



Cloud Computing for e-Governance: Indian Perspective

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ABSTRACT: The dependency of the forthcoming endeavours of human development is the proper utilization of the resources which are becoming scarce day by day. It has been observed that while some places have plenty of resources, other places suffer from the lack of it. For the solution of this problem we are going to use cloud computing for the proper availability and utilization of resources. Governments have been slower in realizing the potential benefits of the Information Technology to provide e-services. E-services are delivering cost-effective services, which can drive the growth of the economy and government productivity.

Cloud computing provides a new service consumption and delivery model inspired by Consumer Internet Services. Cloud is making rapid inroads in several sectors and e-Governance is the latest in this direction. e-Governance with cloud computing offers integration management with automated problem resolution, manages security end to end, and helps budget based on actual usage of data.

In this paper, we describe how this newly emerged paradigm of cloud computing can be helpful for e-Governance. It also describes the role of cloud computing standards and architectures in framing a good e-Governance strategy to realize e-Government.

Keywords- Cloud Computing, Web services, e-Governance.

I. 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. e-Governance is used for the governance activities such as administration, income taxes, pension services etc. to make easy use with the help of IT infrastructure. e-Governance improves the efficiency of government functioning by removing redundancy at different levels. Following are the four main categories of e-governance:

- 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.

The guiding principles for reforming Government through technology in INDIA are:

- Form simplification and field reduction – Forms should be made simple and user friendly and only minimum and necessary information should be collected.
- Online applications and tracking - Online applications and tracking of their status should be provided.
- Online repositories - Use of online repositories e.g. for certificates, educational degrees, identity documents, etc. should be mandated so that citizens are not required to submit these documents in physical form.
- Integration of services and platforms – Integration of services and platforms e.g. Aadhaar platform of Unique Identity Authority of India (UIDAI), payment gateway, Mobile Seva platform, sharing of data through open Application Programming Interfaces (API) and middleware such as National and State Service Delivery Gateways (NSDG/SSDG) should be mandated to facilitate integrated and interoperable service delivery to citizens and businesses.

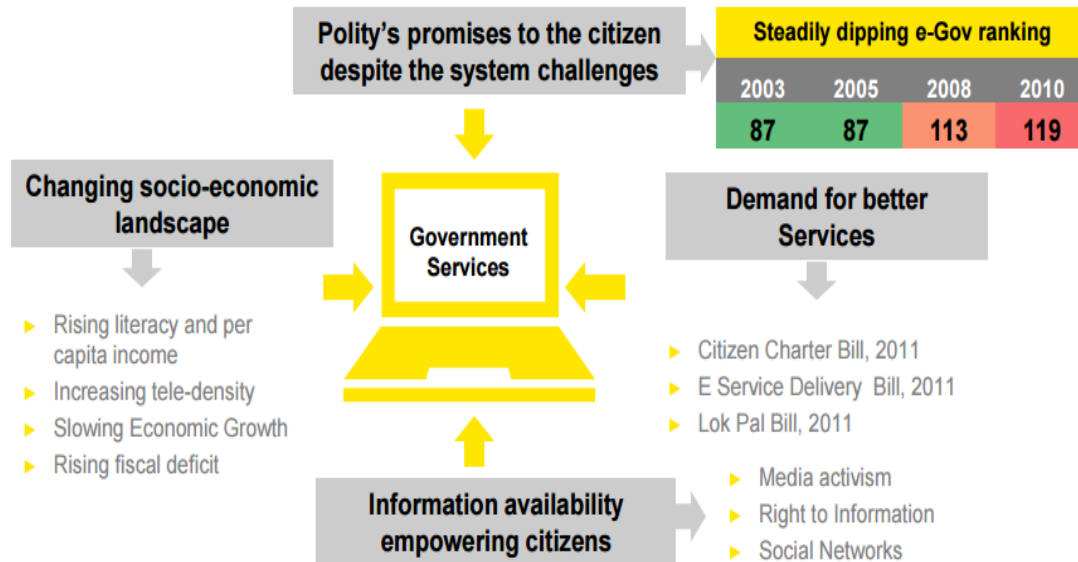


Fig. 1. e-Governance in INDIA.

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.

II. CLOUD COMPUTING

Cloud computing is defined by the IEEE Computer Society as: "A paradigm in which information is constantly stored in servers on the Internet and cached temporarily on clients that include desktops, entertainment centers, computers, notebooks, handhelds, etc.".

The three main tenets of Cloud computing are instance availability of services, pay per use model and massive scalability. Cloud architecture is built with SOA principles and hence is highly flexible and modular and can integrate with other systems. It offers the following layers of abstraction. Each layer offers a service that is virtualized, where they do not have to depend on any physical artefacts.

Another definition of Berkeley RAD Lab is cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. The services themselves have long been referred to as

Software as a Service (SaaS), so we use that term. The datacenter hardware and software is what we will call the cloud.

Many scientists of the National Institute of Standards and Technology (NIST) that work on cloud computing in America defined it as follows: "Cloud computing is a model for enabling convenient to access to networks and applications quickly, common set of configurable computing resources (e.g., networks, servers, storage and applications) that can work with little or interfere with the service provider to provide or be released immediately."

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.

The following characteristics, which are generally inherent to cloud computing:

- Broad network access: Resources are virtually accessible via the Internet regardless the location and the device used (i.e., mobile phones, tablets, laptops, and workstations).
- On-demand self-service: Computing capabilities, such as server and processing time, and network storage, are provided automatically as needed.
- Resource pooling: The resources are pooled to serve different clients with physical and virtual

resources dynamically appointed and reassigned as per client request.

- Measured service: Controlling and optimizing resource use by assigning a measured capability appropriate to the type of service (i.e., storage, processing and bandwidth).
- Rapid elasticity: Resources can be provisioned and to be scaled rapidly outward and inward commensurate with demand.

III. CLOUD COMPUTING FOR e-GOVERNANCE

Cloud computing is one of the new technologies which can significantly improve the way a government functions, the services it provides to its citizens and institutions, and its cooperation with other governments. The cloud computing can help to make computing ubiquitous and bring it within the reach of all type of users.

Hence, 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, cloud computing based 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.

Following are the elements for the cloud which is useful for implementing the cloud based e-Governance.

- Internet over Cloud: Most of services on internet are dependent on cloud 70% of the internet users are also using cloud in various applications.
- Distributed Data Centers: Individual information systems are vulnerable to risks such as outside attacks, intruders, environmental risks etc. Distributed data centers provide protection from various types of threats, Distributed data centers facilitate the e-Governance application usage and management by providing support for communication and real time platform. Data is distributed among different centers so single ownership on data is eliminated and it provides more security to information related to citizens.
- DataCenter Operation: Main aim of data center operations is to facilitate availability and continuity of services. Cloud computing uses cost effective hardware for setting data centers and the same data center can be shared in various e-Governance application. Use of same hardware setup is used for various e-Government applications. It increases the resource utilization and provides scalability to the e-Governance system.

Cloud computing technologies have many benefits in different parts of e-Governance. These benefits discussed in the following points.

- Scalability: Cloud computing resources such as CPU, servers, hard drives can be purchased automatically in any quantity at any time to fit growing number of users.

- Availability and Accessibility: cloud computing applications and information are hosted online therefore it has high availability and citizens can use them at anytime and from anywhere.
- Cost Saving: cloud computing systems do not need to purchase and install the ICT equipment's and software on their own building.
- Backup and Recovery: Since all the data is stored in the cloud, backing it up and restoring is much simpler than traditional way.
- Unlimited Storage. Storing information in the cloud gives you almost unlimited storage capacity.
- Green technology: Cloud computing is relatively good in energy consumption and provides eco-systems through virtual services.

Due to cloud computing benefits as mentioned above, many countries have launched e-Governance services using cloud computing. Although cloud computing offers a lot of advantages to e-Governance, several issues and challenges need to be targeted or to be met when applying cloud computing in countries like INDIA.

The main issues and challenges for adopting cloud computing for the e-Governance are:

- Security and privacy: Security requirements must be fulfilled on several layers where the Implementation of cloud computing includes advanced security technologies.
- Data protection and compliance: Some data protection regulations do not allow the storage of sensitive data in other countries, which is basically not accomplished by most cloud service providers.
- Interoperability and data portability: There is a lack of standards when using and implementing cloud computing services in INDIA. Users should be able to change between cloud service providers with a minimum of risk and cost, so governments may need to adopt open standards policies for the cloud for implementing in INDIA. Identity and access management: As cloud computing services relies completely on the availability and speed of the Internet as a carrier between consumer and service provider, speed and availability will be an issue in INDIAN concern.
- Auditing: Cloud providers currently do not offer detailed auditing possibilities in INDIA where the auditing becomes essential in situations where compliance to specific regulations or policies must be verified.

IV. CONCLUSION

Cloud computing is the future generation of computing. It is a very new concept in the field of computing characterised by three main entities - Software, Hardware and Network.

The collective nature of all these entities is known as the Cloud. The Cloud provides a solid foundation for the introduction of widespread provision of services to various stakeholders.

Cloud architectures when will properly apply for developing e-Governance applications, it will transform the nation into an information Society. The Cloud will help to provide E-governance services faster and cheaper thereby accelerating the adoption and use of IT for e-services. The subject of cloud computing is currently in the very early stages of development and there is a lot of research being carried out in this area. In this paper, we analysed cloud computing and examines its application in the context of e-Governance.

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