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A proposed Model for Risks Management measurement in Cloud Computing Environment (Software as a Service)

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Abstract: Cloud computing is a new and interesting subject. It has resulted in many services besides the increasing number of users. Cloud computing offers good storage, that can be dealt with at different times and locations, because the information that is stored in it does not need any space with no need to transfer from one place to another. In this paper, we have provided security by designing two services for monitoring the processes exchanged between the user and the cloud to protect it from different threats that target the cloud so as to damage data or information stored in the cloud. Therefore, we need to prevent denial of service attack and ensure all the files in the PC are the same files as in the cloud.

Keywords: A Mathematical Programming Language (AMPL), Community Care Services Program (CCSP), Cloud Information Accountability (CIA), Denial of Service (DoS), Infrastructure as a Service (IaaS).

1. Introduction:

During the last decades, the enormous advances in computing power, storage, and networking technology have allowed the human race to generate, process, and share increasing amounts of information in dramatically new ways. In fact the Internet is represented in network diagrams as a cloud, as shown in Figure (1-1). The cloud icon is all that other stuff that makes the network work.

Cloud computing is a subscription-based service where you can obtain networked storage space and computer resources. Cloud computing experience is similar to experience with e-mail. Email client such as Gmail, Yahoo, Hotmail and so on, take care of housing all of the hardware and software necessary to support your personal email account

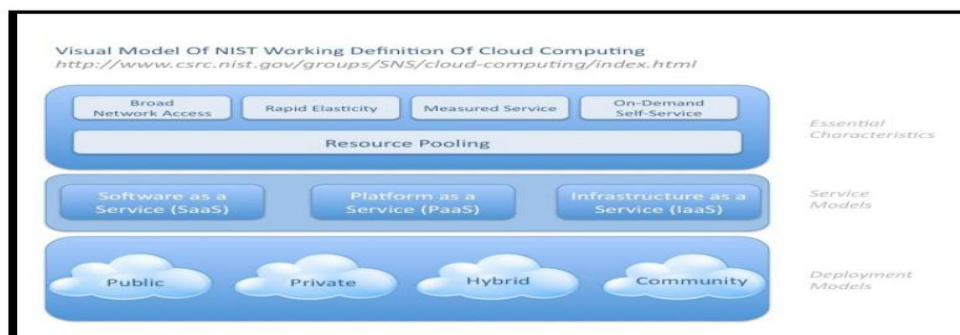


Figure (1-1): Cloud Computing [3].

The use of the email required an Internet service provider for achieving access process to it by web browser. So it can provide access to the email from anywhere and anytime, thus this



process become similar to how cloud computing works. Except in email, accessing given only to email, where in cloud computing, accessing information can be set within the cloud.

In other word , the definition of cloud computing in general is a model for enabling ubiquitous, convenient, on-demand network access to a shared computing resources such as networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models [1].

The cloud computing is an Information Technology (IT) deployment model based on virtualization where resources, in terms of infrastructure, applications and data are deployed via the internet as a distributed service by one or several service providers. These services are scalable on demand and can be priced on a pay-per-use basis.

The rest of the paper organized as follows: Section 2 introduces Service Model of Cloud Computing, section 3 describes Deployment Model of Cloud Computing, section 4,5 illustrates the Cloud Security and Cloud Computing Risks, in section 6 explains aim and objectives ,section 7 presents cloud problems, brief some related work on cloud computing is presented in section 8, section 9 explain design and evaluation of the proposed model, section 10 presents the conclusion, finally future work are presented in section 11.

2. Service Model of Cloud Computing:

There are three types of cloud providers that you can subscribe to the following types as in Figure (2-1).

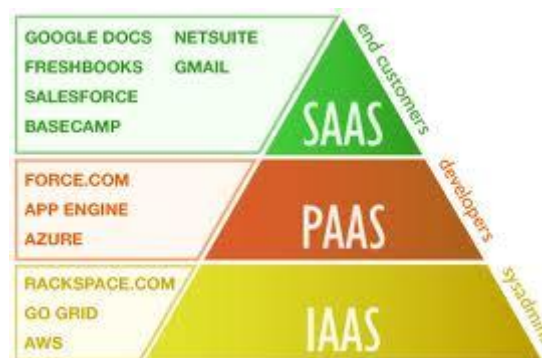


Figure (2-1): Types of Cloud Computing [2]

2.1 Software as a Service (SaaS):

SaaS is a service to improve the software performance through mixing and matching components from many vendors. It is capability to deliver the applications over internet which is installed in cloud infrastructure. This model is designed to provide everything and simply rent out the software to the user. It is sending request for service through internet and gets the application on pay-as-use basis. This service is usually provided through some type of front end or web portal. While the end user is free to use the service from anywhere, the company pays a per use fee [3, 4].



2.2 Platform as a Service (PaaS):

PaaS is checking and compiling the code when the software developer writes it. This model includes all phases of the System Development Life Cycle (SDLC) and can use Application Program Interface (APIs), website portals, or gateway software. Several concurrent users can use the same platform to develop software from different locations. And the buyers do need to look closely at specific solutions, because some providers do not allow software created by their customers to be moved off the provider's platform [3, 4].

2.3 Infrastructure as a Service (IaaS):

When the user is buying infrastructure, it is own the software and are purchasing virtual power to execute as needed. This is much like running a virtual server on the user own equipment, except the running a virtual server on a virtual disk.

IaaS is approach to provide the equipment like server and hard drive via internet where user can install their own software to use. The advantage of this model is used for starting a business which doesn't have much capital to invest for hard drive. It makes sense for organizations to testing or trial their software for temporary basis. It provides scalability to the organizations which are rapidly growing and adding hardware with itself is problematic [3, 4].

3. Deployment Model of Cloud Computing:

3.1 Public Cloud:

The public cloud is the most commonly described, popular and widely used model for deployment of cloud services, resource and services. It is made available to the general various users or to an organization. That resource is dynamically provisioned over the Internet via Web applications or Web services from trusted third party provider[5, 6].

In this model, all of the physical resources are owned and operated by a third party cloud computing service provider. These resources are run by third parties, and applications from different customers are likely to be mixed together on the cloud's servers, storage systems, and networks[13, 14].

Public cloud computing allows end users to create their own services on systems that are hosted and managed outside their limits. These services are all virtualized and can be created, updated and terminated using an API application, so the public cloud is best suited for business requirements where organizations is required to manage load spikes, host, applications, utilize meantime infrastructure and manage applications which are consumed by many users[5, 6].

3.2 Private Cloud:

The private cloud is operated for a specific company. It may be managed or controlled by the company or a third party. It is generally deployed in the enterprises data center and managed by internal personnel or service provider. The private cloud gives an organization greater control on the processing and data resources, providing ease of mind for worried executives, if not greater security and privacy for sensitive data

Private cloud model requires more investment and cost effective model comparable to buying, building and managing infrastructure for running or deploy application. Thus it is well suited to mission critical applications, which consider downtime in terms of internet availability, quality and performance [5, 6].



The IT administrators have to learn and install new software such as hypervisors and cloud management utilities. They need to manage two compute environments side by side and keep IT policies aligned in both. This adds to complexity and staff workload. And it goes without saying that a private cloud runs in an existing corporate data center, which carries high fixed costs to maintain [5, 6].

3.3 Hybrid Cloud (or Mixed Cloud):

The Hybrid Cloud environment intersects and combines multiple public and private cloud models in such a way that its environments appear as a single cloud with implementing standards in order to provide services. In other words, it is a reserved private space within a public cloud [5, 6].

Hybrid cloud is the most common method of cloud deployment within a medium to large organization and employs aspects and issues of rest cloud deployment models. It enables the enterprise applications to running state-steady workload in the private cloud, and requesting the public cloud for intensive computing resources when peak workload occurs. Over its proprietary data, and then use a public cloud storage provider for backing...

The main advantage of this model is scalability and reduces cost in general, and the disadvantage lack flexibility and security because the handling data is distributed between more than one types of deployment model [5, 6].

4. Cloud Security

Cloud computing is the idea that any type of information can be stored centrally and accessed it through any device, the information housed on the cloud is often seen as valuable to individuals with malicious intent. There is a lot of personal information and potentially secure data that people store on their computers, and this information is now being transferred to the cloud. For this reason, it should understand the security measures that the cloud provider has in place, and it is equally important to take personal precautions to secure your data [7, 8].

Cloud computing security concerns all the aspects of making cloud computing secure. Many of these aspects are not unique to the cloud setting: data is vulnerable to attack irrespective of where it is stored. There are some aspects of cloud computing security that appear to be specific to that domain [7, 8]:

1. The main idea in the cloud is the shared resource between different clients, and other sharers may be attackers.
2. Any type of information is stored in the cloud can widely accessible by potentially insecure protocols and APIs across public networks.
3. Data in the cloud is vulnerable to being lost or incorrectly modified by the cloud provider.

5. Cloud Computing Risks:

The risks about integrity, availability, performance and so on are the same in the cloud systems as they are with non-cloud technology system. The solution of the risks will be different between the cloud system and the non-cloud system depending on how and for what purpose the cloud solutions are used.



Thus, the user should be fully understand the risks before is moving to the cloud computing, and how they might affect the user particular business. These risks are the following [9]:

5.1 Interoperability and Portability (Lock – in):

Interoperability and Portability which mean how different clouds are communicated, and the ability of customers is to use the same parameters-management tools, server images with a variety of cloud computing providers and platforms. Then the ability is to move application and data from one cloud to another. And can achieve it by removing dependencies on the underlying atmosphere.

5.2 Development of New Architecture:

In this model the cloud computing in which using voluntary resources, or a mixture of both dedicated and voluntary resources are very economical and it suits such applications as scientific computing. All the cloud computing services are implemented in large commercial data centers and they are operated in old centralized manner.

5.3 Availability of Service and Limited Scalability:

Many systems have been crashed on cloud when using only one Community Care Services Program (CCSP) services this can result in a drawback as when a shutdown event happens on a cloud the service disappears and user cannot find that service. CCSP is found to provide infinite scalability for customer but due to the fact that many of users are now migrating to cloud computing.

5.4 Lack of Standards:

Every cloud provider has its own standards and the user is not given any comparative performance measurement facility which can compare standards and performance of different clouds using some cost per service.

5.5 Security and Privacy :

The security and privacy concerns are the main obstacle when adopt the cloud. Although the modern techniques of security offered, the chances of security flaws are reduced but still. It is necessary that the applications and architectures should be isolated and the mechanism of security must be apposite, surfacing and adoptive.

5.6 Reliability:

Many problems still lie in the reliability of cloud computing. But still the traditional solutions may not achieve high reliability for modern applications in cloud computing. Such as the user is not sure if the user will remain connected to cloud network and keep on doing his work at any time as connections do break, the connections to cloud services are secure or not and the migration of data to cloud computing is in safe environment and as per needed speed or not.

5.7 Denial of Service (DoS):

This point considered the main important risk in cloud computing. Thus in this thesis we focus on this point which occurs when the attacker sends many malicious requests to the server and to be invisible to the user. In cloud computing, this risk becomes large possibility due to the large number of cloud users who share the cloud infrastructure.

The matter of fact cloud offers the allocation of resources dynamically, so the user will be focused on the response of the cloud when it is under a heavy DoS attack, and it is necessary



to build a DoS protection into cloud, or it will be handled on the internet level as it is dealt presently.

6. The Aim and Objectives:

The cloud computing is the new objective presented in the recent time. Many researchers focused on this field based on how to adoption to the cloud computing and what are the requirements and the risks to what this field needs.

In this paper, we discussed several types of risks type sand picked one type for further analysis DoS. By focusing on how it happiness and on its negative results, we proposed a model to handle its issues.

7. Cloud Risk Problem:

The main problem in the cloud computing is how to provide the protection from the risks in cloud environment. To ensure that the user migration process is occurred in secured way, we focused on two important risks:

- The first risk is DoS or resources from the users and is making these resources not available all the time.
- The second risk is mismatching between the files in PC with the cloud and the matching process one of the important characteristic to the cloud.

Therefore we need to provide two services that monitor these risks and handling them, if they occurred.

8. Related work:

Many of the researchers have presented lots of concepts and problems in cloud computing. We present a related work to our problem as listed below:

Declared the trust factor is one of the fundamental security concepts in the cloud computing because it is depending on storing and delivering services[13], authors discussed when the cloud computing is topics today in the field of information technology. It introduces a new Internet-based environment for on-demand, dynamic provision of reconfigurable computing resources and proposed a framework that identifies security and privacy requirements, attacks, threats, concerns and risks associated to the deployment of the clouds[14], declared the cloud computing has been emerged out with various benefits to an individual and organization; on the other hand it exposed various concerns in the security aspects. In this paper, the security aspects of the data management services have been considered. Specifically the malicious behaviors targeting massive scale, Cloud knowledge repositories (e.g. DoS attacks), could drastically degrade the general performance of such systems and cannot be detected by typical authentication mechanisms [15]. In [16], the authors declared the cloud computing provides the capability to use computing and other storage resources which are required by various users on a metered basis and reduce the expenditure in an organization's computing infrastructure.



9. Design and evaluation of the proposed model:

Cloud computing has been considered as a new technology during this decade.

From the user perspective this technology is not reliable in enabling users to store their private data or information in a safe way.

These problems were summarized as lack of experience dealing with the account of cloud computing during any process related to users. Therefore, it should provide its services at all times to users of cloud with easy to use and transparency.

In this paper, we will focus on two main parts in the cloud. The first part is monitoring of the services that provided for the user and correct any technical errors when it happened to avoid the denial of services problem.

The second part is monitoring the back-up files that user uploading to the cloud for achieving the main purpose of the cloud that any files in the personal computer should be found in the cloud. The proposed model includes two procedures, as shown in Figure (9.1):

- Client Procedure.
- Service Procedure.

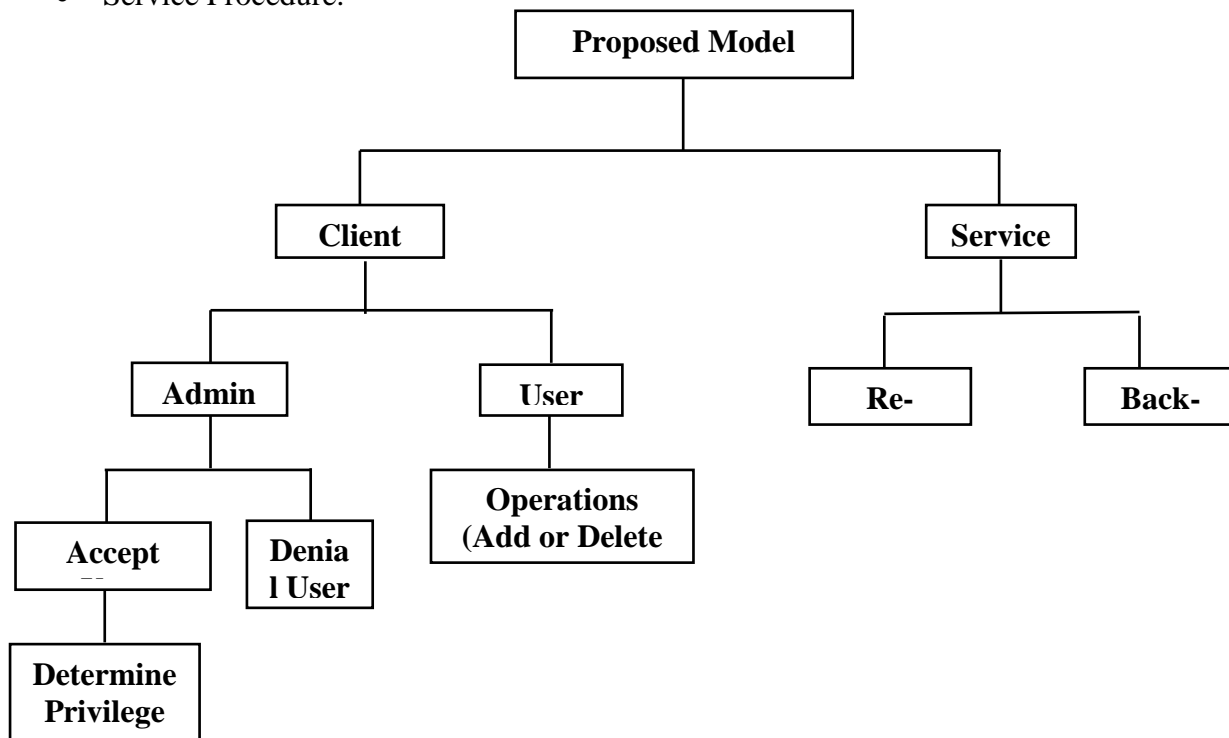


Figure (9.1): The Proposed Model

Between the two procedures, there is a Business Logic Layer (BLL). The position of this layer between the Graphical User Interface (GUI) and the database, this layer is dealing with lower-level details of managing a database or displaying the graphical user interface.

The first function of BLL is how data can be created, displayed, stored and changed by encoded and decoded the instructions between the GUI and database, as shown in Figure (9.2).

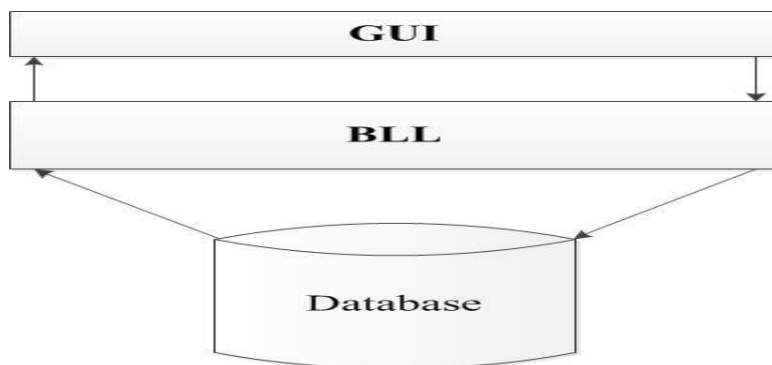


Figure (9.2): Business Logic Layer (BLL)

9.2 Client Procedure:

This procedure is dealing with the users who using this model. The user will register and after that the physical admin will determine the privilege to the user based on the users type. The type of user divided into two stages:

1. Admin Stage.
2. User Stage.

This procedure consist of check-user algorithm, the detailed of this algorithm is listed below:

➤ Check-user Algorithm:

The function of this algorithm is how to determine if the user is a new user or registered already. In this case, if the user was a registered user, it determines the type of user admin or user based on the privilege to this user, as shown in Figure (9.3).

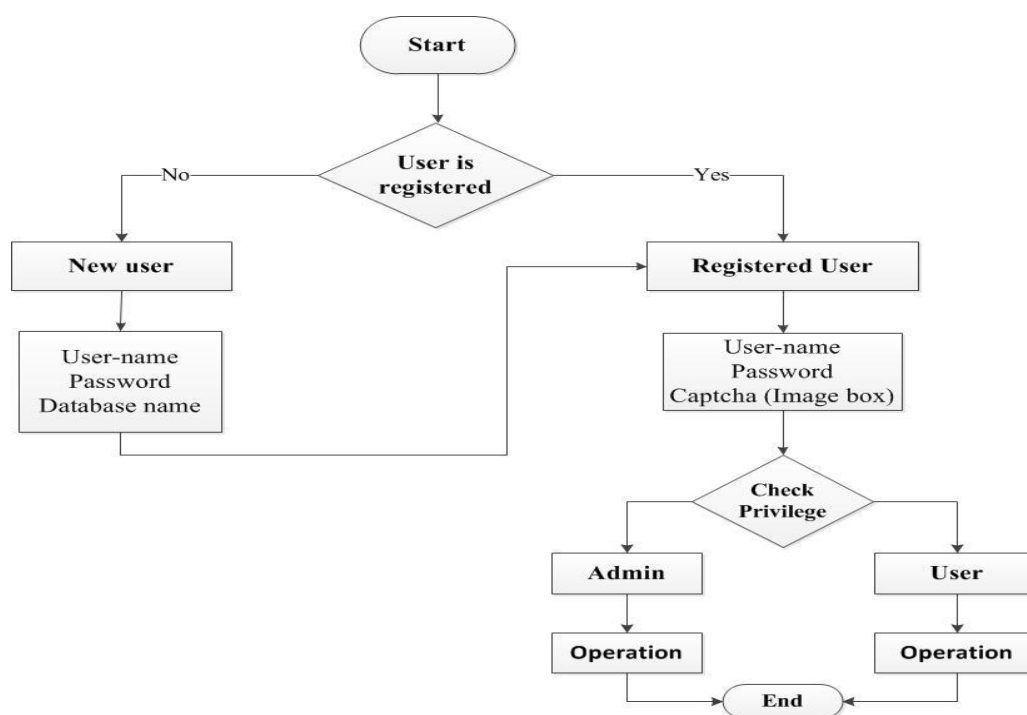


Figure (9.3): Check-user Flowchart



Check-user Algorithm:

- Step1 : Start
- Step2 : if user is new user then
- Step3 : input (user-name, password, database name)
- Step4 : Else
- Step5 : input (user-name, password and captcha)
- Step6 : Check the privilege when the user enter to the model to determine if admin or user
- Step7: End if
- Step8 : End Algorithm

9.1.1 Admin Stage:

This stage is related to the admin, which is a responsibility for determining if the user can an acceptance or denial. Additional another important responsibility, that represented to the admin have a full control on the database. If the user is an accept user, the admin will determine the privilege to the users as (Add user, Add table, Add permission, Delete user and Allow user).

9.1.2 User Stage:

This stage is related to the user. When the user enters to the model, the model will show many tables. The tables build it by the admin and these tables will be different from user to another based on the privilege that admin determine it.

9.2 Service Procedure:

This procedure is dealing with the services in the cloud computing. In this thesis, we designed services inside the window for the users and can install these services on the physical server. The operation of these services is similar to the operation of Dynamic Host Configuration Protocol (DHCP).

The function of these services is how to decrease the risks that threaten the users when it is using the cloud computing by observation all the time on these services that users working on them, the services window can be active through the start option and inactive the services through stop option.

The working of the services operation can be done automatically or manually. Automatically working all the time but stopping it only if any error occurs, or manually the user who can work and controlling on it.

The proposed services in this thesis depend on SQL Server. The service procedure is divided in two services, as listed below:

- Back-up Service
- Re-active Service

9.2.1 Back-up Service:

The function of back-up service is monitoring the information or the data that related to the user continuously and to ensure that all the users files existing in the cloud and can be updated all the time. In this section, it has been added a timer inside the service to work on the monitoring the updating daily. The system will load the new files that added inside the personal computer from the last back-up to the cloud, as shown in Figure (9.4).

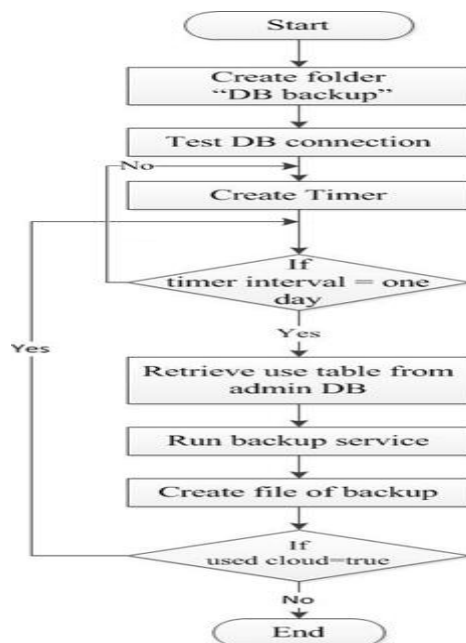


Figure (9.4): Back-up Flowchart

Back-up Algorithm:

- Step1 : Start
- Step2 : Install back-up service in the window
- Step3 : Create new folder (DB back-up)
- Step4 : Testing the DB connection
- Step5 : Create timer to check the update the files every day
- Step6 : if timer interval ==one day then
- Step7: Retrieve the user table from admin DB
- Step8 : Run back-up service from DBMS for each admin and user
- Step9 : Create file of back-ups in DB backup folder
- Step10: if used cloud == true then
- Step11: Return to (step6)
- Step12: END if
- Step13: END if
- Step14: END algorithm

9.2.2 Re-active Service:

The main goal of cloud computing is represented that the services should be available all the time and can prepare the resources to the user in any time that need it. Because of that it should provide the working of the server and avoiding the interruption maybe caused by DoS attack. DoS attack will affect over load on the server and it will cause that the services not available to the users.

The operation of re-active service is monitoring the service of SQL server. It has been added a timer inside this service to monitor the process in general, if the service of SQL server stopping, the timer will run the service immediately for providing all the resources cloud that available permanently, as shown in Figure (9.5).

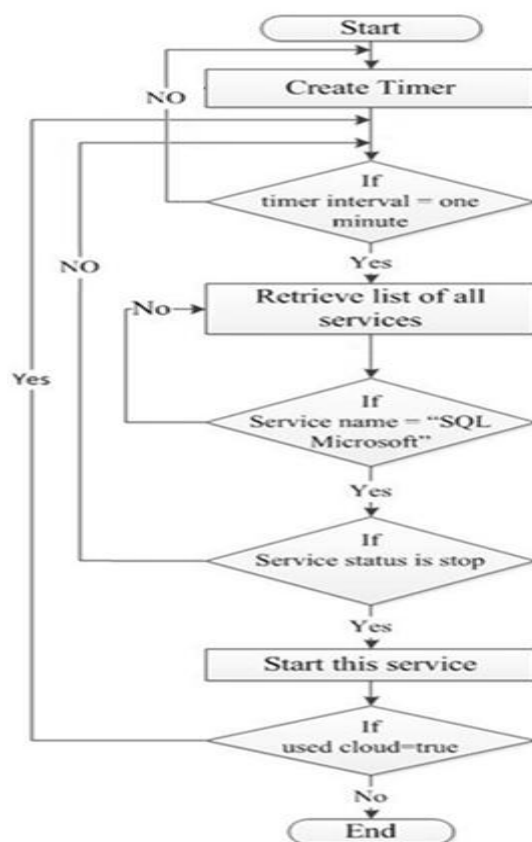


Figure (9.5): Re-active Flowchart

Re-active Algorithm:

- Step1 : Start
- Step2 : Create timer to check each minute
- Step3 : if timer interval == one minute then
- Step4 : Retrieve list of all services in windows
- Step5 : if service name!="SQL Microsoft" then
- Step6 : Return to (step4)
- Step7: Else
- Step8 : if service status == stop then
- Step9 : start "SQL Microsoft"
- Step10: if used cloud == true then
- Step11: Return to (step3)
- Step12: END if
- Step13: END if
- Step14: END if
- Step15: END algorithm

The cloud computing is promising automatically to deliver any service through the internet to the users anytime and from any location.



Therefore, we focused on how to design a model to determine authorized user from an unauthorized user. After the checking, it should take a file copy from personal computer of the authorized user and uploaded these files to the cloud. Then determine the privilege of the authorized user such as (add, edit, delete and so on) for trying decrease the over load when it occurred on the cloud to avoid DoS, as shown in Figure (9.6).



Figure (9.6): Privilege User

In this paper, we designed services for matching the files in the PC with cloud, in the same time it should all of these files available to the user in anytime that need it.

10. Conclusion:

To use cloud computing, we need only the internet connection for accessing to cloud computing, and to make different operations such as (add, edit, delete and so on). The fundamental of building cloud computing technology is the benefits that produced from several concepts: grid, virtual machine, distributed database and so on. This technology provides many benefits for the user so we need to encourage the customers to use the cloud computing by giving the user of suitable security.

There are many factors of the security from the perceptive author in this paper; there are two important points to achieve the security. The first point is avoiding the DoS by monitoring the system. The second point is determining the user who can access to the cloud and select the user privilege from the admin. These two points are the main factors to provide two directions, the first direction focused on security and privacy and the second direction focused on availability and performance.

11. Future Work:-

After the dealing with important risk in the cloud environment, we suggest some thoughts for future, as listed:

1. Add a service that providing scan process on the DB from time to time.



2. Add a service that separated the information and divided into groups such as (Images, text, video and audio).
3. Add a service that determined the type of the user such as individual user or organization based on the size and the type of the information.

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