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Implementation of Web Push Notification Platform

Project Guide
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ABSTRACT
Web push notifications are alerts that are sent to a website visitor's device via a browser, providing a way to increase user engagement and improve conversion rates. By allowing websites to send targeted, personalized notifications even when users are not actively browsing, push notifications can greatly enhance the digital experience for users. As part of our research project, we designed a push notification system that makes it easy for websites to send push notifications to their users. Our system includes powerful features such as A/B testing, which allows randomized experiments on two variants of push notifications to determine which one performs better, as well as segmentation, which enables more effective message targeting by creating target audiences. In addition, our system includes analytics to help track the performance of notification campaigns in real-time. We used ReactJS for client-side rendering, NodeJS for server-side processing, and MySQL as our database. Our push notification system represents a significant advancement in web push technology, enabling businesses and website owners to more effectively connect with their audiences and drive engagement and conversions.

Keywords - Push notification platform, Web push notifications

1. INTRODUCTION
1.1 MOTIVATION
Push notifications are a popular way for websites to communicate with their customers and subscribers about updates, alerts, and other important information. They offer a convenient and timely way for developers to reach out to their subscribers. However, during our project study, we identified a couple of significant drawbacks to the current state of push notification services available in the market. Firstly, many existing platforms start charging website owners a fee after they have sent a certain number of notifications to their subscribers, which can be inconvenient and unaffordable for websites that are not yet generating sufficient income. Secondly, existing systems often lack effective segmentation techniques, making it difficult for website owners to target their intended audience accurately. These challenges motivated us to build our own push notification system. Our system aims to overcome these two major drawbacks by offering website owners a cost-effective way to send notifications to their subscribers and providing top-

tier segmentation techniques to help them target their intended audience more effectively. Additionally, our system includes advanced analytics features that allow website owners to track the results of their campaigns accurately and plan their next steps accordingly.[1]

1.2 PROBLEM STATEMENT

Through our research into web push notification platforms, we discovered that many services charge their users after a certain limit, and lack comprehensive segmentation features. To address these issues, we developed a unified push notification system that builds upon the ideas presented in the Unified Push Notification System paper [3]. This system was originally designed to handle push notifications on embedded devices and platforms that do not support web apps. It offers several advantages, including the ability to handle multiple services without the need for multiple web apps, lightweight processing of push messages to save power, and additional security through user authentication. Our system aims to expand on these ideas to overcome some of the limitations of existing web push notification platforms. With our system, we aim to provide a more cost-effective solution to send notifications to subscribers and offer advanced segmentation techniques to help website owners target their intended audience more effectively.[1]

1.3 OBJECTIVE

The primary objective of this project is to develop a web push notification system that allows websites to send push notifications to their visitors. In addition to this, we have identified several specific objectives that we aim to achieve, including:

a. Incorporating an analytics feature into the system that provides website owners with information on the performance of their push notifications, such as click-through rate and failed sends.

b. Developing a scheduling feature that enables website owners to schedule push notifications to be sent at specific times, allowing for more effective targeting of their audience.

c. Implementing an A/B testing feature that enables website owners to send two variants of push notifications to their users and compare their performance to determine which one is more effective.

1.4 SCOPE

Our web push notification platform has several key objectives to achieve. Firstly, we aim to create a user-friendly and convenient platform that enables websites to easily send push notifications to their visitors. The system is built on a relational database and utilizes the latest push and notification technologies to deliver notifications effectively.

Moreover, our platform incorporates several advanced features to help website owners optimize their push notification campaigns. These features include segmentation, which enables the sending of targeted messages to the right audience, and A/B testing, which allows website owners to compare one or more versions of push notifications to determine which one performs better. Our platform is designed to provide website owners with the tools they need to create and deliver effective push notifications that engage and retain their users.

2. EXISTING SYSTEMS

Web push notifications have become an essential tool for websites to engage with their audiences and drive conversions. However, the security of existing push notification systems is a concern, as they lack adequate measures to protect against unauthorized access to push messages. To address this issue, G.

Saride and colleagues propose a Secure Web Push System that incorporates a Gateway Client and Gateway Server component to encrypt sent push messages and ensure user privacy and authentication [2].

This system offers advanced security features that can help prevent data breaches and ensure that push notifications are only accessed by authorized users. In addition, several popular web push notification systems, such as OneSignal and Firebase Cloud Messaging, offer features such as automation, segmentation, personalization, and scheduling, making it easy for websites to send notifications to users on desktop and mobile devices.

The choice of a specific web push notification system may depend on the needs and requirements of the website, such as the target audience, the frequency and type of notifications to be sent, and the desired level of customization and analysis. By leveraging web push notification systems, websites can improve user engagement, drive traffic, and increase conversions, while ensuring the security and privacy of their users' data.

3. SYSTEM DESIGN

3.1 UNDERSTANDING PUSH NOTIFICATION

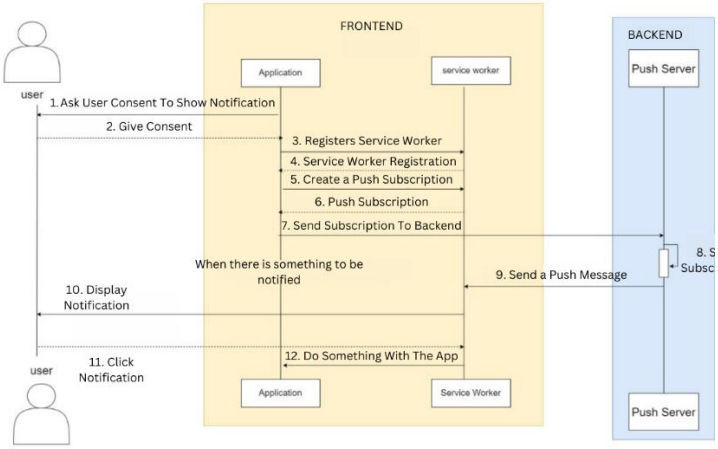

Fig 1: Web push notifications – working overview

1) The process begins by requesting the user's consent to display notifications in the application.
2) The user gives consent to receive push notifications.
3) Upon receiving the user's consent, the application initializes a service worker.
4) Service worker registration is complete. This service worker can be used by the application to create a push notification subscription, which contains an endpoint used to send push notifications to the subscriber.
5) The browser's push service creates a push subscription.
6) The application receives the push subscription.
7) The application sends this push subscription to the push server.
8) The push server saves this push subscription in the database.
9) Whenever there is a push notification to be sent, the push server sends a message to the endpoint of the push subscription. Service worker receives the message, which has a listener for push events.
10) The service worker displays the received push notification to the user.
11) When the user clicks the push notification, a notification click event is fired and handled by the service worker.
12) Upon receiving the notification click event, the service worker has the freedom to execute various actions with the notification and its associated data, such as displaying a webpage, invoking an API, or implementing any other customized functionality.

3.2 PUSH NOTIFICATION SYSTEM ARCHITECTURE

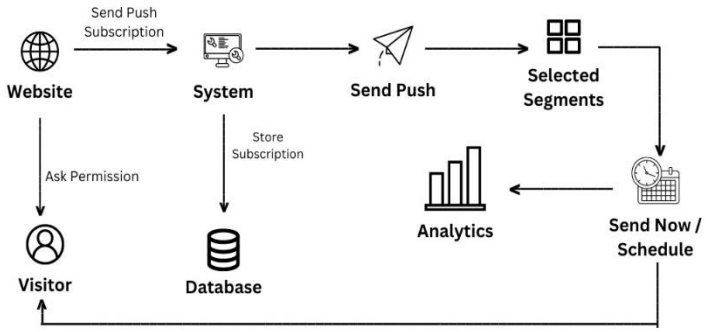

Fig 2: System Architecture

Our system architecture diagram depicts the flow of our web push notification system which starts with the website requesting user permission to receive notifications. Once the user grants permission, the visitor sends a push subscription to our system, which then stores it in the database.

From there, our system provides the option to select specific audience segments for targeted notifications. These segments can be categorized based on various criteria, such as location or behaviour on the website. Once the desired segments are selected, notifications can be sent immediately or scheduled for a later time.

As notifications are sent, our system tracks important metrics such as delivery rates, failure rates, and click-through rates. This data is then analysed to provide valuable insights into the effectiveness of the notification campaign, allowing for continuous improvement and optimization of the push notification strategy.

4. IMPORTANCE

Push notifications are a powerful tool for website developers and marketers to engage and retain their users. These notifications are small alerts that appear on the user's device, even when the application is not currently in use. They can be customized to provide users with relevant and timely information, such as reminders, updates, promotions, or other valuable content.

One of the key advantages of push notifications is their ability to capture the user's attention and encourage them to open the app. This can result in increased user engagement and usage, which can improve retention rates and drive higher revenues. Push notifications enable direct and personalized communication, which helps to build loyalty and trust between users and businesses. By providing users with relevant and valuable information, businesses can create a more positive and engaging experience for their users, leading to increased customer satisfaction and loyalty.

5. FEATURES

The push notification system we are developing includes several key features that enhance its functionality and usability. These features include:

i. Scheduling: This feature enables users to schedule push notifications to be sent at a specific time and date in the future, allowing for more efficient and effective communication with their audience.
ii. A/B testing: With this feature, users can test different versions of push notifications to optimize for better engagement and conversion rates. This allows website owners to experiment with different messaging strategies and determine which ones work best for their audience.

iii. Analytics: Our system includes an analytics feature that provides metrics such as open rates, click-through rates, and conversion rates to track and analyze the performance of push notifications. This allows website owners to make data-driven decisions

and refine their push notification strategy over time.

iv. Segmentation: Our system also includes a segmentation feature that allows users to target specific groups of users with customized push notifications based on factors such as user behavior, location, or interests.

6. WORKING

Subscribers –

Subscribers are users who receive targeted notifications, even when they are not actively using the application on their desktop or mobile device. In order to receive push notifications, subscribers must first grant permission to the browser. This permission is obtained by displaying a prompt when the user opens the webpage from which notifications will be sent. If the user clicks 'allow,' they are then ready to receive notifications.

Website owners -

To use Notify Genie, the website owner needs to create an account on the Notify Genie platform. They can then add their website on the platform and start sending web push notifications after completing the setup.

6.1 SUBSCRIBER JOURNEY

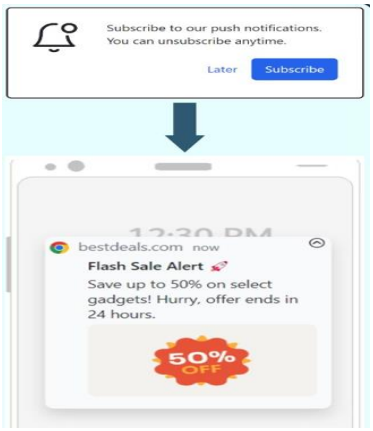

Fig 3: Subscriber Journey

1) When a visitor visits a website that has integrated the Notify Genie web push notification system, they will be presented with a prompt that asks them to subscribe to notifications. This prompt typically includes two buttons: one for subscribing immediately and another for choosing to be reminded later.

2) The prompt is designed to grab the user's attention and encourage them to opt-in to receive notifications from the website.

3) If the visitor chooses to subscribe, they will be added to the website's notification list, and they will start receiving push notifications from the website on their mobile device or desktop computer. These notifications can include real-time updates, reminders, offers, or any other type of message that the website owner wants to communicate to their audience.

4) When a subscriber receives a notification, they have the ability to interact with it by either clicking on it or dismissing it. If a user clicks on a notification, they will be automatically redirected to the relevant page on the website. Additionally, our platform will record the click for analytics.

6.2 WEBSITE OWNER JOURNEY

Fig 4: Website Owner Journey

The Website Owner journey shows how website owners can easily add and integrate their website with the Notify Genie platform and use it to send notifications.

(1) Add Website: Website owners can create an account on the Notify Genie platform and add their website to the platform by providing their website URL.

(2) Integrate Website: Once the website is added, website owners can easily integrate the Notify Genie web push notification system with their website by following simple steps. There are two ways to proceed.

a. Custom Integration.
The website owner can use Notify Genie's custom integration process to enable push notifications on their website. To do this, they can download a service worker file from the Notify Genie platform's integration page, and upload it to their website. Then, they can add a small code to the appropriate pages on their website. This will allow Notify Genie to start showing web push notification permission prompts to their website visitors.[1]

b. WordPress Plugin.
WordPress Plugin: The Notify Genie plugin can be installed from the WordPress admin dashboard, and an API key generated from the Notify Genie platform's WordPress integration page can be pasted into the appropriate field in the plugin's settings. Once the changes are saved, notifications will be active and ready to use.[1]

(3) Send Notification: After the integration is complete, website owners can create and send notifications to their subscribers through the Notify Genie platform.

(4) View Analytics: Finally, website owners can track the performance of their notification campaigns by viewing analytics and metrics.

7. CONCLUSION

In conclusion, web push notifications have become a powerful tool for businesses and website owners to engage with their audiences and drive conversions. By leveraging the real-time, personalized nature of push notifications, businesses can deliver targeted messaging that is more likely to capture users' attention and prompt action. However, a successful push notification campaign requires careful planning, attention to user preferences and privacy, and ongoing optimization to ensure maximum impact.

Throughout this paper, we have explored the technical workings of web push notifications, highlighted the key features and challenges of push notification systems, and discussed the potential impact of push notifications on customer engagement and conversion. Moreover, we have presented our own push notification system, including its architecture and features, and discussed future work that can further enhance its capabilities.

Our research suggests that web push notifications can be a valuable addition to businesses' communication strategies, but they must be used with caution and care to respect user privacy and preferences. As push notification technology continues to evolve, we expect to see even more innovative uses of this powerful tool to drive engagement and conversions in the future. By staying up-to-date with the latest developments in push notification technology and adopting best practices for their use, businesses can leverage this tool to create more meaningful and impactful interactions with their audiences.

Here in this paper, we have coherently described how our push notifications platform would work. How a subscriber or a website owner will carry out the steps necessary to accomplish their target goal. Journey for a subscriber and a website owner is clearly outlined.

8. REFERENCES

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