CLOUD COMPUTING: Architecture, Security, Issue and Research Challenges and Solutions.

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Abstract : Cloud Computing is a new computing Technology (paradigm), which was started in 2007 and it is one of the hottest topic in field of IT industry. Cloud computing is based on different other computing parallel computing, grid computing, SOA, Virtualization technologies which define the shape of new area.

       Cloud computing is an emerging models are used in business computing. In this paper, we explore the concept of cloud architecture and compare cloud computing with grid computing.

We also address the characteristics and application of several popular clouds computing platform.

In this paper we aim to cloud computing becoming popular because it's case of use and providing variety of services. In this paper we aim to challenges and issues of cloud computing, adaption, perspective and highlighted the cloud interoperability issue that deserves substantial further research and development.

In this paper security and privacy issues present a strong barrier for users to adopt into cloud computing systems. In this paper we investigate several clouds computing system provides about their concerns on security and privacy issues.

In this paper we will survey research activities and challenges in cloud computing environment.

Key Word: - Cloud computing, architecture, challenges, cloud platform,research activity, research challenges, research issues.

INTRODUCTION: -cloud computingis a completely new Technology. It is the development of parallel computing, Grid computing and is the combination and evolution of virtualization, utility computing, software-as-a –service (Iaas), and platform-as-a-service (Pass). Cloud computing is a distributed architecture that centralizes server, resources on a scalable platform so as to provide on demand computing resources and services. Cloud service provider(CSP) offer cloud platforms for their customers to use and create their web services , much like internal service providers offer customers high speed broadband to access the internet CSP and ISP(Internet service providers) of the offer services.

Cloud computing is metaphor to describe web as a space where computing has been pree installed and exist as a service , data, operating system, application, storage and processing power exist on the web ready to be shared.

Cloud computing where the IT resources include network, server,storage, application,service and so on and they can be deployed with much quick and easy manner and least management and also interactions with services.

       Cloud computing refers to the use of computing resources, those being hardware and /or software that reside on remote machine and are delivered to the end user as a service over a network with the most prevalent example being the internet. By definition a user entrusts his data to a remote service, on which has limited to no influence. We it first appeared as a term and a concept, a lot of critics dismissed it as being the latest tech trend.

       The cloud computing has achieved cutting costs for enterprises and helping users focus on their core business instead of being obstructed by IT issues.

Cloud computing embraces of cyber infrastructure, and builds upon decodes of research in virtualization, distributed computing, utility computing and recently, networking web and software services. It implies a service oriented architecture, reduced information technology overhead for the end-user greater flexibility, reduced total cost of ownership, on demand services and many other things.

ORGANIZATIONS: -The rest of the paper is organized as in section II we define architectural components such as software as a service (SaaS) , Platform as a service (PaaS) , Infrastructure as a service (IaaS) . In sections III and explain Cloud computing model, in section IV in some popular cloud computing platforms, in sections V we include cloud computing application. We father explained about issues and challenges of cloud computing,in section VI, VII, VIII finally, we conclude in section IX.

II) ARCHITECTURAL COMPONENTS: - Cloud service model are commonly divided into SaaS, PaaS and IaaS. That exhibited by a given cloud infrastructure.

Its helpful to add more structure to the service model stocks: fig1 shows a cloud reference architecture that makes the most important security-relevant cloud components explicit and provides and abstract overview of cloud computing for security issue analysis.
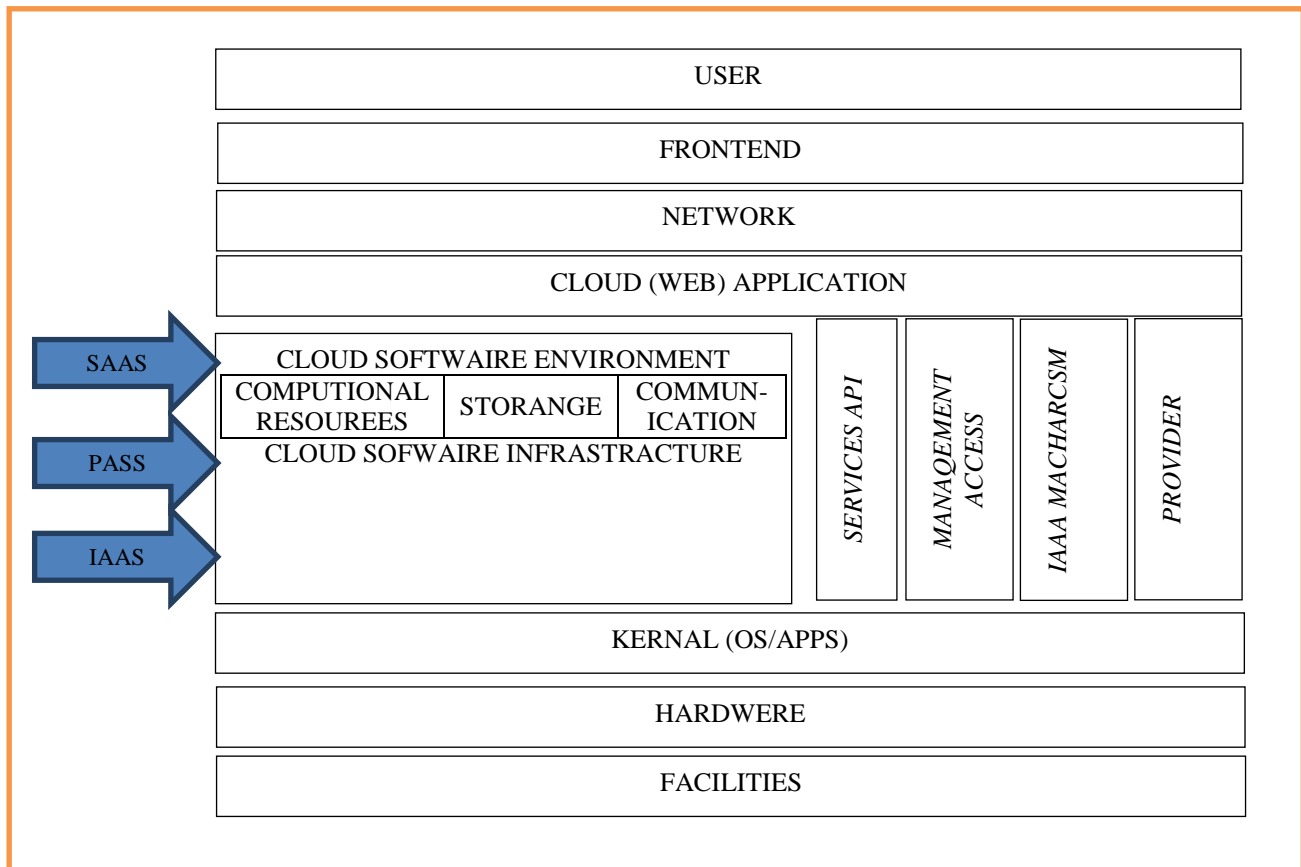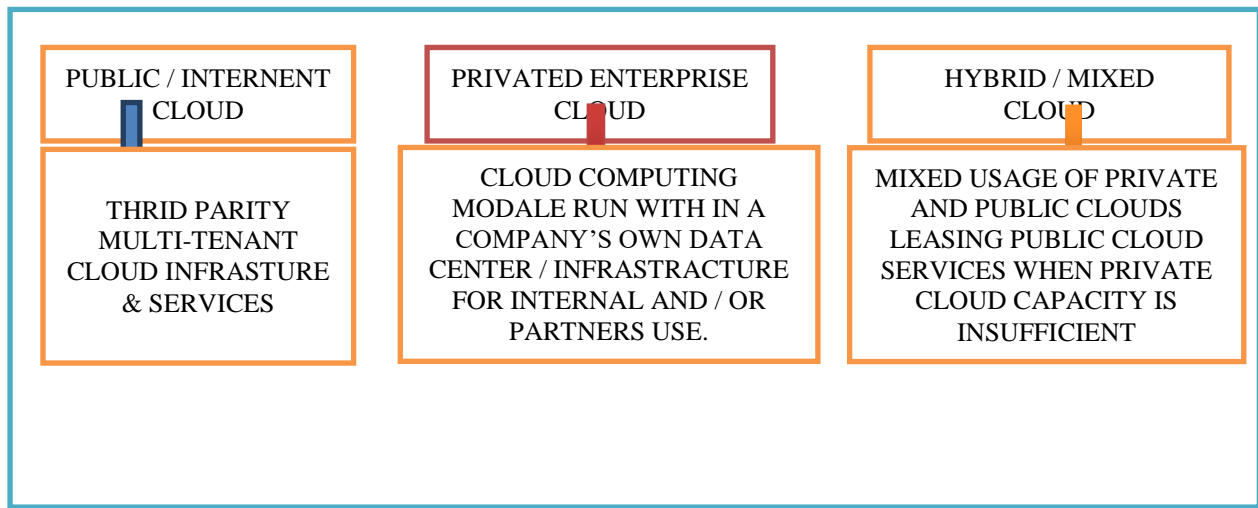
Fig :-The Cloud Reference architecture .

A)   **SoftwareAS A Service (SaaS) :-** Application reside on the tap of the cloud stock .Services provided by this layer can be accessed by end through web portals . There for, consumers are increasingly shifting from locally installed computer programs to on –line software services that offer the same functionally. Traditional desktop applications such as word processing and spreadsheet can now be accessed as services in the web. This model of delivering applications known as software as a service (SaaS), alleviates the burden of software maintenance for customers and simplifies development and testing for providers.

B)   **Platform as a service:** -In addition to infrastructure -oriented cloud that provide raw computing and storage service, another approach is to offer a higher level of obstruction to make a cloud easily programmable, known as platform as a service (PaaS) A cloud platform offers an environment on which Developers create and deploy application and do not necessarily need to know how many processors or how much memory that applications will be using. In addition multiple programming model and specialized services(e.g. data access, authentication, and payments) are offered as building blocks to new applications

C)   **Infrastructure as a service:** **-**offering virtualizedresources (computation storage and communication) on demand is known as service (IaaS). A cloud infrastructure enables on

Demand provisioning of servers running serval choices of operating systems and a customized software stock. Infrastructure services are considered to be the bottom layer of cloud computing systems. Amazon web-services mainly offers IaaS, Which in the case of its EC2 service means offering VMS with a software stock that can be customized similar to how on ordering physical server would be customized. Users are given privileges to perform numerous activities to the server . Such as starting and stopping it, Customizing it by installing software , packages,attaching virtual disks to it, and configuring access permission and firewalls rules.

VII] Deployment Models:-Cloud computing has emerged mainly from appearance of public computing utilities, other deployment models , with variations in physical location and distribution, have been adopted. In this sense, regardless of its services class a cloud can be classified as public , private, community , or hybrid based on model of deployment as shown in

PUBLIC / INTERNENT CLOUD	PRIVATED ENTERPRISE CLOUD	HYBRID / MIXED CLOUD
THRID PARITY MULTI-TENANT CLOUD INFRASTURE & SERVICES	CLOUD COMPUTING MODALE RUN WITH IN A COMPANY'S OWN DATA CENTER / INFRASTRACTURE FOR INTERNAL AND / OR PARTNERS USE.	MIXED USAGE OF PRIVATE AND PUBLIC CLOUDS LEASING PUBLIC CLOUD SERVICES WHEN PRIVATE CLOUD CAPACITY IS INSUFFICIENT

Fig:-Deployment model

I) **Public Cloud :-** As a "Cloud mode available in a pay-as –you-go manner to the general public"

And private cloud as " internal data center of a business or other organization not made available to the general public".

II) Private Cloud: -In most cases establishinga private-cloud means restructuring an existinginfrastructure by adding virtualization and cloud-like interfaces. This allows users to interact with the local data center while experiencing the same advantages of public clouds most notably self-service interface, privileged access to virtual servers and per-usage and billing.

III) Community Cloud: - Is "shared" by several organizations and supports a specific community that has shared concerns (e.g. mission, security requirements, policy , and compliance considerations)

IV) Hybrid Cloud: - A hybrid cloud takes shape when a private cloud is supplemented with computing capacity from public clouds. The approach of temporarily computing capacity from public clouds. The approach of temporarily renting capacity to handle spikes in load is known as "cloud –bursting".

IV) Popular Cloud Computing Platforms:-

A) **Abi Cloud: -** Abi cloud is a cloud computing platform. It can be used to build integrate and manage public as well as private cloud in the homogeneous environments. Using Abi cloud user can easily and automatically deploy and manage the server, storagesystem network, virtual devices and applications and so on. The main difference between Abi cloud and other cloud computing platforms is its powerful web-based management function and its core encapsulation manner.

Using the Abi cloud, user can finish deploying a new service by just and flexible than other cloud computing platforms that deploy news services through command lines.

Abi cloud can be used to deploy and implement private cloud as well as hybrid cloud according to the cloud providers request and configuration. It can also manage EC2 according a whole cloud platform based on Abi Cloud can be packed and redeployed at ay other Abi cloud platform. This is much helpful for the transformation of the working environment and will make the cloud deployment process much easier and flexible.

B)Eucalyptus: -The Eucalyptus frame work was one of the first open-source projects to focus on building IaaS clouds. It has been developed with the internet of providing an open-source implementation nearly identical in functionality to Amazon Web Services APIS. Therefore user can interact with a Eucalyptus cloud using the same tools they use to access Amazon EC2. It also distinguishes itself from other tools because it provides a storage cloud API –emulating the Amazon s3 API for storing general user data and VM images.

C) Nimbus3:- The Nimbus toolkit is built on top of the Globus frame work. Nimbus provides most features in common with other open-source VI Managers, such as an EC2-Compatible front end API, Support to xen, and a backend interface to Amazon EC2. However, it distinguishes from others by providing a Globus Web Services Resource frame work (WSRF) Interface. It also provides a backend service, named pilot, which spawns WM on clusters manage by local resource manager (LRM) such as PBS and SGE.

Nimbus core was engineered around the spring framework to be easily extensible,thus allowing several internal components to be replaced and also eases the integration with other system.

D)Open Nebula: -Is one of the **most** feature-rich open –source VI managers. It was initially conceived to manage local virtual infrastructure,but has also included remote interfaces that make it viable to build public clouds. Altogether, four programming APIs are available, XML-RPC and libvirt for local interaction; a subset of EC2 (query) API and open Nebulla cloud API (OCA) for public access.

E) OpenpEX:-(Open provisioning and Execution Environment) was constructed around the notion of using advance reservations as the primary method for allocating VM instances . It distinguishes from other VI managers by its leases negotiation mechanism, which incorporates a bilateral negotiation protocol that allows users and providers to come to an agreement by exchanging offers and counter offers when their original request cannot be satisfied.

V) Applications: - There are a few applications are cloud computing as follows
1) Cloud computing provides dependable and secure data storage center.
2) Cloud computing can realize data sharing between different equipment's.
3) The cloud provides nearly infinite possibility for user to use the internet
4) Cloud computing does not need high quality equipment for the user and it is easy to use.

VI) Key Security Issue In Cloud Computing :-Cloud Computing consist of applications, platforms and infrastructure segments, Each segment perform different operations and offers different products for business and individuals around the world. The business application includes software as a Service (SaaS), Utility computing Web Services, platform as Service (PaaS), managed service providers (MSP), Service commerce and Internet Integration. There are numerous security issues for cloud computing as it encompasses many technologies including networks, databases, operating systems, virtualization , resources scheduling , transaction, management, load balancing , concurrency control and memory management. Therefore security issues for many of these systems and technologies are applicable to cloud computing. For example the network that interconnects the systems in a cloud has to be secure and mapping the virtual machines to the physical machines has to be carried out securely. Data security involves encrypting the data as well as ensuring that appropriate polices are enforced for data sharing. The given below are the various security concerns in a cloud computing environment.
-Access to servers and application
-Data Transmission
-Network Security
-Data Security
-Data Privacy
-Data Integrity
-Data Location
-Data Availability
-Data Segregation
-Security policy and Compliance
-Patch Management

VII) Research challenges in Cloud computing:-
A)   Virtualization: - Most discussion on cloud computing typically begin with virtualization. Basic idea of virtualization is that the resources of one physical computer can be portioned in to logical resources and rearranged into multiple virtual machines. The operating system, network and storage resources can be virtualized to improve the performance. Virtualization is critical to cloud computing because it simplifies the delivery of services by providing a platform for optimizing complex IT resources in a scalable manner, which makes cloud computing so cost effective. Virtualization is emerging IT paradigm that separates computing tasks and technology implementation from physical hardware virtualization has three characteristics that makes it ideal for cloud computing.
1)   **Partitioning: -**support many applications and operating systems (OS's) in a single physical system.
2)   **Isolation: -** Each machine is protected from crashes and viruses in the other machines.
3)   Encapsulation: -protect each application so that it doesn't interfere with other applications. Using encapsulation, a virtual machine can be represented as a single file, making it easy to identify and present to other application.
4)   Challenges on Cloud Adoption :-
A)   Security :- Well known security issues such as data loss , phishing , botnet (running , remotely on a collection of machines) pose serious threats to an organization's data and software. The Multi-tenancy model and the pooled computing – resources on cloud computing has introduced new security challenges such as shared resources (hard disk, data, VM) . On the some physical machine invites unexpected side channels between a malicious resources and a regular resource. And the issue of "reputation –fate-sharing" who happen to unfortunately, share the computing resources with their follow tenant – a notorious user with a criminal mind. Since they may share the same network address, any bad conduct will be attributed to all the users without differentiating real subverts from normal users.
B)   Costing Model: - Cloud consumers must consider the tradeoffs amongst computation, communication, and integration. While migrating to the cloud can significantly reduce the infrastructure cost, it does raise the cost of data communication.
C)   Changing Model:- From a cloud provider's perspective, the elastic resource pool has made the cost analysis a lot more complicated than regular data enters, which often calculates their cost based on consumptions on static computing.
D)   Service Level Agreement: -It is vital for consumers to obtain guarantees from providers on service delivery. Typically, these are provided through service level agreement (SLA's) negotiated between the providers and consumers.

VII) Security and privacyIssue: -cloud computing can provide infinite computing resources on demand due to its high scalability in nature, which eliminates the needs for cloud service providers to plan far ahead on hardware provisioning. Many company such as Amazon, Google, Microsoft and so on accelerate their paces in developing cloud computing systems and enhancing its services providing to a larger amount of users .
        In this paper we investigate the security and privacy of current cloud computing systems provided by an amount of companies. As cloud computing refers to both the applications delivered as services over the Internet and the Infrastructures that provides those services.
Based on the investigation security and privacy concerns provided by companies new days are not adequate, and consequently result in a big obstacle for user to adapt into the cloud computing systems. Hence more concerns on security issues, such as availability,confidentiality, data integrity, control, and auditand so on, should be taken into account.

A)   Security on Demand: - Cloudservices are application running somewhere in the cloud computing infrastructure through internal network on internet. Cloud computing allow providers to develop, deploy and run applications that can easily grow in capacity (Scalability) , work rapidly (performance) and never (or at least rarely) fail (reliability), without any concern on the properties and the locations of the underlying infrastructures . Cloud computing systems can achieve the following five goals to gather.

1)Availability :- The goal of availability for cloud computing systems (including applications and its infrastructures) is to ensures its users can use them at any time, at any place. As its web-native nature, cloud computing system enables its users to access the system (e.g. applications services) from anywhere. This is true for all the cloud computing systems. (E.g. DaaS, SaaS, PaaS, IaaS and etc). Required to be accessed at any time, the cloud computing system should be severing all the time for all the users. (Say it is scalable for any number of users). Two strategies, say hardening and redundancy are mainly used to enhance the availability of the cloud systems or application hosted on it.

2) Confidentiality: - It means keeping keeping users data secret in the cloud systems. There are two basic approaches (i.e. Physical isolation and cryptography) to achieve such confidentiality, which are extensively adopted by the cloud computing vendors.

3) Data Integrity: - In thecloud system means to preserve inform integrity (i.e. not least or modified unauthorized users). As data are the basefor providing cloud computing services, such as data as service, software as a service, Platform as a service, keeping data integrity is a fundamental task.

4) Control: - In the Cloud system means to regulate the use of the system, including the applications, its infrastructure and the data.

5) Audit:- It means to watch what happened in the cloud system. Auditability could be added as on additional layer in the virtualized operating system (or virtualized application environment) hosted on the virtual machine to provide facilities watching what happened in the system. It is much more secure than that is built into the applications or into the software them sleeves it is able watch the entire access duration.

IX) Conclusion; - Thispaper discussed the architecture and popular platform of cloud computing. It also addressed challenges and issues of cloud computing is a rapidly developing Internet –based computing model.

Firstly this paper presents on Introduction to cloud computing and discuss about on the different types of services models such as (Iaas, Paas, Saas) and cloud Deployment Models.

This paper we have discussed a cloud computing based security, Issue and Research challenges &solutions.

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