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An Overview of Cloud Security Problems and Solutions Using Different Methods

Sukhwinder Kaur[1*], Pooja[2], Harpreet Kaur[3], Rimpi Rani[4]
[1,2,3,4]*Assistant Professor, University College of Computer Application, Guru Kashi University, Bathinda, India*

***Abstract*: Cloud security is also called cloud computing security. It is the set of technologies and applications which includes hardware, software, and application. The field is closely related to database security, network security, etc. Cloud security is very close to computer security, IT security, or information security. Day by day the IT infrastructure becomes a common need of every individual and organization so the security aspect is an important concern in this regard. Cloud computing security is controlled by different methods Such as Authentication and Identity, Data Encryption Information integrity and Privacy, Availability of Information (SLA) etc. Today cloud computing is used in both the industrial field and academic fields. This paper talks about various areas of security in the basic sense. The paper also talks about Security problems related to the Cloud. This paper mainly introduces the concept of cloud security, and cloud security solutions are discussed.**

***Keywords*: Cloud computing, cloud security, users, security threats, security methods, cloud solutions.**

1. Introduction

Cloud computing, also known as internet computing, refers to the services accessed over the internet where data and programs are stored, managed, and accessed on remote servers instead of local computer hard drives. It has gained popularity in various fields, including academia, due to its benefits such as scalability, flexibility, data availability, and cost reduction. Examples of cloud computing include Google Apps.

However, while cloud computing offers numerous advantages, there are also concerns regarding the secure access and storage of data. Issues related to cloud security include elasticity, insider and outsider attacks, multi-tenancy, and loss of control, data loss, and network security. These are areas of ongoing research and development in the field of cloud computing. As more users embrace cloud services with the advancement of cloud computing technology, security has become a top priority. Analyzing different methods to secure cloud computing is crucial. While the cloud computing era has arrived, ensuring its security involves addressing various technical and policy-related challenges. Constantly improving data security requirements and information storage is essential to overcome the issues surrounding cloud security. Cloud security will remain a significant focus in the future to address the evolving landscape of cloud computing and deliver robust solutions for safeguarding data and storage. In today's information technology landscape, security holds paramount importance. Organizations, including government bodies, heavily rely on information technology, with cloud computing.

The adoption of cloud computing extends to various types of organizations and institutions. It necessitates the establishment of proper policies, regulations, frameworks, and their effective implementation. It is crucial to note that enhanced security requires collaborative efforts from both cloud service providers and customers. As cloud-based products and services are widely used by the general public, it becomes highly desirable for individuals to possess a basic understanding and awareness of the field. While we are in the era of cloud computing, ensuring its security entails addressing numerous technical and policy-related challenges. To resolve cloud security concerns, continuous advancements in data protection standards and storage methods are vital.

In conclusion, cloud security will continue to be of utmost importance in the future. Given the significance of security in information technology, particularly within cloud computing, organizations across various sectors

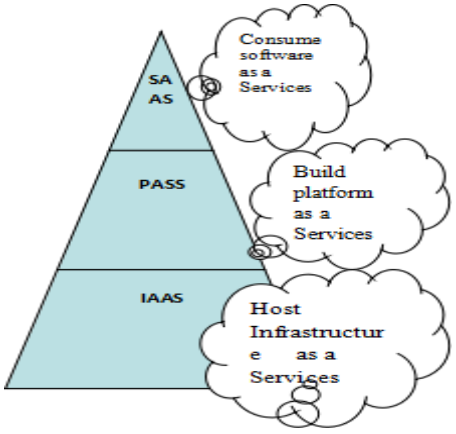

Fig. 1. Cloud computing services

A. Objective

The main aim of this paper includes,

- To learn about the basics of Cloud Computing and its types, nature as well as importance.
- To learn about the basics of Cloud Security Threats and their continuous development about the fundamentals of Cloud Security threat management

*Corresponding author: sukhwinderkaur@gku.ac.in

tools as well as ways.

- To learn about the different Cloud Security Controls and Security and Privacy issues in a brief manner.

B. Cloud Computing Deployment Models

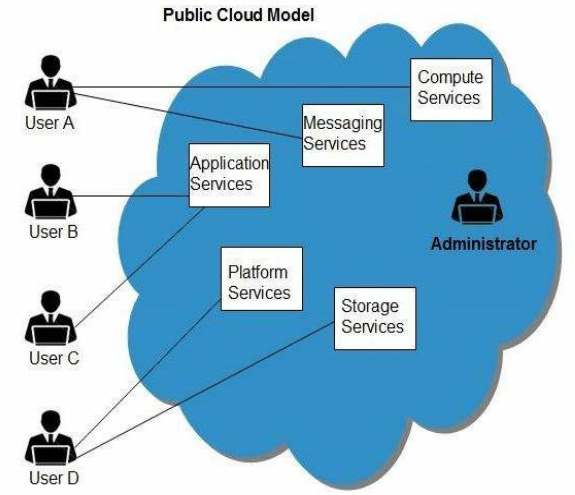

Fig. 2. Public cloud

1) Public Cloud

Public clouds, as the name implies, are accessible to the general public, allowing resource sharing among multiple users. These cloud services are available to anyone with an internet connection, regardless of their location. The public cloud delivery model is widely adopted and popular in the realm of cloud computing. It involves hosting the computational infrastructure in the service provider's data center. The public cloud model provides access to various resources, including storage and applications, through the World Wide Web. This approach ensures that all user requests can be accommodated, and the availability of resources is virtually limitless.

2) Hybrid Cloud

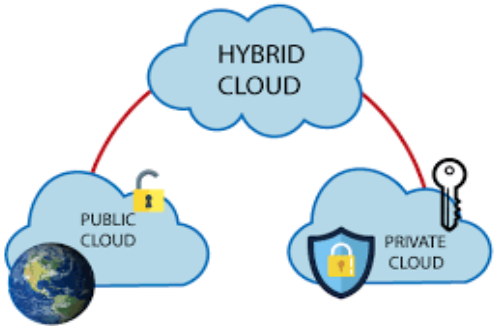

Fig. 3. Hybrid cloud

The hybrid cloud deployment model entails a combination of both public and private clouds. It involves the utilization of public cloud services while maintaining on-premises systems and establishing a connection between the two. This integration enables the hybrid cloud to function as a unified system, making it an ideal choice for organizations seeking a gradual transition to the public cloud.

Certain companies have specific security concerns and privacy requirements that prevent them from operating exclusively in the public cloud. In such cases, opting for a hybrid cloud model allows them to leverage the advantages of the public cloud while accommodating their specific needs. This approach enables on-premises applications that handle sensitive data to coexist alongside public cloud applications, providing a balance between security and scalability.

3) Private cloud

A private cloud [1] delivery model is an environment dedicated to a single user or customer. The hardware is all yours, so you don't have to share it with others.

Since this is a one-to-one disposable environment, there is no need to share hardware with others. A key difference between private cloud and public cloud deployment models show they approach hardware. Also known as an “internal cloud, “it refers to the ability to access systems and services within an organization or perimeter

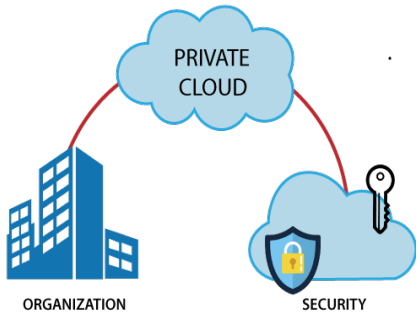

Fig. 4. Private cloud

4) Community cloud

The community cloud model facilitates the availability of systems and services to a specific community or group of multiple companies, enabling them to share data and resources. This type of cloud is owned, managed, and operated by one or more organizations within the community, a third-party provider, or a combination of both. The community cloud model allows for collaboration and data sharing among the participating companies while maintaining control and customization specific to the community's needs.

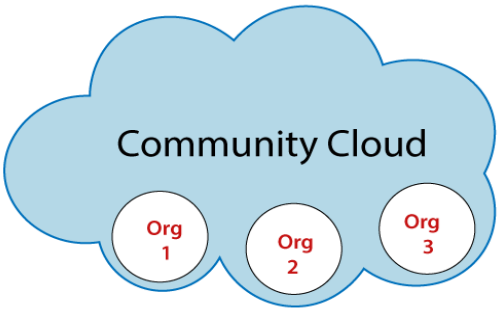

Fig. 5. Community cloud

C. Characteristics of Cloud Computing

Cloud computing has the following characteristics [5],

- Very-large-scale: Computer service providers leverage virtualization technology to distribute data and information across multiple hosts located in

different places, enabling them to deliver efficient and effective processing capabilities. They make use of a resource pool, which encompasses various software and hardware resources offered by cloud computing. When providing services to users, it eliminates the need for users to understand the server's operational procedures or computational methods. Users are not able to observe the entire workflow but can simply pay according to their specific requirements.

Rich and high scalability: Cloud computing platforms offer a wide range of diverse cloud products. These platforms possess a complex internal structure and operate on a large scale, allowing for continuous expansion of storage space and processing capacity to cater to the immense demands of users. Security measures are paramount, as cloud providers employ various data protection technologies, multiple backups, and fault-tolerant mechanisms to ensure the safety and integrity of user operations and data. Compared to local computers, cloud computing offers enhanced security and reliability. Additionally, the automatic management capabilities of cloud computing significantly reduce the data center's

Management costs. The standardized nature of cloud computing enhances the efficient utilization of IT resources, allowing for the utilization of cost-effective nodes to form the cloud infrastructure.

D. Advantages of Cloud Computing

1) Cost Savings

If you are concerned about the initial cost of implementing a cloud-based server, it's important to remember that you are not alone. Many organizations share this concern. However, when weighing the advantages and disadvantages of cloud computing, it is crucial to consider factors beyond just the upfront price. Return on Investment (ROI) should be taken into account.

Once you transition to the cloud, you will benefit from easy access to your company's data, resulting in time and cost savings during design and start-up processes. Moreover, for those worried about paying for unnecessary features, most cloud computing services operate on a pay-as-you-go model. This means that if you don't utilize the cloud's offerings, you won't have to spend money on them. This payment system also extends to the required data storage space for servicing your stakeholders and visitors. You only pay for the necessary space and aren't charged for any unused space. These factors combined contribute to lower costs and increased returns.

According to a survey by Bit glass, half of all CIOs and IT leaders reported cost savings in 2015 as a result of utilizing cloud-based operations. Therefore, it's important to consider the long-term benefits and potential cost savings when evaluating the switch to cloud computing.

2) Security

Many organizations express concerns about security when considering adopting a cloud computing solution. It's understandable to worry about the safety of your data when it's not stored securely on-site. How can you be certain that it is adequately protected? If you have access to your data, what's preventing a cybercriminal from doing the same? However, there are several factors that provide significant security advantages in the cloud.

First and foremost, ensuring security is the primary responsibility of a cloud host. Their dedicated focus on security makes them more effective than a conventional in-house system, where an organization must divide its efforts among multiple IT tasks, with security being just one of them. While many businesses hesitate to acknowledge the possibility of internal data theft, the reality is that internal data breaches do occur and are often executed by employees. In such cases, it can be safer to keep sensitive information off-site.

Let's consider some solid statistics to support the argument. Rapid Scale reports that 94% of businesses witnessed an improvement in security after transitioning to the cloud, and 91% stated that the cloud made it easier to meet government compliance requirements. The key to this enhanced security lies in data encryption during transmission over networks and storage in databases. By utilizing encryption, information becomes less accessible to hackers or unauthorized individuals. Furthermore, with most cloud-based services, different security settings can be established based on the user's needs.

While 20% of cloud users claim to achieve disaster recovery within four hours or less, only 9% of non-cloud users can make the same claim. This demonstrates the effectiveness of cloud computing in ensuring prompt recovery and business continuity in the event of a disaster.

In summary, cloud computing offers robust security measures, including encryption and customizable security settings, which significantly enhance data protection. Embracing the cloud can provide businesses with improved security, easier compliance, and efficient disaster recovery capabilities.

3) Flexibility

Your business has only a finite quantum of focus to peak between all of its responsibilities. However, also you are not going to be suitable to concentrate on reaching business pretensions and satisfying guests If your current IT results are forcing you to commit too important of your attention to computer and data-storehouse issues. On the other hand, by counting on an outside organization to take care of all IT hosting and structure, you will have further time to devote to the aspects of your business that directly affect your nethermost line. The cloud offers businesses more inflexibility overall versus hosting on an original Garcon. And, if you need redundant bandwidth, a cloud-based service can meet that demand incontinently, rather than witnessing a complex (and precious) update to your IT structure. This bettered freedom and inflexibility can make a significant difference to the overall effectiveness of your organization. A 65 maturity of replies to an InformationWeek check said “the capability to snappily meet business demands” was one of the most important reasons a business should move to a cloud terrain.

4) Mobility

Cloud computing enables mobile access to business data through Smartphone and tablets, which is particularly valuable considering the widespread use of over 2.6 billion Smartphone

worldwide. This accessibility ensures that no one is left out of the loop. Employees with busy schedules or those located far away from the corporate office can stay up-to-date with clients and colleagues effortlessly.

With the cloud, you can provide easily accessible information to sales staff on the go, freelance workers, and remote employees, promoting a better work-life balance. It comes as no surprise that organizations prioritizing employee satisfaction are over 24 times more likely to embrace cloud operations.

By leveraging the cloud, businesses empower their workforce to stay connected and collaborate regardless of their location. This level of flexibility and connectivity enhances productivity and supports a modern and dynamic work environment.

5) Insight

As we continue to advance in the digital age, the significance of data has become even more evident. The traditional saying "knowledge is power" has evolved into a more modern and accurate form: "Data is wealth." Within the vast amount of data encompassing your client deals and business processes, there are invaluable pieces of actionable information waiting to be discovered and utilized. However, extracting these insights from the data can be a challenging task unless you have access to the right cloud computing solution.

Numerous cloud-based storage solutions offer integrated cloud analytics, providing you with a comprehensive overview of your data. By storing your information in the cloud, you can easily apply tracking mechanisms and generate customized reports to analyze information across your entire organization. With this level of insight, you can gain a competitive edge and develop action plans to meet your organization's objectives. For instance, Sunny Delight, a beverage company, was able to increase profits by approximately $2 million annually and reduce staffing costs by $500,000 through cloud-based business operations.

By harnessing the power of cloud computing and utilizing advanced analytics tools, businesses can unlock the hidden value within their data. This empowers them to make informed decisions, drive growth, and optimize their operations in ways that were previously unimaginable.

6) Increased Collaboration

In today's business landscape, prioritizing collaboration is crucial, regardless of whether your organization consists of two employees or more. After all, having a team is pointless if they cannot function as a cohesive unit. Fortunately, cloud computing simplifies the collaboration process. Through a cloud-based platform, team members can easily and securely view and share information. Some cloud services even provide collaborative social spaces that facilitate connections between employees across the organization, fostering engagement and interest. While collaboration is possible without cloud computing, it will never be as seamless or as efficient. Embracing cloud technology enhances collaboration, enabling teams to work together effortlessly and achieve greater productivity.

7) Quality Control

Few things can undermine the success of a business as much as poor-quality and inconsistent reporting. However, a cloud-based system mitigates these issues by storing all documents in a unified location and format. By ensuring that everyone accesses the same information, you can maintain data consistency, prevent costly errors, and keep a clear record of any changes or updates. Conversely, managing information in separate silos increases the likelihood of employees accidentally saving different versions of documents, resulting in confusion and compromised data integrity. Adopting a cloud-based approach promotes data integrity, streamlines reporting processes, and safeguards the accuracy and reliability of your business information.

8) Disaster Recovery

One of the factors that contribute to the success of a business is control. Unfortunately, no matter how in control your organization may be when it comes to its processes, there will always be effects that are fully out of your control, and at the moment's request, indeed a small quantum of unproductive time-out can have a resoundingly negative effect. Time-out in your services leads to lost productivity, profit, and brand character.

But while there may be no way for you to help or indeed anticipate the disasters that could potentially harm your organization, there's a commodity you can do to help speed your recovery. Cloud-based services give quick data recovery for all kinds of exigency scripts, from natural disasters to power outages. While 20 of cloud druggies claim disaster recovery in four hours or lower, only 9 of non-cloud druggies could claim the same. In a recent check, 43 IT directors said they plan to invest in or ameliorate cloud-based disaster recovery results.

9) Loss Prevention

Still, also all of your precious data is inseparably tied to the office computers it resides in If your organization is not investing in a cloud-computing result. This may not feel like a problem, but the reality is that if your original tackle gets a problem, you might end up permanently losing your data. This is a more common problem than you might realize computers can malfunction for numerous reasons, from viral infections to age-related tackle deterioration, to simple stoner error. Or, despite the stylish of intentions, they can be lost or stolen (over, 000 laptops are reported misplaced every week at major airfields).

Still, you are at threat of losing all the information you had saved locally If you are not on the cloud. With a cloud-based Garcon, still, all the information you've uploaded to the cloud remains safe and fluently accessible from any computer with an internet connection, indeed if the computer you regularly use is not working.

10) Automatic Software Updates

For those who have a lot to get done, there is not anything further prickly than having to stay for system updates to be installed. Cloud-based operations automatically refresh and modernize themselves, rather than forcing an IT department to perform a homemade organization-wide update. This saves precious IT staff time and Pluto crat spent on outside IT

discussions. PC World lists that 50 of cloud adopters cited taking smaller internal IT coffers as a cloud benefit.

11) Competitive Edge

While cloud computing is adding fashion ability, there are still those who prefer to keep everything original. That is their choice, but doing so places them at a distinct disadvantage when contending with those who have the benefits of the cloud at their fingertips. However, you will be further along the literacy wind by the time they catch up, If you apply a cloud-based result before your challengers. A recent Verizon study showed that 77 of businesses feel cloud technology gives them a competitive advantage, and 16 believe this advantage is significant.

12) Sustainability

In today's world, organizations need to go beyond superficial gestures like placing a recycling caddy in the break room to truly contribute to environmental sustainability. True sustainability requires comprehensive measures that address waste reduction at every level of a business. Hosting on the cloud is a more environmentally friendly option that significantly reduces the carbon footprint.

Cloud architectures actively support environmental preservation by relying on virtual services instead of physical products and infrastructure. This approach reduces paper waste, optimizes energy efficiency, and, since it enables remote access from anywhere with an internet connection, minimizes the need for physical computer resources and associated emissions. According to a Pike Research report, data center energy consumption is predicted to decrease by 31% from 2010 to 2020 due to the adoption of cloud computing and other virtual data solutions.

By embracing cloud hosting, organizations contribute to a greener future by reducing their environmental impact. The cloud offers a sustainable alternative that aligns with the principles of waste reduction and energy efficiency. It's a responsible choice that not only benefits the organization but also helps preserve our planet for future generations.

13) Backup and restore data

Once data is stored in the cloud, it's easier to get its reverse-up and recovery, which is relatively a time-consuming process in on-premise technology.

14) High speed

Cloud Computing lets us emplace the service snappily in smaller clicks. This quick deployment lets us get the coffers needed for our system within Twinkles.

15) Reliability

Cloud hosting comes with the biggest advantage of trust ability. One does not have to worry about changes due to instant updates.

16) Data security

Data security [6] is one of the biggest advantages of cloud computing. The cloud offers numerous advanced features related to security and ensures that data is securely stored and handled.

2. Cloud security issues

There is no doubt that Cloud Computing provides various Advantages but there are also some security issues in cloud computing. Below are some following Security Issues [9] in Cloud Computing as follows.

A. Elasticity

Elasticity consists of the growth and reduction of resources according to the workload. Elasticity implies scalability. It says that customers are capable of scaling up and down as needed. These scaling permits tenants to use an aid this is assigned formerly to a different tenant. However, this can cause confidentiality issues.

B. Multi-tenancy

Multi-tenancy [1] in cloud computing means that many tenants or users can use the same resources. The users can independently use resources provided by the cloud computing company without affecting other users. Multi-tenancy issues in cloud computing are a growing concern, especially as the industry expands. And big business enterprises have shifted their workload to the cloud. Cloud computing provides different services on the internet. Including giving users access to resources via the internet, such as servers and databases. There is no need to be at a specific place to store data. Information or data can be available on the Internet. One can work from wherever he wants. Cloud computing brings many benefits for its users or tenants, like flexibility and scalability. Tenants can expand and shrink their resources according to the needs of their workload. Tenants or users do not need to worry about the maintenance of the cloud. Tenants need to pay for only the services they use. Still, there are some multi-tenancy issues in cloud computing that you must look out for:

C. Insider attacks

Insider threats in cloud computing refer to security breaches or malicious activities that originate from within an organization, rather than from external sources. These threats can come from employees, contractors, or third-party vendors who have legitimate access to an organization's cloud-based resources.

D. Outsider attacks

Attacks by attackers who do not have direct access to any authorized node in the network. However, the attacker may have access to the physical data medium, especially in the case of wireless networks. Therefore, attacks such as replay and eavesdropping fall into this category. However,

Surviving this attack is quite easy using traditional security techniques such as encryption and digital signatures.

E. Data Loss

Data loss can occur due to various reasons, including the overwriting of files, sudden hard drive failures, and internal or external process failures within or outside an organization. Data loss poses a significant risk to the security and integrity of data, much like a data breach where unauthorized individuals gain access to data. However, in data loss scenarios, the data may be

completely lost or inaccessible.

The causes of data loss can vary across different industries and can occur during routine IT procedures like data migration or as a result of malicious attacks from malware or other cyber threats. Regularly backing up your files is a crucial practice that allows for data recovery in case of loss. Without proper backups, professional data recovery services may be required to retrieve lost data. Data loss can affect servers, individual computers, and other devices within an organization.

Protecting against data loss requires implementing robust data backup strategies, ensuring system reliability, and implementing security measures to prevent unauthorized access or data breaches. By prioritizing data backup and recovery processes, organizations can minimize the impact of data loss incidents and ensure business continuity.

F. Loss of Control

Cloud computing operates on a location transparency model, which means that organizations are not necessarily aware of the physical location of their services and data. This allows service providers to host their services from various cloud infrastructures. However, this can introduce potential risks, such as data loss and a lack of awareness regarding the security mechanisms employed by the service provider.

In such cases, organizations may face challenges in understanding the exact security measures implemented by the cloud service provider. This can potentially lead to concerns about data security and confidentiality. It is crucial for organizations to carefully select and collaborate with reputable cloud service providers that have robust security protocols in place. This includes measures such as data encryption, access controls, regular backups, and monitoring for unauthorized activities.

By conducting thorough due diligence and establishing clear communication with the service provider, organizations can mitigate the risk of data loss and ensure that appropriate security mechanisms are in place to safeguard their sensitive information. Regular assessments and audits of the cloud provider's security practices can also provide reassurance and help maintain a strong security posture for the organization's data in the cloud.

G. Network Security

Network security is a comprehensive set of measures and protocols designed to safeguard your network and data from potential data breaches, unauthorized access, interference, and other security threats. It encompasses a wide range of hardware and software solutions, as well as rules, settings, and processes that govern network usage, accessibility, and overall protection against threats.

Effective network security involves various components and practices, including access control mechanisms, implementation of virus and antivirus software, application protection, network analysis tools, and deployment of different network security types such as endpoint security, network security, and wireless security. Additionally, firewalls play a crucial role in monitoring and filtering network traffic to prevent unauthorized access and potential threats from reaching your network.

By implementing robust network security measures, organizations can create a secure environment that protects sensitive data, ensures network integrity, and mitigates the risks associated with cyber threats. Regular monitoring, updates, and adherence to best practices in network security are essential to maintaining a strong and resilient network infrastructure.

H. Flooding Attack Problem

Within cloud servers, communication and data transfer between servers occur to process data requests. Before processing the requested work, authentication is performed to ensure security. However, this authentication process can consume significant CPU usage and memory resources. Consequently, the server may become overloaded, leading to the transfer of its workload to another host. This can cause interruptions in the normal system processing and result in system congestion.

The heavy load on the server due to authentication can impact system performance and availability. To address this issue, it is important to optimize the authentication process and allocate sufficient resources to handle the workload effectively. Load balancing techniques can be employed to distribute the load across multiple hosts and prevent overloading of individual servers. This helps to maintain system stability and ensure uninterrupted processing.

By carefully managing system resources, implementing efficient authentication mechanisms, and employing load balancing strategies, cloud service providers can mitigate the risk of system overload and maintain a smooth operation for their users. Continuous monitoring and scaling of resources based on demand can further enhance the performance and resilience of the cloud infrastructure.

3. Methods to Secure Data in Cloud

A. Authentication and Identity

Users and even communication Systems are Authentications by various methods, but cryptography is common. Users are Authentication through passwords that are known individually, by using Security Tokens, or by an encryption key, fingerprint major problem with using traditional approaches is synchronizing identity information between enterprise and multiple cloud service providers. Migrating infrastructure to a cloud-based solution creates other problems with traditional identity approaches.

B. Data Encryption

If you are planning to store touchy data on large facts save then you need to apply facts encryption techniques. Having passwords and firewalls is good, but humans can skip them to get entry to your facts. While statistics is encrypted it is in a form that can't be read without an encryption key. The facts are useless to the intruder. It's miles a method of translation of statistics into secret code. If you want to examine the encrypted statistics, you need to have a secret key or password which is also referred to as an encryption key.

C. Information Integrity and Privacy

Cloud computing offers records and resources to valid customers. Assets may be accessed thru net browsers and also can be accessed via malicious attackers. A convenient method for the hassle of records integrity is to offer mutual consideration to the company and the user. Any other answer may be imparting proper authentication, authorization, and accounting controls so the method of getting access to information needs to go through various multi ranges of checking to make sure legal use of assets]. A few secured get rights of entry to mechanisms need to be furnished like RSA certificate, and SSH-based total tunnels. Cloud computing provides information and resources to valid users. Resources can be accessed through web browsers and can also be accessed by malicious attackers. A convenient solution to the problem of information integrity is to provide mutual trust between provider and user. Another solution can be providing proper authentication, authorization, and accounting controls so the process of accessing information should go through various multi levels of checking to ensure authorized use of resources. Some secured access mechanisms should be provided like RSA certificates and SSH-based tunnels.

D. Availability of Information (SLA)

The no availability of data or records is a major issue concerning cloud computing offerings. Carrier degree agreement is used to provide statistics approximately whether the network resources are available for users or now not. It's miles a accept as true with bond among client and company. A manner to provide availability of resources is to have a backup plan for nearby resources in addition to for most critical records. This permits the consumer to have data about the sources.

Unavailability: Non-availability of information or data is a major issue regarding cloud computing services. Service Level Agreement is used to provide information about whether the network resources are available for users or not. It is a trust bond between the consumer and the provider. One way to provide availability of resources is to have a backup plan for local resources as well as for the most crucial information. This enables the user to have information about the resources even after their unavailability.

E. Secure Information Management

It's far a technique of information protection for a collection of facts in the vital repository. It's miles produced from agents going for walks on structures that are to be monitored and then sends statistics to a server that is referred to as the “protection Console”. The safety console is managed with the aid of an admin who's a person who critiques the facts and takes action in response to any alerts. Because the cloud consumer base, and dependency stack increase, the cloud protection mechanisms to solve security problems additionally increase, which makes cloud safety control a great deal more complex. It is also referred to as a Log control. Cloud companies also offer a few protection standards like PCI DSS, and SAS. Statistics safety management maturity is some other model of records security control device. Security Management Maturity is another model of an Information Security Management System.

F. Malware-Injection Attack Solution

This solution creates a no.of client virtual machines and stores all of them in an imperative garage. It makes use of fats (report Allocation table) which includes virtual running structures. The software that is run via a purchaser can be found in the fats desk. All of the times are controlled and scheduled with the aid of Hypervisor. IDT (Interrupt Descriptor table) is used for integrity checking This solution creates a no. of client virtual machines and stores all of them in a central storage. It utilizes FAT (File Allocation Table) consisting of virtual operating systems. All the instances are managed and scheduled by Hypervisor. IDT (Interrupt Descriptor Table) is used for integrity checking.

G. Flooding Attack Solution

All of the servers in the cloud are considered as a fleet of servers. One fleet of a server is considered for gadget-type requests, one for reminiscence management, and the last one for core computation-associated jobs. All the servers in a fleet can talk with one another. While one of the servers is overloaded, a brand-new server is brought and used inside the place of that server and the other server referred to as a name server has all the files of contemporary states of servers and could be used to update destinations and states. The hypervisor may be used for managing jobs. Hypervisor also does the authorization and authentication of jobs. An authorized customer’s request may be diagnosed with the aid of PID. RSA also can be used to encrypt the PID.

H. Validation of OTP

In the current scenario, many banks offer Authentication by one-time password (OTP) method. It is generated by random generation, if used for one, it is used to verify the cloud user. Time authentication called system factor authentication can be used by two people temporal authentication is called multiple authentication factors

1) Data Masking

Data masking is a crucial process that enhances the security and confidentiality of data stored in the cloud. It involves obscuring sensitive information to protect it from potential attackers and theft. Data masking ensures that while the data is transformed in a realistic manner, it remains unidentifiable and secure.

By applying data masking techniques, sensitive information such as personally identifiable information (PII) or financial data can be replaced with realistic but fictitious values. This ensures that the data retains its usefulness for development, testing, or analysis purposes while minimizing the risk of unauthorized access or misuse.

Data masking helps organizations comply with privacy regulations and standards by safeguarding sensitive data and preventing potential data breaches. It allows businesses to share datasets with third parties or conduct internal testing without compromising the confidentiality of the original information.

Various data masking methods can be employed, such as substitution, shuffling, encryption, or tokenization, depending

on the specific requirements of the data and the desired level of protection. The choice of data masking techniques should be based on a thorough understanding of the data landscape and potential security risks.

By implementing effective data masking practices, organizations can maintain the privacy and security of their cloud-based data, reduce the risk of data breaches, and uphold the trust of their customers and stakeholders.

2) Data Redetection

Data sanitization and understanding encompass a broader concept than just data masking. It involves the methods and techniques used to transform or alter data in order to protect its confidentiality and comply with privacy regulations. While data masking is commonly used to mask static data, there are other approaches for achieving data sanitization.

Static Data Masking (SDM) is frequently employed by organizations, particularly when creating test environments. It allows for the masking of sensitive data, such as personally identifiable information, to ensure data privacy and security. This is especially relevant when collaborating with external developers or outsourcing work to other locations or companies.

Dynamic Data Masking (DDM) is another technique that grants access to data based on an individual's role within an organization. It allows users to interact with the data while controlling their visibility to sensitive information. By dynamically masking sensitive data, organizations can ensure that only authorized individuals can access and view the complete dataset, while others see only the masked or obfuscated information.

Implementing a combination of data sanitization techniques, such as SDM and DDM, enables organizations to maintain data privacy, security, and compliance. By carefully managing access to sensitive data and applying appropriate masking or obfuscation methods, organizations can protect their data and mitigate the risk of unauthorized access or exposure.

It is important for organizations to evaluate their specific data protection requirements and select the appropriate data sanitization methods accordingly. This ensures the confidentiality and integrity of their data, whether stored in the cloud or on-premises, and helps build trust with customers and stakeholders.

4. Standards for Security in Cloud Computing

A. Security Assertion Mark-up Language (SAML)

SAML (Security Assertion Markup Language) is a widely adopted standard used in business transactions to facilitate secure communication between online partners. It is an XML-based protocol that enables authentication and authorization between various entities involved in the transaction.

SAML defines three key roles: the Principal (User), the Service Provider (SP), and the Identity Provider (IDP). The Principal refers to the user or entity seeking access to a service. The Service Provider is the online platform or application that offers the service, while the Identity Provider is responsible for authenticating the Principal's identity and providing the necessary credentials.

Through SAML, various queries and responses related to user attributes, authorization, and credentials are exchanged in XML format. The Identity Provider verifies the user's identity and generates a SAML assertion, which includes relevant security information and attributes. This assertion is then securely transmitted to the Service Provider, which can use it to make informed decisions about granting access to requested resources or services.

By leveraging SAML, organizations can establish a trusted framework for secure communication and streamline the authentication process between partners. It provides a standardized method for exchanging security information and user attributes, ensuring the confidentiality and integrity of data throughout the transaction.

Overall, SAML plays a vital role in enabling secure online collaborations, protecting sensitive information, and establishing a foundation of trust between partners in business transactions.

B. Open Authentication (OAuth)

This is how you work with protected data. Used to provide data access to developers. Users can grant access to information to developers and consumers. Share their identity. Open Authentication itself does not provide security and relies on it other protocols such as SSL to provide security.

C. OpenID

OpenID is a widely adopted protocol that enables single sign-on (SSO) functionality. It simplifies the login process by allowing users to authenticate themselves once and gain access to multiple related systems or applications without the need to log in again.

With OpenID, users have the convenience of a centralized authentication process. They can use their credentials from a trusted identity provider (IDP) to authenticate themselves across various websites or systems that support OpenID integration. This eliminates the need for users to remember multiple usernames and passwords for different platforms.

The authentication process with OpenID involves the user logging in to their chosen identity provider. Once authenticated, the identity provider issues a unique identifier or token that confirms the user's identity. This identifier is then shared with the relying party (the website or application the user wishes to access) to grant the user access without requiring them to provide additional credentials.

OpenID acts as a decentralized permission system, where the identity provider plays a crucial role in authenticating the user's identity. By leveraging OpenID, users can enjoy the convenience of logging in once and gaining access to multiple related systems or applications, simplifying the authentication process and enhancing user experience.

D. SSL/TLS

The third stage of secure communication involves message encryption and cipher encryption. To achieve secure communication over TCP/IP, Transport Layer Security (TLS) is commonly employed. TLS operates in three phases:

1. *Cipher Negotiation:* During the first phase, the client and server engage in a negotiation process to determine which cipher (encryption algorithm) to use for the secure communication. This allows them to establish a common encryption method that ensures confidentiality.
2. *Key Exchange and Authentication:* In the second phase, a key exchange algorithm is utilized for authentication. This algorithm relies on public key cryptography, where the client and server exchange cryptographic keys to establish a secure connection. This process ensures that both parties can verify each other's identity and protect against unauthorized access.
3. *Message Encryption:* The final stage involves the encryption of the actual data being transmitted. Once the cipher and keys have been established, TLS applies encryption algorithms to encrypt the messages exchanged between the client and server. This ensures that the data remains confidential and protected from eavesdropping or tampering during transmission.

By employing these three stages, TLS enables secure communication by ensuring confidentiality, authentication, and message integrity. It provides a robust framework for protecting sensitive information over TCP/IP networks, enhancing the security of online transactions, data transfers, and other communication channels.

5. Conclusion

This paper describes a number of the cloud standards and demonstrates the cloud properties which include scalability, platform unbiased, low price, elasticity, and reliability. While cloud computing presents security challenges, this study focuses on discussing some of these challenges and proposing strategies to mitigate them, aiming to ensure secure communication and address security concerns. Traditional security solutions designed for non-virtualized environments may not adequately address the dynamic and complex nature of cloud computing. To address these concerns, organizations like the Cloud Security Alliance (CSA) and NIST are actively working on cloud computing security. This paper explores several security strategies, with ongoing efforts to develop additional approaches. Additionally, standards are identified that contribute to secure communication and safety within the cloud, considering the multitude of systems and operations involved. Given the importance of security in today's data-driven world, especially in the context of emerging technologies like cloud computing, it is crucial to establish proper policies, regulations, framework design, development, and implementation. Collaborative efforts between cloud service providers and customers are paramount for enhanced security. Increasing awareness and understanding among the general public, who are increasingly utilizing cloud-based products and services, is also essential. Looking ahead, the future of cloud security systems aims to achieve optimal security protection for users.

References

[1] Akhil Behl & Kanika Behl (2012), “An Analysis of Cloud Computing Security Issues.”
[2] L. Ertaul, S. Singhal & G. Saldamli, “Security Challenges In Cloud Computing”
[3] https://u-next.com/blogs/cloud-computing/characteristics-of-cloud-computing/
[4] https://cloud.google.com/learn/advantages-of-cloud-computing
[5] Velte, “Cloud Computing – A Practical Approach,” Tata McGraw- Hill.
[6] Amazon Elastic Compute Cloud (Amazon EC2). http://aws.amazon.com/ec2
[7] R. Balasubramanian, M.Aramuthan (2012), “Security Problems and Possible Security Approaches in Cloud Computing.”
[8] Alam, M. N., Singh, V., Kaur, M. R., Kabir, M. S. (2023), “Big Data: An overview with Legal Aspects and Future Prospects,” in Journal of Emerging Technologies and Innovative Research.
[9] Alam, M. N., Kaur, B., & Kabir, M. S. (1994), “Tracing the Historical Progression and Analyzing the Broader Implications of IoT: Opportunities and Challenges with Two Case Studies.”
[10] Alam, M. N., Kaur, K., Kabir, M. S., Susmi, N. H., & Hussain, S. (2023), “Uncovering consumer sentiments and dining preferences: a legal and ethical consideration to machine learning-based sentiment analysis of online restaurant reviews,” in International Journal of Creative Research Thoughts.
[11] Kabir, M. S., & Alam, M. N. (2023), “IoT, Big Data and AI Applications in the Law Enforcement and Legal System: A Review.”