Cloud Computing: Future Framework for e-Governance

K.Mukherjee
Department of Computer Science & Engineering.
B.I.T Mesra, Ranchi, India

G.Sahoo
Department of Inmfomation Technollogy
B.I.T Mesra, Ranchi, India

ABSTRACT
The success of the forthcoming endeavors of human civilization depends on the proper utilization of the resources which are becoming scarce day by day. It is observed that while some places have plenty of resources, other places suffer from the lack of it. This discrimination can be wiped out by a proper management and strategy adopted by the Governments of different countries in the form of a properly implemented and managed e-Governance. The existing e-Governance framework can not address all categories of users. In this paper, we propose a new effective framework of e-Governance based on cloud computing concept, which would be intelligent as well as accessible by all**.**

Keywords
Cloud Computing, Web services, e-Governance

1. INTRODUCTION
It is beyond doubt that e-Governance can smoothen the working procedure of Government machinery by providing transparency, effective working, instant response and availability of information of Government machinery to end users, time to time. The existing e-Governance is very much server centric, cost effective in nature and finds itself unable to address all categories of users starting from rural urban to metropolitan citizens. The success of e-Governance lies on wiping out of this discrimination by providing accessibility of different web services of e-Governance irrespective of geographical and language barriers. Accessing the different web services of e-Government by using sophisticated laptop or desktop are beyond the reach for a large number of users in a country like India. In India, 70% of the total population earn less than $2 per day and can not afford expensive laptop or desktop etc to get the facilities of e-Governance. Hence e-Governance facilities are confined within limited inhabitants of India and remain unsuccessful. Keeping all these in mind, we propose a new effective framework of e-Governance based on cloud computing concept. Cloud computing is computing over a cloud, where a cloud consists of clusters or grids of 1000s of commodity machines (e.g. Linux Pcs) and software layers that is responsible for distributing application data across the machines, parallelizing and managing application executing across the machines and detecting and recovering from machine failure. Here, the software layer which is responsible for distributed application is called Hadoop. In cloud computing based e-Governance, the different e-Governance web services would be accessible over a network using thin clients/mobiles, which are a lot cheaper and more affordable by nearly all types of users starting from urban to metropolitan citizens. The cloud computing can help to make computing ubiquitous and bring it within the reach of all type of users. Hence, our proposed cloud computing based e-Governance would peep into all regions of a country like India and would come handy in building a new modern prosperous India. Moreover, apart from traditional e-Governance framework, our proposed framework of e-Governance would be intelligent enough to help the end users to take strategy planning in absence of human experts, which are scarce, mortal and. expensive in nature. The proposed e-Governance framework would have three layers as follows:

a) Knowledge Base

b) Inference Engine

c) User Interface

The knowledge base comprises of a series of facts and rules about the particular problem area from which the system draws its expertise. In order to make use of the expertise which is embodied in the knowledge base, the system must also possess an element, called Inference Engine, which can scan facts and rules, and provides answers to the queries given to it by the user .User interface is the means by which the user communicates with the system using human understandable languages. A fact is a clear, concise statement which expresses something which is true within the particular problem domain. A rule is generally of the form:

If statement1 then statement2.

where statement1 and statement2 are both expressions, which may or may not be true. The rule is simply stating that if statement1 is true then this implies that statement2 is also true. In this paper, we propose intelligent computational web service. The agenda of computational web service of cloud is to offer simple web methods that the computational client can call to perform application specific computation on their own data. Web services are programmable and reusable. They are available anywhere via the internet. Programs built using this model will run across multiple websites, extracting information from each of them and combining and delivering it in a customized form to any device anywhere in the world. The potential of web services is unlimited.

Organization of this paper is as follows: Related work is discussed in Section 2. Proposed cloud based frame work of e-Governance and algorithm is discussed in Section 3. Section 4 concludes with a direction of the future work.

2. RELATED WORKS

Chandwick and May [3] in the year 2003 proposed an e-Governance framework regarding the interaction between Government and its citizens. They had focused on the managerial, consultative and participative models of e-Governance. In the year 2005, Grant and Chau's [7] review report proposed the strong integration between IT and managerial aspect of e-Governance in a sophisticated manner in reflecting the citizen-centric perspective of e-Governance. Coursey and Norris [4]in the year 2008, published in their review report that e-Governance should have web-technology in order to integrate the different Government information and services viz. e-participation, e-democracy etc. Again the existing work in web service performance focuses on the latest trend of technologies and standards. S.Adreozzi, P. Ciancarini, D. Montesi, R. Moretti [1] present a model for rigorous representation of service characteristics. D. Gouscos, M. Kalikakis, and P. Georgiadis [6] present a simple approach to model certain web service management attributes. J.P Thomas, M.Thomas and G.Ghinea [11] represent distributed web service by modeling the flow of messages and methods in a web service transaction. Tu et al. [10] discuss design strategies to improve the performance of web service. Levy et al. [8] present architecture and prototype implementation of performance management system for cluster based web service. V. Cardellini, E. Casalicchio, and M. Colajanni [5] consider different categories of web applications, and evaluate how static, dynamic and secure web service request affects the performance and quality of service of distributed web sites. But the entire above discussed web services are either very much server centric or device centric in nature. A properly distributed cloud computing web service that fit effectively in e-Governance is merely available.

3. PRPOSED CLOUD BASED FRAMEWORK OF e-GOVERNANCE

As we know that cloud computing is computing over a cloud[2], where a cloud consists of grids of commodity machines and a software layer (called Hadoop), which is responsible for distributing applications data across the machines, parallelizing and managing application execution across the machines, and detecting and recovering from machine failures. We propose that the Hadoop should consist of four components. Each of components must have a specific job. The different components of Hadoop are shown in Fig. 1.

Figure. 1. (Proposed Components of Hadoop)

Where

- U.I is User Interface.
- A.C is Authentication Check.
- W.S.M is Computational Web Service Mapping.
- J.S is Job Scheduler.

Whenever user request for a e-Governance web service to Hadoop, the latter first checks the authenticity of the user after interfacing with Authentic Server then Hadoop refers "e-Governance Web Service Mapping" and maps to e-Governance web service existing at different locations and fetches the required e-Governance web service from it and submits it to "Job scheduler" of Hadoop which schedules the jobs to the Grid of volunteer commodity hardware. The idea behind volunteer computing [9] is to allow ordinary users on the internet to volunteer their idle computers, processing powers (PCs, Clusters, Supercomputers, Mainframes etc., which as a whole make volunteer commodity hardware) towards solving computationally intensive tasks. The scheduler of Hadoop sends the jobs to idle volunteer commodity hardware, the sending jobs are loaded to these idle volunteer commodity hardware and when jobs get computed successfully they are pulled back by Hadoop and are sent to the required thin clients, mobile etc. The load balancing of the idle volunteer commodity hardware is being done by the J.S of Hadoop. With the help of cloud computing, software applications can be accessed from a network using thin clients/mobiles(which are a lot cheaper).Thus cloud computing can help to make computing ubiquitous and bring it within the reach of the masses, especially the poor. In this paper, we propose a specific frame work of e-Governance based on clod computing, at which Hadoop is at the top, which is being accessed by thin clients or by commodity hardware(PCs, Clusters, Supercomputers, Mainframes etc).The Commodity hardware again are of two types:

a) Active Commodity hardware: It needs e-Governance web-services.

b) Idle Commodity Hardware: The idle Commodity hardware is used as volunteer computing commodity hardware. It is used for processing the web services and the processed web services are supplied to thin clients, active commodity hardware etc.

Thus, Hadoop is connected with thin clients and commodity hardware. At a time all commodity hardware can not be busy, some may be idle and we have to use them in optimized order in order to enhance the cost/benefit analysis of cloud computing. By providing a simple interface to the user, Hadoop makes it possible to achieve super computing power as easily as one can get electric power through a wall socket. Again we intend to introduce an intelligent layer, with the help of which Hadoop would behave as an expert system on a specific domain. Here Hadoop would help e-Governance to address all types of users along with the flavor of expert system. Thus our cloud based expert e-Governance system would act as a human expert within one particular field of knowledge. The proposed expert e-Governance system embodies knowledge about one specific problem domain and possesses the ability to apply this knowledge to solve problems from that problem domain. We know that human experts are very scarce, their services are expensive, and they are usually very much in demand, very busy

as well as mortal in nature. Above all it is difficult to get experts on several domains at a time. But our proposed framework would have clusters of experts on several domains and would be accessible as and when required. The proposed framework is shown in figure2.In figure 2, when user requests for a service, then Hadoop first checks the nature of the service, if it is merely a request for getting a specific e-Governance web service then it would be provided by Hadoop. But if it is a request for an expert advice then Hadoop would use the inference engine. For launching the inference engine, it would select volunteer nodes. The inference engine would refer the active commodity hardware for knowledge base. It would exploit knowledge base and would find the expert advice for the user and would pass that to Hadoop and from it to end users. Thus hardware commodity would be knowledgebase as well as the hub of different e-Governance web services. Inference engine would exist in W.S.M component of Hadoop, which would either find required e-Governance web service, located at different locations of commodity Hardware or would launch inference engine to different idle Hardware commodity (Volunteer nodes) with the help of J.S component of Hadoop. Thus Hadoop would play a major role to give a new look of intelligent e-Governance web service. In figure 2, K.B1, K.B 2 etc are knowledge base. The working process of the whole system is shown in the algorithm mentioned in figure3. The algorithm implies that the user request for a service, if the service is merely an e-Governance web service then Hadoop would handle it in some way and if it is an expert advice then Hadoop would use inference engine and knowledge base to handle this problem. Thus cloud computing is the natural choice for constructing e-Governance because cloud computing provides a platform for the execution of massive tasks on cloud instead of the execution of tasks on users' Personal Computers, Servers etc. Again, we observe that establishment of e-Governance by any country is also very expensive in nature, but this cost can be subsequently reduced by the use of cloud computing in establishment of e-Governance. It is because cloud computing can provide massive computing power, unlimited storage capacity, less maintenance cost, availability of useful e-Governance web-services etc; above all its ubiquity nature has made it a superior technology as compare to our traditional server centric architecture of e-Governance.

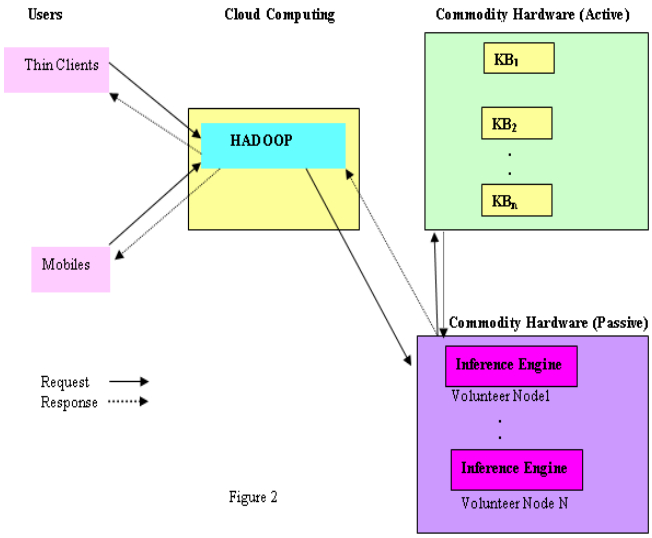

Figure 2

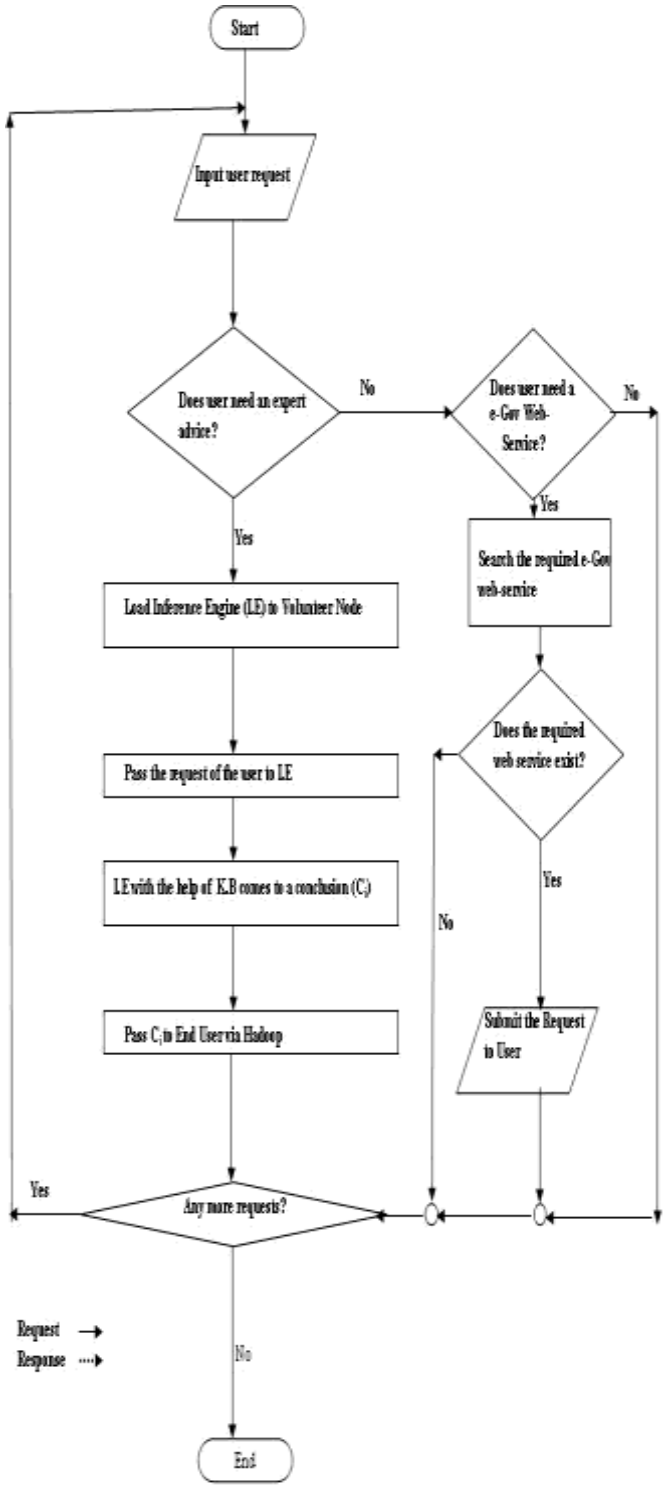

Figure 3

The above algorithm has emphasized on the entire user request.

4. CONCLUSION AND FUTURE WORK

Thus we have proposed a framework of e-Governance based on cloud computing. Here, we have put forward the different components of Hadoop and then specifying the role of each component. We have introduced a new framework of e-Governance based on cloud computing, where Hadoop is at the top which is being accessed by thin cients or commodity hardware. Further, commodity hardware consists of active commodity hardware and idle commodity hardware. The idle commodity hardware plays the role of volunteer node. After this, we have initiated an intelligent layer that helps the Hadoop to behave as an expert system on a specific domain. But here, neither we have discussed the way of accessing the e-Governance web services nor the scheduling of the volunteer nodes. We intend to do so in our forthcoming endeavour.

5. REFERENCES

[1] Adreozzi, S., Ciancarini, P., Montesi, and D., Moretti R., "Towards a model for quality of web and grid service" In Proc 13th IEEE international Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises (WET ICE'04) page 271-276, 2004**.**

[2] Armbrust, M., Fox, A., Griffith, R., Katz, R., Konwinski, A., Lee,G., Patterson, D., Rabkin, A., Stoika, I., Zaharia, M., "Above the Clouds: a Berkeley view of Cloud Computing", Technical report, available at http://abovetheclouds.cs.berkeley.edu

[3] Chanwick, A. and May, C., "Interaction between states and Citizens in the age of the internet: E-Government in the United States, Britain and the European Union, Governance" An International Journal of policy, Administration and Institutions, volume 16, Number 2, pp 271-300, year 2003

[4] Coursey, D. and Norris, D. "Models of e-Government; Are they correct? An empirical assessment" , Public Administration, Review, volume 68, Number 3, pp 523-536, 2008

[5] Cardellini, V., Casalicchio, E., and Colajanni,, M., " A performance study of distributed architectures for the quality of Web services", in Proceeding 34th Annual Hawaii International Conference on System Sciences,2001.

[6] Gouscos, D., Kalikakis, M., and Georgiadis, P. "An approach to modelling Web service QoS and provision price ", in Proceeding 3rd International Conference on Web Information Systems Engineering Workshops, pages 121-130, 2003.

[7] Grant, G., and Chau, D., "Developing a Generic Framework for E-Government", Journal of Global Information Management, Volume 13, Number 1, pp 1-30, year 2005

[8] Levy,R., Nagarajaro, J., Pacific, G., Spreitzer,M., Tantawi, A., and Youssef, A., "Performance management for cluster based Web services", in Proceeding IFIP/IEEE 8th International Symposium on Integrated Network Management, pages 247-261, 2003

[9] L.F.G Sarmenta, "Volunteer Computing", Ph.D. Thesis in "Massachusets Institute of Technology", March 2001

[10] Tu, S.,.Flanagin, M., Wu, Y., Abdelguerfi, M., Normand, E., Mahadevan, V. " Design Strategies to improve performance of GISWeb services", in Proceding International Conference on Information Technology : Coding and Computing(ITCC04),pages 444-448, 2004.

[11] Thomas, J.P., Thomas, M. and.Ghinea, G. "Modeling of Web service flow", in Proceeding IEEE International Conference on E-Commerce (CEC 03) , pages 391-398, 2003.