

Cloud and Web Technologies: Technical Improvements and Their Implications on E-Governance

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Abstract—Cloud computing technology helps to improve ICT based services like e-governance execution and create new business opportunities and their implementation. Cloud computing is an evolution of web based internet application and describes an advance consumption, supplement and delivery model for Information Technology and ICT services based on the global network. This enables allocation of resources and costs across a large pool of users while providing on-demand services with dynamic scalability. So we can say that a technology that has the capability and potential to offer solutions for e-governance is cloud computing. Cloud computing provide service-oriented access to users least compromising on security. In today's era software and their services are biggest cost concern for the implementation of IT environment in an organization. Cloud has the capability to reduce the cost in dramatic way for the all kind of the organization even it is small scale Industry or a big corporate organization. This makes Cloud an excellent platform to host e-governance services and application. The basic intention of this paper is whatever improvement happening in cloud technology and in web technology mention sub sequentially. If we apply them in existing e-governance application running under various department then we can minimize the some of the most basic affected components of application software like cost of the software in its execution, optimal time for usage and running of application software, storage capacity for storing of the data and network infrastructure used for the functioning of the application software.

Keywords—Cloud; Web Semantics; Burst; SaaS; PaaS; IaaS; G-Cloud; M-Cloud; TCO; ICT, E-Governance; ITIL; Cloud legacy; Legacy cloud system silos; Lock-In; RDF; XML; URI

I. INTRODUCTION

Cloud computing is a new business paradigm in a service oriented model, delivering business applications and other IT resources as services over the internet. Cloud computing is shared environment, multitenant and over-the-internet based service delivery model [29]. Cloud provides an attractive alternative to the common man as well as for organizations to transact and do business online. Another variant of cloud computing service model is based on the services offering. Cloud provides infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). A suitable combinational model for e-governance can be selected based

on the desire. On the other hand, technology service providers are competing to provide cost effective and innovative solutions to host services on cloud. There are many providers partnering with governments to build and operate e-governance platforms on cloud. There are many vendors like Google, Rackspace and Amazon in US and Europe who are providing readymade platform for hosting such initiatives [4] [20][21] [29][30].

TABLE 1. PERCENTAGE OF STATE AND FEDERAL CIOs REPORTING STATUS OF CLOUD COMPUTING IN THEIR GOVERNMENT

No	Status of Cloud Computing	Percentage	
		State	Federal
1	Investigating the use of cloud computing but as yet not taken action	54	22
2	Running an active project to move portions of our computing infrastructure to a cloud computing environment	21	54
3	Undertaking a cloud computing pilot for a portion of our computing requirements	13	16
4	No formal plans to use cloud computing	5	8
5	Have been using cloud computing for years but under another name	5	NA
6	Other	3	NA

Status of Cloud computing in their governments [21]

Similarly there are few more vendors like Microsoft, IBM and HP are some key players engaged in developing SaaS based applications for governance initiatives. E-governance architecture calls for scalability and interoperability given the various interconnects that need to be deployed [26][29]. Typically a cloud infrastructure is built with virtualization as key foundation component at all possible levels like server, storage, application, etc. This feature supports all non-functional requirements of e-governance applications seamlessly [4] [12][20] [21] [30].

II. CLOUD SERVICE MODELS

Cloud services models are as follows [4] [20][21] [30].

- Cloud Software as a Service (SaaS)
- Cloud Platform as a Service (PaaS)
- Cloud Infrastructure as a Service (IaaS)

If we see below diagram then we can easily understand. What are the actual differences between these models of the cloud?

Cloud Services Models		
Software as a Service	Platform as a Service	Infrastructure as a Service
Business operations over a network	Deploy customer-created applications to a Cloud	Rent processing, storage, network, other computing resources
"SaaS"	"PaaS"	"IaaS"

A. Software AS A Service (SaaS)

SaaS is a complete online IT solution built and maintained by the SaaS provider.

Examples: Sales & Customer Database Services in the Cloud asSalesforce.com and Collaboration Services as Yammer.

There are many mobile Apps don't store data on the phone but are in fact SaaS. For example: Dropbox in a cloud solution that stores your data in another cloud (Amazon). There are many web applications that store our data like Prezi and Google Apps are also SaaS. SaaS can be utilized for various E-Governance services (G2B, G2G, G2E and G2C) [2]. The basic long-term vision of SaaS is centered around separating maintenance, software control and ownership from its actual use. SaaS providers will often not only provide one service of a certain software suite, but might typically provide a bundle of services, while models are possible in which SaaS services are provided by the company who has developed the software. By delivering services for set of software, the idea is that many of the present limitations constraining its utilization, deployment and evolution can be minimize. The shift in offering services also has implications for the SaaS providers' revenue models. Traditionally, the customer buys a license to use an application and installs it on their owned or controlled hardware [31].

Over time new updates can be including security patches installed other control and update activities. By buying a license, the customer gets unlimited usage of the software. Per user or per installed system additional licenses might be required. In contrast in the SaaS delivery models the user does not buy a lifetime license. The user need to pay only a certain amount for the software running on a third-party server and loses access when he ceases payment. This can be achieved as pay per use or pay per duration basis. The payment can either be charged as a pre-paid subscription or on a pay-as-you-go basis.

B. Platform AS A Service (PaaS)

PaaS is a platform on which you are expected to develop your own solution. Imagine a blank web site or empty database built and maintained by the PaaS provider.

Examples: Database – Oracle Cloud DB and Web site – Amazon AWS.

PaaS providers are able to manage the lower layers and relieve PaaS subscribers of the responsibility to select, install, maintain and operating the platform components. Infrastructure charges are implicitly available in PaaS offerings because PaaS consumes infrastructure resources in some form and the infrastructure charges are bundled in the rates charged for the PaaS execution environment resources (e.g., CPU, bandwidth, storage) [28] [31].

C. Infrastructure AS A Service (IaaS)

IaaS is when the service only provides raw components of a solution. Imagine a company that only provides you data storage and nothing else means you just taking services as for storing the data.

Examples: Laptop backup Mozy and Storage Amazon S3.

The capability provided to the consumer is to provision of processing, storage, networks and other fundamental computing resources where the consumer is able to deploy and run arbitrary software that can include operating systems and applications. Consumer does not manage or control the core cloud infrastructure but has control over operating systems, storage, deployed applications and possibly partial control of select networking components (e.g., host firewalls)[28][31].

III. CLOUD DEPLOYMENT MODELS

Independent of the specific cloud services model used, NIST defined four deployment models [4] [6] [20][21].

What are those models we can see in below pictorial diagram? It is classifying the different deployment model run under the cloud.

Cloud Deployment Models	
Private Operated for a single organizations	Community Shared by several organizations supporting a specific community
Public Available to the general public or large industry group owned by an organization selling Cloud services	Hybrid Two or more Clouds that remain unique but are bound by technology that enables data and application portability

- Private cloud
- Community cloud
- Public cloud
- Hybrid cloud

There are obvious co relation between the features of the cloud computing and their deployment models. See in below diagram how features of the cloud computing varies and demonstrate the different behavior under their deployment models.

Actually it is basic comparison between the legacy system which is non cloud under running in different deployment model and cloud system running under the cloud deployment model. We can see features like cost, liability and assurance of availability is more mature compare to old and exiting legacy system in "Fig. 1".

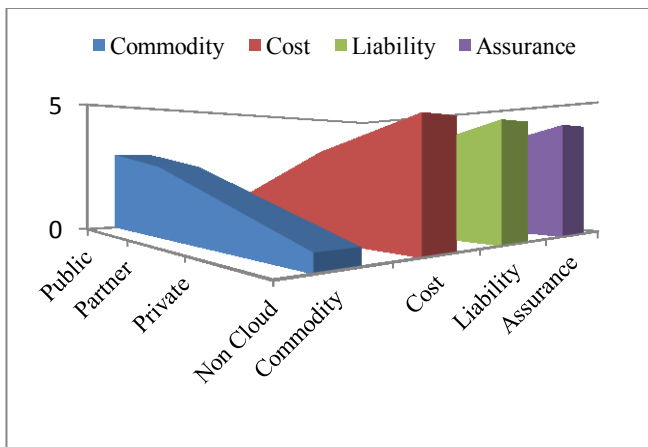


Fig. 1. Features of Public, Community, Private Clouds and Non-Cloud

Government continues to explore innovations for optimizing and harmonizing IT services across state government specially government business services as well. Multiple cloud computing deployment models ranging from internal private clouds to government community clouds to government line of business community clouds to public clouds [30]. As government explores its options, and the various scenarios for engaging cloud computing services, consideration must be given to a number of issues. These are including but cannot limit to the following.

- Actual total cost of a service
- User fees / access fees
- Exit strategy / switching strategy
- Potential for data breach
- Legal liability – assigned and assumed
- Access and use of government data – including emails and the content of email attachments to Service provider
- Provider’s economic model for pricing which may include reselling government data, or reselling analytics about the data
- Location of the data and applications
- Jurisdictional issues related to the physical, virtual, and legal location of data and applications
- Proximity and threats from other data tenants – intended and unintended
- Risks related with the multi-tenant or multiplexing physical infrastructure environment
- The list continues to grow thus the need for agile, dynamic enterprise architectures

IV. RELATED WORK

There are several organizations in US and India working for the implementation of the latest cloud and web technology for the e-governance model. There are several hurdles and blocks at operation level and technology levels. Some of them are like the structure of the data used for the e-governance

operation if the structure of the data is in manageable format then it is easy to make it more relational. Government of India is also working for the proper and more logical structure of the data they are designing data in more appropriate and suitable format so it can be easy to manageable and can be integrated smoothly. Similarly in the area of the shared services governments are trying to make it more identical so it can be used by the multiple organizations. Suppose we have passport number then if a service is implemented based on the passport number then it can be benefitted by multiple departments like if visa department want to verify the visa details then by entering the passport number they can get all the related information of the visa. In the same way immigration department can check the authenticity and validity of the passport and visa by using the shared services provided by passport department. In more broad way suppose police department want to check criminal verification provided on the particular passport then they can verify it just entering the passport number under the shared services provided by passport department. So data management and shared services are the some of the major area where most of the government are working for e-governance program.

V. TECHNOLOGICAL IMPROVEMENT IN CLOUD AND WEB

A. Improvement in Cloud

The Basic idea behind the cloud model is that anything that could be done in computing whether on an individual PC or in a corporate data center from storing data to collaborating on documents or crunching numbers on large data sets can be shifted to the cloud. Certainly cloud computing facilitates a new platform and location-independent perspective on how we are communicating, collaborating and working. So long as you can access the web you are able to work when and where you wish.

By using fast reliable Internet connectivity and computer power it does not matter where the document and e-mail or the data comes from for user sees on the screen. Cloud computing enables providers to use distant data centers for cloud computing. While some have predicted the end of the PC era with the rise of the cloud computing model many believe that most organizations and even individuals will continue to make use of traditional PCs and Laptops even if more and more of their use will be to access the cloud. For individuals, cloud computing means photo sharing, accessing web-based email and productivity software much of it for free [28]. For organizations shifting to the cloud means having the ability to contract for computing services on-demand rather than having to invest to host all the necessary software, hardware and support personnel necessary to provide a given level of services [28]. For governments, the value proposition of the cloud is mainly appealing, given both changing demands for Information Technology and challenging economic conditions [4][20] [21] [30] [31].

The essence of rolling out e-governance services is to ensure reach and high availability of the service and both these tenets have to be provided by the technology platform [29]. Surely, cloud computing provides both. Reach is ensured as it is hosted on internet. With the basic construct of the infrastructure, availability of the platform is ensured by

virtualization technologies with these underlying technologies and storage. The threat of having data read during transmission can be mitigated through encryption. Encryption in transit protects data as it is being transmitted to and from the cloud service. Encryption protects data that is stored at the service provider. Encrypting data in an on-premises cloud service on-ramp system can provide both kinds of encryption protection [17] [20] [21] [22].

B. Improvement in Web

The social work profession has acceptance of Web 2.0 technologies. One of the first references to Social Work 2.0 was made in "The New Social Worker" magazine which was started by Linda May Grobman in spring of 1994. Online publication continues to explore the application of web technology within the social work community. The first article of an ongoing social work 2.0 series was entitled "Caring Bridge: A Valuable Tool for Social Workers and those with Critical Illness" written by Karen Zgoda. It was followed by a column entitled Social Work There's a Blog for that by Karen Zgoda. The article noted that blogging was rapidly becoming a phenomenon within the social work community. Students and professionals had begun chronicling their career development as well as sharing information from their respective practice areas [17]. In 2007, Jonathan Singer, started The Social Work Podcast which provides information about all the things in social work followed by a more formalized outline of the meaning of Social Work 2.0 in 2009 [15].

Web 3.0 or Semantic Web – The definitions of Web 3.0 vary significantly. Some believe its most important features are the Semantic Web and personalization. Concentrating on the computer elements Conrad Wolfram has argued that Web 3.0 is where "the computer is generating new information" rather than humans [32].

Andrew Keen, author of *The Cult of the Amateur* considers the Semantic Web an "unrealizable abstraction" and observes Web 3.0 as the return of experts and authorities to the Web. As example he points to Bertelsmann's deal with the German Wikipedia to produce an edited print version of that encyclopedia. CNN Money's Jessi Hempel looks forward Web 3.0 to emerge from new and innovative Web 2.0 services with a beneficial business model [33].

We can see how much improvement and advancement happened in web technology. By defining these technologies according to their versions, we can describe them briefly below.

a) Web 1.0

That Geocities & Hotmail era was all about read-only content and static HTML websites. People preferred navigating the web through link directories of Yahoo! and dmoz [27][28] [31].

b) Web 2.0

This is about user-generated content and the read-write web. People are overriding as well as contributing information through blogs or sites like Flickr, YouTube, Digg etc. The line dividing a consumer and content publisher is increasingly getting blurred in the Web 2.0 era [27][28][31].

c) Web 3.0

This will be about semantic web (or the meaning of data) personalization (example iGoogle) intelligent search and behavioral advertising among other things [27][28][31].

The semantic web is the next Big Thing. The Semantic Web is "a web of data". In Semantic Web basically HTML describes documents and RDF describes things. Why talk about a "page" in terms of style and links when you know a book has chapters and a CD has tracks?

d) Challenges

- Human error and system abuse
- Selfishness, why take the time to teach the machine how to teach me?

e) Opportunities

- Young people love their RSS feeds
- Data portability and sharing standards are 2008
- If we were all so selfish, Web 2.0 would have never worked (etc Wikipedia)

f) Bottom line (why we should care)

It's not just for academics anymore. People will use the tools that they find most useful. Where the people are advertisers they must follow.

C. Introducing Web 3.0

Web 3.0 creates a big collection of databases which can be connected on demand. The semantic web is about the meaning of data. What could it mean? It means as following

- How will be our information in organized?
- Will we still do the "surfing" or will the machine surf for us?
- The look of web will be the same for me as it does for everyone else?
- What are the technologies that will become usual?

VI. FUTURE WORK

This is the era of the service, when anybody taking any kind of the services then they do not want to take pain of the managing the services that's why people like the concept of the cloud technology and since there are very rapid improvement in web technology that why it is making it more sharpen because by using these web technology like semantic web technology we can get better result in term of personalization and customization of the interface. We can get our data result in more structured and order format. By using java script and json we can design and manage a complete application and we can manage a huge amount of the data in very optimize timing. In the legacy system for using services we need to manage the many areas. Suppose we want to create the profile of the employees in an organization then we need to deploy a complete application for the profile creation of the employees. Now for this application we need resources in term of the software, hardware, storage and network infrastructure. So it is costing a huge operational and maintenance cost for

the just creation of the profile of the some employees in an organization. Suppose we take this service from some cloud provider company who is providing "SaaS" services then just by paying some amount for this service we can use the service without investing the money in other related area of the infrastructure like software, hardware, storage and network.

VII. CONCLUSION

The attractive features of Cloud Computing like on demand self-service, network entrance, sites self-governing reserves of pool components, quick enhancement and calculated pre-planned services for the effective e-governance. As various researchers estimated that till year 2015 50% Cloud Computing is used in e-governance for its proper execution [29].

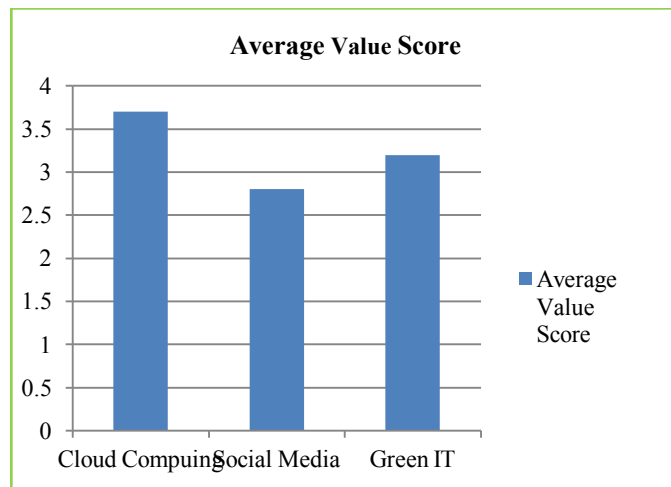


Fig. 2. Average value score given by CIOs to emerging technologies

The advanced development in the ICT field point out that government all over the world will make use of cloud technology. Cloud Computing can ensure the changes in the government scenarios and their policies for the proper working as well as the execution of their e – services. E-Governance system requires entities like hardware, software, service, network, management, business, policy, security etc to survive and function properly. This framework is created to suit the needs of any organization which is keen to develop an enterprise architecture framework to promote reusability agility and flexibility in its IT systems. Framework contains business architecture and functional (software) architecture built on the basis of business requirements. Technical (Software) architecture encompasses application data and technology architecture. The framework also contains management disciplines such as Change Management, Strategic Control and Program (Project) Management. The overall aim is in building and delivering application to bring effectiveness, transparency, efficiency and accountability. The above research is that we can get the better services than traditional computing with reduced cost with the help of cloud computing. The cloud model will ultimately serve to transform - in a big way - not just government Information Technology, but Information Technology in the corporate world as well. The transition still will take time But cloud computing is one of the best option to implement or enhance the Government

services in education, healthcare and social up liftemen of the citizens of the developing countries.

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