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Highlights

- Implementing Cloud Data Single Process Architecture
- E-Learning Over Cloud Architecture for E-Learning

Discovering Thoughts, Inventing Future

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Challenge Token based Security for Hybrid Clouds

By Anukrati Dubey & Sandeep Sahu
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Abstract - Cloud has now become the essential part of the web technology and fast growth of cloud computing technique making it worth for the companies to invest in cloud. Growth of number of clouds is requiring inter cloud communication as concept of multi cloud or hybrid cloud is also spreading quickly. With this fast growth, more and more challenges are arising in the field of cloud computing. Various researchers are focusing on cloud oriented challenges and lots of research works are going on in this field. With emergence of cloud computing, the term "Hybrid Topology" or "Hybrid Deployment" is becoming more and more common. A "Hybrid Cloud" is group of clouds you join different cloud deployments into one connected cluster. Another area of research is to focus on communication between a cloud and non cloud computing system. Hybrid Cloud computing mainly deals with working of data centers where different software are installed with huge of growing data to provide information to the users of the system.

The techniques which can be used in hybrid cloud securities can be built around the encryption and decryption of data, key based security algorithms which are mainly oriented on authentication and authorization techniques as in wired and wireless networks. One such mechanism is to share the challenge text between the clouds before actual communication should start for authentication. The various works done in this area till date are oriented on other techniques of security between the two or more clouds in a hybrid cloud.

Keywords : *cloud computing; hybrid cloud; challenge text; security.*

GJCST-B Classification : *C.1.4*

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Challenge Token based Security for Hybrid Clouds

Anukrati Dubey [α] & Sandeep Sahu [σ]

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Keywords : cloud computing; hybrid cloud; challenge text; security;

I. Introduction

Cloud computing is becoming a buzz word in computer industry and everyone is looking to associate in one way or other with this brand new concept. Cloud computing is a very current topic and the term has gained a lot of traction being sported on advertisements all over the Internet from web space hosting providers, through data centers to virtualization software providers.

Special emphasis is put on the critical examination of each strategy as now more than ever in the face of the global economic crisis, companies face higher refinancing and investment costs and as any company thinking about adopting or moving to cloud computing technology would do in practice; short-to-medium term disadvantages of the technology have to be pragmatically and carefully weighted out against any hyped long- term potential efficiency achievements, be it strategic, technical or cost related. [1]

In order to understand the vision, goals and strategy behind cloud computing, two key concepts that form its foundations need to be explained first.

1. Autonomic Computing
2. Utility Computing

Autonomic computing, the term initially being introduced by IBM's Senior Vice President Paul Horn to the National Academy of Engineers at Harvard University in 2001, represents a research aim towards achieving self-managing computing systems, whose components integrate effortlessly.

Utility computing is the second key concept that one encounters in all cloud computing models. It is by no means a new concept as articulated in one form or another as early as the 1960s and implies that it is only natural that at some point computing power will be offered as a standardized service billed on actual usage with very limited or no upfront set-up charges.

a) Cloud Computing – Definitions

A scientific definition is proposed by the GRIDS Lab at the University of Melbourne:

"A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers."

Berkeley's defines it as:

"Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services (Software as a Service - SaaS). The datacenter hardware and software is what we will call a Cloud. When a Cloud is made available in a pay-as-you-go manner to the public, we call it a Public Cloud; the service being sold is Utility Computing." [1]

Building blocks of cloud computing:

- Storage-as-a-Service
- Database-as-a-Service
- Information-as-a-Service
- Process-as-a-Service
- Application-as-a-Service

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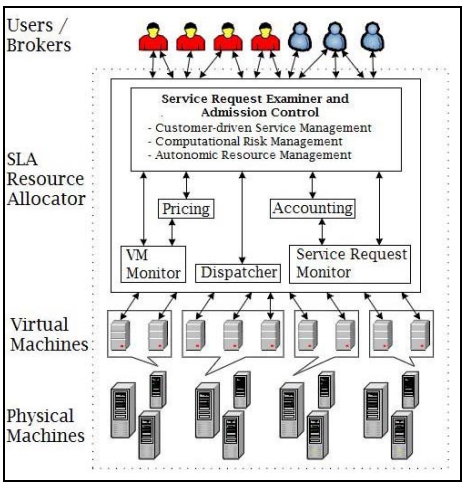
- Integration-as-a-Service
- Security-as-a-Service
- Management/Governance-as-a-Service
- Testing-as-a-Service



b) Hybrid Cloud Computing

1. A hybrid cloud is a composition of at least one private cloud and at least one public cloud. A hybrid cloud is typically offered in one of two ways: a vendor has a private cloud and forms a partnership with a public cloud provider, or a public cloud provider forms a partnership with a vendor that provides private cloud platforms.
2. A hybrid cloud is a cloud computing environment in which an organization provides and manages some resources in-house and has others provided externally. For example, an organization might use a public cloud service, such as Amazon Simple Storage Service (Amazon S3) for archived data but continue to maintain in-house storage for operational customer data. Ideally, the hybrid approach allows a business to take advantage of the scalability and cost-effectiveness that a public cloud computing environment offers without exposing mission-critical applications and data to third-party vulnerabilities. This type of hybrid cloud is also referred to as hybrid IT.

3. *Challenges in Hybrid Cloud Computing*

Here are some challenges to consider when setting up hybrid clouds:

i. *On Demand Startup and Shutdown*

Your infrastructure must be able to start up and shutdown cloud nodes on demand. Usually you should have some policy implemented which listens to some of your application characteristics and reacts to them by starting or stopping cloud nodes. In simplest case, you can react to CPU utilization and start up new nodes if main cloud gets overloaded and stop nodes if it gets under loaded.

ii. *Cloud-based Node Discovery*

The main challenge in setting up regular discovery protocols on clouds is that IP Multicast is not enabled on most of the cloud vendors (including Amazon and GoGrid). Your node discovery protocol would have to work over TCP. However, you do not know the IP addresses of the new nodes started on the cloud either. To mitigate that, you should utilize some of the cloud storage infrastructure, like S3 or SimpleDB on Amazon, to store IP addresses of new nodes for automatic node detection.

3. *One-Directional Communication*

One of the challenges in big enterprises is opening up new ports in Firewalls for connectivity with clouds. Quite often you will only be allowed to make only outgoing connections to a cloud. Your middleware should support such cases. On top of that, sometimes you may run into scenario of disconnected clouds, where cloud A can talk to cloud B, and cloud B can talk to cloud C, however cloud A cannot talk to cloud C directly. Ideally in such case cloud A should be allowed to talk to cloud C through cloud B.

4. *Latency*

Communication between clouds may take longer than communication between nodes within the same cloud. Often, communication within the same cloud is significantly slower than communication within local data center. Your middleware layer should properly react to and handle such delays without breaking up the cluster into pieces.

5. *Reliability and Atomicity*

Many operations on the cloud are unreliable and non-transactional. For example, if you store something on Amazon S3 storage, there is no guarantee that another application can read the stored data right away. There is also no way to ensure that data is not overwritten or implement some sort of file locking. The only way to provide such functionality is at application or middleware layers.

II. Existing System

Paper [4] states that Cloud computing is setting off great changes in the IT industry. There are more and more researches on cloud computing. And this paper focuses on cloud computing too. At the beginning this paper describes the characteristics and definitions of cloud computing, and then introduced its services patterns (including SaaS, PaaS and IaaS) and deployment patterns (including public cloud, private cloud and hybrid cloud), at the end lists the cloud security challenges that cloud computing faces.

Security problems faced by the cloud system about in the following five aspects:

- First, face more security attacks: due to the vast amounts of user data stored in the cloud system, for

attackers there has greater allure. If the attacker in some way successfully attack cloud systems, it will bring devastating disaster for both cloud providers and users.

- Second, virtualization technology: it not only brings cloud computing platform flexibly resources configured, but also brings new security challenges. There is a need to solve the problem that secure deployment of cloud platform based on the virtual machine architecture.
- Third, ensure continuity of the cloud platform services and high availability of user data and business: Amazon data center downtime event, Google's Gmail failing to use event and so on are associated with cloud computing availability. To a certain extent, the events above discourage the enthusiasm of the enterprise to use public cloud.
- Fourth, ensure the safety and privacy of user data: user data stored in the cloud system, for malicious attacks, the primary purpose is to get user privacy, and then to obtain economic benefits.
- Fifth, perfect the cloud standards: Interest-oriented IT development process leads to cloud standards exist everywhere. Many manufacturers have defined their own application standards and data formats, forcing the user deploying IT system and their own business in accordance with the framework set by different service provider [4].

With the advance of cloud computing, hybrid cloud that integrate private and public cloud is increasingly becoming an important research issue. Migrating cloud applications from a busy host to an idle host needs an efficient way to guarantee the performance in the geographical heterogeneous cloud environment [1].

From the studies of various research papers and works done by various researchers it has been found that following are the major areas of focus in the field of cloud computing:

1. Defining Architecture: on the basis of the application areas.
2. Security of communication over the cloud.
3. Integration of services on various layers.
4. Inclusion of Various network and communication devices being developed rapidly [1]

III. Proposed Algorithm

This work proposes a secured intra cloud communication mechanism in which it is being tried to keep the data more secured over the intra cloud communication using a challenge text based communication. Various Steps involved are as follows:

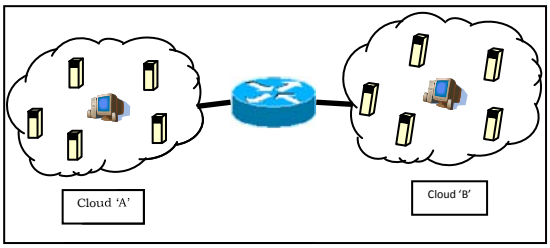
Step 1: Cloud 'A' has to communicate with Cloud 'B'. (Both 'A' and 'B' may be public, private or combination). Both have a trusted environment already created between them using SLA.

Step 2: Cloud 'A' sends a data request (DRQ) to Cloud 'B'.

Step 3: Cloud 'B' receives the DRQ and sends a challenge text (RID) encrypted using RSA algorithm, to Cloud 'A'.

Step 4: Cloud 'A' receives the RID and decrypts the same using its public key. The decrypted text (VID) is sent to the Cloud 'B'.

Step 5: Cloud 'B' if founds that the key is matching, it will send the encrypted data to Cloud 'A' as desired by the Cloud 'A'.



Step 6: Cloud 'B' if founds that the key is not matching, it will reject the request instantly.

DRQ- Data Request
RID-Reveal Identification
VID – Verify Identity

IV. Results

The algorithm is performing better in all situations such as a cloud is performing mal activities, cloud become malicious after a while or a cloud is not at all malicious.

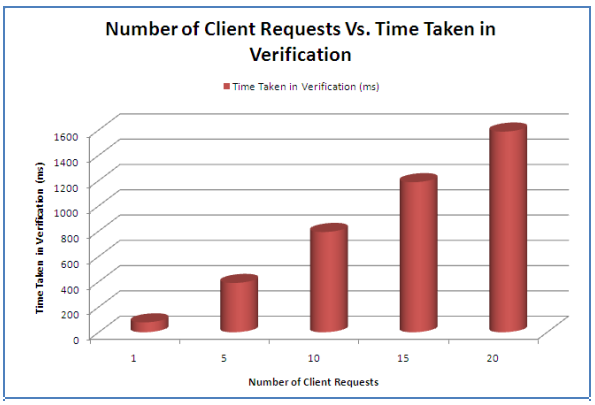


Figure 3 : Graph showing time requirements for verification process in proposed work

From the above graph it is clear that the time requirement for verification of the clouds is almost linear or is lesser. This shows that the proposed work do not impose much loads during the verification process with the increase in number of clouds. The process is similar in case of both multi cloud environment and hybrid cloud environment.

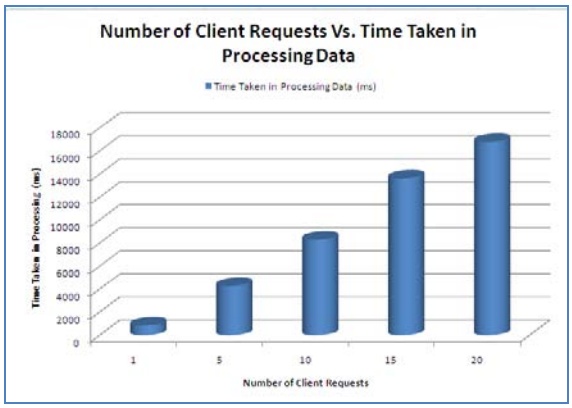


Figure 4 : Graph showing time requirements for Processing of data after verification process in proposed work

From the graph in figure 4 time taken in processing of data after verification process is completed is shown. The graph shows that as the number of clouds increase and the data transferred between them is also increased and it results in linear increase in time with the number of clouds. This is also as per the expected outcome over the cloud environment.

Table 1 show the comparison of the works of the various researchers including the proposed work and from the table it is seen that the proposed work provides better number of services in terms of cloud security. It supports multi-clouds and hybrid cloud and provides both the data and storage oriented services.

Table 1 : Comparison between the proposed work and the work of the various researchers

Ref	Year	Cloud Security	Addressed Security Risks			Privacy/ Security Mechanism	Type Of Cloud		Type Of Service	
			Data Integrity	Data Intrusion	Service Availability		Single Cloud	Multi Clouds	Cloud Storage	Cloud Database
Proposed Work	2013	√	√	√	√	Multi shares+ secret sharing algorithm		√	√	√
[5]	2011	√	√			Multi shares+ secret sharing algorithm				
[8]	2011	√	√	√	√	DepSky,(Byzantine + secret sharing + cryptography)		√	√	
[42]	2011	√ survey	√				√		√	
[3]	2010	√				RAID-like techniques+ introduced RACS		√	√	
[11]	2010	√	√			ICStore,(clientcentric distributed protocols)		√	√	
[17]	2010	√			√	SPORC, (fork)	√			
[22]	2010	√								
[25]	2010					cryptography	√		√	
[30]	2010					Depot, (FJC)				
[48]	2010	√	√			Venus	√		√	
[49]	2010	√ survey	√		√		√		√	
[51]	2010	√					√		√	
[52]	2010	√	√				√		√	
[10]	2009	√	√		√	HAIL (Proofs + cryptography)		√	√	
[12]	2009	√ survey	√					√	√	
[16]	2009	√	√			encrypted cloud VPN	√		√	
[41]	2009	√					√		√	
[43]	2009	√	√		√	TCCP	√		√	
[55]	2009	√	√			homomorphic token + erasure-coded	√		√	
[7]	2007		√			PDP schemes				
[19]	2007	√					√		√	

V. Conclusion and Future Work

Since cloud connects to thousand and thousand people over internet or intranet on pay per basis, therefore security of the cloud is a focused are for researchers and with the growth of the cloud computing and hybrid computing, requirements for security are increasing heavily. The proposed work is expected to provide a good security infrastructure over cloud.

One mechanism is to share the challenge text between the clouds before actual communication should start for authentication. The various works done in this area till date are oriented on other techniques of security between the two or more clouds in a hybrid cloud.

Cloud Computing is facilitating users around the world for the best of the services available across the world on their machines through web. It is beneficial for both the service providers (they get huge clientele) and clients (they get all available services).

For data security and privacy protection issues, the fundamental challenges are separation of sensitive data and access control. Our objective is to design a set of unified identity management and privacy protection frameworks across applications or cloud computing services.

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Single Process Architecture for E-Learning Over Cloud Computing

By Gunjita Shrivastava & Sandeep Sahu
Shri Ram Institute of Technology, India

Abstract - A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers.

Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services (Software as a Service - SaaS). The data center hardware and software is what we will call a Cloud.

From the studies of various research papers and works done by various researchers it has been found that the major areas of focus in the field of cloud computing are architecture definitions, security, integration of services on various layers, inclusion of Various network and communication devices being developed rapidly.

E-Learning through cloud computing is a promising area for the ease of both faculties and students around the world. The work done in cloud computing based e-Learning is oriented on centralized server and further improvement in this can be done.

In this research, a new distributed architecture is being proposed to provide an opportunity to the learners around the world to use the resources being shared by the faculties and online communication between the faculties and students.

Keywords : *cloud computing, e- learning, cloud architecture, virtualization, distributed computing.*

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I. Introduction

Growth of cloud computing is very fast as it is being accepted by persons in spite of its security issues. The problems have been overcome by the latest techniques of security available for the networks. The advantages of the cloud are also making it popular among the people and companies. The clients of the cloud are on whole of the Internet including web space hosting providers, data centres and to virtualization software providers. Since cloud is a new not very clear term and its fuzzy nature is causing researchers to define cloud according to their own thoughts for the cloud.

Companies which have accepted cloud and implemented it and the various researchers have defined the cloud in their own terms. Some companies which are working on cloud, Google, Apple, IBM, Microsoft and Yahoo and others are providing high quality cloud computing services. The cloud solutions provided by these actively sponsor research centres, pursuing development of marketable technology.

The architectures of the cloud provided by these companies are having various layers of processing and the major layers in cloud architectures address the different parts of the cloud applications. The cloud includes various PCs, hand held devices for connectivity to the cloud with Internet, servers processing client requests and provide services to the various connected devices from the cloud, the software tools related to the several cloud applications such as database management systems, hardware resources, virtualization applications etc. Also a data center and broker applications are used for providing the authentication, authorization, confidentiality and sharing of resources for the users of the cloud. These different parts make the complete cloud and can support other cloud oriented devices as well.

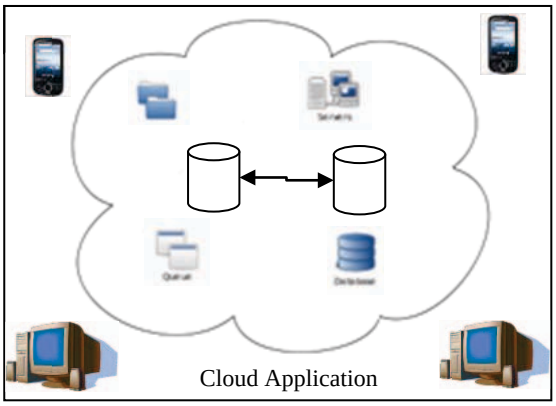

Figure 1 : Cloud Computing

According to the usage, cloud has various types i.e. public, private or hybrid clouds. Public clouds are provided to public users using pay-per-use manner. Services being provided using Public Cloud are called Utility Computing. Similarly when the services are provided for particular organizations then the cloud is known as Private cloud. Private clouds will provide all their services according to the requirements of a specific organization. Examples of the user oriented applications such as shopping carts, banking services etc requires both behaviors of Public and Private Clouds, such clouds serve both the type of users and hence it is known as Hybrid Clouds.

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To achieve knowledge based economy, education is to be affordable and able to reach the mass at an affordable cost. The traditional class room alone is not sufficient to reach the mass population. An E-learning platform based on open standards with minimum initial cost of investment, will be able to scale dynamically based on the demand, capable to collaborate with other enterprise applications, personalization options as per the student requirements, and low maintenance cost can drive the adoption by educational institutions.

Adoption of cloud computing can help, educational institutions to reduce expenditure on infrastructure, software and human resources to a considerable extent. Institutions can rent the services as and when needed. They have the flexibility to mix and match based on the best service available in the market. Cloud computing is based on open standards. The interoperability of applications is dynamic and the resources can be provided based on the demand and usage of the applications. Cloud computing integrates silos of applications in distributed environment. This in turn gives rise to rich and valuable content to meet the needs of teaching, research and student requirements.

Learning through electronic devices, accessing the courseware on line through the Internet is known as e-learning [1]. E-learning platform, electronic learning, virtual learning environment (VLE) and learning management system (LMS) are some of the acronyms meaning the platform providing e-learning capability [2]. In the recent years there is an increase in the usage of electronic devices to access e-learning content due to:

1. Increase in broadband width, affordable cost of computer or hand held devices.
2. Due to low enrolment and budget cuts, educational institutions, like universities and TAFE colleges are offering some of their courses on-line.
3. The aging population's educational needs, to access materials anytime anywhere has also fuelled the growth of e-learning.
4. The recognition of online educational degrees offered by institutions has a great impetus on foreign nationals taking up such courses.

The traditional model of education is class room based or instructor led training. The new paradigm is on-line distance education. Web 2.0 technologies make the delivery of education contents more interactive and encourage students to learn. The e-learning systems customize the course content based on the user's ability [1]. The personalization of the courseware makes it easier and encourages the users to learn at their own pace, giving more flexibility in learning.

E-learning can be delivered by different models based on the bandwidth and the devices used to access by the students.

Tele-immersion environment model uses the video avatar and virtual board [1]. This gives students the feeling of a class room environment, stimulating face to face class room experience. With the 3D enabled video broadcasting, Teleimmersion will be widely accepted by students. The drawback is the initial cost of investment of high resolution video recording devices. A high band width is also necessary to transfer the data and users accessing devices must have high resolution video card and system configuration.

Prior to the inception of web 2 technology, courses were designed for the users to access with low bandwidth networks. Users did not require high end computers to access the content.

Though the personalization option was available, the courseware did not consist of high resolution graphics and video contents.

Hybrid Instructional Model is the blend of the traditional class room and e-learning. Users still need to attend the class and be able to access the course ware through e-learning. This combination makes the best use of both and helps the students to shift from class room training to e-learning mode. Students are able to adapt to this hybrid model as there is a smooth transition. The courseware can be of power point class presentation, reference books, student blogs, 3D based, avatars etc. Hybrid model e-learning platforms can be Web 2.0 based depending on the band width available and the devices used.

II. Architecture of Cloud Computing

a) *Cloud Concepts*

Cloud computing is the utilisation of vacant resources of computer to increase the efficiency through improving utilization rate and reduce energy consumption, one of the solution to reduce green house effect [7]. Cloud computing, is an evolution from Application Service Providers (ASP) [3]. It is based on Service Oriented Architecture (SOA), where the software applications can be dynamically configured to utilize the best breed of application in the market place. Cloud underpinning technologies are virtualization, Software as a Service (SaaS) [4, 3, 8, 6] and broadband width or 3G mobile networks.

b) *Cloud Advantages*

Cloud computing, due to its low or almost zero capital expenditure (CAPEX) cost and low operating expenses (OPEX) has triggered new enterprise applications affordable to educational institutions with low budget [2,3]. A particular university decommissioning hosted email service and moving to vendor supported infrastructure saved $ 4,50,000 per year [5]. Cloud computing due to its open standard provides interoperability with other institutions enabling collaboration of content thereby producing rich content for educational institutions across the world [3,2].

c) Cloud Issues

An organisation moving into cloud space must not depend on services provided by one vendor [5]. Institutions must mitigate the risk with the combination of few cloud providers as it will help, even if one cloud company goes down or become bankrupt.

Service level agreements (SLA) are not well defined in cloud business model. Cloud model is based on dynamic configuration, but the SLA is still applicable for static deployment model [6]. Quality of Service (QoS) is dependent on the SLA. QoS is to be well defined to ensure application usability, availability and experience of the users.

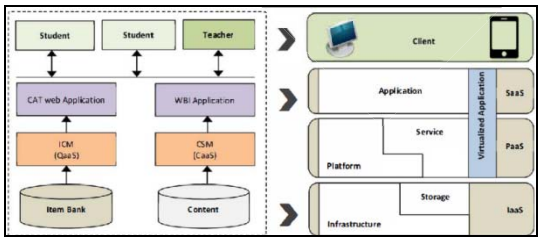
III. Existing System

According to Manop Phankokkruad, 2012 [1] has addressed the problem of the cloud computing as, the classical e-learning system is based on client/server architecture thus they lack of the scalability, flexibility and interoperability. It makes the learning resources cannot share, and the system improvement is not easily.

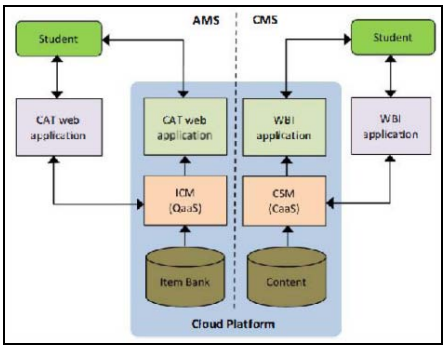
In their paper [1], authors have proposed a new architecture for e-learning system that the architecture separate into three layers includes infrastructure, platform and application.

On Infrastructure layer, the learning resources from the traditional system are transferred to the cloud database instead of the usual DBMS. Whereas on Platform layer, a new e-learning system that consists of the CMS, AMS, and other service components were developed. These components were developed to be the intermediary between cloud database and the applications. [1]

Finally on application layer, CAT web application and WBI application were developed for interacting with the student's client. [1]



Cloud Service Architecture for e-Learning System



The Implementation Components of the Cloud on E-Learning System [1]

Mingwei Wang, Jingtao Zhoul, Shikai Jing et. Al. 2012 [2] have specified in their work that the proposed systems must be self adaptive and should provide the flexibility to the clients as per their requirements. The cloud manufacturing vision (GetCM) is introduced to provide the on demand architecture with reliability, flexibility and reliability based on cloud computing. In contrast to the conventional networked manufacturing paradigm, the paper analyzes from technological, functional and economic aspects to provide the evidences of the benefits from GetCM.

Focuses of this paper are placed on the vision and the outline of GetCM architecture.

Yangpeng Zhu, Jing Zhang, 2012 [3] have focused in their research over SaaS layer and specified that software as a Service is becoming a popular research field in software development for its feature of low costing entry, easy implementation and zero infrastructures.

With the extensive development of SaaS software, how to create a safe, stable, user-configurable, high performance, low cost SaaS development model has become a key issue. As the structures of various Cloud computing platform and the increasing number of tenants[6], combination SaaS system and the cloud platform can reduce operational costs, provide more and more flexibility and scalability.

IV. Proposed Algorithm

Cloud computing is making users convenient around the world using its services which are available around the world directly on their machines over the web. Cloud computing is good for both the service providers (they get huge customer base) and clients (they get all services at their doors).

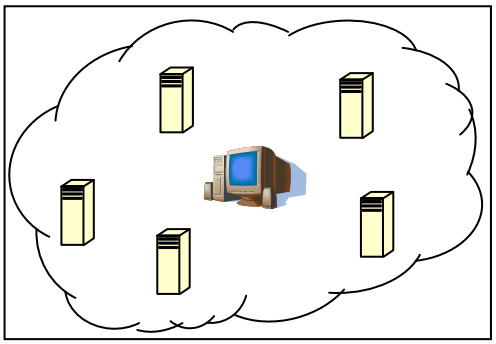


Figure 3 : Simple Cloud

Service of E-Learning is one service which is required for all the students around the world to avail the best faculties around the world teach them with their high skills.

In this paper, a new distributed architecture is being proposed to provide an opportunity to the learners around the world to use the resources being shared by the faculties and online communication between the faculties and students.

Studies of the researches reveal that the cloud computing is enhancing rapidly and various architectures for cloud oriented processing are being proposed specifically such as e-Learning, Manufacturing, Multi Tenant Architecture etc.

In e-Learning, has proposed an architecture which is centralized server database oriented architecture. In this research, emphasis is on SaaS development for providing a cloud solution for e-Learning, which is the area where no other researchers have been proposed earlier. [1]

For e-Learning on Cloud, we need to implement Cloud Application which shall be working on SaaS Layer. Proposed application will be developed in following steps:

Step 1: There are two users, one working as teacher (admin) and other as student (learners).
Step 2: Online text whiteboard and examination system shall be used for presenting the working of the proposed algorithm.
Step 3: There will be two or more servers which will share the information from each other. (Cloud)
Step 4: Teacher can add from any server and students can learn from any server to show the mapping of the clouds.

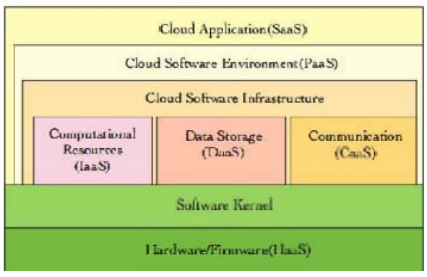


Figure 4 : Cloud Computing Logical Diagram

Step 5: DBaaS (Database as a Service) is also implemented which provides mechanism for data interaction for SaaS layer and manages data using Distributed database management system (DDBMS) so that speed of processing shall always be up to the mark.
Step 6: The overall system architecture defined in this paper is straight forward and allows for simplicity of processing for the users of the clouds.

The two major services being offered as on the proposed architecture are white board and online examination system. Whiteboard is a utility services for the faculties to teach using text, images and other multimedia services available online and in this proposed work it is being implemented using AJAX based chatting service which will allow the faculties to send files over the cloud for all the students who have joined the online class room.

Online examination system is a evaluation system which will be implemented for evaluating the skills of the students who are undergoing the course. It will include objective type questions for evaluation. A common home page shall be there to show the current toppers of the examinations conducted for the students of the system.

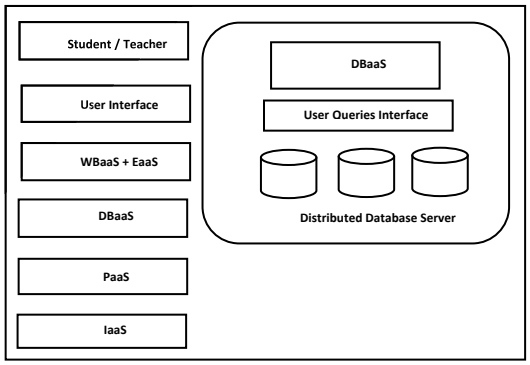


Figure 5 : Proposed Cloud Architecture

V. Results & Discussion

The proposed work has been implemented using C# and SQL Server Database. The work involves two clouds having proposed work applied for sharing of data between then.

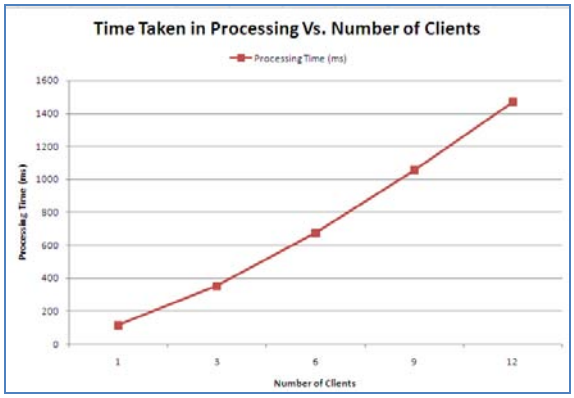


Figure 6 : Time taken in processing vs. number of clients using proposed e-learning architecture

From the graph it is clear that as the load is increased with the clients then the proposed system works smoothly and the time requirement increase gradually with the number of clients. The increase in number of clients does not overload the proposed architecture and hence it is concluded to be upto the mark.

From the above graph resource utilization of the proposed work is shown to be increasing with the number of clients and hence it is as per the expected results.

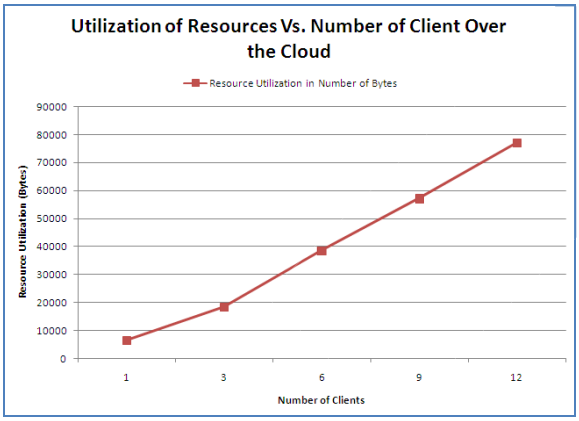


Figure 7 : Resource Utilization for number of clients using proposed e-learning architecture

VI. Conclusion

Studies of the various papers and works done by authors have been done to find out the problem and it is found that the cloud computing is apparently a new technology which is growing very fast and provides new horizons to the computing world. It is technique where implementations are not too many and the major players in industry are very few. The situation is so because a lot of structural, architectural and security work in various applications of the cloud is still to be done. This work selects a similar problem of E-Learning through cloud computing and proposes a new architecture for the same.

E-Learning has been taken as the application area to showcase the working of proposed cloud architecture. Several application areas have been found and it is concluded that e-Learning is the emerging field in which lot of work has not been done for the security of the contents and users.

Various papers and researches in the area have been studied to find that other algorithms in this application area are focused on to provide the contents to the clients.

VII. Future Work

The proposed work is being implemented on simulation environment using standard machines, in future the same can be deployed over the real cloud environment and test it for its accuracy and performance.

A further improvement in the architecture at IaaS and PaaS layers may be helpful in increasing the performance of the e-Learning system.

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Trend and Need of Application Virtualization in Cloud Computing

By Kirandeep Kaur & Dr. Gurjit Singh Bhathal
Punjabi University, India

Abstract - As the variety of applications increases so does the complexity of delivering and managing those applications also increases, many organizations tried to manage that complexity by standardizing on a fixed portfolio of applications in a locked-down configuration. This approach reduces the IT labour costs, but the restrictions involved lead to a frustrating user experience and constraints on flexibility and business agility. Thus This paper presents a better solution that would enable IT to deliver and manage applications at reduced cost while enabling flexibility and agility. Here the concept of application virtualization which is a part of virtualization and how application virtualization is used by cloud computing to deliver application with fast speed, reliability and flexibility shall be discussed.

Keywords : *virtualization, application virtualization, standalone, streaming, saas, agent based, agent less.*

GJCST-B Classification : *C.1.4*

Strictly as per the compliance and regulations of:

Trend and Need of Application Virtualization in Cloud Computing

Kirandeep Kaur [α] & Dr. Gurjit Singh Bhathal [σ]

Abstract - As the variety of applications increases so does the complexity of delivering and managing those applications also increases, many organizations tried to manage that complexity by standardizing on a fixed portfolio of applications in a locked-down configuration. This approach reduces the IT labour costs, but the restrictions involved lead to a frustrating user experience and constraints on flexibility and business agility. Thus This paper presents a better solution that would enable IT to deliver and manage applications at reduced cost while enabling flexibility and agility. Here the concept of application virtualization which is a part of virtualization and how application virtualization is used by cloud computing to deliver application with fast speed, reliability and flexibility shall be discussed.

Keywords : virtualization, application virtualization, standalone, streaming, saas, agent based, agent less.

I. Introduction

A computing device dedicated to individual members of staff or allocated to one specialized software application is surpassingly inefficient and expensive. As we know one water wheel could run multiple textile looms, so can today's high-powered computers run multiple processes. Virtualization is an approach to amalgamate technology resources for improved efficiency and the elimination of redundancy by leveraging every opportunity to utilize idle resources and find places where multiple processes can be run at one time. Application virtualization is one of the many virtualization techniques used in top layer of cloud computing. This layer is called Software as a Service, which is to be discussed in detail in this paper, to understand the need of application virtualization in cloud computing.

II. Virtualization Ensample

Virtualisation is basically one physical computer pretending to be many computing environments Virtualization is the creation of a virtual (rather than actual) version of something, such as an operating system, a server, a storage device or network resource. Virtualization is a computing technology that enables a single user to access multiple physical devices. This paradigm manifests itself as a single computer controlling multiple machines, or one operating system utilizing multiple computers to analyze a database.

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Virtualization is about creating an information technology infrastructure that leverages networking and shared physical IT assets to reduce or eliminate the need for physical computing devices dedicated to specialized tasks or systems.

Virtualization is seen in a central computer hosting an application to multiple users, preventing the need for that software to be repeatedly installed on each terminal. Data from different hard drives, USB drives, and databases can be amalgamated into a central location, both increasing accessibility and security. Physical computer networks can be split into multiple virtual networks, allowing a company's central IT resources to service every department with individual local area networks. Virtualization is a collection of technologies that allow simulated computing resources to be substituted for more costly physical resources.

III. Application Virtualization

Application virtualization is a way of running an application in isolation from other applications. The application runs within a bubble rather than having to be physically installed on a PC. The end results are that the underlying file system and registry settings are never changed, applications no longer fracas and the base operating system remains intact (as shown in figure 1 & 2). The ability to dynamically stream applications to a user provides flexibility, faster deployment, and significantly reduced IT labor required to deploy and update applications.

Application virtualization is an umbrella term that describes software technologies that improve portability, manageability and compatibility of applications by capsulizing them from the underlying operating system on which they are executed. A fully virtualized application is not installed in the traditional sense, although it is still executed as if it were. The application is fooled at runtime into believing that it is directly interfacing with the original operating system and all the resources managed by it, however in reality it is not.

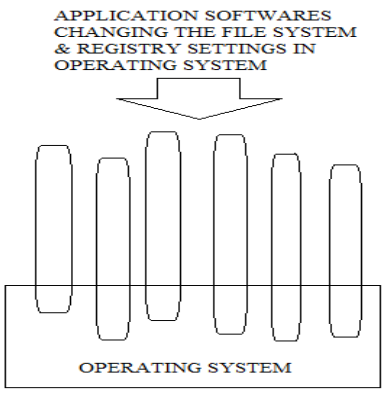

Figure 1 : Before emergence of virtualization

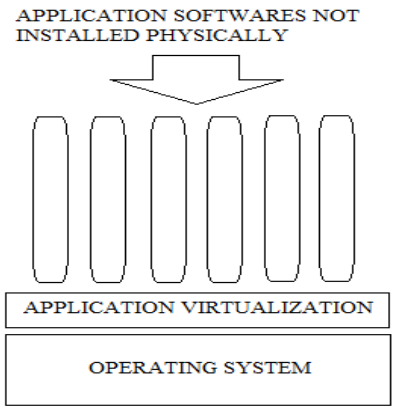

Figure 2 : After emergence of virtualization

Application Virtualization can free you, not only from the limitation of having to "install within each device", but lead the way in offering an alternative to "install on only corporate devices".

There are several other advantages of virtualised applications. Traditional application installations penetrate the operating system and change its configuration. Eventually, managed or unmanaged systems become completely transformed and unrecognizable. For this reason, many organizations continually reimage their desktops over time to reset them to a known configuration. Instead, application virtualization protects the operating system from any modifications and supports completely secure environments. Once an application has been virtualized, it no longer needs to be repackaged each time you need to change the OS. For this reason alone, Application Virtualization is one of the most powerful new technologies IT is fast adopting.

IV. Cloud Computing

Clouds are large pools of easily usable and accessible virtualized resources. These resources can be dynamically configured in real time to adjust to a variable load, allowing optimal resource utilization. It's a pay-per-use model in which the Infrastructure Provider by means of customized Service Level Agreements (SLAs) offers and guarantees a pool of resources. Organizations and individuals can benefit from mass computing and storage centres, provided by large companies with stable and strong cloud architectures.

Cloud computing includes virtualization, on-demand deployment, Internet delivery of services, and open source software. Cloud computing changes how we invent, develop, deploy, scale, update, maintain, and pay for applications and the infrastructure on which they run. Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer through internet access. This technology allows for much more efficient computing by centralizing and decentralizing storage, memory, processing and bandwidth according to usage.

Cloud computing is an archetype of distributed computing to provide the customers on-demand, utility based computing services. Cloud itself consists of physical machines in the data centres of cloud providers. Virtualization is provided on top of these physical machines. These virtual machines are provided to the cloud users. Different cloud provider provides cloud services of different abstraction level. E.g. Amazon EC2 enables the users to handle very low level details where Google App-Engine provides a development platform for the developers to develop their applications. So the cloud services are divided into many types like Software as a Service, Platform as a Service and Infrastructure as a Service. These services are available over the Internet in the whole world where the cloud acts as the single point of access for serving all customers. Cloud computing architecture addresses difficulties of large scale data processing.

In cloud computing environment the client can access his data using database server which is located physically in a highly-secure, remote location. This arrangement eliminates the need for a costly in-house IT department and hardware and the associated capital expense. Instead, a cloud computing provider owns the hardware while providing hosted, managed services to its clients on a usage basis. Cloud computing generally utilizes virtualized IT resources such as networks, servers, and computing devices.

As in the organization, a typical IT department is created to service the peak usage needs. However, during majority of the time, that potential sits idle. Most servers are not operational outside of business hours and when they are in use, they rarely operate at 100% of their capabilities. The data center services provided by a third party are in dynamic use. Powerful computing resources and robust hosted, managed services become available 24x7x365. This fluid scaling of computing resources allows each client to utilize those resources at a competitive price.

A key advantage of Virtualization and Cloud Computing is a significant improvement in security, availability, and data protection in addition to efficient processing and reduced IT labor cost. A decentralized IT infrastructure managed by an IT service provider that is wholly dedicated to its resilience and availability is immune to physical or data disasters. Replication over multiple systems ensures data backups. A dedicated data center service provider is better able to keep up with the latest security methods and technology upgrades. Through the provision of managed IT services, all of these benefits are embedded in the cloud computing model.

a) Cloud Stakeholders

There are three types of stakeholders cloud providers, cloud users and the end users [Figure 3]. Cloud providers provide cloud services to the cloud users. These cloud services are of the form of utility computing i.e. the cloud users use these services pay-as-you-go model. The cloud users develop their product using these services and deliver the product to the end users.

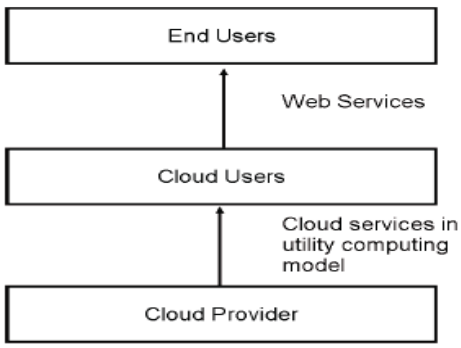

Figure 3 : Interconnection between cloud stakeholders

b) Service Models

There are three different levels of services models. It starts from the lowest service model which is called Infrastructure as a Service (IAAS) and builds up via Platform As A Service (PAAS) to Software As A Service (SAAS). Each level adds extra functionality and abstraction of the technical details of the services which are offered.

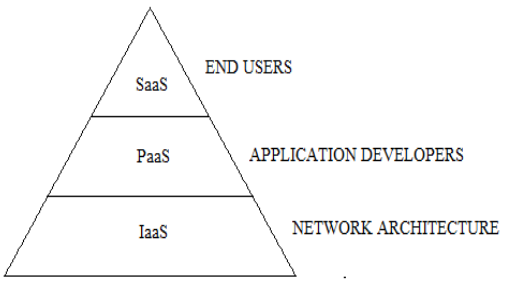

Figure 4 : Cloud computing stack

As shown in [Figure 4] the different levels provide their services to different types of users from network engineers to end users.

1. *IaaS (Infrastructure as a Service):* IaaS service provides the users of the cloud greater flexibility to lower level than other services. It gives even CPU clocks with OS level control to the developers. E.g. Amazon EC2, Google Compute Engine etc.
2. *PaaS (Platform as a service):* Delivers development environment as a service. One can build his/her own applications that run on the provider's infrastructure that support transactions, uniform authentication, robust scalability and availability. The applications built using PaaS are offered as SaaS and consumed directly from the end users' web browsers. This gives the ability to integrate or consume third-party web-services from other service platforms. E.g. - Google App Engine, Appscale.
3. *SaaS (Software as a service):* Delivers a single application through the web browser to thousands of customers using a multitenant architecture. On the customer side, it means no upfront investment in servers or software licensing; on the provider side, with just one application to maintain, cost is low compared to conventional hosting. Under SaaS, the software publisher (seller) runs and maintains all necessary hardware and software. The customer of SaaS accesses the applications through Internet. E.g. - Google Apps, Microsoft Office 365, Petrosoft, Onlive, GT Nexus, Marketo, Casengo, Trade Card, Salesforce and Callidus Cloud.

c) Deployment

The three different service models can be deployed for a customer in many ways varying from the public internet to a private data centre. The [Figure 4] shows the different deployment strategies which are detailed in the following paragraphs:

i. *Public*

Public is a deployment strategy which uses the publicly available internet to deliver the services to the users. A great advantage of this deployment type is that the services are available from any internet connection; a down side however is the security. The cloud services like Gmail and Azure are services provided trough the public cloud.

ii. *Private*

This deployment strategy can be compared with the traditional in-house hosting of a service, however it uses the technologies on which cloud computing is based such as virtualization to provide advantages to the organization.

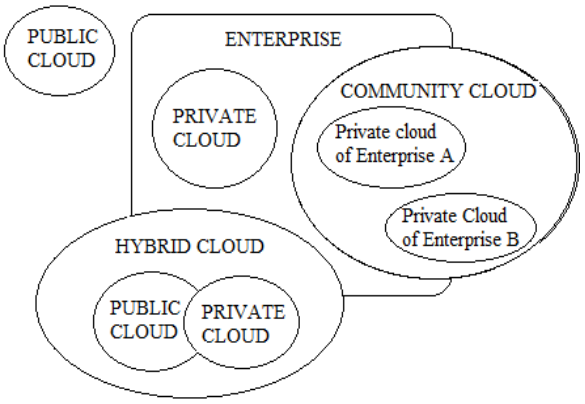

Figure 4 : Deployment Models

iii. *Community*

A community cloud is a bit like a private cloud however the cloud is shared among a community of organizations. This is done to divide the costs and risks of running a own cloud. These clouds can be found in shared service centers which service multiple organizations.

iv. *Hybrid*

A hybrid cloud is a cloud computing environment in which an organization provides and manages some resources in-house and has others provided externally. For example, an organization might use a public cloud service, such as Amazon's Elastic Compute Cloud (EC2) for general computing but store customer data within its own data center.

V. Need of Application Virtualization in Software as a Service

Application virtualization allows you to run applications on client computers as if they were installed locally [figure-5]. There are two different types of application service providers – those who offer the use of an application and the associated infrastructure as a single subscription service, and those who provide the infrastructure as well as the management, and may or may not supply the application licenses. This second type of ASP is frequently also referred to as a managed services provider or an application hosting provider.

When an ASP offers you both the application and the infrastructure together, it usually means that the application software licensing is being provided as part of the service. In most cases, the application itself is the service. This fits into the "Software as a Service" category (SaaS), where the cost of the software is part of the use fee for the service. This model is typically available for web-based applications: applications which have been developed specifically to run in a web server environment and are usually accessed using the browser. An example of such a service is: - instead of selling you a copy of Microsoft Word for $300, a cloud computing model would "rent" word processing software to you through the Internet for perhaps 5 dollars a month. You would not install any special software, nor would you be confined to your home machine to use this rented online product. You simply use your modern web browser to login from any web-enabled computer, and you can access your word processing documents in the same way that you would access your Gmail.

SaaS represents a revolutionary change in the way applications are deployed. Rather than installing software directly on each PC, SaaS enables the IT organization to deliver applications "virtually", to users.

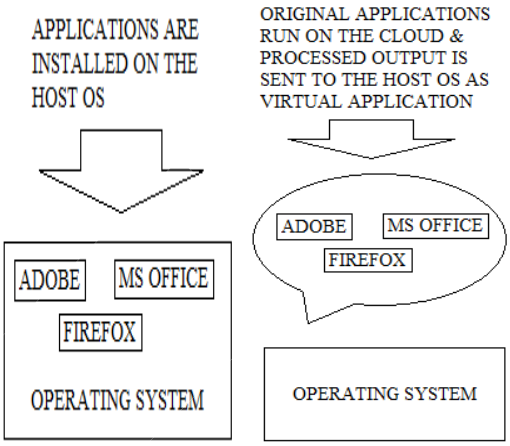

Figure 5 : Difference between non-virtualized and virtualized applications

With SaaS, applications are not installed on a machine; therefore, many of the challenges associated with application conflicts are avoided. Because software and user access are managed centrally, applications can be deployed and updated more quickly and effectively, with least IT effort required. Features of virtualized application are: -

1. Lockdown enabled
2. Available on any PC
3. Centrally Managed
4. Image reducing
5. Test minimizing
6. Never conflicting
7. Never Installed
8. Demand and supply basis

SaaS helps reduce complexity in the application portfolio which, in turn, reduces application-related calls to the service desk, and helps support staff resolve calls more quickly. And because applications are not installed on a specific machine, users can move more freely within their environment, knowing that "their" applications will be available wherever they are.

a) Approaches to Virtualize Application in SaaS

i. *Standalone*

Applications are encapsulated in a single executable. These executables can run instantly from

USB, CDROM or Local Disk. The applications can also be deployed using a management tools.

ii. *Streaming*

Applications are encapsulated in a single file and are located on the network. When starting the application only the blocks needed to run the application are copied to a local drive (cache). When the more features of the application are used, more blocks are copied to the local cache. Streaming can be available for standalone virtualized applications accessed from the network or when the virtualized applications are presented with a locally installed agent.

iii. *Centrally Controlled Access*

Virtualized applications are "distributed" through a central deployment tool. A locally installed agent is required. The applications can be deployed (executables are copied locally) or shortcuts to the applications (located on a network-share) can be presented. When using shortcuts, streaming is used to cache files locally.

b) Methods of Application Virtualization

i. *Agent-less*

Agent less application virtualization involves the use of an embedded virtual OS that is deployed as part of the virtualized application. These virtualized applications are fully encapsulated and are able to run as a standalone executable from multiple locations such as a network drive, local drive, or USB drive.

Vendor and their Products in market as solution:

a. VMware ThinApp encapsulates applications from the OS and each other, eliminating costly regression testing and conflicts from badly behaving applications. Just plug in an executable (.msi or .exe for MS windows) file to deploy a virtual system environment, including registry keys, Dynamic Link Libraries (DLLs), third-party libraries, and frameworks, without requiring any installation of agents or applications on the underlying operating system.
b. InstallFree Bridge provides a clientless platform that creates a transparent “bridge” between virtual applications and the OS, protecting the OS from any application changes.

ii. *Agent-based*

Agent based application virtualization utilizes a combination of a profiled or packaged application, a centralized delivery server, and a locally installed agent on the endpoint. The agents themselves utilize a kernel-mode driver or service. Some agent-based methods do not require the centralized delivery server and allow for shortcuts to be presented from a network share.

Agent-based application virtualization means that the agent must be available before the virtualized applications can run. This means that the agent must be deployed through a standard electronic software distribution tool, installed with the core OS, or, in some cases, deployed through the streaming engine. Agent-based application is a protection mechanism because the applications you virtualize will not run unless the agent is available. As an application that is virtualized will run on any version of Operating System (Windows, Linux etc), if your application virtualization engine is agent-based, your applications are protected, since a malicious user wanting to walk away with your applications would somehow also need to obtain and have the ability to install the agent before being able to use them.

Vendor and their Products in market as solution:

a. Microsoft Application Virtualization (MAV) allows you to deliver applications that are never installed and are dynamically delivered on demand. MAV can be deployed on desktops, laptops, or terminal servers. MAV is a core component of the Desktop Optimization Pack for Software Assurance.
b. Citrix XenApp (Citrix Presentation Server) is an end-to-end Windows application delivery system that offers client-side and server-side application virtualization, as well as presentation virtualization.
c. Symantec Software Virtualization Solution Pro (SVS) is an application virtualization platform that works through local system filters. The Pro Edition includes a streaming component formerly called Appstream and provides perhaps the most advanced streaming platform in the market.

c) Examples of SaaS

i. *Google Apps*

It‘s a office suite offered as a service (SaaS) that everybody can use through a web server. It includes the applications like gmail, google calender, google docs, google groups, google talk, google sites, google drive etc.

ii. *Microsoft Office 365*

It is a subscription-based online office and software plus services suite which offers access to various services and software built around the Microsoft Office platform. It provides hosted e-mail, social networking and collaboration, and cloud storage to teams and businesses.

iii. *Petrosoft*

It has a C-store office which is a Back-office software for gas stations, service stations and convenience stores designed to manage inventory, facilitate automatic ordering and maintain complete price book control. Also it has a Fuel-Central - Jobber software designed to schedule hundreds of runs weeks in advance and in real time. It is a fuel distribution system for petroleum marketers created to fully automate the fuel distribution process including driver and truck scheduling, and communication across the distribution channel.

iv. *Apple Apps*

It has Itunes with which the music you buy from the iTunes Store automatically appears on all your devices. Next it has Photo stream with which, you can take a photo on one iOS device and it automatically appears on all your other devices, including your Mac or PC. Further it has Shared Photo Streams to share just the photos you want, with just the people you choose.

d) Benefits of SaaS

i. *Service Providers' point of view*

Most of the data centres today are underutilized. They are at most 15% utilized. These data centres need spare capacity just to cope with the huge spikes that are sometimes incurred in the server usage. Virtualization can help those large companies having those data centres to easily rent those computing power to other organizations and get profit out of it.

ii. *Service Users' point of view*

Cloud users need not to take care about the hardware and software they use and also they don't have to be worried about maintenance. The users are no longer tied to one or two traditional systems. Virtualization technology gives the illusion to the users that they are having all the resources available. Cloud users can use the resources on demand basis and pay as much as they use. So the users can plan well for reducing their usage to minimize their expenditure (in terms of infrastructure and software costs). Scalability is one of the major advantages to cloud users. Scalability is provided dynamically to the users. Users get as much resources as they need. Thus this model perfectly fits in the management of rare spikes in the demand.

e) Characteristics of SaaS

i. *Self Reviving*

Multiple backup/restore copies of the application are present on the cloud so as to tackle the accidences of copy getting corrupted.

ii. *Multi-user*

Multiple subscribers of the application can use the application at the same time notwithstanding the fact that the same application is being shared by them.

iii. *Software Level Agreement (SLA) Driven*

Scalability and availability issues are catered to by using SaaS as the system adjust itself in accordance to the peak demand & thus all SLA with the clients are fulfilled.

iv. *Virtualized*

The services provided by the SaaS are independent of the hardware and OS, thus the services can cater to abide client base.

v. *Flexible*

The SaaS services can be used to serve a large variety of workload types - varying from small loads of a small consumer application to very heavy loads of a commercial application.

VI. Conclusion

This paper focuses on SaaS which uses the technique of Application Virtualization which is not without its pitfalls, the facility to deliver the tools users need quickly and reliably is core to the concept of delivering a flexible, cost-effective and robust workspace. Application virtualization gives facility to deliver applications to devices which do not support those applications. The Agent-based and Agent less both have their pros and cons. In a way, agent-based Application Virtualization is a protection mechanism because the applications virtualized by you will not run unless the agent is available. Also, an application that is virtualized will run on any version and on any system. If your Application Virtualization engine is agent-based, your applications are protected, since a malicious user wanting to walk away with your applications would somehow also need to obtain and have the ability to install the agent before being able to use them.

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Implementing Cloud Data Security by Encryption using Rijndael Algorithm

By Sanjoli Singla & Jasmeet Singh
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Abstract - Cloud computing emerges as a new computing paradigm which aims to provide reliable, customized and QoS guaranteed dynamic computing environments for endusers. However, adopting a cloud computing paradigm may have positive as well as negative effects on the data security of service consumers. In a cloud computing environment, data and the application is controlled by the service provider. This leads to a natural concern about data safety and also its protection from internal as well as external threats. The major issues in cloud computing is the security of data being stored on the provider's cloud and privacy while the data is being transmitted. This paper deals with the methods of providing security by data encryption and to ensure that unauthorized intruder can't access your file or data in cloud.

Keywords : *authentication, cloud, eap-chap, encryption, rijndael algorithm.*

GJCST-B Classification : *C.1.4*

Strictly as per the compliance and regulations of:

Implementing Cloud Data Security by Encryption using Rijndael Algorithm

Sanjoli Singla [α] & Jasmeet Singh [σ]

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Keywords : authentication, cloud, eap-chap, encryption, rijndael algorithm.

I. Introduction

Cloud computing is the next stage in the Internet's evolution, providing the means through which everything — from computing power to computing infrastructure, applications, business processes to personal collaboration — can be delivered to you as a service wherever and whenever you need. The "cloud" in cloud computing can be defined as the set of hardware, networks, storage, services, and interfaces that combine to deliver aspects of computing as a service as shown in figure 1.[3] It is extremely useful for small and medium enterprises to leverage the advantages provided by the cloud.

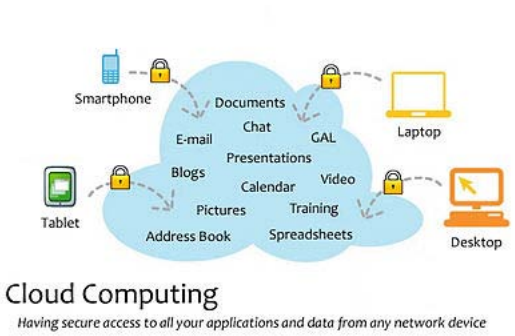

Figure 1 : Cloud Computing

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The main attributes of cloud computing are illustrated as follows [1]:

1. *Multi-tenancy (shared resources):* Cloud computing is based on a business model in which resources are shared (i.e., multiple users use the same resource) at the network level, host level, and application level.
2. *Massive Scalability:* Cloud computing provides the ability to scale to tens of thousands of systems, as well as the ability to massively scale bandwidth and storage space.
3. *Elasticity:* Users can rapidly increase and decrease their computing resources as needed.
4. *Pay as you used:* Users to pay for only the resources they actually use and for only the time they require them.
5. *Self-provisioning of resources:* Users self-provision resources, such as additional systems (processing capability, software, storage) and network resources. [5]

a) Security

In today's era, cloud computing is the most interesting and enticing technology which is offering the services to its users on demand over the internet. Since Cloud Computing stores the data in the open environment, security has become the main obstacle which is hampering the deployment of Cloud environments.[7]

In the light of all the advantages of migrating to the cloud, one of the primary disadvantages of the cloud platform is the security aspect. The security concerns fall into two main categories

1. Cloud provider concerns
2. Client based concerns

The cloud provider should ensure that the architecture and the infrastructure are secure and that the data and applications of the client are not compromised.

On the other hand, the client should make sure that the provider has taken all measures to secure their data in the cloud.

One of the methods to resolve these issues is the encryption of data. Encryption can be done in three ways:-

1. *Server-side Encryption*

With this option all data is encrypted in storage by the cloud platform itself. Server-side encryption really only protects against a single threat: lost media. It is more a compliance tool than an actual security tool because the cloud administrators have the keys anyway. Server-side encryption offers no protection against cloud administrators.

2. *Client/Agent Encryption*

If you don't trust the storage environment your best option is to encrypt the data before sending it up. In it we turn a shared public resource into a private one by encrypting it while retaining the keys.

3. *Proxy Encryption*

One of the best options for business-scale use of object storage, especially public object storage, is an inline or cloud hosted proxy. There are two main topologies:

- The proxy resides on your network, and all data access runs through it for encryption and decryption.
- The proxy runs as a virtual appliance in either a public or private cloud.[8]

II. Problem Definition

While cloud computing greatly facilitating users with storage resources, the greatest challenge or the existing problem comes from the security. The security challenges if not well resolved may impede the fast growth of cloud computing. Previously security is provided to data at rest i.e. encryption is done by the cloud service provider at the cloud side. But it leaves the data insecure while user outsources it to the cloud as the data travel in the original form. So we need method that provides security to both data at rest and data while moving.

Also some mechanism is required to ensure that the cloud must give access of data only to the authorized user.

III. Methodology

Security of data and trust problem has always been a primary and challenging issue in cloud computing. This section describes a methodology as shown in figure 2 to ensure security in cloud computing. The two different approaches used are as follows:-

a) Extensible Authentication Protocol-CHAP

EAP stands for Extensible Authentication Protocol. It offers a basic framework for authentication. Many different authentication protocols can be used over it. New authentication protocols can be easily added. EAP works over a secure line. A client may not support all authentication methods so EAP must support authentication method negotiation. It also allows for mutual authentication by running the protocol in both directions. In our purposed model we use Challenge-Handshake Authentication Protocol (CHAP) for authentication.[10]

b) Rijndael encryption Algorithm

The Rijndael is a symmetric block cipher algorithm with key sizes ranging from 128, 192, and 256. A symmetric algorithm is one in which the cryptographic keys for encrypting plain text and decrypting cipher text are the same. There are two types of symmetric encryption algorithms: stream ciphers and block ciphers. Stream ciphers encrypt data each digits separately and individually whereas block cipher algorithms encrypt text in blocks an pad original plain text so that the size it matches the block size. It uses the encryption of 128 bit blocks. Rijndael is an iterated block cipher, the encryption or decryption of a block of data is accomplished by the iteration (a round) of a specific transformation (a round function). [2,6]

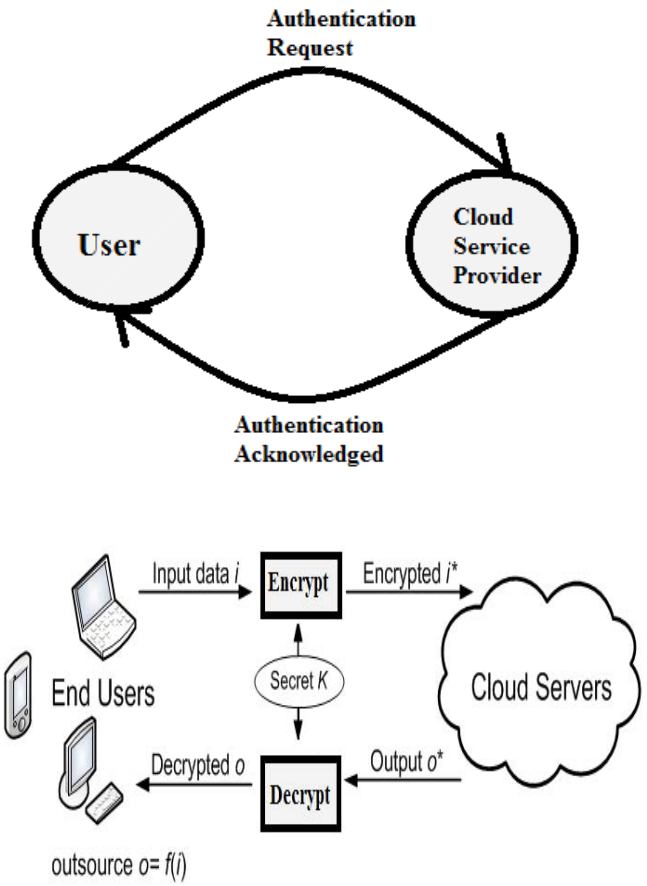

Figure 2 : Methodology

IV. Implementation Details

Using Java NetBeans IDE 7.2 and XAMPP 1.7.0, we have implemented methodology which provides better security as secret key is only known to the user and authenticity of user is ensured by Cloud.

We have created two pages: Client Page and Cloud Server Page shown in figure 3,4.

1. Client Side

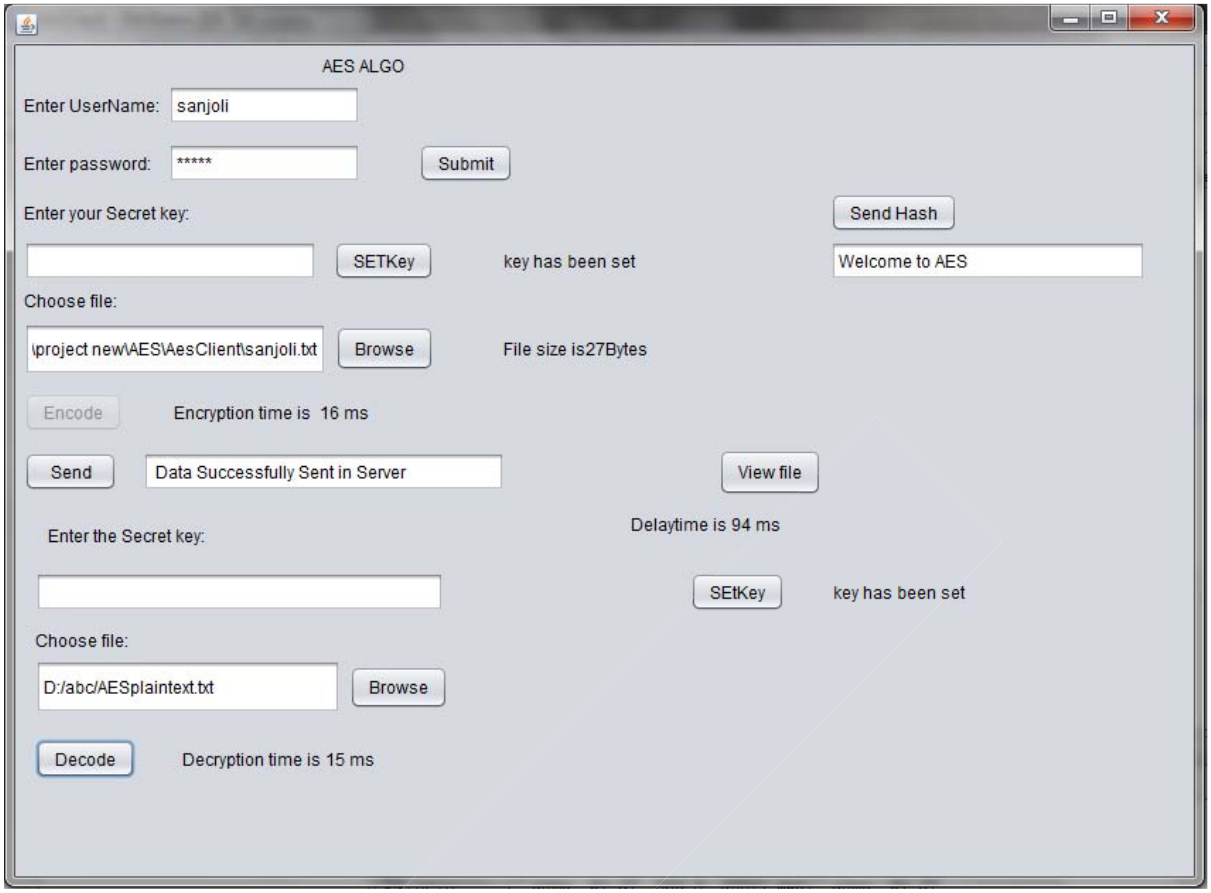

Figure 3 : Client Page

2. Cloud Server Side

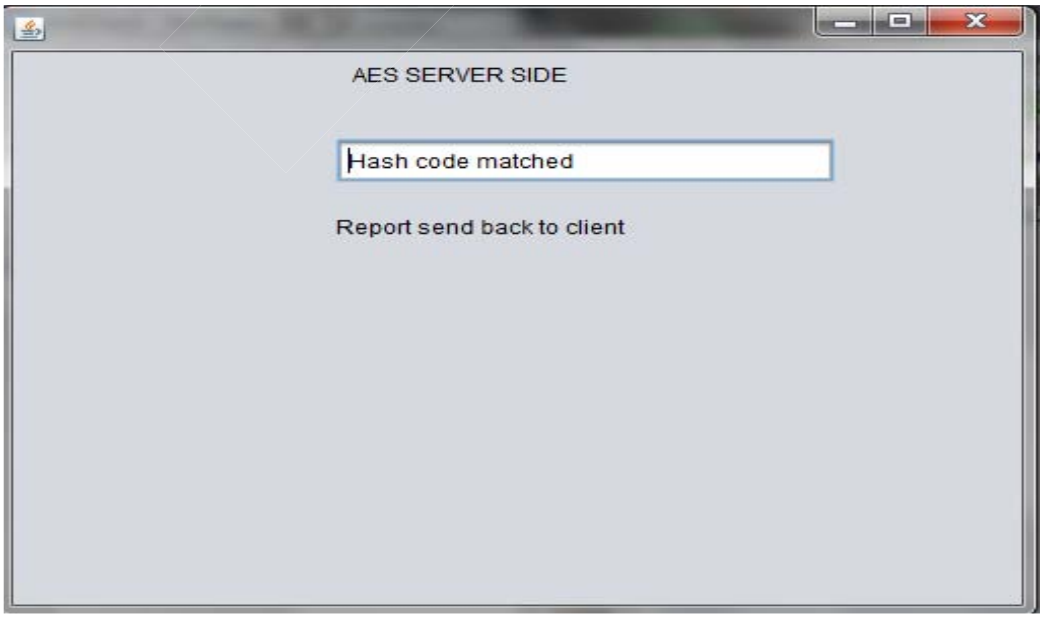

Figure 4 : Cloud Server Page

The steps of the implementation are given below:-

1. User sends the authentication request to the Cloud Service Provider (CSP).
2. CSP checks the authorization using EAP-CHAP and sends the acknowledgement back to the user.
3. User first encrypts his data and then outsources it to the server.
4. When the user downloads his data from CSP, it is received in the encrypted form.
5. To use the data user can decrypt it using same key used for encryption.

V. Results

The results of the above mentioned system are shown in table 1. and figure 5.

Table 1 : Result Analysis

	File Size(in Bytes)			
	51	577	776	975
Encryption Time(ms)	16	32	47	51
Decryption Time(ms)	16	20	25	32
Delay Time(ms)	47	65	72	79

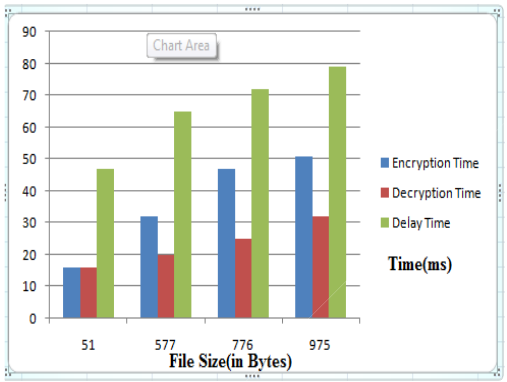

Figure 5 : Graph showing results of encryption and decryption

VI. Conclusion

Although cloud computing has many advantages, there are still many actual problems that need to be solved. The main problem is to maintain the privacy and the confidentiality of the data. Data confidentiality can be achieved by encrypted outsourced content before outsourcing to cloud servers and for privacy it is required that only the authorized user can access the data. Even if some intruder (Unauthorized user) gets access of the data accidentally or intentionally, he will not be able to decrypt it. In my work, I have used Rijndael Encryption algorithm to provide security to the data and EAP-CHAP for authentication purpose.

In future the above approach can be enhanced further by including an integrity check mechanism.

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Safeguarding the Liabilities of Data Accessing in Cloud Computing

By Kethan Harish Yekula, Dr. Y. Venkateshwarlu & Suneel Kumar Badugu
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Abstract - Cloud computing is the process of providing the virtualized services over the internet. The space in the web commonly known as Cloud has been monitored by service provider. In a real time scenario, a user registers for a particular service and shares his data as well as access credential policies with CSP (cloud service provider). Though cloud computing has got major flexibility in data accessing, users are very much concerned about their data security as it may be mislead by service providers. They may share the owner's data to unauthenticated persons. This is a big threat to the data owners. In this paper a modern approach, is proposed namely Cloud Information Accountability (CIA) framework, and based on the notion of data liability. We identify the common requirements and develop several guidelines to achieve data accountability in the cloud. Once the data owner provides data, the service provider will have full access and permission rights, on the data. Using traditional access control mechanisms, after data rights are permitted, the data is in the hands of the service provider. We propose an algorithm, which gives the details of people accessing the data using the automated logging details through the JAR files.

Keywords : *cloud computing, logging, privacy, security, data sharing, information accountability framework.*

GJCST-B Classification : *C.1.4*

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I. Introduction

The *Cloud Information Accountability framework (CIA)* proposed in this work conducts automated logging and distributed auditing of relevant access performed by any object, carried out at any point of time at any CSP's. The CIA concept has two major components: logger and log harmonizer. The JAR file holds a set of simple access control rules specifying whether and how the cloud servers and possibly other data stakeholders are authorized to access the content. Once the login credentials are matched, the service provider accesses the data hidden in the JAR. Based on the settings mentioned during creation, the Java Archive file gives usage control along with log options, for every log, the data is accessed and the JAR generates a record. Cloud computing presents a replacement thanks to resources. The consumption model for IT services on the net, by providing support for ad-hoc increasable randomly virtualizing resources are used as a service over the internet. Knowledge handling is outsourced by the direct cloud service supplier (CSP) to different entities within the cloud and theses entities forward the applications to others, and so on. And, permissions are provided to enter and leave the cloud storage. As a result, knowledge handling within the cloud goes through a posh and dynamic hierarchal service chain that does not exist in standard environments.

To overcome the above mentioned issues, we tend to propose a unique approach, specifically Cloud information Accountability (CIA) framework, supporting the notation of knowledge responsibility. Some of the common needs are determined and various tips are suggested to attain knowledge answerability within the cloud. For example A user, United Nations agency signed to an explicit cloud service, typically has to send his/her knowledge moreover as associated access management policies to the service supplier. Once the info is received, the CSP can get access permission rights, like scan, write, and copy, on the info exploitation standard access management mechanisms, once the access rights are granted, the info are going to be totally offered at the service supplier.

The CIA framework projected during this work conducts machine-controlled work and distributed auditing of relevant access performed by any entity, applied at any purpose to any cloud service applies its two major components: logger and log harmonizer.

The JAR file includes a group of straightforward access management rules specifying whether or not and the way the cloud servers and presumably different knowledge stakeholders are approved to access the data. After the verification is done, the service suppliers are given the permission to access the information closed within the JAR looking on the configuration settings outlined at the time of creation, the JAR can offer usage management related to work. Whenever the associates access the information from cloud, The JAR automatically generates a log report.

II. Literature Survey

a) Provenance Management in Curated Databases (Peter Buneman, Adriane P. Chapman, James Cheney)

Curated databases in bioinformatics and other disciplines are the result of a great deal of manual annotation, correction and transfer of data from other sources. Provenance information concerning the creation, attribution, or version history of such data is crucial for assessing its integrity and scientific value. General-purpose database systems provide little

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support for tracking provenance, especially when data moves among databases. This paper investigates general-purpose techniques for recording provenance for data that is copied among databases. We describe an approach in which we track the user's actions while browsing source databases and copying data into a curate database, in order to record the user's actions in a convenient, query able form. We present an implementation of this technique and use it to evaluate the feasibility of database support for provenance management. Our experiments show that although the overhead of a native approach is high, it can be decreased to an acceptable level using simple optimizations.

b) The Advantages of Elliptic Curve Cryptography for Wireless Security Kristin Lauter, Microsoft Corporation

This article provides an overview of elliptic curves and their use in cryptography. The focus is on the performance advantages to be obtained in the wireless environment by using elliptic curve cryptography instead of a traditional cryptosystem like RSA. Specific applications to secure messaging and identity-based encryption are discussed.

c) Identity-Based Encryption from the Weil Pairing (Dan Boneh, And Matt Franklin)

We propose a fully functional identity-based encryption scheme (IBE). The scheme has chosen cipher text security in the random oracle model assuming an elliptic curve variant of the computational Diffe-Hellman problem. We give precise definitions for secure identity based encryption schemes and give several applications for such systems.

d) Verifiable Security of Boneh-Franklinidentity-Based Encryption (Gilles Barthe, FedericoOlmedo, and Santiago ZanellaBeguelin)

Identity-based encryption (IBE) allows one party to send ciphered messages to another using an arbitrary identity string as an encryption key. Since IBE does not require prior generation and distribution of keys, it greatly simplifies key management in public-key cryptography. Although Shamir introduced the concept of IBE in 1981, constructing a practical IBE scheme remained an open problem for years. The first satisfactory solution was proposed by Boneh and Franklin in 2001 and constitutes one of the most prominent applications of pairing- based cryptography. We present a game-based machine-checked reduction of the security of the Boneh-Franklin IBE scheme to the Bilinear Diffie-Hellman assumption, and analyze its tightness by providing an exact security bound. Our proof simplifies and clarifies the original proof by Boneh and Franklin and automatically verifies by running a trusted checker.

III. Existing System

- Data handling in the cloud undergoes a very complex and dynamic structural service chain.
- In conventional environments these kind of services does not go well in practice.
- For data auditing ordinary web framework is implemented.
- To get request and responses normal web services are used.

a) Disadvantages

- User's data is not secured. Authentication or security not provided.
- The expensive resources are needed for implementation
- Not suitable for small and medium level storage users.

b) Proposed System

- We propose a modern approach, namely Cloud Information Accountability (CIA) framework, based on the notion of data liability.
- The suggested CIA framework provides end-to end accountability in a highly distributed fashion.
- A detailed security analysis is provided, strengths and reliabilities are discussed and our robust architecture in the face of various nontrivial attacks implements Java Running Environment.
- Apart from creating a class file which authenticates the servers or the users, another class file generates the correct inner JAR, a third class file which checks the JVM's validity using oblivious hashing.
- To limit the access for security purpose, timer mechanism is proposed
- Securing the JVM for making software tamper resistance capabilities to JAR file. It provides integrity, confidentiality to JAR.

c) Advantages

- The novel features of the CIA framework lies in its ability to maintain lightweight and powerful accountability that combines aspects of access control, usage control and authentication.
- This technique defends against man in the middle attack, dictionary attack, Disassembling Attack, Compromised JVM Attacks.
- It is suitable for limited and large number of storages.

Architecture Diagram

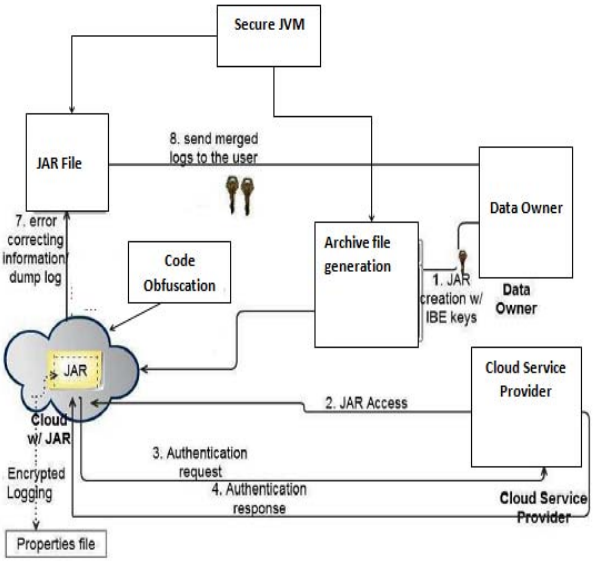

Figure 1 : Architecture Diagram

IV. Related Work

In this paper, we propose an effective and flexible distributed storage verification scheme with explicit dynamic data support to ensure the correctness and availability of users' data in the cloud.

a) JAR Generation

The JAR file contains a set of access control policies mentioning whether and how the cloud servers and possibly other data interested party (users, companies) are authorized to access the information. Depending on the configuration settings, the JAR will provide usage control combined with login credentials.

b) Logger Creation

To conduct automated logging, the programming capabilities of the JAR files are leveraged. User's info and related data items are stored in nested Java JAR file, which is a logger component. The outer JAR provides authentication to entities for accessing the data stored in the JAR file. In this situation, the data owners do not know the exact CSPs who handle data. Hence, authentication is mentioned based on the server's functionality. The data owner can give permissions in user-centric terms as opposed to the usual code-centric security offered by Java, using its Authentication and Authorization Services. Moreover, the outer JAR is also heads the selection of correct inner JAR according to the identity of the entities that requests the data.

c) Log Record Generation

Logger component generates the log records. Logging occurs at any access to the data in the JAR, and consecutively adds the entities in the order of creation LR= (r1; . . . ; rki. Each record is encrypted one by one and updated to the log file. During the read-only request, the inner JAR decrypts the data and a temporary decrypted file is created. This file is shown to the entity using the Java application viewer and suppose it is displayed to a user. Presenting the data in the Java application, he un checks the methods that copy by using hot keys such as Print Screen.

a) Mode Setting

The data owners are timely and accurately informed about their data usage, our distributed logging mechanism complements an unique auditing mechanism. We support two complementary auditing modes:

i Push mode
ii Pull mode.

- *Push Mode:* In this mode, the harmonizer pushes the logs to the data owner (or auditor) in a timely manner. The push action is invoked by either type of the following two events: one is that the time elapses for a certain period according to the temporal timer inserted as part of the JAR file; the other is that the JAR file exceeds the size stipulated by the content owner at the time of creation.
- *Pull Mode:* This mode allows auditors to retrieve the logs anytime when they want to check the recent access to their own data.

b) Algorithm

The concept of push-pull strategies is very beneficial when more amounts of data are accessed in short time. At this scenario, if the data is not sent out random enough, the logging file becomes huge, which increases the operation expenses like data copying. The data owners prefer the push mode and want to keep track of the data usage consistently over time. For such data owners, receiving the logs automatically can lighten the load of the data analyzers. The maximum size at which logs are pushed out is a parameter which can be easily configured while creating the logger component. The pull strategy is most needed when the data owner suspects some misuse of his data; the pull mode allows him to monitor the usage of his content immediately. A hybrid strategy can actually be implemented to benefit of the consistent information offered by pushing mode and the convenience of the pull mode.

c) Logging Mechanism

- The Logger Structure
- Log Record Generation
- Dependability of Logs
- JARs Availability
- Log Correctness

d) The Logger Structure

To conduct the automated logging, the programming capabilities of the JAR file are leveraged.. A logger component is a nested Java JAR file holds a user's data items and related log files.

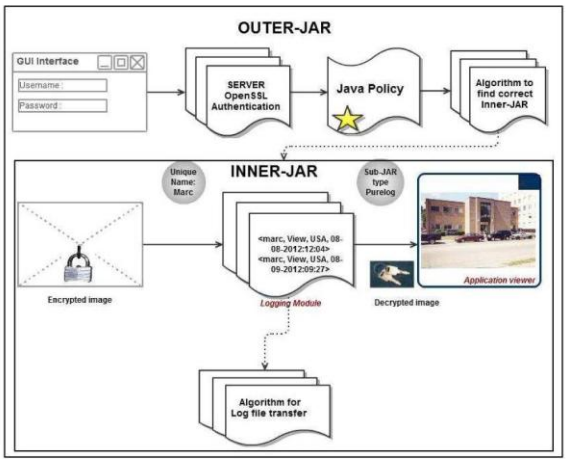

Figure 2 : Logger Structure

The outer JAR takes care of authentication of entities for accessing the data stored in the JAR file. In this scenario, the data owners may not know the exact CSPs who hold the data. Hence, authentication is specified according to the servers' workability For example, a policy may state that Server X is allowed to download the data if it is a storage server. As discussed below, the outer JAR may gain access control to enforce the data owner's parameters, mentioned as policy of java, which is implemented on the data.

What permissions are available to access a particular code in the Java Environment is taken care by the Java policies. These access rights represent the same File System Permissions. However, the data owner can mention the access permissions in user-centric terms as inverse to the usual code-centric security in Java, using its authorization and authentication Services. Moreover, the outer JAR takes the responsibility of selecting the correct inner JAR according to the identity of the entity who requests the data.

To facilitate retrieval of log files and display enclosed data in a suitable format, and to maintain a log file for each encrypted item, Each inner JAR holds the encrypted data, class files. Here two options are supported:

- *Pure Log :* Its records every access to the data and are used for pure auditing purpose
- *Access Log :* It performs two methods logging actions and enforcing access control. In case if a request is denied, the JAR records the request made time If the access request is granted, the JAR record the access information additionally along with the allowed time period access.

These two logging methods provokes the data owner to implement certain access conditions either proactively (in case of Access Logs) or reactively (in case of Pure Logs). For example, services like billing require use of Pure Logs. Access Logs are needed by services, which compel service-level agreements such as limiting the access to sensitive information. To perform these tasks, the inner JAR writes the log record using the class files and another class file agrees with the log harmonizer, the third class file which is an encrypted file that displays or copies the data from the server downloading the data (based on whether we have a Pure Log, or an Access Log), and the public key of the IBE key pair that is necessary for encrypting the log records.

System never stores the secret keys. The outer JAR may contain one or more inner JARs, apart from that a class file for authenticating the servers or the users, and the another one used to find the correct inner JAR, a third class file using oblivious hashing, checks the JVM's validity. Moreover, class file manages the Graphical User Interface for user authentication and the Java Policy.

e) Log Record Generation

Logger Component generates log records. Any access to the data in the JAR requires logging information, and new log entries are added in a consecutive manner, in order of creation LR= (r1; . . . ; rki). Each record ri is encrypted one by one and added to the log file. To make sure that the log records are correct, Access time, locations as well as actions are verified. In particular, the time of access is determined using the Network Time Protocol (NTP) [15] to avoid suppression of the correct time by a malicious entity. By using the IP address, the Cloud Service Providers location is traced out. The JAR performs IP lookup and finds the most probable location of the CSP using the IP address range. For determining locations, advanced techniques are implemented [10]. Similarly, if a trusted time stamp management infrastructure can be set up or leveraged, it can be used to record the time stamp in the accountability log [2]. The most critical part is to log the actions on the users' data. In the current system, we support four types of actions, i.e., Act has one of the following four values [1]: view, download, timed access, and Location-based access. For each action, we propose a specific method to correctly record or enforce it depending on the type of the logging module, which are elaborated as follows:

- *View*

The entity (e.g., the cloud service provider) has only read permissions and cannot save the raw information permanently. In this type of activity, pure log edits the log record about the access while the Access Logs using the enclosed access control module compels the action. We know that the inner JAR stores

and encrypts the data. When the access request is read only, on the fly a temporary decrypted file of data is created by inner JAR. In case the human user accesses the file, by using the Java application viewer the hidden file is shown to the entity viewer. Utilising the Java Applications data, viewer uncheck the copying methods by using some keys such as print screen. And, the data will be hidden to prevent to avoid the usage of some print screen capture software when the application viewing screen focus goes out. When the content is presented to Cloud Service Provider he sees it on the command line using the headless mode in Java

Download

The entity is allowed to save a raw copy of the data and the entity will have no control over this copy neither log records regarding access to the copy. If Pure Log is adopted, the user's data will be directly downloadable in a pure form using a link. When an hyperlink is clicked and downloaded, the JAR file combines the data, decrypts and give it to the entity in raw form. In case of Access Logs, the entire JAR file will be given to the entity. Depending upon the entity the jar file can be accessed.

- *Timed access*

The view-only access works on the time basis and provides data for a limited period. The access starting time and duration are recorded by the pure log, meanwhile the Access Log is also utilised in a given time frame. By using the Network Time Protocol, the duration of access time is calculated. Based on the calculations, the time limit of Access Log records are determined. This timed access is compelled only it is combined with view access and download.

- *Location based access*

In this case, the Pure Log will record the location of the entities. The Access Log will verify the location for each of such access. The access is granted and the data are made available only to entities located at locations specified by the data owner.

Dependability of Logs

First, the intruder stores the JARs remotely to disturb auditing mechanism by, corrupting the JAR, or hides it to make the communication not possible for the user. Second, he gets the control of JRE that runs JAR files

JARs Availability

To protect offline JARs from the attackers, Cloud Information Accountability provides log harmonizer, which has two main tasks: dealing JAR copies and corrupt logs recovery.

Each log harmonizer maintains logger components copies holding similar data items. And the harmonizer being represented as a JAR file does not hold the user's data items for audition, but it allows client and server to communicate with logger components by providing the class file to them. Error correction information received from its logger components are stored by the harmonizer, and using the IBE, decryption key duplicate log records are found out from copies of the people's information JARs. As they are strictly combined with the logger component in a data JAR file, the user's data is copied along with the logger as it is strongly mixed with component. In sequence, the new copy of the logger also holds the old log records with respect to the usage of data in the original data JAR file. Because of old records redundancy is aroused and makes the data unfit for the new copies. The harmonizer merges copies from all log records and presents a clear view to the data owner by removing the redundancy.

Log Correctness

To maintain the log records correctly the JRE present in the logger component should not be modified. To check the logger component integrity, we depend on two-step process [1]:

1. We repair the JRE before the logger is launched and any kind of access is given, so as to provide guarantees of integrity of the JRE.
2. We insert hash codes, which calculate the hash values of the program traces of the modules being executed by the logger component. This helps us detect modifications of the JRE once the logger component has been launched, and are useful to verify if the original code flow of execution is altered.

V. Conclusion

The system suggests some novel approaches for automatically logging any access to the data in the cloud together with an auditing mechanism. This mechanism allows the data owner to not only audit his content but also enforce strong back-end protection. Moreover, one of the main features of our work is that it enables the data owner to audit even those copies of its data that were made without this knowledge.

Future work

Apart from a class file for authenticating the servers or the users, another class file finds the correct inner JAR, a third class file which checks the JVM's validity using oblivious hashing.

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2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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