SECURITY & PRIVACY ISSUES OF CLOUD & GRID COMPUTING NETWORKS

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ABSTRACT

Cloud computing is a new field in Internet computing that provides novel perspectives in internetworking technologies. Cloud computing has become a significant technology in field of information technology. Security of confidential data is a very important area of concern as it can make way for very big problems if unauthorized users get access to it. Cloud computing should have proper techniques where data is segregated properly for data security and confidentiality. This paper strives to compare and contrast cloud computing with grid computing, along with the Tools and simulation environment & Tips to store data and files safely in Cloud.

KEYWORDS

Cloud computing; internetworking; grid computing; confidentiality

1. INTRODUCTION

Cloud computing provides secure anytime-anywhere access, high-level security and data privacy [9]. Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software and information are provided to computers and other devices as a utility. Cloud computing provides computation, software, data access, and storage services that do not require end-user knowledge of the physical location and configuration of the system that delivers the services. Cloud computing providers deliver applications via the internet, which are accessed from a Web browser, while the business software and data are stored on servers at a remote location. Cloud Computing defined according to Foster, Zhao, Raicu and Lu [1] as: "A large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet." 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 according to Buyya R.[10].

Cloud computing tries to enhance the concept of Grid computing and avoid the single point of failure when one unit fails [17], [19]. Cloud computing is designed to act as one whole and its compound units to be automatically interchangeable. That is why cloud hosting offers the highest level of data security in the hosting market. Cloud refers to a collection of nodes and the Cloud computing model focuses on the Cloud to provide the services to the customers. Computing clouds & grids are changing the whole IT, service industry, and global economy. Clearly, cloud

computing demands ubiquity, efficiency, security, and trustworthiness. Cloud & Grid computing [21] has become a common practice in business, government, education, and entertainment leveraging 50 millions of servers globally installed at thousands of datacenters today.

There are three main factors contributing to the surge and interests in Cloud & Grid Computing:

1. Rapid decrease in hardware cost and increase in computing power and storage capacity
2. The exponentially growing data size in scientific instrumentation/simulation and Internet publishing.
3. The wide-spread adoption of Services Computing.

2. PRINCIPLES OF CLOUD COMPUTING

Cloud is a collection of computers and servers that are publicly accessible via the Internet. Cloud computing collects all the computing resources and manages them automatically through software. In the process of data analysis, it integrates the history data and present data to make the collected information more accurate and provide more intelligent service for users and enterprises [6]. The users need not care how to buy servers, software, solutions and so on. Users can buy the computing resource through internet according to their own needs.

Cloud is not only simply collecting the computer resource, but also provides a management mechanism and can provide services for millions of users simultaneously. Nowadays, virtualization is entering every field of data center [7]. It has become useful tool and improved service capacity. When the storage and computing capacity of the server cluster are surplus, we need not purchase servers, all we need to add a virtual machine running on the server.

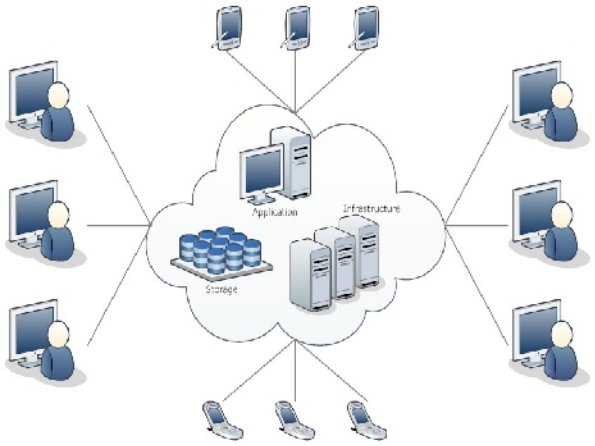

Figure 1. Network diagram in Cloud Computing [5]

The user's request then gets passed to the system management, which finds the correct resources and then calls the system's appropriate provisioning services. These services carve out the necessary resources in the cloud, launch the appropriate web application and either creates or opens the requested document. After the web application is launched, the system's monitoring and metering functions track the usage of the cloud so that resources are apportioned and attributed to the proper user(s).

Once you have moved the bulk of your mainstream computing to the cloud, you can access it from any PC and your mobile phone. This is an enormous convenience which businesses are benefiting from today, and it can work just as well for the home user.

The data center you choose should offer the following protection measures:

Physical Security: Physical security covers the hardware side of the data center [14]. It deals with online redundant issues like power supplies. Application security measures include:

- Redundant power supplies
- Redundant Internet connections
- Redundant hardware

Application Security: Application security covers the software side of the data center. It deals with online security issues like hackers and viruses [8]. Application security measures include:

- Anti-virus detection software
- Data encryption software
- Administrative controls
- Security audits

2.1. Cloud computing benefits include

Cloud computing [20] provides secure anytime-anywhere access, high-level security and data privacy, and it holds the potential to bring about some of the most far-reaching efficiency and productivity improvements ever seen in the tax and accounting profession [16].

- Reduced costs
- Redundant data storage
- Fast Application Deployment
- Anytime/anywhere data access
- Increased storage capacity
- Dedicated resources
- Better Resources Utilization
- Platform Independent, Security,
- Hassle -free maintenance

3. CLOUD COMPUTING SERVICES

A wide range of Cloud services are currently available to the public [11]. These services are broadly divided into three categories:

1. Software-as-a-Service (SaaS)
2. Platform-as-a-Service (PaaS)
3. Infrastructure-as-a-Service (IaaS)

3.1. Software-as-a-Service (SaaS)

Software-as-a-Service commonly refers to applications delivered to the end user through a web browser or any other web-rich client [4]. This kind of cloud computing transfer programs to millions of users through browser. In the user's views, this can save some cost on servers and software. In the provider's views, they only need to maintain one program, this can also save cost. Salesforce.com is so far the most famous company that provides this kind of service. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere.

Examples: Microsoft OfficeLive, DropBox, and CloudNumbers.

3.2. Plateform-as-a-Service (PaaS)

Cloud platform services, also known as Platform as a Service (PaaS), deliver a computing platform and/or solution stack as a service. It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

Examples: Google Apps, SalesForce, VMforce and Joyent Accelerator.

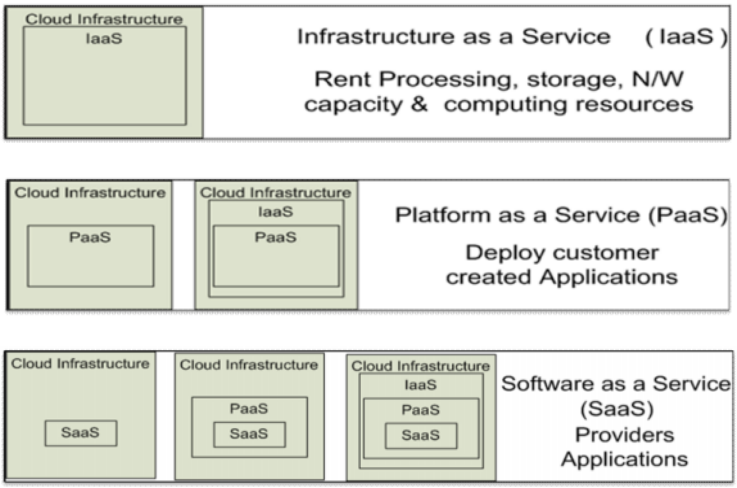

Figure 2. Cloud Service Models

3.3. Infrastructure-as-a-Service (IaaS)

Infrastructure-as-a-Service [3] provides maximum control where a computing infrastructure can be assembled from the operating system upwards like Amazon Web Services provides virtual server instance API (Application programming interface) to start, stop, access and configure their virtual servers and storage.

Examples: Amazon EC2, Eucalyptus Community Cloud, and IBM Cloudburst.

Some providers offer cloud computing services for free while others require a paid subscription.

4. GRID COMPUTING

Grid computing links disparate computers, forming a single unified infrastructure. Grid computing links the disparate parts as a virtual whole [18]. The objective of grid computing is to give users access to IT resources when they need them.

Benefits of GC: Grid computing allows organizations to meet two goals:

1. Remote access to IT assets
2. Aggregated processing power

4.1. Grid & Cloud Protocol Architecture

Platform: collection of specialized tools, middleware and services on top of the unified resources to provide a development and/or deployment platform.

Collective: interactions across collections of resources, directory services.

Resource: discovery, negotiation, monitoring, accounting and payment of sharing operations on individual resources [12].

Unified Resource: resources that have been abstracted/ encapsulated.

Connectivity: communication and authentication protocols.

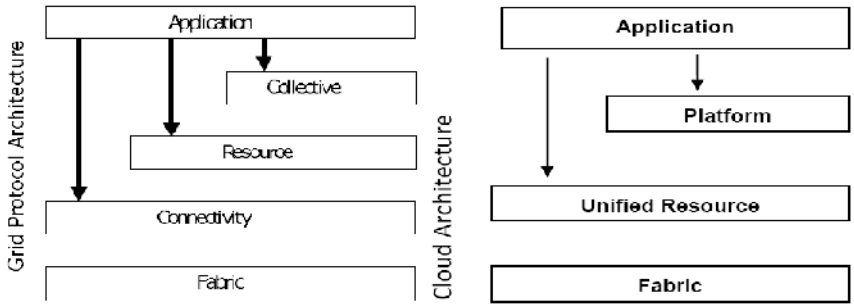

Figure 3. Grid & Cloud Protocol Architecture

Grids are made up of processors, sensors, data-storage systems, applications and other IT resources, all of which are shared across the network. Grid computing [15] systems have made it possible to carry out a number of resource-demanding projects that had previously been impossible or highly challenging, due to the physical location of vital IT assets.

4.2 Similarity in Cloud & Grid Computing

As cloud computing represents advancement from grid computing, there are naturally a number of similarities [21]. These are discussed below:

Scalability: Scalability refers to the system's ability to handle increasing amounts of work, or to improve performance. Both grid and cloud computing are scalable, as application instances are load balanced. CPU and network bandwidth is directed on demand. This means that grid and cloud systems have a storage capacity that fluctuates, depending on the number of users, instances and the amount of data transferred at a specific time.

Multitenancy and Multitasking: Multitenancy refers to a situation in which a single instance of software is able to serve multiple clients (tenants). Multitasking refers to when multiple tasks (processes) share processing resources. Multitenancy and multitasking [2], common to both grid and cloud computing, allow numerous users to perform different tasks and access single or multiple application instances.

4.3 Differences between Grids and Clouds

1. Grid computing is better suited for organizations with large amounts of data being requested by a small number of users (or few but large allocation requests), whereas cloud computing is better suited to environments where there are a large number of users requesting small amounts of data (or many but small allocation requests).

2. Grids are well suited for complex scientific work in virtual organizations, explained Wolfgang Gentzsch, who was behind Sun's grid efforts and now sits on the board of directors of the Open Grid Forum and is an advisor to the EU DEISA project. Clouds, on the other hand, are well suited for simple work such as many short-running jobs, he said.

3. Grids require batch job scheduling or sophisticated policies for allocating jobs, while clouds do not [13].

Table 1. Comparison of Cloud Computing & Grid Computing

S. N.	Characteristic	Cloud Computing	Grid Computing
1	Resource Handling	Centralized & Distributed	Distributed
2	Protocols	TCP/IP,SOAP,REST, AJAX	MPI,GIS, GRAM
3	Business Model	Yes	No
4	Task Size	Small & Medium	Single Large
5	SOA	Yes	Yes
6	Multitenancy	Yes	Yes
7	Heterogeneity	Yes	Yes
8	Scalable	Yes	Half
9	Switching Cost	High	Low
10	Value added Services	Yes	Half

5. TOOLS AND SIMULATION ENVIRONMENT FOR CLOUD & GRID COMPUTING

Various tools and products which provide assistance in development applications on cloud & Grid computing are:

1. **Zenoss** a single, integrated product that monitors the entire IT infrastructure. It manages the networks, servers, virtual devices, storage, and cloud deployments.

2. **CloudSim and CloudAnalyst** are important for developers to evaluate the requirements of large-scale cloud applications. It helps developers with insights in how to distribute applications among cloud infrastructures and value added services.

3. **Cloudera**, an open-source Hadoop software framework is increasingly used in cloud computing deployments due to its flexibility with cluster-based, data intensive queries.

4. **Spring Roo** is a next generation rapid application development tool, combined with the power of Google Web Toolkit (GWT) that enables developers to build rich browser apps in enterprise production environments.

5. **Paradyn**, This Grid computing tool supports performance experiment management through techniques for quantitatively comparing several experiments and performance diagnosis based on dynamic instrumentation.

6. **Nimrod-G** uses the Globus middleware services for dynamic resource discovery and dispatching jobs over computational grids. It allows scientists and engineers to model parametric experiments and transparently stage the data and program at remote sites.

7. **Condor-G** represents the work of Globus and Condor projects which enables the utilization of large collections of resources that span across multiple domains as if they all belonged to the user's personal domain.

8. **Globus**, an open source software toolkit that facilitates construction of computational grids and grid based applications, across corporate, institutional and geographic boundaries.

Table 2. Comparison of different Cloud Computing Storage Space Services

Storage Space						
S.N.	**Service**	**Free**	**25-30 GB**	**50 GB**	**More**	**Special Use**
1	Amazon Cloud Drive	5 GB	N/A	$25/yr	1000 GB: $500/yr	N/A
2	Apple iCloud	5 GB	$40/yr (25 GB)	$100/yr	N/A	N/A
3	Cubby	5 GB	N/A	N/A	100 GB: $6.99/mon	Peer to Peer Sharing
4	Dropbox	2 GB	N/A	N/A	100 GB: $9.99/mon	Real time Collaboration
5	Google drive	5 GB	$2.49/mon (25 GB)	N/A	100 GB: $4.99/mon	N/A
6	IDrive	5 GB	N/A	N/A	150 GB: $4.95/mon	N/A
7	Microsoft skyDrive	7 GB	$10/yr	$25/yr	107 GB: $50/yr	N/A
8	Mozy	N/A	N/A	$19.99/mon	1 TB: $379.99/mon	N/A

6. TIPS TO STORE DATA AND FILES SAFELY IN CLOUD

The days of keeping all your documents, photos and music on your computers hard drive are gradually coming to a close. Cloud storage is helping to solve the ever-present need for more storage space to hold all of your digital property.

The following is an analysis of the public cloud services market size and annual growth rates:

Figure 4. Public Cloud Services Market and Annual growth Rate, 2010-2016.

1. If you choose a cloud storage solution that relies on a password to access your data, choose a password that's difficult to hack with dictionary attacks, and change your password often to reduce the chances of success from brute force attacks.
2. If you have a standalone cloud storage app installed on your computer, check to be sure that app uses some type of encryption for its Internet exchanges.

3. Hackers usually want the most information for the least effort. This means they will likely attack the heart of a cloud storage service rather than its individual users. Thus, you probably want to find a service provider with a good history of keeping its clients' accounts and data secure.

7. CONCLUSIONS & FUTURE SCOPE

In this paper, we have presented a detailed comparison on the Grid computing & Cloud computing. Cloud Computing is the next big thing in the arena of computing and storage. In any case, cloud is getting bigger and better, and as long as they are available through web services, without capital infrastructure investment at reasonable price, it is for sure going to proliferate and create robust demand in times to come. It provides a virtual storage space to the user which could be used without bothering about the details of the entire mechanism. Cloud computing is based on grid computing, and allows users to access shared servers, which distribute resources, software and data on demand. This paper strives the Simulation tools & tips for the store data or files in the Cloud with safe way.

The cloud computing will becomes all the more important with the omnipresence of high-speed, broadband Internet. With the arrival of cloud computing it is no longer necessary to purchase hard drives with large storage capacity, as it can be stored on cloud. cloud computing has many difficult hurdles to overcome, including concerns tied to the availability of broadband spectrum, the ability of diverse systems to work together, security, privacy, and quality of service.

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