E-ROUTER: EDGE DEVICE SUPPORTED INFRASTRUCTURAL UTILIZATION ENHANCES PERFORMANCE OF PRIVATE AND PUBLIC CLOUD FOR IOT SENSOR DEVICES

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ABSTRACT

Nowadays, novel and essential sensor devices for health care, natural and environmental, home appliances and monitoring systems acquire a major role even not in Government but also in an ordinary human being life to be secure and safe. Also, the services remain need to prove reliability, accuracy and on time support to the beneficiary. In this system, we introduce an enhancement to existing model of ROUTER to improve performance on execution and infrastructural utilization through efficient provisioning and scheduling of resources in fog and cloud environment. E-ROUTER (Enhanced-Resource Management technique for smart home) proves optimization and enhancement of multiple parameters such as response time, latency and energy consumption through the combination of Particle Swarm Optimization and Shuffled Frog Leaping Algorithm. This system is designed and implemented in iFog Sim toolkit to evaluate our proposed approach, it performs with better reduction of response time, latency and energy consumption comparatively to existing model.

Keyword: - *IOT, Cloud, Routers, JAVA, J2EE, JAVA Servlets, My Sql, Modules, Testing, Use Case Diagrams, Net Beans, etc…*

1. INTRODUCTION

Cloud computing is an on-demand availability of computer system resources, especially data storage and computational power, without direct active management by the user. The term is generally used to describe datacenters available to many users over the internet. It provides various services in different level as software, platform and infrastructural. In this scenario, Internet of Things (IoT) aims to bring every object online, hence generating massive volume of data that can overwhelm storage systems and data analytics applications. The internet of things are generated and actuated with varied devices based on the requirements and applications. A huge amount of data is sensed and generated on every day through wired/wireless devices of personal wearables, smart home appliances, environmental and industrial sensors and more. The IoT device, transmits the sensed data over internet for process and communicate only with local devices(actuators). Cloud computing offers services at the infrastructure level that can scale to IoT storage and processing requirements. However, there are applications such as health monitoring and emergency response that require low latency, and delay that is caused by transferring data to the cloud and then back to the application can seriously impact their performances. To overcome this limitation, Fog computing paradigm has been proposed, where cloud services are extended to the edge of the network to decrease the latency and network congestion. A latency-sensitive application is an application which needs to react “fast” on specific events. Latency is defined as the time between the occurrence of an event and its handling. However, the smart home applications are structured as directed cyclic graph (DAG), having edges and vertices. It means that each task of the applications is having inter communications and processing modules, so it restricts the execution of one and another. However, such applications when deployed within cloud datacenter encounter possibly high latency and response time based on large geographical distance and data bandwidth requirements between clients and datacenter. It affects the fundamental concepts of latency-sensitive applications in order to provide the constrained quality of services such as minimizing latency, response time and energy consumptions. In this case, Fog computing comprises IoT gateways, network devices (routers, bridges, switches and links), ISP gateways and private cloud datacenters. The fog devices have high computational and storage capabilities. Also, it gathers generated data from IoT devices for processing and establishing communications between edge devices and the datacenters. In this project, we introduce edge device supported cloud computing resource management architecture for smart home applications. This model **E**nhanced-**R**es**ou**rce managemen**t** technique for sma**r**t homes (E-ROUTER) has been framed to consider multiple parameters simultaneously including latency, response time and energy consumption through Particle Swarm Optimization and Shuffled Frog Leaping Algorithm (PSO-SFLA). E-Rourter has been evaluated through design and implementation of IoT based smart home automation which are integrated into iFogSim for experimentation.

1.1 Existing System

- The existing model ROUTER, represents the IoT layer, Fog environment, Cloud datacenter and PSO based resource scheduling processes.
- IoT layer consists of the sensor devices which are used to generate the data due to the home appliances operations and mobile device on which the user IoT application is running.
- Fog environments comprises with edge/network devices and a local datacenter setup between IoT devices and cloud.
- Cloud datacenter includes huge amount of computational, storage and communicational infrastructural capacity to provide the services to the public on pay-as-a usage.
- The above infrastructure constructs the physical ROUTER model, it generates data from IoT sensors and sends towards cloud datacenter to manipulate it.
- The generated data scheduled into edge, fog and cloud resources using Particle Swarm Optimization algorithm to compute and communicate the monitoring and alert systems of a smart home with minimum latency and response time.

1.2 Objective

The IoT device enabled smart home environment provides the monitoring and alert systems to interact with the home appliances for ensuring their safety and services. In this case, the interfacing of the smart home management system through an application that running on a mobile phone. Moreover, this application can actuate the home appliances and the other edge device enabled things and this proposed model of E-ROUTER assures to communicate and interact to the smart home environment with low latency and minimum response time. Also, this approach guarantees to reduce the energy consumption of fog and cloud resources.

1.3 Contribution

The main scope of this project consists of three factors, at first, it needs a detailed requirement and design of a private cloud with edge devices supported cloud architecture to perform effective resource management for various IoT devices. Secondly, how the user requests should be handled in the fog enabled cloud infrastructure to attain the multi-objectives through the resource management techniques of PSO-SFLA algorithms and the third is the way of controlling the home appliances in a smart home environment based on the data generated from IoT sensors.

2. LITERATURE SURVEY

To demonstrate the feasibility of the proposed approach, we have used the framework and scenario into a Fog computing based environment using CloudSim (Calheiros et al., 2011) and iFogSim. In this project work, event simulation functionalities of CloudSim have been used to implementing functionalities of iFogSim architecture. CloudSim entities such as datacenters and communication amongst datacenters through message sending operations are included. Therefore, the core CloudSim layer is responsible for handling events between fog computing components in iFogSim. Big Data and Internet of Things applications such as smart cities and healthcare services have risen in societal prominence, demonstrated by an increase of data velocity of 250MB per minute globally. Therefore, such applications require substantial data and computational capability to provision service, possible via deployment within Cloud datacenters. However, such applications when deployed within Cloud datacenters encounter potentially high latency and response times due to large geographical distance and data bandwidth requirements between clients and the datacenter. A Particle Swarm Optimization Algorithm has a stochastic nature of the particle increases due to this property of PSO and touches rapidly to global minima with a realistic noble solution. PSO has become prevalent due to its easiness and its usefulness in extensive range of application with little cost of computation. Shuffled Frog Leaping Algorithm, originally developed by Eusuff and Lansey in 2003, can be used to solve many complex optimization problems, which are nonlinear, non-differentiable, and multi-modal. Shuffled Frog Leaping Algorithm has been successfully applied to several engineering optimization problems such as water resource distribution, bridge deck repairs, job-shop scheduling arrangement and traveling salesman problem (TSP). The most distinguished benefit of Shuffled Frog Leaping Algorithm is its fast convergence speed. The Shuffled Frog Leaping Algorithm combines the benefits of the both the genetic-based memetic algorithm (MA) and the social behavior-based Particle Swarm Optimization algorithm.

3. PROPOSED SYSTEM

- The proposed system enhances the existing model through an implementation of effective resource scheduling algorithms of the combination of Particle Swarm Optimization and Shuffled Frog Leaping Algorithm.
- The E-ROUTER framework contains the physical resources for IoT devices, edge devices, private and public cloud to implement a monitoring and alert systems in a smart home environment.
- The IoT devices are sensed and generated the data from home appliances and sends towards edge device supported cloud datacenter. When the sensed and pre-processed task reaches the IoT gateway, the PSO-SFLA algorithm starts to schedule the tasks into the provisioned resources of edge, private or public cloud.
- The smart home application which is running on the mobile phone interact the home appliances to know the state and operate the devices remotely.
- The proposed model supports the smart home management systems efficiently by minimizing response time, latency and energy consumption.

3.1 Advantages of Proposed System

- The PSO search procedure depends greatly on pbest and gbest, the searching area is limited by pbest and gbest. However, the effect of pbest and gbest is gradually vanished by the selection mechanism, and a broader area search can be realized by SFLA.
- The most distinguished benefit of Shuffled Frog Leaping Algorithm is its fast convergence speed. The Shuffled Frog Leaping Algorithm combines the benefits of the both the genetic-based memetic algorithm and the social behaviour-based PSO algorithm.
- Besides, the combined PSO-SFLA scheduling algorithm minimizes the response time and latencies of transfer of data over the edge device supported cloud datacenter.
- E-ROUTER creates green cloud environments through reducing the energy consumption of datacenter resources.

4. RESULT

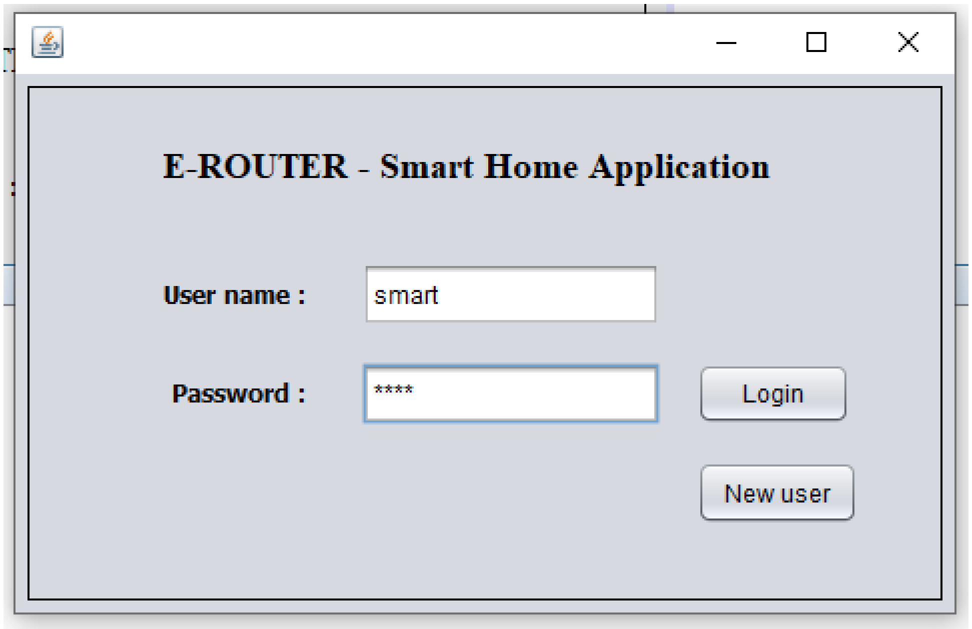
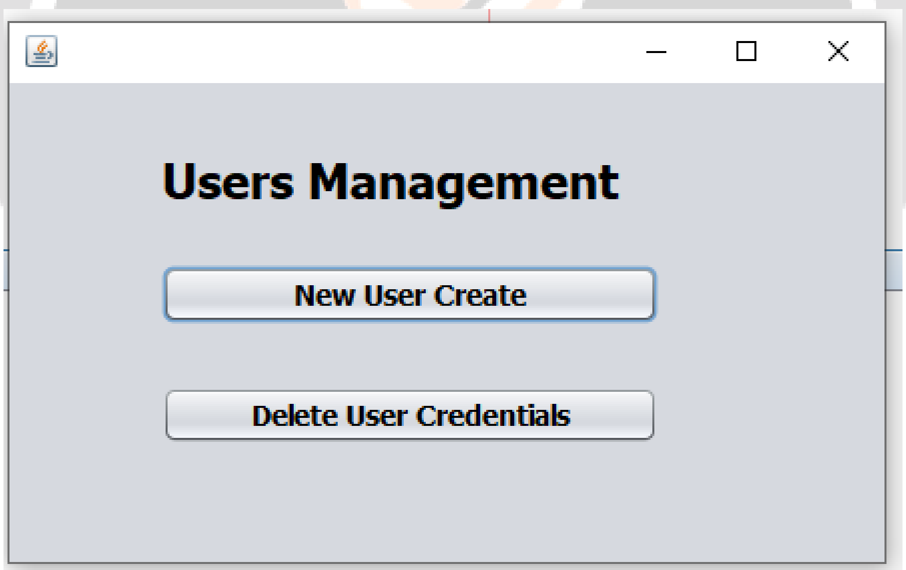


Fig.No.1 Screen Shot of the Project



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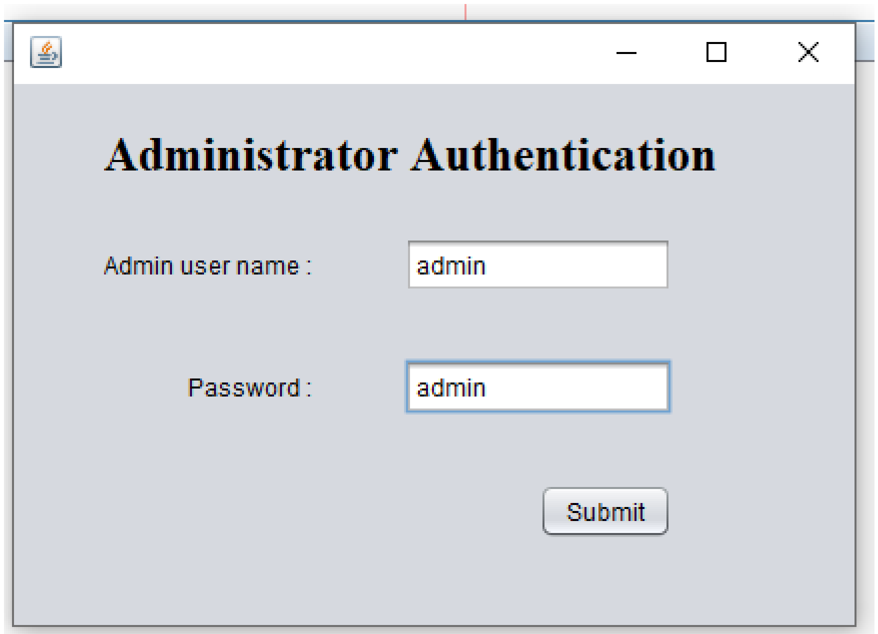

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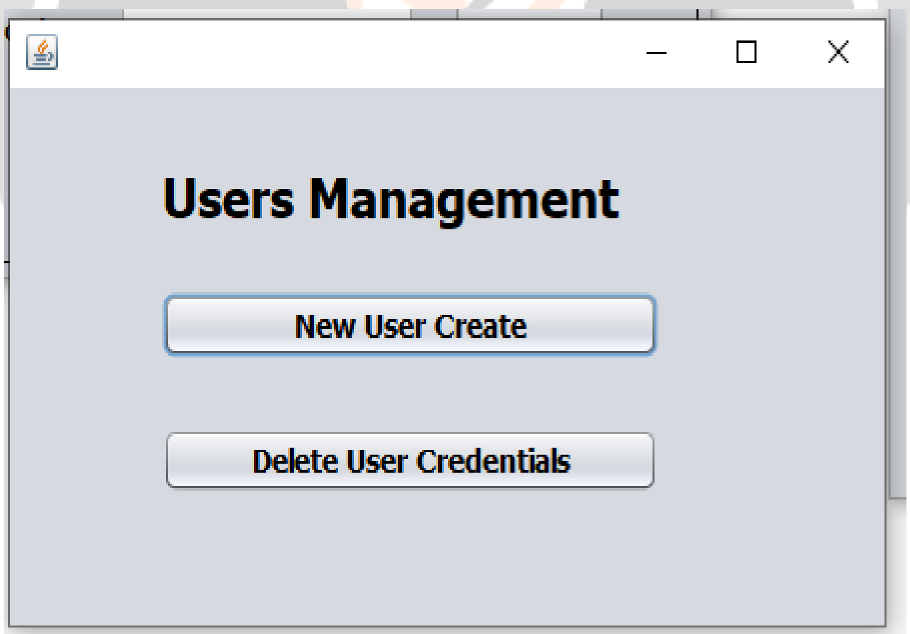

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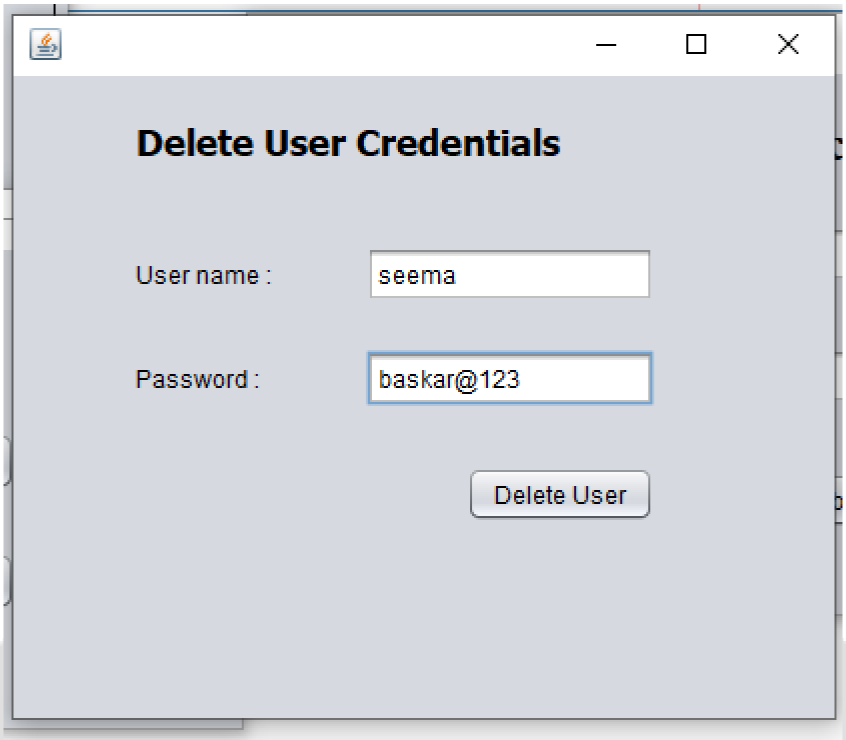

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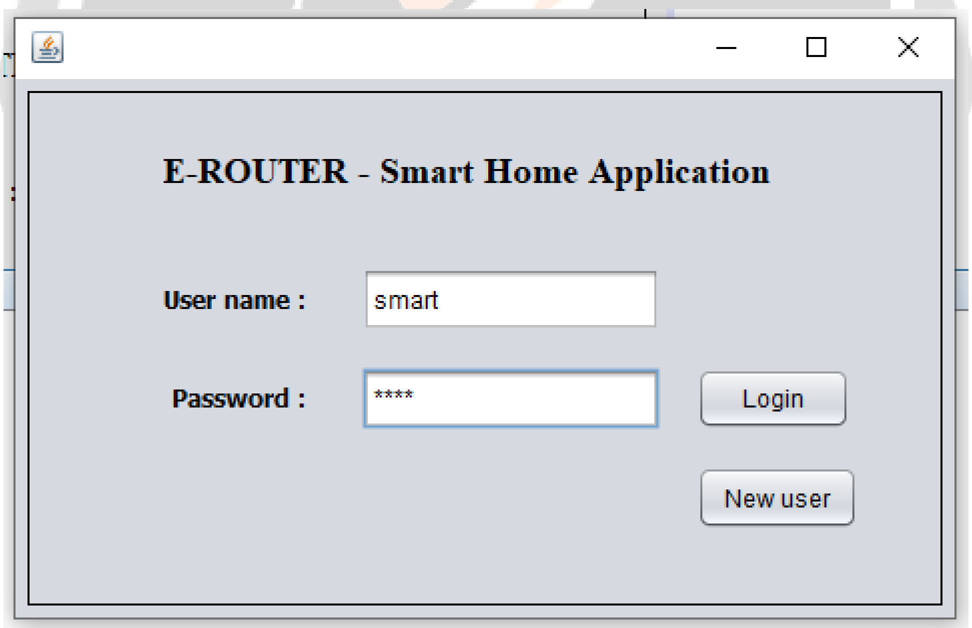

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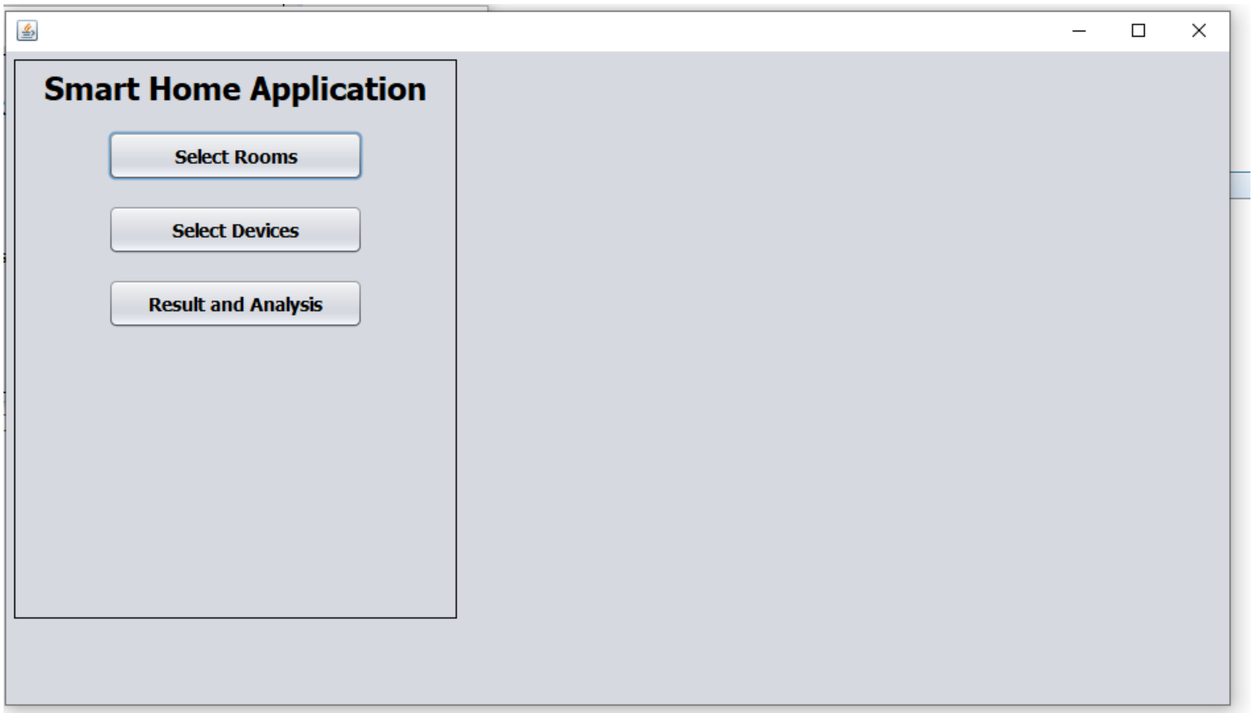

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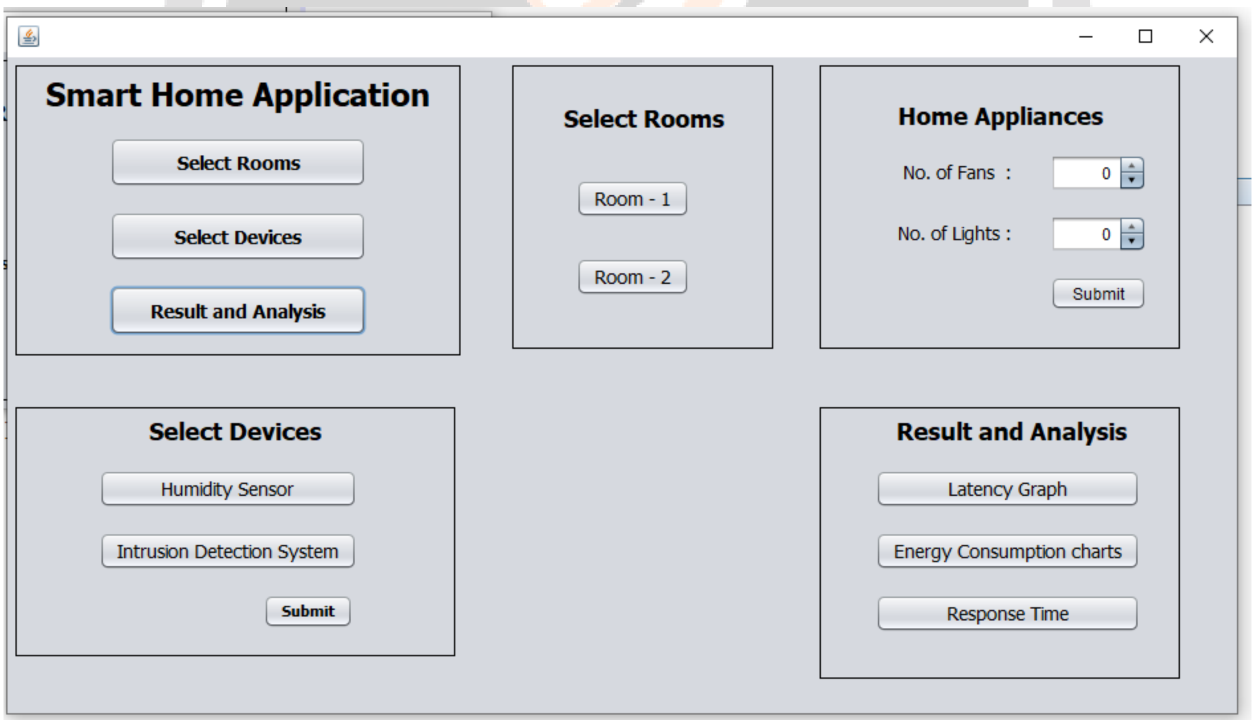

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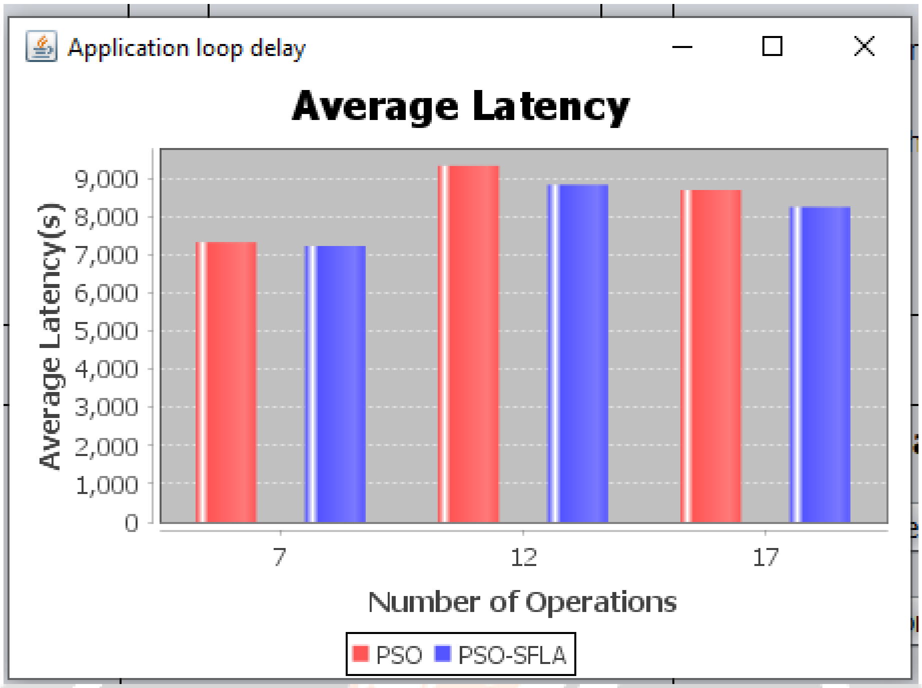

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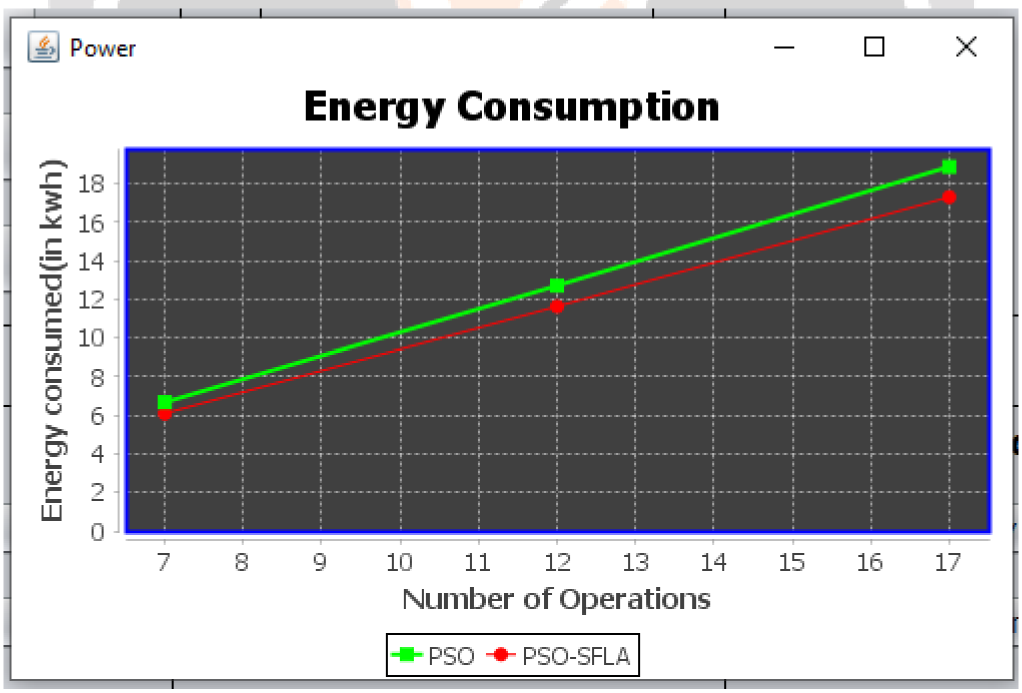

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5. CONCLUSIONS

We proposed a method E-ROUTER for IoT application which is running on a mobile device and used to manage the monitoring and intruder detection systems of a smart home environment. Moreover, this method tests the proposed techniques using iFogSim toolkit and evaluated the performance of algorithms with resultant values. The simulated results illustrate that the proposed method reduces drastically the latency, response time and minimizes energy consumption of edge enabled cloud resources compared to existing system ROUTER. Also, this system detects the intrusions of smart home environment to ensure the security of smart home.

6. REFERENCES

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