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IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

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1

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

Table of Contents

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

Table of Figures

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

ABSTRACT

As organizations are experiencing regular unforgiving financial conditions, ideas, for example, outsourcing, deft and lean administration, change administration and cost diminishment are always increasing more consideration. This is on the grounds that these ideas are altogether gone for saving money on spending plans and confronting sudden changes. Most recent innovations like cloud computing guarantee to turn IT, that has dependably been seen as a cost focus, into a wellspring of sparing cash and driving adaptability and dexterity to the business. The motivation behind this paper is to first incorporate an arrangement of properties that administer the deftness benefits added to data frameworks by distributed computing and afterward build up a study-based instrument to gauge these spryness benefits. Our exploration investigation utilizes non-likelihood testing in light of a mix of comfort and judgment. This approach was utilized to get an agent test of members from potential organizations having a place with different businesses, for example, oil and gas, managing an account, private, government and semi-legislative associations. This exploration will empower leaders to quantify dexterity improvements and henceforth think about the spryness of Information Systems previously, then after the fact conveying distributed computing.

KEYWORDS:

Cloud, Cloud computing, VPC's, VPN, public, private, internet and intranet.

1. INTRODUCTION

The agenda of this research is to make the software engineers identify the different issues that may arise due to the extensive growth of computing in the technology field which can include the technical issues, business issues, data management issues, performance and network issues. The approach for this has been taken with the consideration of the already existing data mining and virtualization techniques that are widely used for the cloud computing services. Cloud computing is different to a specific business and has its own limitations with the risks identified from a producer's and consumer's perspective.

Throughout the previous three decades, one pattern in software engineering and computing has been clear and concentrated that different servers and frameworks have been released out to the general public and can do the general computing and engineering by themselves. Before personal computers came into existence in the 80's, if an organization requires any information related to the any deals or financial figures then the organization would have gone to another organization for information processing administration and paid an amount to retrieve such information and spend some more extra time to calculate the figures, but now a day it is possible to get hold of that information simply by knowing some basic programming using the desktops. In the coming years, many organizations have found the process and started accessing the information without anyone's help and this pattern of cloud engineering has helped the

organization to connect to internet relentlessly and perform operation based on their needs.

Cloud computing means instead of having all the hardware and software equipment of your personal computers or tools required at one place within your house or organization, it is given to an individual or an organization to use its services over the internet and in a very efficient manner. The clients or the organization utilizing the services of the cloud computing tools and technologies really doesn't care where the software or the hardware is presents because these are all present somewhere in the cloud which the internet grabs and presents it to the individuals based on their needs and actions.

This technique of virtualizing the cloud services is setting up a trend amongst the current software development practices that allows the individuals or an organization to achieve various goals using. For most of the individuals these services are just another method of utilizing outer services which can also be implied as outsourcing some of the tasks, whereas the rest of the organizations understand that these are the services that can be borrowed over the internet and set up outside the firewall to execute or utilize the required functionalities.

Since the past decade, the research shows a high interest shown by the enterprises to adopt the cloud computing technologies. Cloud computing has become a simple and effective way to shape the requirements and the resources as needed for more efficiency and cost-effectiveness, by also making the enterprises concentrate on the core business activities, helping in increasing the productivity of the business. A recent survey has

shown that the adoption rates have increased drastically, as 77% with the large enterprise and 73% in the small and medium sized companies.

2. PROBLEM STATEMENT AND JUSTIFICATION

The focus of this research is to cover more details about the different protocols used in different domains and the different ways to orchestrate these services compared to the networking on the on-premise services and the cloud network and their respective advantages and disadvantages. The main problem identified was the issues of data vulnerability across the different cloud regions and the security issues that might arise due to the high data transfers across cloud without any authentication or encryption.

There are quite some problems with the current usage of cloud services for the infrastructure development and deployment strategies which include the problems such as data vulnerability across VPC's of different regions. The impact of this issue has caused the loss of data to the external resources causing the data breach, which is a huge impact to the financial corporations and the companies that store sensitive information of the customers and its clients. The possible solution for this issue is to apply security groups to the instances at an IP address level. This requires additional research on the cloud infrastructure and the different impact of data transactions across VPC's.

While VPC suppliers contend that they give prevalent segregation, the truth is that your information isn't a different physical framework: your information is still put away on genuine

servers alongside other purchasers' information, yet intelligently isolated. On the off chance that the real server comes up short, your information and applications put away on it are lost. Likewise, there should be an abnormal state of trust with regards to the level of separation gave.

3. LITERATURE REVIEW

The agenda of this literature review is to identify and discuss the security concerns that were prevailing in the cloud computing field to protect the data and the confidential information of the businesses that enter cloud side of the technology. The approach is to identify the risks and solely focus on the factors that cause these. This research can be useful to assess the risks for the organization in the cloud environment and the information was gathered from case studies and previous researches. The researchers always suggest doing more researches on these implications. The future research should include the economic turns the cloud environments take in the market for high value businesses and the different frameworks and the components available in the cloud environment including the different obstacles a technical consumer can see.

Cloud computing has gotten expanding enthusiasm from companies since the beginning. With its inventive data innovation administrations conveyance demonstrate, distributed computing could increase the value of companies. Cloud computing postures exceedingly

concerning inward and outer issues. This paper displays a methodical writing survey to investigate the present key issues identified with the different services provided by cloud engineering appropriation. This is accomplished by checking on fifty-one articles distributed about cloud engineering selection. Utilizing the basic research approach, these articles are grouped into eight principle classifications: inner, outer, assessment, evidence of idea, reception choice, usage and combination, IT administration, and affirmation. At that point, the eight classes are partitioned into two dynamic classifications: cloud computing selection factors and procedures, where the previous influences the last mentioned. The aftereffects of this survey show that endeavors confront major issues previously they choose to receive cloud computing. In view of the discoveries, the paper gives a future data framework inquire about motivation to investigate the beforehand under-explored territories with respect to distributed computing appropriation circumstances and procedures. This research cry's out to promote hypothetical, professional, and experimental commitments to the examination territory of cloud engineering selection by companies.

Cloud engineering changes the fact that an enterprise utilizing a service on cloud doesn't have to own the responsibility of maintaining or controlling the service. It also arrives in two basic fundamental types, public and private, the cloud reciprocals of the Internet and Intranets. Emails over the internet and sharing documents are pictures like the ones many companies provide such as Google is the best example of public type. Amazon being one of the world's largest online retailer turned out to be the world's biggest supplier of cloud computing in mid 2000's. When the company discovered that it was just utilizing a small amount of what they were delivering, the company decided to supply the services through a component called Amazon Web Services

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

(AWS). Private cloud works exactly similarly but the assets are accessed through secure system associations, which can be an Intranet. Many organizations such as Amazon lets the other organizations utilize the cloud without any hassles to make an own protected private cloud known as Virtual Private Cloud (VPC), using VPN associations. Authentications across the different networks over the cloud infrastructure or the on-premise servers is provided by a third-party source and is used to collaborate between the different networks as shown in the Figure 1.
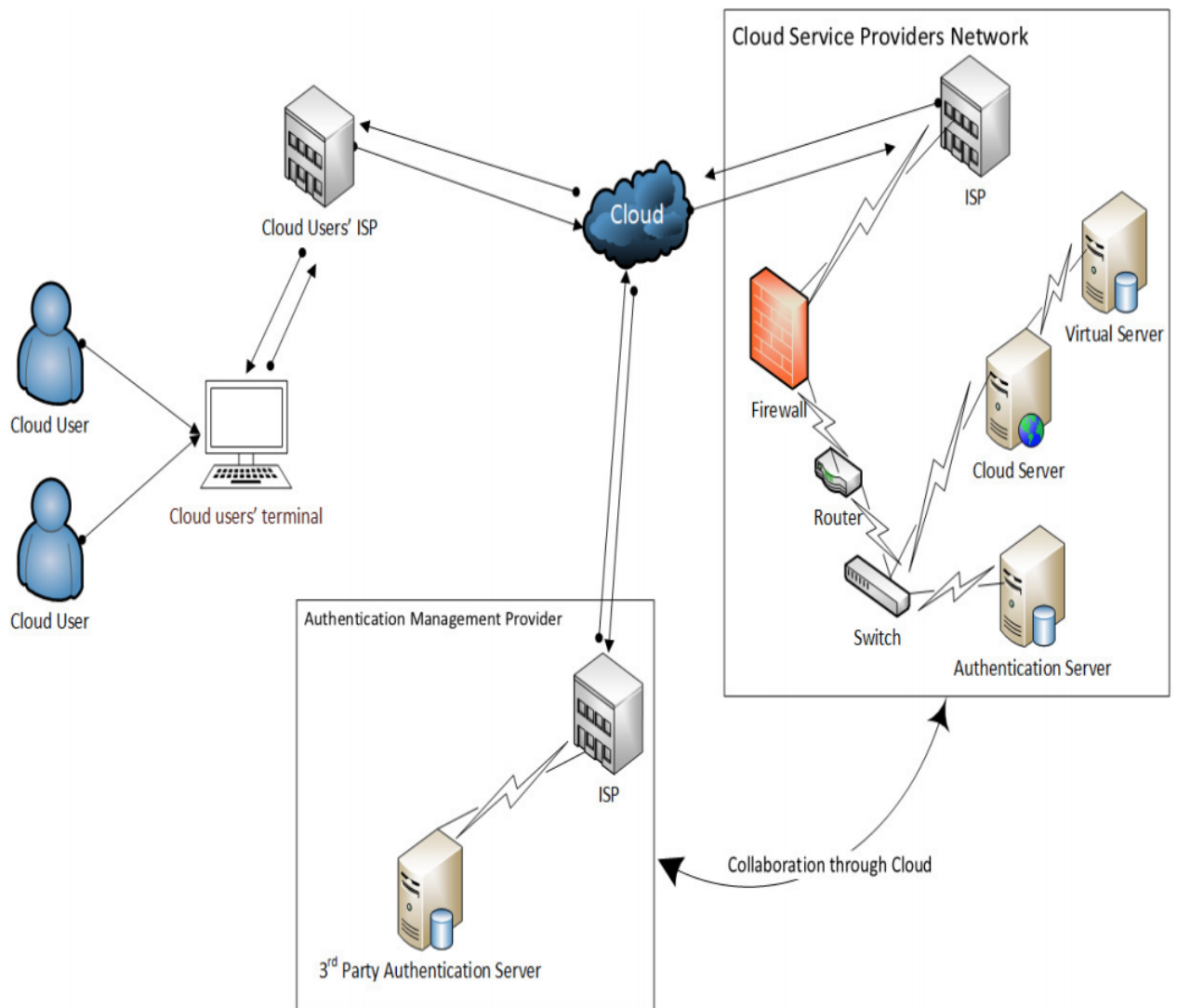

Figure 1 Authentication in Cloud (M. Ahmed & M.A. Hossain, 2014)

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

The cloud models can be utilized or deployed in any of the four following models. Private cloud, in which the service is supplied for select usage by a particular association containing numerous buyers (e.g., specialty groups), and it might be possessed, overseen, and worked by the association, an outsider, or some blend of them, and it might exist on premise or cloud. Community cloud, in which the framework is supplied for selective use by a particular group of buyers from associations that have common interests (e.g., aim, agreement necessities, approach, and consistence contemplations), and it might be claimed, overseen, and worked by at least one of the associations in the group, an outsider, or a few mix of them, and it might exist on premise or cloud. Public cloud, in which the framework is supplied for open use by the overall population. It might be possessed, oversaw, and worked by a business, scholarly, or government association, or, on the other hand some blend of on the premises of the cloud supplier. Hybrid cloud, in which the foundation is a structure of at least two cloud foundations (association, public or private) that stay exceptional elements however are bound together by institutionalized or exclusive innovation that empowers information and application versatility (e.g., adjusting between cloud). It has been accounted for as of late that 61% of ventures are at present utilizing open mists; 38% are utilizing private mists; and 29% are utilizing crossover clouds. Licensing issues might arise between the cloud service providers and the organizations that adopt to the new cloud service infrastructures and hence lay down the terms before getting down into the business. Figure 2 below explains the terms to reduce the risks during the implementation in real time to avoid havoc for the organization. Since the terms can be from both sides of the deal, the cloud service providers also have the rights to lay out some of their terms to respect and make effective use of their cloud computing infrastructure, which enables them to introduce contractual clauses to maintain a healthy business between the service providers and the organization

consuming the cloud services. Figure 3 describes the intellectual property issues and the terms to be followed during the consumption of the cloud services by the clients.

Risk number and name	R.22	Licensing Issues	
Short description	Violating a software supplier's licensing agreements can result in significant financial penalties or disruptions of service.		
Risk rating	Probability: Medium	Impact: Medium	Risk: Medium
Probability in Comparison to classic IT	↗	As many software licensing agreements are not yet "cloud aware", the probability of incidents related to licensing has to be considered higher in a Cloud setting.	
Impact in Comparison to classic IT	→	The impact of a licensing issue is considered the same in both settings.	

Figure 2 Licensing conditions (European Union Agency for Network and Information Security, 2017)

Risk number and name	R.23	Intellectual Property Issues	
Short description	Both in the Cloud and when using certain software and service environments within the own infrastructure, there is the possibility for creating original work (new applications, software etc.) tied to this specific environment. As with all intellectual property, if not protected by the appropriate contractual clauses, this original work may be at risk.		
Risk rating	Probability: Low	Impact: Medium	Risk: Medium
Probability in Comparison to classic IT	↗	The probability of intellectual property issues is considered higher in a Cloud setting.	
Impact in Comparison to classic IT	→	The impact of intellectual property issues is considered the same in both classic IT and Cloud settings.	

Figure 3 Property Issues (European Union Agency for Network and Information Security, 2017)

Cloud engineering adopting factors include internal components and external components that will affect the cloud computing selection forms. External components involve factors from the exterior group condition where the undertaking works and using which its cloud computing appropriation process is impacted. These external elements are: a) politics directions, b) Information industry measures establishments, c) cloud suppliers, d) work accomplices, e) contenders, and f) cloud benefit representative. The reception of engineering is apparently encompassed by diverse zones of ecological and between hierarchical vulnerabilities. It is seen

that there is a distinct accentuation on the significance of political directions at the domestic and global zones. Despite their part in encouraging the cloud computing reception safely, the absence of political controls can impede undertakings from embracing the cloud. A few directions, for example, the Health Insurance Portability and Accountability Act (HIPAA), the Gramm-Leach-Bliley Act (GLBA), the Sarbanes-Oxley Act (SOX) for corporate bookkeeping information were authorized some time recently cloud computing was ending up progressively received, and they won't not be adequate to encourage its selection. Be that as it may, a few nations began to establish laws particular to distributed computing, for example, first approach and the well-being Information Innovation for cloud computing system and Economic and Clinical Health (HITECH) Act in the United States by the Australian government.

Cloud computing Adoption Processes include forms that undertakings regularly take after to receive cloud computing alongside the duties and difficulties looked in each procedure. The assessment includes (1) expenses and advantages, (2) effect on individuals and work hones, (3) interior availability, and (4) cloud supplier determination. Preceding cloud computing selection, the best administration is in charge of assessing the venture's appropriateness for embracing cloud computing and also the reasonableness of cloud computing for the venture. This incorporates: assessing the expenses and advantages related with cloud computing in the long and here and now, for example, gainfulness, contrasting the income produced from the association's information assets along with the income anticipated using the cloud figuring, relocation costs, ROI and reconciliation, usage costs, and cost of covering up, for example, debacle and guiding recuperation. Assessing the effect of cloud computing on individuals and work hones is additionally an unquestionable requirement, as it might change its part staff and

expect them to procure new ranges of abilities (i.e., a few employments might be blended). With respect to affect, boss data professionals, Chief Information Officers may have a feeling of danger of losing importance and, to conquer this, Chief Information Officers should add to business technique and data administration, which requires an adjustment in culture also, abilities over the undertaking drove by Chief Information Officers. Further, cloud engineering is contended to have an occupation importance affect, that is, the degree to which cloud engineering upgrades the undertaking's status and everyday actions and gives administrations relevant to representatives' occupations with the goal that they have control over their work and finish their errands rapidly. Assessing the inside availability of the endeavor, existing IT framework and IT HR, for receiving distributed computing regarding having adequate what's more, dependable assets to help the utilization of cloud computing and fitting learning schedules and execution actions is contended to empower the reception of cloud computing. Choosing the cloud supplier in view of the cloud supplier's capacity to give powerful controls, the venture's comprehension of issues identified with the control over the information, the sort of administration display required, and the apparent cloud supplier's trustworthiness, notoriety, and supportability.

Apart from the major advantages, there are quite some drawbacks in utilizing the cloud computing services from the third-party providers as these instant conveniences includes some major disadvantages. Rather than acquiring computers and services, cloud computing implies you purchase services, upfront capital expenses wind up noticeably continuous working expenses. That may work out significantly costlier in the future works.

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

The case in which an individual is writing a long piece of code or using the programming languages for any of the development purpose and making use of other documentation formats to document any necessary notes, it requires a fast and reliable internet connection that allows the person to send documents and any reports using the mail. This is possible in some of the bigger and well-developed nations such as Japan, United States etc., whereas in the emerging countries and the rural areas it becomes a little difficult for the individuals working with poor internet speeds. Most of the consumers of the cloud computing services, utilize these service in a service-oriented architecture resulting achieving the desired outcome of the process, which is illustrated in the below Figure 4.
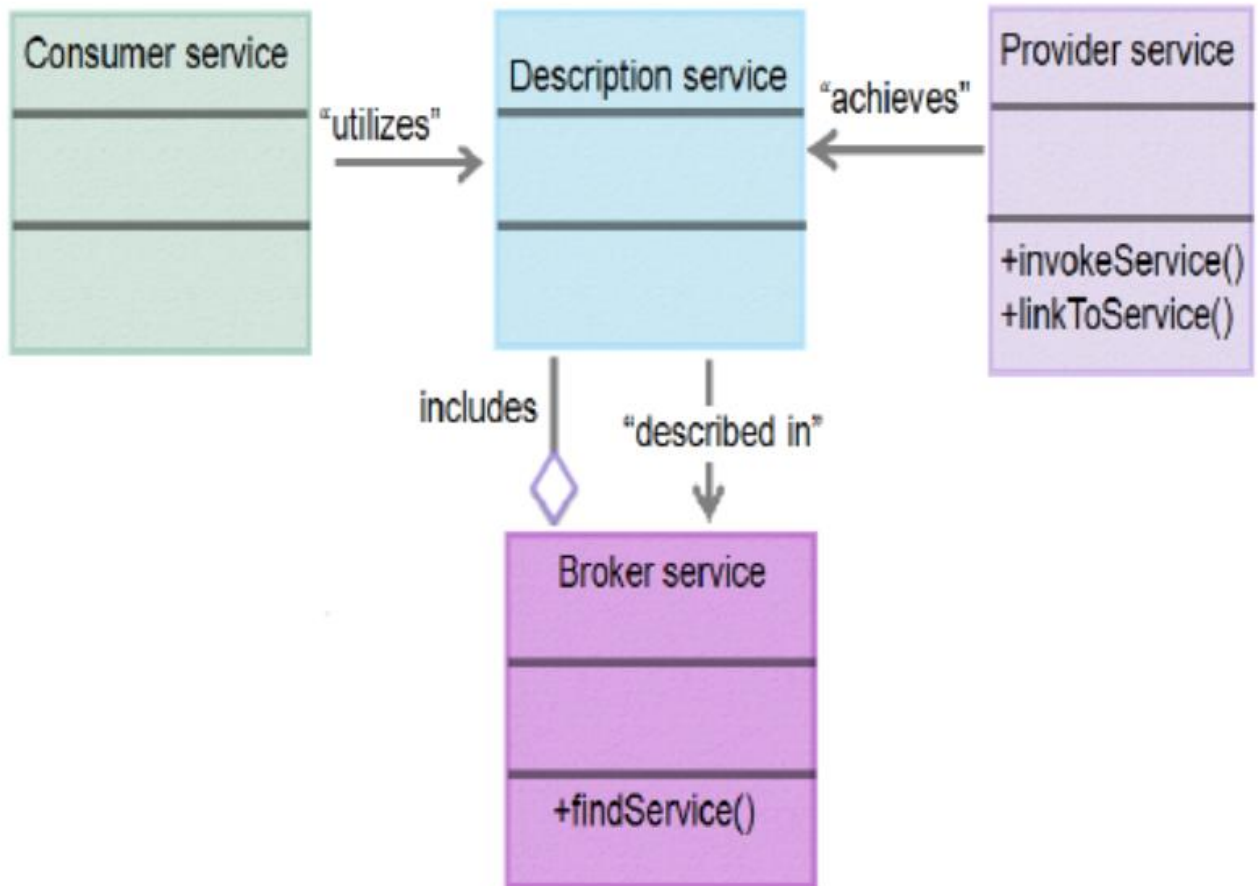
IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

Figure 4 Service Oriented Architecture model (adapted from Souiou, Wafa & Bounour, Nora, 2013)

According to Souiou, Wafa & Bounour, Nora. (2013), "From a business point of view, Service Oriented Architecture is presented as a conceptual business architecture where business functionality or the application logic is made available to Service Oriented Architecture users or consumers as a shared reusable service over computer network". This makes the consumers very vulnerable and very dependent on the services that the providers are providing and also helpless if the provides stop supporting the services. Many individuals have shown their aggression to the very bad past scenarios of using common servers and frameworks and the organization have not accepted these services for their long-term plans and hence came up with enterprise level features, support and maintenance. By using the generalized services provided by the provider, it makes the features and maintenance of the service limited and no innovations within the area can be achieved by the consumers. Using the services as provided, makes it secure but the adaptability for the enterprises reduces which is like renting an RV when you can buy your own house.

4. METHODOLOGY

Recently in the cloud computing world, the organizations that provide service to end users are from various industrial and business domains, which has made the business for cloud service providers very huge. Due to this reason, the service providers of the cloud computing infrastructure have been coming up with a number of new innovations to satisfy the needs of the end customers by providing them full time support and knowledge base of developing new innovations for themselves which has made the end users bend towards using the cloud computing services much more effectively than they used to before. To understand the approach to utilize the cloud service by various organizations in different domains, various research studies have been implemented across organizations in multiple domains to understand the literature review studies of the applications in the infrastructure and concluded to the aspects of the advantages involved in consuming the cloud computing services. Based on these studies a well-structured methodology is laid out to make understand the different solution approaches for the future implementations and any backlogs that have been identified in the current workflow. This section of the thesis entails the different approaches that have been identified to develop the thesis during the analysis of the methodology. Most of the listed scenarios in various organizations are received from a practical knowledge during the planning and development phases of various project.

Literature Review:

Using the approach of literature review, there are many references of approved online articles, books and journals provided. These references help identify the various practical reports and additional theoretical information that is required for a complete knowledge based on the cloud

computing services and to apply them in the scenarios of burst out issue in the real time environment. Additionally, the literature review helps in applying the concepts of the cloud computing to improve the functionality of the applications in a project in various aspects such as functional improvements and performance. The literature review on a whole not only gives the knowledge to an individual in a theoretical pattern but also helps them in applying the concepts of the cloud computing resources and application in the real time scenarios and in actual projects, giving an additional insight into the architecture of the project. After the literature review and its contents and completely analyzed and understood, it is now time for applying individual research on the organizations that have implemented the cloud computing services in their application development and deployment, which then gives any individual to identify and document the various advantages and disadvantages that an organization might have observed during the implementation of these services and document everything in their findings.

Case Studies:

As the cloud computing services start growing in the current market, it is required to analyze and to learn lesson from the organizations that have implemented these cloud computing services during the course of the application development and deployment process. This documentation helps an individual in completely understanding the different actions and the practices that a company has followed during the development process and earn business value for entire organization, which can also help the other departments to adopt these features for future and to earn more value to the organization. The study of these experiences help provide the different experiences that these organizations have faced to evolve during the span of the planning for the infrastructure and maintain these services over different platforms to support the functionality of a single or multiple functional components. As part of evaluation process many organizations

follow the process of referencing various approved online articles and journals before they start to plan on any feature and presenting that to the architects of the company and it will also enable the individuals to learn from the success and failures of other authors and to make use of the best practices that they have followed. Due to drastic changes in the technology fields, which is directly impacting the application of the cloud computing services, it is always recommended to apply a research forehand before jumping into conclusions and discuss the possible options with multiple minds.

5. RESULTS AND FINDINGS

There are many opportunities that the software departments of all organizations including the health care clients observed during the past couple of years. The major advantage that US Department of Health & Human Services observed to implement the Amazon Web Services for their medical record services is cost effectiveness because Amazon Web Services charges the services based on the time and service of utilization and the maintenance cost can be completely eradicated as it be included within the amount charged per service. The cost for these cloud services are way cheaper than the actual amount paid currently for the on-premise services and based on this analysis, we can say that it is a cost initiative effort that this client has taken to decrease the information technology cost on the software services. The other opportunity that the company has observed would be hiring and maintaining additional engineers to maintain the in-house infrastructure as the cloud computing services have the flexibility to speed the automated deployment processes and providing high availability of support for any production run time related issues. The organizations involved with health indulge in planning methods that include

strategic planning's to identify the resource allocations, identifying the issues, evaluations and taking the right actions as shown in the below Figure 5.
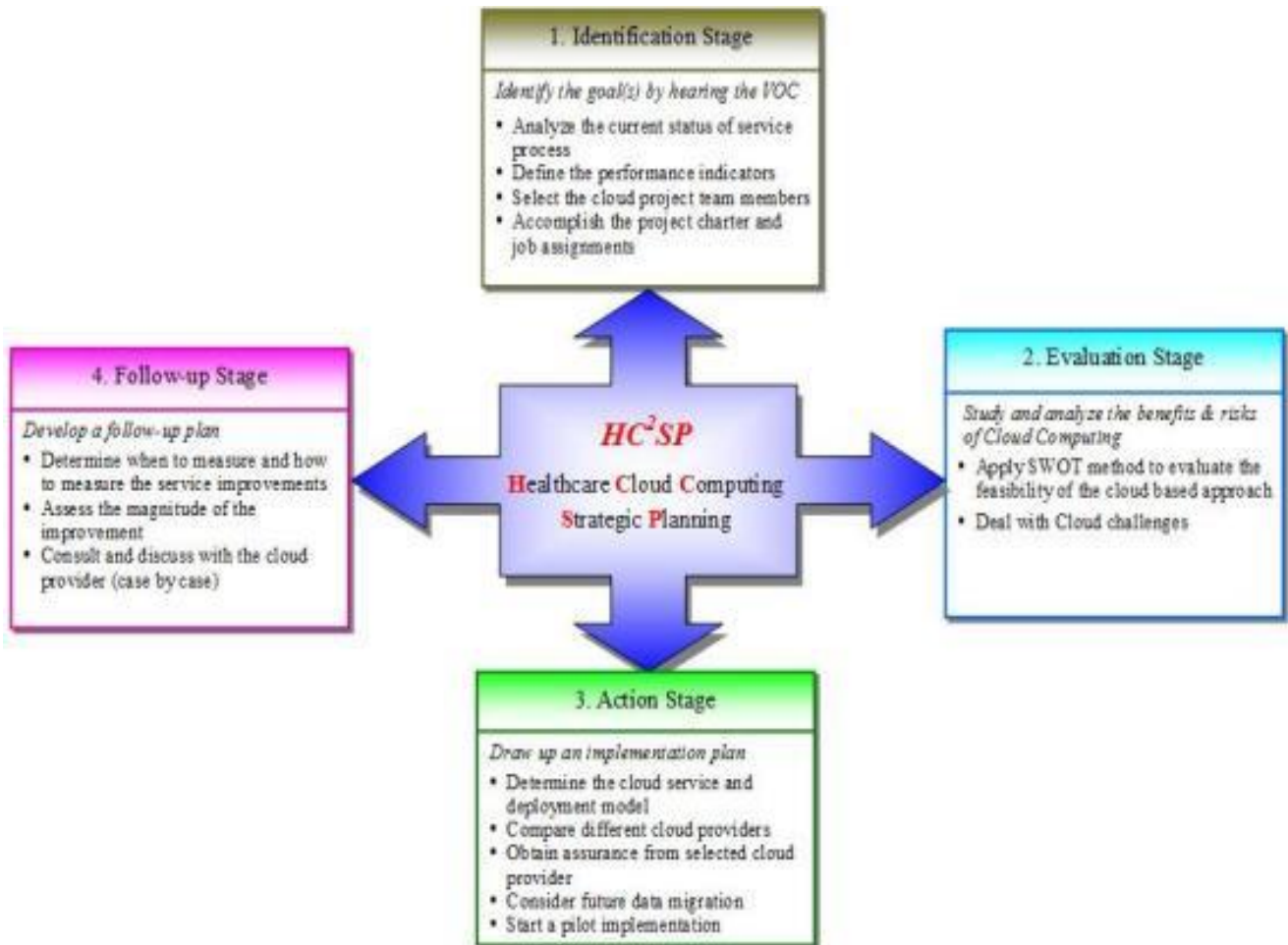

Figure 5 Strategic planning for Health Care Clients

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222190/)

Health care clients require time to time innovations to provide to efficient and quality services to the customers and to achieve these features many professional experts always recommend that utilizing the cloud computing services can help improve the health care services in the information technology field. Introducing the cloud technology services can help the organization to reduce the expenses on the hardware and maintenance costs and will increase the

time utilization on many other aspects such as innovations and adopting the latest and more feasible technologies that can help develop better health care services to the clients. Many health care organizations are implementing automated cloud-based systems to collect the patient's data and transfer to respective cloud storage of medical care centers for further processing or distribution with an added security to the data over the connected networks. The Data Analytics professionals have also indicated that most of the software companies move towards implementing the cloud computing services based on the rate at which the data is slowly getting transferred to the cloud storage services and the different formatting the data is going through during the distribution and processing. The different services that the cloud computing infrastructure provides helps the organizations to manage less as compared to the on premise services and gives an ability to concentrate largely on the applications of the organization rather than worrying about the infrastructural changes to deploy the respective applications. Figure 6 below illustrates how the management styles in utilizing the on premise servers and the hybrid servers provided by the cloud service providers change.

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

Figure 6 On premise Cloud Manageable differences (Victor Bylin, 2016)

One of the software company that I identified during the research is US Department of Health & Human Services has devoted time and effort in the cloud computing services to explore the new processes for medical record services by implementing the cloud services provided by Amazon Web Services (AWS) to store the patient's information and any other medical data online making it accessible to various group based on the required viewership. These medical care services make use of the Amazon Simple Storage Services (S3) to store the data in the required format to present it on the online portal based on the requirements of the direct clients accessing it. The health care organizations such as the US Department of Health & Human Services has listed four models based on the standards and technology to make use of a hybrid cloud which comprises of

the public and private cloud infrastructures to be in synchronization with the other organizations to gather information and provide services.
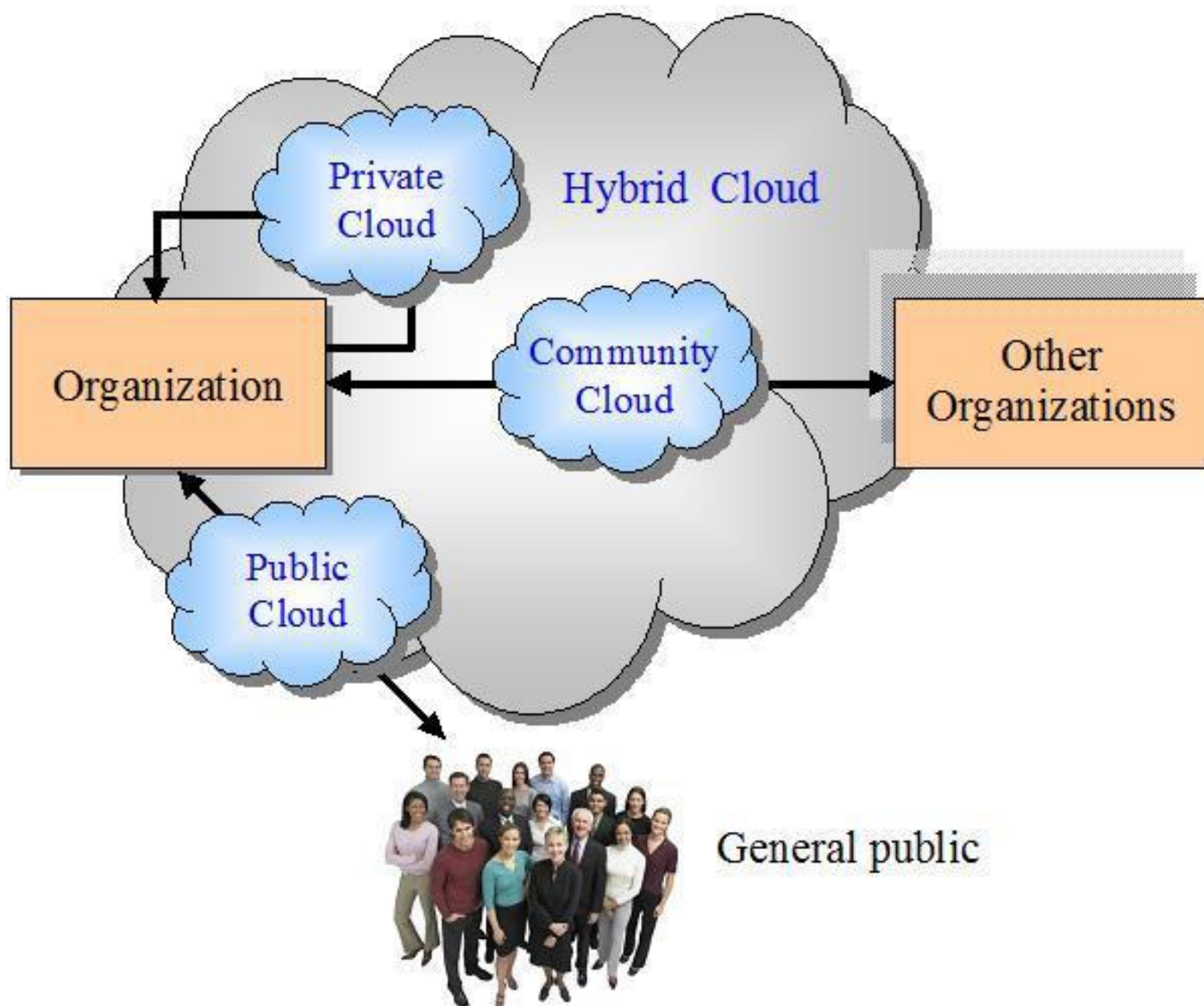

Figure 7 Cloud computing deployment models.

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222190/)

ME bank is an Australian based bank that has many branches located across the Australian continent and the headquarters is located in Melbourne, Australia. The main area that the bank works in is providing Home loans to Australians along with performing retail banking

services such as saving accounts, personal loans. Unlike the traditional banks, this bank serves the customers through via digital channels and mobile banking service agents. After the company has taken the decision to migrate to cloud services, the bank has finally researched the possibility of consuming one of the five major cloud computing service providers and at the end of the research it was cut down to final provider which is Amazon Web Services, since this service provider was giving out the self-service capabilities for an affordable cost. Since, the traffic on the on-premise servers was increasing rapidly, it was increasing the load and maintenance on the physical data centers and hence there was a high need for the bank to migrate to a cloud service, which can avoid the maintenance of the servers for a reasonable cost.

Amongst the vast number of media organizations around the world, Next Media is one of the biggest media company in Hong Kong and Taiwan areas mainly providing the readable sources such as newspapers, magazines and books. Since it also provides its customers with readable content through online portal it is one of the best media company to conduct a research on. This company has migrated its services from on-premise to cloud services to provide its customers with mobile applications for magazine publications. With all the services hosted on the Amazon Web Services cloud infrastructure, it made the customers experience seamless navigation with faster response times between different pages and the customer experience better.

6. PROPOSED SOLUTION APPROACH

At the point when some of the services flop in the cloud, the impact of the disappointments to the mission rationale should be known with the goal that right recuperation actions might be taken. A run-time application particular checking and administration instrument can be performed. With this apparatus, the application rationale can stay on the buyer's host server. This enables the buyer to midway screen all parts of the application and additionally information stream. Since all yields from fundamental administrations are sent to the application rationale, any information contradiction between administrations isn't an issue. The capacities of the run-time checking and administration device are as per the following: a) Enabling application clients to decide the different conditions of the assets that might be utilized to execute the services (over numerous VPC's), b) Enable application client to decide the continuous security act and situational consciousness of services, c) Adding the service clients with the capability to migrate client's application (or a piece of the service) to other websites (to other virtual machines in same or diverse cloud through and through), d) Adding the application clients with capacity to change the service rationale in the process, e) Adding discussion abilities with different suppliers. Migrating the legacy services or the application to the cloud computing infrastructure gives the organization an ability to understand the legacy application more, understand the target systems that are affected by the migration process and provide a better justification to the whole migration process and its advantages to the entire organization which can help better support the

upstream and downstream application reducing the potential impact. Figure 8 shows the interdependencies between the different activities of migrating a legacy system. Availability of couple of merchants, for example, Hyperic and NimSoft that give application-particular checking instruments that give a portion of the above usefulness. These checking devices might be additionally upgraded or utilized as a part of conjunction with different apparatuses to give the level of observing required. Be that as it may, any apparatus that will be utilized for military purposes should likewise get some sort of accreditation and confirmation system.
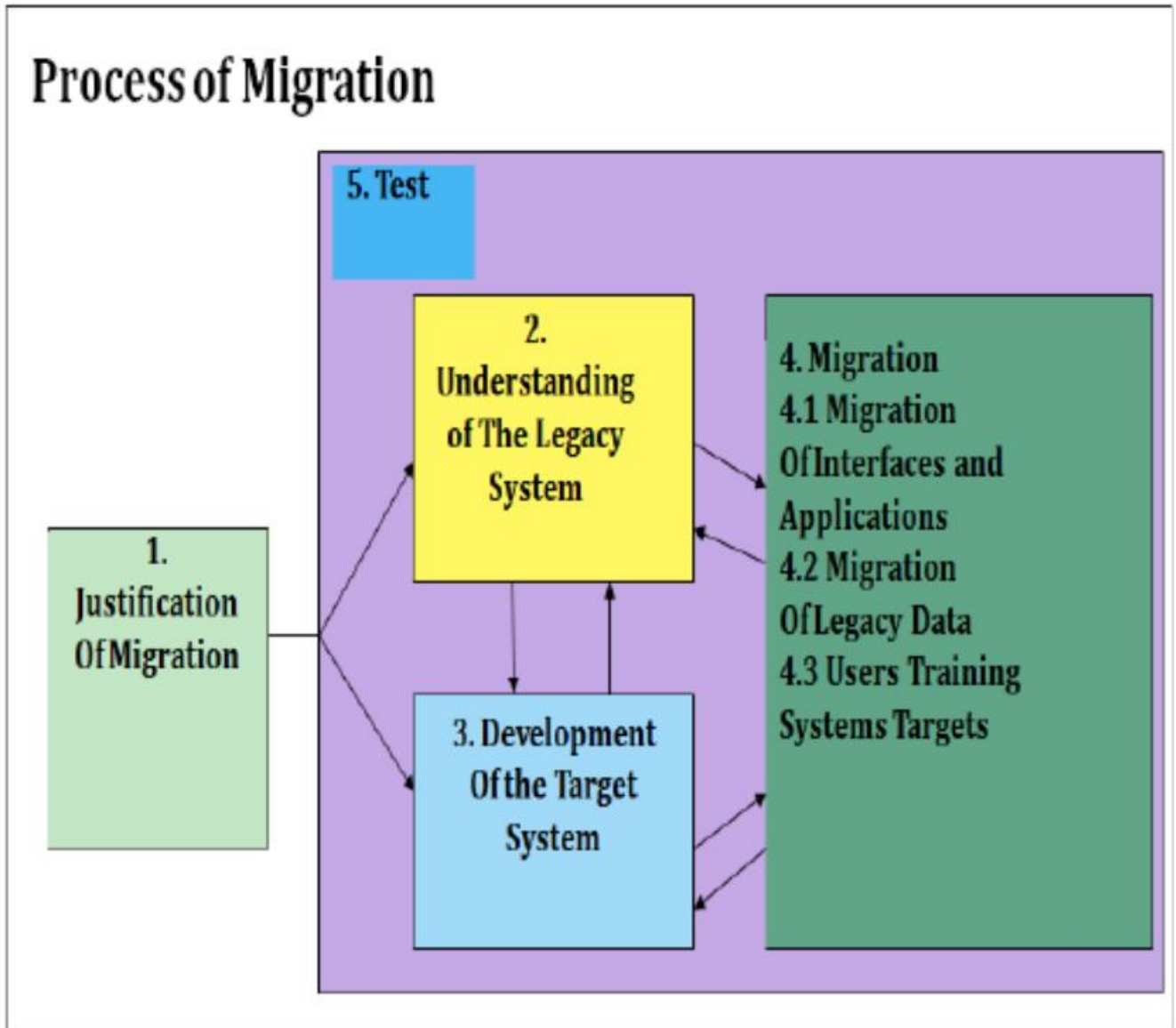
Figure 8 Major Activities in Migrating Legacy System (adapted from Souiou, Wafa & Bounour, Nora, 2013)

These SLAs commonly express the abnormal state strategies of the supplier (e.g. Will keep up the recovery time objective or the service level agreement of ninety eight percent) and don't permit consumers to managing the necessities aligning with the supplier. Community of interests mists specifically have particular security strategy necessities that must be accepted by the supplier, because of the idea of interests and the missions they are utilized for. These necessities

should be imparted to the supplier and the supplier needs to give some method for expressing that the prerequisites can be met. Consumers and suppliers require a fundamental method for speaking to their security necessities and abilities. Customers additionally require an approach to confirm that the gave foundation and its indicated security instruments meet the prerequisites expressed in the shopper's arrangement (proof of affirmations). For instance, if the purchaser's strategy requires disconnection of VMs, the supplier can make an attestation explanation that says it utilizes store partition to help VM disengagement.

According to J. Heiser (2008), "In cloud computing (and in addition different frameworks), there are numerous conceivable layers of access control. For instance, access to the cloud, access to servers, access to administrations, access to databases (direct and inquiries by means of web administrations), access to VMs, and access to objects inside a VM". Probably due to the different models defined, all these services will be monitored and controlled by the provider and the rest of the services by the customer. Google applications, a provide SaaS controls confirmation and providing access within the services, yet clients themselves have the access to control the reports via the gate interface till entrance check instrument. In IaaS sort path, these clients have the ability to create and manage accounts on their own virtual machines and make get to control records for these clients for administrations situated on the VM. Despite the organization demonstrate, the provider of these cloud services will control the client identity and access controlling techniques. While a few suppliers permit united confirmation – empowering the customer side to deal with its clients, the entrance access gateways trouble is dealt by the provider. This requires the consumer to trust the supplier as far as agreement, security, and upkeep of access control comes into the process. This can be oppressive when various clients

from various associations with various access control strategies. This proposition concentrates on get to control to the services on the cloud. In any case, these ideas might be connected to get to access at any of the different level, if esteemed vital. A proposed path is laid out for the customer to deal with the entrance control basic leadership procedure to hold limited access, which requires less assurance of the provider.
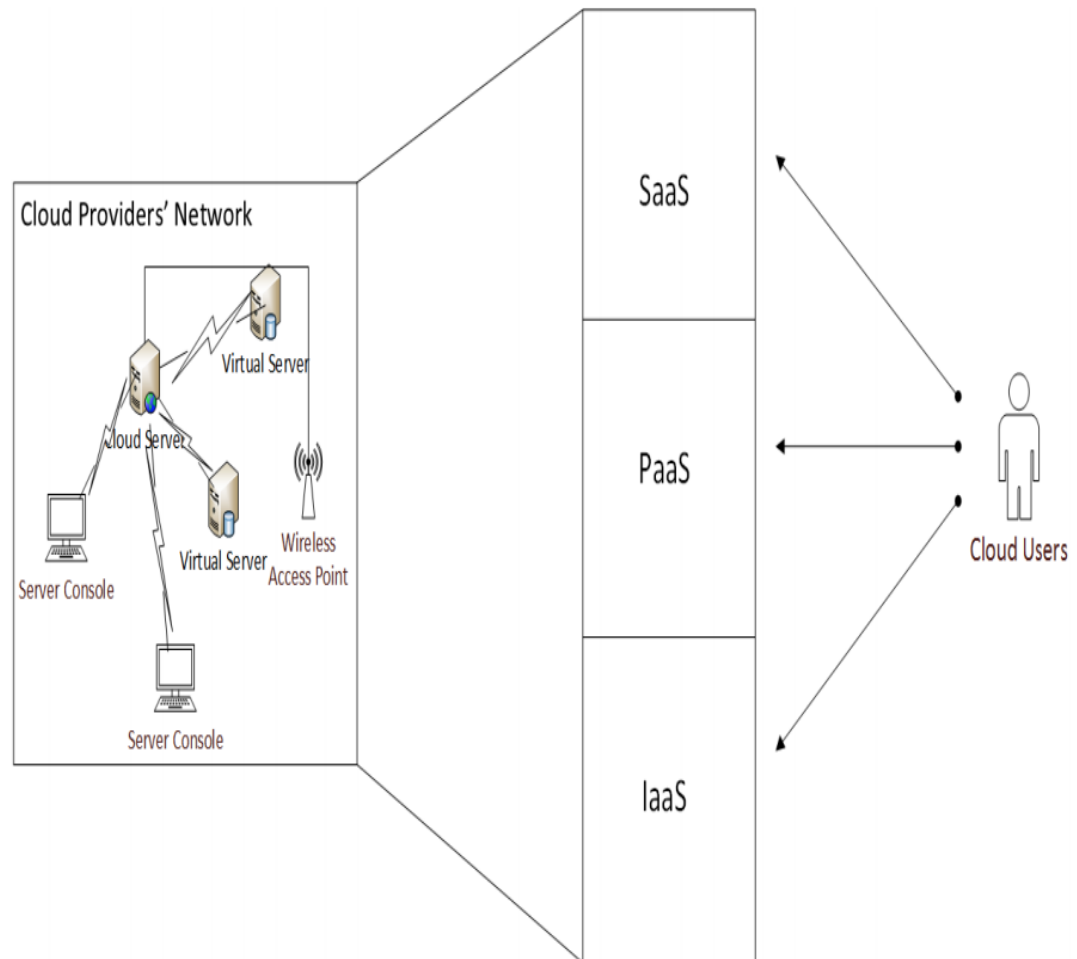

Figure 9 Cloud Service Hierarchy (M. Ahmed & M.A. Hossain, 2014)

As shown in the above Figure 9, there are different ways for the cloud users to access and utilize the cloud services based on the approach used and have strengths and weaknesses with the setup involved in the end user's infrastructure. This strategic approach to resolve this problem

requires the consumer and provider to have a prior strong relation of assurance, and also fundamental methods for depicting services, consumers, and securities between the cloud provider and consumer. It additionally should have the capability to ensure that the supplier will maintain the customer side's entrance choices. Cloud automation is one of the greatest innovation that the mankind has even seen, which gives the developers and testers of an organization the ability to perform their development actions for an application project to daisy chain the sequence of the actions to complete the end to end beginning from the logging into a server to successfully deploying and testing the applications on the cloud servers, which makes the work of the employees effortless and helps the organization to save the costs on the resources. The main differences between the different services provided by the cloud only depends on the level of infrastructure that the organizations want to manage for itself and can greatly help the organization based on the requirements on the developer operations and the application development. There are many reasons and relationships that needs to be understood among the cloud computing models to completely identify the security risks involved. For all the cloud computing services, IaaS is the foundation, while PaaS is built on IaaS and SaaS is built on PaaS (Cloud Security Alliance, 2009) as shown in the below Figure 11. To be on top of identifying the security risks the cloud service consumers are responsible for better managing the cloud environment and the virtualization concepts involved in the cloud computing world, which makes analyze and understand the complete functionality. On the other hand consumer is responsible for security at IT system level i.e. operation system, applications and data (Cloud Security Alliance, 2009), which can be better illustrated from the below Figure 10.
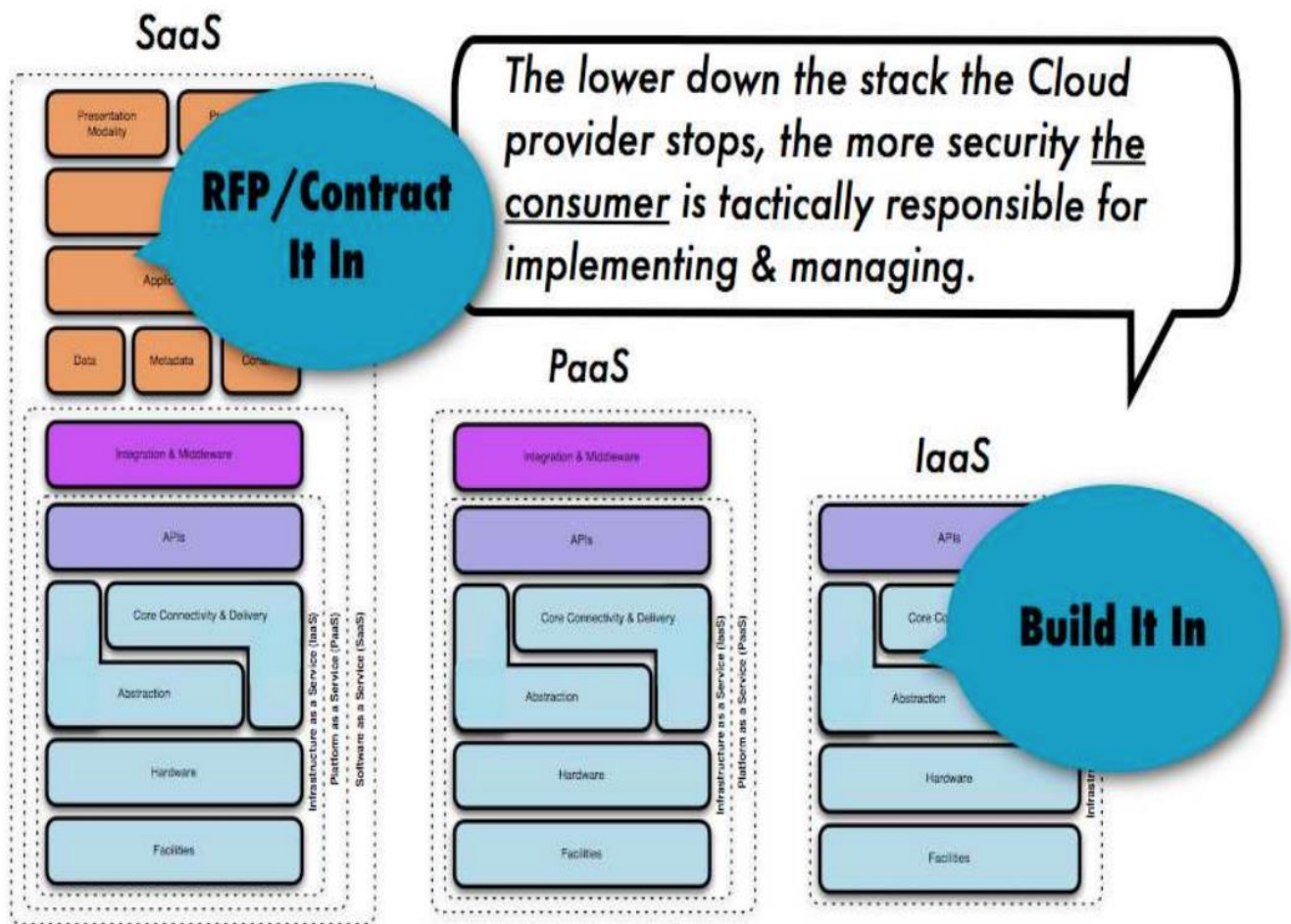
Figure 10 System Integration (Cloud Security Alliance, 2009)

These different layers within the cloud computing architecture helps better protect the information in the cloud storage services and avoids the security risks at a greater level, giving the cloud service consumer a motive to adopt these cloud computing services more efficiently than they could have dreamed during the development and maintenance of the on premise services giving them an ability to better perform during the planning, development and deployment phases of the application lifecycle.
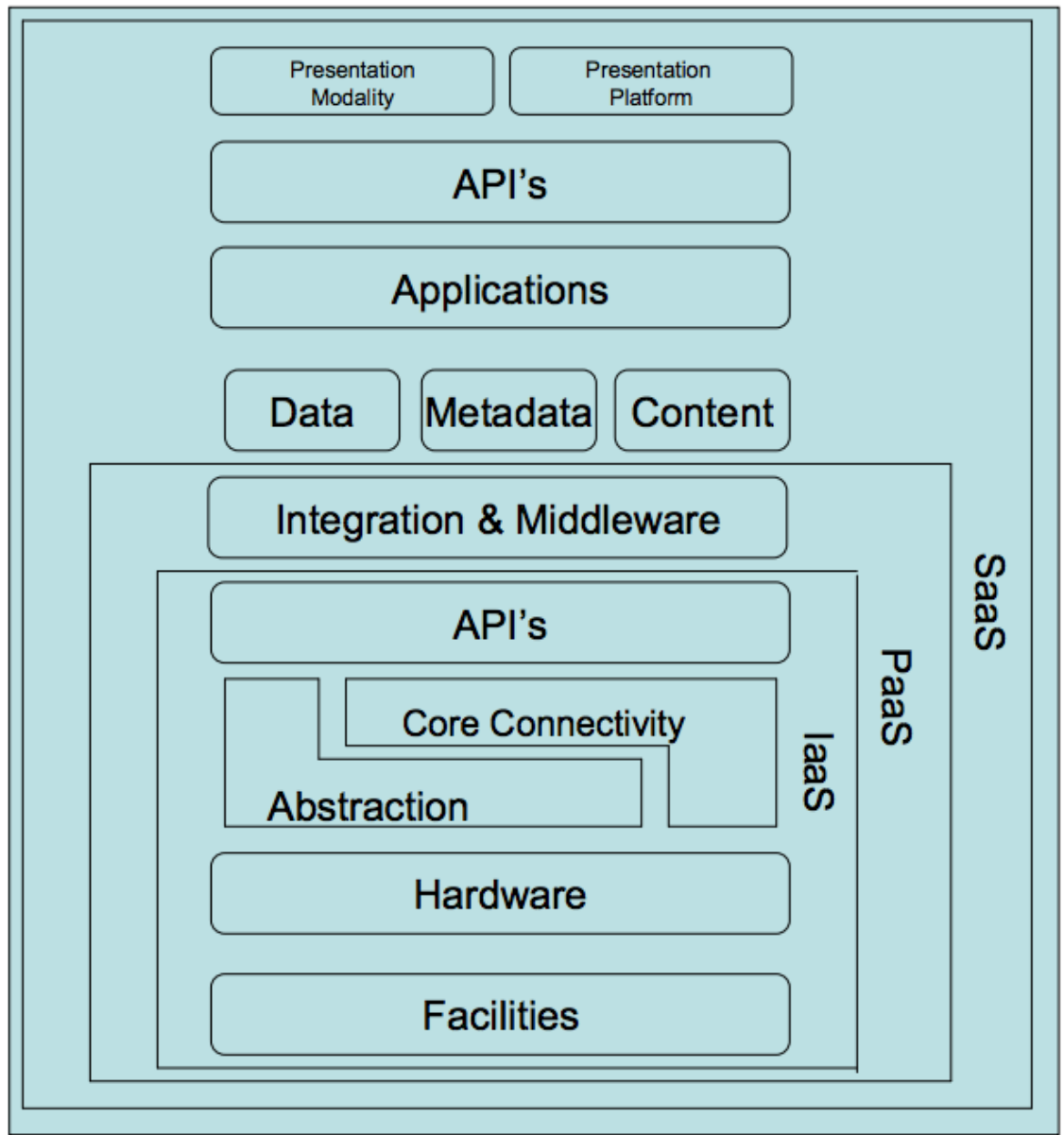
Figure 11 Cloud Reference Model (Cloud Security Alliance, 2009)

Moreover, we must demonstrate that this approach is in any event secured as the customary access control show. This process of security requires the information proprietor to be associated with all solicitations. Consequently, visit get to situations ought not utilize this strategy if movement is a worry. In any case, most secret information expanding plans requires all clients to

IMPROVING SOFTWARE PROJECTS WITH CLOUD COMPUTING

allow testaments to the question way, with the goal at each point the client inquiries a storage

service, the proprietor should be included. In this manner, very little not quite the same as that so
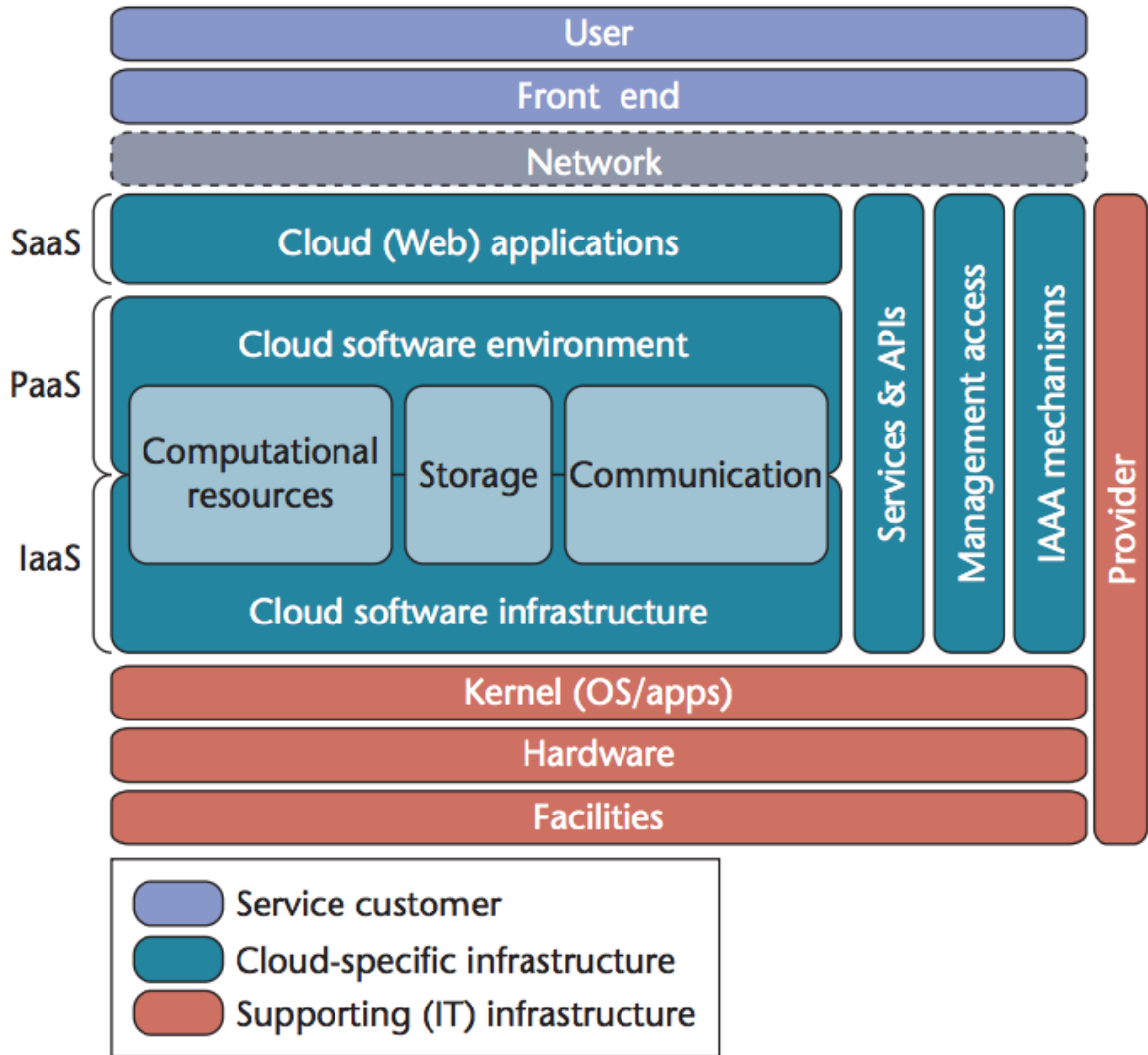
may not be an issue.

Figure 12 Cloud Reference Architecture

(https://cloudcomputing.ieee.org/images/files/publications/articles/CC_Vulnerabilities.pdf)

From the figure 12, it can be identified that all the services within the cloud infrastructure are

isolated and any issues that are identified in a specific module can be easily identified based on

the logging that is in place and be fixed with live traffic on the applications to ensure that there is no potential impact.

7. CONCLUSION

The cloud computing services talks about standing out amongst the most noteworthy actions that processing has viewed and experienced. Moving towards the cloud, one organization would find service-based organization and follow the steps, where many services such as OS, servers, clusters and middleware will get diminished. Much like the other major companies such as Google and Facebook were not well-known a decade prior, the technology scene is expected to fundamentally change in the next couple of years. Many new upcoming organizations with a cloud service are considered to be more likely in achieving the best and ensuring the incomes with a belief of cost proficiency options. Considering the organization that the top players in the market currently will either have more innovations to make the services better or have a better competition in the market. A tolerable shot for most of the organizations that will have unforgiving conditions to move to the cloud-based economy will be essential for most of the discussed reasons. The cloud suppliers have helped most of the organizations in setting up the infrastructure and maintenance today and will accept to continue to do the basic part of development in the coming years. The organization will continue to encourage the use of the cloud engineering techniques and take more courses of action that will make the organizations more secure and profit making to reduce the technology costs and debts. Beginning today, most of the organizations that foresee the future will continue or dive into considering the cloud services and migrating their legacy stacks into the cloud to additionally be more innovative and more engaged with the rest of the world.

8. RECOMMENDATION

From the research applied, there a good amount of companies that have been continuously analyzing and applying the cloud computing services in their organizational infrastructure to understand, identify and resolve the information security risks. All of these organizations are adopting to new ways delivering cloud computing technologies without developing any new technologies and are utilizing the services extensively for huge data storage handling on-demand by making use of the various components available within the cloud computing infrastructure, making them stay on top of the game in the daily market. Recommendation for adopting the cloud computing services can vary upon the features implemented and can also provide its own advantages like maintaining risk measures to identify the security vulnerabilities of a given company since the different networking programs are isolated within the infrastructure, gives a high guarantee of data isolation across different networks. Cost optimization being one of the recommendation, adopting cloud computing services helps an organization to save the annual budget and utilize the amount saved on any new innovations that the company is interested in and can provide a great interest to the company.

As the cloud computing services only charge for the services being utilized rather than maintaining our own servers and spending an enormous amount of budget for their maintenance and resource costs. There are many cloud service providers available in the market, so it is recommended to identify the suitable provider that supports and provides sufficient amount of services according the needs of the organization. It is also recommended to highly make sure that

they provide on-time service support and are available at any time needed and provide additional services like helping in supporting the business needs based on the on-demand requirements that the organizations get from the clients. During the analysis, it is also recommended for every organization adopting the cloud computing services to identify the information risks and maintain data encryption, which most of the cloud services provide so that the information security can be well established. There are several guarantees that have to be taken from a cloud service provider such as a reasonable period of time for which the data will be stored at a particular to not make it vulnerable to other phishing activities. Many organization across the world have individually identified the key risks by their own assessment based on the company requirements and the domain in which the company excels and have reported them to the cloud service providers, which was a long time ago and the cloud service providers have always been very helpful to address these risks and provide a resolution within a short span of time. The countries that will be hosting the data centers for the cloud service providers has to be well defined before the contract is established so that processing location of the data is known to the organization. Security and confidential terms have to be established as the secret information of the organization stored on the cloud is not accessible to anyone and even if some of the security administrators have access to the information, they should be having some good terms with the organization so that the information security compliance is maintained. By applying these recommendations, the organizations can adopt the cloud computing services without any security risks and can benefit from the maximum profits to the organization in the future, helping the company and the employees under it to lead a peaceful and innovative life.

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APPENDICES