Project Report

On

Optimizing Ad Serving in Way2News Ads Panel using Redis Cache

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CERTIFICATE

This is to certify that the project work titled "**Optimizing Ad Serving in Way2News Ads Panel using Redis Cache**" is a bonafide project work submitted by **MOPURU PAVANESH** in the department of **COMPUTER SCIENCE AND ENGINEERING** in partial fulfillment of requirements for the award of degree of Bachelor of Technology in Computer science and engineering for the year 2022-2023 carried out the work under the supervision.

GUIDE	HEAD OF THE DEPARTMENT
RATNAKUMARI CHALLA	SATYANANDARAM

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ABSTRACT

The **“Way2news ads panel”** is a comprehensive web-based platform that offers a range of tools and functionalities for advertisers, sales, and finance teams to efficiently manage their marketing campaigns. The platform comprises several pages, including a campaigns page, creatives page, RO (return on investment) page, reports page, location prices page, invoice page, and user creation page.

The aim of this project is to improve the performance and scalability of the ad-serving system in the Way2News mobile app. This is achieved by replacing the existing MySQL database with Redis, which can handle a higher number of requests and provide faster response times.

The ad-serving system in the Way2News mobile app is an important feature that helps generate revenue for the company. However, the system was facing performance and scalability issues due to the limitations of the MySQL database used for storing and retrieving ad-related data. To address these issues, we decided to implement Redis, an in-memory data store that is known for its ability to handle large numbers of requests with low response times.

The implementation involved migrating the existing ad-related data from MySQL to Redis and modifying the ad-serving code to use Redis as the primary data store. We also had to modify the Redis configuration to optimize its performance and ensure data consistency. The result was a significant improvement in the ad-serving system's performance and scalability, resulting in a better user experience and increased revenue for the company.

INTRODUCTION

Way2News, India's largest hyperlocal news app covers news from 400 districts and generates more than 4 billion screen views every month - that's 3 times the entire Indian population.**"Way2news ads panel"** comprises several pages, including campaigns, creatives, RO, reports, location prices, invoice, and user creation, all aimed at streamlining the campaign management process.

FUNCTIONAL REQUIREMENTS

CAMPAIGNS

The campaigns page enables advertisers to create and manage their marketing campaigns.

CREATIVES

while the creatives page allows users to design and upload promotional materials for use in their campaigns.

RO

The RO page provides data and analytics on the return on investment for each campaign, allowing users to make data-driven decisions to optimize their advertising strategies.

REPORTS

The reports page provides detailed performance metrics and insights on campaign performance, such as click-through rates and conversion rates.

CARD LISTS

while the location prices page allows users to set prices for different geographic locations, providing transparency and consistency across all campaigns.

INVOICE

The invoice page enables the finance team to generate and manage invoices for their clients.

USERS

while the user creation page allows the platform administrator to create and manage user accounts for the advertising, sales, and finance teams.

With our platform, managing marketing campaigns has never been easier. Our solution offers a comprehensive set of tools and functionalities designed to streamline the process, enabling teams to collaborate seamlessly and make data-driven decisions to optimize their advertising efforts. In the following sections, we will provide a detailed overview of each page and explain how it can benefit your business.

PURPOSE

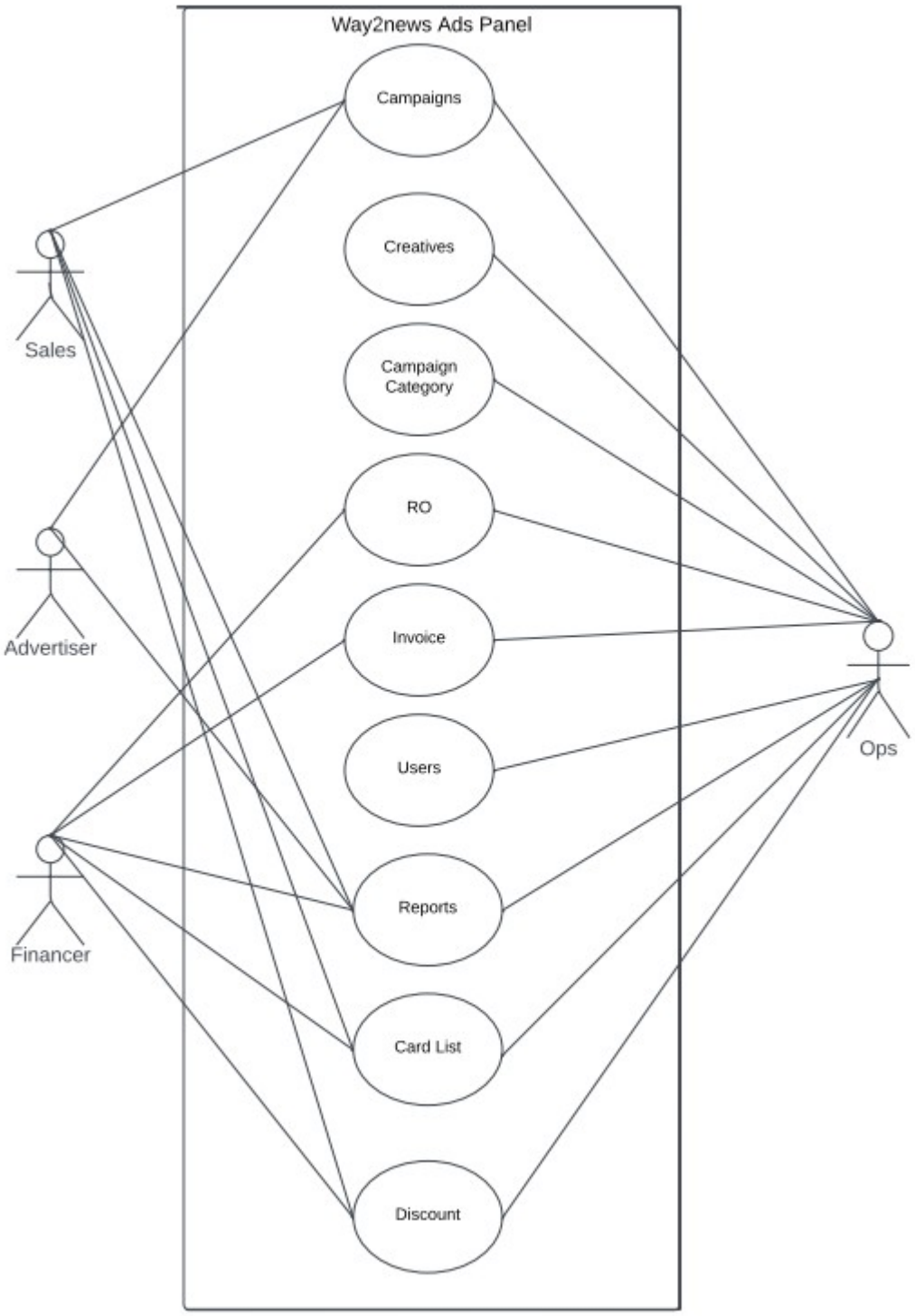
The purpose of **"Way2news ads panel"** is to serve targeted ads to users of the Way2News app based on their geographical location and desired placement. Additionally, the project aims to track impressions and clicks of these ads to measure their performance and effectiveness.

The **Way2News** app is a popular platform that provides users with a range of news and information content. With millions of active users across India, it provides an excellent opportunity for businesses to reach their target audience through targeted advertising.

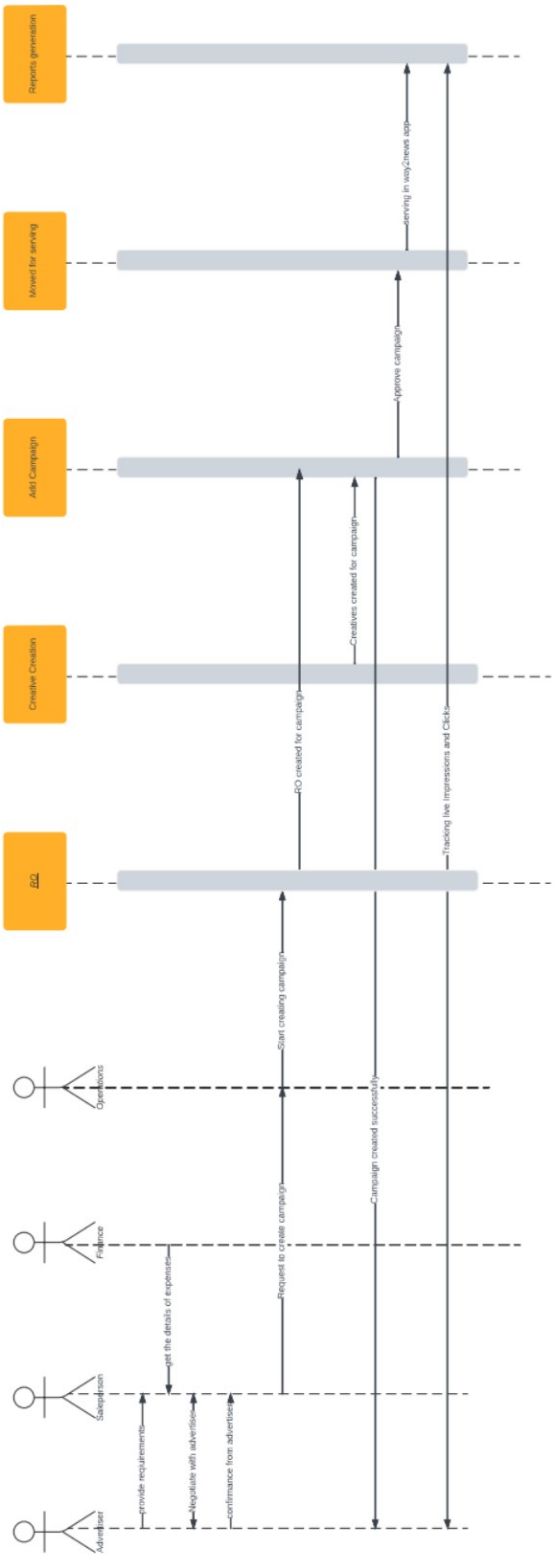
The project's primary objective is to develop a solution that allows businesses to serve ads to Way2News users based on their geographical location and desired placement within the app. Additionally, the project aims to track impressions and clicks of these ads to measure their performance and effectiveness.

DESIGN AND ANALYSIS

USE CASE DIAGRAM



SEQUENCE DIAGRAM



ANALYSIS AND IMPLEMENTATION

LOGIN

The system has four types of users - ops, sales, finance, and advertisers. Each user type has its set of privileges and permissions. For example, ops users can approve campaigns and have access to pages like discount, while sales users can view reports and campaigns, and finance users can view and update payment details.

Advertisers, on the other hand, have access to view their campaigns, spent, clicks, and impressions. The system has been designed to ensure that each user has access to only the relevant pages and information. This helps in maintaining the security and integrity of the system.

The login process ensures that only authorized users can access the system, and their roles and permissions are validated before granting access. Overall, the system aims to provide a seamless experience to all users, ensuring that they can perform their tasks efficiently and effectively.

CAMPAIGNS

The campaigns page is a key component of the advertising platform, where operations team can create and manage their campaigns. There are three types of campaigns: CPC, CPD, and CPM, each with its own pricing model. Operations team can perform a variety of actions on their campaigns, such as approving, pausing, stopping, cloning, and resuming. They can also preview the details of their campaigns, such as the creative assets, target geolocations, budget, and company details. When an advertiser approves a campaign, the campaign details are inserted into Redis, a fast and flexible in-memory data store. When a campaign is paused or stopped, it is deleted from the redis database. The campaigns page is an essential tool for advertisers to manage their advertising efforts and reach their target audience effectively.

The system tracks the spending, impressions, and clicks of each campaign in real-time, providing advertisers with valuable insights into their advertising performance. With this data, advertisers can make data-driven decisions and adjust their campaigns to achieve better results.

CAMPAIGN CREATION

Campaign creation involves four steps:-

- Step 1

  In step 1 users can select campaign details such as campaign type, advertiser related to the selected company and a sales person will be assigned.

- Step 2

  In step 2 the users can select the geographical locations where the campaigns need to be served, users can include or exclude the particular geolocations.

- Step 3

  In step 3 the users can set the budget of a campaign and select the preferred time period to run the campaign and set the impressions and clicks.

- Step 4

  In step 4 users can select the desired creatives in a preferred position where the campaign needs to be served in the mobile application. Cost will be calculated automatically according to the position and geolocation.

CREATIVES

The advertising platform offers a variety of creative types to choose from, including full image, full gallery, full video, half video, video with background, promoted image story, promoted video story, and promoted gallery story. Each creative type has its own unique features and benefits, allowing advertisers to choose the most appropriate one for their campaign. Advertisers can select the desired creative type and

fill in the details, such as the title, description, and call-to-action. They can also watch a preview of the creative simultaneously to see how it will be displayed in the application. The preview feature allows advertisers to make any necessary adjustments to their creatives before publishing their campaigns, ensuring that their ads look great and are effective in achieving their advertising goals. The wide range of creative types and the ability to preview them in real-time make the advertising platform a powerful tool for advertisers to create and manage their advertising campaigns.

To store the videos, images, and gifs used in the advertising campaigns, the platform utilizes Amazon Web Services (AWS).

CREATIVE CREATION

To create a new creative, advertisers must select the advertiser and company for which the creative is being created. They must also choose the creative type and subtype from the available options, such as full image, full video, or promoted image story. Advertisers can then upload images and videos directly to the platform and enter click and impression URLs. Once all the necessary information has been entered, the platform will create the new creative and make it available for use in campaigns. With the ability to create new creatives quickly and easily, advertisers can stay on top of their advertising efforts and respond quickly to changes in their marketing strategies.

In addition to uploading images and videos directly to the platform, users can also enter URLs of existing images and videos. This feature allows advertisers to use existing assets that are hosted on external websites or platforms, without having to upload them to the advertising platform

USERS

The advertising platform has three types of user roles: advertisers, sales, and finance. Advertisers are responsible for creating and managing their advertising

campaigns on the platform, including setting up targeting, selecting creatives, and monitoring performance metrics. Sales users are responsible for managing relationships with advertisers, including onboarding new clients, providing support, and resolving issues. Finance users are responsible for managing the financial aspects of the platform, such as billing and invoicing. Each user role has its own set of permissions and access levels, ensuring that users only have access to the features and data they need to perform their specific role on the platform. The clear division of user roles helps to streamline operations and ensure that tasks are completed efficiently and accurately.

REPORTS

The advertising platform provides comprehensive reporting features that allow advertisers to track the performance of their campaigns. In the Reports section of the platform, users can view key metrics such as impressions, clicks, spent, CTR (click-through rate), ECPM (effective cost per million impression), and budget limit. These metrics provide valuable insights into the effectiveness of advertising campaigns, allowing advertisers to optimize their campaigns for maximum impact. By regularly monitoring these metrics, advertisers can adjust their targeting, creatives, and budgets to improve performance and achieve their advertising goals. The reporting features also enable advertisers to export data to external analytics tools for further analysis and integration into their own reporting workflows.

- The Reports section of the Way2news ads platform offers a range of filter options to help advertisers analyze the performance of their campaigns in a granular way. Advertisers can generate reports based on various dimensions, including date, creative, language, state, district, mandal, OS, device model, brand, and category. These filters enable advertisers to gain deeper insights into how their campaigns are performing across different segments and to identify opportunities for optimization. For example, an advertiser could use the district-wise filter to see which districts are generating the most impressions and clicks, and then adjust

their targeting or messaging accordingly. The reporting features of the advertising platform are designed to provide advertisers with the data and insights they need to make informed decisions and achieve their advertising objectives.

CARD LIST

The Locations Prices section of the Way2news ads platform allows the finance team to manage the pricing of ad positions in the Way2News app across various geographical locations. The finance team can upload a CSV file containing the prices for each position in Way2news app at different locations, making it easy to set and update pricing across multiple locations at once. Additionally, advertisers can edit individual prices for each location after uploading the CSV file. This flexibility enables advertisers to tailor their pricing strategies to the specific needs and demands of each market. By managing the pricing of ad positions in this way, the finance team can optimize revenue while ensuring that prices remain competitive and attractive to potential advertisers.

The Card Lists has a useful feature to prevent data duplication and to provide information to the users about the existing data in the database. It also helps to maintain data integrity and accuracy. By alerting users about duplicate records, they can make informed decisions on whether to add new data or update existing data. This feature can save time and effort for the users by avoiding the need to manually check for duplicates.

DISCOUNT

The Discount section of the advertising platform allows users to create and manage discounts for their campaigns. Discounts can be of two types: percentage discounts or package discounts. Percentage discounts offer a discount on the total cost of a campaign, while package discounts offer a set number of free campaigns when a certain number of paid campaigns are purchased. Users can select the type of discount

they wish to offer and specify the details, such as the discount percentage or the number of paid and free campaigns included in the package. After submitting the form, the ops team will review and approve the discount. Once approved, a unique code will be generated and sent to the selected ops team via email. This code can then be used by advertisers to avail of the discount when creating their campaigns. The Discount section of the platform is designed to help advertisers incentivize their customers and drive more business by offering attractive discounts on their campaigns.

INVOICE

The Invoice section of the advertising platform generates monthly invoices for companies based on their campaign performance. A cron job is set up to automatically generate the invoice each month. The amount billed is based on the number of clicks and impressions generated by the campaigns of a particular company during that month. The invoice ID is generated based on the type of billing - editorial, local, or DFP. By automating the invoicing process, the platform ensures that companies are billed accurately and efficiently, while reducing the administrative burden on the finance team. This helps to streamline operations and improve the overall user experience for advertisers on the platform.

The payment section of the platform allows users to update their payment information and make payments using various methods such as cheque, UPI, or bank transfer. Users can choose to make full or partial payments, and they can view their campaign-wise spend, clicks, and impressions for a particular campaign. The platform also allows users to download their payment and campaign data for easy reference and record keeping. This provides a convenient and user-friendly way for advertisers to manage their payments and track their campaign performance, ultimately helping to improve their return on investment and overall satisfaction with the platform.

TECHNOLOGIES

JAVASCRIPT

JavaScript is a high-level, interpreted programming language commonly used for web development. It runs on the client-side of web applications and can manipulate the Document Object Model (DOM) to dynamically change the content and style of web pages. It has a rich set of built-in functions and libraries that make it easy to add interactivity and functionality to web applications.

JavaScript can be used on both the client-side and server-side of web development, making it a versatile language. Overall, JavaScript is an essential part of modern web development.

REACT JS

React is a JavaScript library created by Facebook. It's the most popular library for building single-page applications and interactive user interfaces. Interestingly enough, oftentimes React is referred to as a framework. It can be used with **different libraries and tools**, such as **Material UI**, **Redux**, or **Create React App**. Doing so can allow the library to spread the wings even more.

NODE JS

Node.js is an open-source, cross-platform, server-side JavaScript runtime environment. It allows developers to write server-side applications in JavaScript, which makes it easier to build scalable and high-performance applications. Node.js is built on the V8 JavaScript engine, which provides a high-performance environment for running JavaScript code. It also has a rich set of built-in modules and packages, such as the HTTP module, that make it easy to build web servers and web applications. Node.js is also popular for its event-driven, non-blocking I/O model, which allows for high concurrency and scalability. Overall, Node.js is a powerful platform for building server-

side applications and is widely used for web development, API development, and real-time applications.

POSTGRESQL

PostgreSQL is a powerful open-source relational database management system. It is known for its scalability, reliability, and robustness. PostgreSQL is used by many companies to store and manage large volumes of data. It supports multiple programming languages, including SQL, Python, and Java, making it a versatile option for developers. PostgreSQL also offers advanced features such as transactions, data integrity, and concurrency control. Overall, PostgreSQL is an excellent choice for businesses looking for a reliable and scalable database management system.

MYSQL

MySQL is an open-source relational database management system (RDBMS). Its name is a combination of "My", the name of co-founder Michael Widenius's daughter My and "SQL", the acronym for Structured Query Language. A relational database organizes data into one or more data tables in which data may be related to each other. These relations help structure the data. SQL is a language programmers use to create, modify and extract data from the relational database, as well as control user access to the database

MONGODB

MongoDB is a cross-platform, open-source, NoSQL document-oriented database system. It is known for its flexibility, scalability, and performance, making it an excellent choice for building modern web applications. MongoDB stores data in JSON-like documents, which allows for a more natural mapping between the data in the application and the data in the database. It also supports dynamic schema, which means that the structure of the data can evolve over time without the need for a schema migration. MongoDB is also known for its scalability, as it can handle large volumes of data and distribute data across multiple servers. It also has a rich set of features, such as indexing, aggregation, and full-text search, that make it easy to work with data in

complex ways. Overall, MongoDB is an excellent choice for building modern web applications that require flexibility, scalability, and performance.

REDIS

Redis is an open-source, in-memory data structure store that is used as a database, cache, and message broker. It is known for its high performance, scalability, and versatility, making it an excellent choice for building modern web applications. Redis stores data in key-value pairs, and it supports a wide range of data structures, such as strings, lists, sets, and hashes. Redis is also known for its speed, as it stores data in memory, which allows for fast read and write operations. Additionally, Redis supports advanced features such as pub/sub messaging, transactions, and Lua scripting. Redis is often used for caching frequently accessed data, storing real-time data, and implementing message queues. Overall, Redis is a powerful tool for building modern web applications that require fast read and write operations, advanced features, and scalability.

SHOELACE

Shoelace is a free and open-source CSS framework for building responsive user interfaces. It offers pre-designed components that can be easily integrated into web applications. Shoelace follows a modular design approach, allowing developers to include only the components they need. The framework is fully customizable, enabling developers to adjust the look and feel of the components to match their design requirements.

TAILWIND CSS

Tailwind CSS is a utility-first CSS framework that provides a set of pre-designed and customizable CSS classes to quickly build modern user interfaces. It is known for its simplicity, flexibility, and efficiency, and it helps developers write less CSS code while improving productivity. Overall, Tailwind CSS is an excellent choice for developers who want a fast and easy way to create beautiful user interfaces.

SERVING PATTERN

When a request is made from the Android application for campaigns with geolocation details, the system filters the campaigns based on the specified geolocation. All the details of the campaigns will be obtained from the redis database based on the positions.

The serving pattern of ads in the mobile app is based on a complex filtering and selection process. The first step is to filter the campaigns based on their geolocation. The campaigns are then further filtered based on their type, which can be either fixed or rotation.

If the campaign is fixed, the least impression creative will be served, while for a rotation campaign, all the least impressions creatives of the campaign will be served. However, this serving pattern is also subject to a frequency cap, which can be set for a day, week or month. This means that even if the least impression creative of a campaign is available, it won't be served if the frequency cap for that campaign has been exceeded.

The frequency cap ensures that the same creative isn't served to the same user repeatedly and ensures that the user experience is not affected negatively by seeing the same ad over and over again. Once a campaign has been selected, the ads are served based on their position in the app, with priority given to ads in premium positions. These positions are determined based on the location of the ad within the app and the amount paid by the advertiser for that position.

Overall, the serving pattern of ads in the mobile app is a complex process that involves multiple filters and checks to ensure that the user experience is not negatively affected by seeing the same ad repeatedly. Additionally, advertisers can choose to pay more to have their ads displayed in premium positions, providing a greater chance of their ad being seen by users.

CAMPAIGNER

The campaigner process is responsible for managing ad campaigns in the Way2News app. It uses a Redis database to store campaign and creative related data such as key-value pairs containing campaign details and target geolocation.

The campaigner process performs two primary functions:

1. Adding key-value pairs to Redis: The process periodically retrieves all scheduled and paused campaigns from the database and checks their daily and total spending, total and daily cap, time slots, and overall time period. If the campaign's spending and time constraints are satisfied, it moves the campaign's status to "running" and adds a key-value pair to Redis containing the campaign details and target geolocation. This allows the app to serve ads to users in specific locations.
2. Removing key-value pairs from Redis: The process also periodically retrieves all running campaigns from Redis and checks their daily and total spending, daily and total cap as well as their time slots and overall time period. If a campaign's daily spending limit or daily cap or daily time slot has been reached, its status is changed to "paused", and the key-value pair related to the campaign is removed from Redis. If a campaign's total spending limit or total cap or overall time period has been exceeded, its status is changed to "stopped", and the key-value pair is removed from Redis as well.

These functions are performed every 5 minutes, allowing the campaigner process to constantly update the Redis database and ensure that the app is serving ads to users in the most efficient and effective way possible.

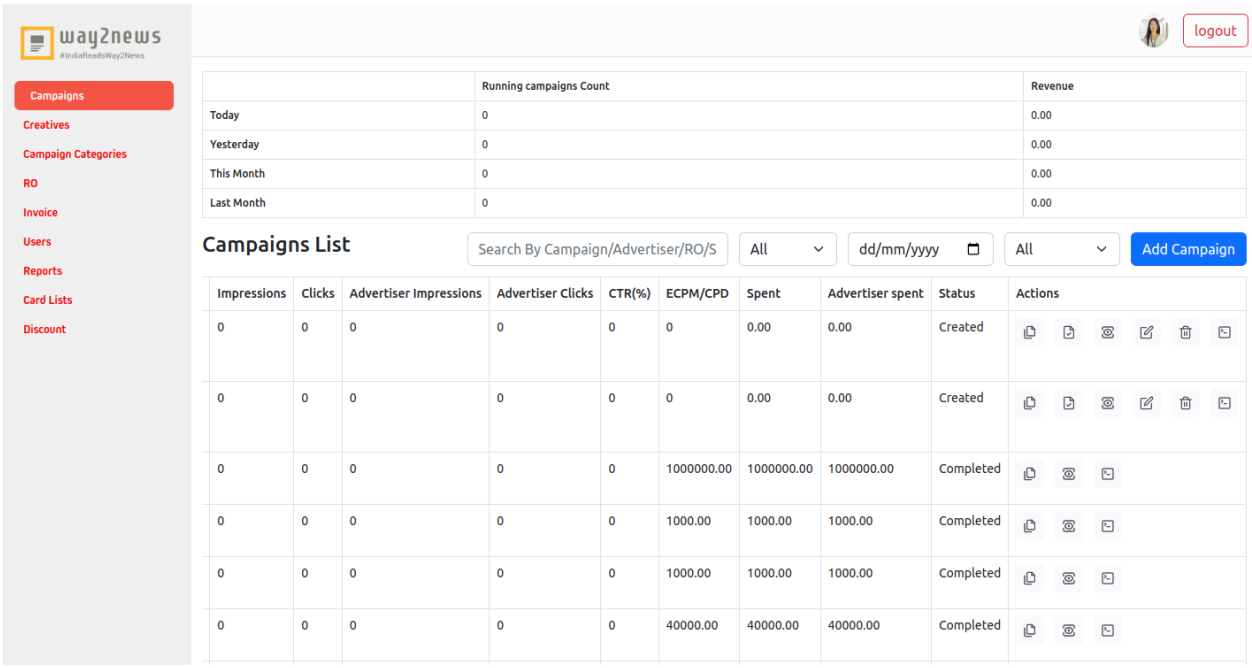
The campaigner process, responsible for managing campaigns, checking their spending and time constraints, and updating the Redis database accordingly. The serving pattern process works in conjunction with the campaigner process by retrieving the key-value pairs from Redis that contain campaign details, creative details and target

geolocation. Using this information, the serving pattern process selects the most appropriate ad to display to the user at that moment.

TESTING

S.NO	ACTION	INPUT	EXPECTED RESULTS	ACTUAL RESULTS	STATUS
1	To ensure that only authorized users are able to access specific pages	Enter Valid Credentials	According to the user only the authorized pages should be shown.	Only the authorized pages were shown.	Pass
2	Campaign Creation	Enter required details of a campaign.	Campaign should be added successfully.	Campaign was added successfully.	Pass
3	Creative Creation	Enter required details of a creative and upload valid media files.	Creative should be added successfully	Creative was added successfully.	Pass
4	For every Five minutes campaigns should be added to redis database.	create a cron job which runs every five minutes.	Campaigns should be added to redis.	Campaigns were added to redis.	Pass
5	Ads should be served according to geo locations	Add campaigns for a particular location	Ad should be served to that location	Ad was served to the particular location.	Pass
6	Redis DB should handle more than 90k requests per second.	Use load balancer to generate 90k requests.	Response should be quick.	Response was quick	Pass

RESULTS


way2news
#IndiaReadsWay2News
Campaigns
Creatives
Campaign Categories
RO
Invoice
Users
Reports
Card Lists
Discount
logout
Running campaigns Count
Revenue
Today 0 0.00
Yesterday 0 0.00
This Month 0 0.00
Last Month 0 0.00
Campaigns List
Search By Campaign/Advertiser/RO/S
All
dd/mm/yyyy
All
Add Campaign
Impressions Clicks Advertiser Impressions Advertiser Clicks CTR(%) ECPM/CPD Spent Advertiser spent Status Actions
0 0 0 0 0 0 0.00 0.00 Created
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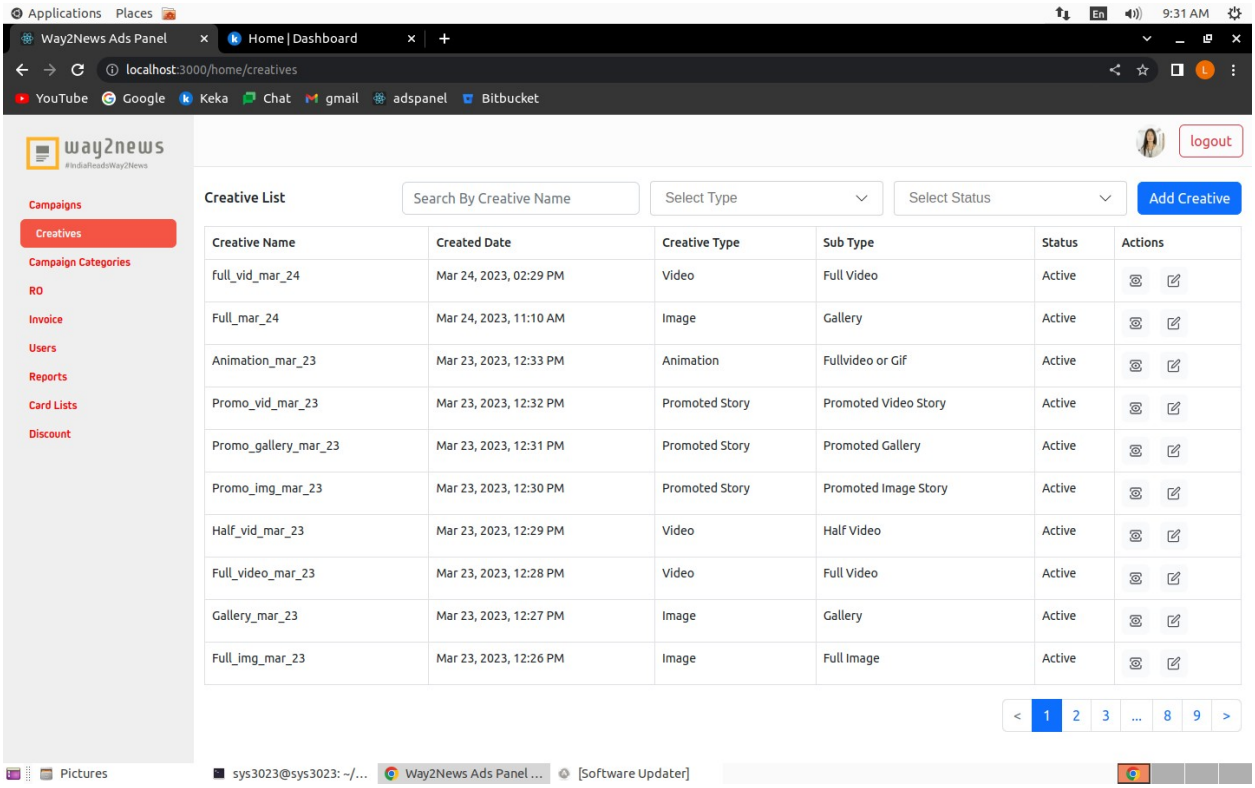
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Home | Dashboard
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Campaign Categories
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logout
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Select Type
Select Status
Add Creative
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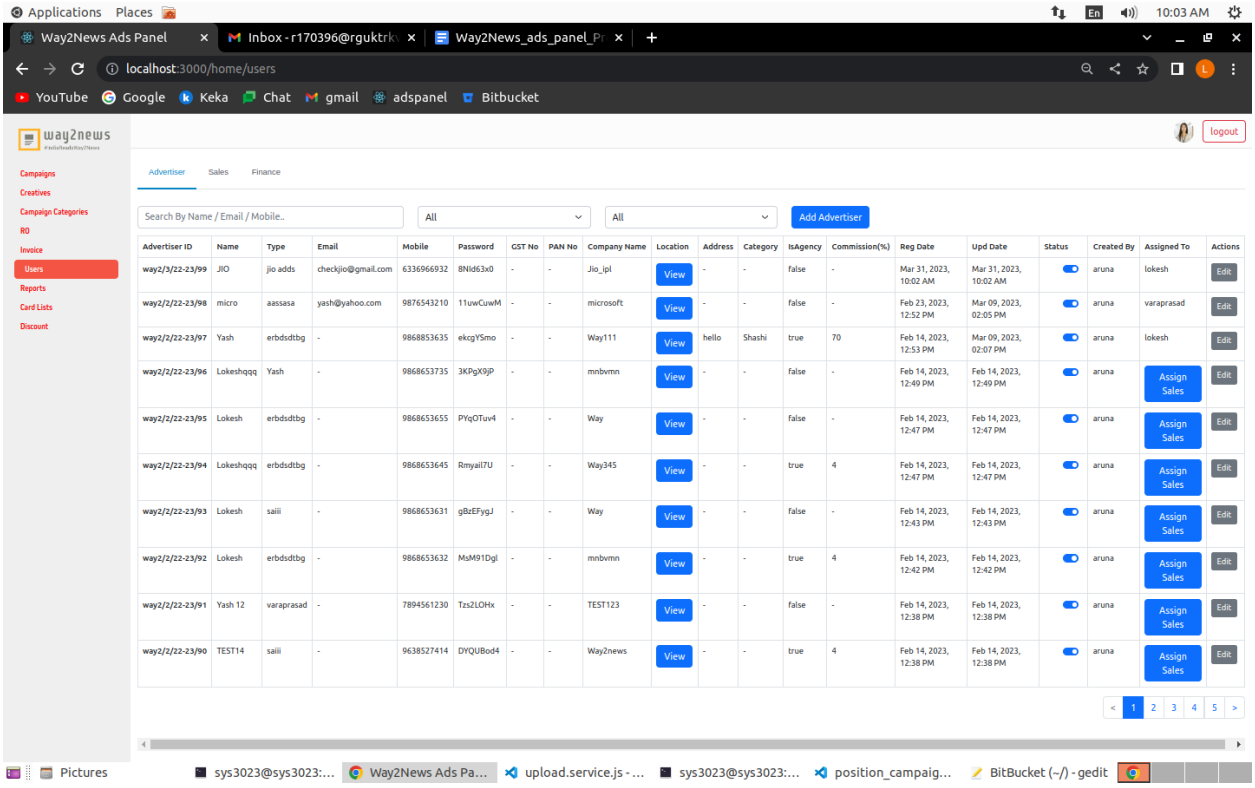
[Software Updater]



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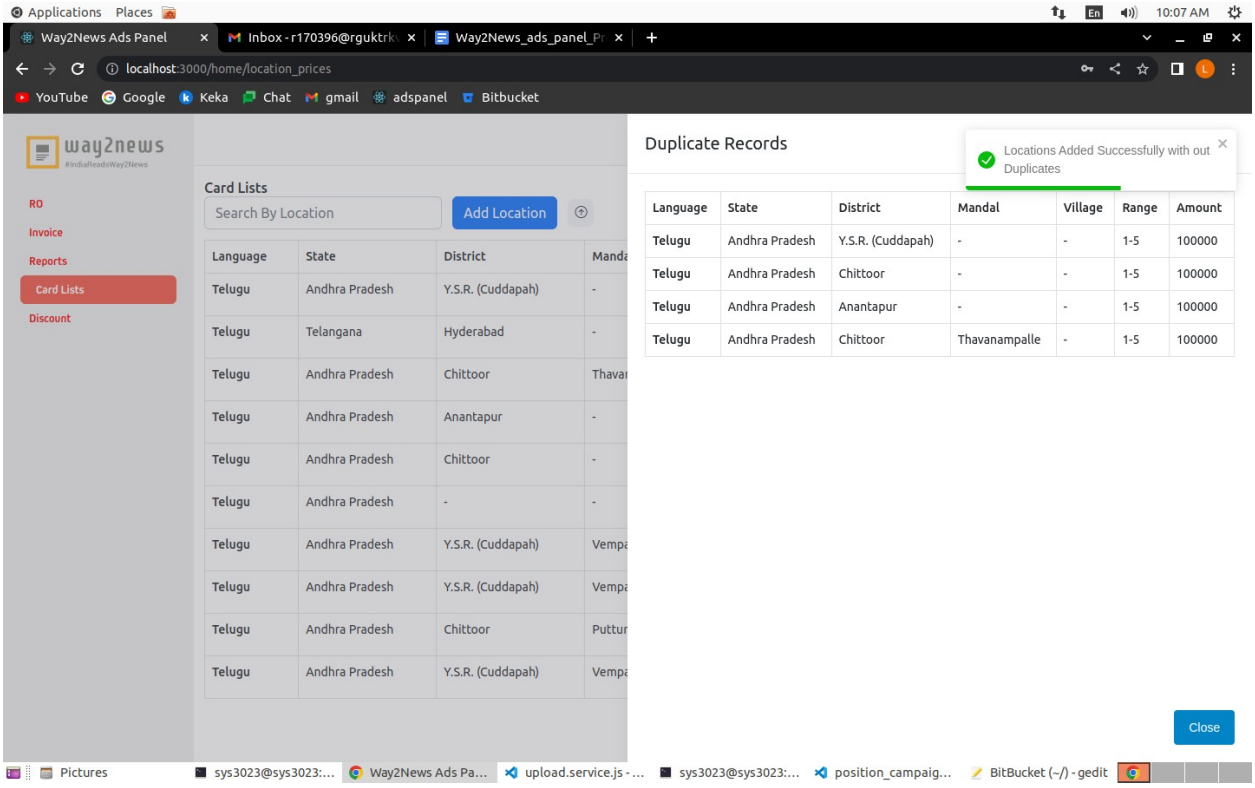
IMPRESSIONS	CLICKS	CTR(%)	ECPM/CPD	TOTAL BUDGET	DAILY BUDGET	SPENT
10	6	60.00	72600.00	1111.00	101.00	726.00

Date Wise | Creative Wise | Language Wise | State Wise | District Wise | Mandal Wise | Os Wise | Model Wise | Brand Wise | Category Wise

Date	Impressions	Clicks	CTR(%)	ECPM	Spent
Mar 17, 2023	3	0	0	0	0.00
Mar 16, 2023	7	6	85.71	103714.29	726.00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RO
Invoice
Reports
Card Lists
Discount
Card Lists
Search By Location
Add Location
Language State District Manda
Telugu Andhra Pradesh Y.S.R. (Cuddapah) -
Telugu Telangana Hyderabad -
Telugu Andhra Pradesh Chittoor Thava
Telugu Andhra Pradesh Anantapur -
Telugu Andhra Pradesh Chittoor -
Telugu Andhra Pradesh - -
Telugu Andhra Pradesh Y.S.R. (Cuddapah) Vempa
Telugu Andhra Pradesh Y.S.R. (Cuddapah) Vempa
Telugu Andhra Pradesh Chittoor Puttur
Telugu Andhra Pradesh Y.S.R. (Cuddapah) Vempa
Duplicate Records
Locations Added Successfully with out Duplicates
Language State District Mandal Village Range Amount
Telugu Andhra Pradesh Y.S.R. (Cuddapah) - - 1-5 100000
Telugu Andhra Pradesh Chittoor - - 1-5 100000
Telugu Andhra Pradesh Anantapur - - 1-5 100000
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Close
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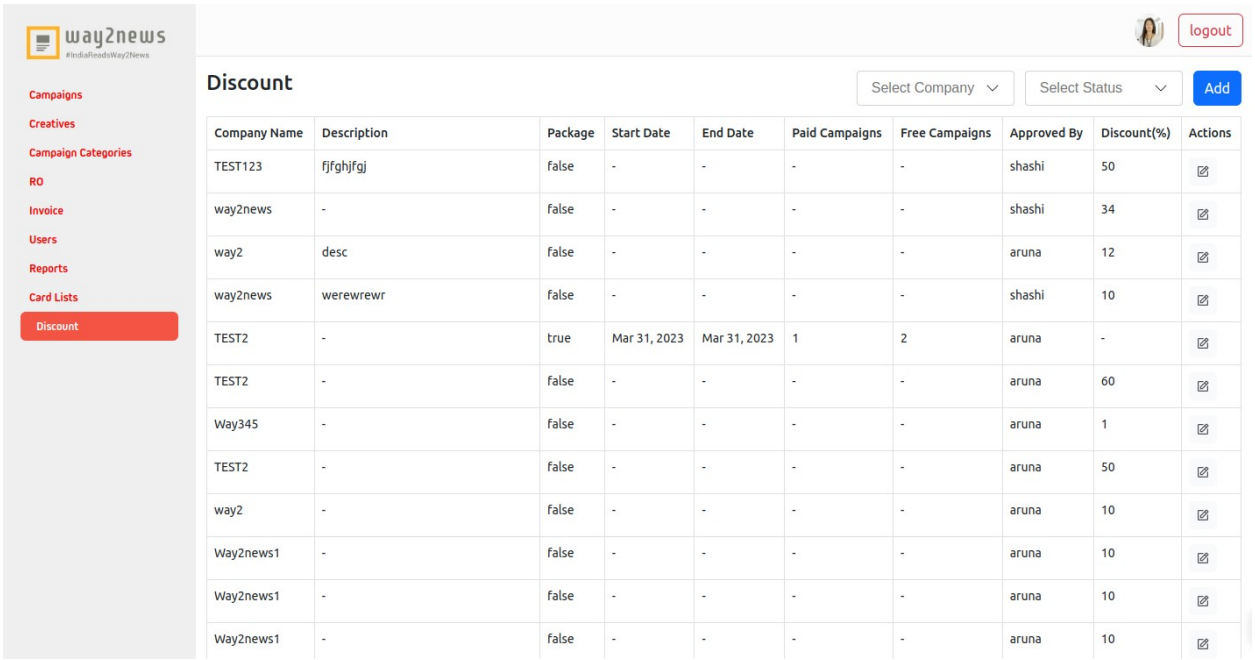
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Select Status
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Company Name Description Package Start Date End Date Paid Campaigns Free Campaigns Approved By Discount(%) Actions
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TEST2 - false - - - - aruna 50
way2 - false - - - - aruna 10
Way2news1 - false - - - - aruna 10
Way2news1 - false - - - - aruna 10
Way2news1 - false - - - - aruna 10


16:07
28.4KB/s
Ad
SOCH NAYI
RISHTA PURAANA
50 YEARS
MILTON
BUY NOW


22:11
15.9KB/s
Ad
SMARTPHONES
at
THE BIG BILLION DAYS
PRICES
before the sale!
during
THE
ZERO HOUR
LIVE
Powered by realme
1 PM, SEP 8
Stand a chance to win
free* phones and other rewards

CONCLUSION

The implementation of Redis in the ad serving system of the Way2News app has greatly improved its performance. Redis has allowed the system to handle a large number of requests with a lower response time compared to MySQL. This has led to a better user experience for the app users and increased revenue for the company. The scalability and high availability of Redis make it a suitable choice for ad serving systems, and we recommend its use for similar systems in the future.

The platform tracks live impressions, clicks, and spend, and generates reports based on various criteria, including date, creative, language, state, district, and more. Users can also upload and manage location prices for different geographic areas and select discounts or packages. Additionally, the platform features an invoicing system that automatically generates invoices based on campaign performance and allows users to make payments through various methods such as cheques, UPI, or bank transfer.

It also provides detailed campaign data for easy reference and record keeping. Overall, the project provides a user-friendly and comprehensive solution for advertisers to manage their campaigns, creatives, and payments in one place, with real-time tracking and reporting for maximum effectiveness .

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