Cloud 101
Lunch and Learn
September 24, 2013
Contents

- What is the cloud
- How did it come into existence
- Types of cloud service
- Advantages and Challenges
- Penn’s approach to Cloud Computing
“The Cloud”?

- Gmail, G+, Android
- Constant Contact / Mail Chimp
- Doodle
- SalesForce.com
- Box / Dropbox / Crashplan
- Facebook
- Office 365, Azure
- Amazon Web Services
Services provided through the internet

Cloud Services provided through the internet

internet

“Your” data

“Your” data

“Your” data
“The Cloud”? 

- Systems connecting to a network were diagrammed with a ‘cloud’ shape
- Services offered through ‘the internet’ are ‘cloud’ services
- Any vendor providing services using the internet now has a ‘cloud’ service or offering
- Broadly 3 classes of services are recognized
  - Infrastructure as a service – IaaS
  - Platform as a service – PaaS
  - Software as a service – SaaS
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A little history
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Cloud
A little history
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The Service Stack

On Premises
- Application
  - Application Services
    - Database
    - Web Servers
    - Enterprise Bus
- OS
- Virtualization
- Servers / Storage
- Network
- Data Center

IaaS
- Application
- OS
- Virtualization
- Servers / Storage
- Network
- Data Center

PaaS
- Application
- OS
- Virtualization
- Servers / Storage
- Network
- Data Center

SaaS
- Application
- OS
- Virtualization
- Servers / Storage
- Network
- Data Center
Enablers

• Virtualization
  – Servers
  – Storage

• Increased Capacity
  – System Performance
  – Storage capacity, speed and size
  – Decreased power consumption

• Improved Internet Infrastructure
  – Bandwidth
  – Latency

• Distributed Computing
• Resource Abstraction
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Advantages

• Trade Capital Expense for Operational Expense
• Distributed Architectures made Easy
• Scalability is Built-In
• Decreased 'Time to Market'
• Fail early, Fail often
• Infrastructure Security vs. Application Security
CapEx vs. OpEx
Distributed Architectures

• Distributed Applications require a lot of plumbing
  – Geographically distributed data centers
  – Network connectivity
  – Replication
  – Load Balancing
  – Reliable storage

• Cloud vendors sweat the details
• Leverage scale to distribute costs needed
Distributed Architectures (example)

AWS Global Infrastructure
Scalability is Built-in

- Cloud vendor provides extensive virtualization
  - You never access any physical device
  - No rack and stack, physical restrictions, approval process
- Cloud vendor provides automated provisioning
  - Cloud vendor scale requires extensive automation
  - Monitoring, restart, recreate can all be automated
- Cloud vendor scale provides ‘unlimited’ growth
- Cloud vendor deals with millions of customers
- No need to purchase capital for your most successful case
Decreased 'Time to Market'

- No capital – no procurement
- Most cloud solutions can be used instantly
  - Ample capacity available
- Most are pay as you go, no upfront cost
  - Stop paying when you’re done
- Allow extensive infrastructures stood up quickly
  - Some allow full automation of application stack
- No 3rd party negotiation
  - Hardware, possibly software
Fail early, Fail often

- No upfront capital investment
- Small scale is inexpensive
- Throw away anything that doesn’t work
  - It’s all virtual/at vendor anyway
  - No cost once removed
- Try new approaches and see what works
- Bring solutions back on premises
  - Legal, compliance, confidentiality or security requirement
  - Excess capacity
Infrastructure Security vs. Application Security

• Cloud vendors manage security for their services
  – Dedicated staff
  – Generally built securely from the ground up
  – Frequent patches and updates

• Easy to leverage cloud vendor’s security

• Bespoke solutions are not part of that ‘package’!
  – Use Penn advocated security standards
  – Understand the vendor’s service and service levels
Challenges

- Variable Cost
- Development and Operational Paradigm Shift
- Privacy, Legal, Compliance
- Network Considerations
- Fluid space
Variable Cost

- Not always easy to predict
  - No one likes a budget that changes
- Turn off, or remove unused applications/data
- Try to understand your best case and worst case
- Realize that cloud costs are part of your operational costs, forever
- Big data vs. Data Obesity
Development and Operational Paradigm Shift

• Use what was purchased efficiently
  vs

• Build for elasticity
  – Develop for Elastic Infrastructure
  – DevOps takes a greater role

• Rip and Replace
  – Something always fails, just start new instance
Privacy, Legal, Compliance

• NSA
  – Nuff’ said

• Strong Contracts and SLAs are paramount
  – Vendor deals with many customers, may not align with Penn’s interests

• Use your Local Service Provider

http://www.upenn.edu/oacp/privacy/
http://www.upenn.edu/computing/security/index.php
http://www.upenn.edu/computing/security/cloud/index.php
Network Considerations

• Where is the service located
  – Physics still matter
  – Network topology matters

• Redundancy?

• Does the vendor charge for network ingress and egress to their service?
  – AWS!

• Confidentiality and Encryption
Fluid space

• Fail Early, Fail often!
  – Vendors will fail
    • http://www.wired.com/wiredenterprise/2013/09/nirvanix/
  – Vendors will change services quickly

• Decreased Time to Market!
  – Many startups
    • Consolidation is inevitable

• What’s my Exit Process?
  – How fast can we get our own data back?
  – In a format that’s usable without the vendor’s product/service

• Big data and analytics will change services
Miscellaneous

• Rip and Replace
• Cloud is green (http://cloudtimes.org/2012/10/28/how-green-is-cloud-computing-new-study/)
• New capabilities
  – 9-5 computing
  – Pilot light computing
  – DR on ice
• Big Data
• “Free”
  – http://blogs.law.harvard.edu/futureoftheinternet/2012/03/21/meme-patrol-when-something-online-is-free-youre-not-the-customer-youre-the-product/
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Penn Cloud Strategy

- **Establish formality of selection**
  - Repeatable processes for dealing with cloud vendors
  - “Team” necessary to identify and negotiate

- **Move beyond click-thru**
  - Negotiate Penn specific contracts

- **Portfolio of Trusted Providers**

- **Maintain market awareness**
  - Leverage Higher Ed collaborations

- **Provide optimal alternatives (in-house and external)**
  - Developing internal “cloudy” services

- **Provide guidelines, web presence, training and forums for knowledge sharing**
# Cloud Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Class</th>
<th>Example Vendors / Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute / Processing / High Performance Computing (HPC)</td>
<td>IaaS</td>
<td>Amazon Web Services (AWS)<em>, ISC Penn Cloud</em></td>
</tr>
<tr>
<td>Storage</td>
<td>IaaS</td>
<td>AWS*, Box*, Nasuni</td>
</tr>
<tr>
<td>Collaboration / Communication / Productivity / Office</td>
<td>SaaS</td>
<td>Google Apps, Box*, Office 365, SocialCast, Yammer</td>
</tr>
<tr>
<td>Platform Services</td>
<td>PaaS</td>
<td>Oracle, Microsoft Azure</td>
</tr>
<tr>
<td>Single Purpose Solutions**</td>
<td>Multiple</td>
<td>SAP (Learning Management Systems), Travel Expense Management</td>
</tr>
</tbody>
</table>

* Preferred Vendor
** Possibly non-cloud Vendor
Portfolio of Trusted Vendors

- AWS
- Google Apps
- Box
- Microsoft Office 365
- Canvas
Strategic Plan

• Cloud Strategy and community
  – Establish a standard repeatable process for cloud vendor selection.
  – Generate best practices guide for decisions involving local infrastructure, Amazon, Google, O365 and other options.

• Additional Cloud Providers
  – Continue to evaluate, select and negotiate next cloud providers with appropriately strong security and privacy protections.

• Cloud SIG
  – A forum for IT Professionals, Support Providers and others at Penn with an interest in cloud computing to determine current need, future directions and other potential use of cloud services for the Penn IT community
Resources

• Cloud SIG

• ISC Cloud Team
  – cloud-help@lists.upenn.edu

• Use your Local Service Provider
Questions