Cloud & DevOps Program
Big Group

March 13, 2015  Friday  2:00-3:00 p.m.  Science Center Hall A
Agenda

• Program Update (10 min)
  – General Accomplishments
  – Wave 1 Overview
  – Schedule
  – Minimum Viable Product

• Cloud Patterns Update (30 min)
  – Overview of Work
  – Demo
  – Outreach and How to Get Involved

• CloudEndure POC and BC/DR (10 min)
  – BC/DR Business Requirements
  – BC/DR POC: Test Criteria, Results, Cloud Support, Architecture
  – BC/DR Next Steps

• Questions & Answers (10 min)
Program Update: General Accomplishments

- Formally announced as a HUIT program Feb. 5
- Transitioned from part-time workgroup to full-time team located at 50 Church Street
- Completed first round of integrated planning to understand foundational work
- Created comprehensive administrative plan
- Wave 1 migration analysis and actions underway
- Program Increment 1 (six sprints) runs from March 9 to May 29
We are committed to moving 25 applications by the end of FY15.

- Apps were prioritized based on application team availability and technical patterns (Java/Tomcat, Apache/LAMP)
- Remaining ~50 apps will be evaluated after first 25 are migrated

<table>
<thead>
<tr>
<th>Group</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAM</td>
<td>Account App, App Admin, CAS Auth Engine, Claim App, Create/Manage ID, FindPerson API, Harvard LDAP, IdDB, Identity Service API, PIN2 Bridge, SailPoint IIQ, Shibboleth IdP, Phonebook, Public LDAP</td>
</tr>
<tr>
<td>INF</td>
<td>OID</td>
</tr>
<tr>
<td>ATS</td>
<td>QlikView (7), ACE, Muse, OARS, Course Catalog, Cross Reg, Winter Break, FCOI</td>
</tr>
<tr>
<td>LTS</td>
<td>Presto, Feedback</td>
</tr>
<tr>
<td>DR</td>
<td>Aleph (LTS), IAM, PeopleSoft (POC)</td>
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</table>
Program Update: Schedule

See the handout for the most recent schedule for PI-1 and PI-2.
Minimum Viable Product

What does “minimum viable product” really mean?

• Establishing the initial features needed to fulfill the proper release of a particular product
Minimum Viable Product: CloudOps

• Monitoring
• Logging
• Backups
Minimum Viable Product: DevOps

- SP Framework/Application Patterns
- CDP
- Data Management
- Security
- VPC
Minimum Viable Product: Admin

- Tagging
- Documentation
- IAM (roles)
- AWS Account
Cloud Patterns Update

• Overview of Work
• Demonstration
• Outreach and How to Get Involved
What Are Cloud Patterns?

Cloud patterns create application infrastructure in the cloud via a command-line interface from a library of standard patterns.
Cloud Patterns: Standard Pattern

- Encapsulates knowledge and best practices of infrastructure provisioning
- Reusable components wired together for specific use case of pattern
- Components parameterized — such as minimum number of servers in autoscaling group, or a specific AMI to use for LaunchConfiguration

Java Tomcat WebApp at AWS

- WebApp
  - AutoScaling
    - LaunchConfiguration
      - SecurityGroup
    - ELB
      - SecurityGroup
Cloud Patterns: Decorators

- Allows for more significant change or added behavior to standard patterns
- Example: Config decorator has been added to LaunchConfiguration to do additional configurations of instances after standard install, and DNS decorator sets the DNS name of the ELB

Java Tomcat WebApp at AWS with Decorators
Cloud Patterns: Outside vs. Inside the Box

We are discovering a sharp delineation:

• Structure outside the box is simpler and highly reusable
• More specifics inside the box — this seems to require a pluggable framework:
  – Configuration Management (SaltStack, Ansible, Puppet, etc.)
  – Deployment (CodeDeploy, Capistrano, S3, etc.)
  – Many of these tools are built for on-premise management models. How do we make these tools work well in the cloud with ephemeral resources?

Framework goal: Make it easy for end users, but also support the switching out of tools
Cloud Patterns: Stackable Patterns

The standard patterns have been built to allow one pattern to depend on another, enabling them to stack.
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Cloud Patterns: Stackable Patterns

The standard patterns have been built to allow one pattern to depend on another, enabling them to stack.
Cloud Patterns: Stacks and Services

Cloud Ops
- Logging
- Monitoring / Alerting
- Backup
- Other...

Base Stack
- ELB
- App

AWS / Services
- Messaging
- Search
- Session Management
- Communication
- Cache
- Scheduling

Legend:
- Default / Required
- Available Services
- Added Services
Cloud Patterns: Complex Stack with Services

Cloud Ops
- Logging
- Monitoring / Alerting
- Backup
- Other...

Base Stack
- ELB
- Web
- ELB
- App
- DB

AWS / Services
- Messaging
- Search
- Session Management
- Communication
- Cache
- Scheduling
Cloud Patterns: Demo

- Application stack definition for HelloWorld Java/Tomcat
- Create stack for HelloWorld Java/Tomcat with app deployment
- Show created stack and running application
Cloud Patterns: Pattern Support

Currently being developed:
• Java/Tomcat
• Python/GUnicorn
• Oracle/RDS

Next set of patterns:
• Windows
• Java/Weblogic
• MySQL/RDS
Cloud Patterns: CLI Support

Current:
• Mac OSX

Being developed:
• Windows
• Linux

Orchestration/CI:
• HUIT Cloud & DevOps Continuous Development Platform
• Jenkins
• AWS CodePipeline
Cloud Patterns: Outreach and How to Get Involved

Want to contribute and need to use now?
• Weekly Cloud Application Pattern Design Workgroup for early adopters and cloud users
• One-on-one workshops on creating patterns

Interested in learning more at your own pace?
• Wiki: https://wiki.harvard.edu/confluence/display/huitcloudpatterns
• Github: https://github.com/HUIT-Cloud-Services/huitcloudpatterns

For any of the above, email us to get access or participate!
Cloud Patterns: Outreach and How to Get Involved

Interested, but want someone to teach you?
• Cloud Technology Workshops in April
• Workshops targeted at specific roles and activities

Email us to get access or participate!
Business Continuance and Disaster Recovery: Technical Recommendation

Steve Martino
Agenda

• BC/DR Business Requirements — Sue Walsh

• BC/DR Proof of Concept
  – Test Criteria and Results
  – Vendor Cloud Support
  – Architectural Diagrams

• PeopleSoft & Aleph POC: High-Level Plan and Next Steps
BC/DR Business Requirements

**Goal:** Solutions to withstand a range of incidents and disasters.
- Embed and build DR design into cloud architecture/migration
- Build new systems to incorporate DR needs

**Current:** BC/DR for mission-critical services using SunGard Availability Services with some failover to 1 Summer St.

**Future:** BC/DR embedded as required into cloud designs and SaaS offerings to meet business needs.

For critical applications that may not migrate immediately, we are exploring a POC for replacing the current SunGard solution.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Sub-Goal</th>
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<tbody>
<tr>
<td><strong>Replace Current BC/DR Solutions</strong></td>
<td>Provide continuous data replication to geographically dispersed off-site data centers; Lower RTO and enhance RPO</td>
</tr>
<tr>
<td></td>
<td>Support (and enhance) Harvard’s cloud migration strategy</td>
</tr>
<tr>
<td></td>
<td>Integrate with Harvard’s network, security, server, and storage infrastructure</td>
</tr>
<tr>
<td><strong>Provide Future BC/DR Solutions for Harvard</strong></td>
<td>Provide on-prem to multi-cloud BC/DR capabilities (AWS, Azure, Google, etc.)</td>
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<td></td>
<td>Provide inter-cloud to cloud BC/DR capabilities (AWS regions)</td>
</tr>
<tr>
<td></td>
<td>Provide cloud-to-cloud BC/DR capabilities (AWS to Azure, etc.)</td>
</tr>
<tr>
<td><strong>BC/DR 1.0</strong></td>
<td>In FY15, provide BC/DR capabilities for PeopleSoft and Aleph (LTS)</td>
</tr>
</tbody>
</table>
The following vendor candidates were considered.

<table>
<thead>
<tr>
<th>Vendor Candidate</th>
<th>Product Description</th>
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</thead>
<tbody>
<tr>
<td>VMWare/vCloudAir</td>
<td>A public cloud platform built on vSphere, compatible with on-premise data centers, that includes infrastructure, disaster recovery, and various applications as service offerings</td>
</tr>
<tr>
<td>Cloud Velox</td>
<td>Key cloud migration and DR process are automated, reducing manual processes, costs, and risks for accelerated deployment, including physical and virtual app environments and data sets</td>
</tr>
<tr>
<td>CloudEndure</td>
<td>Disaster Recovery as a Service (DRaaS) to the cloud solves downtime without the ongoing high costs typically associated with DR; unlike snapshot-based solutions, CloudEndure enables consistent, real-time replication using continuous data protection</td>
</tr>
</tbody>
</table>
# POC Test Criteria & Results: CloudEndure

<table>
<thead>
<tr>
<th>POC Environment</th>
<th>OK?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Initial POC with HUIT test/dev OS and disk configurations</strong></td>
<td></td>
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<tr>
<td>Windows 2003 and virtual disk</td>
<td>Y</td>
<td>Host is VMWare Virtual Server and disk</td>
</tr>
<tr>
<td>Windows 2008 and virtual disk</td>
<td>Y</td>
<td>Host is VMWare Virtual Server and disk</td>
</tr>
<tr>
<td>Windows 2012 and virtual disk</td>
<td>Y</td>
<td>Host is VMWare Virtual Server and disk</td>
</tr>
<tr>
<td>Windows 2008 — RDM disk</td>
<td>Y</td>
<td>Host is VMWare Virtual Server with <strong>physical disk</strong></td>
</tr>
<tr>
<td>Red Hat Linux 5, 6, 7 virtual disk</td>
<td>Y</td>
<td>Host is VMWare Virtual Server and disk</td>
</tr>
<tr>
<td>Windows 2008 physical server (Dell R710 internal disk)</td>
<td>Y</td>
<td><strong>Physical server with physical internal disk</strong></td>
</tr>
<tr>
<td>Chaucer (Aleph Dev System) (33 LUNS)</td>
<td>Y</td>
<td><strong>Really big virtual server with physical disk</strong></td>
</tr>
<tr>
<td>Sun Microsystems</td>
<td>n/a</td>
<td><strong>All three vendors tested do not support Sun OS</strong></td>
</tr>
<tr>
<td><strong>2. Create automated load balancer</strong></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td><strong>3. Test Bluecoat proxy traversal</strong></td>
<td>Y</td>
<td><strong>NO SOC managed systems are directly connected to the Internet</strong></td>
</tr>
<tr>
<td><strong>4. Basic OS readiness (AWS replica)</strong></td>
<td>Y</td>
<td><strong>System will boot</strong></td>
</tr>
<tr>
<td><strong>5. App readiness (AWS replica)</strong></td>
<td>Y</td>
<td><strong>Shavlik (Dell R710 Above and Chaucer on CloudEndure</strong></td>
</tr>
</tbody>
</table>
## BC/DR POC: Vendor Cloud Support

### Public and Private Cloud Support (DR)

<table>
<thead>
<tr>
<th>Movement</th>
<th>On-Prem &lt;--&gt; VMWare VCloudAir</th>
<th>On-Prem &lt;--&gt; AWS</th>
<th>On-Prem &lt;--&gt; Azure</th>
<th>On-Prem &lt;--&gt; Rackspace OpenStack</th>
<th>On-Prem &lt;--&gt; CloudStack</th>
<th>AWS Region &lt;--&gt; AWS Region</th>
<th>Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested</td>
<td></td>
<td>Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Tested</td>
<td></td>
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<tr>
<td>AWS Region &lt;--&gt; Azure</td>
<td></td>
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<td></td>
<td>Tested</td>
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<tr>
<td>AWS Region &lt;--&gt; OpenStack</td>
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<td></td>
<td>Tested</td>
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<tr>
<td>AWS Region &lt;--&gt; CloudStack</td>
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<td></td>
<td></td>
<td>Tested</td>
<td></td>
</tr>
<tr>
<td>VMWare vCloudAir &lt;--&gt; AWS Region</td>
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<td></td>
<td>Tested</td>
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</tbody>
</table>

### Public and Private Cloud Support (On-Prem --> Migration)

<table>
<thead>
<tr>
<th>Movement</th>
<th>On-Prem --&gt; AWS Region</th>
<th>On-Prem --&gt; CloudStack</th>
<th>VMWare vCloudAir --&gt; AWS Region</th>
<th>Not Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWS Region &lt;--&gt; Azure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWS Region &lt;--&gt; OpenStack</td>
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</tbody>
</table>

### Public Cloud Support (Cross-Cloud <--> Migration)

<table>
<thead>
<tr>
<th>Movement</th>
<th>AWS Region &lt;--&gt; AWS Region (In-Cloud)</th>
<th>AWS Region &lt;--&gt; Azure (Cross-Cloud)</th>
<th>Not Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested: Creates ELB, EC2, IAM, Security Groups, Storage, etc.</td>
<td></td>
<td></td>
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</table>

### Additional Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Q2</th>
<th>Point-in-Time Recovery</th>
<th>TESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tagging on Instance Creation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Point-in-Time Recovery</td>
<td></td>
<td></td>
<td>Tested</td>
</tr>
</tbody>
</table>
The replication from AWS Snapshots begins!!! All data synced over port 1500 is AES 256 bit encrypted!!!

Replication surve Manage AWS Snapshots Show The Syncs Synchronized Data And Use These Snapshots To Create The AWS Instances And Storage When A DR Situation Occurs.

By selecting “Create Replica” for a particular system, CloudEndure creates EC2 instances with EBS storage volumes with the latest data from On-Prem.
Create Replica Options

Specify existing or new subnet/VPC the replica will use
Specify IP address that the replica server will use
Specify instance type that the replica server will use
Specify public IP (if necessary) that the replica server will use
Specify storage type that the replica will use
Create Replica Options

In addition to the most recent (Latest) state of the continuous sync, the following points are available:

- Once every 10 min for the past hour
- Once every hour for the past day
- Once every day for the past month

**Point in Time Recovery** brings you back to the OS state, VPC configuration, subnets, security groups, etc., from that point.
PeopleSoft & Aleph POC: High-Level Plan & Next Steps

1. Perform initial POC with test/dev systems ✔
2. Create AWS VPC network and security infrastructure for BC/DR
3. Work with PeopleSoft and Library business owners
   a. Identify core systems
   b. Identify on-prem supporting systems
   c. Identify network and security requirements in AWS
4. Create BC/DR test plan
5. Perform CloudEndure client installation
6. Perform PeopleSoft/Aleph DR test
7. Adjust BC/DR test plan for PeopleSoft and Aleph
Questions & Answers
Thank you!