E-Governance services using Cloud Computing Services

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Abstract

The W3C revolution in Internet is changing our lives in terms of the way we work, learn and interact. These changes naturally should replicate the way Government functions in terms of the organization of the Government, its association with its citizens, institutions and businesses and cooperation with other Governments. Government targets to deliver more interactive services to citizens and businesses through e-Governance. Cloud computing is aimed at providing IT as a service to the users with greater flexibility, availability, reliability and scalability with "Service Computing Model". e-Governance, especially in developing countries, is looked up as a means to change the very concept of Governance resulting in deliverance of the citizens and increased transparency in public dealings by the Governments. In this paper, we describe how this newly emerged paradigm of Cloud Computing Services can be helpful for e-Governance in India.

Keywords

Cloud Computing, e-Governance, Cloud Security, Cloud, Cloud Services, e-Governance Services.

1.   Introduction

The Central Government purposes to deliver more collaborative services to citizens over e-Governance. Cloud Computing allows to consistently cover the entire country with e-Government solution. An e-Government system should be able to selecting the services and provide the services in an efficient and effective way.

2.   Cloud Computing

Cloud computing is popular network access to a public pool of configurable computing resources that can be quickly provisioned and free with minimal

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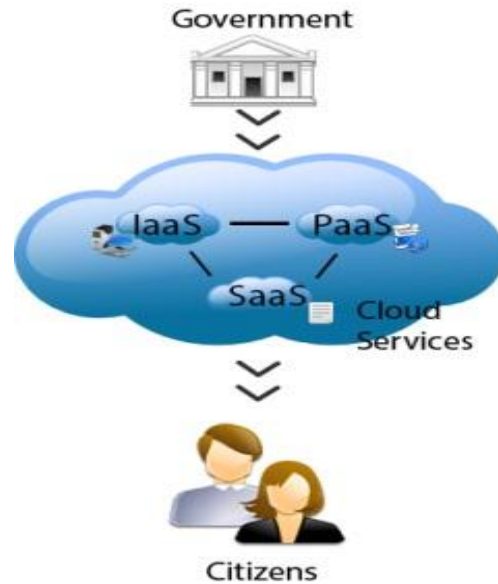
Fig 1: Cloud Services for Citizen

management effort or service provider interaction. According to the IEEE Computer Society Cloud Computing is: "*A paradigm in which information is permanently stored in servers on the Internet and cached temporarily on clients that include desktops, entertainment centers, table computers, notebooks, wall computers, handhelds, etc*."[1] & According to the   *NIST Definition of Cloud Computing*, the National Institute of Standards and Technology describes the Cloud as "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 quickly provisioned and unconfined with minimal management effort or service provider communication." [19] Cloud computing develops as a new computing model which targets to provide consistent, customized and quality of service guaranteed computing active environments for end-users [8] [11]. The main aim of cloud computing is to provide Information and communications technology services with combined infrastructure and the group of systems.

Important Characteristics
On-Demand Service: A consumer can separately provision computing capabilities, such as server time and network storage, as required automatically

without requiring human interaction with each service provider.

Broad network access: Proficiencies are available over the network and accessed through standard mechanisms that promote use by diverse thin or thick client platforms (e.g., smart phones, tablets, laptops, and workstations).

Resource Pooling*:* The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand [4]. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

Rapid Elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand [4]. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

Measured Service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

3. e-Governance

Governance is about making moral decisions about performance probability and requiring accountability. e-Government objective is to provide required services to essential users on the required time. e-Governance make all government services reachable to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realize the basic needs of the common man"[12]. e-Governance is use of IT set-up to simple governance activity such as administration, revenue services, various services to citizens; policy formation etc. e-Governance improves the efficiency of government functioning by removing replicas at different levels [13]. Citizens benefits from several e-services like income tax, pension, and services related to Municipal Corporation and agriculture etc.

The four main kinds of e- Governance applications

- Government to Government (G2G): Administration, Policy formation etc.
- Government to Business (G2B): Taxation, Tender etc.
- Government to Consumer (G2C): Land record, Birth certificate etc.
- Government to Employees (G2E): Income tax, Pension etc.

Government-to-Government (G2G)
Government-to-Government (abbreviated G2G) is the online non-commercial interaction between Government organisations, departments, and authorities and other Government organisations, departments, and authorities [10]. Its use is common in the UK, along with G2C, the online non-commercial interaction of local and central Government and private individuals, and G2B the online non-commercial interaction of local and central Government and the commercial business sector.

Government-to-Business (G2B)
Government-to-Business (abbreviated G2B) is the online non-commercial interaction between local and central government and the commercial business sector, rather than private individuals (G2C), with the purpose of providing businesses information and advice on e-business 'best practices.

Government-to-Citizen (G2C)
Government-to-Citizen (abbreviated G2C) is the communication link between a government and private individuals or residents. Such G2C communication most often refers to that which takes place through Information and Communication Technologies (ICTs), but can also include direct mail and media campaigns [10]. G2C can take place at the federal, state, and local levels. G2C stands in contrast to G2B, or Government-to-Business networks.

Government-to-Employees (G2C)
Government-to-employees (G2E) is the online interactions through instantaneous communication tools between government units and their employees. G2E is one out of the four primary delivery models of e-Government. G2E is an effective way to provide E-learning to the employees, bring them together and to promote knowledge sharing among them. It also gives employees the possibility of accessing information in regard to compensation and benefit policies, training and learning opportunities and civil rights laws. G2E services also include software for

maintaining personnel information and records of employees. G2E is adopted in many countries including the United States, Hong Kong and New Zealand.

4. Outcome of Cloud Computing on e-Governance

Cloud computing is a method for the execution of the national e-governance plan (NeGP), Cloud computing will play an significant role in the national e-governance plan [7]. e-Governance programs in India were implemented separately in various states. Consequently, there were regional differences in the expansion of e-Governance in the country. For deactivating this, the Department of Information Technology in October 2005, initiated an integrated approach called the National e-Governance Plan for developing e-Governance uniformly across India. The NeGP included 26 mission mode projects and eight support components to be implemented at different levels of government [3][1]. The starting step of e-Governance in India was the Automation of Government Departments. Current e-Governance initiatives will be encapsulating the better points of Governance for instance Citizen Centricity, Service Orientation & Transparency. For speeding up the e-Governance implementation across the various arms of Government at National, State and Local levels due cognizance has been taken to adopted common vision and strategy having the potential of huge costs savings in presenting a seamless view of Government to Citizens. The NeGP highlights the role of the public-private partnership (PPP) paradigm for providing totally apparent services to the public [5]. The government on its share is likely to provide the basic infrastructure, such as the Internet and single-window enablement center. With private enterprises operating in the Indian information technology (IT) and IT-enabled services (ITES) landscape well equipped with commercial know-how and managerial skills, the government is expected to transfer the financial risks to the private sector. The private sector also provides opportunities for innovation. If the NeGP does get executed as planned, government services such as issuance of birth and death certificates, payment of various bills and taxes, online submission of applications, and land and revenue records can be accessed from a small STD booth or a photocopying shop by 2008.
- Sharing of core and support infrastructure
- Enabling interoperability through standards

Government of India approved NeGP which consists of 20 Mission Mode Projects (MMPs) of State Governments & Central Government and 7 Integrated MMPs. The theme of the NeGP is to "Make all Government services accessible to the common man in his locality through common service delivery outlets, and ensure efficiency, transparency and reliability of such services at affordable costs to realize the basic needs of the common man". The cornerstones of NeGP are civilian centricity, identification of facilities & service levels, centralized planning & decentralized implementation and Public Private Partnership (PPP) [1] [5]. New Telecom Policy 2011 expected by August 2012 is expected to bring set of new plans for the India telecom industry. The policy stresses on 6 hot areas i.e. Broadband, Manufacturing, Spectrum, Licensing, Grievances and Cloud computing. For the active implementation of NeGP the cloud computing will play a vast role. The unrestricted cloud may be used to bring of e-Government services at the doorstep of the rural community. The G-Cloud Program's core assistances are cost reduction, enhanced services, faster progressing delivery and the sustainability agenda. The G-Cloud policy of India is likely to be unveiled by Department of Information Technology (DIT), by 2012.

Moreover, the physical space required for racks of servers is no longer necessary and the organization no longer incurs energy costs for running and cooling its servers. Cloud computing holds a number of advantages for the government. These include "reduced cost, improved storage, and higher levels of automation, increased elasticity, and employee mobility." e-governance is a big opportunity to bring services to all citizens, but there are some serious challenges for consideration. They can be categorized into three main challenges Technical challenges.
- Economic challenges
- Social challenges

Technical Challenges: Any project could not be start from the scratch. But there in a requirement of proper investments resulting in Legacy Systems. Some of them can be revised in new environment, while in some other case this could be too lavish. Therefore, interoperability is the key factor between existing Software and Hardware platforms. Some authorized aspects like security and privacy must also be an important reflection. The guarantee by the Government could not serve unless accompanied by Technical Solutions, Transparency of Procedures and possibly Autonomous Auditing.

Economical challenge: Cost-effective issues are mainly concerned with return of investment and safeguard of the previous ones. Implementation, Operational and Evolutionary maintenance costs must be low enough to guarantee a good cost and benefit ratio. e-Governance must be seen as a nationwide plan, implemented applications must be reusable by other Administrations. The independency from the Hardware and Software platforms is a primary concern for portable applications. There is also a main issue with maintainability; this is the key success factor for long living systems in a rapidly changing technical environment.

Social challenge: It mainly concerns with the usage made by the citizens. India has a wide range of languages and the technical literacy rate is also not so good. Then there is a challenge of accessibility, usage and acceptance of the e-Governance. Even if the Internet population is growing exponentially, there is a significant portion of the people who may not be able to access e-Government for various reasons.

A. GI Cloud Initiative (Meghraj)

"GI Cloud" has been coined as 'Meghraj'. The focus of this initiative is to evolve a Strategy and implement various components including Governance Mechanism to ensure proliferation of Cloud in Government [6] [16]. Formulation of the Cloud Policy is one of the primary steps that will facilitate large scale adoption of Cloud by the Government. The Government of India has implemented a number of ICT initiatives under the National e-Governance Plan (NeGP), including creation of ICT infrastructure both at the centre and state levels. The infrastructure thus created will provide the basis for adoption of Cloud Computing for the Government with the objective of making optimum use of existing infrastructure, re-use of applications, efficient service delivery to the citizens and increasing the number of E-Transactions in the country, thus helping to achieve the ultimate goal of NeGP [17]. The 'GI Cloud' is the Government of India's Cloud Computing Environment that will be used by Government Departments and Agencies at the Centre and States. In other words, it will enable the Government to leverage Cloud Computing for effective delivery of e-Services.

B. Different Governance Solutions of Andhra Pradesh

Let us consider e-Government Solutions of our State. AP Technology Services has been involved in a large number of e-Government initiatives taken up by the Government of Andhra Pradesh [9]. Andhra Pradesh Technology Services Limited is a wholly owned government corporation focusing on e-Governance. It provides Consultancy, Procurement Services and Implementation Support to the Government Entities for their ICT initiatives. The e-Government solutions provided by APTS include the following:

- Security Audit for AP Secretariat.
- Consultancy for eSeva.
- APHM ECRP - World Bank Project - for Mandal computerization.
- Security Audit for Board of Intermediate.
- Consultancy to Transport Department computerization- FAST.
- Consultancy to IT&C Department – smartGov.
- Consultancy to Finance Department - Budget, REINS Projects.
- Consultancy to Finance Department - PAO computerization.
- EPIC 2004 - for GAD Elections Department.
- Website for Commissionerate of Tenders for contractor registration.
- Case Monitoring System for ACB.
- Guesthouse Information System for AP Guesthouse.
- Scholarship Information system for Social Welfare department.
- Connectivity on APSWAN to PR Engineering Department.
- Consultancy to Registration Department for connectivity.
- Consultancy to Police Department on APSWAN connectivity.
- APNET MANA TV.
- World Bank Procurement for Forest Department.
- APSWAN.
- AP Video Conference.
- Consultancy for Department of Municipal Administration (DMA).
- World Bank procurement for Agriculture Department.

5. An approach for E-governance using Cloud technology services

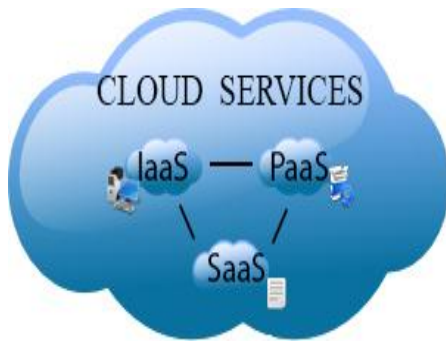The Cloud also embraces three separate service models in e-governance

Fig 2: Cloud Services

Infrastructure as a Service (IaaS):

This IaaS paradigm covers Storage as a Service, Compute Instances as a Service, and Communication as a Service. This paradigm allows users to use virtualized IT resources for Computing, Storage, and Networking [15]. The user can deploy and run his applications over his selected Operating System environment. e-Governance needs a 24x7 infrastructure availability minimizing downtime. e-Governance applications can access unlimited usage of CPU, storage and data transfer when operating from Cloud. Infrastructure as a Service virtualizes the hardware/network and storage phases of the datacenter. Application developer can focus on structures and usability instead of worrying about scalability etc. Still, applications perform better on cloud associated to traditional design as the Infrastructure. The urban and the rural area people can use e-Governance using nodes like a simple PDA hosted by Indian government recently (E.g.: Aakash Tablets).

Fig 3: Infrastructure as a Service

Platform as a Service (PaaS):

The Cloud Platform is an Integrated Computer System consisting of Operating Systems, Software Applications, and Middleware Software's [18]. The User Application can be developed on this Virtualized Cloud platform using some programming languages and software tools supported by providers (e.g., Java, Python, .NET). There are Five PaaS Services offered by Cloud: Google App Engine, Aneka, Amazon Elastic MapReduce, and Microsoft

Azure. Some of the standard platforms they provide are:

- Web Based Operating System
- Web & Mobile based Query Systems
- Middle ware Services
- Workflow Management Services

Fig 4: Platform as a Service

Software as a Service (SaaS):

The SaaS model provides Software Applications as Service. SaaS is often built on top of the PaaS. Services and Tools offered by PaaS are utilized in construction of Applications and management of their deployment on resources offered by IaaS providers. On the customer side, there is no upfront investment in servers or software licensing. On the provider side, costs are kept low compared with the conventional hosting of User Applications. Customer data is stored in the Cloud that is either vendor proprietary or publicly hosted to PaaS and IaaS [19]. Imagine a case of new village of rural area deciding to use the e-Governance solution for some application for their citizens. The village need not purchase the Applications, the Hardware or the Software pertaining to it. They can just make a request for a particular service from the Government (Cloud Provider). Applications instances can then be created for their use. Numerous applications can be Provided as standard services, here departments can request and manage. Some of the applications can be:The best examples of SaaS services include Google docs, Microsoft Share Point, Dropbox and the CRM software from Salesforce.com

- Bill Payments
- e-Police, e-Court
- Video Conference
- Government office service Desk
- Registrations
- Caste Certificates
- Income Certificates
- Pensioner Services
- Transport
- Health
- Tourism
- Education

• Agriculture

Fig 5: Software as a Service

6. Conclusion and Future Work

Cloud supports enabling e-Governing Services faster and cheaper thereby accelerating the adoption and use of Information Technology for e-Services. Cloud is the group of Distributed Computing Devices. Cloud technology will not only decrease IT labor cost and improves On-demand Self-Sufficient Service but also decreases end user IT support costs. Cloud provides service through Public and Private Clouds with the help of required Technology like, System Approach, Distributed System, Service Oriented Architecture, Grid Computing and Virtualization. In future implementing of Cloud Technology will improve interconnectivity of Central & State Governments to give flawless services easily from Urban to Rural area people.

References

[1] Aprna Tripathi., Bhawana Parihar., "e-Governance challenges and cloud benefits," Department of Computer Science and Engineering, Moti Lal Nehru National Institute of Technology, Allahabad, India.

[2] "How about free? The price point that is turning industries on their heads," Knowledge@Wharton, University of Pennsylvania, 4th March, 2009.

[3] "Cloud Computing for e-Governance" A white paper, IIIT Hyderabad,India.

[4] Rajkumar Sharma., and Priyesh Kanungo., "An Intelligent Cloud Computing Architecture Supporting e-Governance," rksujn@rediffmail.com,Vikram University, Ujjain, Patel College of Sc. & Technology, Proceedings of the 17th International Conference on Automation & Computing, University of Huddersfield, Huddersfield, UK, 10th September, 2011.

[5] Deka Ganesh Chandra., "Cloud Computing Model for National e-Governance Plan(NeGP)", ganeshdeka2000@gmail.com., DGE&T, MoLE, New Delh-1, India.

[6] Deity Website: http://deity.gov.in/content/gi-cloud-initiative-meghraj.

[7] NeGp Website: http://negp.gov.in/.

[8] Lizhe Wang., Gregor von Laszewski., "Scientific Cloud Computing: Early Definition and Experience," Service Oriented Cyberinfrastruture Lab, Rochester Institute of Technology,Lizhe.Wang@gmail.com, laszewski@gmail.com, 102, Lomb Memorial Drive, Rochester, NY, 26th, October, 2008 14623-5608.

[9] APTS Website- http://www.apts.gov.in/e-Govsucs.aspx.

[10] en.wikipedia.org/wiki/e-Governance.

[11] Google App Engine: http://appengine.google.com/.

[12] NeGP website - http://www.negp.gov.in.

[13] NISG website - http://www.nisg.org.

[14] http://www.todaysengineer.org/2011/Nov/cloud-defined.asp.

[15] Robin Singh Bhadoria., 2012 Fourth International Conference on Computational Intelligence and Communication Network, , IITM., Gwalior, India.

[16] Department of Information Technology Website: http://www.mit.gov.in/content/national-e-governance-plan, Govt. of India.

[17] http://deity.gov.in/sites/upload_files/dit/files/GICloud%20Strategic%20Direction%20Report(1).pdf.

[18] Ashish Bhushan Khare., Vishal Raghav., Prateek Sharma., Cloud Computing Based Rural e-Governance Model,,Amrapali Institute, Haldwani, Birla Institute of Technology, Kingdom of Bahrain.

[19] NIST Information Technology Laboratory: http://www.nist.gov/itl/csd/cloud-102511.cfm.

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