Data Center Consolidation
Disaster Recovery
Cloud Computing

Discussion and Overview

September 9, 2010
Discussion Topics

Develop a national data center consolidation and disaster recovery plan

- Data Center Consolidation
  - Power
  - Facility Planning
  - Facility Requirements

- Data Center Infrastructure Plan
  - Primary processing sites
  - Disaster recovery

- Move to Virtualization and Cloud Technologies
Government Data Center Reviews

- Individual ministries and agencies are operating critical national systems and applications in small computer rooms and server closets.
- Data is either backed up locally (not offsite) or not backed up at all.
- Limited or no redundancy for applications, power and telecom.

Pacific Tier Interviews in Vietnam, Indonesia, Moldova, Hawaii, Mongolia.
MEMORANDUM FOR CHIEF INFORMATION OFFICERS

FROM: Vivek Kundra
Federal Chief Information Officer

SUBJECT: Federal Data Center Consolidation Initiative

The reported number of Federal data centers grew from 432 in 1998 to more than 1,100 in 2009. This growth in redundant infrastructure investments is costly, inefficient, unsustainable and has a significant impact on energy consumption. In 2006, Federal servers and data centers consumed over 6 billion kWh of electricity and without a fundamental shift in how we deploy technology it could exceed 12 billion kWh by 2011. In addition to the energy impact, information collected from agencies in 2009 shows relatively low utilization rates of current infrastructure and limited reuse of data centers within or across agencies. The cost of operating a single data center is significant, from hardware and software costs to real estate and cooling costs.

The Federal Data Center Consolidation Initiative aims to address these challenges by leveraging best practices in the public and private sector. The focus of this initiative is to:

- Promote the use of Green IT by reducing the overall energy and real estate footprint of government data centers;
- Reduce the cost of data center hardware, software and operations;
- Increase the overall IT security posture of the government; and
- Shift IT investments to more efficient computing platforms and technologies.
“The starting point is this: in central government we have 130 data centers. Following a survey of central government’s insourced and outsourced data centers, we asked the question: ‘Do you need 130?’”

“The analysis was done by IT industry trade body Intellect. It said that we could significantly reduce the number from 130 to something like 10-12.”

(John Suffolk/UK)
Data Center Consolidation

VISION: Create a whole-of-government approach to data centers, disaster recovery, and business continuity. Provides standards and integration of the government’s ICT infrastructure matching a wide range of government information needs in an optimal manner with regard to interoperability, development agility, cost, energy use, and operations.

- Adopt modern technologies and practices that will improve the effectiveness and efficiency of data center use
- Consolidate data centers in a model that will reduce duplication and un-necessary costs for base ICT infrastructure
- Match national objectives and business needs to ICT utility and protection of national data
## Consolidation Initiatives

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<thead>
<tr>
<th>Consolidation Type</th>
<th>Objectives</th>
<th>Cost Savings</th>
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| Physical Consolidation   | • Reduce number of data centers through national data center colocation  
                           • Migrate equipment to national data center locations with more favorable operating costs                                                                                           | • Facility costs  
                           • Hardware and Software maintenance  
                           • Non-application specific admin staff  
                           • Reduced unit costs                                                                                                                             |
| Equipment Consolidation  | • Replace existing hardware systems with a national standard                                                                                                                                               | • Hardware costs  
                           • Hardware maintenance  
                           • Reduced unit costs                                                                                                                             |
| Server/Storage           | • Optimize the number of existing hardware platforms  
                           • Replace low-end and inefficient servers with higher performance and cheaper systems  
                           • Share backup, mirroring, and disaster recovery platforms                                                                                     | • Number of servers  
                           • Number of storage and backup devices  
                           • Hardware maintenance  
                           • Storage systems  
                           • Reduced unit costs                                                                                                                             |
| Applications Library     | • Standardize basic applications used across government                                                                                                                                                   | • Software maintenance  
                           • Software licensing  
                           • Immediate availability                                                                                                                                                                      |
| Communications           | • Provide multiple carriers and service providers to interconnect facilities/users  
                           • High level of communications redundancy to provide 100% availability                                                                                                                           | • Promotes price competition                                                                                                                           |
Sun Consolidation Example

The Economics of DC Consolidation

- Consolidated multiple European data centers into a single, UK facility
  - Achieved an 80% operational space reduction
  - 50% reduction in electrical power and cooling costs

- On a worldwide level the move to new technology has enabled Sun to:
  - Reduce 267,000 square feet of data centre to 133,000 sqft
  - Save around 4,100 tonnes of CO2 per year

- Consolidated design
  - Cut power costs by 66%
  - Increased processing power by around 450% (w/virtualization)
Consolidation Supports Risk Management

Centralized risk management
- Continuous monitoring (including security)
- Immediate nation-wide response to disasters

Cost savings
- Single point of contact for vendor support
- Rapid expansion and technology agility
- Standardization and Interoperability
## Why Some Resist Consolidation

<table>
<thead>
<tr>
<th>Obstacles or Challenges</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Workforce resistance to change</td>
<td>89.7%</td>
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<tr>
<td>Agencies’ desire to remain autonomous</td>
<td>86.2%</td>
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<td>Problems experienced in moving localized devices away from current customer base</td>
<td>48.3%</td>
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<td>Backlash when consolidation didn’t meet specific business needs</td>
<td>20.7%</td>
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<tr>
<td>Higher than anticipated costs</td>
<td>17.2%</td>
</tr>
<tr>
<td>Seeking exemptions from state statutory and regulatory requirements</td>
<td>17.2%</td>
</tr>
<tr>
<td>Seeking exemptions from federal statutory and regulatory requirements</td>
<td>17.2%</td>
</tr>
<tr>
<td>Failure to identify and adhere to service levels</td>
<td>3.4%</td>
</tr>
</tbody>
</table>
Data Center Standards

- Standards differ primarily in terminology
- Recognized as the standard data center architecture for most enterprise
- Universally understood by construction, commissioning, and security
- Promotes standardization

ISO/IEC 24764, TIA-942, BICSI 002-2010

TIA-942 Relationship of Spaces within a Data Center
Disaster Recovery

Pacific-Tier Communications
Disaster Recovery Planning

- International DR/DRC/BCP standards
  - NFPA 1600 (Process and Planning)
  - ISO 24762
  - BS 25999 (UK)
  - COBIT/ITIL

- Main objectives
  - Safeguard data
  - Respond quickly
  - Restore operations

- Monitor
- React
- Restore
- Recover
Tiered Disaster Recovery Model

- **Tier 1: Data backup with no hot site**
  - Off-site storage facility
  - Manual process (tapes)

- **Tier 2: Data backup with a hot site**
  - Backups on tape
  - Restore systems from backup tapes in the event of a disaster
  - Recovery time is more predictable

- **Tier 3: Electronic vaulting**
  - Mission critical data is electronically vaulted
  - High-speed communication circuits connect to an automated tape library at a remote site

- **Tier 4: Point-in-time copies**
  - Disk-based backup
  - Higher frequency network backups to disks

- **Tier 5: Transaction integrity**
  - Consistency of data between the production and recovery data centers
  - Little to no data loss in such solutions
  - Dependent on the application in use.

- **Tier 6: Zero or near-zero data loss**
  - Highest levels of data currency – disk mirroring

- **Tier 7: Highly automated, business integrated solution**
  - Integration of automation
  - Recovery of the applications is automated
  - No loss in application performance for end users
  - **Recommended** for critical government systems and applications

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**Tier – Zero**

No business continuity plan. There is no saved information, no documentation, no backup hardware, and no contingency plan. The time necessary to recover in this instance is unpredictable. In fact, it may not be possible to recover at all.

This applies to several ministry-level data centers visited over the past year.
Best DR/BCP Plan for Developing Nations

- Primary processing location
- Backup processing location
  - Mirrors primary processing location
  - Can be used for load balancing
- Remote storage and archival
  - Data files
  - SaaS library images
- Allows government operations continuity in the event of major disruption
Cloud Planning

Virtualization and Cloud Computing
Strategies for Developing Nation
eGovernment Plans
If an individual can create a free email account in a matter of minutes, and a small business can create its entire financial system online in a couple minutes, then why must the government spend billions of dollars building (similar) systems that may not be sensitive in nature?

Vivek Kundra, the US Government’s Federal Chief Information Officer
Issues and Concerns w/Clouds

- Security of government information
- Personal Privacy of citizens
- Availability and performance
- Management and control
- Migration planning

“Cloud computing is not a silver bullet, but offers a transformational opportunity to fundamentally reshape the operations of government and close the IT gap”

(Kundra)

Pacific-Tier Communications
Cloud Characteristics

- On-demand and self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

From NIST’s Cloud Computing Definition
What a Cloud Brings to Governments

- A manageable pool of compute and storage resource (IaaS)
- An environment allowing creation of virtual data centers (PaaS)
- Standardization and rapid provisioning of applications (SaaS)
- Greater control over security
- Greater control over OPEX/CAPEX
Government Benefits of SaaS

- Data is stored on protected media
- Reduce the cost of IT workstations and equipment
- Reduce the risk of viruses and malware
- Central management of software versions and updates
- Application and data standardization
- Enhance potential for systems integration and data transparency across agencies
- Shared network and telecom resources
Government Roles in Cloud

- Create national policies and standards
  - Data security
  - Data formats
  - Data and IT Governance

- Produce cloud computing solutions in support of government operations

- Provide guidance for both government and commercial initiatives
  - Strategic roadmaps
  - Best practices
  - PPPs
Moldova Issues

- Obsolete or unsupported h/w, s/w
- Incompatible systems
- Old or non-existent documentation
- Loss of skilled or experienced staff
- Inability to meet business requirements
- Data security shortfalls
  - Disaster recovery
  - Standard access controls
Potential Cloud Plan for Moldova

- **Distributed architecture**
  - Cloud processing mirrored in both primary and backup data centers
  - Both locations are real time
  - Disaster recovery is built into the distributed architecture

- **Processing on demand for ministries and other government agencies**
  - Virtual data centers
  - Storage and disaster recovery support

- **Standard applications library**
  - Provides standardized applications throughout national ICT infrastructure
  - Cheaper, maintainable, and promotes data mining for central government
  - Promotes hosted and “web-based” applications
  - Pushes storage and files into data center, away from laptops and unsecure media

- **Transparency**
The Road to Cloud – Moldova

- Short term – take away risk to data and facilities through central backup/DR and consolidation

- Cloud steps
  - Designate and empower CIO/ICT leadership
    - Project management
    - Operations management (could be CTS)
  - Develop project policy and priorities
  - Identify pilot projects
  - Process and integration engineering
  - Technology and standards development
  - Develop standardized applications
    - SaaS
    - Database

Where possible, re-engineer with Commercial-off-the-Shelf (COTS) software/applications or supported Open Source
Cloud High Level Applications

- Relieves the end-user from the burden of infrastructure
- Focus CAPEX/OPEX on core business
Questions?

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