Journal of Information Engineering and Applications
ISSN 2224-5782 (print) ISSN 2225-0506 (online)
Vol.5, No.8, 2015

Implementing cloud computing in Ministry of Justice in Jordan

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Abstract
With the development of technologies a new technique appeared that called cloud computing. Cloud computing runs over high speed Internet and provide scalable and virtualized resources over the network. Data center works as an essential part in the information network, where connect a large numbers of servers together and provides a huge storage to the users. Intensive data are transmitting through network that makes crowding in data movement, which raises some obstacles, threats, waste of time on dealing with critical data over traditional architecture. Traditional architecture should be developed to avoid or reduce some of the problems that occurred in this architecture traditional way that used to preserve and retrieve important data takes a long. This project analyzes current architecture in ministry of justices that have a traditional architecture and displays the most important problems in this architecture. And introduce a proposed cloud computing architecture for solving the problems that encountering the traditional architecture and the way in dealing with important data. Cloud computing architecture saves time and effort in transferring and keeping data. Backup copies in cloud computing architecture do not take long time when dealing with data, and makes the data available and valid any time unlike the traditional architecture. Private cloud computing is appropriate solution to solving problems in ministry of justice.
As well as the large number of maintenance of the traditional infrastructure and the disruption of work and pay a lot of money for the maintenance and development of hardware and software prompted me to conduct a study to reduce the time, effort and solving problems.
Cloud computing reduces time, effort, and costs in maintenance and management. Here, will reviews all benefits of cloud computing technique that enhance the method of work in ministry of justice.

1.1 Introduction

The huge advancements in information technologies, and the applications that use the Internet has created new opportunities in dealing with storing, retrieving and using the critical data.

Cloud computing is a scalable services consumption and delivery platform in the field of services computing. The objective of cloud computing is to share resources among the cloud service consumers, cloud partners and cloud providers in the cloud value chain. (Vishal, Praeek and Manish, 2009)

Cloud computing represents a change for delivering resources and services, from how IT systems are built and used to how IT resources are organized and structured, one of the advantages of cloud computing it that a virtual data center and data recovery can be built in minutes, with minimal technical background and at a low cost. (Vishal, Praeek and Manish, 2009)

It is expected that the high rate and rapid changes and advancements in IT technologies will continue to impose great pressures on the businesses regarding the budgets and capabilities to continue upgrade their software and hardware, this includes the public departments. As a result, cloud computing services provide the opportunities to benefit from the emerging information technologies. (Darrell, west, 2012).

At the same time, one should not underestimate the possible problems that might emerge from the use of cloud computing services. Risks might appear from dependence on the security practices and assurances from the vendor, and from sharing computing resources. (Darrell, west, 2012). It seems that could computing will be an attractive alternative for the solution of many problems relating to data storing and retrieving (Microsoft, 2009).

There is the need for cloud computing users to monitor and protect their virtual existence by applying additional security procedures, like firewalls, access control lists, in addition to intrusion detection system fully controlled by the cloud user. (Turki, Patrick, 2012).

1.2 Research objectives

The main objective is to optimize recovery point and time with a real time replication data recovery when implementing a virtual data center and data recovery.
Also to achieve the following sub-objectives:

1- Determining the most relevant type of cloud computing to be adopted and implemented, whether it is the private, public, community, or hybrid cloud computing.
2- To illustrate the drawbacks and possible problems in traditional data center and data recovery in ministry of Justice.
3- To describe and analyze the current architecture for date center and data recovery in ministry of Justice.

4- To develop cloud computing architecture
5- To final out if the cloud computing solves the current problems and drawbacks.

1.3 Research problems

Research problem stems from the current use traditional data center and data recovery system in the ministry of Justice, in terms of the needed time to make the backup copies, since usually takes more than ten hours, which considers long time. The management and maintenance current data center and data recovery takes a high time, cost, and effort.

1.4 Research Questions:

Research questions include the following:
1- What type of cloud computing is suitable to ministry of Justice?
2- How data center and data recovery are working in ministry of Justice?
3- What are the problems and drawbacks in the current data center and data recovery architecture?
4- How much time needed in makes backup and retrieves this backups when need it?
5- Does cloud computing provide the solution for the problems?
6- Does the use of cloud computing provides the needed data security?
7- Does cloud computing reduce the time, effort, cost in ministry of justice?
8- Does the use of cloud computing provide validity and reliability for backup copies?
9- What are the possible risks of using cloud computing in ministry of justice?
10- Does the cloud computing ensures the continuous availability of the data?

1.5 Motivations for the research:

The motive behind this project is that it is the first project (to the knowledge of me) that addresses the use of cloud computing in the public sector, and its potential to save time, cost, effort and provide validity and reliability of the backup copies.

In addition, this project seeks to provide the ministry of Justice with benefits to overcome the current drawbacks from the use of the traditional data recovery through the use of cloud computing.

1.6 Introduction to Cloud Computing:

The emergence of new information and communication systems and the various applications that could be used though the internet had prompted the businesses and the organizations from both the private and public sector to adopt and employ these new technologies in order to better serve the customers and the users of these technologies to achieve the maximum level of effectiveness and efficacy.

As a result of the new applications of the advanced technologies, cloud computing has emerged to offer companies the creative ways to address how they utilize information technologies (Hartman Tyson & beck Larry, 2009).

One of the important features of cloud computing is that its infrastructures make it possible for the companies and the governmental departments to cut costs by outsourcing computations on demand (Santos Nuno, Gummadi Krishna, and Rodrigues Redrigo, 2008).

1.7 Cloud Computing Definition:

The National institute of standards and technology's definition of cloud computing identified five important characteristics that include:

1- On demand self – service, the consumer can set the provision about the server time and network storage as needed automatically without the need for the human involvement with each service provider.
2- Broad network access – the availability of the capabilities over the network and accessed through standard mechanisms that promote the use of the mobile phones, tablets, laptops, and work stations.
3- Resource pooling – the provider of the computing resources is able to serve many costumers.
4- Rapid elasticity capabilities can be elastically released automatically in any time and at any quantity.
5- Measured service cloud systems automatically control and optimize resource use by leveraging the capability to an appropriate level according to the type of service, such as storage processing and active usage by the customers (National institute of standards and Technologies, 2011).

When we speak about cloud computing in computer networking this term is used to give insights about computing concepts that involve a large number of computers connected through real-time communication network, like the internet, and the great contribution of cloud services that they may be offered in public and private networks. (Tolk, Andreas, 2006).

1.8 Types of Cloud Computing:

According to the National institute of standards Technology's definition (2011), divided the cloud in to the

following categories:

1. **Private cloud**: is a cloud infrastructure operated only for one organization, in this case when adopting the private cloud for a project, this will require the high level and degree of engagement with the business environment, and the organization should reevaluate the decisions about existing resources.
2. **Public cloud**: it is called public when the services are delivered over the network that is open for the public use, security arrangements and considerations differ greatly for services through the public cloud.
3. **Community cloud**: community cloud shares infrastructure between organizations from specific community with common interests such as security, compliance jurisdiction, whether managed internally or by third party, hosted internally or by third party or externally. (NIST, 2011).
4. **Hybrid cloud:** Hybrid cloud is a composition of two or more clouds (private, community or public) that remain distinct entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and/or dedicated services with cloud resources.

Also, Cloud computing divided by the services that providers offer to the cloud customers as the following (Voorsluys, William; Broberg, James; Buyya, Rajkumar, 2011):

1. Infrastructure as a service (IssS).
2. Platform as a service (PaaS).
3. Software as a service (SaaS).

1.9 Fears of cloud computing:

So, one of the most serious fears is the possibility of confidentiality violations. It is clear that cloud services providers are devoting great efforts to secure their systems with the goal to minimize the threat of insider attacks, and to strengthen the confidence of the customers.

Cloud providers work to protect and restrict access to the hardware facilities and to minimize the number of staff who have access to important and critical components of the infrastructure (pelTier, Blackley, 2003).

The study of entitled "Towards Trusted cloud computing".

Showed how leverage the advances of trusted computing technologies to design a trusted cloud computing platform to allow the customer to reliably and remotely determine whether the service is trusted for implementation (Santos, Gummandi & Rodgrigues, 2009).

1.10 Proponents of Cloud Computing:

There are many proponents of cloud computing usage they affirmed that cloud computing makes it possible and easier for the companies and the public sector's departments to avoid any un profit infrastructure costs and focus on businesses, projects and services that have the potential to differentiate themselves.

Also, those proponents state that cloud computing allows the businesses to make their applications up and working faster, with improved management and less time and effort for maintenance, in addition, cloud computing allows information technologies rapidly a just the resources to encounter and deal with the unexpected and fluctuating customers and markets demands (Baburajan, Rajani, 2011).

Cloud computing came as a result of evolution and adoption of the advanced existing technologies, with the goal to allow the users to benefit from all these new technologies, without the need or the requirement of deep knowledge and expertise in each technology, the aim of the cloud is to cut costs and help the users focusing on critical businesses instead of being occupied with the information Technologies barriers and obstacles (Hamdaqa, Mohammad, 2012).

Also, by minimizing the user involvement, automation speeds up the process execution and reduces the probability of errors that might occur from the human during data processing cloud computing as explained is a kind of grid computing developed to address quality of service, and reliably dealing with any possible problems, by providing the tools and technologies to build data intensive applications with much reasonable prices compared to the traditional computing techniques. (Hamdaqa, Mohammad, 2012).

Literature Review

2.1 Cloud Computing in General

- According to a study conducted by (Baburajan, Rajani, 2011) entitled: “The rising cloud storage market opportunity strengthens vendors”. Showed that could computing makes it possible and easier for the companies and the public sector’s departments to avoid any un-profit infrastructure costs, and focus on businesses, projects and services that have the potential to differentiate themselves, Also, the proponents stated that cloud computing allows the businesses to make their applications up and working faster with improved management and less time and effort for maintenance, in addition, cloud computing allows information technologies rapidly adjust the resources to encounter and deal with the unexpected and

fluctuating customers and markets demands.

- The national institute of standards technologies definition (2011) divided the cloud in three categories:

1- Private cloud – A cloud infrastructure operated only for one organization.
2- Public cloud – called public when the services are delivered over the network that is open for the public use, security arrangements and considerations differ greatly for services through the public cloud.
3- Hybrid cloud- is a composition of two or more distinct cloud infrastructure (private, public, or community)
4- Community cloud - shares infrastructure between organizations from specific community with common organizations from specific community with common interests, such as security, compliance and jurisdiction whether managed internally or by their party.

- Rejesh, Tiwari & Bhushon, lal sah (2012) study entitled "A comprehensive study on cloud computing" presented that cloud computing is becoming on increasingly popular enterprise model in which computing resources are made available on – demand to the user as needed, the unique value of cloud computing creates new opportunities to align IT and business goals, and that cloud computing use the internet technologies for delivery of IT capabilities as a service to any needed users, through cloud computing it is made possible to access anything needed from anywhere to any computer without worrying about storage, cost, or management. The study also explores certain benefits of cloud computing over traditional IT service environment, including scalability, flexibility reduced capital and higher resource utilization.
- Kaur, Amandeep & Nishu, Bansal (2013) study entitled "cross – breed job scheduling for reducing the server load using RBAC at cloud" has affirmed that as the cloud computing is a new style of computing over the net, it has many advantages along with some crucial issues to be resolved in order to improve reliability of cloud environment, these issues related with the load management fault tolerance, and different security issues in cloud environment. The study reached that the job load is expected to be reduced b implementing (role based access control) RBAC, and the priority scheduling concept, because the RBAC will restrict the system from unauthorized access to the server where the priority scheduling will speed up the concept of execution.

2.2 Public Cloud Computing Vs. Private Cloud Computing

- In study conducted by (Delvis, Smmonds and Wahab, Alli 2002) entitled "Public cloud computing Vs. private cloud computing" the study stated that cloud computing has the potential and the goal to enhance efficiency, flexibility, greater agility, less capital expenditure, and overcome the geographic limitations to compete in the global market if adopted and implemented, businesses will require new ways to procure it services. More and more companies are shifting to cloud based services, while at the same time they are concerned about the security risks. Also, the study showed that cloud computing represents a major change in how digital information stored and how to run computer applications based on the cloud.
- Schultz, B. (2011) study entitled "Public clouds Vs. Private cloud" presented the debate of public clouds has resulted in other research that found out (76%) of IT decision makers would focus initially on the private cloud, but may not always be the best solution, the better approach is to evaluate specific applications, security and compliance considerations, then decide what is more appropriate for a private cloud and what is more appropriate for public cloud. The size and type of the business are important factors in the decision making process if the business is small and do not have huge data center, then the public cloud service will be acceptable, while if the business is a large company that requires mission-critical applications or data, then it would be better and wise to use the public cloud.

2.3 Security and Privacy

- Joe (2011) study entitled "Are private cloud really more secure than public cloud?" has pointed to an ongoing debate between IT professional of whether or not private clouds are really more secure. According to some analysts and vendors, there is no shortage of debate and consternation about the security threats public cloud computing poses, the concern can be understandable especially if sensitive data and vital applications are in the hands of a party not directly under control.
- Bloomberg, J. (2012) why public clouds are more secure than private clouds" reached that clouds typically would suffer from perimeter complacency, thinking that because it is on the internal network, it must be secure but the viruses and internet are still present, so caution and security standards should not be lowered just because it is private, moreover the private cloud requires that to have total control over all layers of the stack, including any traditional network perimeter security needed to be in place, and that private cloud computing typically uses virtualization technologies to increase hard ware utilization and to obstruct computer, memory, network and storage component from private cloud consumers.
- Allan A. Friedman and Darrell M. West (2010) paper entitled "Privacy and Security in Cloud Computing" reviews current federal IT policy and discuss rules, practices and procedures that limit innovation, and that

there are a variety of obstacles that make it difficult for policy makers to take full advantage of the technological revolution that has revealed in recent years, the paper included a set of recommendations for public official to harmonize their laws on cloud computing so as to reduce current in consistencies in regard to privacy, data storage, security processes and personnel training, and that there should be mechanisms for data exchange that encourage portability across platforms, data on uptime, down time, recover time, archiving and maintenance schedules would help build up public trust by providing information on computing clouding.

- Radha, Reddy, Pavan, Kumar & U. Seshadri (2012)study entitled "the security issues of cloud computing over normal IT sector" discusses security issues for cloud computing and presents a layered framework for secure clouds, with the focus on the storage layer and the data layer, its advantages include scalability, resilience, efficiency and outsourcing no – core activities.

2.4 Advantages and Disadvantages of Cloud Computing

- Alharkan, turki & Martim, parick (2012) study entitled "ID seas: intrusion detection system as a service in public clouds" aimed to show that in public cloud computing environment, consumers can not always just depend on the cloud provider's security infrastructure by implementing their worn intrusion detecting capabilities along with other security technologies with in the cloud fabric, (ID sears) targets security of the infrastructure level for a public cloud by providing intrusion detection technology that is highly elastic, portable and fully controlled by the cloud consumer.
- Hark, Kim (2008) "Google goes to washengton, Gearining up to put its stamp on government" noted that despite the promise of cloud computing, there are four problems that result from the current computing environment, in some respects, cloud applications are disadvantaged in current legal and procurement situations, there is a need for greater performance transparency, also there should be detailed conventions regarding the trades between privacy and security, finally, the lack of uniformity in standards a cross nations has created a "Tower of Bable" atmosphere among cloud computing.
- Boutaba, Raouf, Lu and Zhang, Qi, (2010) study entitled "could compute: state of the art and research challenges" stated that could computing has recently emerged as a new paradigm for hosting and delivering services over the internet. It is attractive to business owners as it eliminates the requirements for users to plan ahead for provisioning, and allows enterprises to start from the small and increase resources only when there is a rise in service demand. The study reached the results that despite the significant benefits offered by cloud computing, the current technologies are not matured enough to realize its full potential, and still there are key challenges facing it, such as power management and security management.
- Teuteberg, Frank, Walterbush, Marc & Benedikt, Martens (2010) study entitled "costing of cloud computing services: a total cost of ownership approach" showed that the use of cloud computing services appears to offer significant cost advantages, particularly start – up companies benefit from these advantages. The study poses the question: are costs associated with cloud computing services really that law?, this study raised the awareness of indirect as well as hidden costs in cloud computing, such as the cost factors, existing internal IT infrastructure and their cost factors, the study recommended that a company plans to implement a private cloud the additional costs are necessary for a complete evaluation.
- Ahad, Abdullah (2014) study entitled "Green cloud computing the need of the hour", stated that the goal of cloud computing is to share resources among the cloud service consumers, partners and cloud vendors in the cloud value chain, but the growing demand of cloud infrastructure has drastically increased the energy consumption of data centers The study reached that, by simply improving the efficiency of equipment, cloud computing cannot be claimed to be green, the important thing is to make its usage more carbon efficient both from the user and provider's perspective.
- Balram, Babu (2014). Study entitled "impact of cloud computing on small and medium enterprises in India" has argued that cloud computing is likely to be one of the opportunities sought by the small and medium sized enterprises in these difficult times and could prove to be of great benefit, to them due to its flexibility, and pay as – you – use cost structure.

The study reached that despite the cloud computing disadvantages, it remains strong and has the great potential for the future, and that it is becoming a standard method software and hardware systems operation, and provides potential cost savings for many businesses.

2.5 Cloud Computing Architecture

- Reddy, Madhava, E. Mruthy Unjaya and J. Srikanth (2012). Study entitled "cloud computing is to make the computing be assigned in a great number of distributed computers, rather than local computer or remoter server, while the development of high speed internet access, web 2.0 applications and techniques have mad cloud computing a leading edge technology. In addition to the deep penetration of cheap personal

computers affected almost every corner of computing thus diverging the resources.

The study reached the results that the architectural design of cloud computing is still in its infancy and needs exploration towards the efficient utilization of large scale IT infrastructure.

The study findings indicated that the main goal is to securely store and manage data that is not controlled by the owner of the data, also that there are many new technologies emerging at rapid rate with technological advancements, cloud computing is no exception from security risks and challenges posed from using these technologies.

- F. Sibai and D. Menasce (2011), "Defeating the insider threat via autonomic network capabilities" communication systems and networks. Pointed that cloud users are totally dependent on the provider's IDS infrastructure but they still partially control the IDS management unit with limited functionality, moreover there are serious privacy concerns arising from integrating IDS components on every customer virtual machine that is installed by the cloud provider, and much of the proposed academic research on IDSs in the cloud has focused on providing intrusion detection mechanism for specific security problems, the autonomic violation prevention system (AVPs) that concentrates on self-protection against security policy violation generated by privileged users.
- Sfekianakis, Onur (2009), study entitled "Intelligent end – to – end resource virtualization using service oriented architecture" mentioned that since the face of the internet is continually changing, as new services and novel applications appear and become globally noteworthy at an increasing pace, the focus of computation is charging, with function migrating to remote data center via internet bases communication, and computing and communication are being blended into new ways of using networked computing systems, the next generation networks and services infrastructure should overcome the scalability, flexibility resilience and security issues of current network and service architecture.

3. The Importance of Ministry of Justice

3.1 Introduction:

Ministry of Justice considers one of the most important ministries in Jordan, because of the services and information it provides to the citizens ministry of justice deals with huge a mounts of important information concerning the cases and the trials, and the counts also because of the importance and sensitivity of the information that the ministry deals with these information and data should be kept in a relevant and secure way, also transforming and exchanging data from one place to another a should be quick and safe.

To protect these data and information backup copies should be made continuously and stored in another place to protect these data from loss or damage, and retrieving these data as fast as possible when needed. These backup copies should be available for use. Ministry of information deals with 60 courts distributed to all parts of the kingdom in the different geographical regions.

3.2 Traditional Method used in the ministry of justice for data storing and Retrieving:

There are two servers in each court to deal with the beneficiaries and used by the employees, according to the courts size the number of the personal computers in it and the number of the users in the courts. The number of the servers in the courts reached (115) server and the number of the personal computers and the courts pertaining to it is (3000) personal computer distributed to the counts and the ministry center.

The personal computers inside each court are connected to the server in each court with LAN also with the ministry center. All the personal computers and the servers in the counts and the ministry center are connected through external web (WAN) with the primary data center ministry of justice depend on keeping and storing the data and information on the primary data center available in the palace of Justice that contains the primary data center with (35) servers divided according to the nature of work, some of which for the primary program data bases, some for managing data basis, and for other services. Also, available in the ministry center the secondary data center, or data recovery center, that equipped with the same instillations. The primary data center includes (35) servers the same type of the servers in the secondary data center and in the data recovery center. Important data and information stored in the primary data center to provide all the counts with the required data. But there is a problem in the current Data Recovery, which is that all servers have become old and need renovation, which requires a big budget, time and effort to this process of renewal.

Regarding the data recovery center the backup copies stored daily and continuously in the data recovery center. Specialists in the IT center take the back-up copies of data and information daily at specific times after three o'clock the end of the work in all counts and the ministry center. Transforming the data and making pack-up copies from it takes long time after monitoring this process from its start to end takes about continuous (10) hours that makes the work more difficult and time consuming.

On the other hand testing and affirming the validity of these back-up copies is weak, that makes depending on these back-up copies less, this courses the risks and threat to the available data in the data recovery center in the case of any default or disaster to the primary data center that calls the retrieving and operating these

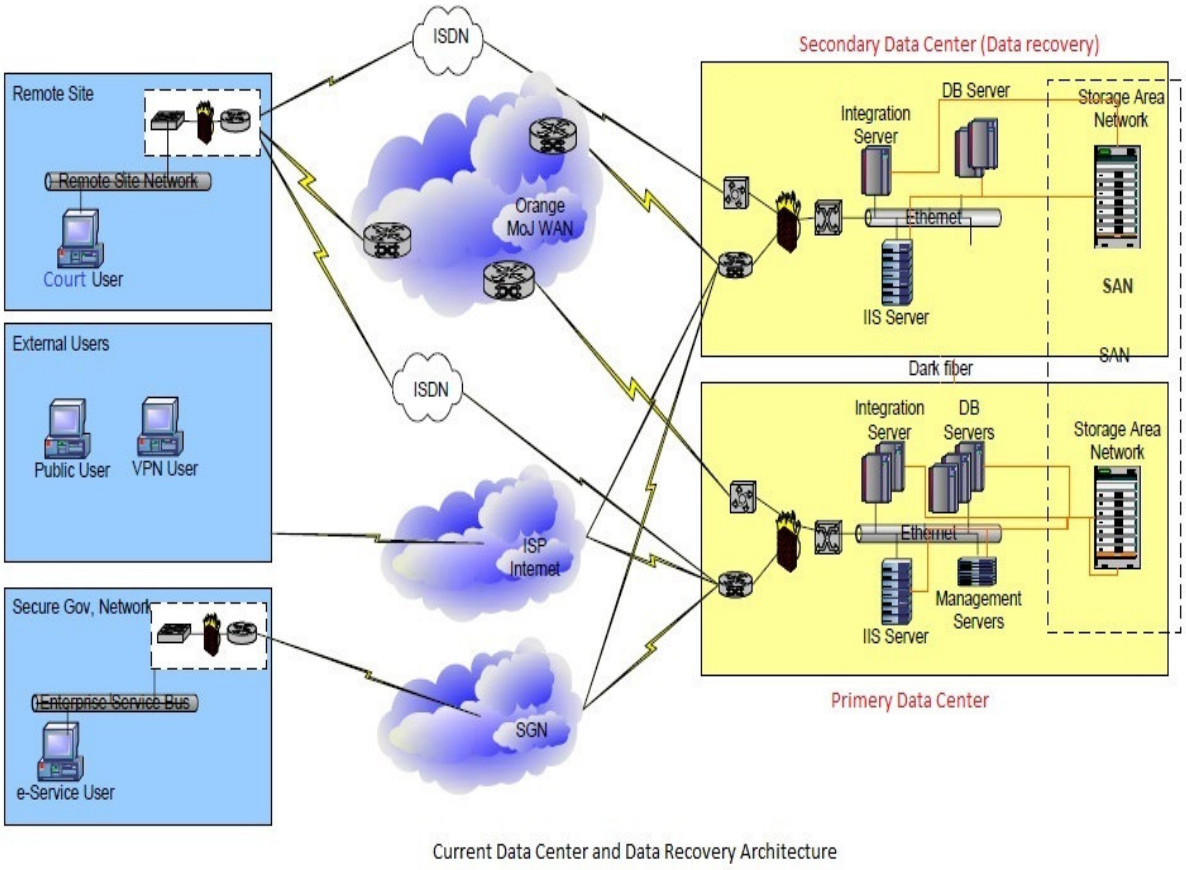
back-up-copies. Generally data lacks the reliability to retrieve them and work on them.

So, the specialists in the IT center make the archive for the pack-up copies daily on apes stored and kept in the tapes library to return to when needed. Also, return to these apes in the case the pack-up copies stored in the data recovery center are not available or not appropriately copied, or in the case any risk on the secondary data center or in appropriately copied. But this method is old with the development in IT and the techniques developments in storing and dealing with the data.

Based on the mentioned previously, making and obtaining the Back-up copies for the data in the ministry of justice is a difficult process and time consuming.

3.3 Traditional architecture in ministry of justice:

The following figure illustrates the structure of the primary data center and the current data recovery center that is available in the ministry of justice.



-Figure1 Current Architecture-

As we notice in the refigure the architecture consists of two main centers which are the primary data center and the recovery data center or the secondary data center, since each center locates in different geographic location for from each other's.

Each primary data center and data recovery center consists of:

1- Storage Area Network (SAN): are hard disks for data keeping and storage that connected with and data bases. Servers, it is the most important part in the primary data center in the ministry of justice because it stores the important, critical and sensitive data.
2- DB servers: Servers for managing the data bases.
3- Integration servers: servers used for the purposes files storage.
4- IIS server: servers contain the applications the users work on data bases for these applications stored on SAN.
5- Orange MOJ WAN: Wide Area Network for ministry of Justice is leased lines from the communication company to connect the courts together with the primary data center.
6- ISDN-Integrated services Digital Networks: are back-up lines from the communication company in the case of any cut in the WAN main lines, the lines transformed to work on ISDN as alternative lines.
7- Remote site: servers and the used personal computers in the courts by the users.

8- External users: any user's benefits from the ministry of justice from outside, like by the use of the internet and the site to benefit from its services.
9- SGN- secures Government Network: The main purpose from SGN is to make any public side or Public institution to be able to communicate securely with the ministry of justice.

3.4 Working method for current architecture:

The most important part of the architecture is SAN, since it consists of many hard disks with very big sizes on which all the data bases stored for the used applications in the ministry of justice and all the important data and information, and copying the back-up from SAN in the primary data center daily at three o'clock after the end of the daily work time. These, copies enforced in SAN available in the data back–up.

Recovery, this process as mentioned previously takes 10 hours daily, then archiving these back – up copies and keeping them in the tapes library to return to when needed.

In the natural situation the primary data center is active and the work will be on the data bases available and the servers in the primary data center also active to transfer the needed data to the courts servers and to the users in the courts. Here the data recovery center will be in active, only transferring the back-up copies to SAN in the data recovery center.

When there is an error or catastrophe in the main data recovery center the work transformed to the data recovery center instead of the primary data center this process needs many gong procedures which are:

1- Ministry of Justice approval to operate the data recovery center, delaying this process at least two days which is very long time.
2- Changing the primary data center from the active position to the in active position and changing the position in the data recovery center from the position in active to the active position.
3- Calling the communication company which is orange to transform all WAN lines between the counts and the primary data center to the data recovery center to transform the work on it for the data recovery center to be the primary data center for work.
4- Reconfiguration the available servers in the data recovery center to correspond with the count servers and data transformation after that.
5- The counts work normally.

After all these procedures the needed maintenance is preformed gong to the primary data center then returning to the original situation. These procedures take about from two to three days.

In the case transforming the work to the data recovery center the back-up copies will not be copied only after the recovery of the primary data center and transforming the work to it which means to the original situation this will subject the important data to risk and will be un-safe in the case of any error or disaster in the main data recovery center, the maintenance process will be very costly in the primary data center and needs great effort from the technicians.

So, from the previously mentioned, the summary of the problems relating to architecture of the primary data center and the data recovery center in the ministry of justice are the consumed time in making the pack-up copies which is very long and the archiving way of these copies also takes very long time.

From the problems are the data reliability and verifying the transformation validity when operating these pack-up, copies in the case of any error or disaster or threat in the primary data center and we need to operate the pack-up copies or the data recovery center to use it as alternative and the copied data for the data recovery unreliable or un-appropriately copied or in complete.

There are also problems in the needed procedures implemented that are long and need high financial cost and effort. In this project, will try to eliminate or reduce these problems through the new technique which is the cloud computing.

3.5 The appropriate type of cloud computing for Ministry Of Justice:-

Because of the importance and sensitive data and information that used in ministry of justice, and because ministry of justice is a public ministry, that deals with specific and private information to the citizens. Also, the security is the most important issue to the ministry of justice.

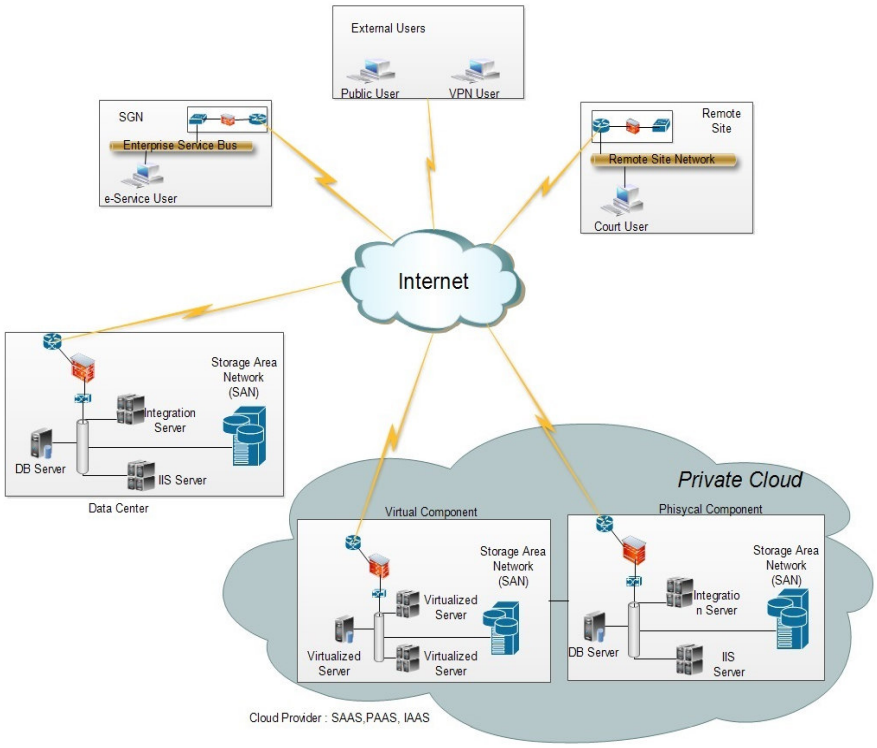
So, the best and more relevant type of cloud computing is the private cloud computing, because data related to ministry of justice only, and it is impossible to manage by other party except ministry of justice. According to the definite of the NIS cloud computing (2011)

According to the definite of the NIS, Private cloud just works only for a single organization and it's a private infrastructure for this organization and managed by the organization itself or by a third party but in ministry of justice managed internally.

The security issues in cloud computing can delaying it is implementation, private cloud computing is more secure because that managed by the organization itself. (Network World. Retrieved 2010)

3.6 Proposed Private Cloud Computing Architecture in Ministry Of justice:

Figure below refer to proposed Private Cloud Architecture to ministry of justice to find out solution to reduce problems in traditional architecture.



-Figure2 Private Cloud Computing architecture-

This architecture in figure2 consists of:

1. Internet: High speed Internet Lines.
2. Data center: that existing in ministry of justice.
3. Remote Site: Court users in ministry of justice which use application in court was connected to data center.
4. Secure Government Network (SGN): it is related to e-Government and the main purpose from SGN is to make any public side or Public institution to be able to communicate securely with the ministry of justice.
5. External User: users' benefits from the ministry of justice from outside, by the use of the internet and the site to benefit from its services.
6. Private Cloud: refer to the physical servers and virtual servers and services that were rented from cloud provider.
7. Cloud provider: who is providing hardware, software, services to the users in exchange to money, and these services are available to access via Internet.

3.7 Differences between current and proposed architecture:

It is appearing the data recovery does not exist in this architecture because we convert it mission to private cloud or cloud provider. According to Bhushan Lal and Rjesh Tiwari (2012), cloud computing reduce the hardware resources that are underutilization and shifting the location of resources to the cloud, to reduce the costs and it is also reduce the time of furnishing to minutes.

Bhushan Lal and Rjesh Tiwari, International of advanced research in computer science and software engineering, "a comprehensive study on cloud computing", 2012

And according to Dr. P.Balaram Babu (2014), no more hardware needed especially on data recovery because all physical hardware in data recovery is hosted in the cloud. Also recovering backup on cloud is easier and fast and organization can retrieve data when needed. So cloud can decrease data recovery efforts.

As we mentioned previously, one of the problems that existing in ministry of justice all servers in data recovery (DR) become old and need of renewal and it is expensive to do that. This problem encourage to implementing cloud computing in ministry of justice.

Private cloud computing working in a different way from traditional architecture, where all network lines may be changed to Internet (high speed Internet) or any high speed communication network, because the Internet are considered as backbone to the cloud computing.

According to Tolk, Andreas (2006) cloud computing connecting computers through a real-time communication network such as the Internet.

And Bhushan Lal and Rjesh Tiwari, (2012), mention cloud computing depend on Internet and considered as the other face of the Internet .and cloud computing can remote data center via Internet based communication.

Instead of data recovery ministry of justice rent a servers, platform and services from cloud provider and pay-per-use to this provider, cloud computing involves any subscription-based or pay-per-use. Dr. Manish Tanwar, Vishal Pareek, (2009)

This provider offer services, platform, and software and provider managed the hardware, platform, and software.

According to Peter R. Egli (2014), in traditional architecture the organization mange all things and make maintenance to everything in data center and data recovery, on the contrary the provider on cloud computing make all thing.

So this reduces the cost, time, and efforts that are spent on ministry of justice and make fewer employees which involve in this work.

Cloud provider offer backup copies any time that needed, at quick period of time, When any disaster happened to data center all data are saved on cloud providers and can retrieve anything in fast way.

According to Dr. P.Balaram Babu, (2014), cloud computing have an efficient recovery plan to retrieve backup data in fast time and accurate retrieval. Cloud computing depend on virtualization that can create virtual hardware, platform, and operating system, that reducing energy and hardware costs through server combination. And virtualization services offer from cloud provider. Bhushan Lal and Rjesh Tiwari, (2012).

3.8 The way that private cloud computing working in ministry of justice:

Zain Telecommunication Company the only cloud provider in Jordan, so ministry of justice should rent and paying to Zain to get services.

When cloud provider prepare physical and virtual component for ministry of justice (this process dos not take a long time), all communication network at ministry of justice will shifting to Internet. Whenever increasing the speed of the Internet has increased the effectiveness of cloud computing. Then after some configuration the cloud begin ready.

The cloud providers manage just hardware, software, and platform and maintain physical and virtual component without managing the services or data that reduce the costs, time, efforts, and maintenance. The data and services are managed by ministry of justice to increase security and privacy.

The provider responsible for making backup copies and offers these backup to ministry of justice anytime, anywhere when it is needed. When defects happened or occur in Data Center at ministry of justice automatically the run backup is working, because cloud computing depend on self-run or automatic run. That reduces the long procedures and backup retrieving time in traditional architecture.

In traditional architecture the making backup and retrieving it that Consuming a long time Possible to days, but in private cloud computing that automatically runs the backup in minutes.

The validity and reliable data on cloud computing is high than traditional non-cloud, because cloud computing use multiple redundant sites which make it suitable for reliability and Validity. King, Rachael (2008)

So, from these last studying that show how private cloud computing is suitable for implementing in ministry of justice .and can solve most important problems that encountering traditional architecture and saves the costs, time, efforts in dealing with critical data.

The private cloud computing increasing the security and offering a valid and reliable data to ministry of justice.

4. Conclusion and Future Work

4.1 Conclusion:

In this project, traditional architecture in ministry of justice was analyzed and viewed the most problems that occurred an proposed cloud computing architecture is presented which yields a solve to most problems that occurred in traditional architecture.

This proposed accord computing architectures saves the time and effect in dealing with important data and provide valid, verity data through the work cloud computing architectures decreased the time on making backup copies and retrieving these back up when need it from 10-20 hours when makes backup to approximately 2 hours.

And reduce retrieving backup time from some days to when any defects that encumbering primary data center. The management and maintenance time, effort, and cost are reduced in cloud computing.

Here private cloud computing is the best type of cloud computing appropriate to implementing in ministry of justice.

4.2 Recommendation:

Implementing this project in ministry of justice is enhancing the work and provides a high speed technology which makes the information technology more effective.

Ease of work and procedures that presented by this project to address problems in ministry of justice encourages to speed implementation within the budget and tine that available ministry of justice

Through the study research and theoretical results, should apply this project in ministry of justice to take advantage of this new technology cloud computing.

4.3 Future work:

This project is still in theory from work and need implementations in ministry of justice to prove all benefits of cloud computing in practical way but before practice implementation must conduct an feasibility study to see the possibility to implement this project in terms of cost, time and training as well as study the possibilities of technology and infrastructure available for this project.

Trying to take advantage of the traditional existing infrastructure for the application of cloud computing project.

If we are not taken advantage of this equipment, we can be sold it and exploitation of the money for the application of the new project.

So, make a good backup of critical data is a must before immigrate to cloud computing to ensure every things are right.

Before all of this, formally approved must take for the implementation of this project.

Then see if this project is proving the benefits mentioned in the theoretical from work after the practice and implementation this deeper experiment.

Implementing this project need more training to information technology employees to execute new project in effective way.

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