International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970)
Volume-2 Number-4 Issue-6 December-2012

Secure and Cost Effective Framework for Cloud Computing Based On optimization and Virtualization

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Abstract

Cloud computing is emerging technology in today's era. Its popularity is because of flexibility, scalability, cost reduction and on-demand service. But there is the demand of security in User-Cloud environment, because of dependency increases on the cloud. Several companies chooses cloud environment for business prospective. So when we choose cloud environment we must think about the security issue, because our data is crucial. I study several research papers in this regards. So in this paper i proposed a security framework which is used for IaaS, PaaS and SaaS by the help of Optimization algorithms. In this paper we first survey and analyzes the research work which concentrates on security and reliability issues, then we consider optimization techniques which is helpful for maintaining the security. So overall i want to introduce security model which is more efficient and reliable.

Keywords

Cloud computing, cloud architecture, security, optimization

1. Introduction

The main aim of Cloud computing is to provide runtime scaling through Internet. The User of Cloud Computing is free from the management and information need. They do not need to bother about the management of technology infrastructure. They simply use the resources on a pay per use basis, How much you use you can pay for this, commissioning and decommissioning as many instances of computing resources as needed. Cloud computing infrastructure accelerates and fosters the adoption of innovations. Cloud computing infrastructure allows enterprises to achieve more efficient use of their IT hardware and software investments. Enterprises strive to reduce computing costs. Many start by consolidating their IT operations and later introducing virtualization technologies. Cloud Architectures address key difficulties surrounding large-scale data processing.

In cloud application applicants on Cloud Architectures run in the cloud environment where the physical location of the Infrastructure is determined by the provider. They take the maximum advantage and according to the velte its reduces the overall cost and the cost reduction is due to the large server overhead is reduced, because we fulfill the requirements from the provider. All the cloud used the concept of virtualization.

The cloud pool is a virtualized way of using computer resources. A cloud is useful in various jobs performing approach in which they can include the concept of aggregation and association. Allow workloads to be deployed and scaled-out quickly through the rapid provisioning of virtual machines or physical machines. Support Redundant, self recovering, highly scalable programming models that allow workloads to recover from many unavoidable hardware/software failures. Monitor resource use in real time to enable rebalancing of allocations when needed. We does not say that the cloud is only the collection of system resources because it is more than this things because cloud also provides a mechanism to manage those resources. Management includes provisioning, change requests, reimaging, workload rebalancing, de provisioning, and monitoring. A pictorial representation of cloud computing is shown in fig 1. So I want to club the task with cloud computing with security.

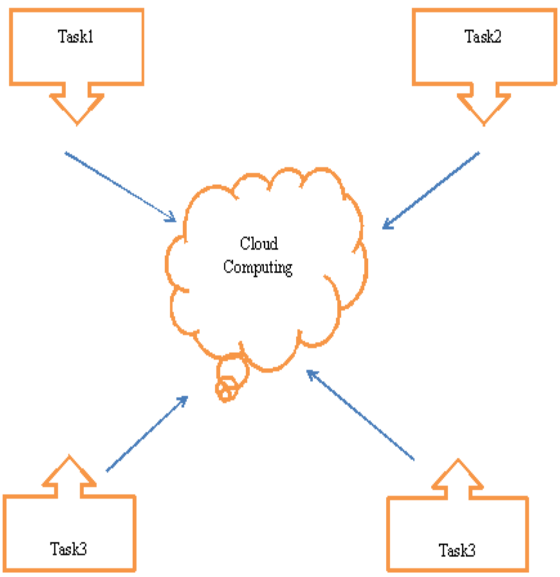

Figure 1: Task Processing in Cloud Computing

We provide here an overview of cloud computing. The rest of this paper is arranged as follows: Section 2 introduces literature review; Section 3 describes about problem domain; Section 4 shows the proposed framework; Section 5 describes Conclusion.

2. Literature Review

In 2009, Vincenzo D. Cunsolo et al. [1] present the Cloud@Home paradigm, highlighting its contribution to the actual state of the art on the topic of distributed and Cloud computing. We detail the functional architecture and the core structure implementing such paradigm, demonstrating how it is really possible to build up a Cloud@Home infrastructure.

In 2010, Saira Begum et al. [2] analyses that Cloud computing is a massively central advancement in the technique that businesses and users devour and work on computing. It's a elementary modify to an prepared model in which applications don't subsist out their lives on a specific section of hardware and in which possessions are more supplely deployed than was the historical standard. It's a primary shift to expansion and utilization model that replaces hard-wired, proprietary associations surrounded by software components and the clients of those components with unimportant Web services and Web-based software admittance.

In 2010, Sang-Ho Na, et al. [3] proposed analyze security threats and requirements for previous researches and propose service model and security framework which include related technology for implementation and are possible to provide resource mobility.

In 2011, Mohssen M. Alabbadi [4] discusses the use of cloud computing in the educational and learning arena, to be called "Education and Learning as a Service" (ELaaS), emphasizing its possible benefits and offerings. It is essential for an educational and learning organization, with its budget restrictions and sustainability challenges, to use the cloud formation best suited for a particular IT activity. The Jericho Forum proposes a cloud computing formation model, called the Cloud Cube Model (CCM), which is based on 4 criteria. To preserve the symmetry of the cube, a new cloud computing formation model, called the Complete Cloud Computing Formations (C3F), is proposed. The IT activities in the educational and learning organizations are then classified with respect to the two criteria: mission criticality and sensitivity.

In 2011, Massimiliano Rak et al. [5] focused on user-perceived performance indexes than on resource usage. They take a step in this direction, presenting the design and development of CHASE, an autonomic engine designed to optimize the scheduling of virtual machines in a cloud environment. The CHASE architecture and its application in two different contexts: in PerfCloud, an environment for IaaS provision based on cloud and grid integration, and inside Cloud@Home, a project whose objective is to build a cloud using volunteer-based resources.

In 2011, Joseph C. Joswig et al. [6] review both past and current implementations of the tactical planning application focusing on remote plan saving and discuss the unique challenges present with long-latency, distributed operations. They then detail the motivations behind our move to cloud based computing services and as well as our system design and implementation. They will discuss security and reliability concerns and how they were addressed.

In 2011, Justin Y. Shi et al. [7] reports a resource planning study using a method derived from classical program time complexity analysis, we call Timing Models. Unlike existing qualitative performance analysis methods, a Timing Model uses application instrumented capacity measures to capture the quantitative dependencies between a computer program (sequential or parallel) and its processing environments. For applications planning to use commercial clouds, this tool is ideally suited for choosing the most cost effective configuration. The contribution of the proposed tool is its ability to explore multiple dimensions of a program quantitatively to gain non-trivial insights. They use a simple matrix multiplication application to illustrate the modeling, program instrumentation and performance prediction processes. Since cloud vender does offer HPC hardware resources, we use Amazon EC2 as the target processing environments. The computing and communication models are not only useful in choosing the processing platform but also for understanding the resource usage bills.

In 2010, Srijith K. Nair et al. [8] describes the concepts of cloud bursting and cloud brokerage and discusses the open management and security issues associated with the two models. It also presents a possible architectural framework capable of powering the brokerage based cloud services that is currently being developed in the scope of OPTIMIS, an EU FP7 project.

In 2011, Dusit Niyato et al. [9] proposed an optimal resource management framework for cloud computing environment. Based on virtualization technology, the workload to be processed on a virtual machine can be moved from private cloud to the service provider in public cloud. The framework introduces the virtual machine manager (VMM) in private cloud operating to minimize the cost due to the outsourcing and performance degradation. A stochastic optimization model is developed to obtain an optimal workload outsourcing policy with an objective to minimize a cost. The numerical studies reveal the effectiveness of the optimal resource management framework to achieve an objective of private cloud. This framework will be useful not only to optimize the performance of resource usage, but also to achieve the best benefit from economic perspective of the cloud computing regime.

In 2012, Feng-qing Zhang et al. [10] presents a data security model for cloud computing, and introduces agents to data security module in order to provide more reliable services. According to authors Cloud computing is now the hot spot of computer business and research. However cloud computing security issues have become more and more pronounced. To protect data confidentiality and integrity, making more reliable in cloud computing becomes priorities. They suggest that the Cloud computing security related to the survival of cloud computing, has become a key factor in the development of cloud computing.

3. Problem Domain

After studying several research work from different authors, we observer some security flaws in which why users believe on cloud. Is there data is safe, is the transaction is safe. There are lot of question in the user's mind. So we provide a secure transaction safe framework, which provides the security also to the user's level. We also provide a cost computation technique which shows cloud is effective in terms of cost.

4. Proposed Framework

Business environments are becoming increasingly complex and competitive. At the same time, the expectations of customers are also increasing. With companies now looking for new ways to enhance the quality of their products and services through IT, the traditional model seems to be inadequate. Sourcing and deploying IT systems and solutions, using the traditional model, requires large investments in IT infrastructure but may not result in the optimal utilization of resources.

Furthermore, businesses not only have to setup an in-house (On-Premise / Hosted) computing environment but they also have to build / source IT teams to manage the same thus adding on to costs.

<table>
<tr><td colspan="3">Access Management</td></tr>
<tr><td colspan="3">Cloud application(SaaS)</td></tr>
<tr><td colspan="3">Workflow Engine</td></tr>
<tr><td colspan="3">Security API</td></tr>
<tr><td colspan="3">Services</td></tr>
<tr><td>Service Management</td><td>PaaS</td><td>Cloud Software Infrastructure</td></tr>
<tr><td colspan="3">Network security</td></tr>
<tr><td colspan="3">Connectivity</td></tr>
<tr><td colspan="3">Security</td></tr>
<tr><td>Computation</td><td>Storage</td><td>Communication</td></tr>
<tr><td colspan="3">Kernel</td></tr>
<tr><td colspan="3">Hardware</td></tr>
</table>

Figure 2: Proposed Framework

In 2012, Ashutosh Dubey et al. [10] propose a new cloud computing environment where we approach a trusted cloud environment which is controlled by both the client and the cloud environment admin. Their approach is mainly divided into two parts. First part is controlled by the normal user which gets permission by the cloud environment for performing operation and for loading data. Second part shows a secure trusted computing for the cloud, if the admin of the cloud want to read and update the data then it take permission from the client environment. This provides a way to hide the data and normal user and can protect their data from the cloud provider. This provides a two way security protocol which helps both the cloud and the normal user. For the above concept we apply any private key encryption.

From the above concept we took the approach for implementing secure framework with attack detection approach where we can detect the attack. In figure 3 we show the outlook of the proposed work, in our work we apply some security algorithm like RSA and DES which is applicable on storage, platform and infrastructure resources. Next we calculate the cost after the task completion by using the software parameter. Then we test the security by maintain the log attacks in the database, if the test is ok, then we can proof that our flowchart performs secure and cost effective transactions for cloud computing. Security test is performed by ant colony optimization.

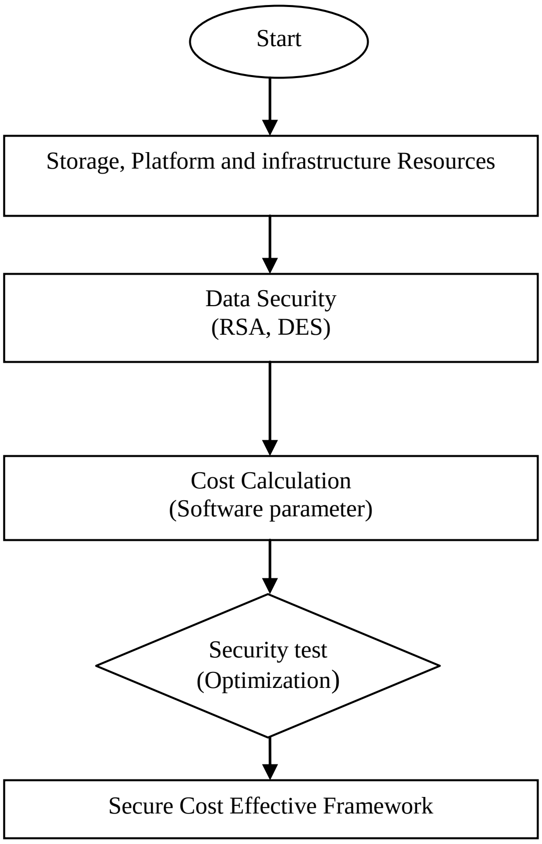

Figure 3: Proposed Flowchart

The Cloud on the other hand signifies a complete transformation from the traditional IT setup. It refers to the process of sharing resources (such as hardware, development platforms and/or software) over the Internet or other WAN technologies. The Cloud enables On-Demand network access to a shared pool of dynamically configurable computing resources. These resources are accessed mostly on a pay-per-use or subscription basis.

Virtualization is the first step to adopting the cloud. Services of the Cloud are made available through virtualization and provided on a usage-based pricing model. These resources can be quickly provisioned and easily managed, by the user, without any major inputs from cloud service provider. Customers sign standard Service Level Agreements (SLAs) with service providers of the Cloud to ensure availability of services based on certain guiding principles.

Cloud computing liberates organizations to deliver IT services as never before. Cloud enables the dynamic availability of IT applications and infrastructure, regardless of location. More rapid service delivery results from the ability to orchestrate the tasks to create configure provision and add computing power in support of IT and business services much more quickly than would be possible with today's computing infrastructure. Enhanced service delivery reinforces efforts for customer retention, faster time to market and horizontal market expansion. Cloud computing can enhance SOA, information management and service management initiatives, which also support service delivery initiatives.

Then we go for the cost calculation. For this we consider two types of environment first are cloud second is non-cloud environment for comparing the cost. For better understanding the concept we define some of the terminology which are used for the cost calculation:
MM: Number of man--months estimated for the SW development which is also called effort.
KDSI: Number of thousands of delivered source instructions.
TDEV: Number of months estimated for the SW development which is also called schedule.
FSP: Fulltime software personnel who are also called average staffing.
ACT: Annual Change Traffic which is the fraction of software source instructions which undergoes.
EDSI-Equivalent number of delivered source instructions.

The required software gathering is needed to calculate the software estimation and their productivity. The calculation is given for organic, semidetached and embedded model.

Cost is calculated according to the table 1.

Basic Cocomo	a	b	c
Organic	2.4	1.05	0.38
Semi-Detached	3.0	1.12	0.35
Embedded	3.6	1.20	0.32

MM= $a*(KSDI)^b$
TDEV=2.5 * $(MM)^c$
Productivity=Total Number of Source Instruction / MM
Average Staffing=MM/TDEV
ACT=(Added Instruction + Modified) / SDI
$MM_{annual\ Maintainenace}$ = ACT * MM
$FSP_{annual\ Maintainenace} = MM_{annual\ Maintainenace}/12$
Effort = 2.94 * EAF * $(KDSI)^E$

Where
EAF: It is the Effort Adjustment Factor derived from the Cost Drivers
E: Is an exponent derived from the five Scale Drivers

As an example, a project with all Nominal Cost Drivers and Scale Drivers would have an EAF of 1.00 and exponent, E, of 1.0997.

Duration = 3.67 * $(\text{Effort})^{\text{TDEV}}$

There are four steps that the user needs to follow, which are:
Step 1: The user should fill the Information Domain table in which he/she can get the Count Total (CT) which will be used in the FP equation. The Information Domain are defined in the following manner:

Number of user inputs: Each user input that provides distinct application-oriented data to the software is counted. Inputs should be distinguished from inquiries, which are counted separately.

Number of user outputs: Each user output that provides application-oriented information to the user is counted. In this context output refers to reports, screens, error messages, and so on. Individual data items within a report are not counted.

Number of user inquiries: An inquiry is defined as an on-line input that results in the generation of some immediate software response in the form of an on-line output. Each distinct inquiry is counted.

Number of files: Each logical master file a logical grouping of data that may be one part of a large database or a separate file, is counted.

Number of external interfaces: All machine readable interfaces data files on tape or disk that are used to transmit information to another system are counted.

Once the above data have been collected, a complexity value is associated with each count. Once all the information are entered, the Count Total (CT) is calculated.

Step 2: The end user should calculate the "Complexity Adjustment Values" (Fi where i = 1 to 14). The user will give a value between 0 to 5. Once Step 1 and Step 2 are calculated, then the end user can calculated the Function Points (FP) which is: FP = CT * [0.65 + 0.01 * SFi]

Step 3: The end user should select a programming language from the table found in step 3 that provides a rough estimates of the average number of lines of code required to build one function point in various programming languages. Once the programming language is selected, then the end user can calculate the Line Of Code (LOC).

Step 4: This is the final step of the basic COCOMO model. The end user has to select one of the three (3) types of modes, which are organic, semi-detached, and embedded.

Organic Mode: Relatively small, simple software projects in which a small teams with good application experience work to a set of less than rigid requirement. The equation for the Effort (E) and Development time (D) for this model are:
MM = 2.4 * $(\text{KLOC})^{1.05}$ D = 2.5 * $(E)^{0.38}$

Semi-Detached Mode: An intermediate (in size and complexity) software project in which teams with mixed experience levels must meet a mix of rigid and less than rigid requirements. The equation for the Effort (E) and Development time (D) for this model are:
E = 3.0 * $(\text{KLOC})^{1.12}$ D = 2.5 * $(E)^{0.35}$

Embedded Mode: A software project that must be developed within a set of tight hardware, software and operational constraints. The equation for the Effort (E) and Development time (D) for this model are:
E = 3.6 * $(\text{KLOC})^{1.20}$ D = 2.5 * $(E)^{0.32}$

Once the end user selects his/her model, he/she calculates the effort and the development time. The above parameters which we will discuss are used for software cost estimation. In the cloud Environment the cost is based on IaaS , PaaS, SaaS, duration ,effort ,productivity. But the cost of MM and TDEV is less ion comparison to the calculation of non-cloud environment.The percentage of the adapted software's code that receives modification to fulfil the objectives and environment of the new product. In Percept of Integration Required for Modified Software . The percentage of effort needed for integrating and testing of the adapted software in order to combine it into the new product. Finally we calculate the estimation which is based on different KDSI

5. Conclusion

In this paper we analyze several different aspects of cloud computing. We discuss the demerits of traditional approach. We highlight the advantages of cloud computing. We survey different techniques about cloud computing. In future we apply some trends and technologies which are based on cloud paradigm. We also apply some real time simulations which can provide a valuable approach for the new era and provide frutility.

References

[1] Vincenzo D. Cunsolo, Salvatore Distefano, Antonio Puliafito and Marco Scarpa,

"Volunteer Computing and Desktop Cloud: the Cloud@Home Paradigm",IEEE 2009.

[2] Saira Begum and Muhammad Khalid Khan, "Potential of Cloud Computing Architecture", 2010 IEEE.

[3] Sang-Ho Na, Jun-Young Park, Eui-Nam Huh , "Personal Cloud Computing Threats", 2010 IEEE Asia-Pacific Services Computing Conference.

[4] Mohssen M. Alabbadi , "Cloud Computing for Education and Learning: Education and Learning as a Service (ELaaS)",2011 IEEE.

[5] Massimiliano Rak, Antonio Cuomo, Umberto Villano," CHASE: an Autonomic Service Engine for Cloud Environments", 2011 20th IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises.

[6] Joseph C. Joswig and, Khawaja S. Shams," Redefining Tactical Operations for MER using Cloud Computing",2011 IEEE.

[7] Justin Y. Shi, Moussa Taifi, and Abdallah Khreishah , "Resource Planning for Parallel Processing in the Cloud", 2011 IEEE International Conference on High Performance Computing and Communications.

[8] Srijith K. Nair, Sakshi Porwal, Theo Dimitrakos, Ana Juan Ferrer, Johan Tordsson, Tabassum Sharif, Craig Sheridan, Muttukrishnan Rajarajan and Afnan Ullah Khan," Towards Secure Cloud Bursting, Brokerage and Aggregation", 2010 Eighth IEEE European Conference on Web Services.

[9] Dusit Niyato "Optimization-Based Virtual Machine Manager for Private Cloud Computing", 2011 Third IEEE International Conference on Coud Computing Technology and Science.

[10] Ashutosh Kumar Dubey, Animesh Kumar Dubey Mayank Namdev, Shiv Shakti Shrivastava ,"Cloud-User Security Based on RSA and MD5 Algorithm for Resource Attestation and Sharing in Java Environment",Conseg 2012, Published by IEEE.

[11] Feng-qing Zhang, Dian-Yuan Han, "Applying Agents to the Data Security in Cloud Computing", IEEE 2012.

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