

Industrial Internship Report on

"URL Shortener"

Prepared by

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Executive Summary

This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT).

This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks' time.

My project was "The URL shortener" project is a web application built to simplify long URL links by generating shorter, more manageable URLs. It features an intuitive user interface allowing users to input lengthy URLs and receive corresponding shortened versions. Utilizing Flask for backend development and HTML, CSS, and Bootstrap for frontend styling.

This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

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1 Preface

I participated in an internship program offered by USC/UCT IoT Academy in collaboration with Upskill Campus and Uni Converge Technologies. This journey was marked by exploration, learning, and professional growth.

Acknowledgments:

I extend gratitude to mentors and program organizers for their guidance and support, shaping my learning experience significantly.

Message to Juniors and Peers:

opportunities for growth, approach challenges with resilience, and never stop pursuing your passions.

Overall Experience:

This internship has been personal and professional growth while equipping me with practical skills for future endeavors

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

A company established in 2013 and working in Digital Transformation domain and providing Industrial solutions with prime focus on sustainability and RoI.

For developing its products and solutions it is leveraging various **Cutting Edge Technologies** e.g. **Internet of Things (IoT), Cyber Security, Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end** etc.



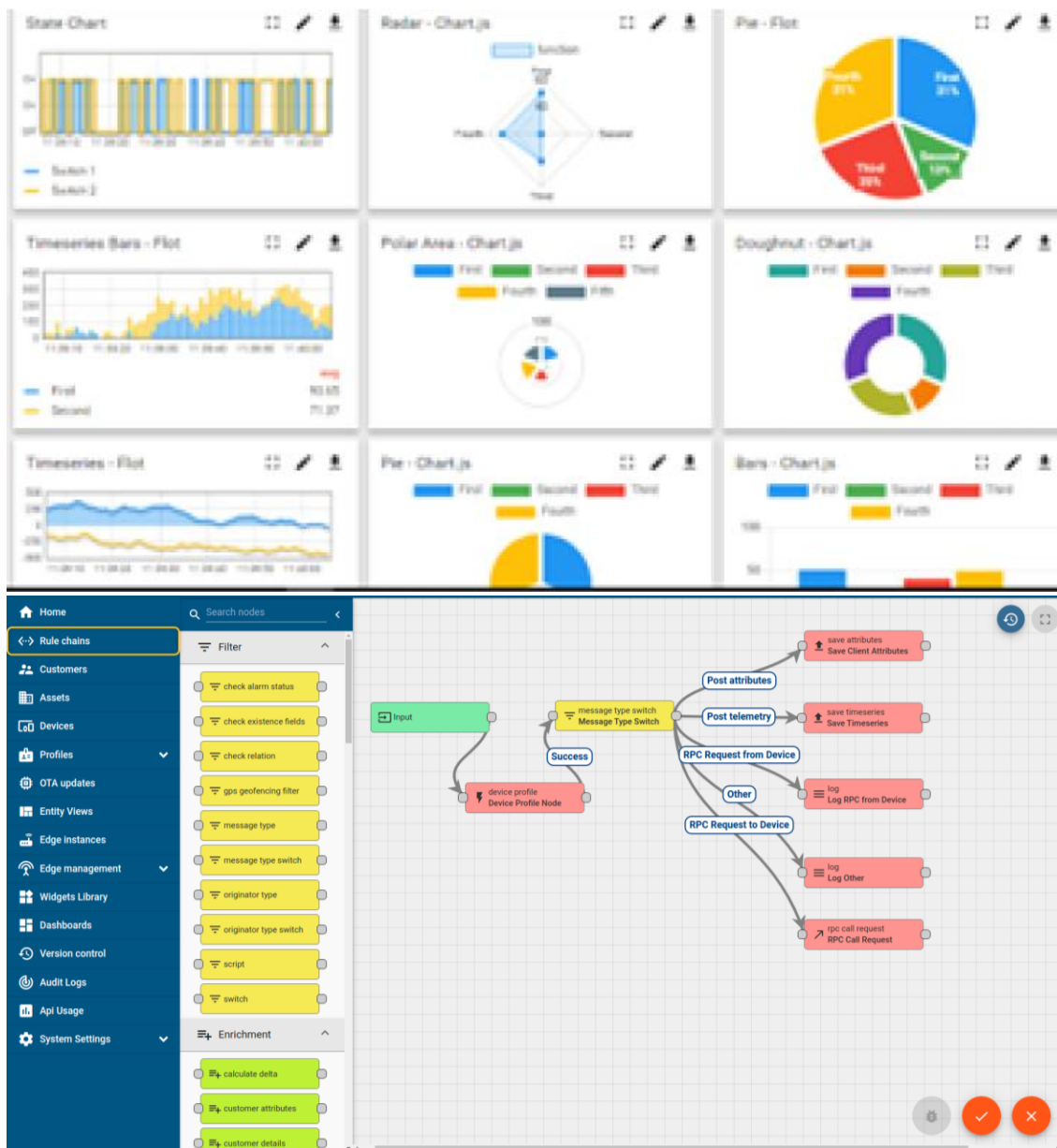
i. UCT IoT Platform ()

UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable “insight” for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- It enables device connectivity via industry standard IoT protocols MQTT, CoAP, HTTP, Modbus TCP, OPC UA
- It supports both cloud and onpremises deployments.

It has features to

- Build Your own dashboard
- Analytics and Reporting
- Alert and Notification
- Integration with third party application(Power BI, SAP, ERP)
- Rule Engine



FACTORY WATCH

ii. Smart Factory Platform ()

Factory watch is a platform for smart factory needs.

It provides Users/ Factory

- with a scalable solution for their Production and asset monitoring
- OEE and predictive maintenance solution scaling up to digital twin for your assets.
- to unleash the true potential of the data that their machines are generating and helps to identify the KPIs and also improve them.
- A modular architecture that allows users to choose the service that they want to start and then can scale to more complex solutions as per their demands.

Its unique SaaS model helps users to save time, cost and money.



Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i



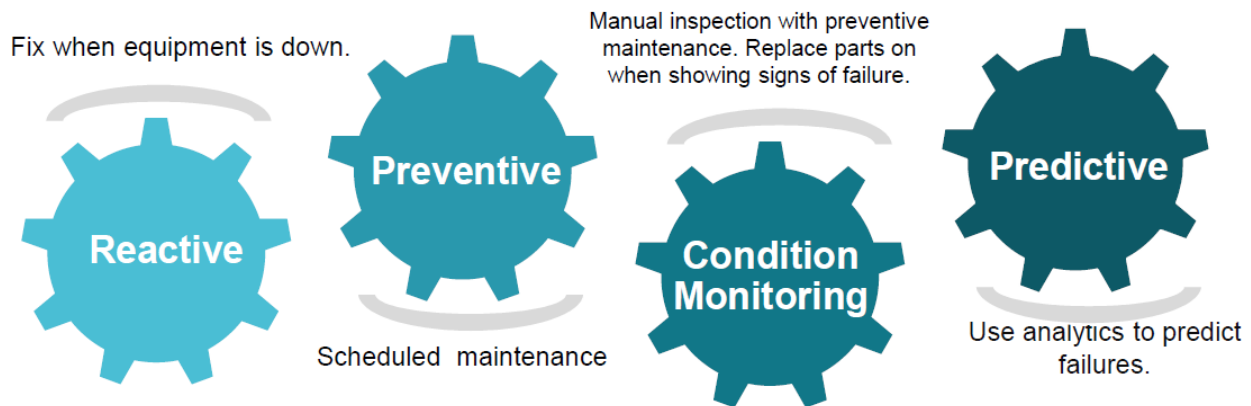


iii. LoRaWAN based Solution

UCT is one of the early adopters of LoRAWAN technology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

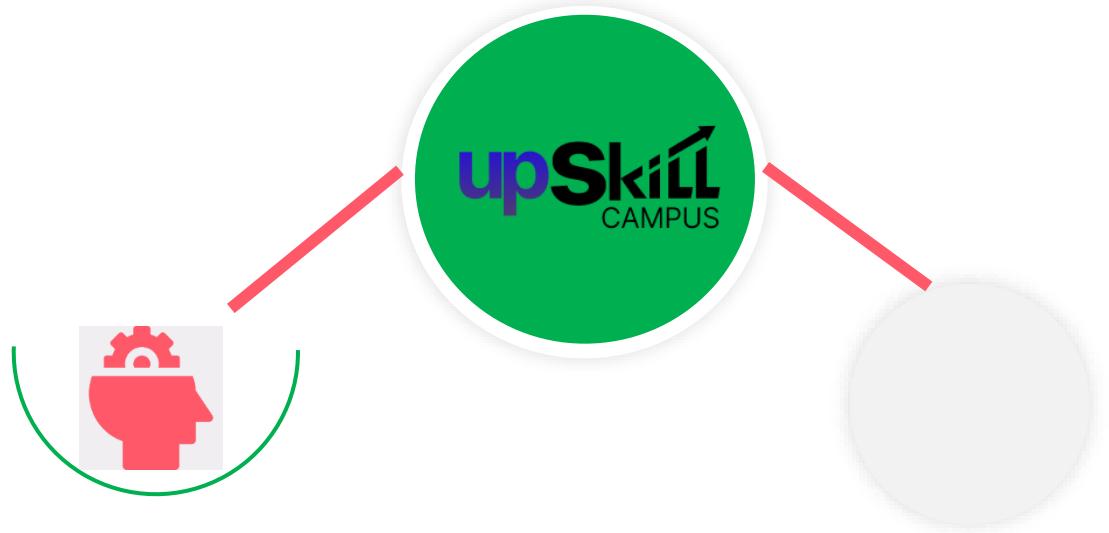
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.

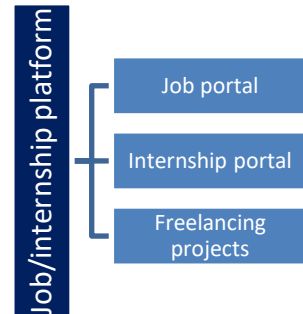
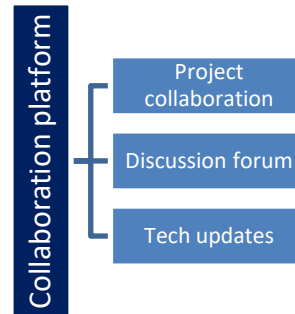
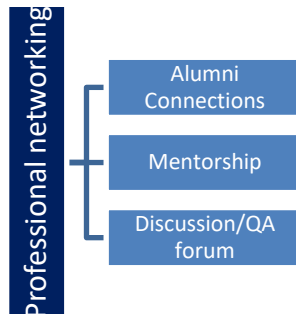
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



Seeing need of upskilling in self paced manner alongwith additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year

<https://www.upskillcampus.com/>



2.3 The IoT Academy

The IoT academy is EdTech Division of UCT that is running long executive certification programs in collaboration with EICT Academy, IITK, IITR and IITG in multiple domains.

2.4 Objectives of this Internship program

The objective for this internship program was to

- get practical experience of working in the industry.
- to solve real world problems.
- to have improved job prospects.
- to have Improved understanding of our field and its applications.
- to have Personal growth like better communication and problem solving.

2.5 Reference

[1] Flask Documentation: Official documentation for Flask web framework.

[2] SQLite Documentation: Official documentation for SQLite database.

Glossary

Terms	Acronym
SQLite	A lightweight, serverless, relational database management system often used for small to medium-sized applications.
Bootstrap	A front-end framework for developing responsive and mobile-first websites.
Analytics	The process of analyzing data to derive insights and make informed decisions.

3 Problem Statement

The problem statement assigned to me entails the development of a URL shortener web application. URL shortening is a process that converts long, unwieldy URLs into shorter, more manageable links. The primary objective of this project is to create a user-friendly interface that allows users to input lengthy URLs and receive shortened versions that are easier to share and remember.

One of the key challenges of this project is to implement the URL shortening algorithm effectively, ensuring that the generated shortened URLs are unique and not easily guessable. The goal of this project is to develop a robust and efficient URL shortener web application that meets the needs of users by simplifying the process of sharing and accessing URLs while adhering to best practices in web development and data management.

4 Existing and Proposed solution

Provide summary of existing solutions provided by others, what are their limitations?

Existing URL shortening services: Several popular URL shortening services such as Bitly, Tiny URL, and Re brandy already exist in the market. These services offer convenient ways to shorten URLs and track click metrics. However, they often come with limitations such as usage restrictions, limited customization options for shortened URLs, and potential privacy concerns due to centralized control of user data.

What value addition are you planning?

The proposed solution will have options for shortened URLs, allowing users to create personalized and branded short links that reflect their brand identity or campaign themes. the application will be designed with scalability and performance in mind, capable of handling a large volume of URL mappings and user requests efficiently. This will ensure a seamless user experience even during periods of high traffic. application will include built-in analytics and reporting features to provide users with valuable insights into link performance and user engagement. This will enable users to track the effectiveness of their marketing campaigns and optimize their strategies accordingly.

4.1 Code submission (Github link)

<https://github.com/Vishwanath355/upskillcampus/blob/main/blob/main/app.py>

Report submission (Github link) :

https://github.com/Vishwanath355/upskillcampus/tree/main/blob/main/UrlShortener_Vishwanath_USC_UCT.pdf

5 Proposed Design/ Model

Given more details about design flow of your solution. This is applicable for all domains. DS/ML Students can cover it after they have their algorithm implementation. There is always a start, intermediate stages and then final outcome.

5.1 High Level Diagram (if applicable)

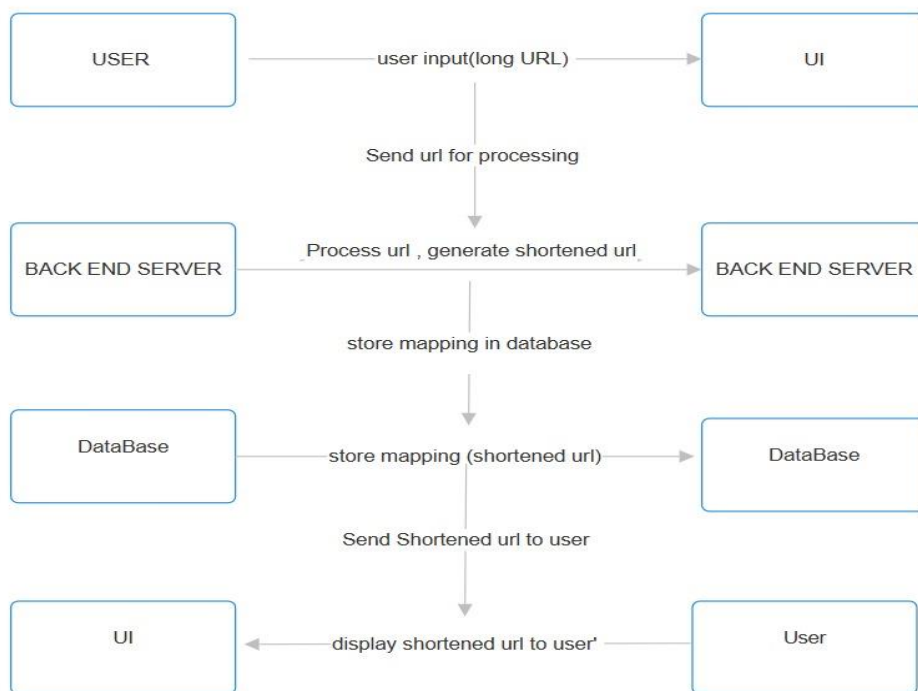


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram (if applicable)

5.3 Interfaces (if applicable)

1. Data Flow Diagram:

- Depiction of the flow of data within the URL shortener web application.
- Movement of information between components such as UI, backend server, and database.
- Path data takes from user input through processing to response generation.
- Highlights the flow of data back to the UI for presenting responses to the user.

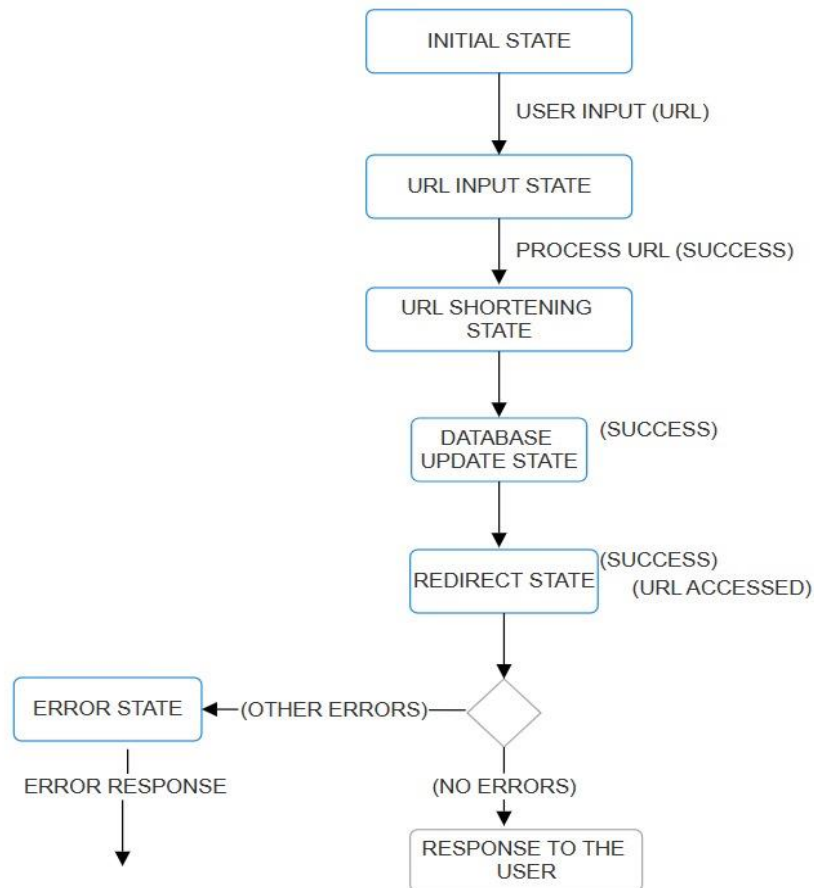


Figure 2: STATE MACHINE DIAGRAM OF THE SYSTEM

2.. State Machine Diagram:

- Representation of different states and transitions within the URL shortener web application.
- States: Initial state, URL input state, URL shortening state, database update state, error state, and redirect state.
- Transitions triggered by events such as user input, URL shortening, database update, error occurrence, and URL access.
- Behaviour of the system in response to user actions and external events.

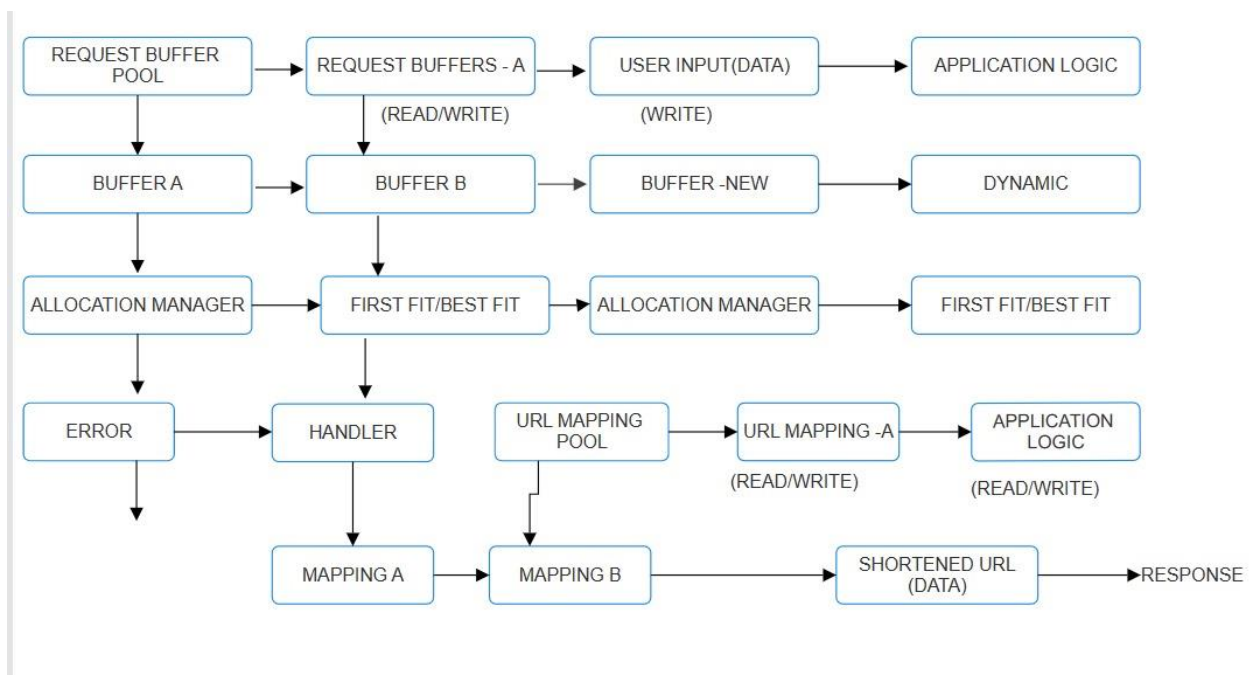


Figure 3: BUFFER DIAGRAM OF THE SYSTEM

5. Memory Buffer Management Diagram:

- Illustration of memory allocation and management within the URL shortener web application.
- Memory pools for storing URL mappings, request buffers, and other data structures.
- Buffers for storing user input, server responses, and other temporary data.
- Allocation algorithm (e.g., firstfit, bestfit) and strategies for memory optimization.

- Error handling mechanisms for out of memory conditions and buffer overflow situations.

6 Performance Test

This is very important part and defines why this work is meant of Real industries, instead of being just academic project.

Here we need to first find the constraints.

Constraints Identified:

1. Memory: We need to make sure our application doesn't use too much memory, especially when dealing with lots of URLs.
2. Speed: Our application needs to be fast at generating short URLs and handling lots of people using it at the same time.

How those constraints were taken care in your design?

1. Memory: We've made sure to use efficient ways of storing data and managing our database to avoid using too much memory.
2. Speed: Our application is designed to handle lots of requests quickly, using smart techniques to process data fast even when lots of people are using it.

What were test results around those constraints?

1. Memory: Testing shows our application uses memory efficiently, even when handling a lot of URLs at once.
2. Speed: Our application performs well under heavy usage, with response times staying fast even with lots of people using it.

Recommendations to Handle Constraints:

1. Memory: Keep an eye on memory usage and continue finding ways to optimize it to ensure our application runs smoothly.
2. Speed: Look for ways to further improve performance, like adding more servers or finetuning our code to work even faster.

6.1 Test Plan/ Test Cases

Test Plan:

1. Objective: The objective of performance testing is to evaluate the speed and efficiency of the URL shortener application under different conditions.
2. Scope: The testing will focus on measuring key performance metrics such as load time, time to interactive, and overall responsiveness of the application.
3. Approach: Performance testing will be conducted using Google Dev Tools to simulate various network conditions and device types to assess the application's performance across different scenarios.

Test Cases:

1. Load Time Test Case: Measure the load time of the application under normal network conditions and compare it against acceptable benchmarks.
2. Time to Interactive Test Case: Evaluate the time it takes for the application to become fully interactive, allowing users to interact with the interface without delays.
3. Responsiveness Test Case: Assess the responsiveness of the application by simulating user interactions and measuring the time it takes for the application to respond to user input.

6.2 Test Procedure

Setup:

1. Set up Google Dev Tools in the Chrome browser to access the performance monitoring tools.
2. Ensure the application is deployed in a testing environment accessible from the browser.

Execution:

1. Load Time Measurement:

- Use the "Performance" tab in Dev Tools to record the load time of the application.
- Simulate different network conditions (e.g., 3G, 4G, and Wi-Fi) to assess performance under varying bandwidths.

2. Time to Interactive Measurement:

- Utilize the "Lighthouse" tool in Dev Tools to measure the time to interactive of the application.
- Analyse the performance audit results to identify opportunities for improvement.

3. Responsiveness Testing:

- Use the "Network" and "Performance" tabs in DevTools to simulate user interactions and monitor application responsiveness.
- Record the response times for different user actions such as clicking on links or submitting forms.

6.3 Performance Outcome

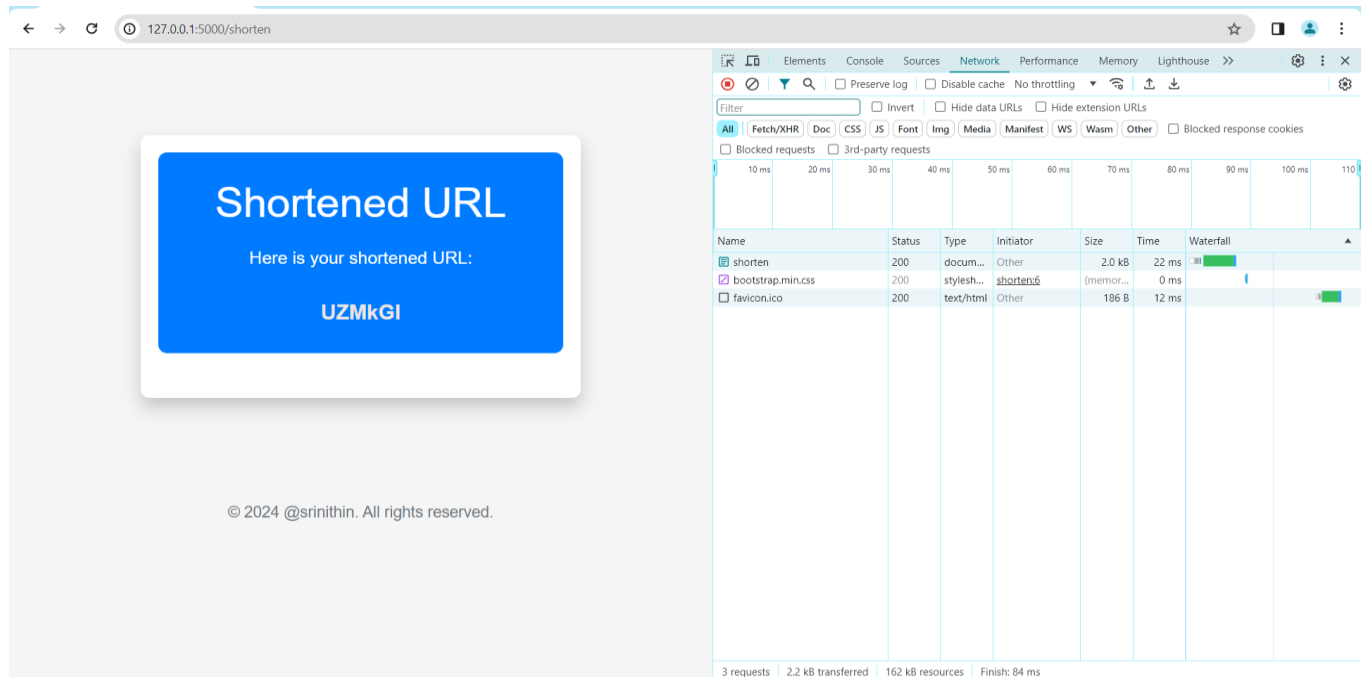


Figure 3: NETWORK PERFORMANCE OF THE SYSTEM

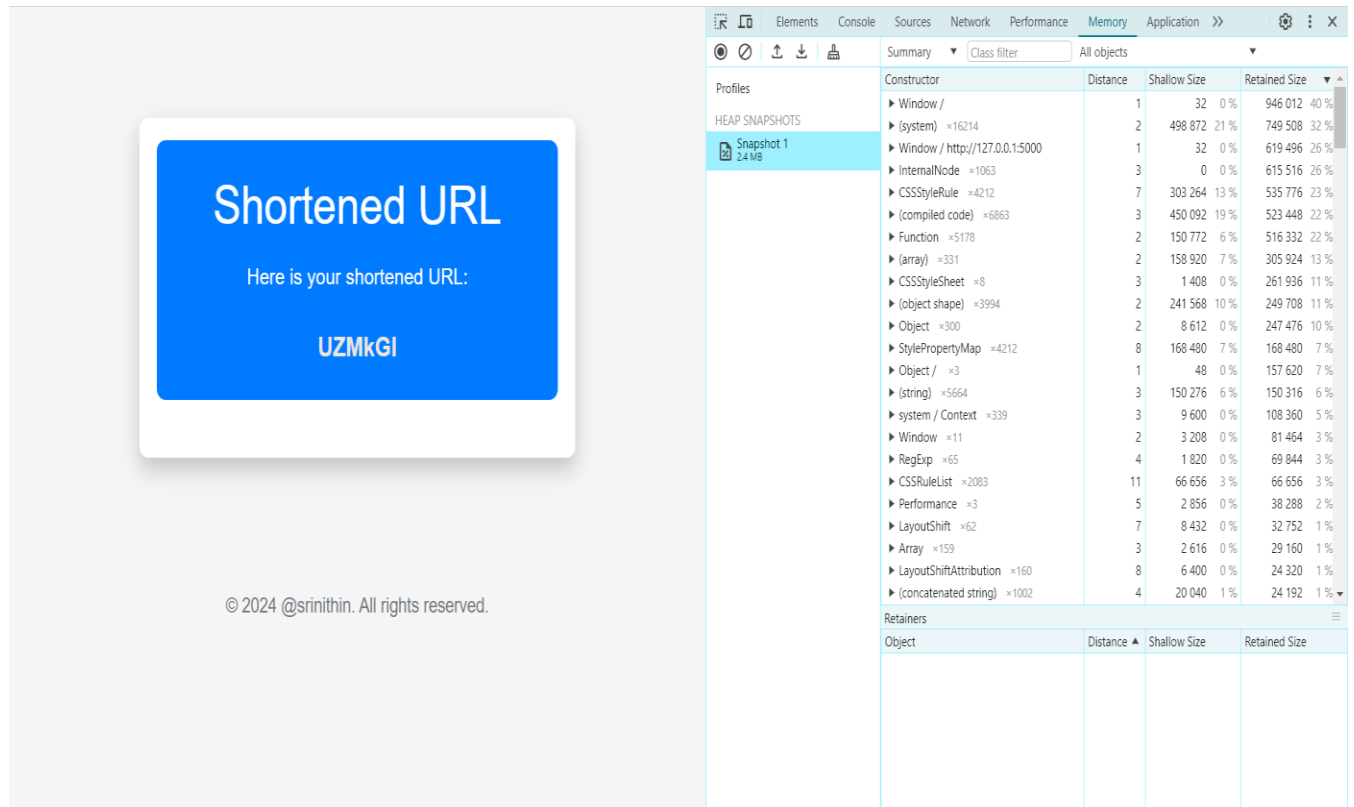


Figure 4: MEMORY UTILIZATION OF THE SYSTEM

```
Command Prompt - sqlite3 urls.db
C:\Users\Srinithin>cd C:\Users\Srinithin\OneDrive\Desktop

C:\Users\Srinithin\OneDrive\Desktop>cd url_shortener

C:\Users\Srinithin\OneDrive\Desktop\url_shortener>sqlite3 urls.db
SQLite version 3.45.2 2024-03-12 11:06:23 (UTF-16 console I/O)
Enter ".help" for usage hints.
sqlite> SELECT * FROM urls;
1|https://www.bing.com/search?q=give+me+a+big+url+shortner&cvid=cc486a84166f499daea04848bd4e8f11&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIGCAEQABhAMgYIAhAAGEAyBggDEAAAYQowajSoAgCwAgA&FORM=ANAB01&adppc=EdgeStart&PC=DCTS|VGAHdo
2|https://www.bing.com/search?q=give+me+a+big+url+shortner&cvid=cc486a84166f499daea04848bd4e8f11&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIGCAEQABhAMgYIAhAAGEAyBggDEAAAYQowajSoAgCwAgA&FORM=ANAB01&adppc=EdgeStart&PC=DCTS|kRjgT6
3|https://www.bing.com/search?q=give+me+a+big+url+shortner&cvid=cc486a84166f499daea04848bd4e8f11&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIGCAEQABhAMgYIAhAAGEAyBggDEAAAYQowajSoAgCwAgA&FORM=ANAB01&adppc=EdgeStart&PC=DCTS|uGXkTo
sqlite>
```

Figure 5: DATABASE STORAGE OF THE SYSTEM

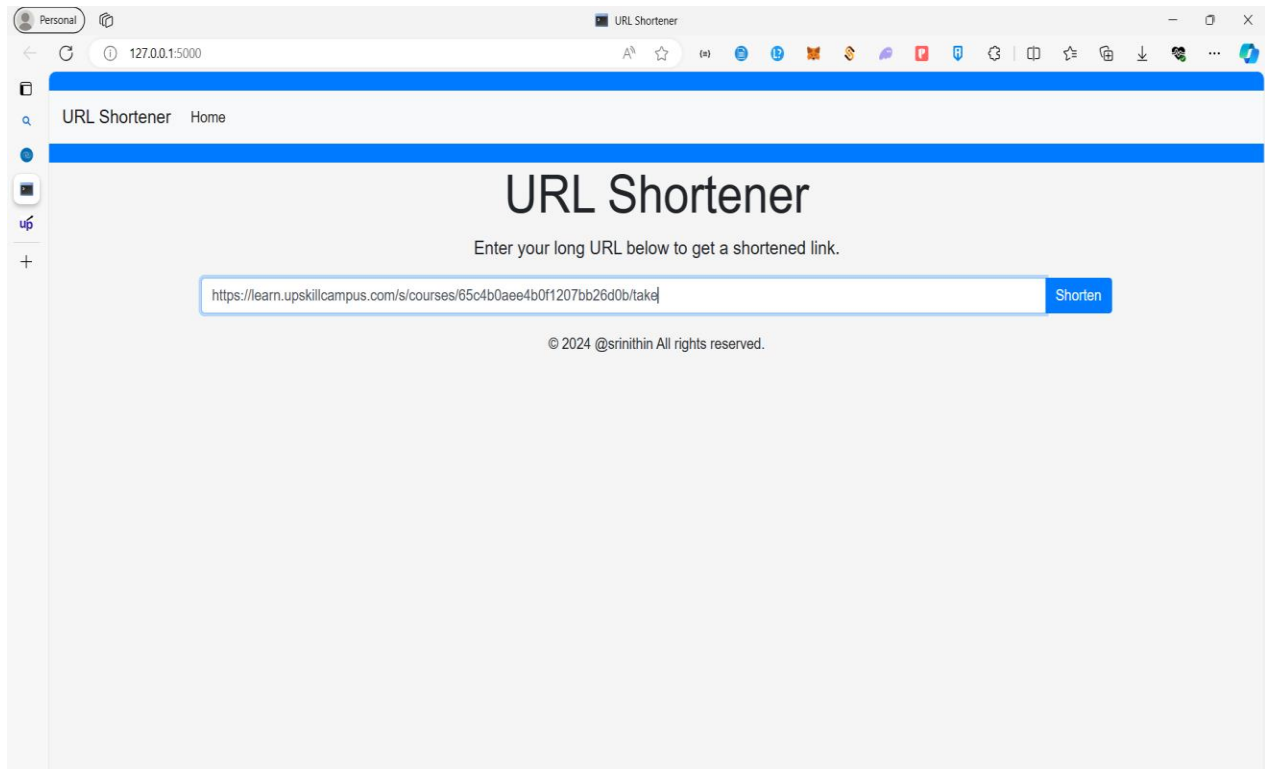


Figure 6: FINAL OUTCOME OF THE SYSTEM-1

Responsiveness:

- The responsiveness of the application is indicated by metrics such as "Frames" and "Animations."
- Frames and animations should ideally maintain a consistent frame rate to ensure smooth and fluid user interactions.

Performance Bottlenecks:

- The performance bottlenecks appear to be related to network latency, as indicated by the significant time spent on network-related activities.
- Additional optimization may be required to reduce network latency and improve overall performance.

Resource Loading:

- The resource loading times for critical assets such as CSS files (e.g., bootstrap.min.css) and the favicon.ico file should be minimized to improve load times.
- Optimizing resource loading can help reduce the overall load time of the application.

Scripting and Rendering:

- Scripting and rendering activities contribute to the overall performance overhead, with notable time spent on activities such as script evaluation and style recalculation.
- Optimizing scripting and rendering processes can help reduce the time to interactive and improve overall responsiveness.

CPU and Memory Usage:

- The CPU and memory usage should be monitored to ensure optimal resource utilization and prevent performance degradation.
- High CPU or memory usage may indicate inefficiencies in code execution or resource management.

7 My learnings

1. Technical Skills:

- Learned how to develop a URL shortener application using Python and Flask.
- Gained experience in working with databases like SQLite for data storage.
- Improved proficiency in HTML, CSS, and JavaScript for building user interfaces.

2. Problems solving Abilities:

- Developed problem solving skills by tackling challenges in application design and implementation.
- Learned to troubleshoot and debug issues encountered during development.

3. Project Management:

- Gained insights into project planning and management through the structured approach to project execution.
- Learned to prioritize tasks, set goals, and meet deadlines effectively.

4. Testing and Quality Assurance:

- Acquired knowledge in performance testing and monitoring using tools like JMeter and New Relic.
- Learned the importance of testing methodologies in ensuring the reliability and efficiency of applications.

8 Future work scope

1. Make the website look better: Improve the design so it's more appealing.
2. Let users pick their own links: Allow users to choose their custom short links.
3. Show link stats: Display how many people click on each link.
4. Manage links easily: Make it simple to set expiration dates and organize links.
5. Connect with other apps: Allow integration with other services.