Preservation, Archiving & Cloud Computing

Marc Hamilton
Global Technology Business Unit
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Welcome To Madrid
Things I Wished I Had Archived in Madrid

- Diego Velázquez's
  *Vieja friendo huevos*

- Tomás Luis de Victoria's *Officium Hebdomadae Sanctae*

- Miguel de Cervantes's
  *Don Quixote de la Mancha*
Everyone Is Talking About Cloud

How Cloud Computing Will Change Business

IBM, Qualcomm, Nokia, and other major companies along with startups are preparing to cash in on new technology. Not that it will be easy.

* Slide Show: Cloud Computing Meets the Smartphone

How Clouds Can Change Management

Jeremy Burton overhauled Serena Software computing—and transformed the management of the company.

Cloud Computing: Quality

OptumHealth’s eSync system assembles medical and drug records in one place and sends out alerts if it detects a potential problem.

Genentech’s Cloud Cover

Microsoft, the world's biggest software company, went from laughing at the idea to fighting it, giving warning that there might be legal risks associated with using open-source software and even calling it a "cancer" that threatened to harm the industry. Yet the popularity of open-source programs such as the Linux operating system continued to grow. The fact that Google, the industry’s new giant, sits on a
250+ Cloud Service Providers Have Adopted Oracle’s Platform for SaaS

“8 out of 10 SaaS vendors delivering business-critical applications run on Oracle.”  
– Nucleus Research
NIST Definition of Cloud Computing

Cloud computing is a model for enabling 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.

This cloud model promotes availability and is composed of:

5 Essential Characteristics
• On-demand self-service
• Resource pooling
• Rapid elasticity
• Measured service
• Broad network access

3 Service Models
• SaaS
• PaaS
• IaaS

4 Deployment Models
• Public Cloud
• Private Cloud
• Community Cloud
• Hybrid Cloud

Source: NIST Definition of Cloud Computing v15
SaaS, PaaS and IaaS

- **Software as a Service**: Applications delivered as a service to end-users over the Internet.
- **Platform as a Service**: App development & deployment platform delivered as a service.
- **Infrastructure as a Service**: Server, storage and network hardware and associated software delivered as a service.
Public Clouds and Private Clouds

Public Clouds:
- Used by multiple tenants on a shared basis
- Hosted and managed by cloud service provider
- Limited variety of offerings

Both offer:
- Lower *upfront* costs
- Economies of scale
- Simpler to manage
- OpEx

Private Cloud:
- Exclusively used by a single organization
- Controlled and managed by in-house IT
- Large number of applications

Both offer:
- Lower *total* costs
- Greater control over security, compliance & quality of service
- Easier integration
- CapEx & OpEx

Public Clouds:
- SaaS
- PaaS
- IaaS

Private Cloud:
- SaaS
- PaaS
- IaaS

Users
Amazon Web Services (AWS)

• Amazon Data Center in the Cloud
• Fast, easy, inexpensive renting of servers / storage
  - Elastic Compute Cloud (EC2) – Rent Linux virtual machines
    • 10-80 cents/hour
  - Simple Storage Service (S3) – Store files
    • 15 cents/GB/month (US)
    • 18 cents/GB/month (Europe)
  - Bandwidth Costs
    • 10 cents/GB incoming
    • 10 – 17 cents/GB outgoing (based on volume)
• Customers demand for Oracle products to run on AWS

http://aws.amazon.com
### AWS Costs vs Sample Storage Costs

<table>
<thead>
<tr>
<th></th>
<th>GB</th>
<th>Cost/GB</th>
<th>downloads /month</th>
<th>Months</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage</td>
<td>1000</td>
<td>$0.15</td>
<td></td>
<td>60</td>
<td>$9,000.00</td>
</tr>
<tr>
<td>Upload</td>
<td>1000</td>
<td>$0.10</td>
<td></td>
<td>60</td>
<td>$100.00</td>
</tr>
<tr>
<td>Download</td>
<td>500</td>
<td>$0.10</td>
<td>2</td>
<td>60</td>
<td>$6,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$15,100.00</td>
</tr>
</tbody>
</table>

- $100/TB Consumer 2TB drive
- $480/TB Dell Powervault 2TB drive
- $1500/TB Sun 7410 Unified Storage Server
- $80,000/TB Sun F5100 Flash Array
- $200/TB StorageTek T10000 tape
## Drive Reliability vs Bandwidth

<table>
<thead>
<tr>
<th>Consumer SATA Usage</th>
<th>OC Channel Speed</th>
<th>MB/Sec/Day – 1 PB</th>
<th>5PB</th>
<th>10PB</th>
<th>25PB</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00%</td>
<td>48</td>
<td>20.8M</td>
<td>8.8M</td>
<td>-6.1M</td>
<td>-51M</td>
</tr>
<tr>
<td>7.50%</td>
<td>48</td>
<td>19.8M</td>
<td>3.6M</td>
<td>-16.5M</td>
<td>-77M</td>
</tr>
<tr>
<td>5.00%</td>
<td>192</td>
<td>92.5M</td>
<td>80.5M</td>
<td>65M</td>
<td>20M</td>
</tr>
<tr>
<td>7.50%</td>
<td>192</td>
<td>91.5M</td>
<td>75.3M</td>
<td>55M</td>
<td>-5M</td>
</tr>
</tbody>
</table>

- Scenario, no local raid, drives geographically mirrored for availability
- Bandwidth simply doesn't handle recovery at scale

Henry Newman,
Sun Unified Storage 7000 series

The Ultimate Cloud Storage

- ZFS file system protects all data with 256 bit checksums
- ZFS data compression
- ZFS data de-duplication
- One of the only true lightweight quota systems
- Transparent flash optimization
44% of Large Enterprises Are Interested In Building An Internal Cloud

“What is your company’s highest level of awareness or interest in building and operating an internal “cloud” or pool of pay-per-use virtual servers?”

- Already implemented
- Interested and planning budget for it
- Not interested
- Implementing in the next 12 months
- Interested but no budget for it
- Not aware (includes “don’t know”)

Enterprise (1,000+ employees):
- 4% already implemented
- 4% interested and planning budget
- 13% not interested
- 23% implementing in the next 12 months
- 33% interested but no budget
- 23% not aware
(N=962)

Mid-market (100-999 employees):
- 4% already implemented
- 12% interested and planning budget
- 21% not interested
- 38% implementing in the next 12 months
- 25% interested but no budget
- 1% not aware
(N=741)

VSE (2-99 employees):
- 1% already implemented
- 6% interested and planning budget
- 12% not interested
- 41% implementing in the next 12 months
- 33% interested but no budget
- 1% not aware
(N=982)

Base: North American and European hardware decision-makers at enterprises, mid-market, and very small businesses

Why Are Enterprises Interested in Cloud? What Are the Challenges Enterprises Face?

Benefits

Q: Rate the **benefits** commonly ascribed to the 'cloud'/on-demand model
(1=not important, 5=very important)

- **Speed**
  - Easy/fast to deploy: 63.9%
  - Pay only for what you use: 61.5%
  - Less in-house IT staff, costs: 57.0%
  - Low monthly payments: 53.3%
  - Offers the latest functionality: 50.0%
  - Encourages more standard IT: 46.3%
  - Sharing systems/information simpler: 43.4%
  - It's the way of the future: 29.1%

- **Cost**

Challenges/Issues

Q: Rate the **challenges/issues** ascribed to the 'cloud'/on-demand model
(1=not significant, 5=very significant)

- **Security**
- Performance: 63.1%
- Availability: 63.1%

- **QoS**
- Hard to integrate with in-house IT: 61.1%
- Not enough ability to customize: 55.8%
- Worried on-demand will cost more: 50.4%
- Bringing back in-house may be difficult: 50.0%
- Regulatory requirements prohibit cloud: 49.2%
- Not enough major suppliers yet: 44.3%

Oracle Cloud Computing Strategy

Our objectives:
- Ensure that cloud computing is fully enterprise grade
- Support both public and private cloud computing – give customers choice

Offer Applications deployed in private shared services environment or via public SaaS
Offer Technology to build private clouds or run in public clouds
Oracle Cloud Computing Strategy

Oracle Applications On Demand

Public Clouds

Oracle Technology in public clouds

Private Cloud

Users

Oracle Private PaaS
Why Enterprise Private PaaS

• Why Cloud?
  - Agility and speed
  - Efficiency and cost

• Why Private?
  - Security
  - Compliance
  - Control (particularly over QoS)
  - Easiest evolution of existing expertise and practices

• Why Platform?
  - Maximizes component re-use
  - Minimizes hand coding
  - Maximizes flexibility and control
Private PaaS with Oracle
Most Comprehensive, Open and Integrated Offering

Shared Components
Self-Service Interface

Oracle PaaS Foundation

Oracle Fusion Middleware
Oracle Enterprise Linux
Oracle VM
Oracle Enterprise Manager
Oracle Database
Oracle Middleware
What: Oracle Cloud Platform for PaaS

Platform as a Service

- Third Party Applications
- Oracle Applications
- ISV Applications

Shared Services

- Integration: SOA Suite
- Process Mgmt: BPM Suite
- Security: Identity Mgmt
- User Interaction: WebCenter

Application Grid: WebLogic Server, Coherence, Tuxedo, JRockit

Database Grid: Oracle Database, RAC, ASM, Partitioning, IMDB Cache, Active Data Guard, Database Security

Infrastructure as a Service

- Oracle Solaris Systems
- Oracle VM for SPARC (LDom)
- Solaris Containers
- Oracle Enterprise Linux
- Oracle VM for x86

Servers

Storage

Cloud Management

- Oracle Enterprise Manager
- Configuration Mgmt
- Lifecycle Management
- Application Performance Management
- Application Quality Management
- Ops Center
- Physical and Virtual Systems Management
How: Enterprise Evolution To Cloud

Public Cloud Evolution

Private Cloud Evolution

Silo’d
- Physical
- Dedicated
- Static
- Heterogeneous

Grid
- Virtual
- Shared services
- Dynamic
- Standardized appliances

Private Cloud
- Self-service
- Policy-based resource mgmt
- Chargeback
- Capacity planning

Hybrid
- Federation with public clouds
- Interoperability
- Cloud bursting
Cloud Security Challenges

- **Private Cloud**
  - IT agility
  - B2B collaboration
  - Access control complexity
  - Privileged user access

- **Hybrid Cloud**
  - Interoperability
  - User experience
  - Workload portability

- **Public Cloud**
  - Data breaches
  - Multi-tenancy
  - Data location
  - Compliance
Security with Oracle Cloud Platform

Application 1
Application 2
Application 3

Platform as a Service

Shared Services
- Integration: SOA Suite
- Process Mgmt: BPM Suite
- User Interaction: WebCenter

Application Grid: WebLogic Server, Coherence, Tuxedo, JRockit

Database Grid: Oracle Database, RAC, ASM, Partitioning, IMDB Cache, Active Data Guard

Infrastructure as a Service

- Operating Systems: Oracle Enterprise Linux
- Virtualization: Oracle VM

Cloud Management

Oracle Enterprise Manager
- Configuration Mgmt: Assembly Builder, Capacity & Consolidation Planning
- Lifecycle Automation: Self-Service Provisioning, Policy-Based Resource Scheduling, Metering
- Application Performance Management: RUEI, SLA Management, Monitoring, Diagnostics
- Application Quality Management: Testing, Patch Management

Database Security

User Interaction: WebCenter

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Service-Oriented Security
Identity Services for the Cloud

Oracle Identity Management

- Identity Administration
- Role Management
- Directory Services
- Authentication
- Authorization
- Federation

Web Services

Oracle Apps

3rd Party/Custom Apps

Cloud Service Providers

- Discrete, easily consumable security services
- Rapid application security, improved IT agility
- Security seamlessly woven into applications
Identity Federation
Federated Single Sign-On

Oracle Identity Federation
- SAML 1.x
- SAML 2.0
  - Windows CardSpace
  - WS-Fed
  - OpenID

• Seamless SSO between on-premise and cloud applications
• Standards-based federation enables interoperability
• Rapid deployment
Multi-Tenant Data Management

- Privileged database and OS user/admin abuse
- Lost backups containing sensitive data or PII
- Network eavesdropping malware
- Application exploits
- Application by-pass
- Regulatory infractions
Database Security Defense-In-Depth

Encryption & Masking
- Advanced Security
- Secure Backup
- Data Masking

Access Control
- Database Vault
- Label Security

Monitoring
- Audit Vault
- Configuration Management
- Total Recall

User/Role Management
- Oracle Identity Management
Oracle Data Masking
Irreversible De-Identification

- Remove sensitive data from non-production databases
- Referential integrity preserved so applications continue to work
- Sensitive data never leaves the database
- Extensible template library and policies for automation
Exadata: Sun Oracle Database Machine
Database and Storage Platform for Cloud Computing

Flexible Capacity
- Grid architecture for scale-out of database and storage servers
- Smart Scan for offloading query processing to the storage layer
- Smart Flash Cache storage for real-time random I/O
- Data compression tuned for OLTP, Warehousing and Archival data
- Infiniband networking to support massive data transfers

Resource Sharing
- ASM (Automatic Storage Management) shares Exadata storage across all databases
- RAC (Real Application Clusters) shares large DBs across many nodes
- IORM (I/O Resource Management) allocates I/O bandwidth based on database or application priorities
- Instance Caging shares CPU for multiple databases within a node

All the Power of the Oracle Database
- Real Application Clusters, Backup/Recovery, Replication, Security, Partitioning, Large Objects, Enterprise Manager…
Oracle Leadership in Cloud Computing

• Oracle provides most complete, open and integrated cloud vision, strategy and offerings in the industry

• Cloud is the evolution of capabilities Oracle has been working on for more than a decade: grid computing, virtualization, shared services and management systems

• Oracle offers:
  - Technology to build private clouds or run in public clouds
  - Applications deployed in private shared services environment or via public SaaS