Optimized Cloudlet Scheduling Based Method for Mobile Phones

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Abstract—**The improvement in communication technology incorporates sophisticated electronic gadgets that rely on wireless technique to support the signal transmission from the emitter to the receiver points. The cloudlet scheduling method relies on the environment and task type to accomplish the scheduling process in an algorithm supported by the visual machine programs. The paper captures the cloudlet network gains attributed to the increased use of cloudlet scheduling technique in tablets and mobile phones operated within the communication and data delivery platform. The system relies on improved storage space and processing speed with which the systems works with reference of minimizing power usage. The platform sustains efficient programming of tasks through the application of meta-heuristic algorithms. The paper focuses on AES algorithm and how it solves a given task at every instance while optimizing system efficiency. The beauty of the algorithm is efficient energy consumption in the data transfer platform that adopts the analysis in response to the task completion based on first-come-first-serve. The concept sustains the sequences of service delivery in the computing networks. The algorithm anchored in the cloudlet platform facilitates the use of the internet to support data transmission between different users and the server that rely on the same computing infrastructure.**

Keywords-Cloudlet Computing; Consumer; Cloud Architecture; AES Algorithm; Encryption and Decryption

I. INTRODUCTION

The advancement made in the communication platform through cloud computing uses alternative scheduling techniques adopted in the recent times that rely on the advanced data transmission technology while using data signals. The cloudlet computing methods depend on the three-level structure necessary in supporting the conversations between different users of the network. Thus, enhances the transmission and reception through the internet communication models. The configured computer hardware sustains cloudlet scheduling alternatives adopted for efficient computing accelerates data transfer while supporting load balance platform depending on the pay as you use structure backed by the visual machine. The existence of a particular algorithm for every set of information improves the performance and participation of other service providers for the benefit of the customer. The cost of processing application in the cloud computing structure relies on the scheduling technique associated with the rates and particulars of the client linked to the pay-as-you-use protocol. The development of cloud computing technology relies on the need to limit the communication costs through energy conservation while improving data security over the Internet platform by involving the RSA and AES algorithm[1]. The increased use of cloud computing scheduling technique in the industrial settings advances the use of an algorithm based program set to accomplish a particular task with utmost reliability and efficiency based on the pseudo code and organized flowcharts programming language intended to eliminate ambiguity while remains in phase to a particular algorithm executable by computers. For instance:

Largest = L_0
 for every element in the list (Length (L) $\geq$ 1),
        if the element $\geq$ L,
                then large element =L,
    return = largest

The use of such algorithms generates clear guidelines that sustain the identification of principal decision points and variables involving the use of transparent programs focused on creating a correct solution to the problem in the communication environment while disintegrating the tasks into smaller units that eliminate the adoption of complex processes attributed with increased data insecurity. The algorithm facilitates the decision-making process due to the increased use of relatively efficient means that foster the development consistency processes without ignoring the problem statements suggested in the solution section. The algorithm compares the intended outcome to the general objectives based on the potential improvement in data security and service delivery [2]. The tests conducted by the algorithm during the development stage, eliminate the weaknesses and error incurred during the formulation of algorithm confine the task in a particular process that improves the analysis, control, and evaluation of the codes before implementation in the communication platform.

The primary focus of the research paper is to establish the performance of cloudlet computing in the network. The use of computer intelligence technique based on the EAS design algorithm optimizes the performance attributed to the multi-objectivity and level optimization limitations. The report established the impact of a generic algorithm in the scheduling supported by cloud computing techniques and such design variables constitute an essential element of the programming method through cloud computing

environment that focuses on the implication of AES algorithm anchored on the VM scheduling models.

II. RELATED WORK

The cloudSim kit provides a suitable platform for testing the selected components of the cloudlet scheduling systems to establish a consistent approach that sustains the productivity of the scheduling policy in place. The presences of optimization algorithm involve generic simulation enhance the scheduling processes applicable in the IT system for increased performance and system efficiency. The study presented by Mehmi, Verma and Singal [1]attributed the cloud computing to intensive advancement in technology regarding mobile internet and computing services applicable in the communication environment. Roy, Banerjee, Chowdhury and Biswas [3] captured the essential elements of multiple techniques that allow the mobile users to offload data and store in the cloudlet supported servers [3].

The weakness in wireless communications includes high power consumptions by the MCC affecting the performance of the clone systems to an extent where data signals fade off. Research presented by Loke Seng captures efficient energy use that improves the stability of the network linked to the productivity of the system. The adaptability of the MCC regarding power consumption provide real-time based visualization of cloud computing intended to benefits the cloudlet users irrespective of the algorithm adopted in the system. The use of cyber foraging in the system requires the installation of alternative software like the spectra and chroma intended to facilitate offloads of the signals in the communication network anchored on cloudlet platform. The presence of a visual machine operates by copying, communication signals from the mobile gadget to the existing infrastructure through the dedicated cloud network[5].

A. Scheduling Algorithm

The link between the user and data center uses the visual machine components that enhance successful data transmission and decoding at the intended nodes anchored in the communication platform that uses the cloudlet systems. The encryption technique facilitates efficient use of energy under resource optimization supported through safe data conversion algorithms that use unique codes that facilitate decryption of data by the intended user in the communication network. The scheduling algorithm is a critical component of the network topology used to differentiate different data bundles in the system for the sustenance of effective communication in the cloudlet bundles. The symmetric code encryption has a provision of a single code in the system to allow the user gain access to the data. The asymmetric key has an arrangement of two identifiers; private and public. The public key enables the user to accomplish the encryption as the private key support decryption process[6].
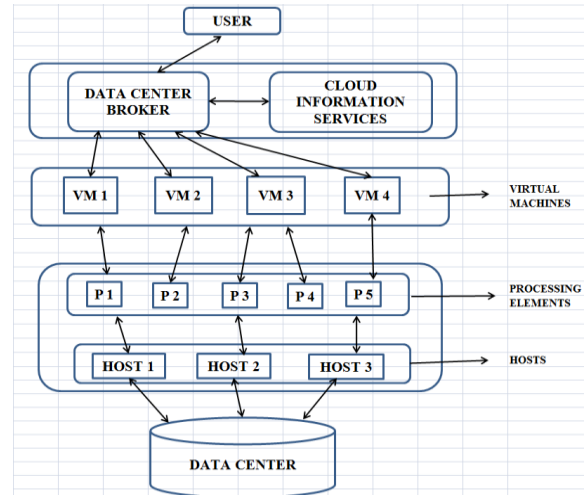

Figure 1. Scheduling in Cloud Computing

B. Communication Algorithm

Data encryption standards (DES) operate in a 64 bit key and block as recommended by the national institute of standards and technology. The algorithm encounters several threats to the extent of hampering the performance of communication device in the DES platform [3].

Algorithm 1: Communication Algorithm

Encrypt M, K where M = (L, R)

   M ← IP (M)

   For rounds 1 to 16 (K) do

      K_i ←SK (K, round)

      L← F(R, Ki)

      Swap (L, R)

   End

   Swap (L, R)

   M← IP-1(M)

   return M

End

The advanced encryption standard (AES) refers to the newly developed encryption algorithm intended to replace the DES that encounters numerous threats from brute force that test several codes to establish the key that comfortably unlocks the encryption. The algorithm operates on the encryption key of 128 and 192 or 256 by default with encryption data blocks of 10, 12 and 14 rounds based on the size. The process is fast and flexible and is compatible with small devices that suit diverse security applications[7].

III. SCHEDULING TECHNIQUES

The selection of improved scheduling technique enhances the performance of cloudlet systems in the communication platform. The prominent genetic algorithm depends on various scheduling arrangements yet the

coverage made on the research reflects the influence of three leading techniques [8].

A. Min-Min Algorithm

The algorithm computes the minimum completion time requirement for the selected tasks before assigning resources to the activities thus ensure an appropriate match of the tasks to relevant resources with minimal end span. The duration spent in a single activity to terminate the process for the entire activities supported by the same machine by the time interval. The steady engagement occurs until the complete data receive their match in the system[9].

B. Max-Min Algorithm

Once the establishment of the minimum time requirement for task completion is complete, the selection of maximum time occurred and assigned to the resource where the job takes minimal time to come to an end. The updates for all functions correspond to the time limits in the execution order designed for the machine operations[10].

C. Generic Algorithm

The use of the genetic algorithm in the cloud computing sustains task assignments to the devices based on the organic elements of the cloudlet system. The generic algorithm relies on the initial population to establish the solution based on a particular criterion. The fitness functions estimate the quality of components in the cloud platform selected from group size to individual fitness. The adoption of a crossover operator sets the intersection of the codes proportional to the chromosome in the system. Consideration of gene mutation algorithms sustains different approach in the continuous evaluation of the principle approach to the cloudlet computing by distinct binary codes assigned to accomplish a particular task. The scheduling of the visual modeling depends on the simulation frameworks in the cloud environment that rely on the data center to sustain data transfer between the source and user [11]. The cloud network enhances the performance of the selected algorithm through extensible toolkit that models the cloud computing systems in correspondence with the fulfillment of the algorithm through fixed computer hardware.

IV. PROPOSED ARCHITECTURE

The use of conventional architecture sustains the steady growth in the application of cloudlet computing platform that adopts particular algorithm in achieving optimal growth in the design systems. The selected use of cloud depends on the coordinated use of the mobile devices to communicate based on the cellular networks supported by high latency and low bandwidth.
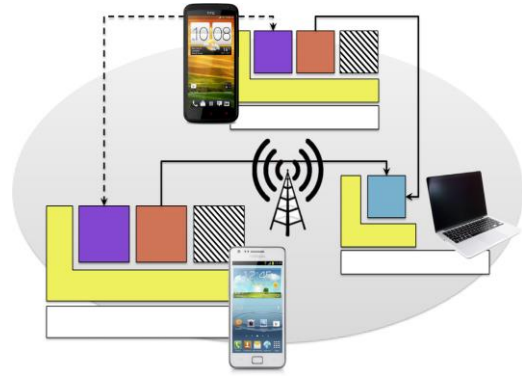

Figure 2. Collaboration on cloudlet platform

The mobility of the gadget sustains the connectivity to the nearby cloudlet computing, where at every instance the offloaded code and data remain stable despite the loss of connectivity and reconnection to the available cloudlet in the vicinity. The advanced cloud computing, communication platform uses the novel consisting of two layers of the mobile clone and cloudlet clouds with the architecture anchored in the Thinker framework based on the conceptual framework. The presence of free clone hosted in the Visual machine assigns the device to a particular server. Hence, sustain the offload and catching that is necessary for maintaining the conversation[12]. The link between the clones supports signal transfer to the cloudlets anchored on the cellular networks that use the Wi-Fi technology of the base station.

The mobile devices save energy once operating on the Wi-Fi platforms through a specific public IP, the presence of dynamic content supports the download based on the utility of the policy framework associated with code computations in the networks. The data migration handler in the system manages the transmitted signals between the mobile and the clone linked to the progressive controller. The architecture relies on the dynamic adaptation to the shifting environment associated with code migration among the clones that retard the severity of data loss. The user often records improvement in the communication anchored in the cloudlet and clones that increases the bandwidth available for the mobile device [8]. The proposed architecture enhances rapid code execution through data localization to limit the extent of data traffic defined by the computer algorithm for the energy that supports signal execution of a selected task within the specified time interval result from;

$$tj = ij/\mu cpu \qquad (1)$$

Energy consumption $(E) = (Pcomp* tjmob)$ (2)

The response time for sustained offload time for the tasks to remote cloud server;

$$tcloud = d/b + i/\mu cloud \qquad (3)$$

The entire calculations sustain the assumption that the cloudlets operate on Wi-Fi platform where the failure to meet task deadline affects energy consumption in the system. The cloudlet platforms provide relatively moderate power consumption compared to the cloning technology. The existence of steady bandwidth and latency link for the uplink and downlink associated with task processing dictates the magnitude of energy and time spent by the signal in accomplishing the task designated in the architecture [2].

V. EXPERIMENT AND ANALYSIS

The simulation approach adopted in the cloudlet performance estimate the corresponding energy consumption that elevates the cost of operating the system in a clean environment. The increased modifications in the cloud platform improve the performance accuracy in the network regarding power consumption [13]. The inclusion of individual elements like the cloudlets predicts the performance relative the adaptability of the hardware for a particular activity. The inclusion of mathematical deductions eliminates the prominent challenges attributed to the extent of disparity with which the system limits energy use compared to the traditional cloud computing arrangement. The algorithms in place strengthen the element of efficient energy consumption. Simulation of the communication standards relies on the data collection strategies in the system necessary to improve the compatibility of the data systems. Simulation of the communication routes facilitates examination of the algorithm and the preferred routes implemented by the systems. The experimental evaluation depends on the statistics generated from the used algorithms provides relevant results for the establishment of energy efficiency about the design elements in the cloud computing platform.

TABLE I.   RESULTS

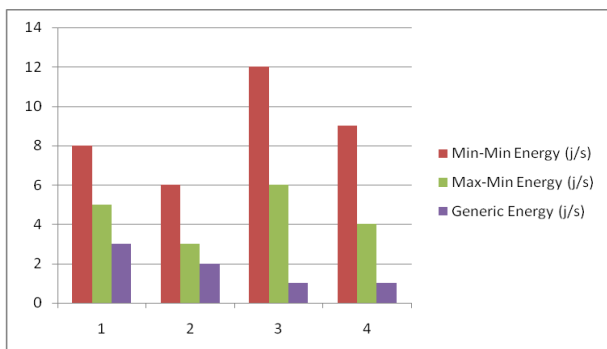| Cloudlet nodes	Min-Min Energy (j/s)	Max-Min Energy(j/s)	Generic Energy (j/s)
0	8	5	3
1	6	3	2
2	12	6	1
3	9	4	1

Figure 3.   Energy consumption based on scheduling technique

VI. DISCUSSION

The experimental variation in energy efficiency monitored with the increased use of the different algorithm in the cloud platform indicate the best performing algorithm that uses minimal energy while supporting operations of both mobile users and the receiver in the network for increased data transfer over the network. The presentation of Emin and Emax indicate the extent of energy consumption in the system. The power consumption for different models depends on the time and performance. The cloudlets application reduces the magnitude of energy requirement in support of the necessary signal transmission between the communication devices [14]. The communication anchored on the cloudlet schedules relies on the improved energy efficiency to an extent where the progressive estimation of the performance improves with increased innovation in the scheduling techniques in the platform. The simulation of power consumption of the computer and mobile device interface anchored on the Wi-Fi platform incorporate the collaboration among service providers to develop transparent customer service regarding data size based on the existing architecture.

The advanced encryption standard algorithm adopts several components that practically eliminate weak and semi-weak codes in the system. The presence of microcontrollers in the separate cloudlets servers uses a computer algorithm in the harmonization of the signal delivery. The execution time and intervals affect energy consumption while elevates the cost of communication. The algorithm helps cloud service provider in establishing the pricing for the services offered on the network. The encryption favors memory use and computation time while sustaining data security within the cloud infrastructure. The development of cloud computing shifts the events in IT services regarding infrastructure and platform applications symmetric and asymmetric and the extent of data storage in the communication environment[12].

Cloud computing offers great data mobility as the consumer may not have the ability to influence the location of data in the storage space, though the service providers ensure a high level of data security and integration in the system. The cloud system maintained without interruption in status and sustained resiliency in case of robust transfer of data in a strategic manner. The information anchored in the cloud platform relies on limited efforts from the client or data user in sustaining data secure location that the organization may attain through the implementation of AES framework in the cloud platform. The element of mix and match combines the sensor and the end user adaptation and re-composition mechanisms applicable in the cloudlets platform. The use of generic algorithms is quite significant in the harmonization of the contemporary elements that is appropriate for the enhancement of the alternative models in the communication networks while economies energy consumption. The increased threats linked to cybercrime affect the progress and application of the technology in a business organization dealing with critical and confidential data that require maximum privacy[15]. The excessive use

of energy facilitates redefinition of the cloudlet platform to operate on a Wi-Fi supported platform that limits the level of power consumption by the communication gadgets.

The research proposed adoption of an optimized algorithm for scheduling and allocation of the visual machine. The scheduler learning approach anchored in the cloud computing principle provides limited consideration of dynamic changes in the cloud computing resources that captured algorithm architectures to establish the performance of cloudlet scheduling based on the automata and associated capability optimization. The approach favors mobility and energy economization as compared to the older programming techniques designated for computing like the Min-Min algorithm that relies on the single channel communication through signal transfer algorithms. The outstanding principle of the AES algorithm is the increased resource utilization efficiency compared to other algorithms that use high energy in accomplishing the task.

VII. CONCLUSION

The advancement in IT focuses on improving the efficiency with which social media operates, the inclusion of modern innovation of cloud computing supports the multiuser friendly environment and attracts distinct components that enhance energy efficiency while maintains information quality in the network during signal transmission. The separate computer algorithms designated for data storage and transfer presents a favorable environment in the social network for both the user and operator to accommodate the innovations for sustained data transmission and dissemination to different users.   The reasonable valuation of the algorithm about energy consumption is an essential element that regulates the cost of operation and client preference of the services. The increased cost of energy is a clear determinant that influences the need for re-modification of the algorithm to use limited power in achieving better performance.   The improved understanding of users on the best alternative cloud computing algorithm to adopt provides maximum befits regarding efficient use of energy.

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