Cloud Computing

Strategy Update for
ITOTS Networks Cloud Roadmap
v1.1
Date: October 17, 2012
Agenda

- Scope and Goals
- Vision / Mission / Strategy
- Technology (Brief Cloud Overview)
- Federal Cloud Computing
- Policies and Regulations
- Prioritization Criteria
- IT Services Model
- Transition Phases
- Advantages
- Risks and Mitigations
- Comparison & Adoption
- Recommendations
- Examples
- Summary
Scope and Goals

Scope

• Leverage Cloud To Enable ITOTS’ Cloud Initiative
• Engage Cloud Vendors to provide an optimal solutions for ITOTS Clients

Goal

• Lower Total Cost of Ownership
• Achieve Policy Compliance
• Improve Flexibility and Responsiveness to Demand
• Achieve Elasticity and Economies of Scale
• Secure/Protect Client’s Information (Assets)
Vision / Mission / Strategy

Vision
“To create a robust, secure, integrated, easy to use, and efficient IT infrastructure that supports various business units in their execution of the ITOTS’ mission”

Mission
“To define, deploy, manage, sustain, and protect an integrated IT infrastructure that ensures appropriate access, storage, processing, and security of data used by ITOTS employees, business partners Worldwide”

Strategy
“Improve efficiencies (cost, performance, …) and become a World Class IT Infrastructure by working together to mature from a project based to a Service-Oriented Infrastructure (SOI)”
Technology (Brief Cloud Overview)

<table>
<thead>
<tr>
<th>Models</th>
<th>Types</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software as a Service (SaaS) is a virtualized web application</td>
<td>Private (Sole property of a single organization)</td>
<td>On-demand self-service</td>
</tr>
<tr>
<td>Platform as a Service (PaaS) is a programming environment</td>
<td>Community (Shared property of multiple organizations with similar mission or interest)</td>
<td>Broad network access</td>
</tr>
<tr>
<td>Infrastructure as a Service (IaaS) is an operating environment</td>
<td>Public (Property of cloud provider and open to everyone)</td>
<td>Resource pooling</td>
</tr>
<tr>
<td></td>
<td>Hybrid (Integration of private, community, and/or public clouds)</td>
<td>Rapid elasticity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured Service</td>
</tr>
</tbody>
</table>
Policies and Regulations

OMB
- **25-Point Plan**
  Vivek Kundra - U.S. Chief Information Officer “The Federal Government must be better prepared in the future. Beginning immediately, the Federal Government will shift to a “Cloud First” policy. The three-part strategy on cloud technology will revolve around using commercial cloud technologies where feasible, launching private government clouds, and utilizing regional clouds with state and local governments where appropriate.”
- OMB wants every agency to identify three “must move” technologies that will go to the cloud by March, move at least one of them by the end of 2011, and the other two within 18 months.

FDCCI
- The FDCCI is aimed at assisting agencies in identifying their existing data center assets and formulating detailed consolidation plans.

NIST
- **Guidelines on Security and Privacy in Public Cloud Computing (SP 800-144)**
  Provides an overview of the security and privacy challenges for public cloud computing.
- **NIST Special Publication (SP 800-145)**
  Provides the NIST definition of cloud computing.

FedRamp
- Provides a standard approach to Assessing and Authorizing (A&A) cloud computing services and products.
Prioritization Criteria

• Ease of Deployment
  • Minimize risk and produce quick results by giving preference to less complex, independent systems

• Compliance with FISMA & NIST Policies
  • Consider systems with policy restrictions lenient enough to support adoption in the cloud

• Behavioral Changes & New Skills Required by End-Users
  • Avoid any lapse to productivity by selecting transitions that can be transparent to end-users and support staff

• Greatest and Fastest Return on Financial Investment
  • Focus on immediate relief for budgetary strain
## IT Services Model

### Information Services

#### Business Intelligence
- Dashboard and Scorecards
- Advanced Analytics and Data Mining
- Document Management
- Content Management

#### Collaboration
- Presence
- Instant Messaging
- Conferencing and Virtual Meetings

#### Information Management
- Search
- File Transfer
- Directory

### Application Services

#### Developing Products
- Managed Self-Service BI Tools
- Operational BI
- Accounts Management
- Loan Management

#### Line of Business Systems
- Product Lifecycle Management
- Project Management
- Portfolio Analysis
- Loan Management

#### Managing the Enterprise
- Business Intelligence
- Dashboard and Scorecards
- Managed Self-Service BI Tools
- Business Intelligence

### Infrastructure Services

#### Computing Platform
- Desktop
- Mobile
- Server
- Storage

#### Data Management
- Databases
- OLAP
- Replication
- Backup

#### Communication
- E-mail
- Fax
- Voice

### Security

#### Directory
- Identity Management
- Information Access

#### Connectivity and Networking
- Wired
- Wireless
- Internet

### Data Consolidation and Integration

#### Data Warehouse
- Data Transformation
- Data Mapping
- Indexing

#### Content Management
- Archiving
- Publishing

### Operations

#### Support
- Incident Management
- Help Desk
- Desk side Assistance

#### Administration
- Security
- Services Directory
- Data Restore

#### Monitoring, Reporting, Alerting
- Availability
- Capacity
- Security

#### Self Service
- New Hire
- Office Move
- Purchasing
- Distribution List Management

### Organization Services

#### Portfolio Management
- Strategic Planning
- Workforce Management
- Asset Management

#### Engineering
- Architecture Management
- Solution Development
- Configuration Management

#### Delivery Management
- Change Management
- Supplier Management

### Common Services For all Users
- Financial Management
- Governance
- Configuration Management
- IT Services Model
- IT Services Model
- Common Services For all Users
- Priority Service

- Virtually All These Services Can Be Cloud-based

- Priority Service

- Virtually All These Services Can Be Cloud-based
Phased Transition

3-6 months
- Web Hosting
- Document Management
- Email
- Storage Provisioning Service

6-12 months
- Desktop Provisioning Service
- Test Infrastructure Provisioning
- Non-Critical Line of Business Applications

12-18 months
- Critical Line of Business Applications
- Legacy Applications
- Virtual Machine Provisioning Service
## Suggested Transition – Detail (cont.)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Service</th>
<th>Service Description</th>
<th>Cloud Vendor</th>
<th>Service Type</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Website Hosting</td>
<td>Web-based applications and services. (.com, .gov, etc)</td>
<td>• Accenture</td>
<td>IaaS</td>
<td>In Progress</td>
</tr>
<tr>
<td>2</td>
<td>Document Management</td>
<td>Collaboration and document management portals such as Microsoft SharePoint.</td>
<td>• Office 365</td>
<td>SaaS</td>
<td>3-6 months</td>
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<td></td>
<td></td>
<td></td>
<td>• Google Apps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Email</td>
<td>Email service provided by internal Exchange system.</td>
<td>• Office 365</td>
<td>SaaS</td>
<td>3-6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Google Apps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Storage Provisioning Service</td>
<td>Provisioning of storage resources to meet disk space, throughput, and IOPs requirements. Storage RFP is currently in place to accomplish this goal.</td>
<td>• Rackspace.com</td>
<td>IaaS</td>
<td>3-6 months</td>
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<td></td>
<td></td>
<td></td>
<td>• GoGrid.com</td>
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<td></td>
<td></td>
<td></td>
<td>• Amazon AWS</td>
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<tr>
<td>5</td>
<td>Desktop Provisioning Service</td>
<td>Delivery of the desktop computing environment in a variety of form factors (thick client, zero-client, tablet, smart phone)</td>
<td>• Rackspace.com</td>
<td>IaaS</td>
<td>6-12 months</td>
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<td></td>
<td></td>
<td></td>
<td>• GoGrid.com</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Amazon AWS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Test Infrastructure Provisioning</td>
<td>Test environment resources for custom application development and third party software solutions development.</td>
<td>• Amazon AWS</td>
<td>PaaS</td>
<td>6-12 months</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>• Force.com</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Windows Azure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Non-Critical Line of Business Applications</td>
<td>Business applications that do not fall within the 14 Critical Business Processes (CBP). (Business Intelligence, OLAP, Collaboration tools, Lifecycle Management, CRM)</td>
<td>• Amazon AWS</td>
<td>PaaS</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Force.com</td>
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<td></td>
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<td></td>
<td>• Windows Azure</td>
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<tr>
<td>8</td>
<td>Critical Line of Business Applications</td>
<td>Business applications that fall within the 14 CBPs. (AIMS, ACS, CADE)</td>
<td>• Amazon AWS</td>
<td>PaaS</td>
<td>12-18 months</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Force.com</td>
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<td></td>
<td></td>
<td>• Windows Azure</td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td>Legacy Applications</td>
<td>Applications developed using legacy coding techniques that are difficult to port to modern frameworks.</td>
<td>• Amazon AWS</td>
<td>PaaS</td>
<td>12-18 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Force.com</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Windows Azure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Virtual Machine Provisioning Service</td>
<td>Delivery of virtual machines for projects required to manage operating system resources.</td>
<td>• Rackspace.com</td>
<td>IaaS</td>
<td>12-18 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• GoGrid.com</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Amazon AWS</td>
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</tbody>
</table>
Advantages

- **Low Total Cost of Ownership**
  - Offset facilities, operations, maintenance costs
  - Selective Service saved ~1.6 million over 3 years by moving to a private cloud

- **High Availability**
  - Negotiated RTO RPO

- **Improved Mobility**
  - Increased access to personal computing environment

- **Rapid Deployment to New Technology**
  - Effortless transition to new messaging systems

- **Scalability**
  - On-demand access to system resources as needed

- **Improved Performance**
  - Optimally configured services based on design best practices
## Risks and Mitigations

<table>
<thead>
<tr>
<th>Risk</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Security / Privacy</strong></td>
<td>• Secure with cryptography, using data at rest and transport encryption methods</td>
</tr>
<tr>
<td></td>
<td>• Well documented end of life data destruction and disposal</td>
</tr>
<tr>
<td></td>
<td>• Evaluate service provider's security policy</td>
</tr>
<tr>
<td></td>
<td>• Promote Cyber Security Awareness</td>
</tr>
<tr>
<td><strong>Dependencies and Compatibility</strong></td>
<td>• Identify the assets</td>
</tr>
<tr>
<td></td>
<td>• Analyze the dependencies</td>
</tr>
<tr>
<td></td>
<td>• Conduct post application and system evaluations</td>
</tr>
<tr>
<td><strong>System-Wide Failure</strong></td>
<td>• Implement plans for failover mechanisms</td>
</tr>
<tr>
<td></td>
<td>• Implement Business Continuity</td>
</tr>
<tr>
<td></td>
<td>• Implement Disaster Recovery</td>
</tr>
<tr>
<td><strong>Insufficient network-based controls / latency and bandwidth</strong></td>
<td>• Review service provider IP-based network zoning policies to ensure the ability to properly monitor network service level</td>
</tr>
<tr>
<td></td>
<td>• Provide sufficient network-base controls to distinguish network traffic</td>
</tr>
<tr>
<td></td>
<td>• Upgrade WAN capacity as needed to achieve acceptable service levels for end users</td>
</tr>
</tbody>
</table>
Key Private Cloud Migration Issues (i.e. Risk)

- **GOTS Applications**
  - Most are not ready for application virtualization. They must be able to run on the standard offered environment or modifications are required with time and cost money impact. Similar problems may occur with COTS Applications

- **Infrastructure**
  - The IT Infrastructure is evolving with the ability to offer true cloud services, but the timetable is presently 2+ years. Acceleration of this evolution is necessary to achieve cloud benefits gained through resource sharing
    - Processing - to establish a virtual environment using clustered operating systems
    - Storage and Backup - to establish a “Storage/Backup as a Service” plan
    - Networking - to support workload caused by Load-Sharing, Desktop Virtualization, and increased remote access
    - Workstations – to implement Virtual Desktops with Persona Management
  - We can define a Federal Cloud (e.g. Private, Public, Hybrid) by encompassing all of the criteria mentioned, pending additional characteristics, such as elasticity and measured service
## Cloud Vendor Comparison

<table>
<thead>
<tr>
<th>Provider</th>
<th>Service Type</th>
<th>Age of Service</th>
<th>Virtualization Platform</th>
<th>Availability</th>
<th>Pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Web Services</td>
<td>IaaS</td>
<td>Since Early 2006</td>
<td>Modified Xen</td>
<td>99.99%</td>
<td>Per Instance Hour</td>
</tr>
<tr>
<td>Office 365</td>
<td>SaaS</td>
<td>Since June 2011 (Formerly “BPOS”)</td>
<td>Modified Hyper-V</td>
<td>99.9%</td>
<td>User / month</td>
</tr>
<tr>
<td>force.com</td>
<td>PaaS</td>
<td>Since 2007</td>
<td>Undisclosed</td>
<td>99.9%</td>
<td>User / month</td>
</tr>
<tr>
<td>Windows Azure</td>
<td>PaaS</td>
<td>Since October 2008</td>
<td>Modified Hyper-V</td>
<td>99.9%</td>
<td>Compute, Storage, Storage transactions, Data transfers</td>
</tr>
<tr>
<td>Google</td>
<td>PaaS</td>
<td>Since July 2008</td>
<td>Undisclosed</td>
<td>100%</td>
<td>Outgoing bandwidth, Incoming bandwidth, CPU time, Stored data, Recipients emailed</td>
</tr>
<tr>
<td>Rackspace</td>
<td>IaaS</td>
<td>Since 2006</td>
<td>Xen</td>
<td>100%</td>
<td>Outgoing bandwidth, Incoming bandwidth, Instance hour, Backed up data, Public IP addresses</td>
</tr>
<tr>
<td>GéGRID</td>
<td>IaaS</td>
<td>Since March 2008</td>
<td>Xen</td>
<td>100%</td>
<td>RAM usage, Outgoing bandwidth, Data storage</td>
</tr>
</tbody>
</table>
# Federal Government Cloud Adoption

<table>
<thead>
<tr>
<th>Agency</th>
<th>Vendor</th>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Treasury</td>
<td>Amazon</td>
<td>AWS</td>
<td>Cloud hosting of Treasury.Gov web portal.</td>
</tr>
<tr>
<td>GSA</td>
<td>Google</td>
<td>Google Apps</td>
<td>Cloud-based email and collaboration tools for 17,000 GSA employees. $6.7 million five-year contract.</td>
</tr>
<tr>
<td>State Department</td>
<td>Salesforce.com</td>
<td>Force.com</td>
<td>Implementation of a financial tracking solution that includes access to reports using mobile devices. Average annual TCO of $475,564.</td>
</tr>
<tr>
<td>Department of the Army Experience Center</td>
<td>Salesforce.com</td>
<td>Salesforce.com</td>
<td>CRM solution tracks recruits as they work with the Center. The cloud-based solution has been implemented at the cost of $54,000 compared to $500,000 for a traditional CRM deployment.</td>
</tr>
<tr>
<td>USDA</td>
<td>Microsoft</td>
<td>Office 365</td>
<td>Microsoft’s Exchange, SharePoint, Office Communications, and Live Meeting online services for 100,000 employees and 20,000 contractors.</td>
</tr>
<tr>
<td>Executive Office of the President</td>
<td>Amazon</td>
<td>AWS</td>
<td>Cloud hosting of Recovery.Gov web portal.</td>
</tr>
<tr>
<td>Selective Service System</td>
<td>Savvis / Microsoft</td>
<td>Private Cloud &amp; Office 365</td>
<td>Deployment of private cloud to support the agencies initiative for collaboration and infrastructure services.</td>
</tr>
<tr>
<td>Department of Energy</td>
<td>Google</td>
<td>Google Apps</td>
<td>The Lawrence Berkeley Lab has deployed over 5,000 mailboxes.</td>
</tr>
</tbody>
</table>
Recommendations

IT Environments should start moving into the cloud computing environment to take advantage of **virtualization technology and economies of scale**, but slowly with caution as there are many known and unknown security and privacy related concerns.

- Conduct further research to evaluate suitable cloud providers
- Perform security assessment against data to determine cloud readiness of systems
- Evaluate infrastructure compatibility for cloud transition
- Develop and define testing solutions in a demo/prototypical environment
- Implement “secured” cloud solutions using security tools to determine weaknesses where threats/vulnerabilities can be mitigated
ITOTS Cloud Monitoring Solution (ex.)
ITOTS Physical Design (ex.)
Summary

Cloud computing represents a new standard for the deployment and delivery of IT services. These changes are similar to any significant changes to any organization. **People, Process and Technology** is the main factors for the success of any organization.

IT environments should start moving into the cloud computing environment to take advantage of **virtualization technology and economies of scale**, but slowly with caution as there are many known and unknown security and privacy related concerns.

Conduct complete market research and request for information from the industry to evaluate the best possible option to satisfy potential security issues. At the same time, ITOTS should reevaluate companies infrastructure risk management program. Cloud computing introduces additional risks that must be considered and managed, including security, compliance, monitoring, operational dependency, and others.

At this point, the best possible solution for ITOTS is the “safe secure cloud” option that could be used amongst all IT business units. In this way the IT organizations could reap the benefits of cloud computing with minimal impact to operations.