RESEARCH ARTICLE

Government cloud system for Jordan

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ABSTRACT

Cloud computing as a new information technology trend widely adopted as a new e-government services and resources and changes it into cloud-government. Moving between the two services can help in facing new technologies challenges and solve many difficulties that face e-government, such as quality of the service, availability, higher efficiency, and reasonable price. In this paper, we will be presenting the current running cloud in Jordan and the use of that cloud for e-government. The paper will also present the reasons why the Jordanian government is go cloud and their future plans. The paper will then present a new cloud computing solutions, called the government cloud system (GCS) that can make the service for the Jordanian government more fixable and efficient. The GCS is made of two main components; the first one is how to make the search customized and not preset, and the second is to have one big database.

Key words: Cloud computing, cloud security, e-government, electronic bank system, g-cloud

INTRODUCTION

Cloud computing is a service or a business model that can use the current technologies with some additions to make all needed data and services (such as e-government) to be accessed remotely without considering the location.[1] NIST[2] defined it as an on-demand network that can be run from anywhere and stored all data in a pool that is researchable and can be modified from authorized people without having actual hardware in-house. Cloud computing includes database, servers, memory, applications, communication, and others. All these components are available in grid computing where a lot of effort is spent to sustain them, and with minimal effort (technical and managerial), the service can be run as shown in Figure 1.

The grid computing components are used in cloud computing, so the core of the cloud is hardware, communication (network), applications, and database (software). The efficiency of the software depends on both the communication and the hardware since they complement each other to run the service. Once the cloud is built and before it can run, the service performance test should be performed using software tools to check the quality of service and the virtualization of the cloud.

The online services provided by the Jordanian government support the governmental institutes and citizens using up-to-date technologies to run the applications and services.[4] The main purpose of the e-government is to provide real-time services to users effectively. As number of services increased, the online systems should be kept up to date and sustained with reasonable cost and online support, which is a big challenge to all online suppliers. Moreover, collaborative efforts are needed as well as technical cooperation. Online suppliers must keep their eyes open to any new technology that can support better services since the demand is continuously increasing and the available technologies cannot address all future challenges. Therefore, new technology is needed, a technology that can offer centralized management, reduced cost, and secured. All these properties must be available in a good cloud computing system.

CURRENT SITUATION

Most of the ministers who participated in the e-government in Jordan have their own servers and services started to move to cloud computing

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by having their virtual machines (VMs) in the G-cloud. VM is not a new technology; it is a part of the technology that cloud computing is using. Cloud that uses only VM is similar to having an expensive luxury van just to go to work, where small car is adequate. Figure 2 shows the current IT model used by the National Information Center (NIC) for the Jordanian ministries.

E-government process in Jordan is of two stages, e-transformation and e-government.[5] The role of e-government is to encourage and support the government entities to deliver high-quality services to the citizens. And e-transformation is focusing on evolving the development of service delivery including emerging, enhancing, transaction and connection.

As in any transactional stage, the government of Jordan is aiming to achieve this cloud computing strategy. Therefore, Jordan is currently offering more sources of information through the National Government Portal.[6]

SUGGESTED SOLUTIONS

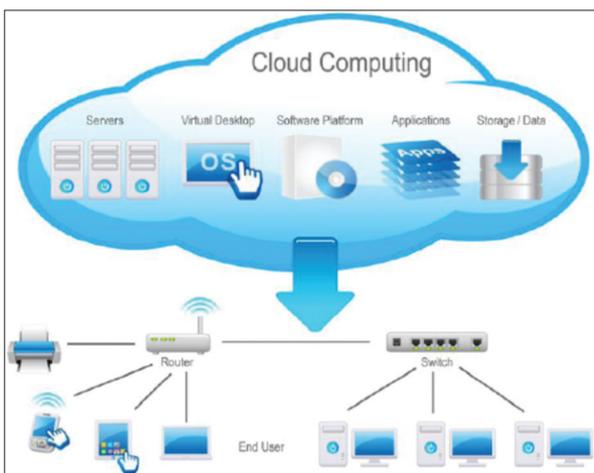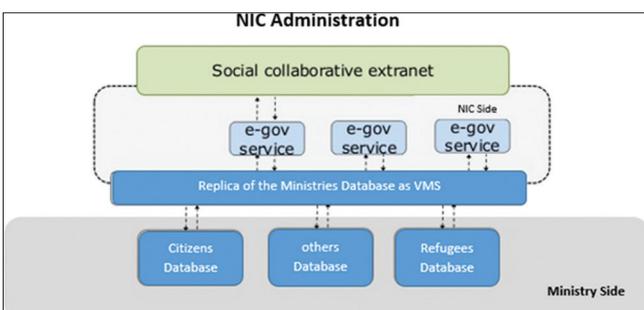There are many ways in which the Jordanian government can go about using the cloud in an efficient way. The following are the suggested approaches:

1. The first approach divides the solution into two parts; the first one is to use an enterprise service bus (ESB). The second part is to use available services on all e-government VMs to establish a preset quire system that allows users to choose from different preset quires as shown in Figure 3.

2. The second solution is to use a unify database software that can unify many different types of databases into one and keep the current running databases formats as is. A web base is then built to interface users, ministries, and administrators so that they can access the database with different levels of access (depending on their access permissions). As a result of that a scalable quire system is established which allow the user to customize their queries as shown in Figures 4-6.

After the contents of the ministries databases have been discussed with their IT specialists, the proposed cloud will be of the hybrid type. Therefore, the ministries of interiors, justice, and foreign affairs can be together on a public cloud and the ministry of health will be in a private cloud since there is limited information to be shared with the public cloud. The reason for proposing a hybrid cloud is that the ministries will be able to eliminate the duplication of the available data. Finally, the ministry of finance will be independent from other ministries since the ministry has no common data with other ministries and also for privacy reasons. Figure 6 shows the proposed hybrid cloud.

3. And e-transformation is focusing on evolving the development of service delivery including emerging, enhancing, transaction and connection. A multi-relational database will be established between the different VMs, which will help in not only centralized the management, reducing the cost, and make the data reliable but also make it easy to use and get information as shown in Figure 7.

The main difference between the first two approaches is that, in ESB, predefined queries should be prepared and certain data sharing are allowed by the cloud operator. Where in the second solution, no restriction is applied to the shared information. ESB uses the existing VM, where the other approaches built the system from scratch. The last approach (the third approach) is the most expensive one and needs a lot of time and effort.
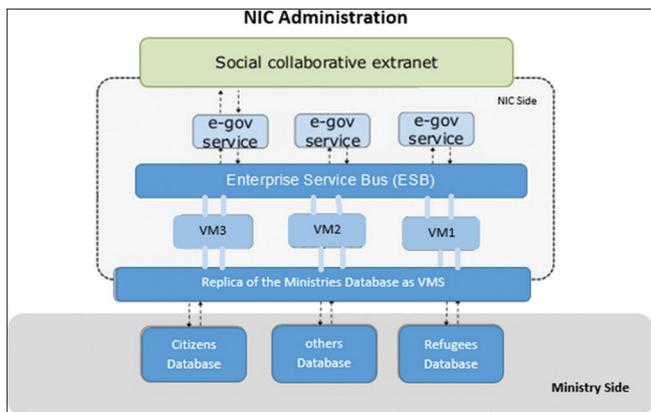

Figure 1: Cloud computing[2,3]

Figure 2: Current situation IT model used by Jordanian ministries

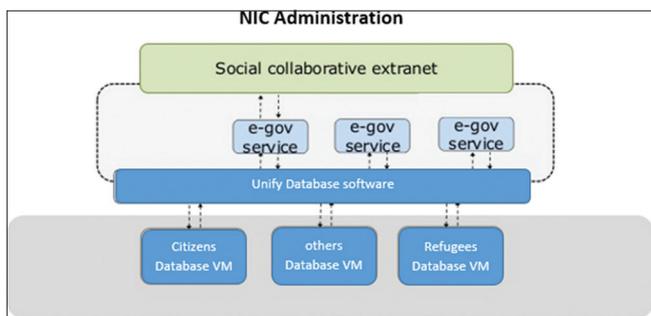**Figure 3:** Enterprise service bus solution
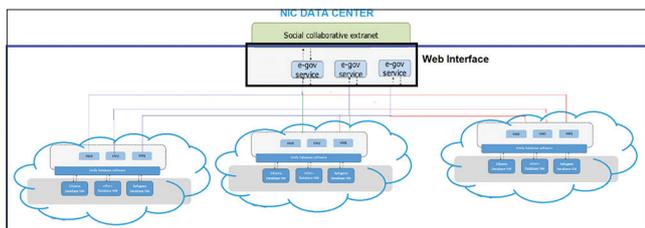

Figure 4: The second solution

Figure 5: Different ministries connected with the National Information Center cloud
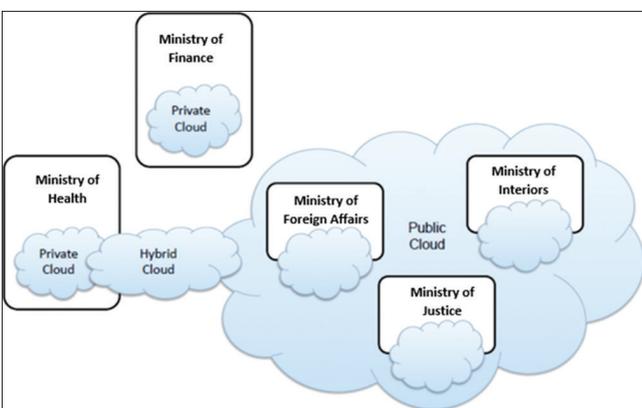

Figure 6: Ministries' cloud

IMPLEMENTATION, REVIEW, AND ANALYSIS

An implementation of the first proposed could model was applied to the Aqaba Water Company where a first private cloud in the Middle East was implemented for the Aqaba Water Company
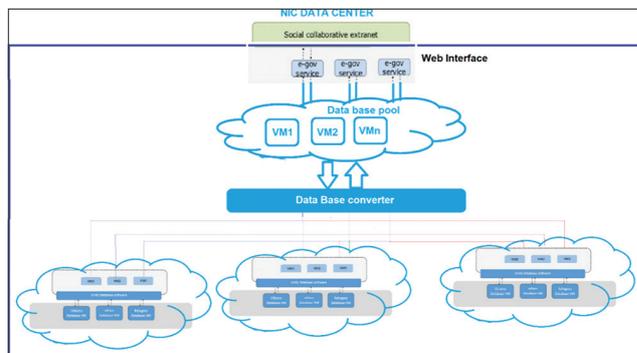

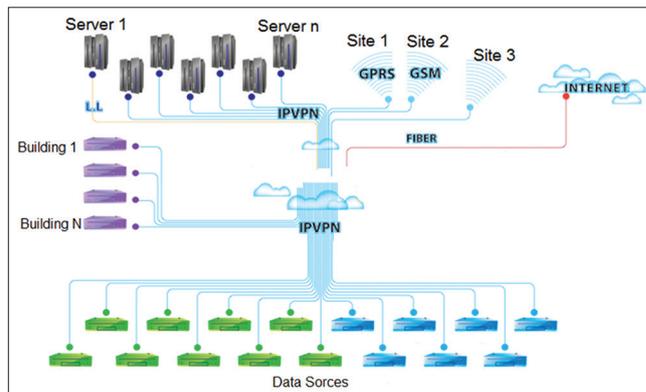**Figure 7:** Common database approach

Figure 8: Network layout

Utilities using HP cloud. The Aqaba Water Company got some feedback for using the HP cloud such as Huge Savings on its IT operating expenses, readiness to implement Smart Electronic Metrology Infrastructure, increased customer satisfaction, increased employee satisfaction, and more focus on customer service.

The implementation of the cloud model for the Aqaba Water Company was done through the following phases:

1. Process redesign, optimization, and automation (end-to-end).
2. System design, selection, and implementation.
3. Knowledge and expertise transfer and training.
4. Gap analysis.
5. IT support, IaaS, and SaaS services.
6. Comprehensive training on various domains in utility management.

The proposed model network design

The proposed model network design is widely distributed, and many inputs are coming from different data sources (sensors) and network nodes as shown in Figure 8.

The data are distributed on multiservers and VM and monitored by HP monitoring software which monitors
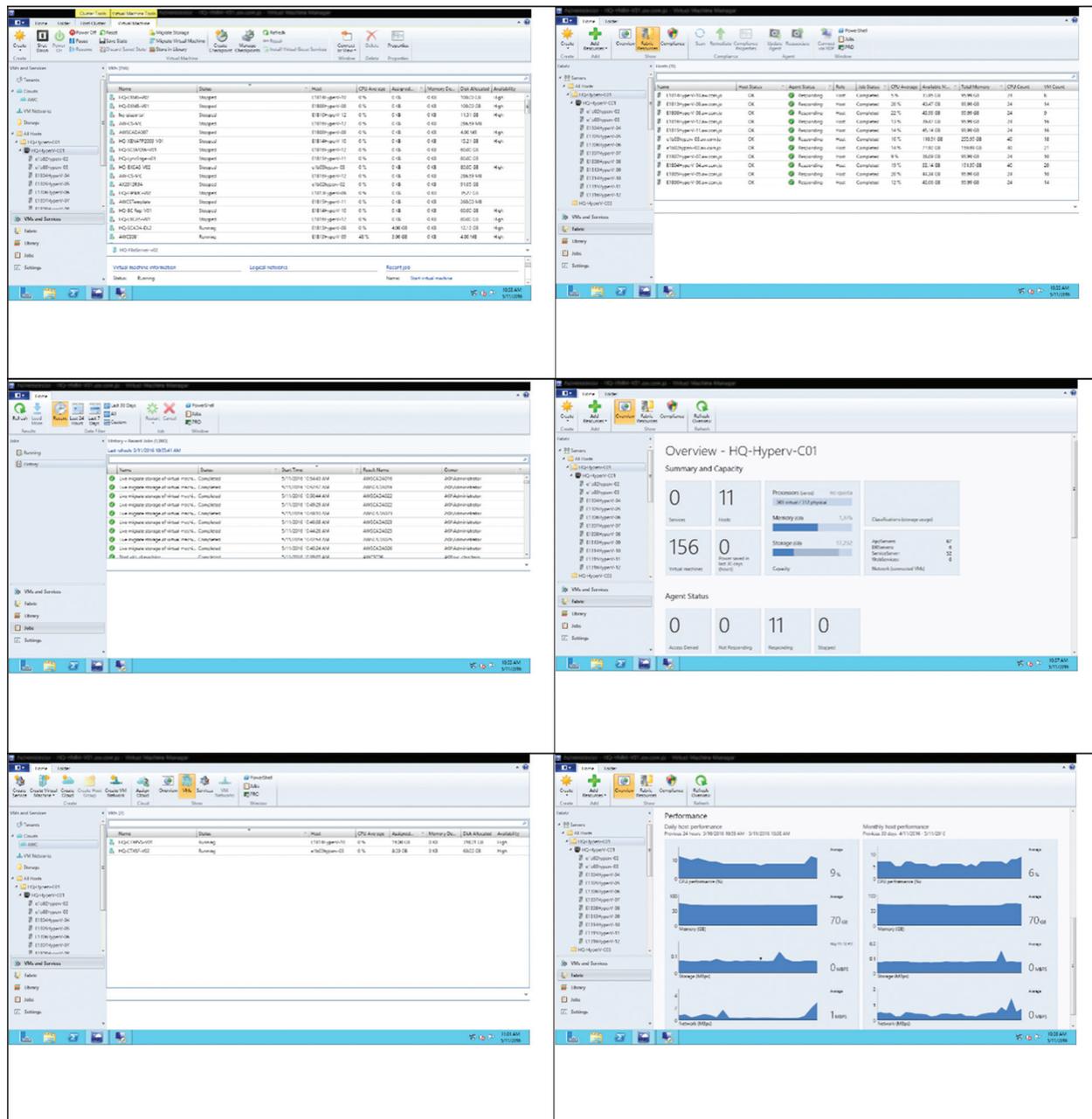
Figure 9: Snapshots of performance testing for the cloud model

every cloud resources such as memory, storage, processor, and availability as shown in Figure 9.

As seen from the performance testing results, the system is always available, not too much load on the resources, and as the quires increased, the load is increased but not reaching the critical value limits.

FUTURE WORK

The main concerns of all Jordanian governmental agencies are securing their data and trusting the data management party. In Jordan case, building the confidence is the NIC responsibility. They should strengthen the security system using up-to-date technologies and use a high level of data encryption to guarantee safe data transfer between the different agencies and NIC.

As a solution for this concern, rather than performing software encryption, an additional hardware encryption is recommended. One hardware encryption can be located at the agency to encrypt data transmission and another at NIC to decrypt the received data so that if any intruder tries to sniff or tamper the communication link then will not able to get any beneficial data.

CONCLUSION

In this paper, we discussed why the Jordanian government should go to cloud, what is the current

system adopted by the Jordanian e-government, and what are the ways to improve the system, including the current situation, plans, and future work. In addition, we discussed the proposed improvements which are under process ESB and two other approaches as long-term solutions to improve the current situation.

From design perspective, the first proposal cost is very reasonable compared with the benefits. The network is expandable since there is a VM for every ministry's service. The load is distributed on multi-VM and multicloud. The hosting will be at the Internet main distributor which reduce the possibility of communication problems. Since NIC has experience with securing the running system, so the security issues are well considered using this proposed model.

The case study of the Aqaba water company which is a prototype of what we proposed may considered as a start point of a huge governmental comprehensive cloud and as a proof and support to government cloud system.

REFERENCES

1. Cellary W, Strykowski S. E-Government Based on Cloud Computing and Service-Oriented Architecture. The 3rd International Conference on Theory and Practice of Electronic Governance (ICEGOV '09). New York: ACM Press; 2009. p. 5-10.
2. Hashemi S. Security challenges in cloud computing with more emphasis on trust and privacy. Int J Sci Technol Res 2012;1:50.
3. Available from: https://www.stepzindia.com/cloud-computing/. [Last accessed on 2018 May 15].
4. Margetts H, Dunleavy P. Cultural Barriers to e-Government. London: Academic Article in Support of Better Publicservices through e-Government. National Audit Office, Ordered by the House of Commons; 2005.
5. e-Government Program, e-Government Strategy; 2014-2016.
6. Available from: www.jordan.gov.jo/wps/portal/ncc_en. [Last accessed on 2018 May 15].