Current Trends in Software as a Service (SaaS)

T.C. Sandanayake;P.G.C.Jayangani

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Software as a service (SaaS) is one type of the cloud computing that has gained more popularity in the world. It is a way of delivering the software through the internet to its end users. Then users can use it through subscriptions from vendors. Users have to pay only for what they use. SaaS architecture is a very high level model which is based on Application Service Provider (ASP) concept and Service Oriented Architecture. Currently many organizations are using SaaS as it is a service centric model and it uses technologies like multi-tenant architecture which in turn provides the users with many desired set of features. SaaS also have some security challenges which can be classified under data, application and deployment of SaaS architecture. Furthermore there are many emerging trends in SaaSwhich are focused on full filling advanced customer demands. This research study is evaluating the current trends, approaches and applications of SAAS.

Current Trends in Software as a Service (SaaS)

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Abstract

Software as a service (SaaS) is one type of the cloud computing that has gained more popularity in the world. It is a way of delivering the software through the internet to its end users. Then users can use it through subscriptions from vendors. Users have to pay only for what they use. SaaS architecture is a very high level model which is based on Application Service Provider (ASP) concept and Service Oriented Architecture. Currently many organizations are using SaaS as it is a service centric model and it uses technologies like multi-tenant architecture which in turn provides the users with many desired set of features. SaaS also have some security challenges which can be classified under data, application and deployment of SaaS architecture. Furthermore there are many emerging trends in SaaSwhich are focused on full filling advanced customer demands. This research study is evaluating the current trends, approaches and applications of SAAS.

Keywords – *Software as a service (SAAS), SAAS Architecture, Multi-tenancy, Security challenges*

Introduction

The world is rapidly changing everyday with the use of internet into many different purposes. Cloud computing is such a trend which entire world has embraced recently. Cloud model consists with three essential components and Software as a Service (SaaS) is one of them. Although SaaS is a newly emerging business model in the software industry its growing speed is very high. This is mainly because it delivers a lot of benefits and facilities to the end user (Levinson, 2007).

SaaS is a software distribution model where applications are hosted by the service provider. It is made available to the end users though the internet (Levinson, 2007). Here the software vendors host and maintain the servers which includes code and database in the application. Customers do not have the ownership of the software but they rent it normally for a monthly feeHence many people embraced SaaS quickly as it promised to give their services to overcome almost all issues related to packaged software. It delivered easier, speedier and cheaper services and therefore customers were attracted to it. If anyone has internet connections they could access data on SaaS application from any device (Hancheng 2009). Unlike

traditional packages, the SaaS vendors own the software and host it. SaaS vendors also take care of upgrading, security, and maintenance of the software. Hence, SaaS is sometimes known as hosted software or "on demand software" (Levinson, 2007). In SaaS the user can run software without expending for investments in database, servers and software licensing. In SaaS all customers use the same software and it cannot be customized. SaaS service providers add features based on different clients feedbacks and reviews. Then those features will be available to all users ultimately which is known as the multitenant architecture (Hancheng 2009).

On the other hand, security is an important thing in SaaS applications. Data can be owned by the users through negotiations with the vendors. So in terms of data ownership in SaaS, users should make sure that they hold the ownership of data. In real world vendors take more measures and invest more in security, privacy, recovery and maintenance than other usual enterprises (Levinson, 2007). Nevertheless SaaS also faces with different security challenges. Those security challenges can be further divided as security of data, security of application and security of deployment. There are also some countermeasures which can be taken to face those security issues and they are discussed further in this article (Yao et al, 2015)

Here, a deep analysis and a review of the SaaS has been done with its evolution and architecture. This article mainly focuses on giving a good understanding on what is happening in SaaS and what are its benefits. So the organization of the article is as follows. First it discusses about the SaaS and its functionality (Yao et al, 2015). Then its evolution has being explained and thereafter the architecture of the SaaS has being discussed with respect to its maturity levels an architectural levels. Next the benefits of SaaS have been analyzed descriptively (Levinson, 2007).The security challenges faced by SaaS users and service providers have been presented in the next section and finally emerging trends of the SaaS have been described.

Why Software as a Service?

Today software is a very common attribute in all business areas such as sales, production, managing inventories, recruiting and training of employees, managing customer relationships, financial and accounting activities and many more. So to handle all these activities people use on premise software which needs to be installed and maintained by themselves. They also have to pay a large cost for the infrastructure needed in order to store data and manage their security. As an alternative for this people have introduced SaaS where software is given as a service over the internet by service providers (Levinson, 2007; Yao et al, 2015).

It is a model where providers give their service so that users can pay as they use it instead of having the entire application with them. They also provide their services at any time of the day. Therefore SaaS has changed the way of building, selling as well as using the software. This was introduced at a time when people were fed up with the traditional software. As they were facing with a lot of difficulties in traditional software like unwanted costs , licenses and many more they were attracted and moved to SaaS without a

pull from the vendors. SaaS has also promised with higher values such as speed, quality, easiness and low cost and it has rapidly become an emerging passion in the business world (Yao et al, 2015)

Currently SaaS is relying on many technologies like web services and Service Oriented Architecture (SOA). In this case every software gets the chance to act as a service provider. A service provider exposes its functionality and operations through a public broker. Also it can act as a service requester. In this case it cooperates data and functionalities from other services (Satyanarayana, 2012). In the multitenant architecture where thousands of users use one instance of the server which is hosted on the server side. This has helped to reduce the cost on resources which in return has given the chance for the users to rent the application as they use it (Yang, 2011).

SaaS is also known as on demand software (Mahesh, 2014). With the development of technologies like Web 2.0 and HTML 5.0, the quality of the graphics and other functionalities has increased and users feel like they are using software which is running on their personal computers. For this simplicity it has been embraced by many people all over the world (Mahesh, 2014). As SaaS providers use the concepts of multi-tenancy and virtualization it has helped to improve efficiency and more successful resource utilization. According to some researches it has been said that SaaS is five times faster than on premises (Mahesh, 2014).

Evolution of the Concept of Software As A Service

Even though the term SaaS has been more popular in these days, the idea has emerged around in 1950s. In those days though they had this idea the needed infrastructural facilities and other technologies were not very much available (Yao et al, 2015; Yang et al, 2011). Concept of SaaS is a bit similar with Application service Providers (ASP) which emerged around 1990 due to the expansion of the internet and centralized computing. Asp tried to give all things to all users and serve unique needs of their customers. So as a result they lost the economies of scale and failed.

The concept of ASP was similar to that of SaaS where ASP also hosted applications and delivered them over the internet (Yang et al, 2011). The concept of cloud computing has helped for the SaaS to a huge extent. Cloud computing is a concept of distributed computing around the internet where users have given the permission to access the data. It is a more dynamic and flexible mechanism where it provides services and data to the users and the providers take care of maintenance, deployment and storage over the network (Yang et al, 2011). Today the cloud has categorized based on the service delivery models or the type of service set they provide. They are described below.Infrastructure as a Service (IAAS) : IAAS is the lowest layer of the network. This basically provides the needed computing power and storage resources. This makes a virtual pool where the users can use the computing power and storing facilities (Yang et al, 2011).

Platform as a Service (PAAS): Then there is the PAAS and it is created upon the infrastructure layer and make a higher level of abstraction. It provides middleware, operating system and many more while the user

only needs to install applications on it. Therefore it gives the facility to users for development, testing, storing and other services (Yang et al, 2011).

Software as a Service (SAAS): The top most layer is the SAAS. Here the applications are already deployed by the providers through the internet. All the users use same software and they are not customized. So when a vendor adds a feature it is available for all the users. Also the SaaS providers need to provide needed software, hardware, network infrastructure, operating platform and others. So this reduces the cost for the users. They just want to pay for their usage. SaaS vendors are responsible for all other works like upgrading the systems, security and maintenance. The users do not want an upfront cost for or investment for database, servers and lice Software. And another important fact is that SaaS is much more closely related with other service delivery models (Yang et al, 2011).

SAAS Maturity Levels

SaaS is comprised with sophisticated technologies and application frameworks which has resulted in giving more valued services for the end users. There are many types of modern components which are used to enhance the usability of the SaaS as well as to reduce time and cost which is spent to convert traditional software in to a SaaS application. So Microsoft has identified that SaaS architecture can be categorized into four different types of maturity levels (Hancheng, 2009).

Ad-Hoc /Custom : This is the first level and it has no maturity. Here each customer is having a customized SaaS application which has been hosted on the server. So the application is running its own instance in the server. Low development efforts , low operating and maintaining costs are the advantages when normal applications transfer to SaaS can have through consolidating administration and hardware (Yao. 2015; Mahesh, 2014).

Configurability: This is the second SaaS maturity level and it provides users with a flexible programs to recognize different users via one application as a result of configuring the metadata. Metadata helps to identify different users and their needs so that cloud providers are able to maintain a general core code of the application without considering the users and their requirements. This eases the burden of the vendor. In addition to that it also helps to allocate resources like application or software for the users' demands (Yao. 2015; Mahesh, 2014).

Multitenant Efficiency: This is third level of maturity and this is formed by adding the multi-tenancy for the second level. What is happening here is that through one program instance it can serve all of the users and also it still can identify each individual users and their demands separately (Yao. 2015; Mahesh, 2014).

Scalable : This is the last maturity level and it uses a multi-tiered architecture. Locking duration is optimized and shared resource pool is used to make maximum usage of the available resources. So the system capacity can be dynamically raised or deducted through addition or removal of servers (Yao. 2015;

Mahesh, 2014).

SAAS Architectural Levels

There are five levels in the SAAS architecture. They are user layer, distribution layer, application later, data access layer and network layer.

User Layer : This is the top most layer. It is comprised with the web browser, user interface a client software. This software is very easy to find and download to their machines. Users can use these gateways to enter into applications. There are also components called as user process components which supports in synchronizing the user interactions. There is also a web site to show user about the payments. Interface in which users can choose extra services as they want (Hancheng, 2009; Yao, 2015; Satyanarayana, 2012) .

Distribution Layer: This is the second layer which is placed between user layer and the application layer. The application instances on the application server have to distribute to the users in an efficient and effective way. But there can be instances where one server group get overloaded with request while other server group has a lot of resources remaining. So what the distribution layer does is that it handles the load balancing between application servers. Distribution layer is also responsible for transferring and replicating relevant data to another place to make data redundant and available.

Another goal of the layer is to optimize the usage of resources and improve the response time. There are also financial and security solutions available in this layer as SaaS is more related with business models. Therefore it has a metering and a billing system which calculates the total fee and pass the results through the billing system as a user readable invoice in order to support financial models (Satyanarayana, 2012 ; Hancheng ,2009) .

Application Layer - Http request which are sent by users are managed here and processing of these requests with the business logic are also performed. There are some components which perform several tasks separately. Customization /personalization components make the user aware of configuration options which in turn affects for the performance and view of the application. In addition to that there might also contain integration servers which are specially designed to make the main functionality of applications easier when it combines and integrates with an existing system. There are also some other services which are provided by the application layer such as clustering for data redundancy (Yao, 2015; Satyanarayana, 2012).

Data Access Layer: Data segregation and processing them is performed through this layer. Well structure database models like SQL databases and object databases or unstructured file systems are used to store data here. At the time of transmitting data across different servers it provides security and data integrity also (Yao, 2015).

Network Layer: High security should be maintained when data is transferred across the SaaS providers'

internal network as well as external network. Internal networks are highly ensured with the security protocols and their own set of policies. External network basically includes internet and more precisely a model where data flows through the network according to the relevant protocols. Internet is also connected with mobile networks to support the data flow of networks (Yao, 2015).

There are three main components in this layer. Communication servers make sure that communication takes place when it faces different types of protocols among users. Network monitoring component check network traffic regularly to recognize where data may not transfer successfully. Network logging component keeps track of in and out network traffic and when a particular part is accessed by a host it records the data about the context and protocols associated with the scenario. Instances of tracking down the potential malicious host and blocking them to prevent the access to servers can be done by the network logging (Yao, 2015; Satyanarayana, 2012).

*Security Layer:*This is the final layer of the SaaS architecture and it is very essential for all other layers. This provides the facilities of authentication and authorization, log system and monitoring solutions to other layers. All the security needs of layers are carried out by this security layer. SaaS users can decide whether to implement these security measures to a specific layer or even for all layers thinking about the requirements of them. This layer also have the mechanisms for the user support where it contains different security policies or specialized user requirements (Yao, 2015; Satyanarayana, 2012). The layers which are described above are not must in every SaaS application. But it is needed for a more mature, secure and reliable application where it helps for a smooth and effective business functions.

Benefits of SAAS

SaaS has been able to establish a prominent place in the business world though it has a short history. It is the best-known branch of cloud computing as it promises and delivers the users with many potential benefits. Enterprises didn't take SaaS in to much consideration earlier, but later this attitude was changed dramatically with SaaS's affordability and the convenience (Yao, 2015) . In traditional software systems people had to face with many issues like high initial costs, licensing and training. Hence SaaS promised much easier cheaper and speedier implementation enterprises were intrigued and moved into SaaS by considering it as a strategic alternative to on-premise application (Levinson, 2007). As a result SaaS has grown far beyond its early stages which included areas like Human Resource and Customer Relationship Management technologies and it has moved to broad range of applications for business and IT. The benefits of SaaS can be identified as follows.

Cost Saving : This is a major reason for people to embrace SaaS applications over the traditional software. SaaS excludes a lot of costs and provides its services much cheaper. SaaS is known as pay-as you-go software. Because they allow their users to some amount in each month with respect to their usage. SaaS implementation is also not expensive and it does not need additional infrastructure like hardware. The cost types are as follows (Yao, 2015). First one is the implementation cost of SaaS and it is comparatively very

low with on-premise software. in traditional software people have to pay a huge amount to obtain license but here that is not needed. Also need of heavy infrastructure like hardware components and other supporting software is not occurred in SaaS. SaaS is often come up with reduced customization capabilities which in return reduce the costs. Cost needed for training the people is also much reduced than other software (Herbert et al, 2009).

Other one is the recurring cost and it is simply the subscription cost. People can pay for the time period they use it, the amount of resources they use or even as per transactions they make. SaaS is much more popular among people due to this reason. In traditional software they have to pay a huge amount in purchasing and even after that though they do not use it on regular basis. So the pay-as-you-go is much fair for the users and it attracts more customers. Also firms have other recurring costs such as costs for integration tools or other add-on-technologies. Firms also have people costs like admin and support costs, training costs. With the usage of SaaS these costs reduced to a great extent. However these can be varied with the type of application, size of deployment and the organization's IT skills (Mahesh, 2014).

Final type is the upgrading cost. SaaS providers take care of maintenance and security of applications. So the users do not want to expend on those attributes. They also offers seamless, automatic and frequent upgrades on the charges they get for subscription. They have specially reduced testing and training costs as these upgrades are offered more frequently and incrementally than traditional software (Herbert, 2009; Yao, 2015).

Fast Deployment : SaaS is very fast in installation and addition of users. The need of having their own hardware and associated testing and ready-to-go preconfigured solutions is removed in SaaS.in SaaS the purchasing cycles are also short where t the organizations are made easy to deploy incrementally and offers monthly or annual contracts. SaaS also supports in long run as well as in short run where they provide easy measures to add new users, new suites, and new functionality (Mahesh, 2014; Herbert et al, 2009).

Better User Adoption : As the firms record it is also seen that the adoptability of users is also high. In traditional software firms complain that they suffer from low user adoption rates although they invest a lot in end user training and user interface designs. But in SaaS applications the providers have increased the user friendliness. They have made use of familiar web programs to users and made them more natural and more intuitive. SaaS applications are also cable of delivering usage reports so that the firms can identify gaps in user adoption. Then they can eliminate the identified gaps or address the problems with a proper solution (Mahesh, 2014; Herbert et al, 2009).

Reduced Technical Support and Training : Unlikely in traditional software the support needed for the SaaS applications are very low. Earlier, firms had to pay for third parties in order to get IT services. But those have been eliminated and the technical support staff which performs training, bug fixing, patching are also eliminated completely in the SaaS environment because those are already done by the service providers.

The support given by SaaS is also useful. They enhance the usability through built-in tutorials and help files with standards (Herbert et al, 2009).

Upgradeability, Scalability and Accessibility : As mentioned above the service provider deals with the updates which incurred with software and hardware which in return unload a huge burden from the firm. This helps to get the latest versions of upgrades and the systems are always up to date. SaaS is more flexible towards scaling. Firms can add more users and more functions. It will only adjust the monthly subscription as required. The required resources to access the SaaS are very few. It only needs a browser and an internet connection. So this has led SaaS to be available in on a wide range of desktop and mobile applications (McLellan, 2013).

Resilience: The security issues and threats from external disasters like flood or fire to physical premises where the systems are located can happen at any time in traditional software. So they will have to face problems of losing data. But in SaaS as the data resides in the cloud service provider's datacenter it will not be problematic. Firms can receive their back up easily from any location by connecting to the internet (Herbert , 2009; McLellan, 2013).

Security Challenges Faced by SAAS

SaaShave a huge market in the business world by providing benefits and convenience to the users through to its high performance. However when the usage is increased and additional functionalities are added, SaaS is facing with many challenges. Sometimes unawareness of clients on technical security and other security measurements on SaaS will lead for many inconveniences. Hence clients may doubt on reliability and safety of SaaS. However there are some issues which are really bothersome and confusing. They may arise due to some mistakes of the security aspects and deployments. Clients believe that service providers will protect their data and maintain it properly. Nevertheless clients should be well aware on possible security risks therefore they could take necessary measures beforehand (Yao, 2015).

Clients should be well aware of the correct security measures and how to come with agreements with service providers so that they can protect their data. SaaS vendors have to provide solutions to solve the issues which are usually face by common communication systems together with issues inherited by cloud computing platform. Frequently the service providers host their applications on their servers or sometimes they deploy it on a third party provider such as Amazon, Google. (Thiwari, 2014)
SaaS security issues can be grouped under 3 main categories as follow (Yao, 2015).

Security of Data

This is an essential aspect for the users and it mainly concerns with the protection of data in databases. Threats may come from the intentional unauthorized people as well as unintentional access by authorized users. Data is placed in a database and transmitted through the internet and mobile network. Therefore data which is related to an enterprise resides outside their premises. Hence, SaaS vendors must ensure and

inform the clients about their safety measures and cautiousness in managing data. Data security issues can be described as below (Yao, 2015).

Storage of Data: Data is stored in a database. SaaS providers must separate each users' data and prevent seeing individual data to others. Various users' data may be stored in the same server or in various instances are made on the same server due to the multi-tenant architecture and virtualization. Therefore if one instance surpass with a malicious attack other instances are also at a danger of being attacked (Yao, 2015, Thiwari, 2014).

Also service providers make duplicate copies of data to make sure the redundancy and availability of data. They make copies and send them over country boundaries. This makes data to be in risk and data can be exposed to other external parties. Legal actions are taken in some countries to check the data which crosses the boundaries. They will check in and out data through them. This is a huge threat to the confidentiality of data. Another aspect is that if the user wants to resign from SaaS applications all of his data must be deleted from the storage. But it may not fully destroyed as data is duplicated on several places and service providers may forget the copies which are available on multiple locations and not connected with the system directly (Yao, 2015).

Accessibility of Data: Access to the data is controlled as data could be breached within the organization and outside of the organization. Sometimes inside trusted employees may cause data loss or leakages (Patel, 2014). Therefore the providers must ensure only the privileged people are accessing the data. Each user is defined and they are enlisted by looking in to their capability of accessing various levels of data. Some organizations are having special policies to settle with these issues. SaaS providers also should compromise with these policies and incorporate them to their access policies (Yao, 2015; Thiwari, 2014).

Integrity of Data: Data must be guaranteed from deletion, modifications from unauthorized intruders and it should be transmitted securely from one destination to another. Service providers should maintain the correctness and transparency of data and data always remains actual throughout its entire life cycle. When data is transferred from one database location to another as well as when data is entered to database human errors could occur. Other situations like natural disasters, software bugs, virus and hardware crashes may also affect to the integrity of data(Yao, 2015).

To protect from these integrity issues service providers should arrange the data to the formulated syntax in the database and prevent invalid data inputs. When the transactions occur at one place data should be updated other places as well. Atomicity, Consistency, Isolation, and Durability which are collectively known as ACID properties should be maintained to assure the integrity of Data.(Thiwari, 2014) As an overall idea SaaS providers should maintain integrity of data in order to tell what has happened to any data item at anywhere(Yao, 2015).

Backup and Recovery of data:SaaS vendors should take care if anything happen to the data. Data can be lost because of natural disasters, hardware failures and corruption of data. SaaS users don't have backup facilities and they depend on vendors for backup and recovery. If anything happens to the data vendors should take countermeasures and recover full files. Following strong security mechanisms like encrypting helps them to protect data from frauds an accidental thefts (Yao, 2015; Thiwari, 2014).

Availability of Data: Data should be offered to users at any given time without any difficulty or interruptions. They should also maintain quick response time and effective results. SaaS providers should use effective load balancing methodologies to provide data to the users (Thiwari, 2014),(Patel, 2014) .

Security of Application

This sector describes the utilization of software or hardware to overcome harmful or unexpected actions. Security of the SaaS can be in risk through the applicationit self. Therefore vendors should guarantee that the attackers don't get an opportunity to approach to the administrator and make unwanted changes. The issues regarding application can be arisen at some levels of its design, developments, implementations and access(Yao, 2015).

Design Flaws of Software: Software designs of SaaS is different from traditional software with the architecture, user interface and different APIs. A SaaS developer who is familiar with developing isolated and single applications has to overcome the barriers associated with the multi-tenant architecture. Therefore it requires a technology to maximize the sharing of resources among different users while differentiating data of each user (Yao, 2015). As SaaS is heterogeneous APIs are more essential parts in the design. Programming languages need to support the front end and back end of the application with the APIs' ability of interoperability. APIs must be strong and solid because poorly designed APIs will cause threats and attacks (Thiwari, 2014).

Authentication and Authorization: Authentication means the users are verified before logging to the systems to check whether they are the permitted people. Therefore SaaS users such as organizations should remove accounts if employees left the organization and give new user accounts and passwords to the new employees (Thiwari, 2014). In authorization it entrust responsibilities and give permission to different access levels for the users. Hence different roles are made and users are validated to check his accessibility. People who will have right to access will only get to enter in this mechanism (Patel, 2014), (Keiko et al, 2013).

Malware: These are harmful software or code parts that will change or destroy the user details without user's grant. Therefore users should make precautions actions in the situations like downloading application software. Users should have proper security measures installed such as firewalls, virus guards and etc. If not their valuable data may face to security risks (Yao, 2015).

Security of Deployment

There can be different threats in deploying SaaS applications. Virtualization technology is used by SaaS vendors and they create different instances on hardware therefore each instance has a guest Operating System (OS) (Keiko et al, 2013) .Provider has one instance running for every user. Each user get a unique experience and unique set of features. Further it is transparent to the end users that their application instance is being shared among many users. Virtualization approach saves the usage of resources and optimize server allocation. At the same time weaknesses in virtualization may affect to the security of SaaS. Two aspects of SaaS deployment security can be identified as follows(Yao, 2015).

Vulnerabilities in the Virtual Machine: A machine called as Hypervisor is available where number of Virtual Machines (VMs) having separate OS are hosted. Attackers reach to these hypervisor across a running instance hosted in it(Keiko et al, 2013). Also attackers can interfere to the in and out data flow as well as CPU utilization and even they can close any hosted instances. In VM environment resources such as CPU, RAM and hard disk are shared among instances. Therefore if one instance acquire many resources, requests from other users may throw back due to lack of resources(Yao, 2015).

Vulnerabilities of Virtual Network: Many hypervisors let VMs to connect to the outside physical environment by having Virtual Networks (VN). However virtual networks in SaaS may cause security issues than normal physical networks. For an example   attackers can forge IP address which is similar to other VM in the network. Therefore VMs traffic will be redirected(Jensen et al, 2012).

Emerging Trends of SAAS

Users are the product changers of any field. Any business owner must know about the requirements of customers and change their strategies accordingly. Similarly SaaS also have identified some drawbacks of their existing methodologies and they are moving into new trends. SaaS been engaged in various innovations to develop their applications. Following are some of the emerging trends that has been entered to the market recently (Gohring, 2014).

Vertical SaaS Applications are one such emerging trend in the business world. It is a type of SaaS application which is designed specially target group of customers like insurance, retail, manufacturing, health care and etc. Textura (TXTR), Veeva systems (VEEV) are examples for such applications (Ding, 2014). Vertical SaaS is focusing on all business processes from Customer Relationship Management (CRM) to Supply Chain Management (SCM) in a specific type of customer base. But in horizontal SaaS it focuses on a specific functional area like finance or sales for every customer type. Therefore it gives one software which will fit to all type of customer groups while vertical SaaS targets a homogeneous market (Manninen, 2015).

Most of the vertical SaaS providers are startups. They focus on a small market or a niche market. Then they go deeply through it and produces better customized products which will be more specialized to a selected

customers. This will full fill customers' requirements and those customers do not need to individually customize the products. It is very easy to create products for specialized group and therefore it is inexpensive compared with horizontal SaaS. This will also attract new customers. Vertical SaaS results in creating business solutions much faster and it saves money as well. They provide strategic solutions for customers by identifying their demand. Therefore this results for higher market growth and higher revenue. Customers also find easy to adapt to these systems as they are more user centric (Rouse, 2015).

Vertical SaaS providers give better products and high quality solutions as they have a narrow focus. There are many businesses which use traditional technologies and have more manual processes. Therefore they are reluctant to adapt to normal SaaS environment due to lack of support provided. But through vertical SaaS those types of customers are also targeted. If few business firms adopt to these kind of application it will spread in entire niche market. Then it will cause less cost for sales and marketing as well. Through these customized applications firms can collect specific data and use them for business analytical purposes and strategic decision making. Existing SaaS systems do not provide precise or relevant data and they do not have needed infrastructure for collecting them. Vertical SaaS also helps to understand common problems faced by the selected customer group and it helps to develop solutions according to the preference of them. Due to all above reasons Vertical SaaS is becoming more popular today (Rouse, 2015; Poulos, 2015).

Another technology which was emerged recently is Salespod. It was introduced by the collaboration of SaaS service provider known as Sales force and HP. (Hewlett - Packard). This is an alternative solution for multi tenancy where users have to share a common instance of application while data is kept separately. This model provides the companies to have their own separate infrastructure which is connected to a single server side instance. There are fifteen computer pods spread over datacenters and every pod has a huge number of customers with multitenant services (Kanaracus , 2014; Deutscher, 2014).

This product is built to cater the customer needs of high security and transparency. Some customers were claiming for more personalized usage and safety of data.in order to meet those demands Salespod has been developed. It is more of a hybrid solution which will pave the way for many innovations in the future as well. This product is basically aimed at larger customers who are not satisfied with the current facilities provided. Therefore it will be very useful for the customers and will be able to eliminate the drawbacks of the SaaS to some extent (Henschen,2014).

Discussion

SaaS is a service centric software model which delivers software to the end user through the internet. Users can use the software and pay as for their usage. SaaS uses multi-tenant architecture which in turn helps to deliver many positive impacts on the user. . Therefore SaaS provides many benefits to its users such as cost saving, easy adoption, easy upgradability and etc. SaaS providers take care of maintaining and utilization of resources efficiently and they always try to meet the demands and challenges of the business world. Due

to these reasons most of the conventional software has been replaced by SaaS. Although there are many advantages in using SaaS it still have some practical issues which have to be solved related to privacy and security. Those security challenges make SaaS vulnerable for data loss and safety issues. Therefore SaaS vendors have to face these challenges successfully so that they can retain their position in the business world. To deal with higher customer expectations new trends like Vertical SaaS and Salespod are introduced by the service providers and they promote the usage of SaaS further.

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