Overview on Data Center and Its Challenges

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Abstract- *Cloud Computing has been the booming sector in Information technology field. In this paper, I have provided an overview of cloud computing, their architecture model. Various services are offered at each layer of the cloud architecture. Challenges faced by the data center with proposed solution for each of the challenge.*

Keywords- Cloud, Data center, IaaS, PaaS, SaaS

I. INTRODUCTION OF CLOUD COMPUTING

US standardization body, the National Institute of Standards and Technology (NIST), has defined Cloud computing as below:

Cloud computing is a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provisioned and released with minimal management effort or service provider interaction.

Cloud computing involves hosting applications on servers and delivering software and services via the Internet. In the cloud mode, companies can access computing power and resources on the "Cloud" and pay for services based on usage. This contrasts cloud computing from the traditional, ownership-based model of IT assets and resources. One Way of describing cloud services is that they are services that are provided and used by clients "on demand at any time, through any access network, using any connected devices [that use] cloud computing technologies"

II. LAYERS OF CLOUD COMPUTING

There are three layers of Cloud Computing architecture which can be listed as below:

a. Software as a Service (SaaS)
b. Platform as a Service (PaaS), and
c. Infrastructure as a Service(IaaS).

2.a) Software as a Service (SaaS): It is a Software distribution model, in which application are hosted by a vendor and made available to customers over a network. The provider licenses

an application to customers for use as a service on demand. With the SaaS, users do not need to hire professional IT staff to install and use software. SaaS, is the most widespread form of cloud service. Some well-known examples include Google email, Google Apps.

2.b) Platform as a Service(PaaS): Applications are developed and executed through platforms provided by cloud vendors. This model allows a quick and cost-effective development and deployment of applications and provides facilities such as database management, security, workflow management, and application serving. PaaS is often used by application developers working on mobile applications. Some well-known PaaS vendors include Google (Google App Engine) and Microsoft (Windows, Specialized on building, operating, and managing PaaS-based solutions, which was acquired by India's Aditi Technologies.

2.c) Infrastructure as a Service (IaaS): In IaaS, compute power and storage space are offered on demand. IaaS can provide server, operating system, disk storage, and database, among other things. One of the main advantages of IaaS is that it offers rapid elasticity and flexibility.

Amazon.com is one of the biggest Iaas providers. Its Elastic Compute Cloud (EC2) allows subscribers to run cloud application programs. IBM, Vmware, and HP also offer IaaS. China's Huawei provides IaaS solution for operators, governments, and enterprises with data center IT infrastructure.
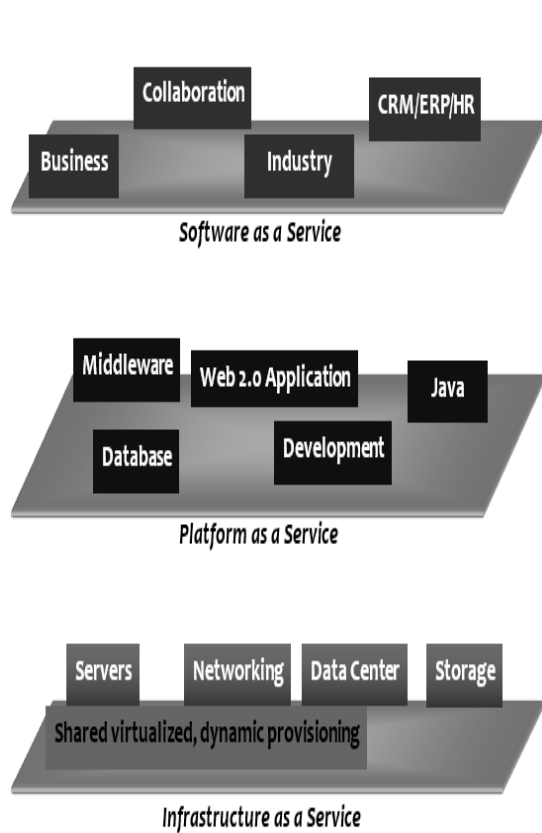
Figure 1.1
Layers of Cloud Computing

III. SERVICES PROVIDED BY THE LAYERS IN DETAIL

The various cloud based services commonly Provided are:

- Infrastructure as a Service (IaaS): Organizations make use of the unlimited storage potential of the cloud infrastructure. They can expand and shrink their storage space as needed without having to worry about dedicated servers on site.
- Software as a Service (SaaS): It allows people to access the functionality of particular software without worrying about storage or other issues.
- Platform as a Service (PaaS): Companies can run their applications on the cloud service's platform without having to worry about maintaining hard drives and servers.
- Utility Services: Companies that need to store a lot of data can store all of their data remotely and can even create a virtual data center.
- Managed Services: These are applications used by the cloud service providers, such as anti-spam service.

- Service Commerce: It is the creation of a hub of applications that can be used by an organization's members. It provides organizations the applications they need along with the services they desire.

IV. INTRODUCTION TO DATA CENTER

Known as the server farm or the computer room, the data center is where the majority of an enterprise servers and storage are located, operated and managed. There are four primary components to a data center:

White space: This typically refers to the usable raised floor environment measured in square feet (anywhere from a few hundred to a hundred thousand square feet). For data centers that dont use a raised floor environment, the term "white space" may still be used to show usable square footage.

Support infrastructure: This refers to the additional space and equipment required to support data center operations — including power transformers, your uninterruptible power source (UPS), generators, computer room air conditioners (CRACs), remote transmission units (RTUs), chillers, air distribution systems, etc. In a high-density, Tier 3 class data center (i.e. a concurrently maintainable facility), this support infrastructure can consume 4-6 times more space than the white space and must be accounted for in data center planning.

IT equipment: This includes the racks, cabling, servers, storage, management systems and network gear required to deliver computing services to the organization.

Operations: The operations staff assures that the systems (both IT and infrastructure) are properly operated, maintained, upgraded and repaired when necessary. In most companies, there is a division of responsibility between the Technical Operations group in IT and the staff responsible for the facilities support systems.

4.2 Management of Data Centers

Operating a data center at peak efficiency and reliability requires the combined efforts of facilities and IT.

IT systems: Servers, storage and network devices must be properly maintained and upgraded. This includes things like operating systems, security patches, applications and system resources (memory, storage and CPU).

Facilities infrastructure: All the supporting systems in a data center face heavy loads and must be properly maintained to continue operating satisfactorily. These systems include

cooling, humidification, air handling, power distribution, backup power generation and much more.

Monitoring: When a device, connection or application fails, it can take down mission critical operations. Sometimes, one system's failure will cascade to applications on other systems that rely on the data or services from the failed unit. For example, multiple systems, such as inventory control, credit card processing, accounting and much more will be involved in a complex process such as eCommerce checkout. A failure in one will compromise all the others. Additionally, modern applications typically have a high degree of device and connection interdependence. Ensuring maximum uptime requires 24/7 monitoring of the applications, systems and key connections involved in all of an enterprises various workflows.

Building Management System: For larger data centers, the building management system (BMS) will allow for constant and centralized monitoring of the facility, including temperature, humidity, power and cooling.

The management of IT and data center facilities are often outsourced to third party companies that specialize in the monitoring, maintenance and remediation of systems and facilities on a shared services basis.

4.3 Challenges faced by Data Center and their proposed solutions:

4.3.a) Poorly Managed Cables

The basic problem faced in the data center is the poorly managed cables which can act as a major safety hazards and can cause downtime. They may also result into potential accidents or network outages.

Solution: Ladder rack runways, cable trays and even zip-ties are all options to keep cable secure and out of the way.

4.3.b) Propping Open Doors

Commonly administrators tend to prop open a door to improve the airflow inviting unwanted creatures like rodents and dirt/dust which can potentially harm the data centers. This may also invite intruders to get a chance to notice the working of the data centers putting the security in danger.

Solution : Proper ventilators and exhaust fans should be provided for the data center rooms.

4.3.c) Eating or Drinking Inside

The datacenter equipments can get easily damaged with the spilling of the food or drinks carried inside the data center .

Solution: Complete prohibition on the eating or drinking inside the data center should be implemented by the organization. Additionally CCTV cameras can be used to keep a tab on the people.

4.3.d) Freely Giving Out Keys and Access Codes

Many services personal might need the access to the data centers. However any unauthenticated personnel if permitted can cause a serious security breach. Another lurking danger is anyone with access to your data center can steal valuable information from storage devices with a simple thumb drive.

Solution : Make sure you have systems in place to allow temporary, regulated access for specified periods of time. Even if the person in question forgets to turn his or her key back in, their access will expire so you don't have to worry about potential breaches or other data center issues in the future. Securing the cabinets within the data center can prevent the issue of data theft using thumb drive .

4.3.e) Forgetting to Manually Check In

With DCIMs and environmental monitoring, it's easy to manage your data center remotely. But physically being present can help you keep tabs on potential cable-management issues, incorrect temperature or humidity levels, etc.

Solution: Verify temperature and humidity levels, check to see if filters have been changed, ensure that maintenance logs are updated, check for loose equipment, verify visual alarms etc. Another solution is to install the sensors that can check and verify different parameters.

4.3.f) Using Too Many Extension Cords

Too Many extension cords cause overloads or trips, ultimately taking vital equipment down if a receptacle is overloaded.

Solution: proper measured resources with some additional length should be kept and in case the extension cords are to be used, they are to be used with extra care.

4.3.g) Never Getting an Outside Opinion

Generally owners of data center may ignore various parameters.

Solution : Bringing in a third party to conduct regular audits. This can help you uncover potential data center issues and gain a better understanding of overall data center performance.

4.3.h) Unpacking Equipment Inside

Refrain from unpacking or uncrating equipment inside the data center; do so in a separate, designated area instead.

V. CONCLUSION

In this paper , I have focused only on the potential challenges of the datacenter. In the next paper, I would like to find more in depth knowledge on the architecture of the data center.

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