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# Investigation of Progressive Web Applications and Understanding Its Working Mechanism, Advantages and Disadvantages

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**Abstract**: - Progressive web applications are similar to the mobile applications and are more reliable and secure than the normal applications. The PWA are developed in such a way that nobody can tell the difference between mobile apps and the progressive web applications. The progressive web apps are developed using normal web techniques like HTML, Java Script, CSs etc. It is a software application which will resemble like a desktop or mobile app but it will operate on web-based technology. The main advantage of this type of web bases application is that they are faster and provides good user experience due to their simple user interface. This type of applications can directly be published online on the web page and does not require separate platform. The paper will explain the need and importance of the progressive web applications and shall also discuss the benefits and challenges of these kind of applications.

**Keywords**: -Importance and need for PWA, Characteristics of PWA, Benefits, Disadvantages, Components of PWA, Life Cycle process.

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Introduction: - [1]

These days there are many applications which can be installed on mobile or on the desktop in order to use them. These applications will have simple user interface and are easy to use and navigate through the application. The only thing to install the application on the mobile or the desktop will be to check whether it is compatible with the operating system of the devices on which the application will be downloaded or not. If it does not fit with the operating system of the device on which it is being installed, then the user will not be able to use the application on that particular device. In order to overcome this issue, the concept of progressive web applications has been introduced. The concept behind this technology is that it is a web bases application which will be developed similar to the mobile based applications and it can be executed through the browser in the devices. It will have good features of web applications as well as mobile based applications due to which it is successful. Only the developers need to follow the standard protocols in order to develop them. The advantage of having progressive web application is that it is much faster than the other applications and reduces the option of installing the application. The user can just enter the link for the web-based application and start using it. If the user wants to share it with anyone, they just need to simply send the link for the web applications. PWAs convey a quick encounter in any event, when the client is disconnected or on an untrustworthy organization. There is additionally the possibility to fuse includes already accessible just to local applications, like pop-up messages. Creating web applications with disconnected usefulness and superior execution relies upon involving administration laborers in blend with a client-side capacity API, like the Cache Storage API etc. PWA will have features of both native applications as well as the web applications. PWA will have enhanced features which will deliver reliability, consistency, more capabilities etc. It will also have the capability to operate offline in case of network issue just like the native applications can do.

Characteristics of Progressive web applications: - [2]

PWA are the web-based applications which will have the features of both device-based applications as well as web-based applications. In this way they are much efficient and faster than the native applications. Following are the three main features of the progressive web applications which will make it strong web-based application: -

1. Reliability
2. Capability
3. Installable

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1.  Reliability: -

    Progressive web applications are reliable as compared to the other available native apps. Speed is basic for getting clients to utilize your experience. Execution doesn't stop after the onload occasion. Users using these kind of apps does not feel that the app is too slow otherwise they will lose interest and will look for other options. The user interface should be such that it can be easily used and interpreted by the user himself. The speed at which the application works will attract more users as they always want to use applications which are faster and easy to use. Applications should be usable paying little mind to organize association. Clients expect applications to fire up on sluggish or flaky organization associations or in any event, when disconnected. They expect the latest substance they've collaborated with, similar to media tracks or tickets and schedules, to be accessible and usable regardless of whether getting a solicitation to your server is hard. At the point when a solicitation is beyond the realm of possibilities, they hope to be told there's inconvenience rather than quietly falling flat or crashing.

2.  Capability: -

    Progressive web applications are capable of performing all the tasks similar to the native applications by using API's. Up to this point, just stage explicit applications could truly make a case for these capacities. While certain abilities are still not possible to implement in the we-based applications, the latest APIs are hoping to change that, extending how the web can manage highlights like document framework access, media controls, application badging, and full clipboard support. These abilities are worked with the web's protected, client driven authorization model, guaranteeing that going to a site is never a startling recommendation for clients.

3.  Installable: -

    The native applications may be downloaded from the store online and then can be used. But in progressive web applications, it can be installed and can be accessed from the icon present in the tool bar, desktop, home screen etc. They execute in the window and no on the browser due to which they operate much faster. There is no issue like compatibility to execute them and install them. Once the web application is installed, then the keyboard short keys can also be used in order to navigate through the application.

    Components of PWA: - [3]

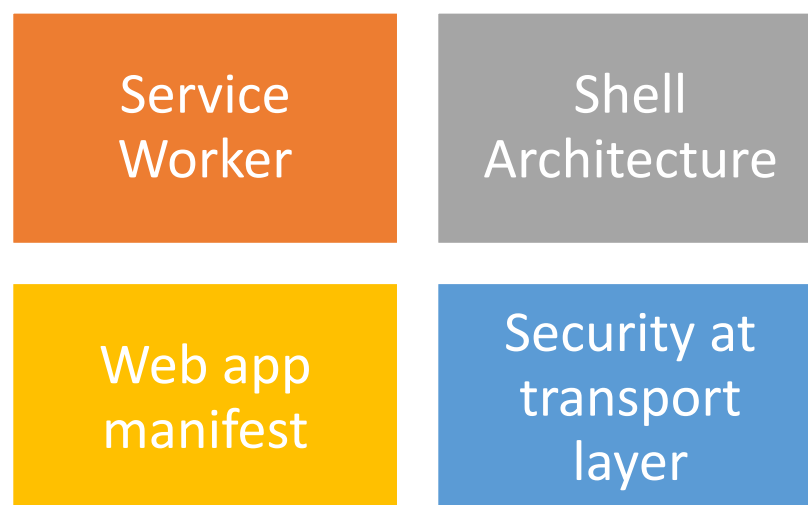    Following are the four main components of the PWA: -



Figure 1 Components of PWA.

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1. Service Worker: -
   ➢ Service worker is the technical element which helps to implement one of the important features of PWA which is to work in background in offline mode, Push notifications, synchronisation etc.
   ➢ The responsibility of service worker is to interact between user's requests and the application. For this purpose, it will use separate script file and it will operate only for the time period when request is being made.
   ➢ Push notification: - PWA has the capability to send the push notifications even when the application is not in use and when the browser is closed.
   ➢ Synchronisation: - Service worker is responsible for backing up the synchronisation process. It is its responsibility to send notifications to the app to take back up whenever the network is up and running.
   ➢ Offline mode: - It will also perform as cache and restore the last saved information as soon as the app is in use again. This provides better user experience to the app and users are satisfied.

2. Shell Architecture: -
   ➢ In order to develop PWA, it is important that the static content is filtered from the dynamic data.
   ➢ The methodology which is used for developing PWA will use shell architecture technique.
   ➢ The application shell will have all the necessary elements which are required for the designing and developing of the PWA which can execute without the need for connection.

3. Web app Manifest: -
   ➢ This component is used for the designing of the user interface of the PWA applications. This will help the developer to design the app in such a way that the user can navigate through it easily and it will decide that how it will launch.
   ➢ The manifest for the most part contains beginning URL, an application's full and short name, connections to symbols and symbols' sizes, type, and area. A designer can likewise characterize a sprinkle screen and a subject tone for the location bar.

4. Security at transport layer: -
   ➢ PWAs influence the Transport Layer Security (TLS) convention.
   ➢ TLS is the norm of secure and strong information trade between two applications.
   ➢ The uprightness of the information requires serving the site by means of HTTPS and introducing a SSL endorsement on a server.

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Life Cycle Process of PWA: -



Figure 2 Process of implementation of PWA.

1. Security Layer: -
   In this process, it is made sure that the developer adds the security layer so that the application is safe and secure to use. The PWA should take all the necessary security measures so that the users will feel safe to use the apps.

2. Develop Application shell: -
   This is the first thing that the user will see whenever he will try to load the app. This is the user interface which serves as a medium to navigate through the application. The developer will use HTML along with CSS in such a way that as soon as the user will click on the icon the app should open immediately and the user does not need to wait for the app to open. Application shell helps the developer to enhance the user interface as soon as more data is loaded in the application.

3. Configure the Service Worker: -
   In order to implement push notification, background synchronization etc the developer need to configure service worker. First of all, the developer needs to check the compatibility of the user browser with the service worker. If yes, then the developer will configure the service worker also.

4. Adding push notification feature to the app: -
   Administration laborers allows the clients to get message pop-ups through the web Push API. To get to it, self.registration.pushManager from inside administration laborer document is used.

5. Adding of Web-Manifest: -
   This is the step where the UI of the app will be created. The developer will pay attention in this step seriously in order to build a app which is user friendly and the user can easily work upon the app. It will contain all the details of the application in form of icons, check boxes, description etc.

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6. Configuration process: -

The application is designed in such a way that if a user visits the site twice with less minutes of gap, then the app will automatically ask it to install it on the desktop etc.

7. Analysis of application: -

The PWA application is analysed based upon the speed and accuracy with which it works. The user should not have increased wait time for the app to load in fact, as soon as he clicks on the icon it should immediately open.

Advantages of PWA: - [4]

➢ Better response time: -

The PWA applications are much faster as compared to the native app as they do not depend upon the operating system on which they are executed. They have combined features of itself as well as the native apps due to which it gives very fast response to the user's queries.

➢ Easy installation process: -

The installation process is very and the user can directly install it from the website onto their devices on which the wish to install the app. Once installed a unique icon for the app will be visible in the device.

➢ Also available in offline mode: -

If the network connection is slow or not present, then also the PWA app has few features which makes it possible to use in offline mode as well.

➢ Efficient performance: -

The performance of the PWA app is efficient and accurate and it gives good results even when the network is not present.

Disadvantages of PWA: - [5]

➢ Less Functions: - PWA still cannot implement all the features of the native apps. Like if one is using PWA and it demands to use the hardware features of the device then it is not possible but on the other hand if other apps are used it is possible.

➢ Performance issues when compared to native apps: - PWA will give good performance but when compared with the native apps, then it is discovered that the native apps are still efficient in performance.

➢ Push notifications: - If one need to use push notification feature then they should have secured TL connection without which it will not be possible to use it.

➢ Battery Life is decreased: - PWA does no need fast network connection but it will consume most of the battery of the device.

Conclusion: - Moderate web applications are like the portable applications and are more dependable and secure than the typical applications. The PWA are created so that no one can differentiate between portable applications and the dynamic web applications. The dynamic web applications are created utilizing typical web strategies like HTML, Java Script, CSs and so forth It is a product application which will look like a work area or versatile application yet it will work on online innovation. The principle benefit of this kind of web bases application is that they are quicker and gives great client experience because of their basic UI. This kind of utilizations can straightforwardly be distributed online on the site page and doesn't need separate stage.

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