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Token Management System

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Abstract: *Token Management System is used to manage crowds / queues efficiently by issuing tokens in customer-facing businesses and departments. Since time plays a significant role in human life, the main objective of this project is to reduce the wait time for customers and make their service smooth. Token Management system is a public initiative to help every enterprise publish their calendar of resources (people, counters, meeting rooms, interviews rooms, queues etc) along with their available capacity and time slots for the public to take a token. They can book their own appointment by their name and receive a token online (no OTP, email or mobile number is mandatory).This will help avoid unwanted queues and waiting time for the public. It also brings significant discipline and saves a lot of time which when put together saves billions of hours every day. Key features for an organization: Organization registration, publishing services, token prefix and suffix, time-zone, working hours, slot timing, number of slots and seats for each slot, tracking the appointment list for each queue by date/time and option to update status as completed, cancelled or now show up. It will also include making announcements that will appear to the public, options to support bulk mailing and options to enable email and mobile as mandatory.*

Keywords: Token Management System.

I. INTRODUCTION

Token Management System is used to manage crowds / queues efficiently by issuing tokens in customer-facing businesses and departments. Since time plays a significant role in human life, the main objective of this project is to reduce the wait time for customers and make their service smooth. Token Management system is a public initiative to help every enterprise publish their calendar of resources (people, counters, meeting rooms, interview rooms, queues etc) along with their available capacity and time slots for the public to take a token. They can book their own appointment by their name and receive a token online (OTP, email and mobile number is mandatory).

Key features for an organization: Organization registration, publishing services, token prefix and suffix, time-zone, working hours, slot timing, number of slots and seats for each slot, tracking the appointment list for each queue by date/time and option to update status as completed, cancelled or now show up. It will also include making announcements that will appear to the public, options to support bulk mailing and options to enable email and mobile as mandatory.

- This will help avoid unwanted queues and waiting time for the public. It also brings significant discipline and saves a lot of time which when put together saves billions of hours every day and also decrease staff idle time.
- Token Management System will help organizations manage their services by automating and simplifying the process of booking appointments.

Use of digital token - which certifies the bearer's rights to some kind of products or services - is quite common nowadays for its convenience, ease of use and cost-effectiveness. Many of such digital tokens, however, are produced with software alone, making them vulnerable to forgery, including alteration and duplication. For a more secure safeguard for both token owner's right and service provider's accountability, digital tokens should be tamper-resistant as much as possible in order for them to withstand physical attacks as well.

II. PROBLEM IDENTIFICATION AND DEFINITION

Everyday millions of hours are wasted in waiting for an appointment or in queues. In organizations, it’s not always guaranteed that whoever comes first gets served first. In order to overcome this problem a proper system to handle the queues is required. This system should also include the services provided, resources available and the day-to-day schedule

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of the organization. The systems available today require the user's personal details such as email, phone number and address. These personal details take up a lot of time in processing the request. A system which does not need any personal details to process a request is required.

2.1 Scope

Token Management system is a public initiative to help every enterprise publish their calendar of resources (people, counters, meeting rooms, interview rooms, queues etc) along with their available capacity and time slots for the public to take a token. They can book their own appointment by their name and receive a token online (OTP, email or mobile number is mandatory). Everyday millions of hours are wasted in waiting for an appointment or in queues. In organizations, it's not always guaranteed that whoever comes first gets served first. In order to overcome this problem a proper system to handle the queues is required. This system should also include the services provided, resources available and the day-to-day schedule of the organization. The systems available today require the user's personal details such as email, phone number and address. These personal details take up a lot of time in processing the request. A system which does not need any personal details to process a request is required.

III. LITERATURE SURVEY

A literature review discusses published information in a subject area, and sometimes information in a particular subject area within a certain time period. A literature review can be just a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis. A summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that information. It might give a new interpretation of old material or combine new with old interpretations. Or it might trace the intellectual progression of the field, including major debates. And depending on the situation, the literature review may evaluate the sources and advise the reader on the most pertinent or relevant.

Title: Mobile-Augmented Smart Queue Management System for Hospitals
Author: Sudeep Rai, Priyesh Ranjan, Amarjeet Singh Cheema, Praveen K Srivastava
Abstract: They presented a method on how to use "Queue management system" which has unique properties and that are entirely different from other standard solutions available in the market. Patients often need to queue up at various service areas in hospitals such as at registration, laboratory test and bill payment counters. It provides multiple interfaces for token generation and consumption on mobile devices integrated with hospital service counters, while using smart algorithms for token generation and allocation. The solution is comprehensive as that it caters to streamlined queue management across multiple hospital service areas using a single token for a patient, that improves the patient experience and also helps the hospital administration track and optimize key performance metrics. We present the architectural and operational design of this system, along with an illustration of the use of this system in tracking productivity of service counter operators in a pilot implementation.

Advantages

- Conventional Queue Management System (QMS), are not generic by design and depend on hardware components and do not provide comprehensive end-to-end solution that caters to the complete patient workflow.

Disadvantages

- It takes user's personal data which in turn consumes a lot of time.

Title: An IoT Smart Queue Management System with Real-Time Queue Tracking
Author: Mohammed Ghazal, Rania Hamouda, Samr Ali
Abstract: This paper proposes a smart queue management system for delivering real-time service request updates to clients' smart phones in the form of audio and visual feedback. The proposed system aims at reducing the dissatisfaction with services with medium to long waiting times. To this end, the system allows carriers of digital ticket to leave the

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waiting areas and return in time for their turn to receive service. The proposed system also improves the waiting experience of clients choosing to stay in the waiting area by connecting them to the audio signal of the often muted television sets running entertainment programs, advertisement of services, or news. The system is a web of things including connected units for registering and verifying tickets, units for capturing and streaming audio and queue management, and participating client units in the form of smart phone applications. We implemented the proposed system and verified its functionality and report on our findings and areas of improvements.

Advantages:

- Reduces user dissatisfaction with respect to long waiting time. Since the system provides digital tickets it allows users to leave the waiting area and return in time for their turn to receive service.

Disadvantages:

- The system is a web of things including connected units for registering and verifying tickets, units for capturing and streaming audio and queue management is challenging.
- Security and privacy. Keeping the data gathered and transmitted by IoT devices safe is challenging.

Title: An Approach for Queue Management System of Non Critical Services
Author: Mai Abusair, Mohammad Sharaf, Tuqa Hamad, Raghad Dahman, Shahd AbuOdeh
Abstract: In many public and private sectors that provide services there are physical queues. Waiting in the queue can affect the clients experience and can exhaust them as well. On the other hand, idle time in many sectors of valuable resources, such as, healthcare sectors, can be expensive. In this paper we aim to enhance the clients experience when they are looking for non critical services. The paper suggests an approach for appointments using queue management system. The customers in the queue are divided into several priority classes that is considered in computing the expected waiting time. To show the efficiency of the suggested approach, we applied it on healthcare vaccination system.

Advantages:

- Enhances user experience when they are looking for non-critical services and computes the expected waiting time.

Disadvantages:

- Takes user's personal details like phone number and email address which consumes a lot of time while processing the request.

IV. SYSTEM REQUIREMENT SPECFICATION

This software requirement specification is the official statement of what is required for the development of particular project. It includes both hardware requirements and software requirements. This requirements document is utilized by variety of users starting from project manager who gives project to the engineer responsible for development of projects.

4.1 Functional Requirements and Non Functional Requirements

Functional requirements are the statements of services that the system should provide, how the system should react to particular inputs and how the system should behave in particular situations. Non-functional requirements are the constraints on the services or functions offered by the system such as timing constraints on the development process, standards etc

A. Functional Requirements

In a nut shell, functional requirements describe what the software / website should do (the functions). Think about the core operations.

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Because the "functions" are established before development, functional requirements should be written in the future tense. In developing the web application for the auto car shop, some of the functional requirements could include:

- The web application shall accept customer orders
- The web application shall be able to cash a sale
- The web application shall produce a receipt detailing a customers' purchase information and include name of customer, items purchased, cost of each item and total cost
- The web application shall be able to produce weekly, monthly and yearly reports about sales

4.2 Non Functional Requirements

While developing any mobile application there will always be restriction to which you can implement certain features, Hence there will be often trade off during the development life cycle. So based on the app requirement the trade off happens. Even with all trade off there should be some minimum criteria that should be taken care for smooth performance of the application, this is where the NFR comes in to picture.

Non-functional requirements are requirements that define 'how' the app must perform a certain function. In essence, they are the quality attributes of an app that define the user experience of the app. They are also known as non-behavioral requirements and are to be implemented according to their priority to the app function. This makes them flexible to an extent, making it possible to skip a few in case of time, budget or technology constraints.

Hence few things to be noted before Mobile Application Development are:

- Unlike laptops/Desktop the resources available on Mobile devices are very less like processor , speed , screen dimension etc.
- Scalability of device screen is different for different mobiles.
- Network condition may vary (2G/3G/3G/Wifi etc).
- Multitasking capability and Memory available.
- Different version of OS and backward compatibility etc.

4.3 Software Requirements

- Operating System: Windows
- IDE: Visual Studio Code
- Web server: Node.js web server, NGNIX web server
- Database: MySQL 5.5
- Scripting Language: JavaScript, Angular 12
- Markup Language: HTML
- Styling Language: Bootstrap
- Cloud server: Sponsored by Talent Micro Corporation, USA

4.4 Hardware Requirements:

- Processor: Pentium IV 2.4 GHz
- Hard Disk: 5 GB recommended
- Memory: 512 MB of RAM, 1 GB recommended
- Display: Standard Display
- Internet Connectivity: 50kbps or above required

V. OBJECTIVES

- Token Management System is used to manage crowds / queues efficiently by issuing tokens in customer-facing businesses and departments. Since time plays a significant role in life, the main objective of this project is to

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- Token Management System will help organizations manage their services by automating and simplifying the process of booking appointments.
- This will help avoid unwanted queues and waiting time for the public. It also brings significant discipline and saves a lot of time which when put together saves billions of hours every day and also decrease staff idle time.
- Organizations/Companies can make sure that they are not double booked which will help their company be more organized and can help the companies in various ways which will in turn increase the customer satisfaction and allows the customers to manage their appointments according to their own preference

VI. METHODOLOGY

- Methodology is the analysis of the principles or procedures of inquiry in a particular field.
- It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge such that the methodologies employed from differing disciplines vary depending on their historical development.
- Let us know how to implement Token Management System for a better understanding of how it works:
- The system will support an organization to create multiple services and each service having multiple resources and each resource is linked to capacity(slots), available time slots of working days and a holiday calendar. Holiday calendar will have non working days and Schedule will have time slots, working hours of each day and ability to block the full days in any ad-hoc situations.

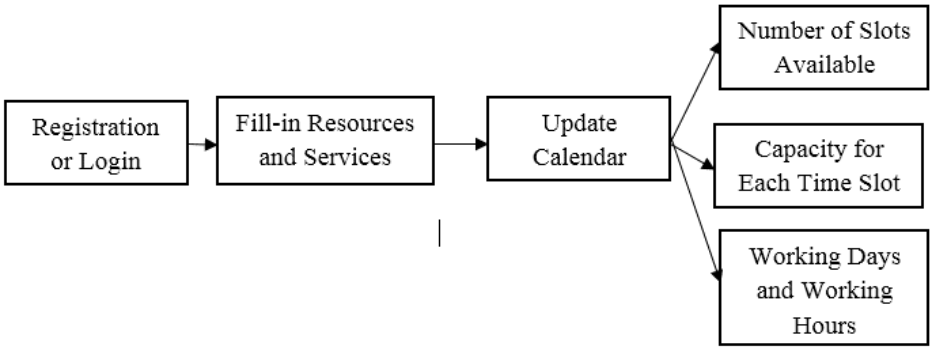

Figure 6.1: Organization Registration

6.1 Timeout Locking Mechanism

Strategy where a slot will be locked temporarily for a user for a specific time session (for example, 1-2 minutes). If the user is not able to book the slot within that time-frame, then release the slot for another user. This should be done on a first come first serve basis.

Session timeout represents the event occuring when a user does not perform any action on a web site during an interval (defined by a web server). The event, on the server side, changes the status of the user session to 'invalid' (ie. "not used anymore") and instructs the web server to destroy it (deleting all data contained in it).

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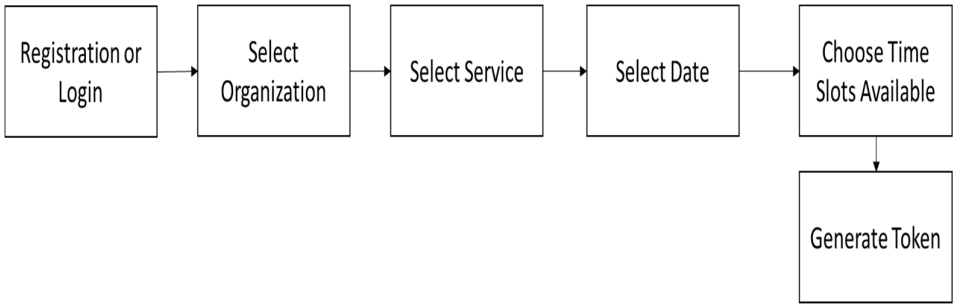

Figure 6.2: Generation of Token by User

- The portal will list down the different organizations (RDBMS).
- Once the user selects the organization, it should display the services offered by that particular organization to that user.
- Once the user selects the organization, the portal will display the available slots for that particular service.
- Users will be able to select the particular service & book the tokens.
- After successful booking of a token, a unique token will be generated by the organization and it will be provided to the web/app server.
- A copy of tokens will be sent to the customers via SMS notification or Email.
- Users will be able to hold the slots for 1-2 minutes before he/she finalizes the slot.
- The portal will serve the slots in First In First Out manner
- The system will be highly concurrent as there will be multiple booking requests for the same slot at the same time.
- The core of the portal is token bookings which means financial transactions. So the system should be secure and ACID compliant.
- Responsive design (ReactJS and Bootstrap) to run on devices of various sizes like mobile, tablet, desktop etc.

6.2 Load Balancer

Load balancer is used to distribute the load on the server and to keep the system highly concurrent when we are scaling the app server horizontally. Load balancing refers to the process of distributing a set of tasks over a set of resources, with the aim of making their overall processing more efficient. Load balancing can optimize the response time and avoid unevenly overloading some compute nodes while other compute nodes are left idle.

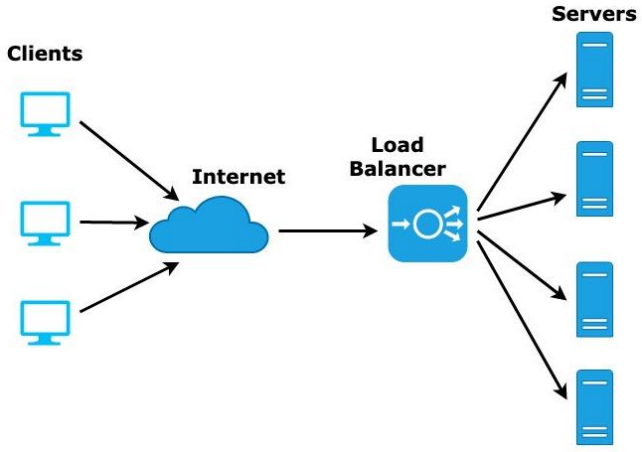

Figure 6.3: Working of a Load Balancer

We will be using NGINX as our load balancer. NGNIX accelerates content and application delivery, improves security, and facilitates availability and scalability for the websites.

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In this manner, a load balancer performs the following functions:

- Distributes client requests or network load efficiently across multiple servers
- Ensures high availability and reliability by sending requests only to servers that are online

Provides the flexibility to add or subtract servers as demand dictates

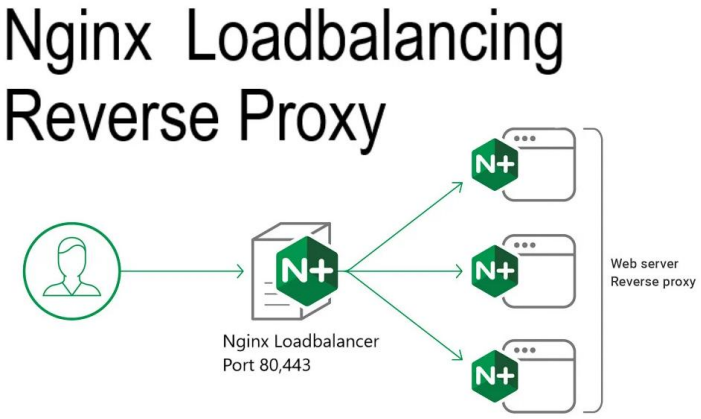

Figure 6.4: Working of NGNIX

6.3 Log Management System

A Log Management System (LMS) is a software solution that gathers, sorts and stores log data and event logs from a variety of sources in one centralized location.

Customer visits the portal, then the organizations and services provided by the organization will be provided from the organization's Database. To link our Token Management System with the organization's database we need to use Application Programming Interface (API).

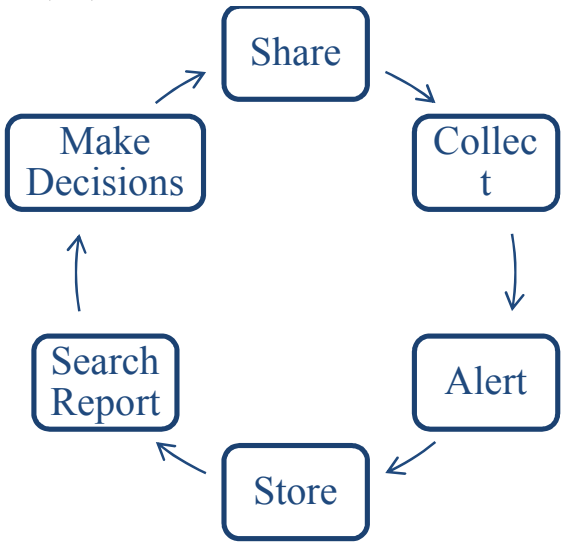

Figure 6.5: Log Management System Flow Chart

APIs:

API is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other. API's needed for the Token Management System are as follows:

- GetListOfServices()
- GetListOfOrganizations ()

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- GetSlotsAvailable()
- BlockUserSelectedSlots()
- BookUserSelectedSlots()
- GetTimeoutForUserSelectedSlots()

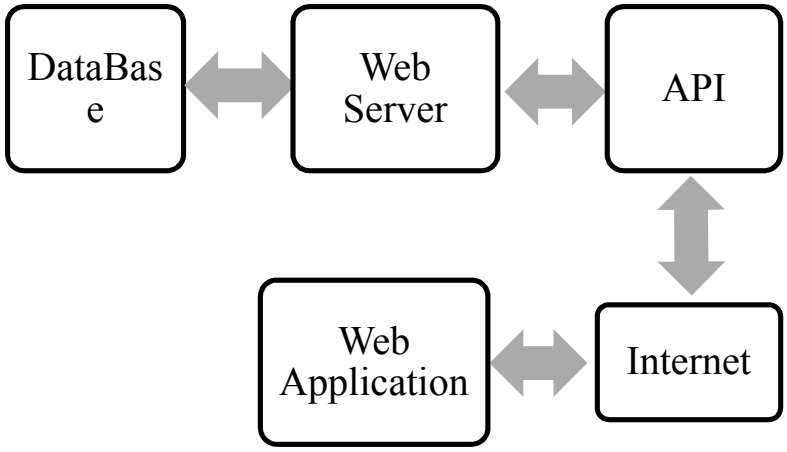

Figure 6.6: Working of an API

6.4 Use of reCAPTCHA for Protection of Website from Fraud

reCAPTCHA is a free service from Google. reCAPTCHA uses an advanced risk analysis engine and adaptive challenges to keep malicious software from engaging in abusive activities on your website. Meanwhile, legitimate users will be able to login, book slots, view pages or create accounts and fake users will be blocked. reCAPTCHA is a free service from Google that helps protect websites from spam and abuse. A "CAPTCHA" is a Turing test to tell humans and bots apart. It is easy for humans to solve, but hard for "bots" and other malicious software to figure out. By adding reCAPTCHA to a site, you can block automated software while helping your welcome users to enter with ease.

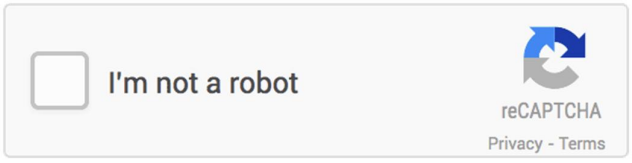

Figure 6.7: reCAPTCHA

To start using reCAPTCHA, you need to sign up for an API key pair for your site. The key pair consists of a site key and secret key. The site key is used to invoke reCAPTCHA service on your site or mobile application. The secret key authorizes communication between your application backend and the reCAPTCHA server to verify the user's response. The secret key needs to be kept safe for security purposes.

First, choose the type of reCAPTCHA and then fill in authorized domains or package names. After you have accepted the terms of service, click Register to get new API key pair. Now, perform the following steps to add reCAPTCHA to your site or mobile application:

Choose the client-side integration:

1. reCAPTCHA v3
2. reCAPTCHA v2
3. Checkbox
4. Invisible
5. Android

Verify the user's response

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VII. IMPLEMENTATION

Project managers are professionals who organize and oversee projects for organizations. If you're a project manager or considering becoming one, a tool you may use is an execution plan. Learning more about the execution planning process could help you organize your next project. In this article, we explain what execution planning is, why it's important and provide steps and tips to help you create a project execution plan for your company or client.

Execution planning, also called project management planning, involves creating a strategy for new projects. It's one of the first stages in project management. During this stage, project managers and team members take an initial idea and create a written execution plan. It occurs after the project initiation stage, where team members think of new designs and projects, and before the execution stage, where team members complete the planned tasks.

7.1 Creating Database

Tables Created:

1. Appointment booking
2. Organization services
3. Organization services working
4. Otp
5. Public announcements
6. Registered users
7. Service holidays
8. Service slot generation
9. Session
10. Booking Status
11. Time Zone

7.2 OTP

We use a node js module called nodemailer to send otp to the user.

- Step1: The authorization email id to send OTP is set.
- Step2: The email id entered by the user is saved.
- Step3: We create an OTP of length 4 using random number generator.
- Step 4: The OTP and the email entered by the user is saved in the database.
- Step5: We send the same OTP to the user with the subject as “OTP Generated”.
- Step6: The status is set to 1 in the database as soon the OTP is sent.
- Step7: We verify the OTP entered by the user with one stored in the database.
- Step8: If it matches then email is marked as verified. Else it sends a message “invalid OTP”

7.3 Database Connection

We create connection in node js and enter the database name to make a connection using the require() and mysql.createConnection().

VIII. RESULTS

- Token Management system is a public initiative to help every enterprise publish their calendar of resources (people, counters, meeting rooms, interview rooms, queues etc) along with their available capacity and time slots for the public to take a token. They can book their own appointment by their name and receive a token online (OTP, email and mobile number is mandatory).
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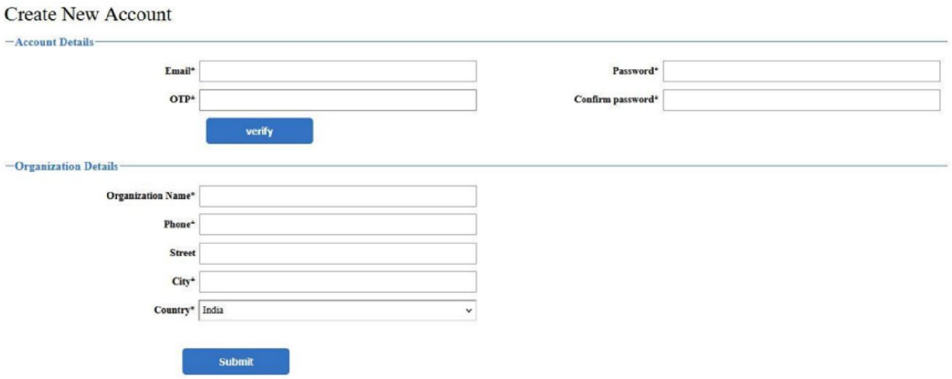

Figure: Organization Sign up page

Length of Token: 9 Characters
1st 2 Characters: 22
Next 2 characters: Month of the year
5th & 6th character: Day of the month
Next: hyphen (-)
Last 2 characters: Slot Number

Figure 8.2: Token Generated

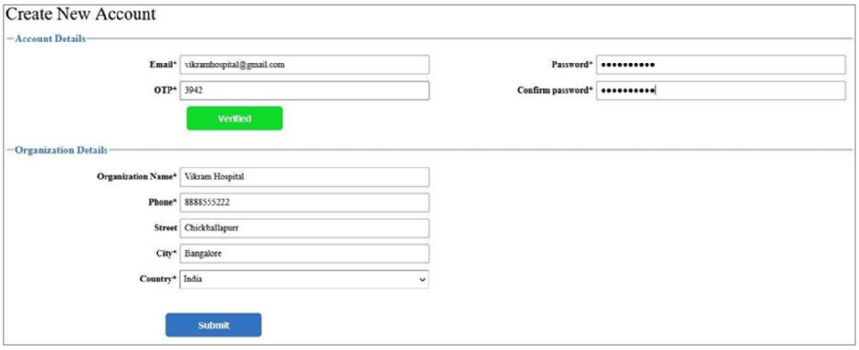

Figure: Organization's email id verified using otp.

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IX. CONCLUSION

The token-based authentication allows users to verify their unique identity, and in return, they receive a unique token that provides access to certain resources for a particular time frame. Organization can leverage tokens depending on the nature of the requirement and their individual business needs. A token management system can dramatically reduce no-shows by automatically sending out appointment reminders, and by integrating with your clients' online calendars. An online token booking system gets around the problems of traditional of manually entering and registering customers to provide appointments, idle time of the staff, waiting in long lines and crowding the organization to let you focus on important things; Helps in managing time of both customer and the organization.

Automatic Token Management System also cut out many of the errors that humans can introduce into appointment booking systems. Making a mistake with a customers' contact details can have significant consequences: not only in terms of missed appointments, but making mistakes like this also makes your company look unprofessional. A Token Management System doesn't make mistakes like that.

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