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A Details Review on Cloud Computing Application and its Security Challenges

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Abstract: *This paper gives an overview of cloud computing applications including its particular characteristics, advantage, disadvantage and issues. The distribution of computing services via the Internet in a way that is less expensive and more dependable is known as cloud computing. The utilisation of the cloud is crucial due to the growing demand for diverse technologies that satisfy customers' dynamic resource demands at one location and make it easier for users to work on all platforms from any location at a lower cost. When using the cloud, security is the primary consideration because third parties will be involved. describing various security problems in detail and offering mitigation measures.*

Keywords: Cloud Computing, on demand, pay per use, threats, data leakage

I. INTRODUCTION

For computer users, cloud computing is nothing new; the idea behind it has been around for years. The capacity to share computing resources among multiple users is what cloud computing is. In the early days of computers, there was just one machine that many people shared in a far-off data centre (companies). A lot of users' resources were distributed and managed by the computer, and users might request more or less processing time. We can generate electricity by utilizing a generator or we can have a connection to the electricity board and pay for the electricity utilized. This is another analogue to cloud computing. It is comparable to cloud computing.

1.1 Definition of Cloud Computing

- Cloud computing is a pay-per-use model that makes it possible to have easy, on-demand network access to a shared pool of reconfigurable computing resources, such as networks, servers, storage, applications, and services. These resources can be quickly provisioned and released with little management work or service provider involvement.
- The concept of cloud computing is centred on the sharing of data and computations across a scalable network of nodes. End-user PCs, data centres, and cloud services are a few examples of these nodes. We term such a network of nodes as a Cloud .
- A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers
- Cloud Computing Applications: Virtually every industry, including business, entertainment, data storage, social networking, management, entertainment, education, the arts, and global positioning systems, can benefit from cloud computing.

II. LITERATURE REVIEW

In terms of leveraging the most recent technologies, cloud computing has advanced significantly. The practice of integrating cloud services into a business appears to be gaining popularity. Organizations need to think about using cloud services as a crucial component of their foundations to save capital expenses. However, a number of obstacles are preventing widespread adoption and deployment, and the biggest disadvantage of the current cloud service implementations is their inability to offer a recognized high level of security. Storage security, data security, network security, middleware security, and application security are among the security concerns of cloud computing. The main objective is to securely manage and store data that is not under the data owner's control. They are specifically employing a bottom-up strategy to security, where they focus on smaller cloud-related issues in order to address the more significant

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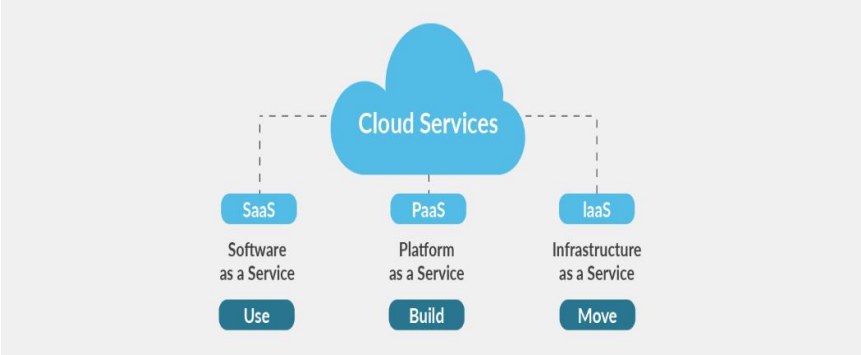
issue of cloud security. We talked about the potential for using secure co-processors to improve security. They finally put Hadoop into use. There are numerous new technologies developing quickly, each with the potential to progress technology and simplify human life. One must take great care to comprehend the security dangers and difficulties posed by using these technologies, nevertheless. various architectural designs that are centred on the services they offer. Data centres are centralised locations with vast amounts of data storage where data is kept. Data and processing are stored on servers. Customers must therefore have faith in the provider about both data security and availability. Prior to transferring data to a public cloud, difficulties with compatibility and security requirements must be resolved. A reliable monitor that can audit the cloud server's operations has been installed there. A pre-requisite control measure is to guarantee a specific Cloud computing Service Level in order to reduce potential security trust issues and adhere to governance challenges facing Cloud computing. main emphasis on a new technology that is anticipated to lower the cost of existing technologies dramatically. . Servers are used to store and process data. Customers must consequently have confidence in the provider about data availability and security. Compatibility issues and security criteria must be fulfilled prior to moving data to a public cloud. There is a trustworthy monitor there that can audit the cloud server's functioning. In order to reduce potential security trust issues and comply to governance challenges faced by Cloud computing, a prerequisite control solution is to guarantee a certain Cloud computing Service Level. focus on a new technology that is predicted to significantly reduce the cost of existing technologies

III. CLOUD SERVICES MODEL



- Software as a Service (SaaS) - The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. eg:web browser
- Platform as a Service (PaaS) - The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created applications created using programming languages, libraries, services, and tools supported by the provider
- Cloud Infrastructure as a Service (IaaS) - The capability provided to provision processing, storage, networks, and other fundamental computing resources. Consumer can deploy and run arbitrary software eg: Amazon Web Services and Flexi scale.

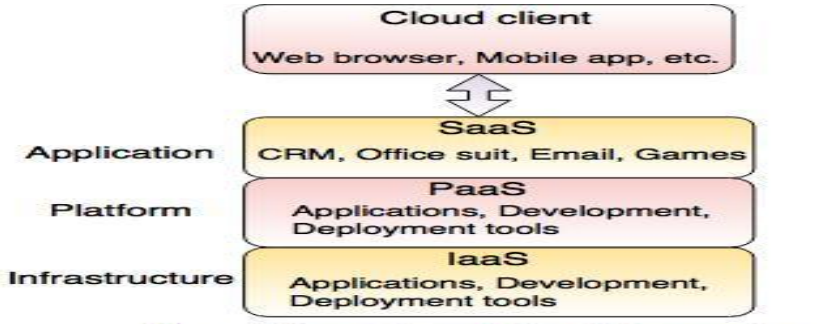


Fig. - Categories of Cloud Computing

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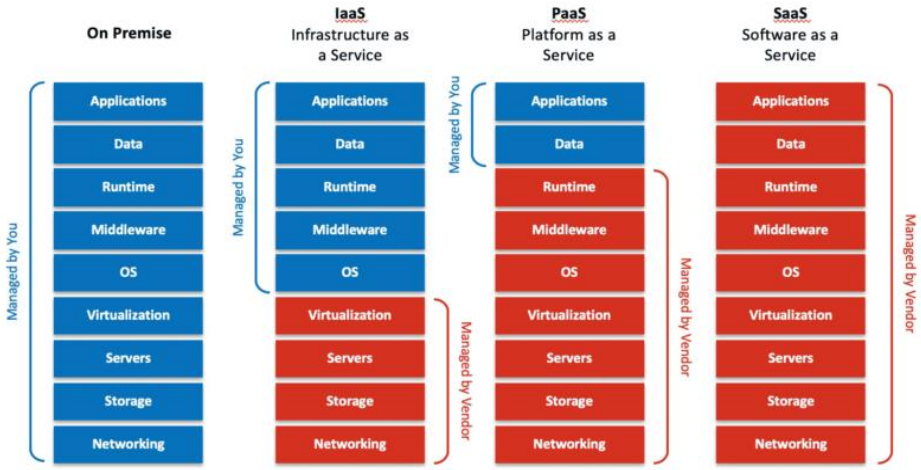
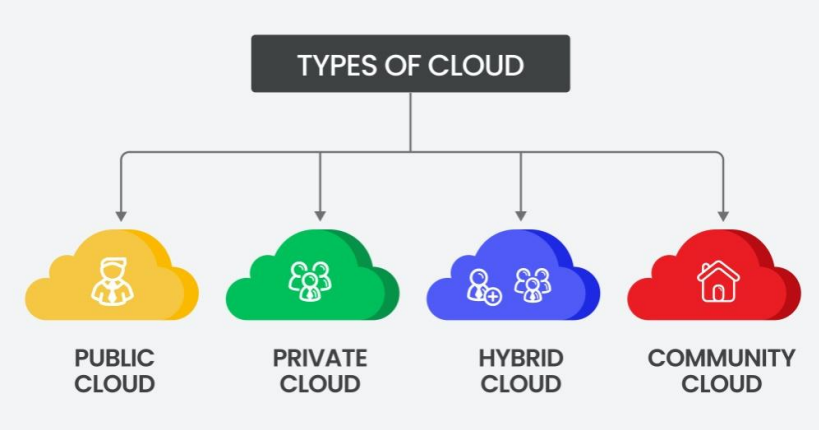
- SaaS-web browser-applications are designed for end users and are delivered over the web
- PaaS-cloud development environment-the set of tools and services designed to make coding and deploying applications quickly and efficiently
- IaaS-virtual infrastructure manager-the hardware and software that powers it all –servers, storage, network, operating systems



IV. TYPE OF CLOUD(4)- CLOUD COMPUTING DEPLOYMENT MODELS



- Private cloud- The cloud infrastructure is operated solely for an organization. e.g. Window Server 'Hyper-V'.
- Community cloud- The cloud infrastructure is shared by several organizations and supports a specific goal.
- Public cloud- The cloud infrastructure is made available to the general public e.g. Google Doc, Spreadsheet
- Hybrid cloud- The cloud infrastructure is a composition of two or more clouds (private, community, or public) e.g. Cloud Bursting for load balancing between clouds.

V. CLOUD COMPUTING APPLICATIONS

Nowadays organizations, especially small and medium-sized organizations are utilizing the benefits of cloud computing by putting their data and applications over the cloud [4]. The adaptation of cloud computing may lead to reduce the cost of purchasing and maintaining the IT infrastructure [1]. Cloud computing is composed of several features and provides plenty of facilities specifically for remote online access to resources. There are five common features illustrated at different domain as below [2].

- On-demand services

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- Wide network accessibility
- Resource pooling
- Quality of service
- Prompt scalability

The modern period has had a significant impact on the explosion of cloud applications. Such a movement of resources from physical to virtualization has a number of potential causes. The fundamentalist approach to IT resources has changed as a result of social media. The three most well-known technical concepts that emerge as the cutting-edge areas of innovation are quality of service (QoS), the Internet of Things (IoT), and e-commerce. For projecting and comparing virtualized technologies to traditional grid computing, Google Trends can be used [3]. According to the most recent research, the cloud has held roughly more than 60% of the data, including business transactions and personal data, through different cloud application software. The newest applications that generate massive data are social networks or the media [4]. The growth of data in recent years may have been caused by a number of factors, but the cloud's innovation is actually to blame. Internet users' worries about security and authenticity have increased as well, despite the rise of cloud software [5]. It is possible to claim that the rise in social networking through the cloud has increased security risk. Traditional applications need a lot of resources to operate efficiently, but most of us typically lack those resources to reap the full rewards. Applications for cloud computing are crucial in today's digital environment, which supports anything from bits to Big Data. They are practical tools for completing numerous ordinary activities and making efficient use of the resources at hand [6]. There are innumerable roles, and there are countless functionalities. Today, the cloud plays a significant role in the following sectors.

5.1 Ecommerce and Business Applications

The internet-based sales and service model known as ecommerce gained popularity in the 20th century [4]. Vendors and service providers are being encouraged by the most recent developments in mobile computing to capitalise even more commercially on the internet revolution. The emergence of e-commerce websites and mobile apps encourages business owners to take calculated chances in new endeavours [8]. With very little expenditure, e-commerce enhanced business revenues. The architecture of modern e-commerce depends on the live website availability, and since the cloud doesn't depend on a single machine, it manages this requirement quite effectively. The cloud is an interconnected network of devices with modern hardware and software resources that support one another and offer the optimum resource availability for things like product storage, product catalogue browsing, and processing of electronic payments [9]. The development of cloud computing, according to Danping Wang [5], is creating contemporary benefit settings that will coordinate all E-commerce assets and promote the underutilised benefit mode. Cloud computing is testing the viability of traditional service providers while creating fantastic prospects for E-commerce suppliers. Cloud computing is a key component of the top ecommerce service providers in the world, and some of them, like Amazon and Alibaba, also offer cloud computing services to other companies all over the world [5].

5.2 File Storage and Access Applications

Cloud storage is a type of cloud computing where data is kept on remote servers that are accessed over the internet, or "cloud," and is maintained, controlled, and managed by a service provider on storage servers built using virtualization techniques [5]. Hard discs, flash drives, and other conventional physical storage solutions have long since lost their lustre. These physical storage devices no longer rule the technological world; instead, consumers are turning to more sophisticated and alluring technical alternatives to store their files and data. The risk of losing storage and the need for cloud storage have both increased with the advent of these services. Based on the data storage server, cloud offers subscribers remote file storage services [4]. After processing all of their files on these storage servers, the subscriber can save or retrieve the files they require whenever they choose. The cloud has an advantage over conventional storage alternatives since it enables access to files from faraway locations with only a reliable internet connection. Google Drive, One Drive, Dropbox, Mediafire, and other well-known online cloud file storage and access programmes are a few examples. The main advantage of cloud-based storage services is accessibility as a user can access from anywhere in the world or by using any interconnected device like PC, Laptop, Tablet, Smart Phone or Smart Watches.

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5.3 Multimedia Processing Applications

Cloud-based processing, according to Ramasubramanian et al., is a fresh set of methods used to store multimedia material and offer consumers various capabilities via Internet access [6]. The cloud offers a common service for hardware, software, and a centralised server that fully supports whatever peripheral devices it connects to [7]. Applications for multimedia processing are typically free or paid subscription services, with the money made from paid customers going toward the upkeep of the service and paying for cloud processing expenses [8]. The few minute clips may be reserved many GBs of data, and their processing time is also determined according to the computer system's processing speed [9]. The multimedia processing activities required high processing speed and big storage space. The design of the cloud, which allows for 24-hour availability, greatly facilitates the processing of multimedia demands including encoding, conversion, marking, and streaming [1]. Applications for processing multimedia in the cloud are widely available online, including Netflix and YouTube.

5.4 Security and Antivirus Applications

The cloud is crucial to the security of the digital world. Due to multiple attacks on various systems in recent years, data protection has become more important [2]. New security requirements are emerging along with the new forms of assaults. With the help of legacy networks, users can access information stored in the cloud in the form of various services. This information is also commonly referred to as cloud storage because it contains a brief summary of cloud users' profiles, company information, and copy information that is made widely accessible using the internet as the backbone.Online knowledge backup, knowledge archiving, knowledge compliances, disaster recovery, and compliance rule area unit are the number of the problems in cloud knowledge storage [6]. The Most common cloud-based end-point protected antivirus is Malwarebytes, Sophos, Webroot, Symantec, and Eset

5.5 Map and Location based applications

Applications for location identification are often used today. These tools are frequently used to locate destinations, optimum routes, and other features on the chosen map. Maps, whether 2D or 3D, were employed in a variety of applications [6]. Some tools, like Google Maps, provide real-time data about the optimal route or accessible roots. The development of technology enables users to identify traffic patterns and map the most direct path to leave a specific spot [66]. There is a constant requirement for high processing machines with superior quality of increased storage devices since these applications are typically associated with satellites and the enormous volume of data that is typically exchanged between satellites and computing devices, therefore, the idea of cloud computing greatly aids in the support of location-based and geo-specific map applications. These applications can perform their live activities effectively and efficiently thanks to high-performance cloud computing. Ride-sharing, asset monitoring, gaming, traffic, GPS, and other common applications are gaining advantages from maps and location-based applications [7]. These apps can help real estate-based businesses by allowing them to label real estate on maps and simply measure the estate with a few clicks. All of these functions are provided by cloud computing technologies. Google Maps, Sygic, Here, MapFactor, Waze, Maps.me, and TomTom are some of the well-known cloud-based map and location programmes [8].

VI. SECURITY CHALLENGES IN THE CLOUD

Numerous security issues prevent customers from using the cloud's advantages. The dangers that are present in the cloud and their mitigation are listed below [7].

- **VM Attacks:** VM technology is the foundation of cloud computing. VMware, Sphere, and other hypervisors are utilised for cloud implementation. Attacks must be considered by developers. These issues can be resolved through coding and the usage of IDS and IPS, as well as the appropriate firewall.
- **Data Loss or Leakage:** It has a detrimental effect on company. by encrypting data in transit and safeguarding its integrity. Initial phases should include analysis of data protection at both design and runtime..
- **Loss of Governance:** SLA may not have commitment on part of cloud provider or cloud provider. But there is no proper SLA i.e. standard SLAs are not present.
- **Use of Cloud Computing:** This is used mainly due to weak registration system
    - By credit card fraud monitoring.

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- By implementing stricter registration process

- **Lock-IN:** Customer cannot move from one service provider to another. So to overcome this APIs should be used which should be standardized. So anybody can use them on cloud.

VII. SECURITY CHALLANGES AND ITS POSSIBLE SOLUTIONS

The cloud is the distribution of on-demand computer resources through the Internet on a pay-per-use basis, including everything from applications to data centres. Reduced capital expenses, improved accessibility, and increased flexibility are some benefits of the cloud. Despite all of its advantages, information security remains the most important issue. This study examines the likelihood of the data/information being secure in the cloud computing environment. There are various security concerns, but this paper focuses on the major ones. Following is a summary of the cloud security concerns [4][5][6]

7.1 Multi tenancy

Implies sharing of databases, computing resources, services, storage, physical access, and logical access with other tenants residing on the same physical or logical platform at the provider's premises. Due to the fact that this resource sharing compromises the security of tenants' IT assets, secure multi-tenancy is required. In order to provide this, there should be a level of data isolation between tenants as well as location transparency, meaning that tenants may not be aware of the physical location of their data or processes. In order to prevent premeditated assaults, a secure multi-tenancy platform must have location transparency, isolation of tenant data, and tenant data that is not known to or under the control of any one tenant.Always keep data at multiple locations so that even if at one place attack occurs back up is in other place.

- Isolation on PAAS should be done on running services and API.
- Isolation on SAAS isolate among transaction carried out on same instance by different tenants.
- Isolation on IAAS is on VM storage, memory network and cache memory.

7.2 Availability of Information

Implies that a company takes a calculated risk when it moves its processes, services, and applications to the cloud in terms of essential data, information, or procedures not being available when they are most required. Having a backup plan to cover an outage occurrence for local resources that contain vital information is one strategy to reduce the impact of resources not being available. A monitoring and notification system should be set up by the supplier so that customers can be informed of any potential downtime.

7.3 Elasticity

Implies that customers have the choice to adjust the resources allocated to resources according to the level of demand at the time. The tenant's nation should be the location of the data, which is the answer to this problem. In order to fulfil demand and ensure effective resource usage, the placement engines also incorporate mitigation strategies that involve moving services from one logical or physical host to another, or from one cloud provider to another.

7.4 Information Integrity and Privacy

Means making resources accessible to both lawful users and malicious attackers through the internet. Through remote connections, web browsers, etc., tenants can access their resources. Lack of authorisation and authentication, accounting controls, and improper management of encryption and decryption keys are a few of the significant privacy and authentication challenges in information security. To solve this issue, adequate authentication and authorization procedures must be put in place, requiring that any attempt to access the data pass through a series of checks to guarantee that only tenants who have been given permission can access it.

7.5 Secure Information Management

The microkernel that may be expanded to include and coordinate elements like service monitoring, billing, services registration, and cloud security management is known as the cloud management layer. This layer is extremely important

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because if it is breached, a hostile user might end up controlling the entire cloud platform like an administrator. The answer is to integrate security configurations, input from the environment to security management, and security requirements specifications created from tenant organisations that are examined and applied in tenants' unique physical and logical environments.

7.6 Multiple Stake Holders

Various parties with an interest in cloud computing are The person who uses cloud infrastructure to deliver apps to end users is a service provider. Infrastructure is delivered to cloud customers by the cloud provider. The customer is the one who utilises the cloud-based service. Each of the aforementioned has unique security concerns. Each consumer will have a unique level of trust with the suppliers, and occasionally the user may even be the aggressor. However, in order for the normal conditions to be there, the provider and the consumer must agree on the terms.

7.7 Cloud Secure Federation

When a cloud customer uses apps and information that rely on cloud services from various providers, it creates a problem since it must maintain security standards that are upheld on both clouds and anywhere in between. Identity federation, which makes use of dense attributes federation, single sign-on, authentication, and authorization, can help to solve this issue.

7.8 Third Party Control

Owner has no control over how their data is processed because it is a concern of a third party. As a result of cloud providers' ignorance of cloud architecture, adequate security is not offered. Users may occasionally become bound to a single vendor. This occurs as a result of agreement or a challenge with data migration to a new vendor.

7.9 Repudiation of Information

When it comes to proving the transaction they carried out was indeed them, the provider and the consumer find themselves in a tight spot. They may even deny that it was them. The cloud provider must make sure that a non-repudiation enabled protocol or handshake is implemented in order to prevent this problem at the cloud level. This protocol or handshake prevents the participating parties from denying their involvement in a disputed transaction.

7.10 Integrity of Information

Is attained when there is mutual trust between the service provider and the customer, and they support one another and the security so that the entire system runs well. The cloud service provider and customer should set authorization and accounting procedures in order to achieve this proper authentication. The login information for the cloud should be unique, secure (RSA tokens or one-time passwords), and not shared between the divisions of the customer business.

7.11 Service Disruptions

Any business or organisation may find itself in a challenging situation if the information needed is unavailable when it is most needed. A DOS or DDOS attack may also result in undesirable conduct. Sharing of account credentials between customers should be outright forbidden. This problem can be solved by using the defense-in-depth strategy to install security controls at different stages along the cloud access channel as well as within the consumer and provider network.

7.12 Loss of Control

For an organisation, the loss of controls can be disastrous. Before making the decision to migrate their data/information to the cloud, this is one of the CIOs' top worries. Organizations should be aware of the security policies, storage policies, and SLAs of cloud providers in order to reduce this impact. This will help both the provider and the customer understand how the customer's data will be handled in the cloud.

7.13 Security Management

What security controls the customer must offer in addition to those built into the cloud platform and how must an

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organisation secure itself in the cloud are two key components of effective cloud security management. Based on the sensitivity of the data and evolving service levels, each of these aspects need to be continuously reevaluated.

VIII. CONCLUSION

A new technology that is predicted to dramatically lower the cost of existing technologies is cloud computing, which is the current development trend in the IT sector. Cloud computing has both advantages and disadvantages for information security. Whether we can maximise its advantages while minimising its drawbacks will determine the final outcome. Only in this way can the cloud become a platform for increased productivity, actual cost savings, and security. Security of information, whether it is at rest or in transit, is the most significant of all these problems. The most important security concerns relating to cloud infrastructure are covered in this paper. There are several security concerns. To protect the data from outside threats, the next secure cloud architecture is suggested. Next cloud computing security considerations are discussed which must be included in every cloud for the data in it to be secure.

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