Abstract in English

Will traditional Applications be replaced by Progressive Web Applications (PWA) ?

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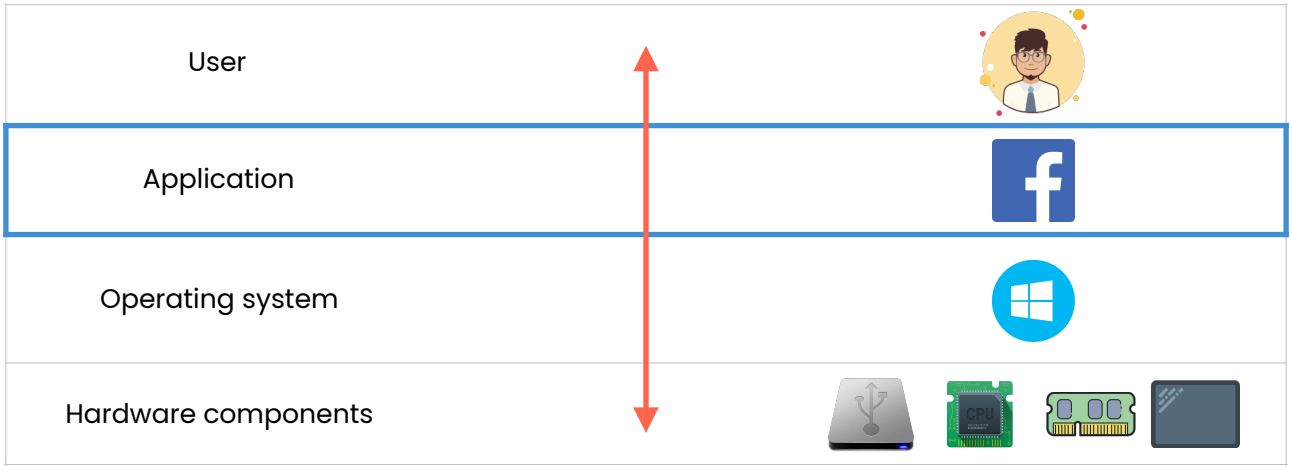
I - Présentation générale

1.1 - Introduction

We always use applications. They can be installed on our smartphones, tablets, desktop and mobile computers, watches, or on robots explorers going to March. We don't all have a Martian robot, but applications represent what is computing in the broad sense. Without application(s) nothing would happen in the electronics of our devices.
Today, finding one's way in the middle of all the devices and applications that come in different forms is a real headache.

1.2 - Qu'est-ce qu'une application ?

The application is the highest computing layer that the user will use. Thanks to the application, the user use the various components of his device.
Please note that the 3 terms "Application", "Software" and "Program" refer to the same thing, although by convention we use them in different contexts. An App is often used as a diminutive "mobile app" but nothing differs with "software" and "program". The term software is often associated with a heavier solution for desktop computers and laptops, the programs themselves, rather in industrial automation and IOT. But the 3 terms are interchangeable and in the following document only the term "application" will be used.



Please note that the operating system is an application. But dont complicate things :-)

II - Les différents types d'applications

2.1 -There is 2 family of applications

There are 2 different application families which are '**native**' applications and '**web**' applications. These applications are different both in the way they are developed and in the way they work.

Different things can motivate a choice of an application :

- Available features (Bluetooth, offline availability)
- Performance (speed, fluidity)
- Adaptability to different devices (screen size, OS, processors)
- Costs (initial development and maintenance)
- Channels of distribution (By the web, by a store of certified applications, ...)

Applications from "native" family		Applications from "web" family	
Natives Applications	**Natives hybrid** Applications	**Progressives Web** Applications	**Web** Applications
Description : Classic application that can be downloaded from a store.	Description : Similar to the native application, except that it borrows technologies from web applications and makes it easy to export to different devices	Description : C'est une application web qui emprunte des fonctionnalités issues des applications natives.	Description : It is a web application that borrows features from native applications.
Exemple : Twitter application from the l'app store.	Exemple : ...	Exemple : Twitter web application, when installed on the home screen, is a PWA.	Exemple : Twitter web site.

2.2 - Natives applications

Native application is developed specifically for one of the targeted operating systems (MacOS, Ubuntu, Windows, iOS, Android, etc.). For example, **native applications** for iPhone are developed with the Swift development language and usually use libraries available only on iOS

Disadvantages :

❌ **Devices of different sizes** With native applications =, it's complicate to manage different screen sizes	❌ **Operating systemsare différent** An an=pplication made for Windows 10 will not run on an iPhone with iOS.	❌ **Operating systems updates** Updates can make both bugs or completly broke the application.

2.3 - Web applications

A **web application** is an application developed in the manner of a website, accessible and executable by an Internet browser. A webmail, an online banking service or a search engine are **web applications**. "Web applications" are in opposition to "native applications".

Disadvantages :

❌ **No offline mode** A web application can't be run without an internet access	❌ **Pas de NFC** Web application can't use the NFC chip	❌ **Pas de Bluetooth** Web applications can't use the Bluetooth chip

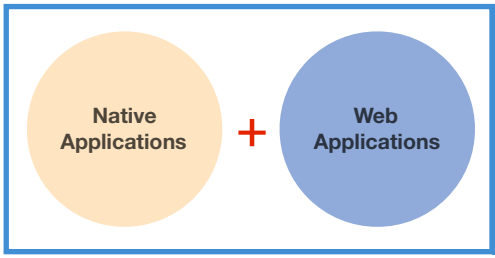
III - Progressive Web Applications

Introduction

A progressive web application (PWA) is an application that is technically "halfway" between a web site or application and a "traditional" native application.

Features

A progressive web app (PWA) can be defined by simplification as a form of web application (or website) that can be accessed directly from an internet browser and which, after authorization and installation, can be used as a native application with the advanced features of the device (camera, geolocation, Bluetooth, etc.).

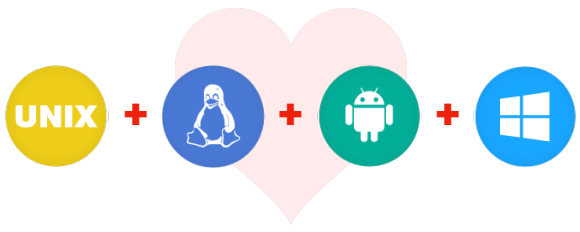


A PWA is theoretically compatible with all available features, from native applications to web applications.

Operating system

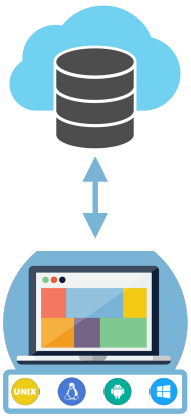
The PWA is primarily a web application. It is therefore technically compatible with any operating system that has an internet browser. When the PWA is installed on the device, it runs through the web browser but in an invisible way for the user. That is without the navigation bar or other interface elements specific to the browser.

Only one PWA is compatible with all operating systems of all versions and processor architectures. The only prerequisite for its use is a web browser.



Only one application ⭐

The PWA is primarily a web application. It uses the same software and hardware components. As represented by the diagram opposite, the PWA works within the Internet browser (Safari, Firefox, Chrome, Edge ...) which run the application.



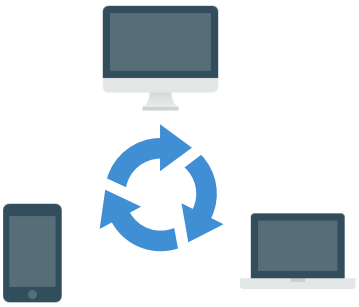
- Internet
- Web server distributing an application
- data
- Web browser
- Operating system

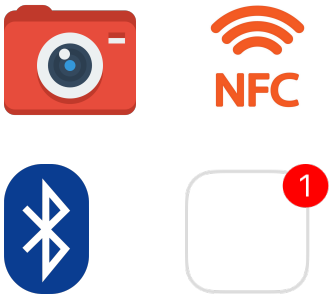
Web but also offline ⭐

This is innovation number 1. Once installed, the PWA can be run without requiring an internet connection. And this, while being a 'web' application.

Synchronisation made easy ⭐

Synchronization is in the brain of the Progressive Web App. So if you need to build an application that needs to be able to run both online and offline, that this same application needs to sync its data online after being used offline, then the PWA is most likely the solution you need. This is the foundation of the PWA.





The best of two worlds ⭐

The PWA being a web-based application has various advantages such as being compatible with any device. But it has nothing to need from a native applications because it has features that are usually reserved for them.

IV - Study of what exist

4.1 - Today's problem

The problem we face today in the field of applications is that we must make a decision on which type of application to choose. However, the two types of "**web**" and "**native**" applications respond for each to different needs, and each have their advantages and disadvantages. therefore it's necessary to have a global vision of what is being done today to make good technical decisions, during a project or a corporate strategy.

4.2 - Towards a single entity?

The current situation regarding the applications

Although very exciting and interesting, the world of applications is a puzzle more and more complicated to understand. There are different types of applications, each with its own specificities. After having the idea and having thought of how to turn it into a successful application, it must be remembered that each type of application does not necessarily address the same needs. That's why it's important to understand the different types of applications.

What technical decision ?

In order to make a relevant technical choice, it is essential to have a vision as well as a global understanding of what is a native, hybrid, web, progressive, mobile, desktop, responsive application. head begins.

Towards homogenization of applications

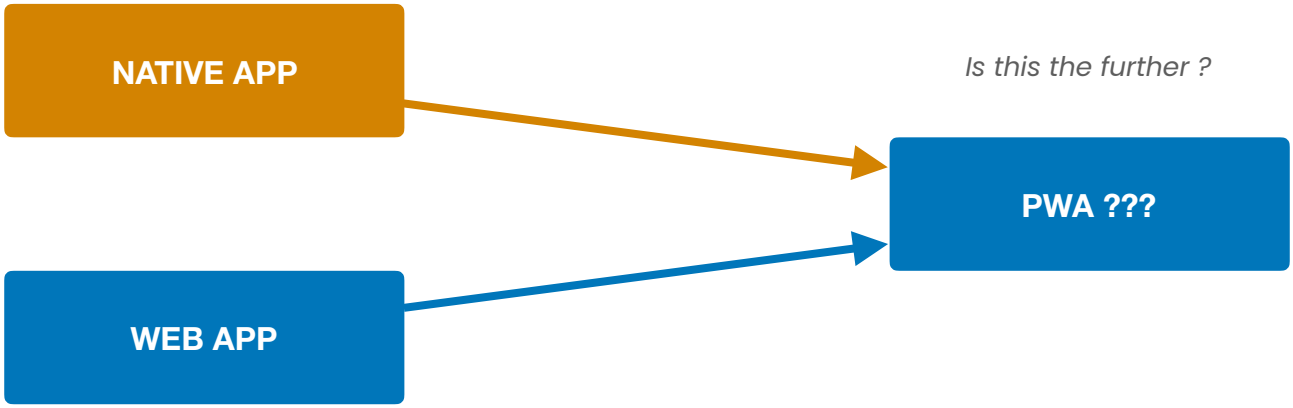
Today, the technical choice of the solution should not be taken lightly. Web-based applications are similar to native-type applications and vice versa. The features and performance are now similar.

Limited short-term risk

We can therefore say that the risk in the short term is limited, since we can go where we want with any type of application. It is true. But in the longer term the deal changes.

Long-term risk

Where the risk is present, it is on the long-term sustainability and if ROI (return on investment) is expected to be long. Indeed, the different types of applications seem to be moving towards a single entity, which seems to be the PWA.



PWA is a web application ++

That's the question. Will there be a common entity? Will the joint entity be a PWA ? Indicators say yes. According to this reasoning, for a long-term solution, the web applications, or better the PWA, seem to be an ideal solutions because their evolution over time will be ensured by means of updates, without having to redevelop everything from scratch.

4.3 - They have PWA

If you still think that a responsive mobile website is enough for your business, you are wrong. Some of the biggest brands have, or are in the process of adopting, PWAs. Among them we find :

- **Twitter**
- **L'équipe**
- **Trivago**
- **Forbes**
- **Starbucks**
- **Pinterest**
- **Flipkart**
- **Ola**
- **....**

These companies highlight the following elements:

- Full offline features
- Less data use
- Fast, responsive, native-quality performance and animation
- Higher conversion rate (once the app has been added to the home screen)
- Increase the number of active users and the interaction rate
- More time of use
- Higher re-engagement rate
- Increase number of pages per session
- Increase the number of address shares
- Decrease in the rebound rate

V - Study case

5.1 - Présentation of TRACY project

In 2015, DAVI developed a solution called "TEMIS" for the customer KREMER. Today renamed "TRACY", this solution aims to facilitate the process of regular control of industrial equipment. It makes it possible to trace and follow the lifecycle of a device in a reliable and less restrictive way, by the use of NFC tags placed on the equipment and which allow their identification.

5.2 - What is needed

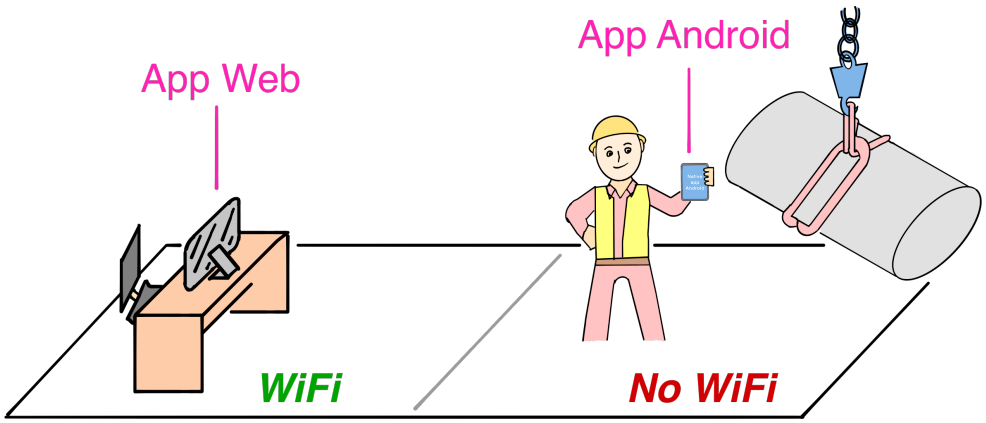
Today, the rigid architecture implemented for the TRACY solution must be re-developed. This is an opportunity to learn about alternative solutions and see if it is possible to use PWA.

5.3 - The existing

The control solution, to meet the needs of customers must be usable even in the absence of internet connection. Indeed, several equipment in the companies of the users of the application, are located at locations where an internet connection is not possible or too restrictive to set up. To meet this need, the technical choice was to go through the use of 2 applications.

The first is a web application based on the Drupal CMS. This application requires an internet connection to be used. It allows to administer all the data.

The second application is an Android native application that can be used even if there is no internet connection. It allows controllers to control equipment (for example from a factory) even when the internet connection is not available.



4.4 - Can a PWA answer the problems of TRACY ?

If we take back the TRACY solution as a whole, two different applications are not a need but a necessity related to current technological locks. Indeed, if we take again the table below, a web application alone can not answer all the needs. A native application alone can not either. This is the reason why today two applications must be maintained and complicate the Information System.

The question that arose was whether a PWA could be the only and best solution to meet all the needs of this solution, from a global point of view, as a whole.

**** Le tableau ci-dessous illustre la réponse de manière théorique ****

Global functional issues of the solution	Is the PWA the most suitable solution?
The user experience must be intuitive, fast and fluid.	✅
The graphics must be modern (rely on the current interface of the Android application).	✅
The application must be able to synchronize with various devices and provide consistent data to the entire fleet of devices.	✅
The solution, all or part, must be able to work with AND without internet connection.	✅
The application must be able to connect to Bluetooth devices.	✅
The application must be able to send notifications.	✅
The application is a solution "multi-tenants". That is, it must fully manage the "Resellers of the solution", "Clients" and "Final users" aspects, with different levels of rights.	✅
ETC...	✅

4.6 - Has the PWA solution been selected for the next version of TRACY?

❌ **No**

No, the PWA solution was not selected (immediately) for this project. Although the PWA theoretically ticks all the boxes, the youth of this technology is an undeniable brake. In a context of putting into production at the beginning of 2020 and where the right to the error is not allowed.

❌ **Just fully supported**

Today, only the Google Chrome browser for Android and desktop computers support all the features offered by PWA, such as offline operation. On the Apple side, the next mobile OS update brings a lot of improvements, with full support for PWA. iOS 13 which I have access in preview because I am certified Apple developer, only released for the general public in a few days for the general public!

❌ **Lack of perspective**

The PWA are so new and unknown that very few web developers know their interest. Do a social experiment and ask your developer if he knows them and what they are. You will be surprised answers. If it's a web developer, you'll probably spoil his day by telling him that they exist. However, this lack of hindsight creates certain obstacles, such as a lack of documentation available on the internet and forces developers today to rely solely on official documentation (eg Google), without being able to count on help and quick answers from discussion forums (ex: Stack Overflow). Also, the lack of returns makes it more difficult to put in place a risk management plan.

❌ **Difficulty finding competent resources**

What may seem like a future solution for the service provider and a much lower maintenance cost can also quickly become counterproductive if the software architecture is not properly designed.

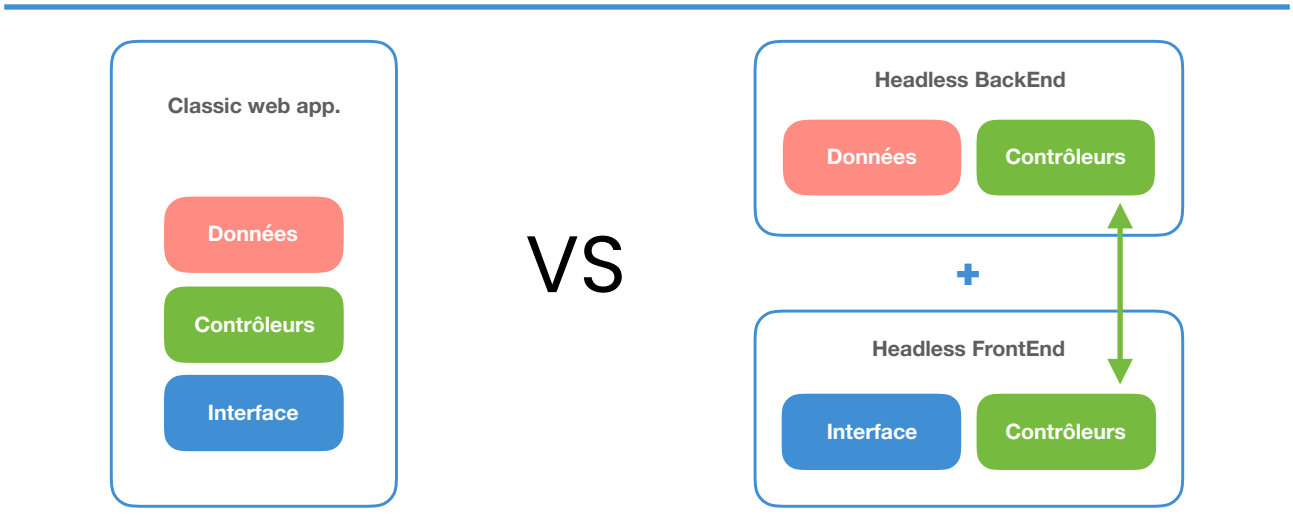
Pricing ❌

The unknown share of PWA is time consuming and directly impacts the cost of the solution. Moreover it is highly recommended to go through a web architect who will draw the so-called "offline-first" architecture (which allows a relevant offline operation) before the developers can begin to create software bricks for the solution.

4.7 - Headless architecture, ready to deliver a PWA!

Introduction

The technical solution chosen for the new version of TRACY is a called "Headless" architecture. It's a software architecture based on the MVC (Model View Controller) philosophy but pushing the reasoning to the extreme. Unlike a traditional MVC architecture, the Headless architecture separates the data management and user interface parts to the extent that 2 different applications communicate using an API. The API is a software brick for inter-connecting applications together.



Modularity and easy maintenance

The Headless architecture allows a great modularity of the software bricks for next evolutions and facilitates maintenance. This is a solution called "scalable".

Make easy a further transition to the PWA

Getting into the development of a PWA today can be expensive and restrictive in many ways, but these disadvantages should disappear within a few years. The choice of the Headless architecture is partly related to the fact of a possible future transition to a PWA, when features, returns and documentation will be fully developed.

V - Conclusion

5.4 - A very promising future in the short term for the PWA

Today, I lack perspective on the use of PWA as the only application in production which makes it difficult to recommend this type of solution. PWAs are still under development and all environments are still not all the same. As we have seen, at the time of writing, Apple will only fully support the PWA in a few days, when the next update I have, iOS 13 (beta developer), will come out for the public.

Nevertheless, PWA seems to respond to a general demand for homogenization of applications, features and development methods.

The solution that I recommend today in my environment is a "Headless" web architecture that allows a modularity and scalability incomparable to other types of architecture. In addition to the many benefits previously explained, the Headless architecture makes it very easy to switch from a classic web application to a PWA, which will probably be the case in the next few years for the TRACY project..