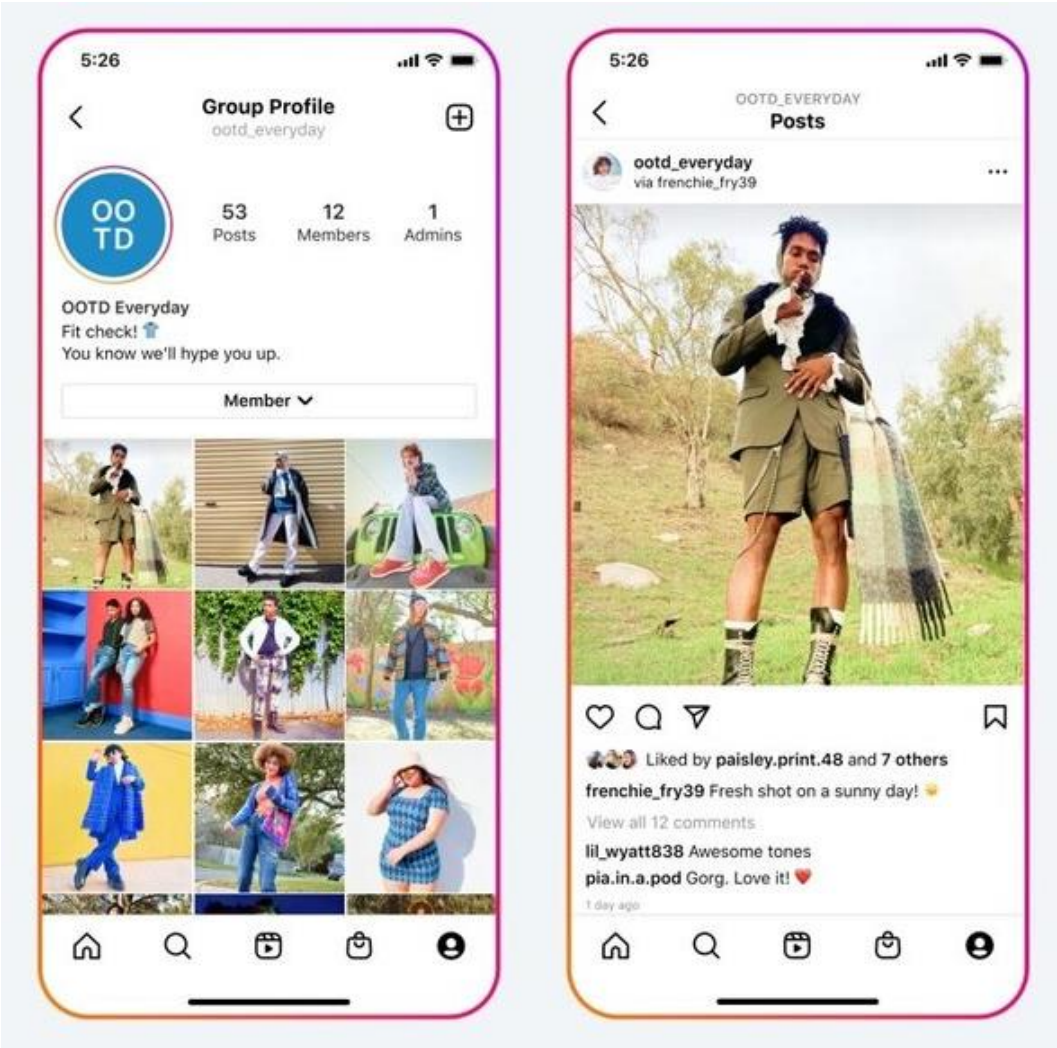




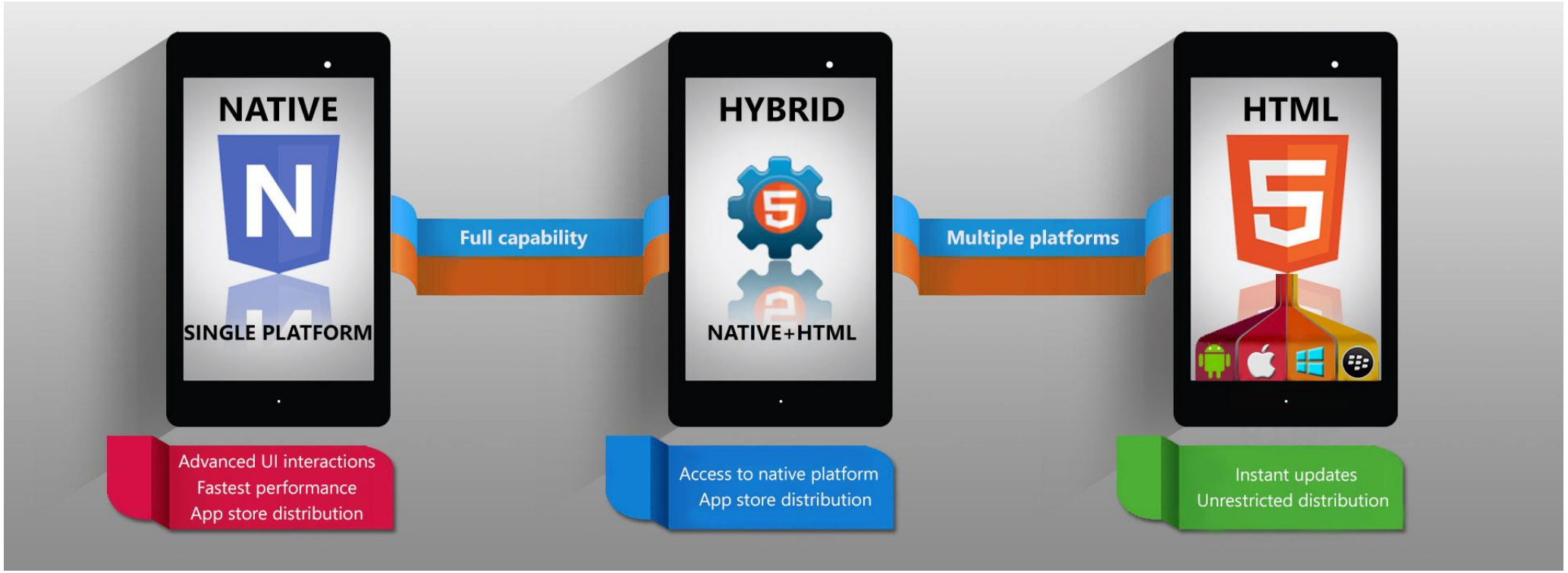
Who uses React Native?

FB & IG eat their own dog food





Summary: Hybrid apps are recommended



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Game Over