

Cloud & DevOps Program January Big Group

Jan. 21, 2015

Thursday

1:00-2:00 p.m.

Science Center, Hall C

Agenda

- Program Status Update (5 min)
 - Progress Against the Plan: FY16 Goals
 - Progress Against the Plan: Accomplishments
- Collaboration Working Group Update (5 min)
- Spotlight: ATS Migration (15 min)
- Overview: Billing in the Cloud (25 min)
- Questions (10 min)

Progress Against the Plan: FY16 Goals

Since we met in December, we've been working toward FY16 goals.

26 of 50 apps are in progress and/or migrated to an external provider

• Remaining applications for FY16 have been identified and/or scheduled

We have made big strides in advancing our DR goals

• Critical 1 and 2 applications (non-Level 4) for Campus Services have been identified for DR implementation as part of FY16

Crimson Cloud is progressing

- We are working to have a defined, approved vision and roadmap March 1
- PaaS PoC:
 - Working to define requirements
 - Evaluating vended solutions, including Deis, Cloud Foundry, and Oracle

Progress Against the Plan: Accomplishments

And we have program news and other accomplishments to share!

Our new Cloud Liaisons are collaborating to achieve our goals

- Jean Pfeifer, ATS and HAM Jerry Larviee, CS •
- Colin Murtaugh, AcTs and TLT
- Sharon Bayer, LTS

- Mike Rowe, UC
- Sean McCarty, Infra (SOC) •

Evgeny Platonov, IAM

Held new AWS training programs, with plans for more in the near future

- Completed AWS Architecture Training Jan. 13
- AWS Essentials Feb. 9
- AWS SysOps targeted for March 8

Cloud firewall project to support Level 4 data is in progress

Firewall implementation plan reviewed and updates made to improve delivery schedule — target completion end of FY16

Progress Against the Plan: Accomplishments

Cloud Connect is coming Friday, Feb. 19!

- Create awareness and share info on future roles and opportunities as we transition to cloud and DevOps
- Features:
 - Information and vendor stations
 - Special interest group sessions
 - Seminars led by industry experts
 - Q&A panel
 - Cloud-inspired fun, food, and games
 - "Walking on Clouds" social hour

Initiatives based on your feedback:

- Defining migration services to align the needs of projects and project teams
- Comprehensive planning with SOC underway to create plan and timeline for expanding operational support of migrated apps to SOC resources
- Collaboration Working Group



Collaboration Working Group

Collaboration Working Group Update

Our collaboration working group brings together existing expertise and cloud knowledge to ask, answer, and propose solutions to HUIT cloud architectural questions through breakout meetings in the following areas:

- Networking and security
- Systems and storage
- Application designs
- DR and high availability

Teams have decided upon charters and key deliverables, and will be providing critical input for the larger Working Group the first week of each month.

Contact Xenia Sibova for information on how to get involved!

The Office of the President and Provost recently collaborated with the Cloud & DevOps program to migrate the University Course Catalog and Cross Registration applications to the AWS cloud.

This discussion covers:

- Application overview
- Why move to the cloud?
- Key benefits of moving to the cloud
- Challenges and lessons learned from migrations

About the University Course Catalog and Cross Registration applications:

- Course Catalog lists more than 13,000 Harvard courses across 10 Schools, including descriptions, faculty, meeting times, and links to location and textbook information
- Cross Registration is used by students, faculty, and staff to manage cross-registration workflow between Schools

Harvard	d Course Catalog	Cross-Registration	Academic Calenda	ar Contact								
My Cross	s-Registration List	General Policies School	ol Specific Policies	Credit Conversion								
Av Cr	oss Registr	ation List										
J OI	033 Registi											
1, 01	033 Negisti											
Fall Mo	odule 2 2015, Harv	ard Kennedy School (H	IKS), Cross Registr	ation Open From 08/2	24/2015 12:00 AM	To 10/3	0/2015	11:59 PM				
Fall Mo	odule 2 2015, Harv	ard Kennedy School (H	IKS), Cross Registr	ation Open From 08/2	24/2015 12:00 AM Credit Level	To 10/3 Grading Option	0/2015 Section	11:59 PM Adviser Approval Required/Status	Faculty Approval Required/Status	Petition Status	Registrar Status	Action

Why move to the AWS cloud now?

Top FY16 projects:

- 1. Migrate off iSites platform
- 2. Migrate to the cloud
- 3. MIT Integration: MIT course feeds and secure API will enable Harvard students to submit online petitions to cross-register for MIT courses

Reasons for moving to the cloud:

- Agility of Cloud & DevOps reduced time to deliver
- Eliminates the need for a separate "lift and shift" project

Key benefits of moving to the AWS cloud:

- Increased resiliency and elasticity of infrastructure
 - Automated recovery
 - Automatic scale up/down in response to load
- Ephemeral resources; infrastructure as code

Existing Architecture: Cross Reg & Course Catalog



AWS Architecture: Cross Reg



AWS Architecture: Course Catalog



Migration has presented us with valuable challenges and lessons learned.

Technical:

- AWS SMTP rate limit
- SMTP relay
- SQL query performance from AWS to on-prem database
- API whitelisting
- PIN/CAS integration with anonymous access
- Quartz scheduler clustering

Project:

- Testing in parallel environments with shared data indicate source or shut down old processes
- Clear roles and responsibilities AWS team supported all things AWS, and project team supported application dev and testing
- Hands-on collaboration with team and partners (MIT and Harvard)
- Provided opportunity to review release management process
- Need to engage impacted teams early and communicate often!

Billing in the Cloud

Billing in the Cloud: Overview

There are three major types of cloud billing:

- Unmanaged cloud (direct pass-through)
- Managed cloud, dedicated account
- Managed cloud, shared account

Billing in the Cloud: Example Statement

Let's break down a sample monthly statement.

Information Email: Phone: Web Portal	N St	Monthly Statement Statement #: 00192-2015-12				
Statement Period: 2 HUIT Customer: H HUIT Customer Code: 0	015-12-01 2015-12-31 UIT Atlassian Tools Cloud Account 0192					
Account Level Charg	les					
Service		Quantity	Rate	Net Charge	GL Code	
CALISTS		1.00	\$3.80	\$3.80	175.11250.8071.00000	1.520007.0000.00000
Fotal Account Level Ch	arges			\$3.80		
Asset Charges						
Asset	Service	Quantity	Rate	Net Charge	GL Code	
Total Asset Charges				\$0.00		
endor/Pass Throug	h Charges					
Asset	Service	Quantity	Unit Price	Net Charge	GL Code	
tlassian-AWS	MSO-AMAZON-REALLOC	1.00	\$4,086.29	\$4,086.29	175.11250.8250.00000	1.520007.0000.00000
Total Vendor/Pass-thro	ugh Charges			\$4,086.29		

Billing in the Cloud: Unmanaged Billing

Direct pass-through of AWS charges; matches an AWS account with a Slash account to enable payment using a Harvard billing code.

Vendor/Pass Through Charges					
Asset	Service	Quantity	Unit Price	Net Charge	
AMAZON-428700087581	MSO-AMAZON-BLENDED	1.00	\$0.00	\$0.00	
AMAZON-428700087581	MSO-AMAZON-BLENDED	1.00	\$0.07	\$0.07	
AMAZON-485363461672	MSO-AMAZON-DEBLEND	1.00	\$0.06	\$0.06	
AMAZON-485363461672	MSO-AMAZON-UNALLOC	1.00	\$82.22	\$82.22	
AMAZON-485363461672	MSO-AMAZON-FREEZE	1.00	\$40.00	\$40.00	

Billing in the Cloud: Managed, Dedicated Account

These include the fee for Cloud & DevOps services (architecture migration, ops), as well as charges for Direct Connect.

Asset Charges				
Asset	Service	Quantity	Rate	Net Charge
AMAZON-009817842927	CLOUD-OPS	1.00	\$499.57	\$499.57
AMAZON-009817842927	NETWORK-CONNECT-AWS	1.00	\$800.00	\$800.00
AMAZON-009817842927	NETWORK-CONNECT-AWS	1.00	\$800.00	\$800.00
Vendor/Pass Through Cha	irges			
Asset	Service	Quantity	Unit Price	Net Charge
AMAZON-009817842927	MSO-AMAZON-BLENDED	1.00	\$2,497.83	\$2,497.83
AMAZON-009817842927	MSO-AMAZON-DEBLEND	1.00	\$3.12	\$3.12

Billing in the Cloud: Managed, Shared Account

Allocate services and app costs using AWS tagging.

Vendor/Pass Through	Charges			
Asset	Service	Quantity	Unit Price	Net Charge
Atlassian-AWS	MSO-AMAZON-REALLOC	1.00	\$4,086.29	\$4,086.29
Total Vendor/Pass-throu	gh Charges			\$4,086.29

Billing in the Cloud: Managed, Shared Account

It's possible to allocate a portion of the cloud ops charge by application using AWS tagging.

Asset Charges				
Asset	Service	Quantity	Rate	Net Charge
App 1 - AWS	CLOUD-OPS	1.00	\$53.07	\$53.07
Total Asset Charges				\$53.07
en Dichich				
Vendor/Pass Through (Charges	2		
Vendor/Pass Through (Asset	Charges Service	Quantity	Unit Price	Net Charge
Vendor/Pass Through (Asset App 1 - AWS	Charges Service MSO-AMAZON-REALLOC	Quantity 1.00	Unit Price \$265.33	Net Charge \$265.33

Billing in the Cloud: High-Level Freeze Model

"Freeze" revenue for a fixed period, absorbing early transition costs and stabilizing later volume loss, until a new model is created in FY18.



Billing in the Cloud: Financing Matrix

	Migrations (Fr	eeze-Eligible)	DR	New Applications (Not Freeze-Eligible)		
	Replatform to shared AWS account (e.g. CrossReg)	"Lift and shift" to shared AWS account (e.g. ADP.FAS)	DR to dedicated account (e.g. Aleph)	New application to shared account (e.g. QlikView)	New application to dedicated account (e.g. HPAC)		
Who pays AWS costs (including 20% cloud ops fee)?							
Paid by SOC funds until end of migration program	х						
Paid for by application funds [1]		Х	Х	Х	х		
	Who pays	on-premises hosting cos	sts?				
Frozen at current level and paid for by application funds until end of migration program	х	Х					
Paid for by operational application funds until on- premises assets are decommissioned			Х	х	x		
	Who pays Direct Connect	costs (and other AWS ac	count-level costs)?				
Paid by SOC funds until end of migration program	x	х		х			
Paid for by application funds [1]			х		х		
	Who pays F	TE costs for DevOps eng	ineer?				
Paid by SOC funds until embedding occurs and end of migration program [2]	x	X	N/A	X [3]			
Paid for by application/project funds [1] [1] If application is FAS-funded, costs will be covered	by FAS funds, not specific a	pplication budget	N/A		х		

[2] Upon embedding, application operations budgets must include funds for DevOps engineer

[3] If application is project-funded, DevOps engineer funding needs to be included in project budget

Billing in the Cloud: What Am I Actually Paying For?

AWS pass-through costs:

- Metered usage pay as you go
- Inbound data is free
- Outbound data is charged

Direct Connect (NETWORK-CONNECT-AWS):

- Access from AWS to Harvard-internal IP space
- Necessary prerequisite for Level 4 data (also requires Cloud Firewall)

CloudOps fee:

- Managed migration
- Cloud infrastructure support
- Managed relationship with AWS
- Architecture
- Cost engineering support

Upcoming Events

Cloud Connect will be held in place of the Feburary Big Group.

We look forward to seeing you again in March for our next Big Group!

As always, don't forget to watch our Web site: http://cloud.huit.harvard.edu





Thank you!



Existing Architecture: Cross Reg

