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**COURSE INSTRUCTORS: DR NKEMINI Valery APRIL 2024REPUBLIQUE DU CAMEROUN**

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**CEF440**

**INTERNET PROGRAMMING AND MOBILE PROGRAMMING**

**BY**

**GROUP 25**

**OPERATIONAL RESEARCH**

**LIUNEAR PROGRAMMING PROBLEMS (LPP)**

**BY**

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**Matriculation number: AV19A131**

**SUPERVISOR:**

**ACADEMIC YEAR:**

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**Task 1**

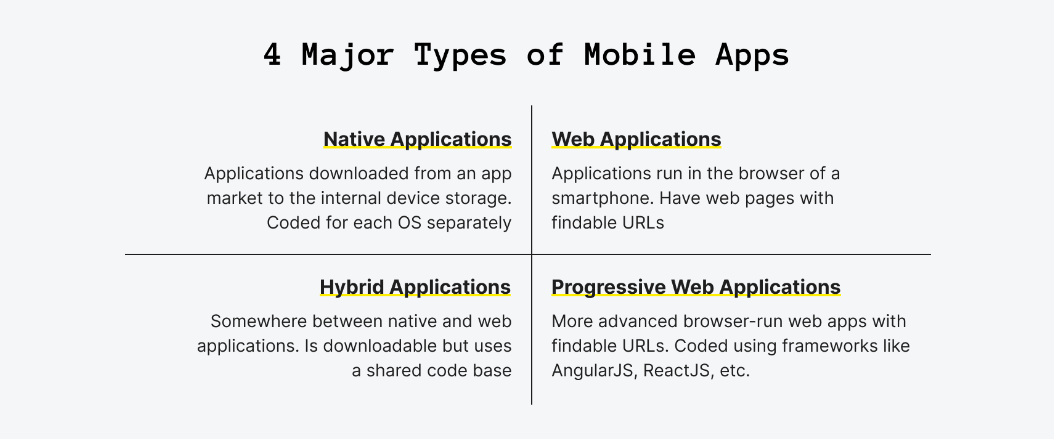
# MAJOR TYPES OF MOBILE APPS AND THEIR DIFFERENCES (NATIVE, PROGRESSIVE WEB APPS, HYBRID APPS)

A mobile application is a kind of software that is created for being run on a mobile device. This includes not only smartphones but also tablets and smartwatches.

There exist various types of mobile applications which differ by purpose and the ways they operate on mobile devices. Shortly mentioning the latter, mobile apps may be coded differently, for instance, depending on the operating systems (OS) of the devices they'll be used on or if they'll be launched in browsers instead of being downloaded to the device's internal storage.

Accordingly, the programming languages and frameworks to create mobile applications vary as well. For instance, Flutter, React Native, and Ionic are considered among the best mobile app development frameworks.

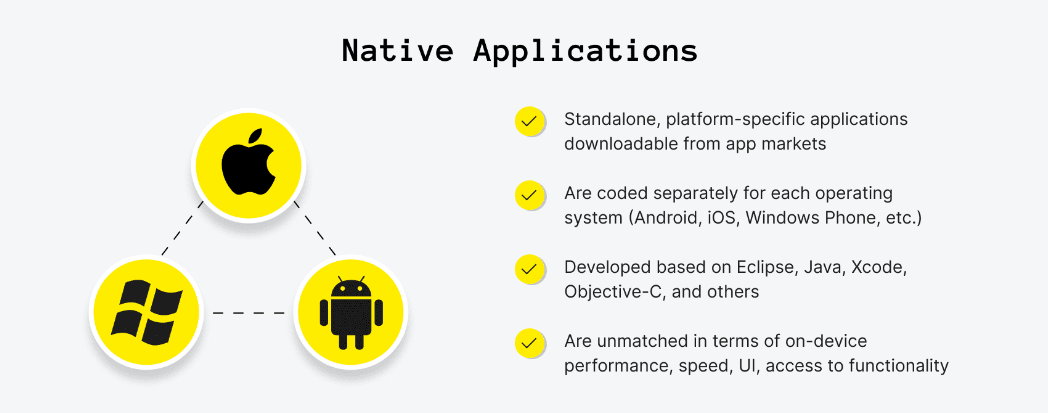
A cross-platform app is an application that works on multiple platforms, such as Android, iOS, or Windows.



## 1.1 Native Applications

Native mobile apps are applications downloaded from an app market to the internal device storage. They are usually coded for each device separately.

When building native apps developers have to code the app at least twice for Android and iOS so that the audience would have the chance to get it. Twice because the two most popular mobile OS are based on different programming languages, so the code is not reusable.



The best-fit software programming languages for native application development fully depend on the operating systems and their mobile application requirements. For instance, Android applications are usually developed based on Eclipse and Java while iOS apps use Xcode and Objective-C. But then again there are specially designed SDKs (software development kits) and frameworks that can help speed things up.

### 1.1.1 Native Application Advantages

- On the bright side, because native applications are standalone and platform-specific, they are practically unrivaled in terms of usability and compatibility.

- They can boast unmatched on-device performance, advanced security, the capability of working offline, tend to have fewer bugs, and are tailored to make the most of each device's native UI.

- Plus, they have no roadblocks to accessing the smartphone's hardware and features like the microphone, GPS, or camera.

- Since the application may be up on app markets, this could mean additional discoverability.

- It is possible to charge users for downloading the app, providing a monetization path.

### 1.1.2 Native Application Disadvantages

- These types of mobile applications are quite costly to develop. Launching a native app requires additional investment and possibly time. And their maintenance won't come easy nor cheap either.

- After being coded for separate OSs, these apps have to go through the process of approval to become available on the app markets. This may also be time-consuming and can possibly delay your mobile app launch on the market.

-The step that follows launch on the app markets may be even harder as you'd need to make your users manually install the app on their devices to use it.

- There’s no guarantee that users won't delete the app after installing if it isn't used regularly. This is a common scenario since native applications are usually weighty, and not everyone likes their smartphone's internal memory to be clogged with applications they might not use often.

- Native applications require users to make updates. Whenever the application gets a new version rolled out even with minor changes, the users must make corresponding updates on their mobile devices. At times, they'll lose access to the app completely until the update is made.

Hence, opting for classic native application creation might not be the right path for all businesses or ideas.

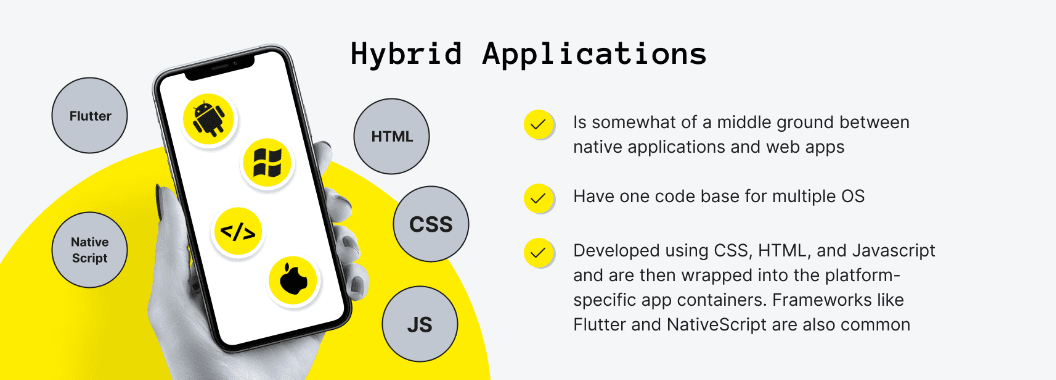
### 1.1.3 Examples of Native Application

Google Play or AppStore, comprises of dozens of mobile apps categories to choose from. Among them, there are plenty of native applications available for download. WhatsApp Messenger is a native app example.

## 1.2 Hybrid Applications

Hybrid mobile apps are applications that combine web apps with the native capabilities of a platform. They are developed in one go for all platforms, which means less time and money spent on cross-platform development. This brings us to one more mobile application type.

Hybrid mobile apps are similar to the cross-platform mobile app development concept, hybrid application development values the reusability of code and accessibility on numerous devices. This solution is somewhat of a middle ground between native applications and web apps.



They are developed using web technologies like CSS, HTML, and Javascript and are then wrapped into the platform-specific app containers (meaning that they integrate well both with iOS and Android). Hybrid applications are also commonly developed using specially designed mobile application development frameworks like Flutter or React Native.

### 1.2.1 Hybrid Applications Advantages

- Cost-effectiveness and an accelerated time to market are the major benefits of this mobile app type compared to native applications.

- You don't have to work on separate mobile apps in terms of iOS and Android code. Hybrid apps have one code base for multiple OS, so maintenance is simple. This partially explains why hybrid applications are currently gaining popularity and why they've become one of the mobile application trends.

- Hybrid apps exist in the form of downloadable applications from app markets, so technically they're sort of like native apps.

- They can be accessed offline or with a bad internet connection (but only to a limited extent).

- They're capable of supporting the built-in smartphone hardware and features (just like native applications do but aren't compatible with all the functionality).

### 1.2.2 Hybrid Applications Disadvantages

- Their speed may be dependent on the browser (so, regular native apps usually operate faster).

- They aren't as interactive and quick as native applications.

- Hybrid applications might not perform flawlessly if the application is too complex since this requires more power and speed.

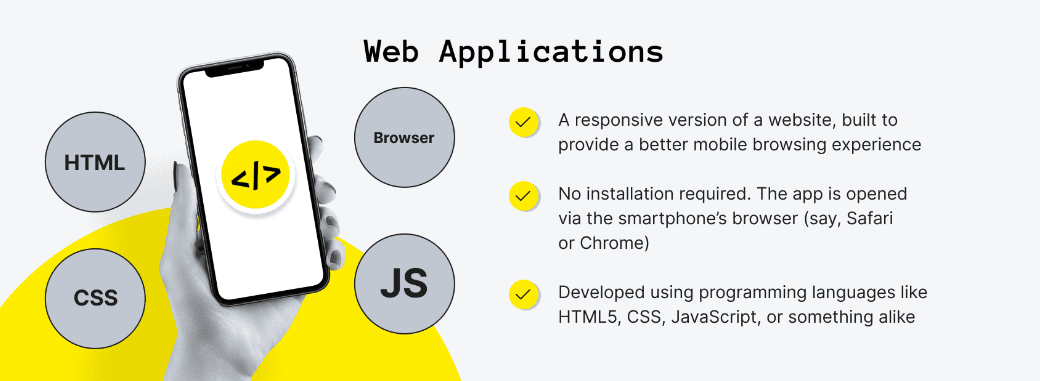
### 1.2.1 Hybrid Applications Examples

There are tons of hybrid applications today, including Instagram, Gmail, Facebook, and many others.

## 1.3 Web Applications

Web apps are a responsive version of a website, built to provide a better mobile browsing experience when compared to using the website's regular mobile version.

A web app makes a website responsive, it is launched via the browser (so you don't have to force users to install the app to the device to use it like in the case with native apps). Mobile websites are the version of a website that people see when opening a site from a mobile browser, but they are commonly unoptimized, not user-friendly, slow, and look like the shrunk desktop website version.



Once again, web applications are basically websites that are designed to be responsive and work well on a mobile device. Hence, they are developed using programming languages like HTML5, CSS, JavaScript, or something similar.

### 1.3.1 Web Applications advantages

- Cross-platform and cross-device accessibility using a smartphone browser without installation.

- Increased user satisfaction with their mobile experience (if compared to opening a static website version that's poorly optimized for mobile).

- No internal device storage nor updates are required on the user's end.

- Not missing out on SEO (because web applications have URLs like any website, search bots see the pages separately and people can find them via a fast Google search or direct URL address input).

- They are cheaper to develop than native mobile applications.

### 1.3.2 Web Applications Disadvantages

- If the users fail to have decent access to the internet, they won't have the chance to enjoy the web app to the fullest until the connection is back.

- When a user closes the web page, they'll have to find a way to reopen it in the browser and return to the website again (to compare, native applications are downloaded to the device and are accessible in one tap).

- There may also be additional restrictions with such types of apps due to limited hardware accessibility (such as with sending push notifications).

- Web applications might be far from perfect in terms of UX, security, and speed.

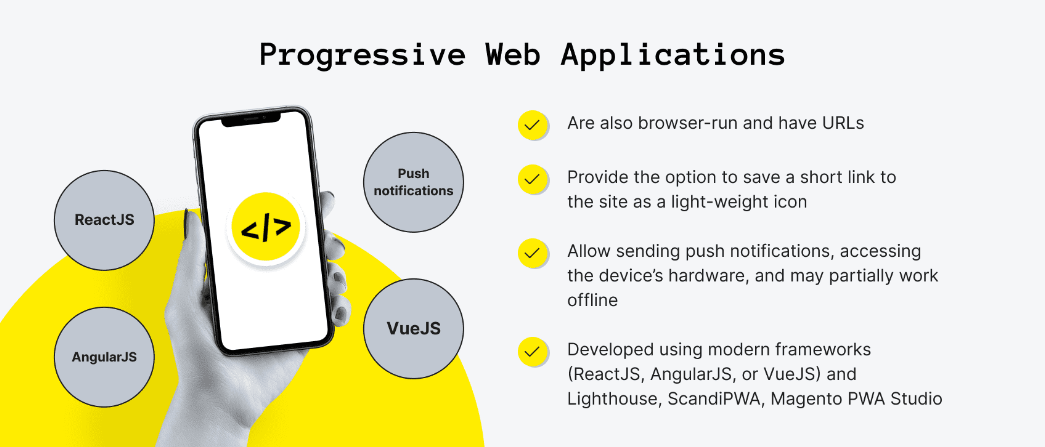
1.3.3 Progressive Web Applications examples

Numerous websites have chosen custom web application development and made web apps to improve the mobile experience of their users, including Trello.

## 1.4 Progressive Web Applications

Progressive Web Apps (PWA) are web apps that simulate the behavior of native mobile apps (they can send notifications, use the camera, ask for location, etc.) They are typically accessed via a web browser of your choice but can be installed and accessed on a device. PWAs are radically accessible, making them a great choice for dynamic eCommerce solutions.

Web application development is constantly moving forward, and the progressive web application (PWA) solution emerged not too long ago. This web-based technology overcomes many of the previously existing web app issues (including the ability to be used offline or send push notifications).



Progressive web apps are built using modern frameworks like React.js, Angular.js, or Vue.js. Lighthouse, ScandiPWA, and Magento PWA Studio are also commonly used for their development.

### 1.4.1 Progressive Web Applications advantages

- PWAs are also browser-run and have URLs (so the pages can be promoted in terms of SEO and found via the web search).

- They put page loading speed in the spotlight (while native apps still perform faster, PWAs use optimized rendering to accelerate the page loading times).

- Progressive web apps are immersive and may resemble the look of native applications.

- They also provide the option to save a short "Add to Home Screen" link to the site (and this link will look like any other app icon on the smartphone's screen). Importantly, these bookmarks are low-weight.

- These types of mobile applications allow sending push notifications, accessing the device's camera and other functionality, and may partially work offline.

- Notably, when rebuilding a website into a PWA, the desktop version of the website can get optimized as well.

- Progressive web apps cost less to develop when compared to native applications.

### 1.4.2 Progressive Web Applications Disadvantages

- These apps aren't available in app stores and can be saved to the home screen only after the website was accessed via a browser.

- PWA technologies are advancing, yet there is still room for improvement, including offline use and device functionality access limitations on iOS.

But the main question is can a PWA be considered a mobile app substitute? Perhaps, not. They target different audience groups and have different aims.

### 1.4.3 Progressive Web Applications examples

The implementation of progressive web apps has been especially seen in the e-commerce sector recently. Many renowned companies including Starbucks have converted their websites into PWAs.

# MOBILE PROGRAMMING LANGUAGES