2017 GUIDE TO UNDERSTANDING PROGRESSIVE WEB APPS

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INTRODUCTION

This whitepaper is meant to provide a comprehensive, non-technical overview of the state of Progressive Web Applications in 2017. This is not a developer's guide, but rather is meant to breakdown the key differences between the current application options: native, hybrid, web, progressive; highlight the advantages of building a Progressive Web App; and review the current state of Progressive Web App features and support.

WHAT IS A PROGRESSIVE WEB APP?

A Progressive Web App, or PWA, is a type of web application that leverages the latest browser technology in order to provide an experience closer to a native application, via the web, on mobile devices. The term Progressive Web App was coined in 2015 by designer Frances Berriman and Google Chrome engineer Alex Russell. Progressive Web Apps are installable on any mobile device and offer better performance / faster loading than a traditional web app, and they even work in offline mode like a native application would. We will get more into the defining characteristics later in the whitepaper, but the key takeaway is that a PWA is a web app that is installable on a user's mobile device like a native application but that will work agnostically across any device or platform, and does not require visiting an application store to install.

WHY ARE PWAS A BIG DEAL?

Progressive Web Apps are a meaningful advancement in device/ browser technology, because at their core, native applications are not a sustainable approach to building applications for most companies/ startups. The mobile device industry has always been highly competitive with a number of different companies / platforms battling for dominance at one time. However, the biggest hurdle to success in the market is not in the device or technology itself, but rather is the adoption of the new device by businesses building applications. New devices need to offer and support the user's favorite apps and games in order to be a competitive force in the market place. However, a

company is not going to invest in building a new application every time a new type of device gets released. The classic "chicken and the egg" scenario is often visibly prevalent in the advances of many new technologies. In this case, you need the apps to get the users, but the users to get the apps.

Progressive Web Apps reduce the barrier of entry for new device technologies, and also save businesses a huge amount of money by offering one solution that will work seamlessly across any device- from desktop to tablet to mobile to whatever the future holds. As long as the device supports a browser, the Progressive Web App will look and work like a native application would. Adopting PWA technology will allow hardware manufacturers to more rapidly evolve devices, and allow for new technologies to enter the market more quickly and without as high of a cost of entry.

THE HARDEST PROBLEM WITH SOFTWARE IS DISTRIBUTION.

BRIEF HISTORY

WHEN WERE PWAS CREATED?

Web applications have been around since ~1995 when Netscape first introduced the client-side scripting language Javascript back in the early days of the web. However the concept of a Progressive Web App is relatively new. As stated previously, the term was coined in 2015, and the concept and standards of what defines a PWA has been evolving rapidly ever since.

Previous to the creation of PWAs, the concept of using web technology to build native applications was not exactly new. There were many options to allow developers to build web applications that "worked like a native application". A few examples of the possibilities pre-PWA:

Adobe AIR Applications

Windows Store Apps

Chrome Packaged Applications

Firefox OS Packaged Applications

Cordova/PhoneGap and Crosswalk Apps

BlackBerry WebWorks Apps

W3C Widgets (these enjoyed several implementations)

WebOS Apps

Chromium Embedded Framework

Electron

But, there was no universal standard, and at their core each implementation was different and none of them were really "the web." The inevitable trade-off is the loss of linkability in order to gain an app-like look and feel. The concept had long been in motion, but it was the Chrome team that began to define the standard and push the progress of the technology.

PROGRESSIVE ENHANCEMENT MEANS THAT EVERYONE CAN ACCESS THE BASIC CONTENT AND FUNCTIONALITY OF A PAGE IN ANY BROWSER, AND THOSE WITHOUT CERTAIN BROWSER FEATURES MAY RECEIVE A REDUCED BUT STILL FUNCTIONAL EXPERIENCE.

WHO IS SUPPORTING THE ADVANCEMENT OF PWAS?

Progressive Web Apps were initially just a vision of the Google Chrome team, but Mozilla Firefox quickly joined the movement in November of 2015, and in 2016 the Microsoft Edge team joined forces to help continue to define and promote the standards of PWAs. Many device manufacturers, like Samsung, are big proponents of Progressive Web Apps, and have been supporting the advancement of the technology for sometime. However, the biggest roadblock to the rise of PWAs has been Apple.

Apple has been reluctant to join the growing PWA trend, and as a result there has been a big delay in the spread of the technology. PWAs cannot be a reliable replacement to native applications if they do not work on one of the most popular devices / browsers (Safari). In early August 2017, there were signs of Apple actively developing service workers, which is a key technology required by Progressive Web Apps. But it wasn't until Jonathan Davis, Apple's Web Technologies Evangelist, confirmed that the team was actively working on PWA technology on August 3 that the future of Progress Web Applications was solidified.

OVERVIEW OF PROGRESSIVE WEB APPS

DEFINING FEATURES

There are several key features that make a web app “progressive”. These apps are just regular web apps that “took all the right vitamins.” They keep the web’s approach of ask-when-you-need-it permissions, and add in new capabilities to make them more app like.

Progressive - Works for every user, regardless of browser choice because they’re built with “progressive enhancement” as a core tenet.

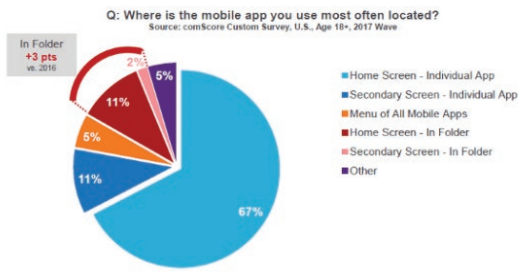
Responsive - Visual Display adapts to fit any form factor: desktop, mobile, tablet, or forms yet to emerge.

Connectivity Independent - Service workers allow work offline, or on low quality networks.

App-like - Feel like an app to the user with app-style interactions and navigation.

Fresh - Always up to date thanks to the service worker update process.

Safe - Served via HTTPS to prevent snooping and ensure content hasn’t been tampered with.



67% OF USERS USE THEIR APPS FROM HOME SCREEN THE MOST

Discoverable - Are identifiable as "applications" thanks to W3C manifests and service worker registration scope allows search engines to find them.

Re-engageable - Make re-engagement easy through features like push notifications.

Installable - Allow users to "keep" apps they find most useful on their home screen or app drawer without the hassle of an app store.

Linkable - Easily shared via a URL and do not require complex installation.

KEY ADVANTAGES

Progressive Web Apps attempt to take the best features of native apps and the best from traditional web apps and make them available to users via a technology they are familiar with, the web browser.

A few of the key advantages of PWAs include:

Show in Search - Unlike native apps, PWAs are discoverable. Users can find the application content through a standard Google search, and then view the content without installing an application. If they choose to install the PWA, they can do so without ever leaving their browser.

Shareability - One of the most frustrating things about mobile apps, is the inability to share content with other users. Native apps do not have the concept of a URL, so there is no inherent way to share the content with other users unless those tools are built into the application. PWAs solve this problem by being built with web technology. Web Apps do have the concept of a URL, so pages are easily linkable without additional development work.

Cost - This one should go without saying. Instead of building and maintaining 3+ separate applications (website, iOS, Android, other), there is finally one application to rule them all! Build a PWA, and it will work seamlessly across platform and device.

Performance - PWAs are often architected around an application shell. This shell is cached, and contains the local resources needed to load the skeleton of the user interface. This helps to produce the more app-like responsiveness and load times that have always been the downfall of traditional web apps.

Work Offline - PWAs leverage Web Worker browser technology to be able to cache data so the application will work offline or with low quality networks.

Consistent Experience - PWAs offer the ability to provide a consistent responsive user experience no matter what device your users are on. Your app looks and feels like your app, it is just optimized for the size and functionality of the device it is viewed on.

Low Bar of Initial Engagement - One of the biggest drawbacks to traditional apps is the high cost of the initial engagement. Users must find your app, approve of all of the potential permissions, and install your app, before ever being able to engage with your content. PWAs offer content first, with options to install available later.

As Needed Permissions - As mentioned, PWAs keep the web's approach of ask-when-you-need-it permissions, so the user does not have to make a heavily weighted upfront decision about app permissions (whether they would use the functionality or not). This is definitely one of the biggest deterrents to any user installing a new native application. PWAs allow users to approve/deny permissions for the app as they use it. So they can engage first, and approve permissions later as needed.

GOOGLE'S CASE STUDY COMPARING PROGRESSIVE WEB APPS TO NATIVE APPS FOUND THAT PROGRESSIVE WEB APPS SEE A 68% AVERAGE INCREASE IN MOBILE TRAFFIC AND A 52% INCREASE IN CONVERSIONS.

DISPELLING THE MYTHS

THE DIFFERENCES IN APP TYPES: NATIVE, WEB, HYBRID, PROGRESSIVE

There is a lot of confusion about what exactly a Progressive Web App is, or how it differs from a native, web, or hybrid app. It is most commonly confused with a hybrid app, but a PWA is an entirely new concept trying to solve the problems/gaps created by the available app types.

NATIVE

A computer program that runs on "native code," that is, it uses the system's default resources with minimal computational overhead or additional components needed. Native applications are built for a specific platform, but as a result have high performance capabilities and access to device resources and functions not available to traditional web applications.

AVAILABILITY: DEVICE SPECIFIC
PERFORMANCE: HIGH
ACCESS TO CORE FUNCTIONS: YES
WORKS OFFLINE: YES

WEB APP

A client-server computer program in which the client runs in a web browser. Traditional web apps include: webmail, online stores, wikis, instant messaging services, and more. Unlike a native application, web apps are confined to a browser, and have limited access to device features.

AVAILABILITY: ANY BROWSER
PERFORMANCE: LOW - MEDIUM
ACCESS TO CORE FUNCTIONS: LIMITED
WORKS OFFLINE: NO

IT WAS ALSO REVEALED THAT PROGRESSIVE WEB APPS ARE 15 TIMES FASTER TO LOAD AND INSTALL ON AVERAGE, AND REQUIRE 25 TIMES LESS DEVICE STORAGE COMPARED TO NATIVE APPS.

HYBRID

A mobile website or web app embedded inside of a native app wrapper. Hybrid apps allow companies to save on cost by using one web app for the core functionality, which reduces the time and effort of developing a native application. They often leverage hybrid frameworks like Cordova or PhoneGap to develop native apps using web technologies.

AVAILABILITY: DEVICE SPECIFIC
PERFORMANCE: LOW - MEDIUM
ACCESS TO CORE FUNCTIONS: YES
WORKS OFFLINE: YES

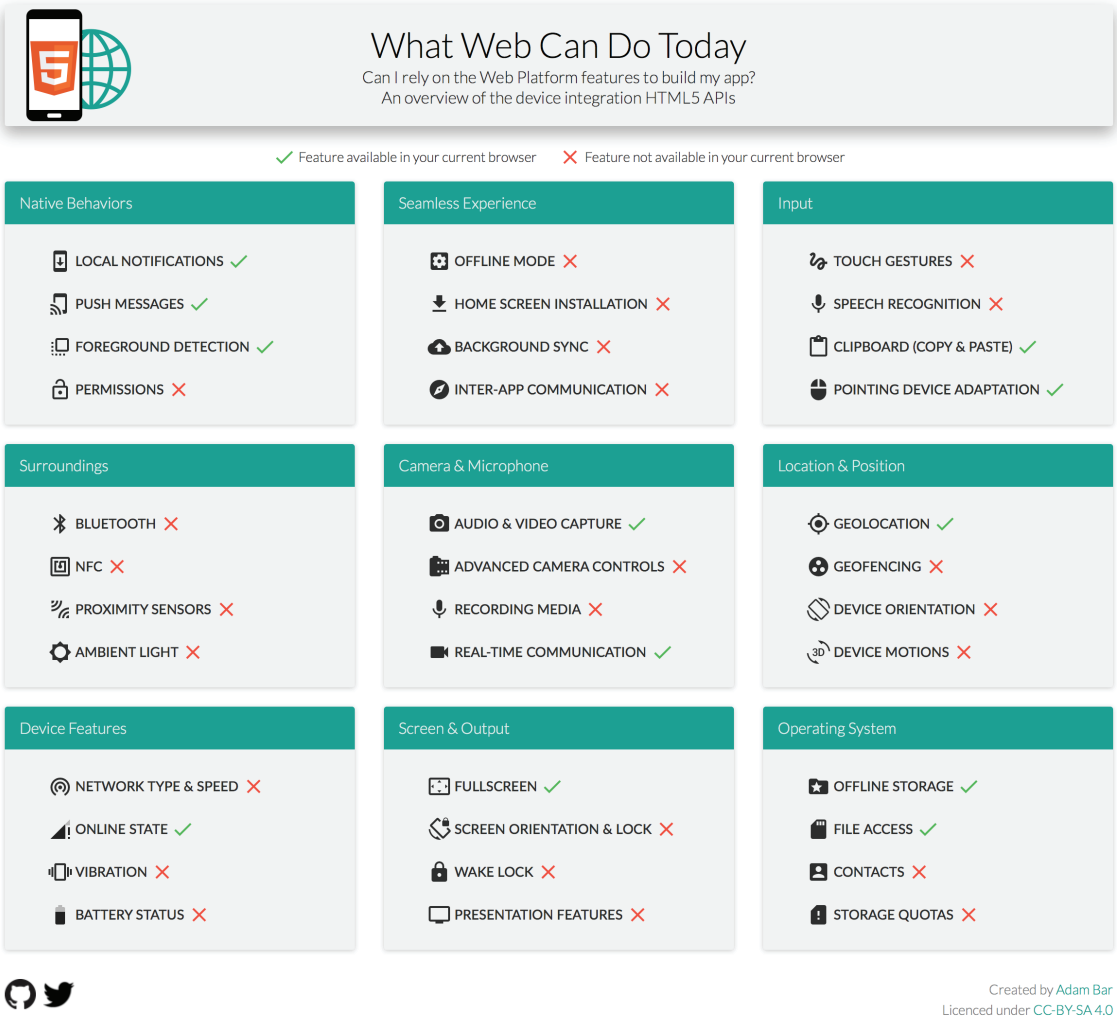
PROGRESSIVE

A Progressive Web App is a web application leveraging the latest browser technologies to bridge the gap between native and web. These apps are viewable in a browser, but also installable to the user's device. The app has access to more core device functions and can run as a standalone display as well as work offline.

AVAILABILITY: ANY BROWSER OR DEVICE
PERFORMANCE: HIGH
ACCESS TO CORE FUNCTIONS: YES
WORKS OFFLINE: YES

NATIVE FEATURES AVAILABLE TO A PWA

Another common misconception is the features that people think are available to a Progressive Web App. Many companies (startups specifically) believe that they have to create a native app in order to leverage certain device functionality. That may have been true at its conception, but today nearly all native features are available to a PWA. Below is a screenshot from September 2017 showing the native features that Progressive Web Applications can leverage.



While some functionality still requires a native application, most popular applications today could be completely rebuilt with a single Progressive Web App.

CURRENT POPULAR PWA FRAMEWORKS

Building a PWA does not require a certain framework. Any web application can be improved and expanded to work as a PWA. That being said, several popular frameworks have started to come forward as leaders of this new technology. One of the reasons for this is that PWA performance and responsiveness is limited by the size of the application framework as that is a large part of the initial load of the app. PWA-first frameworks combined with the development of an application shell help to reduce the size of the initial load to give users something visible to interact with faster.

PREACT

A 3kb alternative to React which leverages the same ES6 API. This framework was built to help React developers start making extremely fast PWAs faster and with little learning overhead. Built to be as small as possible, offer lightning fast performance, and allow developers to be instantly productive.

Companies using Preact: Uber, Lyft, Pepsi, Smashing Magazine, The New York Times, and Native Instruments.

https://preactjs.com/

VUE.JS

A progressive javascript framework for building user interfaces. It was built from the ground up to be incrementally adoptable so that it can easily scale from a library to a full-featured framework. Vue has one of the lowest learning curves, and is one of the fastest frameworks around.
Companies using VUE: Facebook, Alibaba, WizzAir, Grammarly, Gitlab, and Laracasts.

https://vuejs.org/

POLYMER

An open-source project led by a team of front-end developers from the Google Chrome team. The platform is focused on exposing underlying browser technologies directly as well as building tools to help developers build modern Progressive Web Apps that take full advantage of cutting-edge platform features.

Companies using Polymer: McDonalds, Coca-Cola, USA Today, EA, Dominos, Salesforce, and Victoria's Secret.

https://www.polymer-project.org/

ANGULARJS

Angular is a popular javascript framework made by the developers at Google. Angular is a MVW style app built to speed up development from prototyping through deployment. Angular delivers the productivity and scalable infrastructure that supports Google's largest applications. Additionally, the new Angular4 leverages the latest in browser technologies to provide PWA-ready applications with high performance, offline mode, and zero-step installation.

Companies using Angular: Netflix, Lego, YouTube, PayPal, jetBlue, iStock, and the Guardian.

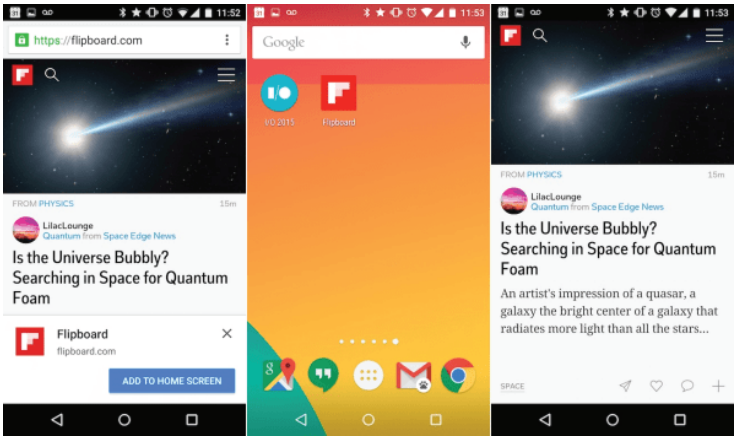
https://angular.io/

THE STATE OF PWAS IN 2017

Progressive Web Apps have only been around since 2015, yet their speed of advancement and acceptance has been impressive to say the least. You have to stay up-to-date with the latest data to make an informed decision about whether building a PWA is right for your organization. However, with such a rapidly evolving technology it is sometimes not clear when the right time to invest is.

THE PURSUIT OF BETTER WEB APPS ISN'T JUST ACADEMIC. PROGRESSIVE WEB APPS HAVE A REAL-WORLD ADVANTAGE, RUSSELL SAYS, IN THAT THEY DON'T HAVE TO PROVE THEIR VALUE TO USERS UP FRONT.

While initially just a focus of the Google Chrome team, both Mozilla Firefox and Microsoft Edge teams joined the cause in late 2015 and 2016 respectively. However, the future of PWAs was not fully solidified until Apple announced it had begun development on the technologies in August of 2017. This was a major cause for celebration, because without the acceptance of the iOS team the technology had no future, since the core point of it is to allow one application to work agnostically across all browsers and devices. This would be impossible without the support of the company with the second largest mobile market share in the world.



The great thing about Progressive Web Apps is that they use "progressive enhancement" - meaning they only use technology that is available on the current platform, and degrade to older technologies when newer ones are not available. By doing this, PWAs are not an all-or-nothing technology. A PWA can currently work fine on an iOS device, just not all of the features will be supported.

Until PWAs are fully supported by Apple, it might be a prudent investment to also build an iOS app along with your PWA. However, unless you are developing an application that requires specific native device functionality, building a Progressive Web App is the right choice. In 2017, companies should be developing PWAs over traditional websites, web apps, or native applications if they want to be forward-thinking and ahead of the curve.

WHO DO PWAS BENEFIT THE MOST

Progressive Web Apps are creating an improved application experience for both users, developers, and businesses alike. Everyone will benefit from this advancement in technology in one form or another, but below we have highlighted a few organization-types that we feel will gain the most from the rise of PWAs:

ONLINE PUBLICATIONS

News and blog sites have a lot to gain from Progressive Web Applications. The discoverability and the SEO impact alone is enough incentive to make the move, but there is a lot more that digital publications will gain from PWAs. The low barrier of entry will allow users to browse the online content, with the ability to easily install the application to their mobile device if they find the content valuable enough. Leveraging the PWAs connectivity, will allow publishers to send push notifications to their subscribers whenever a new article is published in a topic area they are subscribed to. Finally, PWAs provide a lower cost to develop a better experience across all devices. Smaller publications can take advantage of this to create a industry-leading experience without the cost of developing and supporting 3+ digital entities.

STARTUPS

Everyone knows that startups are cash-strapped. They alway have the biggest ambitions, and commonly the smallest budgets. One of the hardest dilemmas facing any new start up is “what application type should I build?” Start ups have to literally choose which audience (iOS or Android) is their “target audience” and which will lead to the highest user acquisition the fastest. The trend is for startups to build an iOS applications, slap together a basic/templated website, and make the Android market wait to see if they succeed or fail before they get an application of their own. PWAs will revolutionize the startup world by allowing them to develop one top-notch experience that works great on any device. So instead of trying to make their budgets stretch to produce three mediocre experiences on three platforms, they can take the time and budget to develop one first-class experience that works agnostically across all mediums (even future devices). Any advancement that helps startups reach more users, and allows them to stretch their budgets for more innovation is a positive step forward for all of us.

SAAS COMPANIES

Software As A Service, SAAS, Companies will benefit greatly from PWAs. Leveraging the technology will increase the reach of their product, while lowering their overhead. Software companies will only have to support one application instead of 3+, which will allow them to spend less time on bug fixes, and more time on feature development. Additionally, feature timelines will be shortened due to simple fact that they will only have to create the feature once for a single application. Progressive Web Apps have the potential to decrease costs and increase profits across the board for the companies with their own software service.

RECENTLY, CHROME ON ANDROID ADDED SUPPORT FOR INSTALLING WEB APPS TO THE HOMESCREEN WITH A NATIVE INSTALL BANNER, JUST LIKE THE NATIVE APP BANNERS WE'RE USED TO.

LARGE CORPORATIONS

Large corporations that have their own custom user or customer portals will also be able to leverage this new advancement in technology. Progressive Web Apps will allow large corporations to develop better portals available across all devices, which will lead to higher adoption rates and increased use. Whether the portal is for an employee, a customer, or a contractor the benefits of building PWAs to replace outdated applications will far outweigh the cost.

E-COMMERCE

Progressive Web Apps have a huge potential to create a big impact in the e-commerce space. Native applications have too high of a bar of entry, and users are only going to install an application for an online store that they use frequently and for everything, like Amazon. Few people are going to go search out an application for smaller e-commerce sites that they visit less frequently. PWAs, however, provide a much lower bar of entry for users. Users will be able to browse the site normally, and can easily install the PWA from their browser if they want to save the application to return to later. Companies will be able to use PWA features like push notifications to keep in direct communication with their buyers to better publicize sales and offer incentives for things like cart abandonment. Many e-commerce platforms are already aware of this huge potential and are creating special versions of their software specific to building PWAs.

CONCLUSION

COLLECTIVELY, THE TOP 1,000 MOBILE WEB PROPERTIES HAVE AN AUDIENCE THAT'S 2.5 TIMES LARGER THAN THE TOP 1,000 MOBILE APPS. THAT REPRESENTS A HUGE OPPORTUNITY FOR PROGRESSIVE WEB APPS.

It is an exciting time for both users and developers as the web continues to evolve and permeate deeper into our everyday lives. In order for technology to continue to advance, the application development process needs to be re-thought. Native applications are not a sustainable approach and are completely unnecessary for 90% of the apps in the iOS/Android markets. But traditional web applications lack the features and performance that user's want from their applications on their mobile devices.

Luckily browser manufacturers have been hard at work evolving browser technology, and re-thinking how users should be able to interact with, and install applications. The creation of Progressive Web Applications has created a bridge between native and web applications to create a "best of both worlds" approach that tries to bring the most value and the best experience to both users and developers.

While the technology is still in its infancy, it is definitely more than stable and the recent announcement that Apple is working on the technology has solidified its place in the future. Digital industry leaders are already using the technology to create next-generation web apps focused on performance, connectivity, and built on a device-agnostic medium. However, now the technology has reached a point where it is ready for smaller, forward-thinking companies to begin to leverage the technology to minimize cost and maximize the experience that they create.

If you are ready to step into the future, contact us to learn more about how a Progressive Web App can help propel your company ahead of its competition.

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CITATIONS

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