

IJIS Institute

New Horizons in Information Sharing

Cloud Computing: An Essential Overview

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Agenda

- **Defining “Cloud Computing”**
- **Business Case for the Cloud**
- **Cloud Deployment Models**
- **Risks of Cloud Adoption**
- **Impacts & Considerations**
 - **Security**
 - **Portability**
 - **Interoperability**
- **Cloud Case Studies**



What is Cloud Computing?



What is Cloud Computing?

- a) A way to access applications hosted on the web through your web browser
- b) A pay-as-you-go model for IT resources accessed over the Internet
- c) Use of computer resources, distributed throughout an internet, to perform parallel processing, distributed storage, indexing and mining of data
- d) Gartner: “Cloud computing is a style of computing where massively scalable IT-related capabilities are provided “*as a service*” across the Internet to multiple external customers”
- e) Commercial: An IT buzzword that assures potential clients that your product is on the cutting edge of technology
- f) All of the above



What is Cloud Computing?

- Internet is the democratization of information
- E-commerce is about the democratization of business
- Blogging is the democratization of news
- Cloud Computing is about the democratization of servers

Cloud Services

SaaS

A way to access applications hosted on the web through your web browser

PaaS

The delivery of a computing platform and solution stack as a service. A pay-as-you-go model for IT resources accessed over the Internet

IaaS

Use of computer resources, distributed throughout an internet, to perform parallel processing, distributed storage, indexing and mining of data

Common Cloud Themes

- They're **BIG** – massively scalable... Small agencies, with big system resources.
- **Elastic** - Use what you need – no upfront commitments, *Pay As You Go* eliminates up-front commitment allowing agencies to start small use on short-term basis, and release them as needed
- **Ubiquitous** - Out there on the network somewhere – accessible via Internet, location independent
- **Transparent** – complexity concealed from users, virtualized, abstracted
- **Service-oriented** – easy to use, SLAs, accessible

Simple Metaphor:
Like Power Company

Better Metaphor:
**Cooperatively Owned
Semiconductor Lab**



Commercial Cloud Formation



Amazon Elastic Compute Cloud (Amazon EC2) - Beta



TAP INTO THE POWER OF NETWORK.COM



Cloud Deployment Models

- ▶ **Internal (private) cloud.** The cloud infrastructure is operated within the consumer's organization, or external but exclusively used.
- ▶ **Community cloud.** The cloud infrastructure is jointly owned by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations).
- ▶ **Public cloud.** The cloud infrastructure is owned by an organization selling cloud services to the general public or to a large industry group.
- ▶ **Hybrid cloud.** The cloud infrastructure is a composition of two or more clouds (internal, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability.

NIST working definitions

Some of the Risks of Cloud Adoption

- ▶ **Reduced service performance**
- ▶ **Loss or corruption of data**
- ▶ **Jurisdictional issues related to location of data**
- ▶ **Issues related to multi tenancy**
- ▶ **Access and download capability for all data**
- ▶ **Transfer of data at termination of contract**
- ▶ **Unauthorized access to data or services**
- ▶ **Leveraging the data for advertising or mining**
- ▶ **Third party access to data**

Options for Addressing the Risks

- **By Assuring that Standards are Leveraged to the Extend Practical**
- **By Developing a Comprehensive Cloud Adoption Strategy**
- **In Requests for Proposals and Statements of Work**
- **In the contract (SLA) with the cloud service provider, examples:**
 - **Performance expectations**
 - **Separation of data; location of data**
 - **Protection of data:**
 - **Non-disclosure agreements**
 - **Notice of, and remedies for, breach**

Cloud Standards Customer Council

The goal of the council is to separate the hype from the reality on how to leverage what customers have today and how to use open, standards-based cloud computing to extend their organizations.

Key considerations outlined by the council:

- ▶ **Security**
- ▶ **Portability**
- ▶ **Interoperability**

Security in the Cloud

A cloud implementation introduces security risks and at the same time security advantages.

Selecting a migration path is a key strategy to reduce the risks and maximize the advantages

Considerations on Migration



► Balancing Threat Exposure and Cost Effectiveness

- Private clouds have less **threat exposure** while massive public clouds are **cost effective**
- Leverage increasing amount of **knowledge** available from the Cloud Security Alliance (CSA) and the National Institute of Standards and Technology (NIST)
- **Public data** can be moved to the cloud today while **higher sensitivity data** is likely to be processed on clouds where organizations have control over the security model

Portability in the Cloud

- ▶ The Open Virtualization Format (OVF) is an industry standard format for portable virtual machines.
- ▶ Virtual machines packaged in this format can be installed on any virtualization platform that supports the standard.
- ▶ The companies behind the collaboration on this specification include Dell, HP, IBM, Microsoft, VMware, and XenSource.

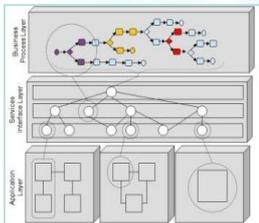
Interoperability in the Cloud

- ▶ Standards are Foundational Elements and Enablers of Cloud Computing Interoperability
 - Grid Computing and Server Virtualization
 - Web Services and Service Oriented Architecture
 - Federated Identity Management
- ▶ Justice and Public Safety Standards
 - The National Information Exchange Model (NIEM)
 - The Global Reference Architecture (GRA)
 - The Global Federated Identity and Privilege Management (GFIPM)
- ▶ An increasing number of organization invest in cloud standards development

Clouds and NIEM



Data interoperability based on NIEM is critical to cloud implementations. Clouds have the potential to further enable NIEM to become the basis upon which successful data sharing across federal, state, local and tribal government is achieved.



The Global Reference Architecture (GRA) provides a model for using cloud services to compose complex, customizable, distributed applications



The Global Federated Identity and Privilege Management (GFIPM) standard provides governance mechanism to establish trust across security domains and could be a critical enabler to security in the cloud.

A Strong Commitment to Cloud Computing

- ▶ The current administration has made cloud computing a high priority
 - Considered the “next generation of IT” in government
 - Supports the objective of creating a more agile federal enterprise, where services can be provisioned and reused on demand to meet business needs
- ▶ “The advantages of cloud computing are so compelling, I don’t think there is any going back”
- ▶ The justice and public safety world is already developing capabilities to use this paradigm. Companies are offering Software as a Service using Nlets as the network cloud within which smaller police agencies can have systems without paying the cost of their own server and localized application software.

Source: “Federal government takes steps toward cloud computing environment”, by Richard W. Walker

Source: The IJIS Factor: “When will cloud computing come of age?”, by Paul Wormeli

The Evolution of Government Clouds

- ▶ Amazon Web Services GovCloud designed for sensitive workloads
 - Managed by US Personnel
 - Conformant with Government Specific Controls and Certifications
- ▶ Microsoft has announced a number of diverse offerings ranging from its Azure Appliance to a dedicated government cloud offering based on the Business Productivity Online Suite (BPOS)
- ▶ Google has announced completion of FISMA certification for a multi-tenant cloud application and GoogleApps has received an authority to operate at the FISMA-Moderate level

Source: "Government Clouds", by Tom Kooy, September 12th, 2011

Cloud Case Studies



▶ Selective Service Systems

- The **goal** was to operate at maximum potential with reduced annual budget and at the same time achieve agility at a reduced total cost of ownership.
- Employed a phased **approach** migrating one system at a time and performed ongoing improvements of the cloud environment.
- Achieved the following key benefits
 - Improved Database Analysis Performance
 - Ease of Implementation
 - Rapid System Deployment

Cloud Case Studies



▶ City of Miami Cuts Costs with Cloud Services

- The **goal** was to develop an online application to record, track and report on nonemergency 3-1-1 incidents to better serve citizens under significant budget constraints.
- The **benefits** were reduced cost, fast time-to-market, greater ability to offer new services to citizens and improved disaster recovery.

▶ Town of East Hampton New York RMS/CAD

- The **goal** was to leverage existing investments and at the same time to adopt an operating-expense centric strategy which provided more flexibility.
- Key **benefits** are reduced hardware, software and maintenance cost, new functionality and improved productivity.

Cloud Case Studies



▶ Cloud User: City of Washington D.C.

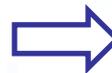
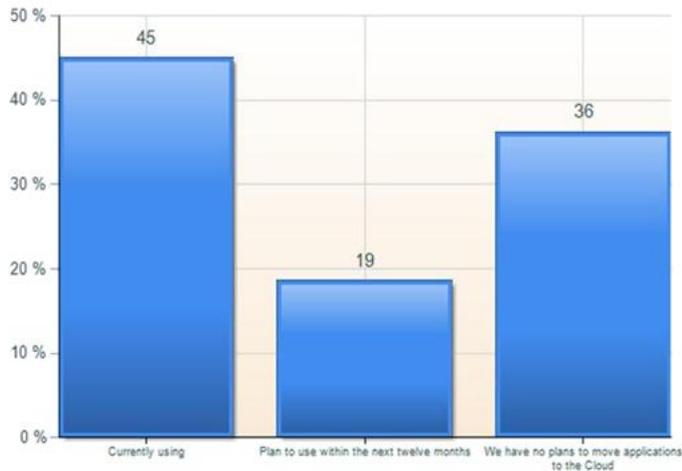
- Migrating **38,000** employees to Cloud Applications
- Replaced software with the following cloud capabilities:
 - Email
 - Word processing and spreadsheets
 - Intranet sites and wikis
- **500,000+** organizations use cloud computing to effectively deliver back office capabilities

“ It's a fundamental change to the way our government operates by moving to the cloud. Rather than owning the infrastructure, we can save millions. ”

Vivek Kundra, Former Federal CIO

Local Government and the Cloud

Is your organization currently using or do you plan to use the Cloud (hosted services across the Internet) for government applications within the next twelve months?



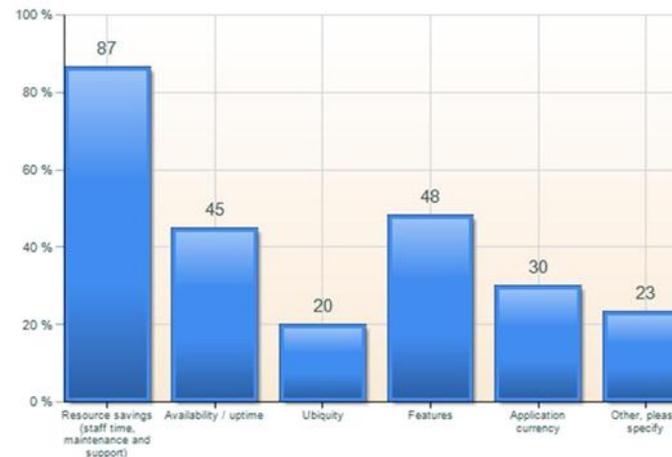
64 % of Government Agencies which Responded Use or Plan to Use Cloud Computing

Key Drivers are:

- Resource Saving
- Features
- Availability and Uptime



If you are currently using or plan to use the Cloud, please identify the reasons why. Select all that apply.



Source: PTI – “Local Government and the State of Cloud Computing”