Journal of Scientific & Industrial Research
Vol. 78, September 2019, pp. 596-600

Dynamic Key Based Algorithm for Security in Cloud Computing Using Soft Computing and Dynamic Fuzzy Approach

P Kumar[1], A Gupta[2]* and S Kumar[3]

[1]IKGPTU Kapurthala, Punjab

[2]ECE, IKGPTU Kapurthala, Punjab

[3]Department of Computer Science and App GTBC, Sangrur, Punjab

Received 19 July 2018; revised 3 March 2019; accepted 17 June 2019

As cloud computing is escalating by number of services, there are lots of issues regarding vulnerability and integrity in the data centers from where these cloud services are disseminated. This research manuscript presents and implements a unique and effectual approach for security of data centers using dynamic approach for encryption during communication and accessing the cloud services. The results in the projected novel approach are effective in terms of cost, complexity and overall performance. The projected novel approach is using nature inspired approach river formation dynamics for the enhancement of results and performance. In this manuscript, different aspects of cloud environment and the implementation of efficient security is integrated. Using cloud based simulators, the effective implementation can be done on different aspects and algorithms of cloud computing.

Keywords: Cloud Computing, Performance Evaluation, Cloud Computing, Cloud of Things, Nature Inspired Approach, Network Security, River Formation Dynamics

Introduction

Cloud computing[1] has been one of the fastest growing parts in IT industry as well as illustrious in the research community. Cloud computing refers to the delivery of computing resources to cloud users as a service rather than a product. Here, the computing power, devices, resources, software and information is delivered to the clients as a utility. Classically these services are delivered or transmitted to the client end by making use of a specialized network infrastructure or Internet. Cloud computing services are delivered by the service providers using different specific models. Scope and features of cloud simulations are: Data Centers, Resource Provisioning, Scheduling of Tasks, Load Balancing, Creation and Execution of Cloudlets, Storage and Cost Factors and many others. Green Cloud, Cloud Auction, Cloud Sim with Cloud Analyst, MDC Sim are the Cloud simulation tools and plugins used for simulation.

Proposed work & implementation results

In this research work, CloudSim[6] a cloud computing functions library is used for simulation and integration of security in the algorithmic approach. A novel security algorithm based on hash key is implemented in the proposed approach. Using this approach, the security algorithmic scenario on cloud sim is giving effective results in terms of improvements in the cloud infrastructure. After execution of the code using Cloud Sim, the output shows the successful results in terms of security enhancement and overall performance of the cloud service delivery. For implementation, the prominent cloud computing based library and simulator Cloud Sim is used which is having all the libraries and base classes for implementation of security at multiple layers. Using Cloud Analyst [7] and Grid Sim [8], there is integration of high performance computing in the grid-based environment which can impose more security and performance in the higher load to avoid the congestions.

In this proposed work and implementation, cloudsim is used to call and integrate the cloud components, virtual machines and related objects in the cloud environment. Cloudsim provides the library and framework to with the cloud components. The association of cloud analyst is done to present the data centers and virtual machines with associated factors in the graphical perspectives. The proposed algorithm of

*Author for Correspondence
E-mail: amitguptacgc@gmail.com

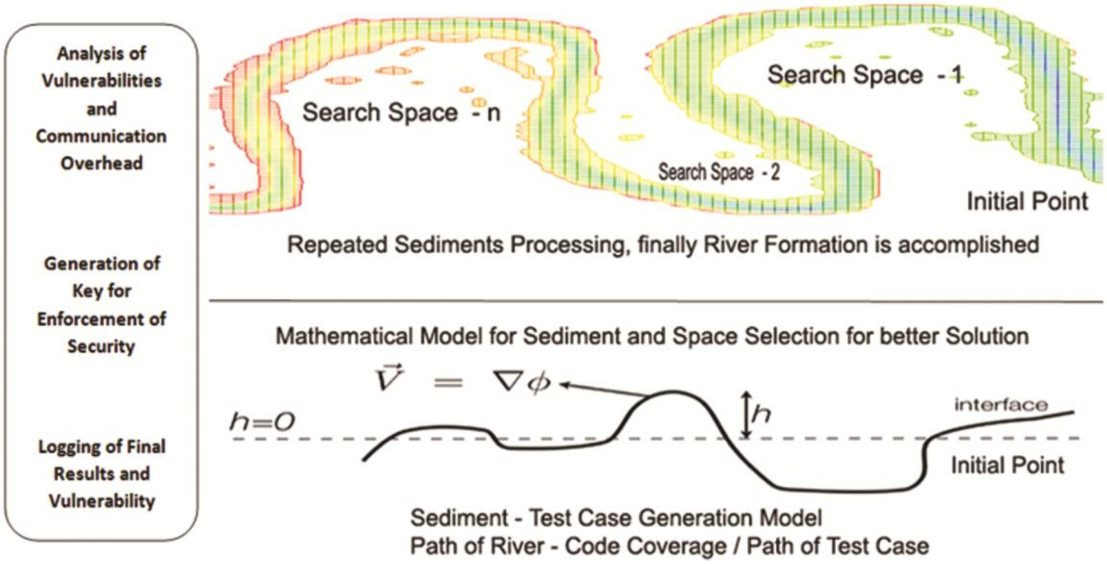

Fig. 1 — River Formation Dynamics in Cloud Environment

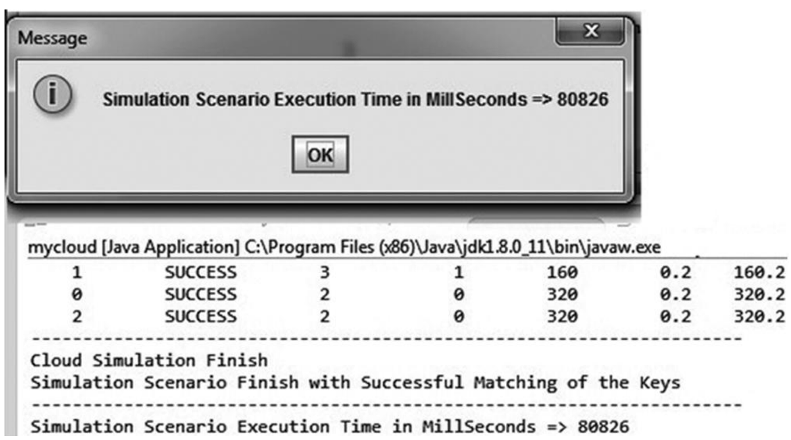

Fig. 2 — Fetching the Results from Cloud Simulation on implementation

Table 1 — Comparative Evaluation of Results on multiple parameters

Parameter / Algorithm	Cost	Complexity	Performance
Traditional Approach (Ant Based Optimization)	89	88	53
River Formation Dynamics	54	27	95

river formation dynamics is implemented in this phase of cloud-based transmission and communication between the cloudlets and in secured dimensions (Figure-1).

The Results from Cloud Simulation on implementation is shown in figure 2 with execution time parameter.

Comparative Evaluation of Results on multiple parameters like cost, complexity and performance is given in table 1.

Formulation of the parameters

Time complexity: Big0N (n log (n^2))

Creation of Cloudlet and Virtual Machine Based Scheduling Big0N(n)

+

Evaluation of the Requirements and Resource Replenishment Big0N (n log n)

+

Allocation of Tasks to the Cloud Server and Data Centers Big0N (n)

+

Data Centers with loop towards resources to virtual machines Big0N (n^2)
+
Virtual Machines and Cloudlet Interfacing Big0N (n)
+
Fetching of Required Parameters for best fit allocation Big0N (n)
+
Sequential Assignment and Processing Big0N (n)
+
Analysis of cloud parameters Big0N (n^2)
+
Inner Loop for Job Assignment Big0N (n^2)
+
Deep Inner Loop for cloudlet replenishment n Log (n)
+
Time and frequency-based job execution n Log (n2)
+
Job preparation and Execution on server n Log (n)
= Big0N (n^2) + n Log (n) ... (1)

Space complexity
Cloud Tasks and Machine Requirements (n^2)
+
Memory Allocation for Virtual Tasks Big0N (n^2)
+
Memory Allocation for Cloudlets n * Big0N(n)
+
Inner Requirements for Cloudlets n * Big0N(n)
+
Memory Consumption at each phase Big0N(n)
+
Deep Inner Memory Consumption n log (n)
+
Cumulative Space Allocation n * Big0N(n)
= Big0N (n^2) ... (2)

Comparative analysis of conventional and projected approach

The following results are logged using assorted cloud simulation scenarios with the varying number of data centers and virtual machines. The cloud simulations based on different sets of input parameters including bandwidth, internet characteristics, cloudlets, data centers and related dimensions are executed so that the overall integrity and consistency of classical and novel projected approaches can be evaluated using effectual methodology.

Evaluation of Execution Time in microseconds with each approach is given in table 2.

Graphical representation of proposed and existing approach based on Evaluation of Execution Time in microseconds is shown in figure 3.

Logs of key generation during cloud simulations for security and overall performance

Execution Time=> 13207 Atomic Static Key : *!(!&^%$#@$^)(*

Table 2 — Evaluation of Execution Time in microseconds with each approach

Simulation Scenario with Varying Input Sets	Projected Novel Approach based on Soft Computing and Fuzzy Integration	Traditional Approach with the Classical Paradigms
1	1315	2722
2	1241	2912
3	1112	2369
4	1194	2302
5	1280	2975
6	1802	2361
7	1481	2614
8	1284	2099
9	1853	2702
10	1088	2051
11	1417	2941
12	1375	2590
13	1003	2153
14	1037	2487
15	1339	2799
16	1829	2757
17	1682	2137

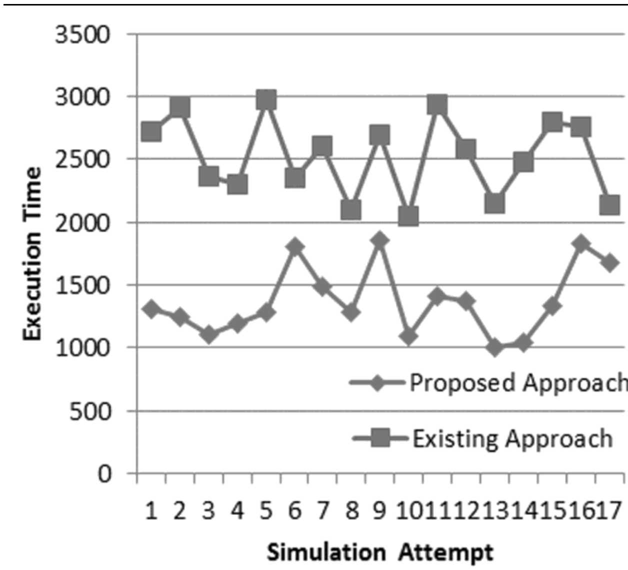

Fig. 3 — Line Graph based Evaluation of Execution Time in microseconds

Execution Time=> 4678 Atomic Static Key : *!(!&^%$#@$^)(*

Execution Time=> 3915 Atomic Static Key : *!(!&^%$#@$^)(*

Execution Time=> 6031 Atomic Static Key : *!(!&^%$#@$^)(*

Execution Time=> 12631 Atomic Static Key *!(!&^%$#@$^)(*

Execution Time=> 6658 Atomic Static Key *!(!&^%$#@$^)(*

Execution Time=> 8561 Atomic Static Key *!(!&^%$#@$^)(*

Execution Time=> 5744 Atomic Static Key : *!(!&^%$#@$^)(*

Execution Time=> 4348 Atomic Static Key : *!(!&^%$#@$^)(*

Proposed approach with dynamic hash algorithms

Execution Time=> 8038 Dynamic Hybrid Secured Key qucjlkpmfnr4¨? §-?££-ª¨

Execution Time=> 3723 Dynamic Hybrid Secured Key : wwrsgpavsrn4?ª¡±«¤?©®¬¢

Execution Time=> 4035 Dynamic Hybrid Secured Key : dlrvakssuni4?¢?©?¨²?±¦²

Execution Time=> 5649 Dynamic Hybrid Secured Key : dneumimwqga4¨°¡?¡¢?¦¤±ª

Execution Time=> 6802 Dynamic Hybrid Secured Key fbebxupsjhs4²®?®£¯?£¯¥?

Execution Time=> 3768 Dynamic Hybrid Secured Key : kwinksoausi4?????¨?¨²?®

Execution Time=> 4312 Dynamic Hybrid Secured Key : ninkqqvxmdd4?²¯?¯³-¡?³?

Execution Time=> 31888 Dynamic Hybrid Secured Key dtoodwfoltm4ª?±£-¥¥§©¯¢

Execution Time=> 10408 Dynamic Hybrid Secured Key : rhtpjoardll4©¥ ?¡-®?©?©

Execution Time=> 6947 Dynamic Hybrid Secured Key puavxilpgdw4?²²¦«ª®£?¬±

Execution Time=> 7267 Dynamic Hybrid Secured Key : dmqnegjlppm4?®?¯?°?®§¢®

Execution Time=> 7964 Dynamic Hybrid Secured Key : mimdoxtjwwp4°?£?£²¦-?¦¬

Execution Time=> 6925 Dynamic Hybrid Secured Key : vqnsymhapoo4¡£°¨?¯¡¥±ªª

Execution Time=> 3860 Dynamic Hybrid Secured Key : ajdwcxfubba4«® ©§ ¥± ?-

Execution Time=> 5896 Dynamic Hybrid Secured Key: nrsieyvocfm4±?-£³ ??°?®

Execution Time=> 4681 Dynamic Hybrid Secured Key cqjyyptkwpq4±ª®¨¢?²£?®¬

Execution Time=> 5904 Dynamic Hybrid Secured Key iyoqhefjwcn4??¯¨¡®??²?¬

Execution Time=> 5767 Dynamic Hybrid Secured Key: ygcxsbyybpr4¢- ª¢£?¡®-£

Execution Time=> 15417 Dynamic Hybrid Secured Key: xcyvqjijbyp4??¡® ª?¬-?¡

Execution Time=> 24093 Dynamic Hybrid Secured Key: rojoeonhivv4©¥¨¥??¥?-²®

Execution Time=> 28061 Dynamic Hybrid Secured Key: anfcjunqhct4§¯¨?¡²¡®°²²

Conclusion

The cloud based simulators accelerate the research and development process for analyzing and deep investigation of different parameters including security, energy, integrity, power and related aspects. Research scholars, scientists as well as engineers can analyze the simulated cloud to compare the impact of their experiments on the infrastructure rather than using the actual resources. Using a wide variety of free and open source cloud simulators, the engineers and trainees can work freely with their ideas and algorithms without affecting the actual cloud infrastructure. In this manuscript, an effective algorithmic approach is implemented for security of cloud environment based on secured hash keys. For future scope, the integration of nature inspired approaches or metaheuristic approaches can be done so that the higher degree of optimization can be achieved with the evaluation of other related parameters including energy, power and overall integrity of the cloud environment.

References

1 Kavitha R, Kannan N, Nazneen R & Jubar H A, Cloud Computing Integrated with testing to ensure quality, *J Sci Ind Res*, **75** (2016) 77-81.

2 Purohit S, An Exhaustive Study on Cloud Computing, *Int J Adv Trends in Tech & Mgmt*, **2** (2016).

3 Kanmani A & Sukanesh R, Adequate Algorithm for Effectual Multi service load balancing in Cloud based data storage, *J Sci Ind Res*, **74** (2015) 614-617.

4 Wohl A, Software as a Service (SaaS), *The Next Wave of Technologies: Opportunities from Chaos*, (2010) 97-113.

5 Sîrbu A, Pop C, Şerbănescu C & Pop F, Predicting provisioning and booting times in a Metal-as-a-service system, *Future Gen Comp Sys*, **72** (2017) 180-192.

6 Buyya R, Ranjan R & Calheiros R N, Modeling and simulation of scalable Cloud computing environments and the CloudSim toolkit: Challenges and opportunities in High Performance Computing & Simulation, *Int Conf on IEEE*, (2009) 1-11.

7 Wickremasinghe B, Calheiros R N & Buyya R, Cloudanalyst: A cloudsim-based visual modeler for analyzing cloud computing environments and applications in Advanced Information Networking and Applications (AINA), *Int Conf on IEEE,* (2010) 446-452

8 Wickremasinghe B & Buyya R, CloudAnalyst: A CloudSim-based tool for modelling and analysis of large scale cloud computing environments, *MEDC proj report*, **22** (2009) 433-659.

9 Rani D, *A Comparative Study of SaaS PaaS and IaaS in Cloud Computing, Int J Adv Res in Comp Sc & Soft Eng***,** **4** (2014) 458-461.

10 Yaser M, Adel Nadjaran T, & Buyya R, Data Storage Management in Cloud Environments: Taxonomy, Survey, and Future Directions, *ACM Comp Sur*, **50** (2018) 1-66.

11 Raghavendra S, Chitra S Reddy, Geeta C M, Buyya R, Venugopal K R, S S Iyengar, & Patnaik L M, Survey on Data Storage and Retrieval Techniques over Encrypted Cloud Data, *Int J Comp Sc Info Sec (IJCSIS)*, **14** (2016) 718-745.

12 Sareh Fotuhi P, Amir Vahid D, Rodrigo N C & Buyya R, Container CloudSim: An Environment for Modeling and Simulation of Containers in Cloud Data Centers, *Soft Pract Exp*, **47** (2017) 505-521.