



e-GiMod: Modeling an Information Highway for Cost Effective and Efficient e-Governance in India using Open Source Cloud Computing Services

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Abstract— *e-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems as well as back office processes and interactions within the entire government framework. The Cloud provides an exciting platform to develop new applications and new ways to deliver services and information to communities. It has the stamina to overcome the challenge in the ICT world. E-Governance is required to run the government in efficient way with the use of ICT. Cloud solutions can help improve transparency, accuracy and can stop the malpractices which are major goal for government enterprises. The key to successfully using the Cloud for e-governance is based on how to combine the new capabilities of computing with the heritage systems that will often be the most valuable link in the value chain, holding data vital to the end user's experience. We are here to propose an easy model for e-Governance in India (e-GiMod), the Cost Effective and Efficient e-Governance Initiative with Open Source Cloud. We want to extend the NeGP (National e-Governance Plan) plan of GOI using the Cloud Computing Services with Open Source Cloud Eucalyptus and Meghdoot.*

Keywords— *Cloud Computing, Data Centre, Eucalyptus, e-Governance, ICT, Meghdoot, IaaS, PaaS, SaaS, NeGP.*

1. Introduction

With the advent of Cloud Computing every enterprise want to implement Cloud Computing to fulfill its day to day computational needs. The reason is obvious. Using the cloud services one can cut the unnecessary cost of heavy hardware and software infrastructure which makes cloud adoption a cost effective services. In the same way the government can deliver its integrated services through the means of cloud computing to its citizens, organizations and other government institutions. Application of Cloud Computing for better e-Governance in India is very essential to deliver its services in efficient and cost effective manner [1][2].

2. Cloud Computing

Cloud computing gets its name as a metaphor for the Internet. Typically, the Internet is represented in network diagrams as a cloud, as shown in Figure 1-1. The cloud icon represents “all that other stuff” that makes the network work. Cloud Computing is associated with a new paradigm for the provision of computing infrastructure. This paradigm shifts the location of this infrastructure to the network to reduce the costs associated with the management of hard-ware and software resources [2][3]. According to National Institute of Standards and Technology, Cloud computing is a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

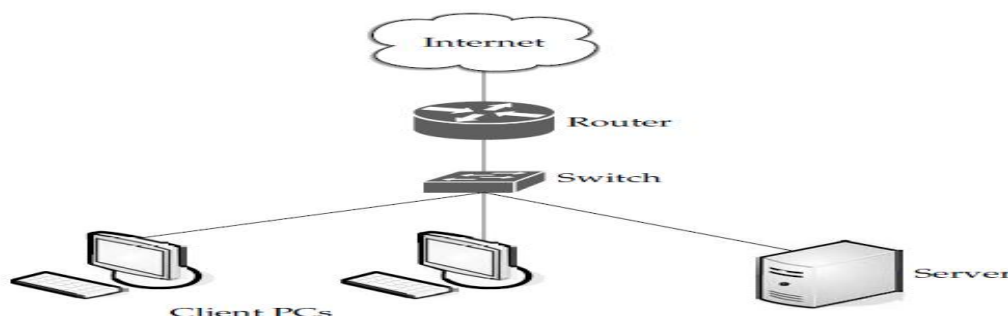


Fig: 1.1 -The Cloud Computing Model

2.1 Cloud Services

There are different categories of cloud services such as infrastructure, platform, software etc. These services are delivered and consumed in real-time over the internet [3]. Figure 2.1 depicts main Cloud Services namely Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Let us discuss these services in some broader view.

2.1.1 Platform as a Service (PaaS)

The consumer uses a hosting environment for their applications. The consumer controls the applications that run in the environment (and possibly has some control over the hosting environment), but does not control the operating system, hardware or network infrastructure on which they are running. The platform is typically an application framework. The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.

2.1.2 Infrastructure as a Service (IaaS)

The consumer uses "fundamental computing resources" such as processing power, storage, networking components or middleware. The consumer can control the operating system, storage, deployed applications and possibly networking components such as firewalls and load balancers, but not the cloud infrastructure beneath them. The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems; storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls).



Fig: 2.1- Cloud Services

2.1.3 Software as a Service (SaaS)

Software as a Service, SaaS is a software delivery method that provides access to software and its functions remotely as a Web-based service. Software as a Service allows organizations to access business functionality at a cost typically less than paying for licensed applications since SaaS pricing is based on a monthly fee. Also, because the software is hosted remotely, users don't need to invest in additional hardware. Software as a Service removes the need for organizations to handle the installation, set-up and often daily upkeep and maintenance. Software as a Service may also be referred to as simply hosted applications Units.

2.2 Eucalyptus-The Open Source Cloud

Eucalyptus is a free and open-source computer software for building Amazon Web Services (AWS)-compatible private and hybrid cloud computing environments marketed by the company Eucalyptus Systems. Eucalyptus enables pooling compute, storage, and network resources that can be dynamically scaled up or down as application workloads change. India's National Informatics Centre (NIC), a division of the Department of Information Technology, has selected and deployed the Eucalyptus Systems' open source software as the foundation for its cloud project, which calls for the execution of cloud-based e-governance projects on a broad scale.[4]

3. e-Governance

UNESCO defines e-governance as [5] “**e-Governance refers to the exercise of political, economic and administrative authority in the management of country’s affairs, including citizen’s articulation of their interests and exercise of their legal rights and obligations. E-governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities**”. Dr. APJ Abdul Kalam, former President of India, has visualized e-governance in Indian context refers to a smart transparent means with uninterrupted right to use, safe as well as genuine information between interdepartmental organization and give the fair information to the citizens regarding to the services provided by the Indian government.

3.1 Types of e-Governance

The e-Governance is divided in various categories on the basis of relationship between the government and participants. They are:

Government to Government (G2G):- It includes the various functions of the government which necessitate the fulfillment of government. It is across the departments and it is between one government to another state government. For e.g. Toll Tax.

Government to Employee (G2E):- It includes the technology which is used to enhance the government services to provide advantage to its citizen, business partners and employees. E.g. Central Government Employees Welfare Housing Organization is a ‘Society’ well-known to encourage, manage and organize the expansion of housing schemes at selected places, all over India, on no profit-no loss basis as a welfare measure.

Government to Business (G2B):- It means government is providing benefits in business in terms of enforcement, collection of taxes etc.

Government to Citizens (G2C):- It includes the strategy used for Customer Relationship Management (CRM) with business concept. It also provides the goods and services to accomplish the need of its citizens. E.g. UID, E-taxation, E-passport, E-procurement etc.

4. The Existing System in India

India both government and enlightened citizen expect IT-driven public-private partnerships become the order of the day. The last couple of years have seen e-governance dropping roots in India offering government services to a large base of people across different segments and geographical locations. At present, the status of e-Governance in India presents a wide variation in the level of computerization and the use of IT enabled applications within and outside the Government. In spite of sustained efforts, the entire Government machinery, especially in the States has not yet become fully available for the use of computerization and other IT applications. Notwithstanding, India has gained considerably in terms of Internet access in the recent past. The growth rate of 684%¹ in last five years and the rise in number of internet users makes hope for the planers to use this media for reaching the mass with least ambiguity or aberrations.. India still has poor penetration of telephone lines – that could be attributed as the live vessels for e-governance. This brings the initial doubt whether e-governance is relevant at all for India in the present context.

As an announcement by GOI **NeGP** (National e-Governance Plan) is being planned to make all government services available to the citizens of India via electronic media. The program required the development of new applications to allow citizen access to government service through Common Service Centers; it aims to both reduce government costs and make access to services easier. The NeGP infrastructure is reliant upon the development of State Wide Area Networks (SWAN) to be connected to form a nation-wide network, State Data Centres (SDC) to consolidate services, applications and infrastructure, and common service centers (CSC) for end user access. The goals of the eGovernance plan are to increase the efficiency of service delivery, empower citizens by providing information, and create an environment of transparency. The eGovernance plan aims to make the government more accessible to citizens and businesses alike and foster a more open atmosphere. Our proposed model enhances the NeGP using Open Source Cloud Infrastructures for efficient delivery of e-Governance Services which is obviously managed by NIC and other government bodies.

5. Cloud Based e-Governance Model

Remote rural areas are constrained by serious limitations such as lack of reliable power supply, etc., which are essential for setting up advanced IT infrastructure such as Servers, Storage, etc. Therefore, Cloud Computing comprising of an infrastructure-as-a-service (IaaS) is well suited to provide such IT infrastructure in remote rural areas. With a high level adoption of cloud computing, IT resources like servers and storage will be shared amongst departments and also provide elasticity and on demand services. Ensuring high reliability, scalability, high availability of citizen centric e-Governance services is very important [6][7]. Cloud computing makes it possible to accomplish this task cost effectively and efficiently. The Cloud can also play a significant role in e-governance, in the following ways:

- The expansive storage capacity of the Cloud can be leveraged to host unique (and large) datasets, making them available to citizens or researchers with Web browsers.
- The government can almost instantly scale its successful applications/services as more and more citizens begin availing of them, on a need-to-basis.
- The Cloud can enable organizations to deliver better services, even as they work with fewer resources.
- By sharing IT services in the Cloud, huge savings and economies of scale and standardization can be achieved
- Cloud solutions can help improve transparency, a major goal for government enterprises.

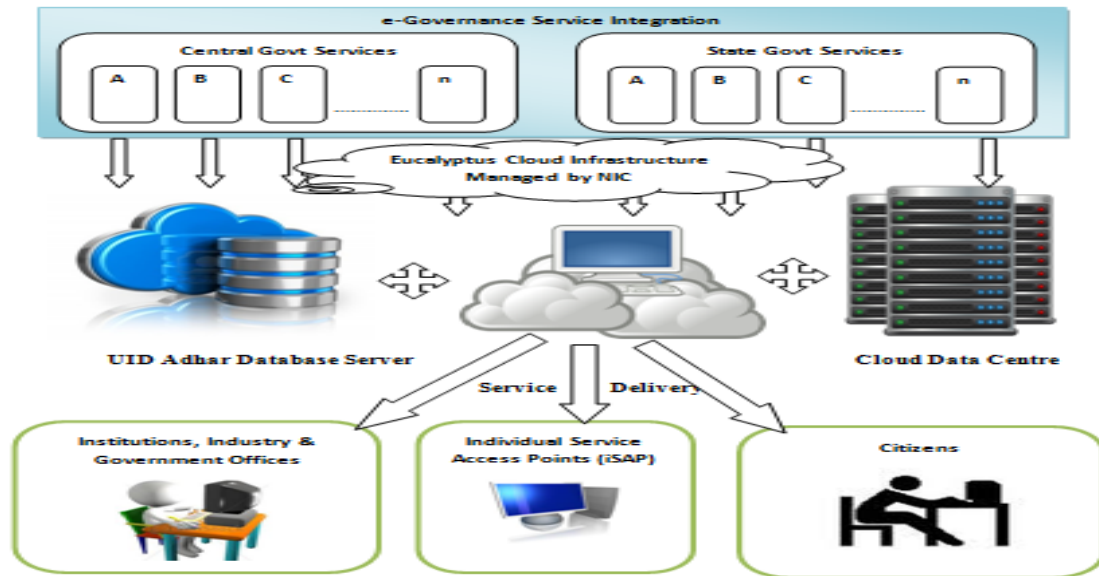


Fig: 5.1- e-GiMod: The Cloud Based e-Governance Model

5.1 Advantage of Cloud Based e-Governance Model

Significant Cost Reduction

The cost of implementing the E-governance is very high but in cloud computing available at a fraction of the cost of traditional IT services; upfront capital expenditures eliminated; dramatically reduced IT administrative burden.

Increased Flexibility

On-demand computing across technologies, business solutions and large ecosystems of providers; reduced new solution implementation times.

Access anywhere:

The services accessed from a single computer or network. Use different computer or move to portable devices, and applications and documents follow.

Elastic scalability and pay-as-you-go

Add and subtract capacity as your needs change. Pay for only what you use.

Easy to implement

No need to purchase hardware, software licenses or implementation services.

Service quality

Reliable services, large storage and computing capacity, and 24X7 service and up-time. Delegate non-critical applications Outsource non-critical applications to service providers and focus agency IT resources on business-critical applications.

Always the latest software

Updates are automatic in cloud computing.

Private Public Partnership

Applications and documents accessible from anywhere in the world, facilitating group collaboration on documents and projects.

Green ICT: The use of ICT devices is increasing very rapidly. In e-government system, we can find thousands of PCs, a huge number of sophisticated servers, printers, scanners, digitizers etc in a single organization. Green ICT is environment friendly ICT which has the main goal of reducing the rate of emission of carbon dioxide from ICT tools and preserve the energy. Even though cloud is also collection of computing devices, but number of such devices are very less as compared to the traditional ICT infrastructure. The features of cloud do support in making green ICT.

6. Conclusion & Future Work

The concept of cloud computing is widespread popular because it offers all-in-one solution and can satisfy the IT needs that grow all the time. We can conclude that the cloud adoption for e-governance in India give a fair and effective way of Governance. In this paper we discussed how a Cloud could be utilized to provide useful e-Governance. Government services can become more reliable and transparent. The issues pertaining to the realization of Cloud based e-Governance

were discussed emphasizing the points like implementation, usability and infrastructure. Current governments should take due steps to build a favorable infrastructure for Clouds. E-Government system requires entities like, software, hardware, service, management, network, business, policy, security etc to survive and function properly. Unfortunately current approaches or technology is insufficient to manage all these entities. Cloud computing which treats all these entities as a service can be used in e-government system. Although GOI has already announced the implementation of NeGP, but still a strong decision and planning is needed to make e-Governance operation fully functional with use of Next Generation ICT services. Cloud has the potential to solve the bottleneck of the operational and infrastructure difficulty.

In future Government can use all the models of cloud computing to offer more complex service like e-commerce, e-procurement etc. The future of cloud computing has to be visible more in coming years and people will learn lessons about the drawbacks of cloud computing like security of data[8].

References

- [1] Vasudeva Varma, C.: Cloud Computing for E-Governance. Cloud Computing Group, International Institute of Information Technology, Gachibowli, Hyderabad (2010)
- [2] Rastogi Ashish: A Model based Approach to Implement Cloud Computing to E-Governance, International Journal of Computer Applications (2010)
- [3] Luis M. Vaquero, Luis Rodero-Merino, Juan Caceres, Maik Lindner, A Break in the Clouds: Towards a Cloud Definition.
- [4] http://en.wikipedia.org/wiki/Eucalyptus_software
- [5] http://portal.unesco.org/ci/en/ev.php-URL_ID=3038&URL_DO=DO_TOPIC&URL_SECTION=201.html
- [6] Mukherjee, K., Sahoo, G.: Cloud Computing: Future Framework for E-Governance. International Journal of Computer Applications 7(7), 0975–8887 (2010)
- [7] Mubarik Ahmed, Zainal A Hasibuan.: E-Governance based on Cloud Environment in Indonesia. University of Indonesia (2012)
- [8] Das, Patra, and Misro: Cloud Immunization and Security for E-Governance. International Journal of Cloud Computing and Services Science (IJ-CLOSER).(2013)