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Implementation of backend services in mobile applications

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Abstract

Mobile apps are the epitome of innovation, productivity and convenience in today's dynamic, technology-driven world. The delightful user experience we encounter isn't just a result of intuitive interfaces, it's a complex and often hidden side of mobile app development. The mobile app backend is the brain of the mobile app. Among other things, the backend takes care of data processing, storage and security. The backend runs on the server and is the part of the application that we cannot see, but the mobile application is functionally dependent on it.

The article discusses the various aspects of mobile application development, highlighting the indispensable nature of the backend for creating high-quality and reliable mobile applications. Supports adherence to best practices and an organized development process for successful mobile application implementation.

Keywords: mobile applications, backend, server, cloud systems, API, databases.

In the absence of a robust propulsive system, a rocket remains bereft of efficacy. Analogously, a mobile application, lacking a proficient backend infrastructure, confronts limitations in both its operational capacities and user interface, irrespective of the latter's aesthetic appeal. This deficiency arises from the integral role played by the backend in facilitating data exchange and intercommunication processes. It substantiates the mobile application's ability to execute computationally intensive tasks, thereby underscoring the imperative of a potent backend for optimal functional augmentation.

A backend for a mobile application is the part of the app that runs on a server, rather than on the device itself. The backend provides the functionalities that the app needs to store and manage data, authenticate users, process and analyze data, and communicate with other systems or services.

A backend can take many forms, such as a server running on a cloud service, a database, or an API. It provides the necessary infrastructure and tools that the app needs to function properly and enables the app to provide a rich and engaging user experience.

The backend is the inner layer of a site or application that is hidden from the user. It's also known as the server component. It is the service software and hardware part that runs on the server.

The server is hidden behind the user interface, the site or application visible element that operates on the client side. For example, when a user submits a query to a search engine and hits the "Search" button, this query is routed to the server – that's where search algorithms pick out the relevant data. However, the search results displayed are just the user interface.

Servers, comprising both physical computing hardware and software programs, operate as providers of computational services to interconnected devices, embodying a prevalent architectural paradigm embraced by software developers. In the specific domain of mobile applications, a server-oriented backend, residing within cloud infrastructures, exemplifies discernible advantages, including optimized data interchange and harmonious interfacing with a spectrum of computing devices. The inherent centralization of this architectural framework designates a singular point of access, situated ubiquitously, be it in residential, occupational, or alternate settings.

This server-oriented architectural construct delineates three stratified layers:

API (Application Programming Interface): Serving as an intermediary abstraction, the API facilitates developers in the assimilation of internal functionalities into web-based platforms or applications. Its multifaceted utility extends to the integration with social networks, the transmission of messages, the assimilation of smartphone features, and analogous functionalities. The efficacy of the backend API for mobile applications is contingent upon the technological capacities that it harnesses.

Database: Functioning as an extensive repository for voluminous datasets accessible to both end-users and computational processes, databases are conceived and administered through diverse modeling techniques. Various database technologies furnish tools for the creation and management of data storage. Developers possess the option to devise external applications interfacing with the database via a command set, colloquially known as queries, thereby facilitating the storage of novel data or retrieval of extant information.

Application: Constituting the uppermost stratum, the application layer encompasses computer programs that orchestrate an array of queries directed toward the database. Upon eliciting a response from the database, the outcomes are presented cohesively in the pertinent sections of the application interface, consummating the iterative cycle of data interaction and display.

Mobile app backend development is a vital component of comprehensive mobile app creation. It involves the construction and management of the server-side aspect of a mobile application. Typically, there are two primary approaches to mobile app backend development:

Conventional Server-Side Development:

In this method, app developers construct a bespoke backend server to handle data storage, retrieval, and business logic. Programming languages like Python, Java, Ruby, or Node.js are commonly employed to create server-side logic. The server communicates with the mobile app through APIs (Application Programming Interfaces). This method offers a high degree of adaptability and customization, enabling developers to tailor the backend to specific project requirements.

Backend as a Service (BaaS) or Serverless Architecture:

BaaS providers, such as Firebase, AWS Amplify, and Parse, provide pre-built backend services that developers can utilize to simplify the development process. With serverless architecture, developers focus on writing the application code, while the cloud provider manages the backend infrastructure. This approach reduces the necessity for handling servers, scaling infrastructure, and dealing with low-level backend tasks. It is often quicker to set up and can be cost-effective, especially for smaller projects.

The selection between these two approaches depends on factors such as project requirements, scalability needs, development timeline, and the level of control desired by the development team. Some projects may benefit from the control and customization offered by traditional server-side development, while others may find the convenience and rapid setup of BaaS or serverless architecture more suitable. It's crucial to assess the specific needs of the mobile app and opt for the backend development approach that aligns with those requirements.

Table 1. Comparison of Baas and custom backend

Difference	BaaS	Custom Backend
Cost	Lower at the start of the development process; may go higher with added functionality and scaling.	Often more expensive than BaaS, yet on the beginning only.
Speed	Fast and smooth app development.	Takes more time than BaaS.
Reliability	Depends on the development platform.	Highly reliable; doesn't depend on the platform.

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Security	Depends on the development platform.	Highly secure, especially when based on the local servers.
Scalability	Limited customization; scaling can be challenging and costly.	Highly customizable and scalable.

The backend of a mobile app should encompass various features beyond its fundamental component. While these features are numerous, the basic set may generally include the following:

The app's backend enables the delivery of push notifications, strategically crafted to keep users informed and engaged with the application. Employing these notifications strategically allows app developers to improve user retention, foster app usage, and prompt user actions, ultimately enhancing the overall user experience.
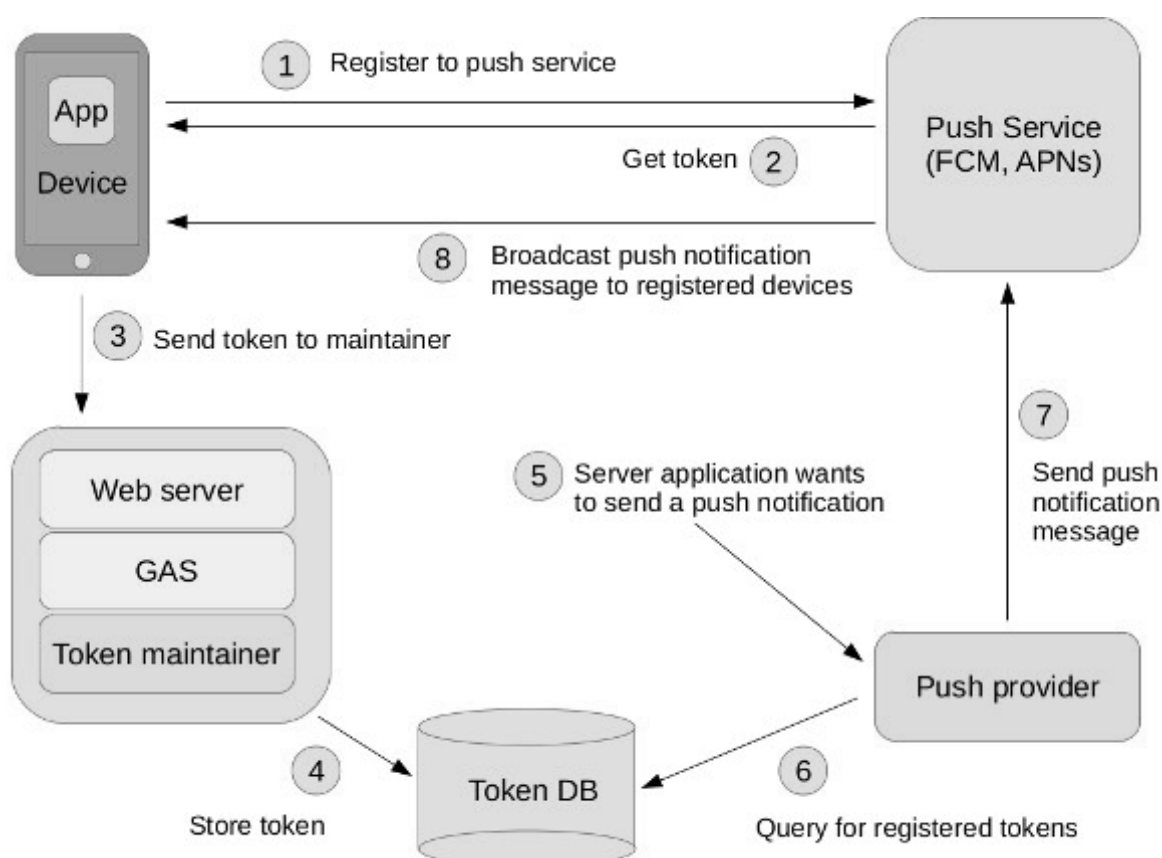

Figure 1. Push Notification workflow

However, it is essential to judiciously employ push notifications, as excessive or irrelevant heads-ups can lead to annoyance and app uninstalls. The backend needs to allow users to customize their notification preferences and implement smart targeting to ensure that users receive relevant and timely notifications.

Securing user authentication and authorization is vital for a thorough strategy in safeguarding user data and privacy. The backend incorporates a range of authentication mechanisms, including username-password authentication, social media logins, multi-factor authentication, and biometric authentication. Through the implementation of robust authentication measures, the backend guarantees that only authorized users can access their accounts. Simultaneously, user authorization dictates the extent of access provided to authenticated users. For example, administrators might enjoy elevated privileges compared to regular users.

By incorporating robust authentication measures, the backend ensures that only authorized users can access their accounts. At the same time, user authorization determines the level of access granted to authenticated users. For instance, administrators may have higher privileges compared to regular users. The integration of a payment gateway enhances the user experience, streamlines conversions, and boosts trust in the app's reliability. Offloading the responsibility of payment processing to the external payment gateway allows the app's backend to concentrate on other critical tasks.
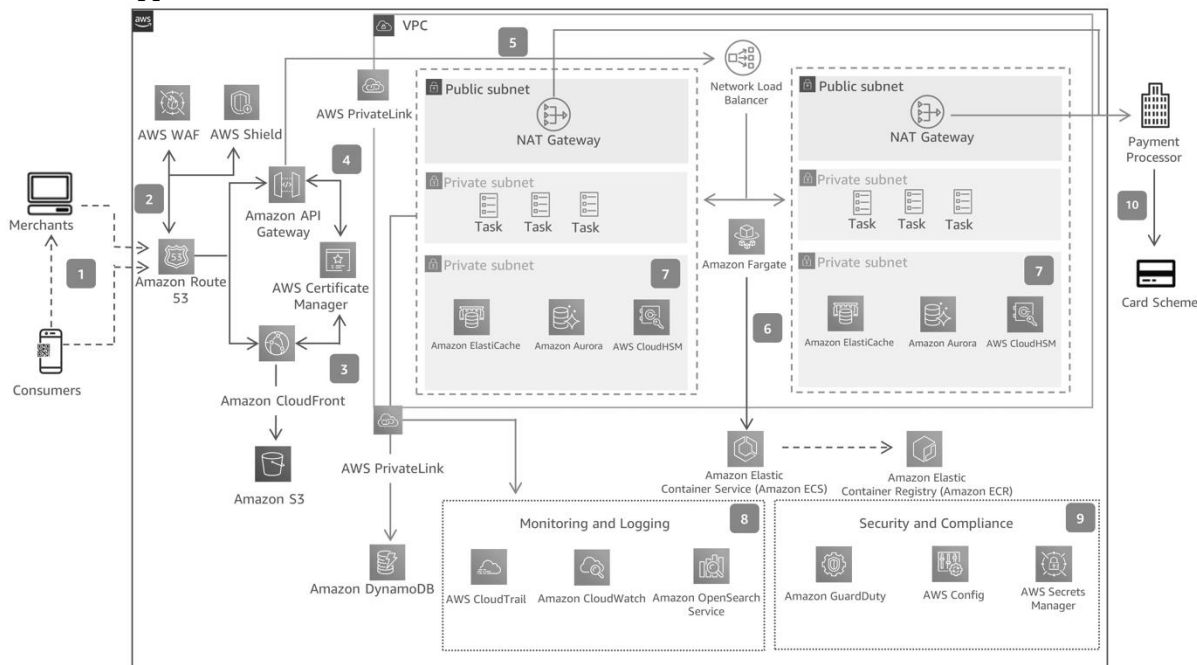
Figure 2. Payment gateway integration

Today, the creation of a mobile app backend may be simplified using a variety of tools and technologies. Our top automated platforms for mobile backend development include the following:

Firebase

Google's Firebase is a backend-as-a-service (BaaS) platform that provides various services. These services include real-time data support large databases, user authentication, and cloud functionalities. It also offers a multitude of extensions to automate different apps' mobile backend processes.

Amazon Web Services (AWS) Amplify

Amplify is an Amazon Web Services (AWS) component offering extensive tools and services for constructing scalable and secure mobile app backends. This software as a service actually provides full-stack functionality so that it will be of use for frontend developers, and backend development pros alike.

Parse

Parse is an open-source backend as a service (BaaS) platform that may be self-hosted. It offers various capabilities, including user authentication, database storage, and file storage. Their comprehensive guides for each platform can help iOS and Android app developers.

Backendless

Backendless is a BaaS platform that offers ready-to-use APIs for data management, user authentication, and push notifications. Its friendly user interface allows you to build the best backend app solution without coding by adding desired features in a format of codeless logic blocks.

Crafting the backend for a mobile app is indispensable for producing mobile applications that are both high-performing and dependable. Seasoned developers possess the expertise to choose suitable tools and

technologies, constructing backends that are scalable, secure, and user-friendly. This ensures that mobile backend solutions effectively fulfill their purpose, regardless of the app's scale or advancements in the backend technology stack.

The dynamic nature of the mobile app environment underscores the enduring significance of effective backend development, a critical determinant of the user experience quality and overall app success. Nevertheless, upholding best practices and maintaining an organized development process will remain essential for the successful launch of any app.

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გიორგი კაკაშვილი

Backend სერვისების რეალიზება მობილურ აპლიკაციებში

რეფერატი

მობილური აპლიკაციები წარმოადგენს ინოვაციის, პროდუქტიულობისა და მოხერხებულობის განსახიერებას დღევანდელ დინამიურ, ტექნოლოგიებზე ორიენტირებულ სამყაროში. მომხმარებელთა სასიამოვნო გამოცდილება, რომელსაც ჩვენ ვხვდებით, არ არის მხოლოდ ინტუიციური ინტერფეისების შედეგი, არამედ ეს არის მობილური აპლიკაციების განვითარების რთული და ხშირად ფარული მხარე. მობილური აპლიკაციის backend არის მობილური აპლიკაციის ტვინი. სხვა საკითხებთან ერთად, backend ზრუნავს მონაცემთა დამუშავებაზე, შენახვაზე და უსაფრთხოებაზე. Backend მუშაობს სერვერზე და ეს არის აპლიკაციის ის ნაწილი, რომელსაც ვერ ვხედავთ, მაგრამ მობილური აპლიკაცია ფუნქციურად დამოკიდებულია მასზე. სტატიაში განხილულია მობილური აპლიკაციების განვითარების მრავალფეროვანი ასპექტები, ხაზს უსვამს backend-ის შეუცვლელ ბუნებას მაღალი ხარისხის და საიმედო მობილური აპლიკაციების შესაქმნელად. ნაშრომი მხარს უჭერს საუკეთესო პრაქტიკის დაცვას და ორგანიზებულ განვითარების პროცესს მობილური აპლიკაციების წარმატებით განხორციელებისთვის.

საკვანძო სიტყვები: მობილური აპლიკაციები, backend, სერვერი, ღრუბლოვანი სისტემები, API, მონაცემთა ბაზები.