Avenue for e-governance on cloud computing

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Abstract
Today the government of every country is instantiating and implementing its operations through the CAPS “Computer Aided Paperless System” i.e. incorporating its operations through IT model so that the schemes can be reached to the masses. As of now every state government has its own E-Governance model, and with the deployment of multi-perspective features of Cloud computing, E-Governance operations can be built up as Cost effective Technology solutions and can be geographically distributed to heterogeneous resources thereby making it as information centric with enhanced quality of service. This paper analysis the e-Governance initiatives across the states of India, and World and how cloud computing can effectively impact the E-Governance operations.

Keywords: Cloud Computing, E-Governance, Operations, Information Technology, Public Sector.

1. Introduction

Government forms the backbone of a community. Public welfare is the key agenda of any sane government, be it socialist, capitalist or otherwise. It has to ensure that the services and benefits reach to the needy. However this sounds simple, but in practically it is not. The state needs to run its affairs in a transparent and efficient way, to reach and be reachable to its citizens. E-Governance has the ability to lend the required efficiency and transparency. The right blend of political will and technology is what it takes to make E-Governance a success.

E-Governance rides on advances of information and communication technologies like the internet, local area networks and mobiles to improve effectiveness, efficiency and service delivery, thereby promising speedy information dissemination, higher administrative efficiency and improved public services. As the era of digital economy evolves, the need for good governance assumes a greater significance. E-Governance has been around for more than a decade now. E-Governance is the effective use of Information and Communication Technology to improve the system of governance that in place and thus provide better services to the citizens. E-Governance is concerned with
transforming Government from ‘Procedure and Power Centered’ to ‘Citizen and Service Centered’ using technology as a tool. According to OECD, the term E-Government focuses on the use of new ICTs by government as applied to the full range of government functions [1]. E-Governance is a process of reform in the way and delivers services to external and internal clients for the benefit of both government and the clients that they serve. Governments have innumerable applications that can be automated. Government spending on IT would increase the productivity of the government and would help in decision making and policy enforcement etc. E-Governance Applications in the government are basically divided into four broad categories like (i) Government to Government (G2G); (ii) Government to Enterprise (G2E); (iii) Government to Business (G2B); (iv) and Government to Consumers (G2C). The technology has the potential to account for E-Governance in cloud computing. Cloud computing provides service oriented access to users without compromising on security. This makes cloud an excellent platform to host E-Governance services.

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[2]. Apart from the services that government has to render, Information management is one of the intensive factors in its operations. The integration of all e-solutions under the head of E-Governance services, can be made centralized as information centric, centralized control and with its interjection with the Cloud computing can impact extensively in deploying the E-Governance operations and integrating custom applications faster, timely, and cost effectively thereby its Monitoring and Evaluation can be reviewed and analyzed for any decision making. The information can be available on e-Mode and will be content centric. There are number of worldwide examples where government is investing in cloud.

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<tr>
<th>Table 1: Government Embracing/Investing in Cloud</th>
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<td><strong>European Commission</strong></td>
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The Government’s current e-Governance practices can be enhanced by an effective deployment of Cloud Computing environment that can be characterized by high asset utilization, a continuum demand for resources, universal systems, and platforms, environments which are easier to manage, and on-time procurement may lead less time. These efficiencies positively impact any Government’s ability to serve the public and masses. India’s National Informatics Centre (NIC), a division of the
department of information technology, has selected and deployed the open source eucalyptus software as the foundation for its cloud project, which calls for the execution of cloud-based e-governance projects on a broad scale. NIC is providing the network backbone and a wide range of ICT (Information and Communication Technology) services to government organizations throughout India, including a nationwide communication network for decentralized planning, improvement in government services and wider transparency of national and local government institutions.

2. Advantages of Cloud Computing on E-Governance

The advantages of the cloud computing approach include:

- **Flexibility**: Cloud computing offers flexibility and independence from resources. Any staff can access the files and data that they need even when they're working remotely and/or outside office hours. Documents can be concurrently be viewed and abridged from various locations.

- **Lower Total Cost of Ownership**: With cloud computing, one can subscribe to the software, rather than buying it outright. This means that pay only when in need and offers flexibility in the sense that it can be quickly and easily scaled up and down according to demand. The need to pay for extensive disk space is also removed.

- **Pay as You Go Model**: The end user canister unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interface with each service’s provider.

- **Extensive network admittance**: Capabilities are obtainable over the network and can be accessed all over standard mechanisms that endorse use by client platforms (e.g., mobile phones, laptops, and PDAs).

- **Pooled resourcing**: The provider’s computing possessions are pooled to serve multiple clients using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. A sense of location independence exists because the customer generally has no control over or knowledge of the provided resources’ exact location but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

- **Time effective integration of applications**: Frequent or periodic integration of applications via cloud computing that offers centralized platform is more cost effective and viable as it removes repeated nesses of the integration approach.

- **Robust Security Network**: Cloud computing provides Smart Computing Protection Network architecture that enables the web status technologies that reduce and block the latest web threats.

- **CAPW Model-Computer Aided Paperless Warehouse**: The computer aided paperless warehouse system not only saves the trees, the environment and provided efficient tracking and availability of documents anywhere anytime.

- **Enhance effectiveness of services**: Cloud computing can enhance effectiveness to the delivery of services on time and always on time thereby meeting increasing demand at lower costs.
• **Disaster recovery:** Ensures disaster recovery with a secure central repository

• **Monitoring & Evaluation:** Putting applications on cloud enables centralized monitoring, evaluation and future impact analytics.

### 3. Challenges In E-Governance Operations

The prime challenges in E-Governance operations are the following:

- **On time effective delivery of services:** To cater to the need of rising demands of society and legislative entities, on time with 0% tolerance is required for effective delivery of services.

- **Ensuring compliance:** Ensuring conformity within the system with all the grievances of the citizens.

- **Flexibility, Scalability & Robustness:** E-Governance should offer flexibility and easiness to scale up the applications as and when required.

- **Integrated services:** E-governance should act as collaborative and one stop hub for its citizens.

- **Document repository management:** Centralized repository and availability that enables the documents accessibility from anywhere any time and across multiple locations.

- **Time and controlled cost effective solutions:** E-governance needs to offer its applications to be operated from centralized location and domain specific area and centralized infrastructure enables less demand of resources and hence making it as Cost and time effective solutions.

- **Monitoring and Evaluation:** All e-Governance initiatives involve timely monitoring and evaluation for its smooth functioning along with Cost Benefit Analysis.

- **Management Information System:** MIS enables all the features relating to Inventory control and management, Invoice processing etc. to be centrally managed and visualized from any hierarchy or level in the government.

- **Statement of expenditures:** Justification of statement of expenditures and the finance spent on e-Governance activities by the government can be efficiently audited at central level rather than at different locations.

- **Security:** The issue concerns security of E-Governance data and infrastructure and the services that demands the privacy of data for the citizens.

### 4. Beneficial areas for E-Governance Cloud Computing

The domain where the E-Governance cloud computing services would be beneficial are:

- **UIDAI (Unique Identification Authority of India):** It is as integrated centralized project initiated by Government of India to have all the details of the citizens of the country in one repository. The UID application will be architected for the cloud and will sit on an “e-Governance cloud platform,” that will be assembled using open architecture and components [3].

- **Centralized Monitoring and Evaluation:** Cloud enables centralized monitoring and evaluation of the services and facilities offered to the public.

- **Centralized Auditing:** Since cloud offers its application to be centrally operated, the Auditing of the proofs and expenditure could be done with less cost and more effectiveness.
Management Information System: It offers integrated decision making platform for any Electronic Procurement, Invoice Processing and Stock.

Deployment of Citizen Services: Deployment of citizen’s services can be implemented by adoption of cloud computing in less time and more effectively.

Agriculture: Farmers forms the strength of any country. Agriculture is that domain where cloud computing can efficiently act as mediator or source of information for the practices and research that are being carried out in other countries by the farmers.

Education: Enabling cloud for education will provide us the best trainings and practices adopted by overseas Educational hubs thereby making practical and productive learning.

Crime management: Crime management, if made on cloud, the information about the various crimes and types of crimes and the research done on them and the centralized repository can efficiently help to curb the crime.

Health and Land Records: Health and land records are the areas which are numerous in numbers and consume lot of papers. If converted on cloud in e-Formats can enable efficient handling and more effective healthcare services.

Case Management and Legal Records: e-Courts can be established on Cloud and from where all the cases can be referred and studied for effectiveness of solving the issued. Legal records if kept on cloud for reference can stop the unauthorized services or activities happening anywhere.

Food & Drug Administration: Food and Drugs Administration is being given all the times, when any epidemic or disaster due to natural calamity, but no one is accounted for its expenses, monitoring and budget. Cloud computing can ensure the effective analytics of the disaster and can help the decision makers to optimally work on the crises management.

Postal Services: The postal service’s if made on cloud can help reach its services anywhere any time instantly without any mediators thereby making it as time-effective postal services. The centralized postal services portal will not only help to monitor and trace-out the status of the services taken from but also will embrace the notifications published by UPSC (Union Public Service Commission) in time and to masses.

5. E-Governance in Indian States And World

E-Governance in Indian States: The following are the e-Governance projects in Indian States:

Andhra Pradesh: The Hi-Tech City has its e-governance already at place which has implemented more than 60 e-gov projects which includes major projects as CARD, e-Seva, CFST, VATIS, E-procurement, Caring gov, FHMIS, Parishkaram, APportal, MPHS, LRMIS, eCOPS, APSWAN, Municipal MIS at state level; Soukaryam, rural e-seva, District portals, Collector’s dashboard at district level; simultaneously HRMS, SBMS, e-Biz, RAJiv, Unifie-x gateway these are the projects under PILOT Phase.[5]

Madhya Pradesh: Madhya Pradesh, India’s second largest state has implemented e-Governance projects that includes: Headstart for computer aided learning program for teachers; Result processing system for Rajya Siksha Kendra; E-learning for effective learning and academics analytics of students as well as teachers; Gyandoot which is implemented at Dhār district of Madhya Pradesh aims to create
a cost-effective replicable, economically self-reliant and financially viable model for taking the benefits of ICT to the rural masses. The project contains: forms of various government schemes; new khasra nakal avedan; rural hindi e-mail; landholder’s passbook of lands and loans (bhooldhikar evam rinpustika); castle certificate; domicile certificate (mool niwaci); income certificate; commodity/mandi information system; employment news; rural market (gaon ka bazaar); advisory module (salahkar); new driving license; new warmi compost khad booking; e-education; rural matrimonial (vivah sambandh); public grierana redressal (shikayat nivaran); below poverty line family list and rural news paper (gram samchar).[6]

**Chandigarh:** e-Governance is the most significant aspect of the I.T. Policy of Chandigarh Administration aiming to use IT as a medium for effective interaction between the Administration and the public so that exchange of information and access to government departments is speedy and easy, leading to a better quality of life. As per the IT Policy, all departments of the Administration are to be computerized, with the Public dealing departments to be taken up first. Accordingly, significant work has been done in the Departments of Excise and Taxation, Licensing and Registering Authority, Transport, Registration of Births and Deaths, and Police. Other Departments like Estate Office, Health, Education, and Food & Supplies are currently being taken up for computerization. Relevant applications in all these Departments are being identified and prioritized. The budget for all these projects is to be drawn from the funds available with the Departments themselves. As per Government of India guidelines, 1 to 3 per cent of each Department’s Budget is to be allocated for e-governance. The relevant information to be placed on a citizen’s portal which could be accessed either through the internet or through a chain of Information Centres by the public, so that they are not required to visit Government offices frequently. An Optic Fiber Network has also been set up in the city by private companies at their own cost. Part of this Network is being utilized to connect Government Offices and Information Centres.[7]

**Himachal Pradesh:** The Double Entry Accounting System software of Himachal Pradesh Institute of Public Administration (HIPA) has won the prestigious National eGovernance Bronze Icon Award in the 10th National eGovernance Conference held at Bhopal, Madhya Pradesh on 2nd February 2007. Some of the other e-Governance projects includes e-Samadhan for Online Public Grievance Solution; Sugam which is an Integrated Community Information Centre; Write to Chief Minister which is an Utility to send grievances, suggestions, proposals online to the Chief Minister of Himachal Pradesh; Online Electoral Rolls where one can search name online in electoral rolls providing full details of voters; besides this other projects are: Online Bus Ticket Booking, Examination Result, Employment News, eGazette, HP Police web portal, e Pensioner’s Helpline, Online Blood Donor List, Online Tenders, Website Directory, Online Hotel Registration, e-Salary.[6]

**TamilNadu:** The state has emerged as the top five e-governed states in India in 2008-09. The e-Governance projects includes: TamilNadu InfoSystem on Land Administration and Management (Tamil NILAM) where all the taluk offices in TamilNadu have been provided with computers under this programme which provides Land Records, Old Age Pension, Management Certificates, Public Grievances etc; Simplified and Transparent Administration of Registration (STAR) is a Citizen-centric application which has been implemented at 300 sub registrar office in TamilNadu; Treasury Computerization for treasury process computerization; Computer Assisted Learning Centre (CALC)
with objective of attracting more children to schools, simplifying difficult concepts thereby making learning exciting and creating sound foundation of IT literacy.[6]

**Maharashtra:** The e-Governance initiatives taken by Maharashtra government are as follows: RojgarWahini which is an web portal for the department of Employment and self-Employment; SARITA which is an G2C-U project for Stamps and Registration Information Technology based Administration system; Digital Payment System with the objectives to help the poor farmers in using IT as a tool to help increase the productivity of existing cooperatives of these farmers; SETU is an Integrated Citizen Facilitation Centres that aim to provide greater transparency, accessibility and efficiency to government procedures; Warna Wired Village Project aims to bring benefits of Information and Communication Technology (ICT) to rural India.[8]

**E-Governance On Cloud In World:** The following are some of the renowned examples of e-Governance projects in World which are implemented on Cloud[9]

*Argonne National Laboratory:* To test cloud computing for scientific capability, DOE centers at the argonne leadership computing facility (ALCF) and the National Energy Research Scientific Computing Center (NERSC) will install similar mid-range computing hardware, but will offer different computing environments, that will create a Cloud test bed which scientists can use for their computations while also testing the effectiveness of cloud computing for their particular research problems.

*Defense Information Systems Agency (DISA):* The DISA has developed a number of cloud computing solutions available to US military, DoD government civilians and DoD contractors for government authorized use; which includes: forge.mil, a system that currently enables the collaborative development and use of open source and dod community source software.

*Department of Energy (DOE):* The DOE National Laboratories are exploring the use of cloud services for scientific computing and developing high bandwidth networking to transport the high volumes of data between DOE and cloud service providers required by scientific computing.

*Department of the Interior National Business Center (NBC):* The Department of the Interior's National Business Center (NBC) plans to bring the benefits of cloud computing to both NBC's business services clients and data center hosting clients alike through advancements to the highly efficient NBC shared infrastructure.

*Federal CIO Council:* It believes that Cloud computing plays a key role in the President's initiative to modernize Information Technology (IT) by identifying enterprise-wide common services and solutions.

*General Services Administration (GSA):* To increase operational efficiencies, optimizing common services and solutions across organizational boundaries and enable transparent, collaborative and participatory government, the GSA is focusing on implementing projects for planning, acquiring, deploying and utilizing on cloud.

*Ministry of Internal Affairs and Communications:* Japan has created Digital Japan Creation Project (ICT Hatoyama Plan) which seeks to create new Information and Communications Technology (ICT) markets to help boost Japan’s economy.

*NASA:* NASA has several cloud programs including Nebula, a Cloud Computing pilot under development at NASA Ames Research Center. It integrates a set of open-source components into a
seamless, self-service platform, providing high-capacity computing, storage and network connectivity using a virtualized, scalable approach to achieve cost and energy efficiencies.

6. Future E-Governance

Cloud computing is an emerging technology in which every services are available in the cloud. E-Governance needs in conjunction with Cloud Computing will focus on the needs of the Citizens by delivering integrated functionality across the masses and the Web can be accessed through a wide variety of devices anywhere anytime. There are many avenues in the area of e-policing, e-tourism, e-healthcare, e-agriculture, e-defense, e-insurance, e-resource management, e-postal services and e-tax where the processes can be put as an Integrated solution on the cloud. As of now the replication of tasks or the services are being done across various states at independent level, but incorporating E-Governance with cloud will can great a impact on the GDP and efficiency and robustness to the e-Governance project of Indian government.

7. Conclusion

This paper analysis the various work done in field of e-Governance across various states and world. There is a lot of room that can enable e-Governance to put on cloud and thereby enhances the e-Governance efficiency and henceforth providing widespread provision of services to various stakeholders. To cater to all the constituencies’ needs, forward-looking e-solutions will utilize their existing investments and scale out across the sectors and imply the Web to balance devices, servers, and services. Cloud Computing provides a great opportunity for governments across the globe, to provide reliable E-Governance quickly, at lower costs.

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