G-cloud (e-Governance in cloud)

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ABSTRACT
Cloud computing is the future of next generation of computing. It is a new and emerging concept in the field of computing. There are many concepts involve in cloud computing but the major are Software, Hardware and Network. The collective, shared and integrated nature of all these entities is known as the Cloud. The subject of cloud computing is currently in the very early stages of development and there is a lot of scope to do research in this area. In this paper, we analyze cloud computing and examines its application in the context of e-Governance. As existing e-Governance projects in India are facing many challenges, from development to implementation. We propose the use of cloud computing in e-Governance model, as a new and ideal solution to face these challenges in future.

KEYWORDS
Cloud, ICT, Cloud computing, e-Governance, IaaS, SaaS, PaaS, Data centers

1. INTRODUCTION
Indian government is keen to implement the model of e-Governance on country level as well in all states of India. The main objective is to use ICT for planning new ways of interacting, improving user end services, optimizing processes and revitalizing democracy by the new form of ICT based governance. e-Governance aims to deliver more interactive services to citizens at their door steps with businesses oriented applications like e-commerce, m-commerce through ICT and e-Governance. The identified barriers are cost, unavailability of infrastructure like hardware, software and network, untrained workforce and software applications on user end. Cloud computing is a new form of computing can solve various problems identified earlier and it may lead to significant cost savings with a infrastructure less model for e-Governance. [2] The function of cloud computing is based over the use of Internet with third party hardware and software infrastructure and applications that are remotely hosted. All that applications can run by a web browser easily. In this paper, we describe how this newly emerged paradigm of cloud computing can be helpful to design future e-Governance model in India.[1]

2. INTRODUCTION ABOUT E-GOVERNANCE
e-Governance is a process of reform in the way and deliver services to external and internal users or stack holders for the benefit of both government and the users that they serve. There is a great number of government services that can be offered online to end users in a e-Governance model. [3] E-governance requirements may be driven by economic, political, technical and cultural reasons. E-governance requires applications to be secure and protect the privacy of end users. Some of services that can be offered by e-Governance are:

- Government to Government
- Government to Enterprise
- Government to Business
- Government to Consumer

3. CLOUD COMPUTING MODELS TO OFFER 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.[5]

There are three delivery models:

Software as a Service (SaaS): The consumer uses an application, but does not control the operating system, hardware or network infrastructure on which it's running. Cloud offers applications as a service. Imagine a case of new state like Uttarakhand deciding to move to E-Governance to offer some services on districts level. They need solution for some application for their citizens. The state need not to purchase applications, hardware and software. They can make a request for a particular service from the cloud provider. Applications instances can then be created for their use. Numerous applications can be provided as standard services, where departments can request and manage online without wait for development. Some of the applications can be:

- Birth, death, cast certificates management System
- Job portal to provide employment support to users
- E-Procurement management system
- E-police, E-court
- Municipal management system
- Water Boards, Electric, Telephone Billing and Payment Systems
- District Management Solutions
- Service and help Desk
In this model there is no need for each department to purchase hardware, software and applications, they can get all the applications from cloud serviced provider at district level and they may offer to all that services to down level. As with cloud the implementation phase of e-Governance services can be faster we may offer the service within short time. This model can also reduce the cost of e-Governance infrastructure in early phase.

**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.

In traditional model of e-Governance the departments have to wait till they purchase, deploy and start working. Now in PaaS model if some Government departments requiring resources for new Operating system of for new Database software they can request and get resources instantly. Some online application that requiring middleware services to run the process can be provided instantly.

Some of the working platforms that PaaS provide are:

- Dynamic Operating System
- Dynamic Query Service
- Dynamic Database Software services
- On demand Middleware Services
- On demand Workflow Services

**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.

E-Governance applications like Indian railway or Indian bank ATM services requires a model which can offer 24 hours and all 365 days online services to end users, for that a great infrastructure availability is required. There is a need of unlimited supply of power, CPU services, applications and server services. When operating from cloud using IaaS model e-Governance applications can use unlimited supply of CPU, storage and bandwidth when operating from cloud. Thus, applications perform better on cloud compared to traditional architecture.

**Private Cloud:** A private cloud offers many of the benefits of a public cloud computing environment, such as being elastic and service based. The difference between a private cloud and a public cloud is that in a private cloud-based service, data and processes are managed within the organization without the restrictions of network bandwidth, security exposures and legal requirements that using public cloud services might entail. In addition, private cloud services offer the provider and the user greater control of the cloud infrastructure, improving security and resiliency because user access and the networks used are restricted and designated.

**Community Cloud:** A community cloud is controlled and used by a group of organizations that have shared interests, such as specific security requirements or a common mission. The members of the community share access to the data and applications in the cloud.

**Hybrid Cloud:** A hybrid cloud is a combination of a public and private cloud that interoperates. In this model users typically outsource non-business-critical information and processing to the public cloud, while keeping business-critical services and data in their control. [6]

5. CLOUD COMPUTING BENEFITS IN e-GOVERNANCE

**Significant Cost Reduction:** Available at a fraction of the cost of traditional ICT services; upfront capital expenditures eliminated, dramatically reduced ICT administrative burden as you can hire the infrastructure from clouds.

**Increased Flexibility:** On-demand computing across technologies will help us to run applications on demand as specific to our need like if some one want to use some ERP applications with own procedures, business solutions for e-commerce based application that are required in e-procurement type of services can be shared easily, and large group of service providers will available to reduced new solution implementation times.

**Access anywhere:** Unlike to offer government services from a single computer or network, we may use different computers in shared network environment or we can use portable devices like laptops, notepads, mobile phones, to run applications and documents everywhere.

**Elastic scalability and pay-as-you-go:** We can add and subtract the services and infrastructure support as we need. Pay for only what we use.

**Easy to implement:** No need to purchase hardware, software licenses or implementation services. You can just start within a less time.

**Service quality:** Reliable services, large storage and computing capacity, and the user will get 24*7 services and uptime.

**Delegate non-critical applications:** We can Outsource non-critical applications to service providers and we may focus on to more business-critical applications.

**Always the latest software:** As updates are automatic we will get the latest software without paying new purchase cost to vendor. [7]
Sharing documents and group collaboration: Applications and documents accessible from anywhere in the world, will help in facilitating group collaboration on documents and projects.

Data Recovery
Natural disasters like floods, earthquakes, wars and internal disturbances could cause the e-Governance applications not only loose data, but also make services unavailable. Multiple installations in geographically separated locations with complete backup and recovery solutions is required as without this we may fall in huge problems. Applications and data must be redundant and should be available on a short notice to switch from one data center to center. Cloud virtualization technologies allow backups and restoring. It offers application migration seamlessly compared to traditional data center.

Distributed Data Centers
ICT based e-Governance model have many risks, like attack of viruses, hackers, fire and terrorist some time. Some disasters possess mass destructibility, and even intentioned activities after disasters. Distributed data centers provide fault tolerance against such disasters. These centers facilitate robust communication support, self-supervision capability and real visible platform, which will help in e-Governance applications to use and manage.

6. CONCLUSIONS
In Indian most of the states are willing to adopt the e-Governance model to offer government services online up to last level, some major barriers are unavailability of required infrastructure, unavailability of e-Governance application, unavailability of trained workforce in IT and unavailability of required funds. They can use the power of cloud computing to offer some urgently required e-Governance service within short time as described in this paper. In future they 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 we will learn lessons about the drawbacks of cloud computing like security of data after some time.

REFERENCES:
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