UNDERSTANDING CLOUD ARCHITECTURE AND ITS NEED IN TODAY'S WORLD

Whitepaper

Call Center Hosting

Content

Abstract

This Whitepaper talks about how cloud is shaping up the new era with its unprecedented features and capabilities. Cloud has proved its potential with the best possible ways to bring in innovation to the fullest. But there are various touch-points that are needed to be looked at while developing a cloud infrastructure. And if you are opting for a cloud based infrastructure then it is advisable to understand about some necessary technical terms in a general language as well that would become a part of your business operations vocabulary.

Introduction

The cloud technology has taken its position in every field that has a role of data in it and the results have made it more promising to adopt. It's not just the ease of use of this technology but the powerful features that come with it that give priority to the idea of business success. Every business has IT resources and cloud has turned these resources into virtual format. The best part is you don't need a physical set up to go ahead in your business. The virtual resources become more useful to the users because it gives an unprecedented flexibility in opting for a solution and paying accordingly for it. In another term cloud is a dynamic technology.

An organisation opting for cloud also opts for cost efficiency and security. However, the best of the results show up only when you evolve the technological infrastructure of your organisation to take the advantages of various other capabilities of cloud. But before all this, it becomes necessary to understand the architecture of cloud and how fits in well for a particular need of the organisation. We know that cloud computing is a mix usage of the internet and central remote servers to control the data and application. But it's the cloud architecture that helps in making the use of resources more result oriented. So as a user one needs to understand the cloud architecture and its different touch points.

In the recent times, the users have sought mainly for an efficient and scalable infrastructure. The new cloud based architecture is capable of supporting the real time data analytics and the futuristic attributes of the Internet of the Things (IoT) or other communication devices.

Era of Cloud

Cloud technology came in with a lot many innovation and scope of changes in the traditional set up. Every department that needs the storage and retrieval of data, cloud technology has played a very significant role in it. With the passage of time issues related to the cloud such as security, scalability and user-friendliness have only improved. And the improvement is still on.

Today every big organisation has a cloud infrastructure that's helping them with various means. The foremost reason that comes into picture is, cloud computing has given us avenues to use the available resources without a large capital expenditure. This is one big reason that is making every big company to get either their own data centers or outsource to others. Data has turned into bigdata now and no company wants to keep away from the benefits of deductions of bigdata. Not merely the big companies but the smaller ones are also being benefited.

In the current times, cloud computing has come up with a typical pricing model in which it allows you to pay for what you use. And that is the reason cloud is providing the users with several options such as public, private and hybrid cloud. As the name suggests, public cloud is about outsourcing your cloud infrastructure to a data center that is located somewhere else. On the other hand private cloud is all about getting your own infrastructure for your company. And hybrid is a mix of both, part of the infrastructure remains public and some part remains private.

In a way cloud has fulfilled the requirements for processing, performance, storage, security and data transfer.

There are various public cloud vendors such as Amazon AWS, Microsoft Azure and Google Compute Platform (GCP) are providing IaaS (Infrastructure as a Service) offerings to support their client needs.

Meaning of Cloud Infrastructure

An infrastructure that is virtual and is only accessed by network or internet. The services of cloud infrastructure come under infrastructure as a service (IaaS). Iaas is just a model of service that creates a virtual infrastructure that can be further outsourced to an enterprise. The IaaS services include hardware, storage, servers, data center space or network components and the software as well.

Once the infrastructure is created it remains automated in the execution of the processes for the user. Cloud infrastructure is the most basic part of the cloud computing services of IaaS model. A physical infrastructure falls behind in case of virtual machines because physical infrastructure has certain limitations. The components of a cloud infrastructure are virtual machines and components like,

- Virtual servers
- Virtual computers
- Virtual network switches and hubs
- Virtual Memory
- Virtual storage clusters
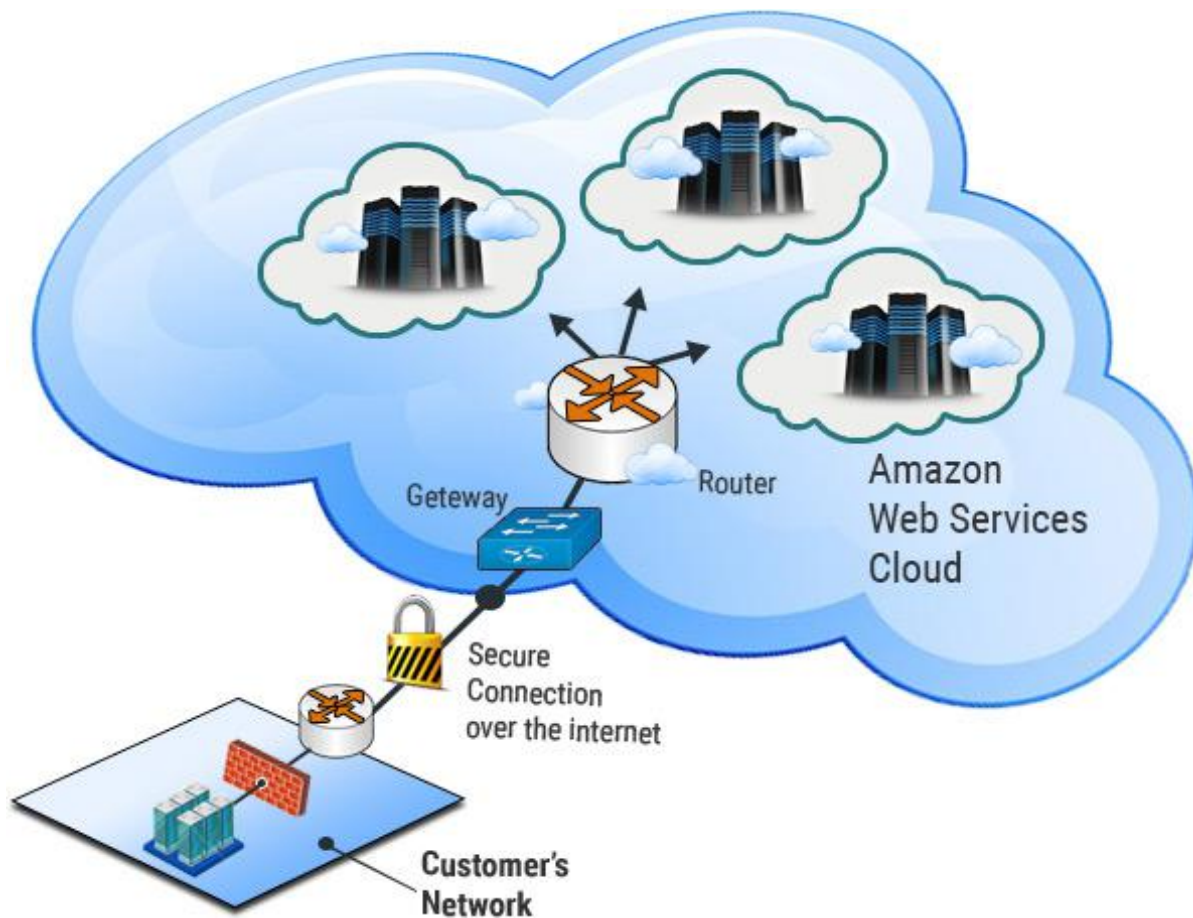
Cloud Infrastructure Source: Amazon

The above mentioned components can be mainly categorised in three groups mainly.

- **Computing:** This component is mainly responsible for providing the computing infrastructure that includes racks of servers powered by server chips. The servers can be clubbed together with the help of

virtualization software in order to split up the computing power for different clients or services.

- **Networking:** This includes routers and switches that are used to take data from one computing resources to another, the storage system and the world outside. These might include software defined networking (SDN) software.

- **Storage:** The cloud services need a large scale of storage resources. The storage systems have their own networking gear and storage software to manage high performance connectivity with the service.

A non cloud environment has limitations, and to get attuned with the contemporary needs, an organisation needs to go beyond these limitations and make the best out of the available resources. For this, one needs the implementation of the latest technologies. Cloud is one such technology that helps in taking the growth of your company into a right direction.

According to recent researches, Cloud is the best way to make the infrastructure scalable and as per the needs of the users. And this is the sole reason that most of the companies are investing into cloud to take their business from local to global. With the help of cloud computing, cloud helps in business continuity, lowering the cost and enhancing the speed of development.

Benefits of Cloud Infrastructure

Global Scalability

Once you deploy your application to cloud, it becomes much easier to use operational applications and databases by staying connected with different data centers. This also ensures higher efficiency and flawless execution. With cloud, the future expansion is always a possibility for your IT infrastructure.

The demand capacity with cloud is virtually unlimited and the IT infrastructure is totally scalable. The arrival of cloud has brought in many changes to the environment and has made it more worthwhile for the users. Setting up a new industry has become a lot easier because of cloud.

Remarkable Management Services

The cloud subscribers get an access to the broad set of storage, and data analytics related to it. The application and deployment services are the most refined because of the involvement of experts. It relieves you from being dependent on an in-house technological set up or skills. Eventually you deliver your services much faster.

The lesser complexity in operations and economics make the cloud services highly implementable.

Security

So far in the traditional IT infrastructure, security auditing has been a manual and periodical process. But with the help of cloud, the capabilities in terms of continuous monitoring has also improved.

There are plethora of options to enhance the security and encryption eventually leading to better data protection and also compliance. In a survey, 50 percent of people said they found private cloud to be safer over the public cloud. When it comes to physical disasters, 55 percent of the respondents suggested that information was much safer with the private cloud. Overall people have showed faith in the cloud infrastructure.

Flexibility

The bandwidth demands are growing with time and the number of customers looking for customer support has gone up exponentially. The ability to scale up and scale down makes the scenario more flexible in terms user friendliness. And this is why cloud has become a choice of small businesses as well. With the help of flexibility, there is always a possibility of getting an edge over competitors.

Disaster Recovery

Every business has data recovery in the back of its mind. Some businesses are able to make such robust platforms to get the data safe and easily recoverable with the help of cloud technology. Cloud technology helps in saving the time by avoiding any kind of traditional set up or reduces the investment cost. In terms of making the data much safer, cloud also includes the expertise of third party.

Enhanced Collaboration

If the whole team of an organisation is on cloud then everybody can share and edit the documents anytime from anywhere. With enhanced collaboration the last results become much better. In today's times when the client side is looking for the best available solutions then a collaborative approach is one thing that helps in making the best possible results. Cloud takes everybody on a single platform for discussion and collaboration.

Remote Work Station

If you have a cloud architecture then you can work remotely from anywhere. With this autonomy, you get the distant located agents work together on the same platform and make a business communication success. Since cloud infrastructure works on every device so its user friendliness takes your business way ahead with the ease of accessibility.

Competitive Environment

Cloud infrastructure gives you an edge over others because moving to cloud gives you an access to enterprise level technology where every business need is taken care of. Even a small business can be benefited from the cloud technology because it works on 'pay as you go' method and you can get the best technologies for your business with selected features.

Automatic Updates of the Software

The cloud infrastructure works based on a software that gets updated on its own and this makes the system much safer from any kind of security breach. You just don't need to put efforts in maintaining the system and it also relieves you from the need of putting in extra money. It helps you grow your business.

Environment Friendly

Moving to cloud is also helpful for the environment as it's a green technology and also helps the environment with lesser IT waste. The overall energy that is being used to execute the process doesn't leave the environment with oversized carbon footprint.

Scope of Cloud Infrastructure

Cloud technology is about making a virtual environment. So the adeptness and expertise of the service provider. According to the report given below 53% of the respondents found the cloud technology to be cost effective. 52% have had their intention to move the infrastructure to the cloud. It clearly depicts the faith in the cloud technology has strengthened.

Another aspect that comes into picture is the needed skills to maintain a cloud infrastructure. If we look at them holistically they are technical skills, project management skills, business and financial skills and most importantly data integration and analytics skills. One can not choose one over the other in these skills.
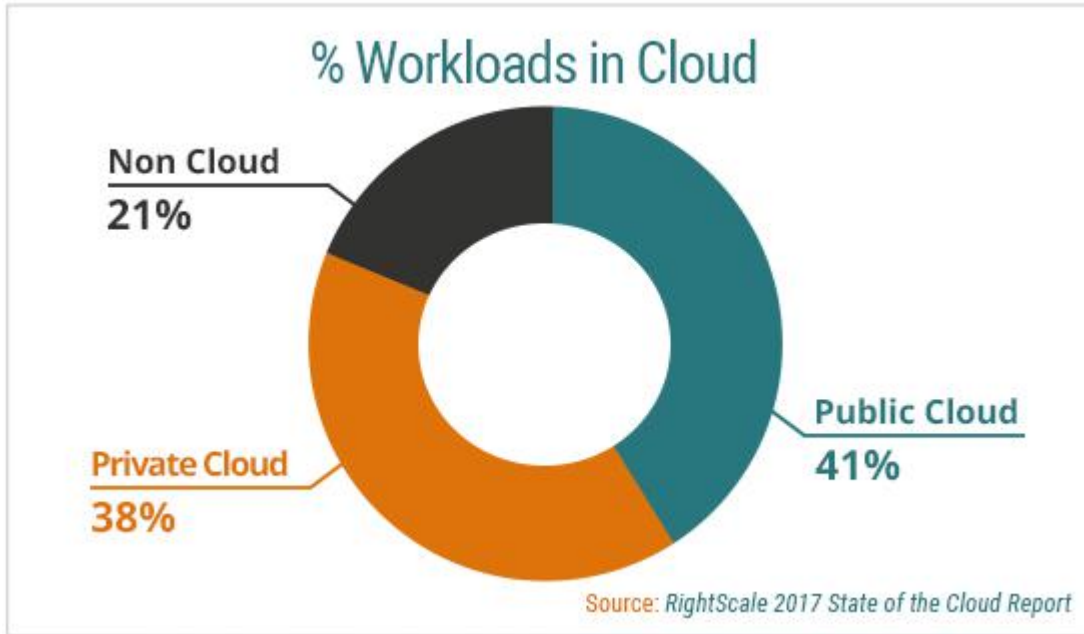
Cloud Initiatives in 2017

Initiative	Percentage
Optimizing existing cloud use (cost savings)	53%
Moving more workloads to cloud	52%
Expanding public clouds we use	42%
Implementing a cloud first strategy	40%
Implementing CI/CD in the cloud	38%
Expanding use of containers	38%
Enabling IT to broker multiple cloud services	30%
Expanding private clouds we use	24%

Source: RightScale 2017 State of the Cloud Report

Source: Rightscale

Every online activity creates some data and this data remains there for eternity. The storage and retrieval of data doesn't lose its significance with time. So the scope of cloud is important to deal with such bulk of data. All the big companies Facebook, Amazon and Google are investing in their data centers.

Preference for Cloud

The intelligence behind the robust and secure infrastructure of cloud makes the virtual environment more reliable and this is the reason most of the companies are also opting for public cloud. Once the infrastructure is outsourced on public cloud the organisation get far more options to take the advantages of cloud, be it communication, CRM or business operations.

% Workloads in Cloud

Non Cloud 21%

Public Cloud 41%

Private Cloud 38%

Source: RightScale 2017 State of the Cloud Report

Source: Rightscale

According to the Rightscale 2017, cloud report. 41% of the cloud is shared in public domain. 38% of the organisations have developed a private infrastructure of cloud. And 21% have not been able to make up their minds towards cloud. These deductions clearly depict that public cloud is being considered to be safe for hosting the data and applications. This assurance has made the small businesses to opt for cloud for better revenue.

Cloud on a Global Scale

If we look at the preference of cloud, globally. We can see that every year the overall expenditure on cloud is increasing. The faith in cloud infrastructure has increased because it has produced results. Every business needs allocation of money, intelligently. And most of the companies are now spending on cloud or at least looking forward to it. The scale of inclination is increasing

Global Spending in Cloud Through 2017

Source: IHS Technology Reprinted with permission.
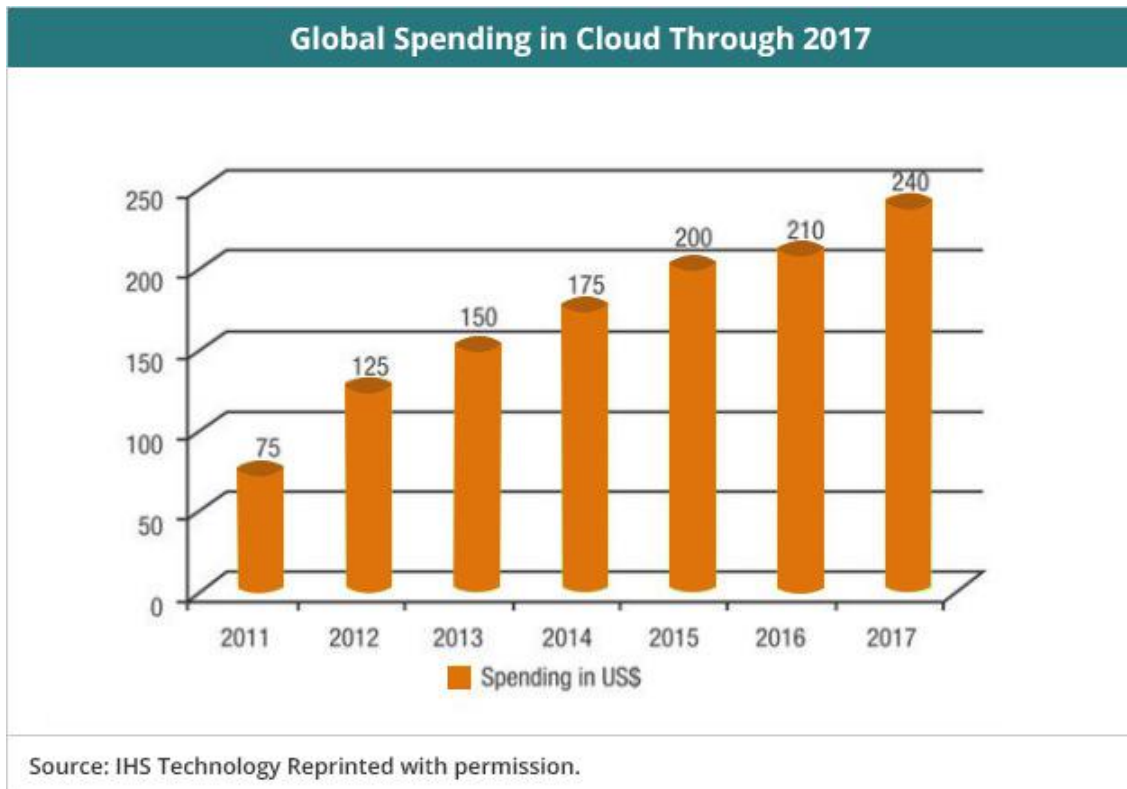
Cloud has challenged the traditional set up very meaningfully and this is one reason that most of the companies are opting for cloud. If we look at the diagram below we can see that cloud has has clearly taken over the on premise set up.

Companies are opting for cloud and their use of data. The cloud infrastructure bases on the software interface and 10-15 % of enterprise software is on cloud with an imminent increase in percentage in the future.

Challenges of Cloud Infrastructure

Although cloud technology has grown with times, there are several challenges that are needed to be addressed. Let's look at some challenges that cloud technology is facing in the current times.

Privacy

The data is valuable to all the enterprises and keeping it outside of your corporate firewall makes it a big concern. Although there are various security measures that are taken to avoid any kind of security breach. Such risks of security can be eliminated by using security application, encrypted file system, data loss software and deploying equipped hardware to track any kind of unusual behaviour across servers. This is for sure that any business would be reluctant to switch to cloud without a strong and secure service quality.

Portability

Cloud infrastructure has to be smoother in integrating it on-premise IT. Interoperability is another concern where cloud has found itself not much competent while merging two different technologies. Every business should be given a proper medium of opting for cloud and a way out of it, if preferred.

Performance and Bandwidth

The cost of bandwidth differs place to place and as per the need of the user. It can be lower for a small application and can be much higher for a data intensive applications. The cost of the bandwidth purchase is one big reason that many companies are still waiting for switching to cloud.


Source: Rightscale

If we look at the above diagram, the challenges related to different metrics such as performance, complexity, security, control have only reduced. And the big reason behind it is cloud is evolving with time every year.

Aspects of Designing a Cloud Infrastructure

There are several permutation and combinations when it comes to designing the cloud infrastructure. The architectural properties are applicable in a wide variety of options. Let's look at various touch points of designing.
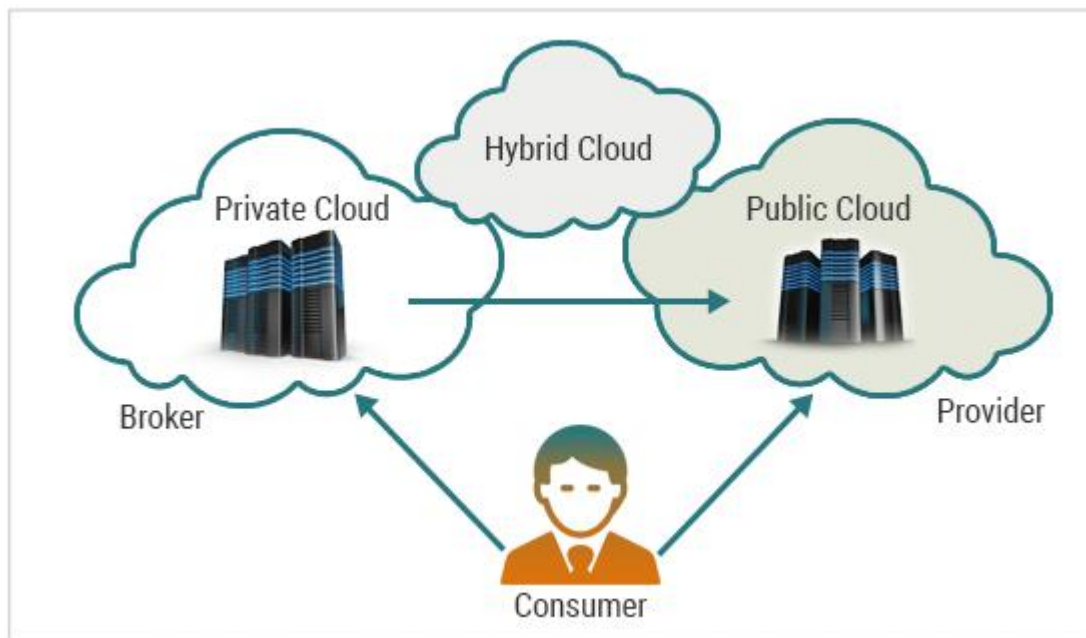
The three types of cloud that come into picture: private, hybrid and public. Together they make a cloud infrastructure.

Designing a cloud infrastructure is an aspect for the system development and infrastructure growth. And designing should take care of the ways it can be scaled up and scaled down as per the need.

With the passage of times scaling the architecture becomes a necessity point to match up the contemporary needs. Scalability is a big influencing factor because once you think of changes in your infrastructure, it should not hinder the overall performance. It should be in compliance with the additional load and should comply with every extra added resources. Scalability should be in proportional with every unavoidable need.

Cloud computing provides unlimited possibilities to take advantage from the available resources seamlessly. If we look at the methods of scaling the IT infrastructure, there are two methods.
Scaling it **vertically** or **horizontally**.

Scaling Vertically means increasing the specifications of a single resource. It means making your server equipped with a larger hard drive and a faster CPU. Also revamping its networking capabilities. But vertical scaling has its own limitations and and it is not cost efficient or easily approachable.

Scaling Horizontally means increasing the specifications of the number of resources. This helps in taking benefits out of the elasticity of cloud computing.

Type of Components

When it comes to maintaining a cloud hosted IT infrastructure there are two types of components, **stateful components** and **stateless components**. Most of the applications need to save some sort of information. For example almost all the web applications track the history of a signed in user and that further helps them to provide a more personalised content based on the past ways of using a media.

There should be an automatic, multi-step process that could track the activities of the user in the past and makes the present ideas of executing a process more dependent on the patterns that have been proven to be fruitful.

But a stateless application is an application that doesn't need any knowledge of the previous sessions. So you don't need to store any information. The efficiency of a stateless application remains the same and it can scale horizontally as per the needs. When there is no need to share the data then more number of resources can be added according to the need. This way such application helps in distributing the workload.

On the other hand, the part of the architecture that you don't want to keep as a stateless, it can be kept as a stateful component.

Alternatives for a Fixed Server

The traditional infrastructure environments use fixed resources and likely to stay like this because of the cost and time involved in bringing in a change such as a new hardware.

While cloud based infrastructure gives an opportunity to expand, contract or scale accordingly. Cloud computing is dynamic in its nature as you consider the ideas related to the application you can use it according to the need.

The problem with the fixed infrastructure of a server is the 'configuration drift', it means different environments may respond differently over the time by the changes made in the software and the hardware configuration.

This problem is solved by 'immutable infrastructure', in this approach once a server is launched, it is never updated throughout its launch time and whenever there is a problem or an issue that is needed to be addressed, then the whole server is replaced instead of making some amendments. This way the resources are always kept in the latest configuration with much better efficiency.

Removing Possibility of Failure for Cloud Infrastructure

By introducing redundancy, it is all about having multiple resources for the same activity. Redundancy is implemented on both, standby or active mode. In standby mode, when there is a failure of the resource then the functionality is recovered by a secondary resource by a process that is known as failover process.

The failover process takes some time before it completes the process and during that period the resource remains unavailable. The secondary resource can either be launched automatically only when needed or can be kept running.

On the other hand standby redundancy is used for stateful components that come under the relational databases.

Active redundancy is another medium of distributing the workload to several resources. When one of them fails then the rest of them can share a the workload, easily. In comparison to standby redundancy, active redundancy has better potential of utilization.

Data Storage and Its Durability

It is a lot necessary to have your architecture to protect availability and integrity of the data. For this data replication technique is used and it introduces redundant copies of data. It can help in horizontally scale the read capacity data, but it also increases the data durability and availability.

Further replication can be done in two modes, Synchronous replication and Asynchronous replication. Synchronous replication only deals with the transaction once it has been durably stored in primary as well as the replica.

Synchronous replication does the transaction part only after storing the data in primary as well as in the replica. So the primary node remains safe despite any event of failure

Asynchronous replication decouples the primary node from its replicas by introducing the replications tag. In this way if there are some changes done in the primary node then it is not reflected on the replicas.

Caching

If the data is stored for future use then this technique is called caching. With the help of this technique, the application performance is enhanced also the overall cost efficiency. There are various spots where this can be applied in the IT architecture. There are various type of caching.

Application data Caching

To store and retrieve the information, it is necessary to design the applications to be managed in-memory caches. If the cache doesn't respond for the result set then the application can find it from a database and store it in the cache for further usage.

In case if the result set is found then in the cache the application can use it directly this reduces the latency and improves the efficiency for the user. The easy retrieval of the cached data leads to further decrease on the load for the database.

Edge Caching

There are two types of content on the database. Dynamic as well as static content. Dynamic contents are like live video streaming or html responses. Static contents are images, CSS files or playing a pre recorded video. Edge caching allows the content to be retrieved in an infrastructure that is closer to the viewer, it means better data transfer rates and better data delivery.

Other connection optimizations can also be applied to remove the possibility of possible bottleneck it also helps in utilizing the whole bandwidth in a much efficient way. We get to see edge caching when we visit a website and download some kind of static content and it is cached. And further each subsequent user is served from the cached data.

Glossary of Technical Terms in Current Cloud Architecture

Compute Resources

There are certain approaches that help to achieve automated or repeatable process. In a cloud infrastructure, a compute resource is an object that represents a host, or a pool in a virtualization platform or a datacenter.

Bootstrapping

Bootstrapping is all about joining the server nodes into clusters. There is a default configuration with every server and it makes the bootstrapping a lot easier for the database. Bootstrapping can be done automatically. Various scripts are run to install software or copy data to bring it to a particular state. The configuration can be easily parameterized that helps in running the same script without modification in different environments.

Golden Image

Golden image is just like a template for a virtual machine (VM), virtual desktop. Server or any hard disk drive. An administrator sets up a computing environment the way it is needed and saves a disk image as a pattern to incorporate more number of copies. The use of golden image becomes more important because it reduces the time and number of efforts in maintaining consistency by eliminating the need for repetitive configuration changes.

Hybrid

This is just the combination of two approaches in which some part of the configuration is captured in golden image while rest are changed dynamically through bootstrapping.

Loose Coupling

Various applications coming together make the setup more complex and to reduce this complexity, it should be designed in such a way that the whole infrastructure is made of loosely coupled components and it further reduces interdependency. So a change happening in one of the components doesn't affect the other.

Intelligent Interface

The best way to reduce the interdependency is to make the different components interact with each other only through specific interfaces that are intelligent and driven by data. In other sense, the technological implementation details don't affect the underlying implementation without affecting any IT component.

Interactive Services

Applications with a set of smaller services totally remain dependent on the mutual interaction of the services. So each such services should be addressed and should be compatible with the new computer resources. In traditional infrastructure, the front end services should be connected to the back end services. But in today's cloud computing, the services are needed to be loosely coupled as these components don't need to have any prior knowledge of the existing topology.

In addition to this, these infrastructure details can change at any time. Loose coupling is an essential element when it comes to elasticity of cloud computing where new application or components can be added or removed at any point of time. But when try to understand the loose coupling, we should also understand about asynchronous integration.

Asynchronous Integration

It is just a different form of loose coupling for services. This kind of model is all about making usage of the resources and going for a service that doesn't need any kind of immediate response, in other words once the acknowledgement of the services has been registered then its execution can be easily postponed as per the need. It involves one component as an event generator and another as an event consumer. The two components don't integrate through direct interaction but through an intermediate durable storage.

In this way, the two components are easily decoupled and it introduces additional autonomy. For example the occasional peaks for the need of data storage doesn't lead to implementing new application or addition of new components. Because with the help of asynchronous integration, the process is executed asynchronously with some delay.

Databases

In the traditional infrastructure, there were many limitations in the kind of technology that could be used. These limitations also comprised the various licensing cost and ability to support various database services. It is necessary to understand the need of the right technology for the database. There are various aspects that can help you understand which database is necessary to your business.

There are two types of workloads, write-heavy and read-heavy. So check if the kind of workload you are going to deal with is write-heavy or read-heavy or it is a mix of both. Check how much data you are going to need and for how long you need them stored. The rate of growth of this data is also necessary to be checked.

The concurrent users decide the latency requirements and query of the data. The flexibility of the databases is an important aspect, let's look at the various kind of databases.

Relational Databases

Relational databases that is also called RDBS and SQL databases normalize data into well defined tabular structure known as tables consisting rows and columns. They have a powerful query language and flexible indexing capabilities.

Relational databases can be scaled vertically and for read heavy applications, the horizontal scaling is also possible beyond the capacity constraints.

NoSQL Database

NoSQL is a term used to describe that trade some of the query and transaction capabilities of relational databases that deal with the query and transaction capabilities of relational databases and are easily scaled horizontally. NoSQL databases utilize a variety of options in the database model. And due to its flexibility and resilience NoSQL are widely adopted. It supports both document and key value store models.

Data Warehouse

If we give a special shape to relational database and optimize it for analysis of a big amount of data then it becomes a data warehouse. The deployment of data workloads is done in multi node clusters in which data written to a node production is replicated to other nodes within the cluster. The adaptability and integration of data warehousing is very promising and that is why it is being adopted by many big companies.

Conclusion

This whitepaper gives you a picture of cloud architecture that one should be well acquainted of while hosting your services on cloud. Most of the IT infrastructure is shifting to the cloud and this is one big reason to get an in depth knowledge of the technical terms of cloud in a very general way. Once you understand the ideas of cloud architecture then it becomes a lot more effective to implement cloud hosted services to your business with a much better results.

About the Author

Vipul Srivastav is an Editor at CallCenterHosting. Clouds have always fascinated him. For the same reason he loves to explore and share his understanding and ideas related to cloud-based innovations. He writes aboutcontemporary subjec ts as well. Apart from this he is a vor acious reader and loves music.

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