IMPEDIMENT AND COST OF CLOUD MIGRATION

Ms. SYEDA HUSNA MEHANOOR,
Research Scholar,
Department of Computer Science and Engineering.
SHRI JJTU, Jhunjhunu, Rajasthan, India.

Abstract : **Certainly many companies remain concerned about the security of cloud services, although breaches of security are rare. How secure you consider cloud computing to be will largely depend on how secure your existing systems are. In-house systems managed by a team with many other things to worry about are likely to be more leaky than systems monitored by a cloud provider's engineers dedicated to protecting that infrastructure[1]. However, concerns do remain about security, especially for companies moving their data between many cloud services, which has leading to growth in cloud security tools, which monitor data moving to and from the cloud and between cloud platforms. These tools can identify fraudulent use of data in the cloud, unauthorised downloads, and malware. There is a financial and performance impact however these tools can reduce the return on investment of the cloud by five to 10 percent, and impact performance by five to 15 percent.**

IndexTerms-:Infrastructure-as-a-Service(Iaas),Platform-as-a-Service(Paas),Software-as-a-Service(Saas),Datacenters.

I. INTRODUCTION

Cloud computing is the delivery of on-demand computing services -- from applications to storage and processing power -- typically over the internet and on a pay-as-you-go basis[1]. Rather than owning their own computing infrastructure or data centers, companies can rent access to anything from applications to storage from a cloud service provider. One benefit of using cloud computing services is that firms can avoid the upfront cost and complexity of owning and maintaining their own IT infrastructure, and instead simply pay for what they use, when they use it.In turn, providers of cloud computing services can benefit from significant economies of scale by delivering the same services to a wide range of customers. Cloud computing services cover a vast range of options now, from the basics of storage, networking, and processing power through to natural language processing and artificial intelligence as well as standard office applications. Pretty much any service that doesn't require you to be physically close to the computer hardware that you are using can now be delivered via the cloud.

Cloud computing underpins a vast number of services. That includes consumer services like Gmail or the cloud back-up of the photos on your smart phone, though to the services which allow large enterprises to host all their data and run all of their applications in the cloud. Netflix relies on cloud computing services to run its its video streaming service and its other business systems too, and have a number of other organisations. Cloud computing is becoming the default option for many apps: software vendors are increasingly offering their applications as services over the internet rather than standalone products as they try to switch to a subscription model. However, there is a potential downside to cloud computing, in that it can also introduce new costs and new risks for companies using it.

II. LITERATURE SURVEY

Cloud computing as a term has been around since the early 2000s, but the concept of computing-as-a-service has been around for much, much longer -- as far back as the 1960s, when computer bureaus would allow companies to rent time on a mainframe, rather than have to buy one themselves.

These 'time-sharing' services were largely overtaken by the rise of the PC which made owning a computer much more affordable, and then in turn by the rise of corporate data centres where companies would store vast amounts of data.But the concept of renting access to computing power has resurfaced again and again -- in the application service providers, utility computing, and grid computing of the late 1990s and early 2000s. This was followed by cloud computing, which really took hold with the emergence of software as a service and hyper scale cloud computing providers such as Amazon Web Services.

Building the infrastructure to support cloud computing now accounts for more than a third of all IT spending worldwide, according to research from IDC. Meanwhile spending on traditional, in-house IT continues to slide as computing workloads continue to move to the cloud, whether that is public cloud services offered by vendors or private clouds built by enterprises themselves.451 Research predicts that around one-third of enterprise IT spending will be on hosting and cloud services this year "indicating a growing reliance on external sources of infrastructure, application, management and security services". Analyst Gartner predicts that half of global enterprises using the cloud now will have gone all-in on it by 2021.According to Gartner , global spending on cloud services will reach $260bn this year up from $219.6bn. It's also growing at a faster rate than the analysts expected. But it's not entirely clear how much of that demand is coming from businesses that actually want to move to the cloud

and how much is being created by vendors who now only offer cloud versions of their products (often because they are keen to move to away from selling one-off licences to selling potentially more lucrative and predictable cloud subscriptions).

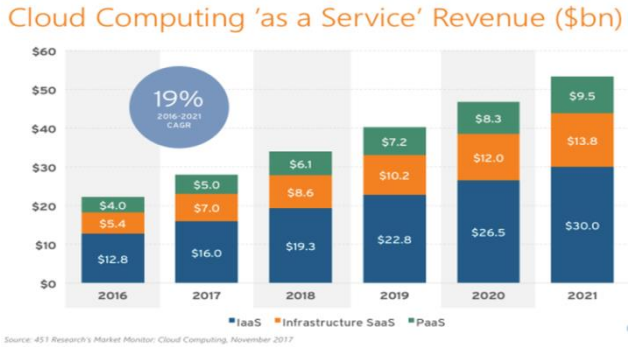

Fig 2.1: Predictions for cloud computing revenues to 2021 from 451 Research.

III. SERVICE MODEL OF CLOUD

3.1.Infrastructure-as-a-Service(Iaas):

Cloud computing can be broken down into three cloud computing models[2]. Infrastructure-as-a-Service (IaaS) refers to the fundamental building blocks of computing that can be rented: physical or virtual servers, storage and networking. This is attractive to companies that want to build applications from the very ground up and want to control nearly all the elements themselves, but it does require firms to have the technical skills to be able to orchestrate services at that level. Research by Oracle found that two thirds of IaaS users said using online infrastructure makes it easier to innovate, had cut their time to deploy new applications and services and had significantly cut on-going maintenance costs. However, half said IaaS isn't secure enough for most critical data.

3.2 **Platform-as-a-Service (Paas):**

Platform-as-a-Service (PaaS) is the next layer up -- as well as the underlying storage, networking, and virtual servers this will also include the tools and software that developers need to build applications on top of: that could include middleware, database management, operating systems, and development tools[2]. An SaaS solution sits atop a platform. Vendors that offer platform-as-a-service portfolios generally face corporate clients. PaaS products include virtual servers, operating environments, database environments, and any other *middleware* component that sits between the hardware and the consumer-facing application.

3.3. Software-as-a-service (Saas):

Cloud services using a software-as-a-service model, or SaaS, provide fully functional programs to end users even though the programs may not be resident on their local computers. Email providers like Gmail and Outlook.com are SaaS applications, as well as just about any computer program that runs inside of a browser. As such, SaaS is most familiar to home consumers[2].Software-as-a-Service (SaaS) is the delivery of applications-as-a-service, probably the version of cloud computing that most people are used to on a day-to-day basis. The underlying hardware and operating system is irrelevant to the end user, who will access the service via a web browser or app; it is often bought on a per-seat or per-user basis.

According to researchers IDC SaaS is and will remain the dominant cloud computing model in the medium term, accounting for two-thirds of all public cloud spending in 2017, which will only drop slightly to just under 60 percent in 2021. SaaS spending is made up of applications and system infrastructure software, and IDC said that spending will be dominated by applications purchases, which will make up more than half of all public cloud spending through 2019. Customer relationship management (CRM) applications and enterprise resource management (ERM) applications will account for more than 60 percent of all cloud applications spending through to 2021[10]. The variety of applications delivered via SaaS is huge, from CRM such as Salesforce through to Microsoft's Office 365.

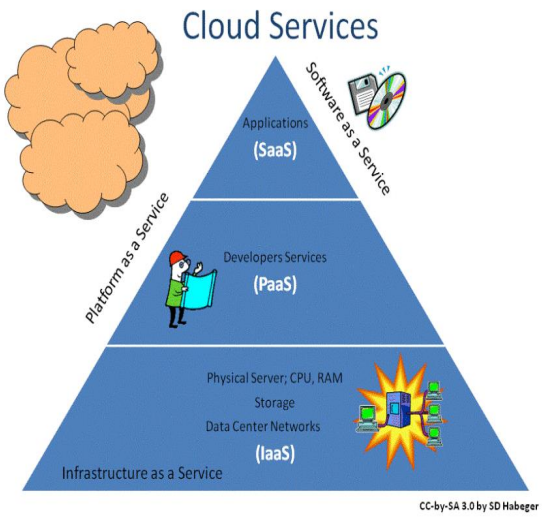

Fig 3.1:Deployment of Cloud Services

IV. DEPLOYMENT MODEL OF CLOUD

4.1.Public Cloud:

- The Public Cloud allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness.
- Public cloud facilitates access to IT resources on a "pay as you go" billing model. A service provider manages a public cloud.
- With a public cloud, all hardware, software and other supporting infrastructure is owned and managed by the cloud provider.
- Examples: Gmail, Amazon Elastic Compute Cloud (EC2), IBM's Blue Cloud, Sun Cloud, Google AppEngine and Windows Azure Services Platform.

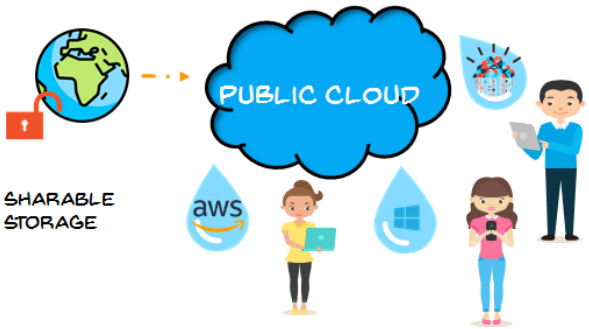

Fig 4.1.1:Public Cloud

4.2.Private Cloud:

- The Private Cloud allows systems and services to be accessible within an organization. It offers increased security because of its private nature.

- The services in a private cloud are provided behind a firewall and are only accessible to the users or partners of a single organization.
- Eamples: Amazon Virtual Private Cloud. Amazon Virtual Private Cloud (Amazon VPC), VMware Private Cloud, Rackspace Private Cloud

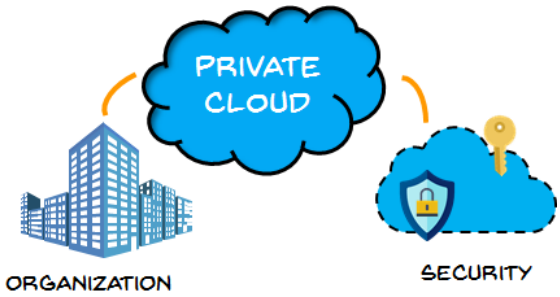

Fig 4.2.1: Private Cloud

4.3: Hybrid Cloud:

- The Hybrid Cloud is mixture of public and private cloud. However, the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.
- Hybrid cloud service integrates in-house IT infrastructure with other products and services to meet a business's specific and unique needs.
- Hybrid cloud is a situation where companies use both private and public clouds for their business needs.
- Management tools such as Red Hat CloudForms and VMware Cloud Suite, IBM Cloud Orchestrator etc.

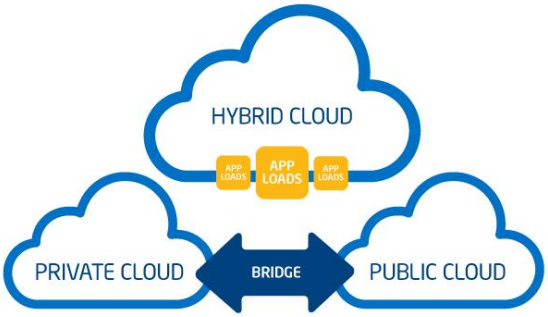

Fig 4.3.1: Hybrid Cloud

V. PROS AND CONS OF CLOUD COMPUTING

If used properly and to the extent necessary, working with data in the cloud can vastly benefit all types of businesses. Mentioned below are some of the advantages of this technology[3].

Cloud computing is now evolving like never before, with companies of all shapes and sizes adapting to this new technology. Industry experts believe that this trend will only continue to grow and develop even further in the coming few years. While cloud computing is undoubtedly beneficial for mid-size to large companies, it is not without its downsides, especially for smaller businesses.

- **Cost Efficient**

Cloud computing is probably the most cost-efficient method to use, maintain and upgrade. Traditional desktop software costs companies a lot in terms of finance. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payment, pay-as-you-go and other scalable options available, which makes it very reasonable for the company in question.

- **Almost Unlimited Storage**

Storing information in the cloud gives you almost unlimited storage capacity. Hence, you no more need to worry about running out of storage space or increasing your current storage space availability.

- **Backup and Recovery**

Since all your data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, most cloud service providers are usually competent enough to handle the recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.

- **Automatic Software Integration**

In the cloud, software integration is usually something that occurs automatically. This means that you do not need to take additional efforts to customize and integrate your applications as per your preferences. This aspect usually takes care of itself. Not only that, cloud computing allows you to customize your options with great ease. Hence, you can handpick just those services and software applications that you think will best suit your particular enterprise.

- **Easy Access to Information**

Once you register yourself in the cloud, you can access the information from anywhere, where there is an Internet connection. This convenient feature lets you move beyond time zone and geographic location issues.

- **Quick Deployment**

Lastly and most importantly, cloud computing gives you the advantage of quick deployment. Once you opt for this method of functioning, your entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that you need for your business.

In spite of its many benefits, as mentioned above, cloud computing also has its disadvantages[4]. Businesses, especially smaller ones, need to be aware of these cons before going in for this technology.

- **Technical Issues**

Though it is true that information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. You should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance. Besides, you will need a very good Internet connection to be logged onto the server at all times. You will invariably be stuck in case of network and connectivity problems.

- **Security in the Cloud**

The other major issue while in the cloud is that of security issues. Before adopting this technology, you should know that you will be surrendering all your company's sensitive information to a third-party cloud service provider. This could potentially put your company at great risk. Hence, you need to make absolutely sure that you choose the most reliable service provider, who will keep your information totally secure.

- **Prone to attacks**

Storing information in the cloud could make your company vulnerable to external hack attacks and threats. As you are well aware, nothing on the Internet is completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

VI. CLOUD COMPUTING MIGRATION COSTS

For start-ups who plan to run all their systems in the cloud getting started is pretty simple. But the majority of companies it is not so simple: with existing applications and data they need to work out which systems are best left running as they, and which to start moving them to cloud infrastructure. This is a potentially risky and expensive move, and migrating to the cloud could cost companies more if they underestimate the scale of such projects.

A survey of 500 businesses that were early cloud adopters found that the need to rewrite applications to optimise them for the cloud was one of the biggest costs, especially if the apps were complex or customised. A third of those surveyed said cited high fees for passing data between systems as a challenge in moving their mission-critical applications.

The report by Forrester also found that the skills required for migration are both difficult and expensive to find - and that even when organisations could find the right people they risked them being stolen away by cloud computing vendors with deep pockets. One third of those surveyed said their software database license costs drastically increased if they moved applications.

Beyond this the majority also remained worried about the performance of critical apps and one in three cited this as a reason for not moving some critical applications.

VII.CLOUD REGIONS AND AVAILABILITY ZONES

Cloud computing services are operated from giant data centers around the world. AWS divides this up by 'regions' and 'availability zones'. Each AWS region is a separate geographic area, like EU (London) or US West (Oregon), which AWS then further subdivides into what it calls availability zones (AZs). An AZ is composed of one or more data centers that are far enough apart that in theory a single disaster won't take both offline[5], but close enough together for business continuity applications that require rapid failover. Each AZ has multiple internet connections and power connections to multiple grids: AWS has over 50 AZs.

Google uses a similar model, dividing its cloud computing resources into regions which are then subdivided into zones, which include one or more datacenters from which customers can run their services. It currently has 15 regions made up of 44 zones: Google recommends customers deploy applications across multiple zones and regions to help protect against unexpected failures.

Microsoft Azure divides its resources slightly differently. It offers regions which it describes as is a "set of datacentres deployed within a latency-defined perimeter and connected through a dedicated regional low-latency network"[6]. It also offers 'geographies' typically containing two or more regions, that can be used by customers with specific data-residency and compliance needs "to keep their data and apps close". It also offers availability zones made up of one or more data centres equipped with independent power, cooling and networking[7].

When it comes to IaaS and PaaS there are really only a few giant cloud providers. Leading the way is Amazon Web Services, and then the following pack of Microsoft's Azure, Google, IBM, and Alibaba. While the following pack might be growing fast, their combined revenues are still less than those of AWS, according to data from the Synergy Research Group[8].

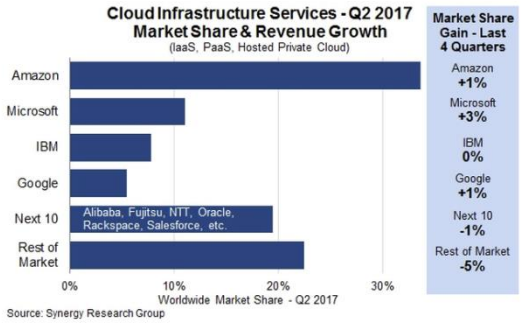

Fig 7.1.Cloud market share and revenue growth chart

Analysts 451 Research said that for many companies the strategy will be to use AWS and one other cloud provider, a policy they described as AWT +1.These big players will dominate the delivery of cloud services: Gartner said two thirds of the spending on cloud computing services will go through the top 10 public cloud providers through to 2021.It's also worth noting that while all these companies are selling cloud services, they have different strengths and priorities[9]. AWS is particularly strong in IaaS and PaaS, but has designs on moving up towards databases. Microsoft in contrast has a particular emphasis on SaaS thanks to Office 365 and its other software largely aimed at end user productivity, but is also trying to rapidly grow its IaaS and Paas offering through Azure.Google Cloud Platform (GCP) (which also offers office productivity tools) is somewhere between the two. IBM and Oracle's cloud businesses are also made up of a combination of Saas and more infrastructure based offerings.There are vast numbers of companies who have are offering applications through the cloud using a SaaS model. Salesforce is probably the best known of these.

VIII. CONCLUSION AND FUTURE

Cloud computing is still at a relatively early stage of adoption, despite its long history. Many companies are still considering which apps to move and when. However, usage is only likely to climb as organisations get more comfortable with the idea of their data being somewhere other than a server in the basement. We're still relatively early into cloud adoption - some estimates suggest that only 10 percent of the workloads that could be move have actually been transferred across. Those are the easy ones where the economics are hard for CIOs to argue with. For the rest of the enterprise computing portfolio the economics of moving to the cloud may be less clear cut. As a result cloud computing vendors are increasingly pushing cloud computing as an agent of digital transformation instead of focusing simply on cost. Moving to the cloud can help companies rethink business processes and accelerate business change, goes the argument, by helping to break down data and organisational silos. Some companies that need to boost momentum around their digital transformation programmes may find this argument appealing; others may find enthusiasm for the cloud waning as the costs of making the switch add up.

REFERENCES

[1] Nagaraju Kilari, “Cloud Computing - An Overview & Evolution”, Cloud Computing - An Overview & Evolution, Vol 3, No. 1, 2018, pp.149-152.

[2] Dimpi Rani, Rajiv Kumar Ranjan, “A Comparative Study of SaaS, PaaS and IaaS in Cloud Computing”, A Comparative Study of SaaS, PaaS and IaaS in Cloud Computing, Vol 4, No. 6, June 2014, pp. 458-461.

[3] Muhammad Aamir, Prof. Xiang Hong,Atif Ali Wagan,Muhammad Tahir,M.Asif, “Cloud Computing Security Challenges and their Compromised Attributes” International Journal of Scientific Engineering and Technology, Vol 3, No.4, 2014, pp. 395-399

[4] S. Singh, Y.-S. Jeong, and J. H. Park, ‘‘A survey on cloud computingsecurity: Issues, threats, and solutions,’’ J. Netw. Comput. Appl., vol. 75,pp. 200–222, Nov. 2016.

[5] T. Keskin, N. Taskin, A pricing model for cloud computing service, in: 47th Hawaii International Conference on System Science, 01/10/2014, pp. 699–707.

[6] S. Fremdt, R. Beck, S. Weber, Does cloud computing matter? An analysis of the cloud model software-as-a-service and its impact on operational agility,in: 46th Hawaii International Conference on System Sciences, 01/10/2013, pp.1025–1034.

[7] Mohammad Aazam, et al. Cloud of things: Integrating Internet of things and cloud computing and the issues involved, in: Proceedings of 2014 11thInternational Bhurban Conference on Applied Sciences & Technology, IBCAST,Islamabad, 2014.

[8] P. Viswanathan, Cloud Computing – Is it Really All That Beneficial?, about-tech, 07/07/2012. [Online]. Available:http://mobiledevices.about.com/od/additionalresources/a/Cloud-Computing-Is-It-Really-All-That-Beneficial.htm (Accessed 24 January 2015].

[9]Y.Mamoon,‘‘SwampComputing’’a.k.a.CloudComputing,WEBSecurityJournal,28/12/2009.[Online].Available:http://security.syscon.com/node/1231725(Accessed 27 July 2016).

[10] Ochei L, Petrovski A, Bass J (2016) Optimizing the deployment of cloud-hosted application components for guaranteeing multitenancy isolation. In: IEEE Conference Publications. pp 77–83. 2016 International Conference on Information Society (i-Society 2016).