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Particle Large Number Improvement with Outing for Organization Putting Away and Task Offloading in Edge-Appropriated Registering

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ABSTRACT: Edge-cloud computing is an efficient approach to address the high latency issue in mobile cloud computing for service provisioning, by placing several computing resources close to end devices. To improve the user satisfaction and the resource efficiency, this project focuses on the task offloading and service caching problem for providing services by edge-cloud computing. This project formulates the problem as a constrained discrete optimization problem, and proposes a hybrid heuristic method based on Particle Swarm Optimization (PSO) to solve the problem in polynomial time. The proposed method, LMPSO, exploit PSO to solve the service caching problem. To avoid PSO trapping into local optimization, LMPSO adds lévy flight movement for particle updating to improve the diversity of particle. Given the service caching solution, LMPSO uses a heuristic method with three stages for task offloading, where the first stage tries to make full use of cloud resources, the second stage uses edge resources for satisfying requirements of latency-sensitive tasks, and the last stage improves the overall performance of task executions by re-offloaded some tasks from the cloud to edges. Simulated experiment results show that LMPSO has upto 156% better user satisfaction, upto 57.9% higher resource efficiency, and upto 155% greater processing efficiency, in overall, compared with other seven heuristic and meta-heuristic methods**.**

I. INRODUCTION

Nowadays, mobile and Internet of Thing (IoT) devices can be seen everywhere, and their popularity is on the rise with the increasing of user requirements and the development of information and communication technology. As shown in Cisco Annual Internet Report, global mobile subscribers will account for 71% of population, and IoT devices will account for about half of global networked devices, by 2023. The mobile and IoT users' requirements cannot be guaranteed only by cloud computing for service delivery, due to the abundant variety and quantity of Internet services and the high network latency of the cloud. Therefore, more and more service providers use edge computing to improve the. Service quality, by placing some computing resources close to user devices.

Due to the restricted space of edge computing centers (edges for short), there are limited amount of computing and storage resources in edges. Therefore, edge computing cannot provide all services at a time. Thus, edge-cloud computing is an efficient way to deliver both latency-sensitive and resource-hungry services, by combining the advantages of both edge computing and cloud computing. In edge cloud computing, some services are deployed (cached) on an edge for latency-sensitive requests, and the cloud can deliver all services due to its ''infinite'' computing and storage resources. There are two decisions must be made for service provisioning by edge-cloud computing with high efficiency and performance, service caching and task offloading. The service caching is to decide which services are deployed on edges. Task offloading decides the location where each request task is served.

These two decision-making problems are interrelated. A task can be offloaded to an edge only when its requested service is cached on the edge. In general, it is better to cache services with more requests and offload more requests into edges, as edges provide much lower network latency than the cloud. But due to the limited resources on edges, offloading more tasks to edges can result in an increasing of the computing latency. Thus, the service caching and task offloading strategies should be jointly designed carefully for balancing the computing latency on edges and the network latency on the cloud to improve the service quality. Unfortunately, the joint service caching and task offloading problem is NP hard. There mainly three kinds of methods to address the problem, which are respectively heuristics, meta-heuristics, and machine learning (ML). In general, heuristics are is fast to provide solutions, but the solution performance is limited due to their local search ideas. Metaheuristics can achieve better solutions than heuristics, benefiting from their global search abilities, but they usually consume more computing time. ML-based methods learn

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some patterns from the historical states of task executions, and make caching and offloading decisions for subsequent tasks based on learned patterns. ML-based methods may achieve better performance than other two kinds of methods, but they are too costly for the pattern learning (training).

Therefore, several researches used meta-heuristics, e.g., Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Whale Optimization Algorithm (WOA), and Cuckoo Search Algorithm (CSA), for solving the service caching and task offloading problem. This is mainly because meta-heuristics usually achieve a better performance than heuristics due to their global search abilities. Some works exploited the hybrid of two meta-heuristics, e.g., PSO + GA, which can achieve a better performance than each one. While, these methods didn't consider to integrate heuristic local search strategy into a meta-heuristic for the joint service caching and task offloading problem, even though it have been used in other problems due to the good performance by combining both advantages of heuristics and metaheuristics.

Thus, this project exploits a hybrid heuristic method by combining a representative meta-heuristic algorithm, Particle Swarm Optimization (PSO), and a heuristic algorithm for joint service caching and task offloading. Specifically, the proposed method, named LMPSO, employs PSO to achieve a service caching, with the fitness evaluated by the user satisfaction and resource efficiency. To achieve a task offloading solution given a service caching solution, LMPSO uses a heuristic algorithm to improve the user satisfaction and resource efficiency. To overcome the issue that PSO is easily trapped into local optimization, LMPSO integrates lévy flight scheme into particle movements to improve the diversity of particles. The contributions can be summarized as follows.

1) The joint service caching and task offloading problem is modelled into a constrained discrete optimization problem, to minimize the user satisfaction and resource efficiency, for edge-cloud computing. In this project, the user satisfaction is quantified by the number of tasks with the satisfaction of their requirements. The resource efficiency is evaluated by the overall resource utilization.
2) To solve the joint service caching and task offloading problem in polynomial time, a hybrid heuristic algorithm is designed, which is named as LMPSO. LMPSO exploits PSO algorithm, and employs lévy flight in particle moving to improve the performance of PSO. In LMPSO, each particle position represents a service caching solution, and the value in a dimension is the edge servers that the corresponding service is cached. Given a service caching solution, LMPSO uses a heuristic method with three stages for task offloading. The first stage is pre-offloading as many tasks as possible to the cloud, for making full use of the richness of cloud resources. The second stage offloads remain tasks to edges for executing latency-sensitive tasks. At last stage, the heuristic method re-offloads tasks from the cloud to edges to improve the overall performance of task execution.
3) Extensive simulated experiments are conducted for evaluating the performance of LMPSO, where parameters are set referring to existing works and the reality. The experiment results show that LMPSO has 8.34%–156%, 1.00%–57.9%, and 7.91%–155% better performance in user satisfaction, resource efficiency, and processing efficiency, respectively, compared with other seven heuristic and meta-heuristic methods, in overall.

II. LITERATURE SURVEY

Password-guessing attack-aware authentication scheme based on Chinese remainder theorem for 5G-enabled vehicular networks written by M. A. Al-Shareeda, M. Anbar, S. Manickam, and I. H. Hasbullah inthe year 2022.The new fifth-generation (5G) cellular networks dramatically improve the speed of message transmissions. Most existing authentication schemes that secure 5G communication rely heavily on the vehicle's tamper-proof device (TPD) and roadside units (RSUs) to store the system's master key. However, it only takes a single compromised TPD to render the whole system insecure. We propose a password-guessing attack-aware authentication scheme based on the Chinese Remainder Theorem (CRT) to secure inter-vehicle communication on 5G-enabled vehicular networks to address this issue. The trusted authorities (TAs) in the proposed scheme generate and broadcast new group keys to the vehicles assisted by CRT. Moreover, since the system's master key does not need to be preloaded, the proposed scheme only requires realistic TPDs. The proposed scheme overcomes password-guessing attacks and guarantees top-level security for entire 5G-enabled vehicular networks. The security analysis indicates that the proposed scheme is secure against adaptive chosen-message attacks under the random oracle model and meets the security requirements of a 5G-enabled vehicular network. Since cryptographic operations based on elliptic curve cryptography are employed, the performance evaluation shows that the proposed scheme outperforms the eight existing schemes in terms of computation and communication costs.

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Towards identity-based conditional privacy-preserving authentication scheme for vehicular ad hoc networks written by M. A. Al-Shareeda, M. Anbar, S. Manickam, and I. H. Hasbullah in the year 2021.

Vehicular ad hoc networks (VANETs) have become increasingly common in the past decades and provides essential and efficient communication for vehicles within intelligent transportation systems. Securing the VANETs wireless communication channel is one of the principal challenges in VANETs since existing security schemes are still vulnerable to security and privacy issues and have substantial computational and communicational overheads. To overcome these issues, this project focuses on enhancing an authentication scheme based on conditional privacy-preserving and improving its performance efficiency. This project reviews the security vulnerabilities of the existing schemes. It also proposes enhancements to the identity-based conditional privacy-preserving authentication scheme to secure and improve the efficiency of VANETs communications. The proposed scheme not only satisfies the security and privacy requirements but also has been proven secure under the random oracle model. Finally, the performance evaluation shows that the proposed scheme is more efficient computationally and communicational than the existing schemes in signing and verifying VANETs messages.

Orchestration in fog computing: A comprehensive survey written by B. Costa, J. Bachiega, L. R. de Carvalho, and A. P. F. Araujo in the year 2020.Fog computing is a paradigm that brings computationalresources and services to the network edge in the vicinity of user devices, lowering latency and connecting with cloud computing resources. Unlike cloud computing, fog resources are based on constrained and heterogeneous nodes whose connectivity can be unstable. In this complex scenario, there is a need to define and implement orchestration processes to ensure that applications and services can be provided, considering the settled agreements. Although some publications have dealt with orchestration in fog computing, there are still some diverse definitions and functional intersection with other areas, such as resource management and monitoring. This article presents a systematic review of the literature with focus on orchestration in fog computing. A generic architecture of fog orchestration is presented, created from the consolidation of the analyzed proposals, bringing to light the essential functionalities addressed in the literature. This work also highlights the main challenges and open research questions.

III. METHODOLOGY

The previous literature is mainly based on the use of the total evaluation score of products for product selection, and has obtained a wealth of research results. However, there are relatively few studies on the topic feature mining from the user review data of baby pacifier products provided by Amazon platform. This project constructs LDA topic model, extracts topic features and measures topic intensity to understand the discussion bias of users. The research results of this project provide theoretical support for improving the understanding of online shoppers purchase needs.

EXISTING SYSTEM DISADVANTAGES:

- service caching problem for providing services by edge-cloud computing
- focuses on the task offloading

Increasing of user requirements and the development of information and communication technology.

PROPOSED SYSTEM

This project formulates the problem as a constrained discrete optimization problem, and proposes a hybrid heuristic method based on Particle Swarm Optimization (PSO) to solve the problem in polynomial time. The proposed method, LMPSO, exploit PSO to solve the service caching problem. To avoid PSO trapping into local optimization, LMPSO adds lévy flight movement for particle updating to improve the diversity of particle. Given the service caching solution, LMPSO uses a heuristic method with three stages for task offloading, where the first stage tries to make full use of cloud resources, the second stage uses edge resources for satisfying requirements of latency-sensitive tasks, and the last stage improves the overall performance of task executions by re-offloaded some tasks from the cloud to edges. Simulated experiment results show that LMPSO has upto 156% better user satisfaction, up to 57.9% higher resource efficiency, and up to 155% greater processing efficiency, in overall, compared with other seven heuristic and meta-heuristic methods.

PROPOSED SYSTEM ADVANTAGES:

- To avoid PSO trapping into local optimization, LMPSO adds lévy flight movement for particle updating to improve the diversity of particle.
- Last stage improves the overall performance.

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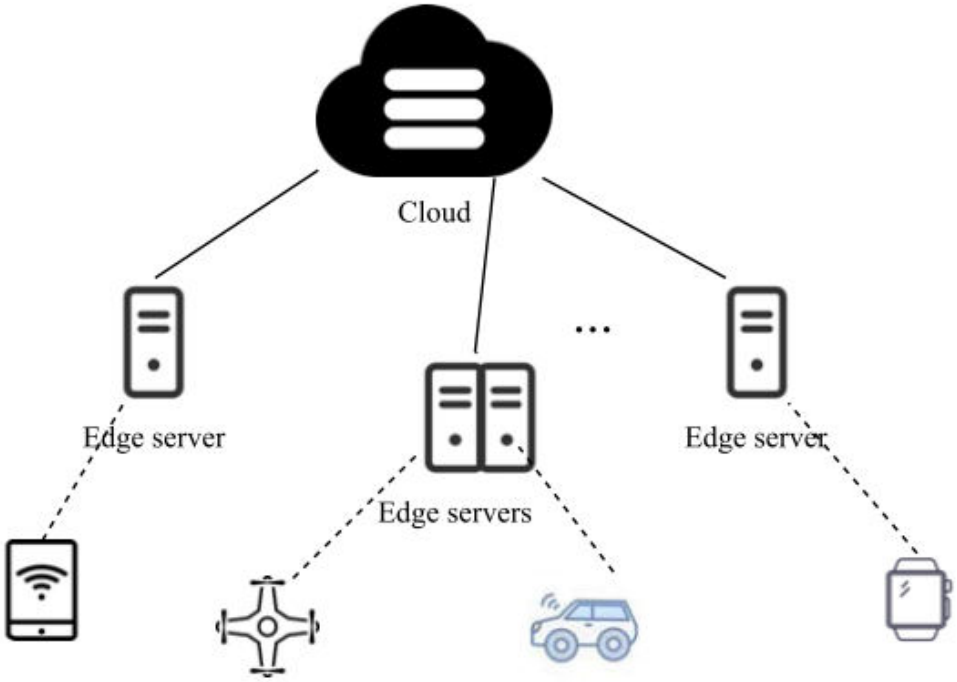
- higher resource efficiency

SYSTEM ARCHITECTURE:



MODULES:

User Interface Design: In this module we design the windows for the project. These windows are used for secure login for all users. To connect with server user must give their username and password then only they can able to connect the server. If the user already exits directly can login into the server else user must register their details such as username, password and Email id, into the server. Server will create the account for the entire user to maintain upload and download rate. Name will be set as user id. Logging in is usually used to enter a specific page.

Visitor: This is the first module of this project and he will be the administrator and has control over all the things. In this module User can login. After login user can view the products pictures. a user can be view products lists and user can be check the product quality percentage and user can a see the reviews products and give the reviews.

Admin: This is the second module of this project. In this project admin will Register and admin he should login. Admin will upload the products. Admin can add the products. Admin can have seen the product list and admin can check the product quality percentage

Sales: This is the third module in this project. In this project user will login in this page and admin also login in this page admin and user both are log in in this page. In this page it will show how many products will sales and there information. This page will show product name, Price of unit, quantity and final one is date.

Purchases: This is the fourth module in this project. In this page admin will log in and admin will check products purchases and the products status. Admin and users are login in this page. This page will show product name, quantity, purchases and date of product purchase

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IV. IMPLEMENTATION

Particle Swarm Optimization (PSO) in Edge Computing

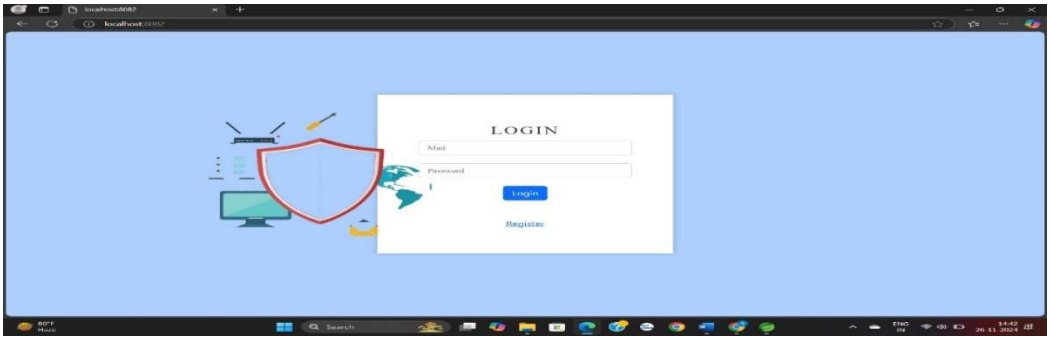
Particle Swarm Optimization (PSO) is an algorithm inspired by the collective behavior of swarms, such as birds flocking or fish schooling. In edge computing, PSO can be employed to address the problem of task offloading. Each "particle" represents a potential solution for task distribution among edge nodes. These particles explore the search space and iteratively update their positions based on their own experience and that of their neighbors to find the optimal solution. By leveraging PSO, the system can balance computational loads, ensure efficient resource allocation, and achieve better response times. This results in a significant improvement in task execution, even with the limited resources of edge nodes.

Linear Multiplicative Particle Swarm Optimization (LMPSO)

Edge-cloud computing integrates edge and cloud resources to address the high latency issues typically found in mobile cloud computing, improving the efficiency of service provisioning for end devices. This paper addresses the task offloading and service caching problem, essential for maximizing user satisfaction and resource utilization. The authors formulate this as a constrained discrete optimization problem and introduce a hybrid heuristic method, LMPSO (Linear Multiplicative Particle Swarm Optimization), as a solution. The LMPSO method extends traditional PSO by incorporating Lévy flight movements in particle updates to escape local optima and improve particle diversity, thereby enhancing its search capabilities for solving the service caching problem**.**

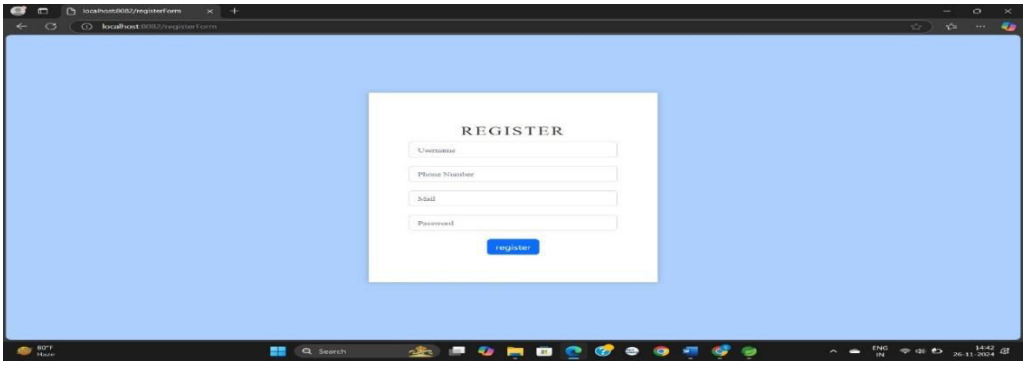
V. EXPERIMENTAL RESULTS

LOGIN PAGE



Explanation: After implementing the code, browse using the system port number as localhost:8082.
Then the interface looks like the above.

REGISTER PAGE



Explanation: After clicking on the register in user interface. Then the register page looks like above one. Fill the given sections such as Username, Phone Number, Mail, Password. After filling all the details, remember password and click on register. Then it is registered successfully.

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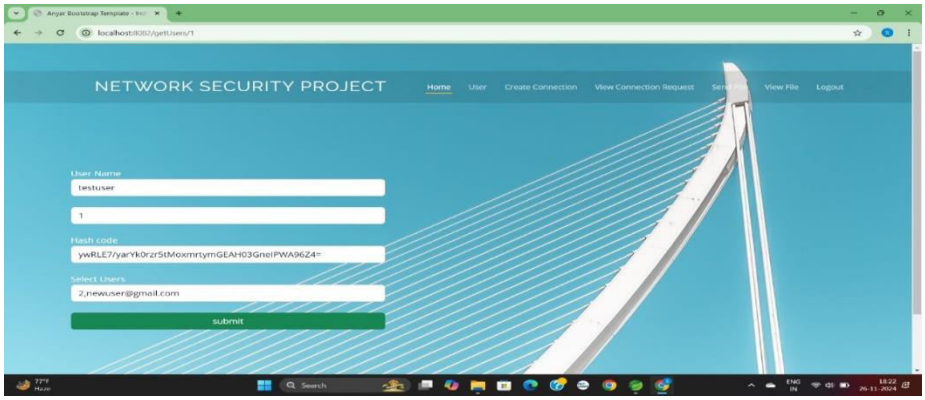
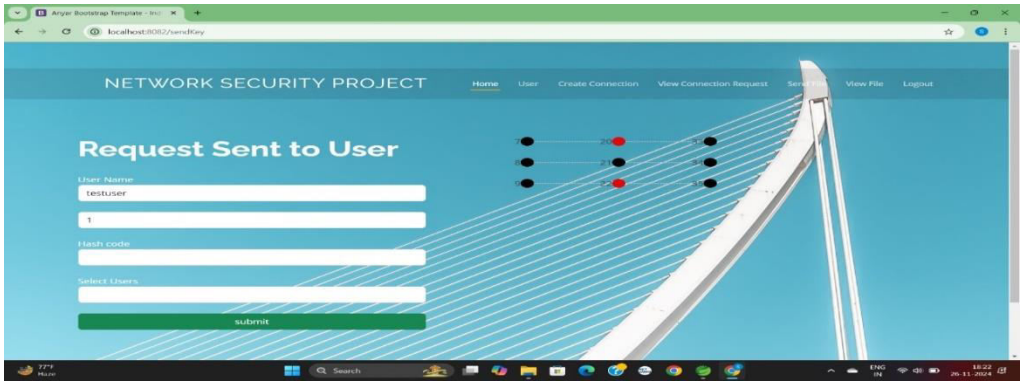
CONNECTION REQUEST PAGE



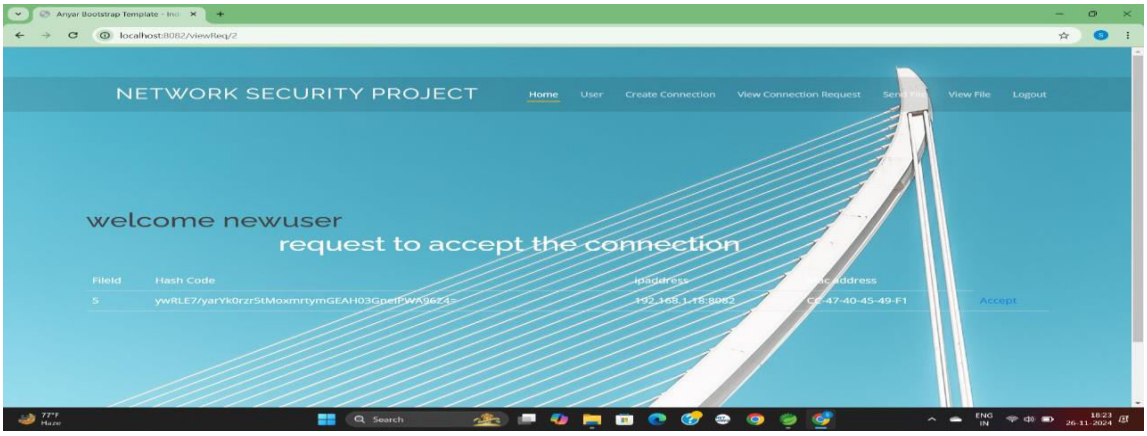
Explanation: After registering with two users that are testuser and newuser. Login with testuser and click on create connection section. In that section you can find the login users. So create connection request with newuser and click on submit button.

REQUEST PAGE



Explanation: Then after clicking on submit, the request has been sent through the nodes.

ACCEPT REQUEST PAGE



Explanation: Login with the new user and check in the view connection request section. Then the you can find an accept to whether to make a connection with testuser. So after clicking the accept, the connection is established with the testuser to newuser.

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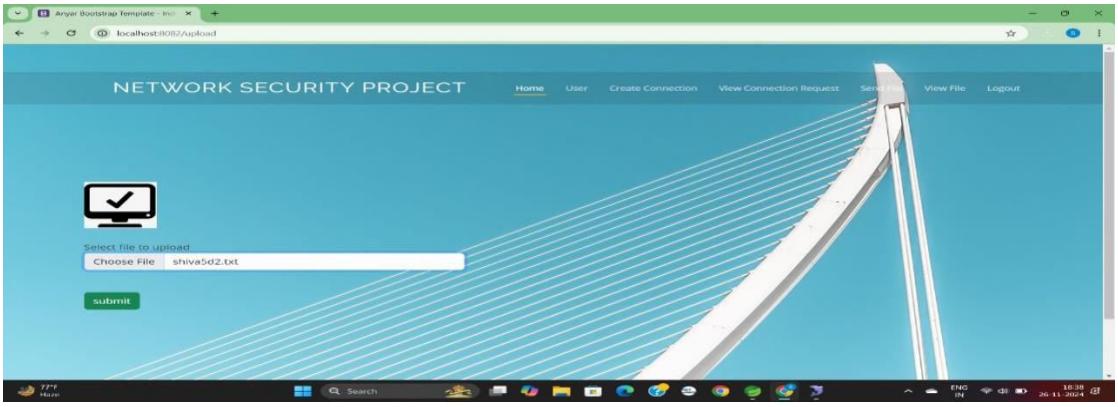
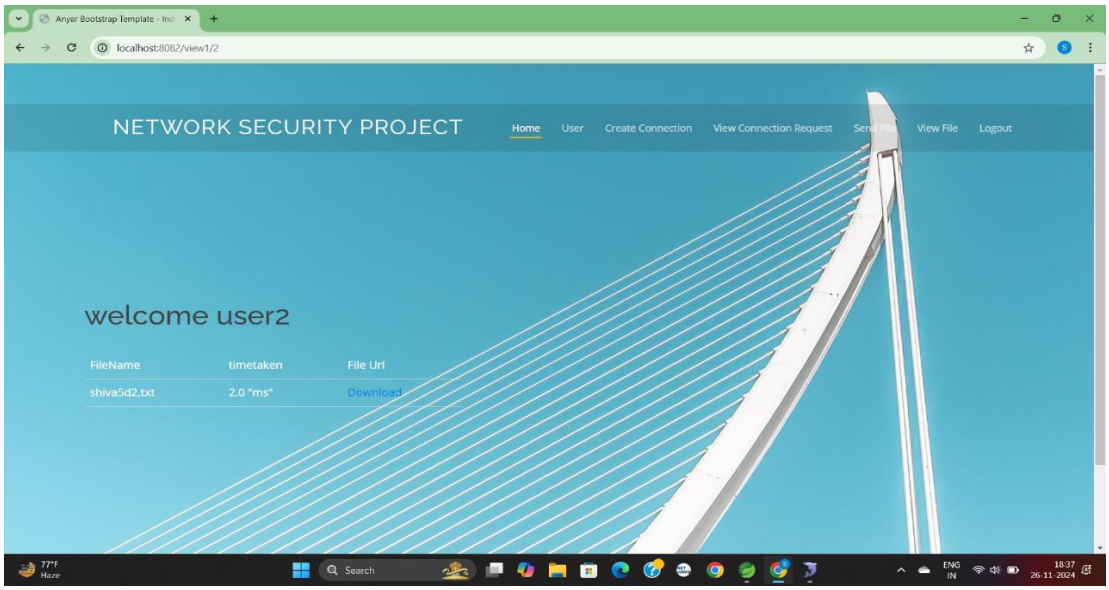
SEND FILE PAGE



Explanation: Login again using testuser and send a file or message using send file section in txt format.

VIEW FILE PAGE



Explanation: Now login with the newuser. Check in the view file section whether any file or message has been sent or not. You can find the file which has been sent to you by the testuser. Then you can click on download to view the file or message.

VI. CONCLUSION

This research studies on the service caching and the task offloading problems to improve the user satisfaction and the resource efficiency for edge-cloud computing. Their joint problem is formulated as a discrete optimization problem, and a hybrid of PSO with the lévy flight movement and a three-stage heuristic method for solving the problem. Simulated experiment results verify the performance advantages of the proposed hybrid heuristic method. This project focuses on the static caching of services on edges, which means the caching replacement doesn't concerned during the service provisioning. When there is no storage space for caching more services on an ES, it is an option to replace a service by another new service to improve the overall performance. It is a challenging work for designing efficient caching replacement solution. If the caching replacement solution is improper, it will waste a lot of edge-cloud resources for replacing a service, leading to a much low resource efficiency. Therefore, one of the future works is to design caching replacement method with high efficiency and effectiveness.

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V. FUTURE ENHANCEMENT

Therefore, one of the future works is to design caching replacement method with high efficiency andeffectiveness.

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