Using Splunk to Manage AWS

Gaining Transparency into Cloud Computing

splunk>

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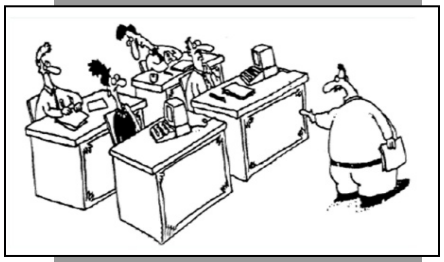
Who We Are

- FINRA—the Financial Industry Regulatory Authority—is an independent, non-governmental regulator for all securities firms doing business with the public in the United States
- FINRA protects investors by regulating brokers and brokerage firms and by monitoring trading on U.S. stock markets
- FINRA monitor over 6 billion shares traded on the stock market each day
- FINRA handles more 'Big Data' on a daily basis than the Library of Congress or Visa®—to build a holistic picture of the trading market
- FINRA – Deter, Detect, Discipline

Investor Protection

Historical View

- Cyclic Processes
  - POC – Budget Approval – SDLC - Maintenance
- Defined Roles
  - Coders Code
  - Managers Manage
  - Administrators Administer
- Agile Development/Cloud Computing
  - Developers Make These Decisions:
    - Security
    - Financial
    - Architecture
  - And It's All Point and Click
- Hacking Redefined Security
  - Defensive Coding
  - Baked In, Not Painted On



"You guys start coding, I'll go find out what the users want."

Same Challenges/Different Environment

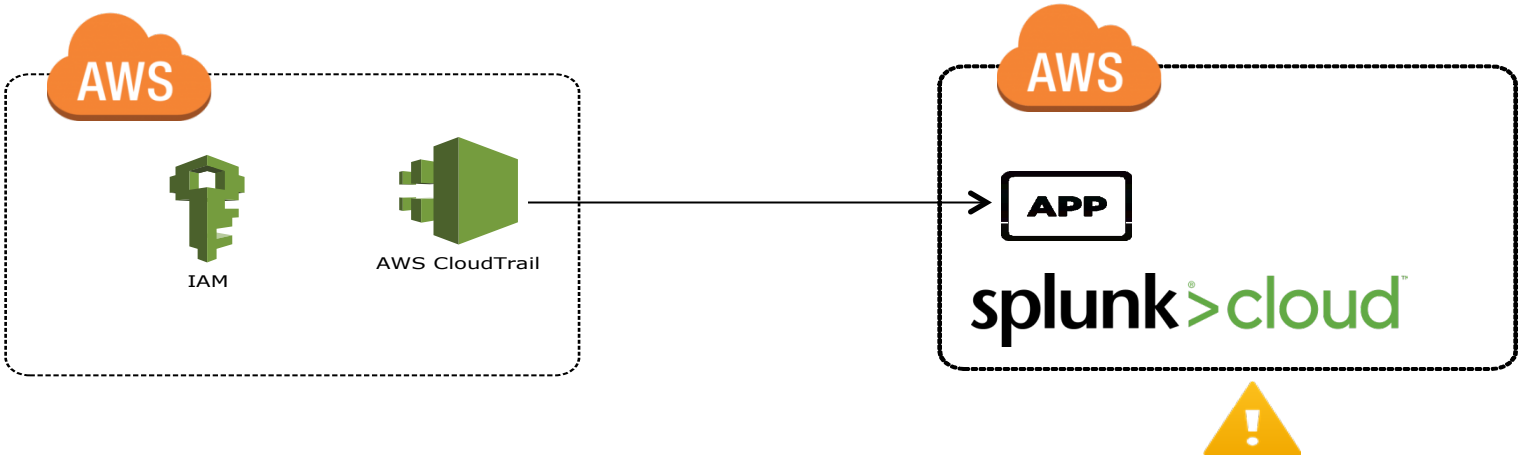
- Security
  - Engaged All Necessary AWS Security Features
  - Are we Firewalled Correctly
- Compliance
  - Followed All Published Standards
- Networking
  - Placed Servers on the Correct Network
- Finance
  - Stayed within Budget
- Capacity Planning
  - Used Resources Optimally
- But, Now in a Decentralized Model
  - It's déjà vu all over again…*Yogi Berra*

"With great power comes great responsibility."

AWS Security – Identity Access Management

- AWS Shared Responsibility Model
  - AWS – “Security of the Cloud”
  - YOU – “Security in the Cloud”
- Identity Access Management (IAM)
  - Critical security-related “service”
- Best Practices
  - Lock away your AWS account (root) access keys
    - Console Access
  - Rotate Credentials Regularly
    - Time vs Event Driven
  - Remove Unnecessary Credentials
    - Unused
  - Grant Least Privilege
  - Keep a History of

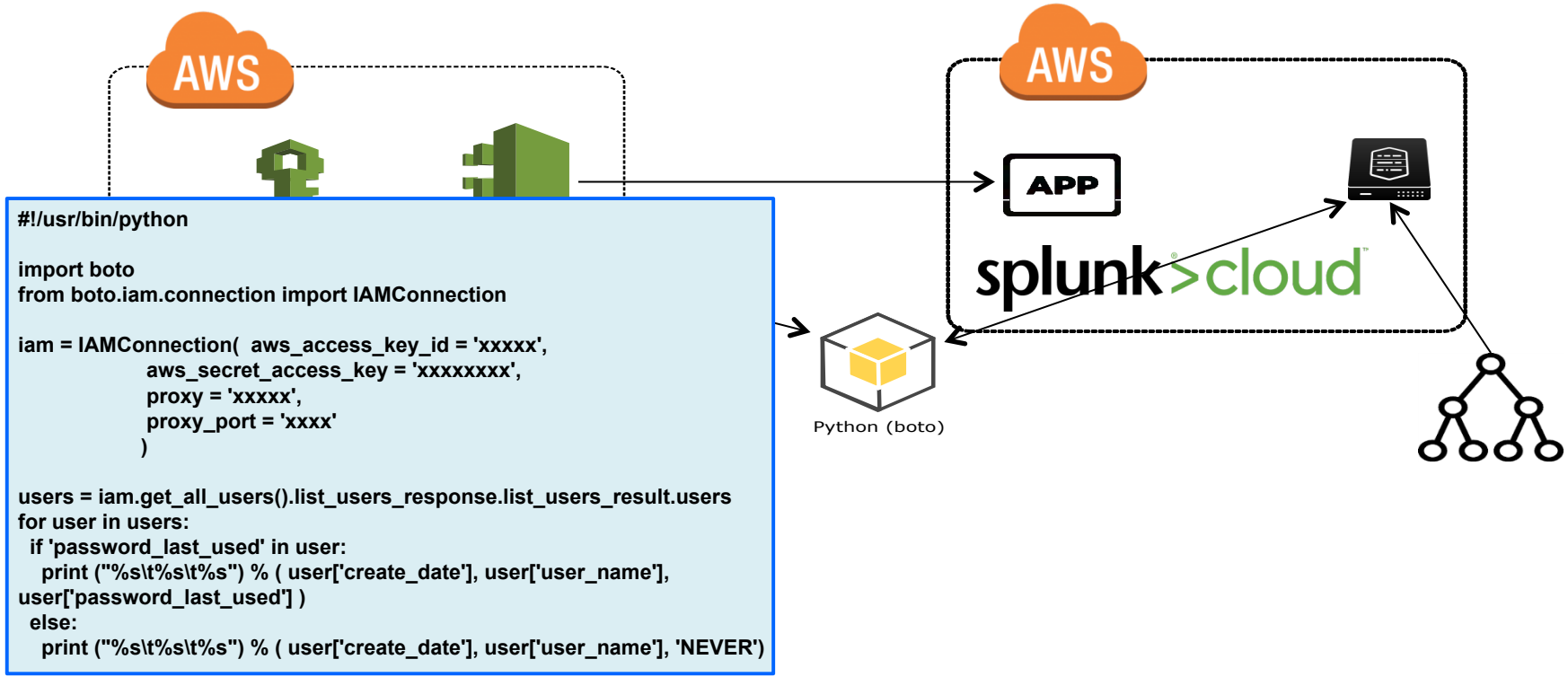
Lock Away Your AWS Account (Root) Access Keys



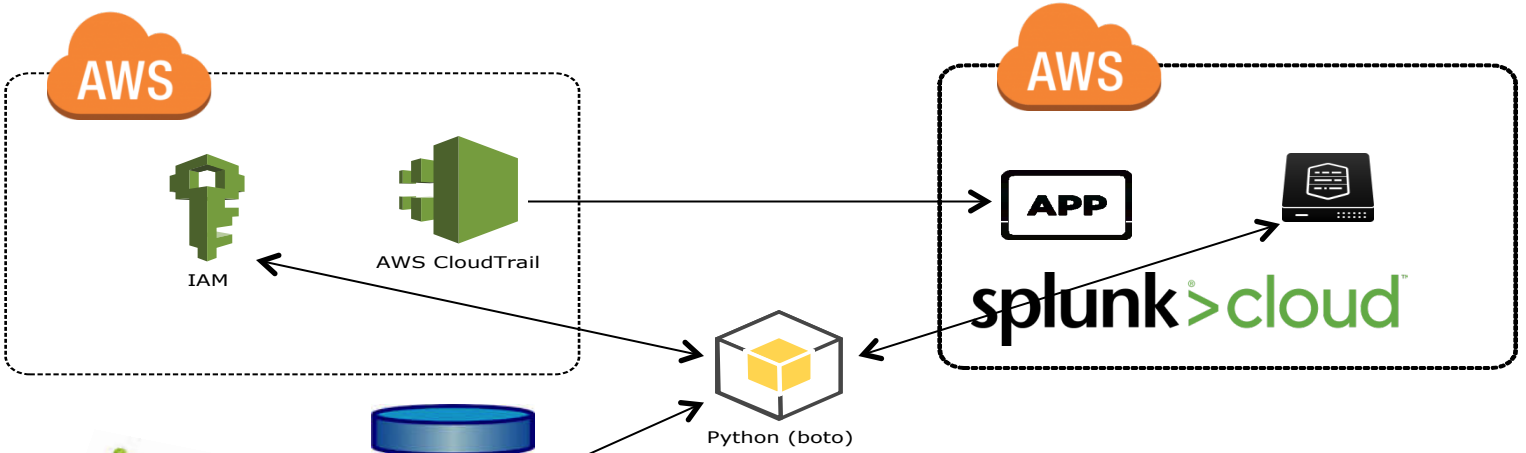

```
index=aws-cloudtrail sourcetype=aws-cloudtrail "requestParameters.userName"=root eventName=CreateAccessKey
```

```
index=aws-cloudtrail "userIdentity.arn"="*:root" eventName=Console* |
table _time eventName responseElements.ConsoleLogin awsRegion sourceIPAddress eventSource userIdentity.arn userIdentity.type
userIdentity.accountId userAgent
```

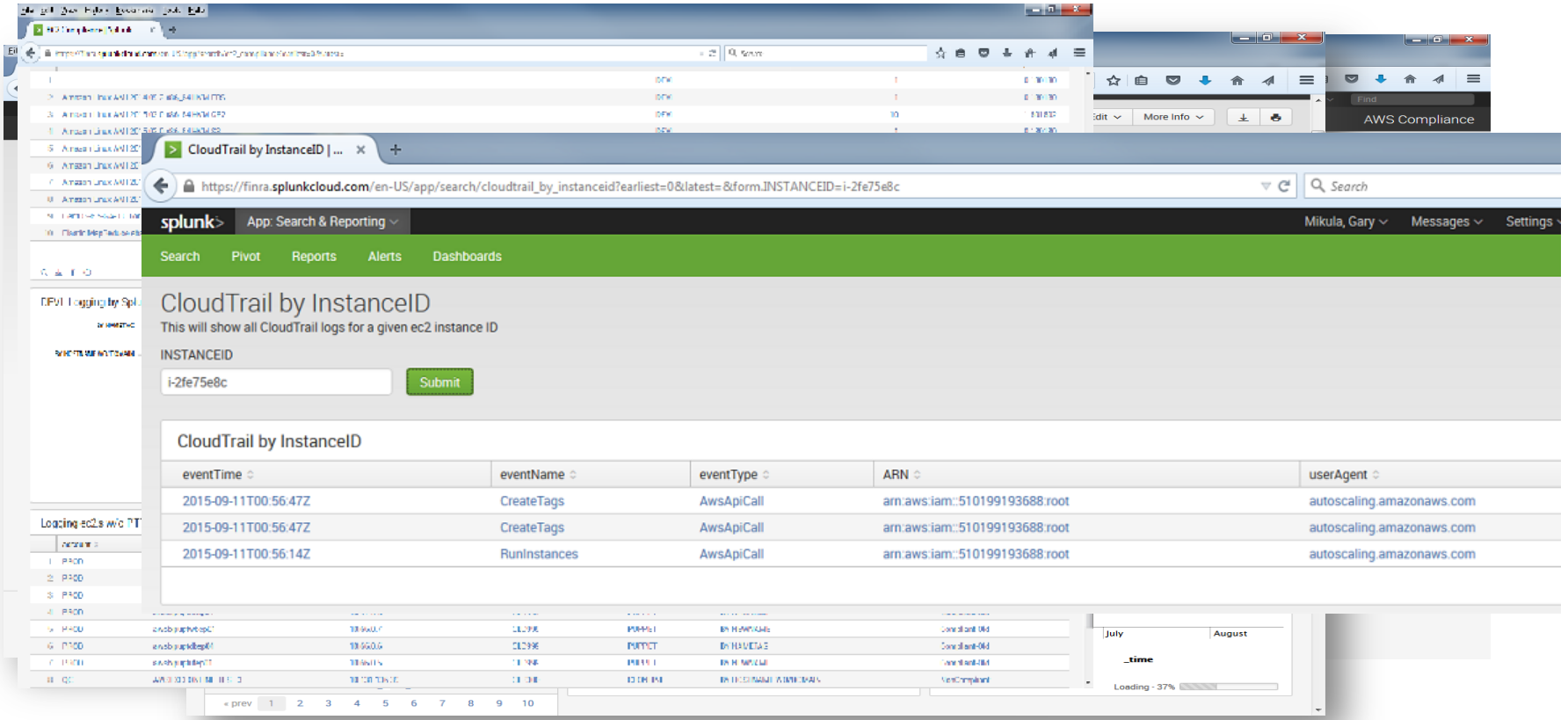
Credentials (Rotation/Unnecessary)



Grant Least Privilege



ROLE ABC
autoscaling:DeletePolicy:Deny
autoscaling:DeleteScheduledAction:Deny
autoscaling:DeleteTags:Deny
autoscaling:DescribeAdjustmentTypes:Allow
autoscaling:DescribeAutoScalingGroups:DontCare
autoscaling:DescribeAutoScalingInstances:Allow


CloudTrail by InstanceID | ...
https://finra.splunkcloud.com/en-US/app/search/cloudtrail_by_instanceid?earliest=0&latest=&form.INSTANCEID=i-2fe75e8c
Search
splunk>
App: Search & Reporting
Mikula, Gary
Messages
Settings
Search
Pivot
Reports
Alerts
Dashboards
CloudTrail by InstanceID
This will show all CloudTrail logs for a given ec2 instance ID
INSTANCEID
i-2fe75e8c
Submit
CloudTrail by InstanceID
eventTime
eventName
eventType
ARN
userAgent
2015-09-11T00:56:47Z
CreateTags
AwsApiCall
arn:aws:iam::510199193688:root
autoscaling.amazonaws.com
2015-09-11T00:56:47Z
CreateTags
AwsApiCall
arn:aws:iam::510199193688:root
autoscaling.amazonaws.com
2015-09-11T00:56:14Z
RunInstances
AwsApiCall
arn:aws:iam::510199193688:root
autoscaling.amazonaws.com
AWS Compliance
More Info
July
August
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Beyond IAM Best Practices

- Tagging Compliance
- Security Group
- Logging
- S3/EBS Encryption
- S3 Bucket Policies
- AMI White/Blacklisting
- EC2 Role
- Naming Conventions
- New AWS Features will Supplant
  - VPC Flows
  - Config

Project Cost Management in AWS

Harnessing the Power of Splunk

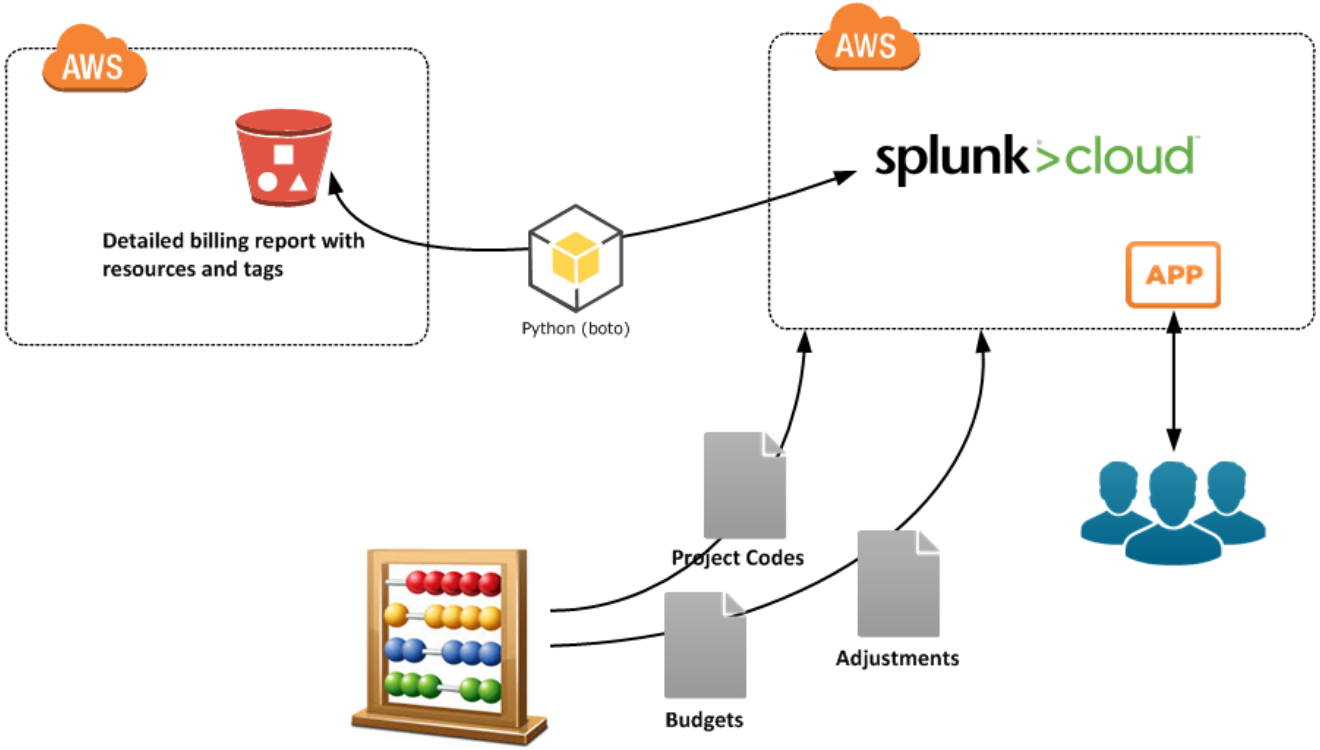
Where We Were

- Traditional Financial Review Cycles Too Long
  - Quarterly Reviews
- AWS Detailed Billing Reports Are Daunting
  - Over 10 Million Line Items
- Project Managers Need Focus
  - Am I Below My Budget?
  - Where Are My Costs Going?
  - Who's Spending Them?
- Manual Compilation of Reports
  - Integrate FINRA Data

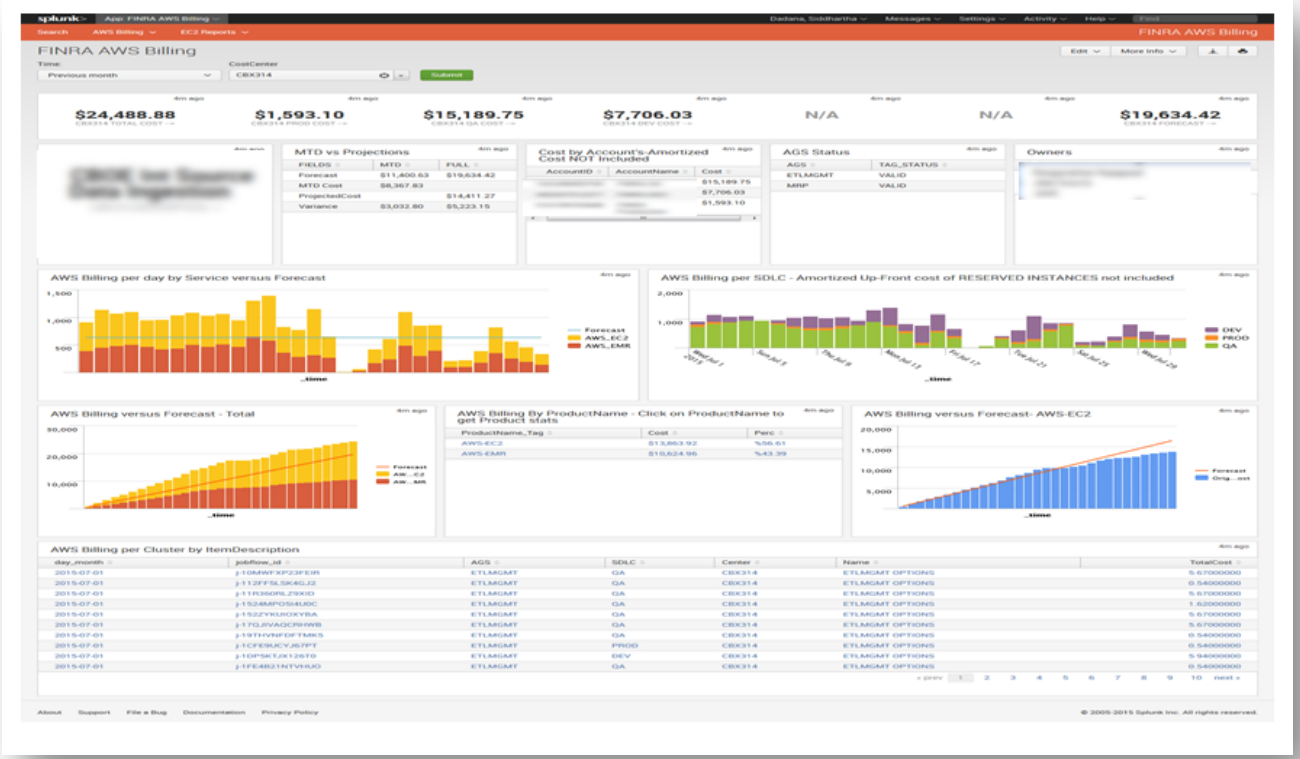
Approach Chosen

- Use Splunk as Process/Delivery System
  - Ability to Collect/Analyze/Visualize
- Collect AWS Billing Data in Splunk
  - Billing Data from S3 bucket (Daily Load)
  - Detailed Line Items w/Resources & Tags
- Data Enrichment
  - Project Code Lookups
  - Forecast Projections
  - Billing Adjustments
- Build Interfaces
  - FINRA AWS Billing

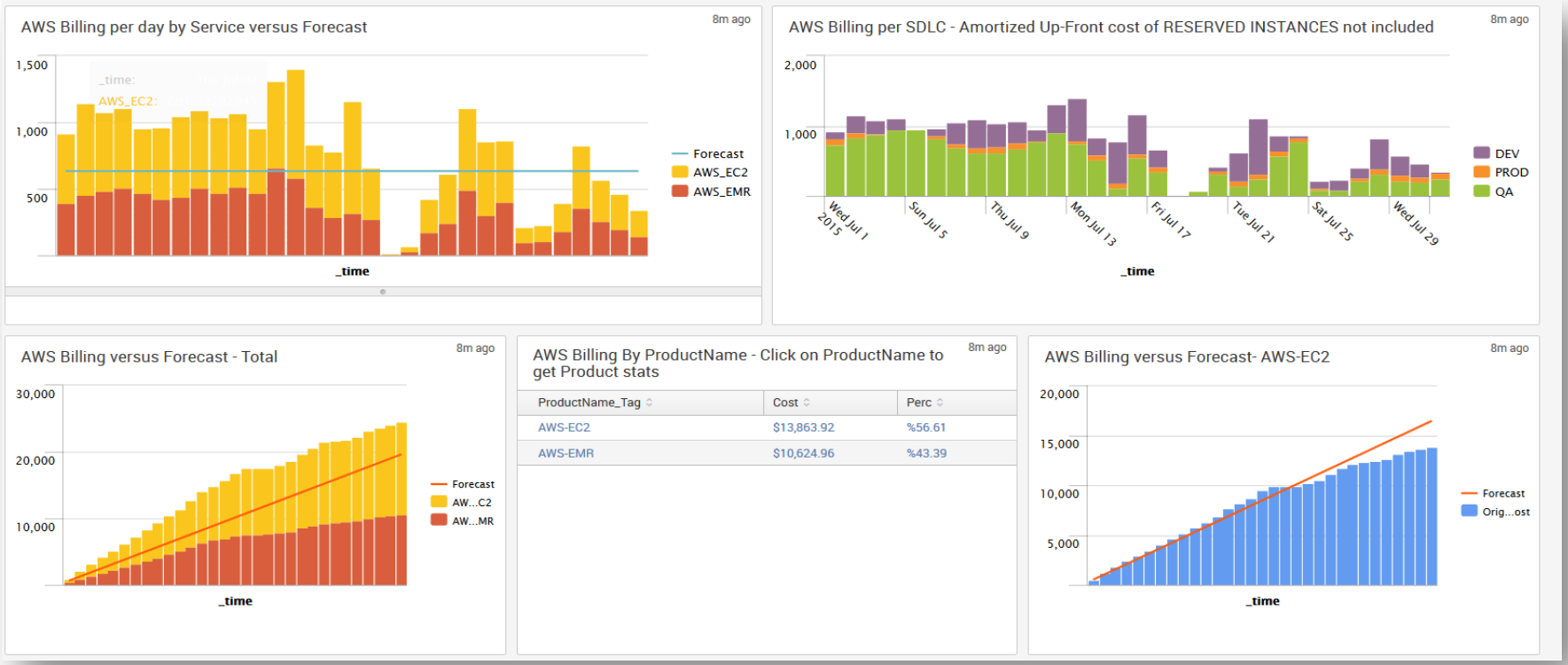
How We Did It


AWS
Detailed billing report with resources and tags
Python (boto)
AWS
splunk>cloud
APP
Project Codes
Budgets
Adjustments

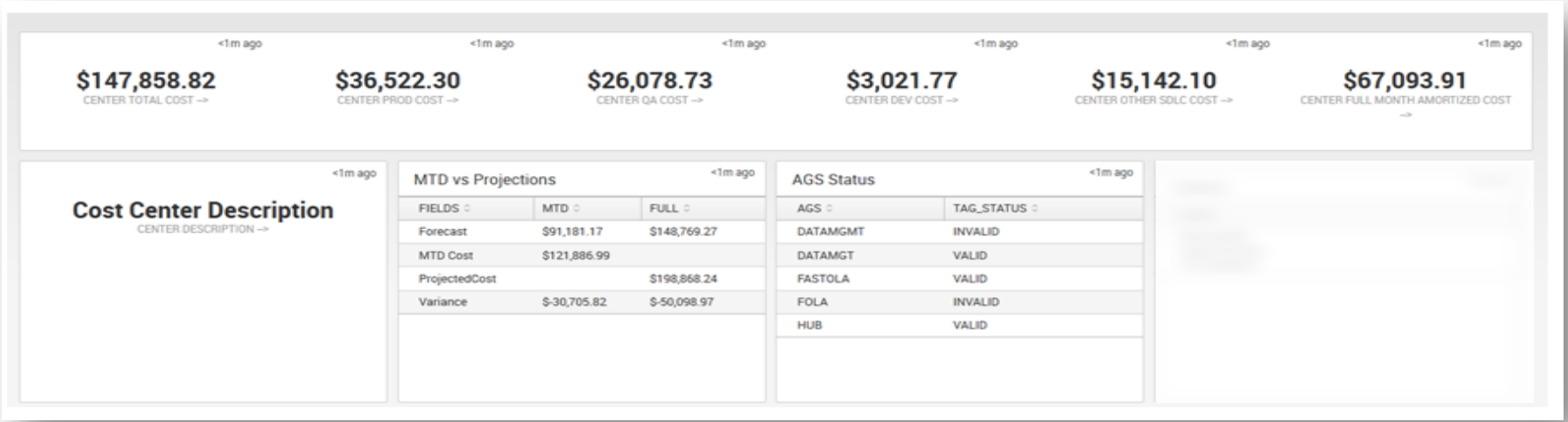
FINRA AWS Billing App



AWS Billing App



AWS Billing App



Impact – Reduced Costs

- Focus on Low Hanging Fruit
  - Shutting Down Services over Weekends/Evenings
  - Storage Sun Setting/Dormant EC2
  - Identify AWS Services with Highest Spending
  - Projects Over Budget
- Results
  - 13.5% Reduction in Billing Line Items in 1 Month
- Better Forecast Projections
  - Feedback and Control

Futures

- Users Want Even Shorter Cycles
- Back Tagging
- ‘Free Rider’ Services
- Drill Down Analytics

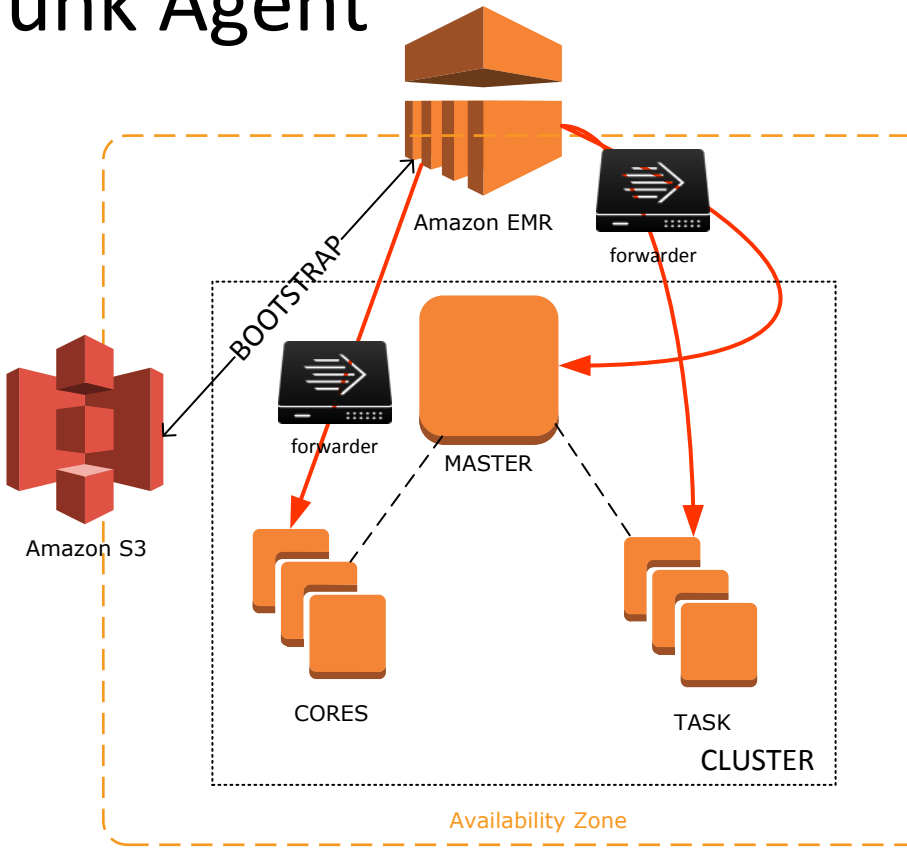
Splunking in AWS EMR
Gaining Transparency Into PaaS

What Stood In Our Way

- PaaS and IaaS are not Equal
- Instance Fingerprinting
  - Identify Nodes
  - Instance Role
  - User Tags
- Data Retention
- Collection Delay
- ➢ Bootstrap Splunk Agent

Bootstrap Splunk Agent

- Store bsx in S3
  - Splunk rpm
  - Deploymentclient.conf
  - Discovery Scripts*
- Execute Bootstrap
- Master Installation
- Core & Task Installation
- AWS was Extremely Supportive of this Method



Instance Fingerprinting

1. Determine the Identity of the Node:
   - EC2 nodes have “metadata” service @ http://169.254.169.254
     - INSTANCE_ID=`curl http://169.254.169.254/1.0/meta-data/instance-id/`
     - echo $INSTANCE_ID i-8f0d4c75
     - IP=`curl -s http://169.254.169.254/2014-11-05/meta-data/local-ipv4/`
2. Grab the User Defined Tags
   - AGS_TAG=`/opt/aws/apitools/ec2/bin/ec2-describe-tags|grep $INSTANCE_ID|grep AGS|cut -f5`
   - SDLC=`/opt/aws/apitools/ec2/bin/ec2-describe-tags|grep $INSTANCE_ID|grep SDLC|cut -f5|awk '{print substr($0,1,1)}'`

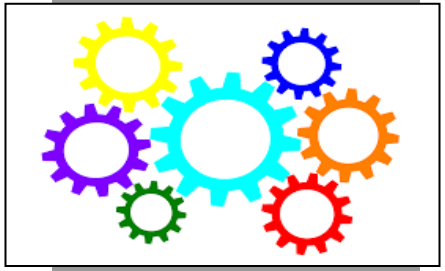
Instance Fingerprinting

3. Get the jobFlowID (EMR Cluster ID) for the node:
   - JOBFLOW_ID=`awk -F"[,:]" '{for(i=1;i<=NF;i++){if($i~/jobFlowId\042/){print $(i+1)} } }' /mnt/var/lib/info/job-flow.json|tr -d [\"\ ]`
4. Determine Role Node in the EMR cluster:
   - INSTANCE_ROLE=`cat /mnt/var/lib/info/job-flow.json | ruby -e "require 'rubygems'; require 'json'; require 'pp'; igs=JSON [STDIN.read]['instanceGroups']; igid=ENV['INSTANCEGROUP_ID'];ig = igs.find {|i| i['instanceGroupId'] == igid};puts ig['instanceRole']"|awk '{print toupper($0)}'`
5. Update Splunk Config Files
   - Deploymentclient.conf
   - Inputs.conf

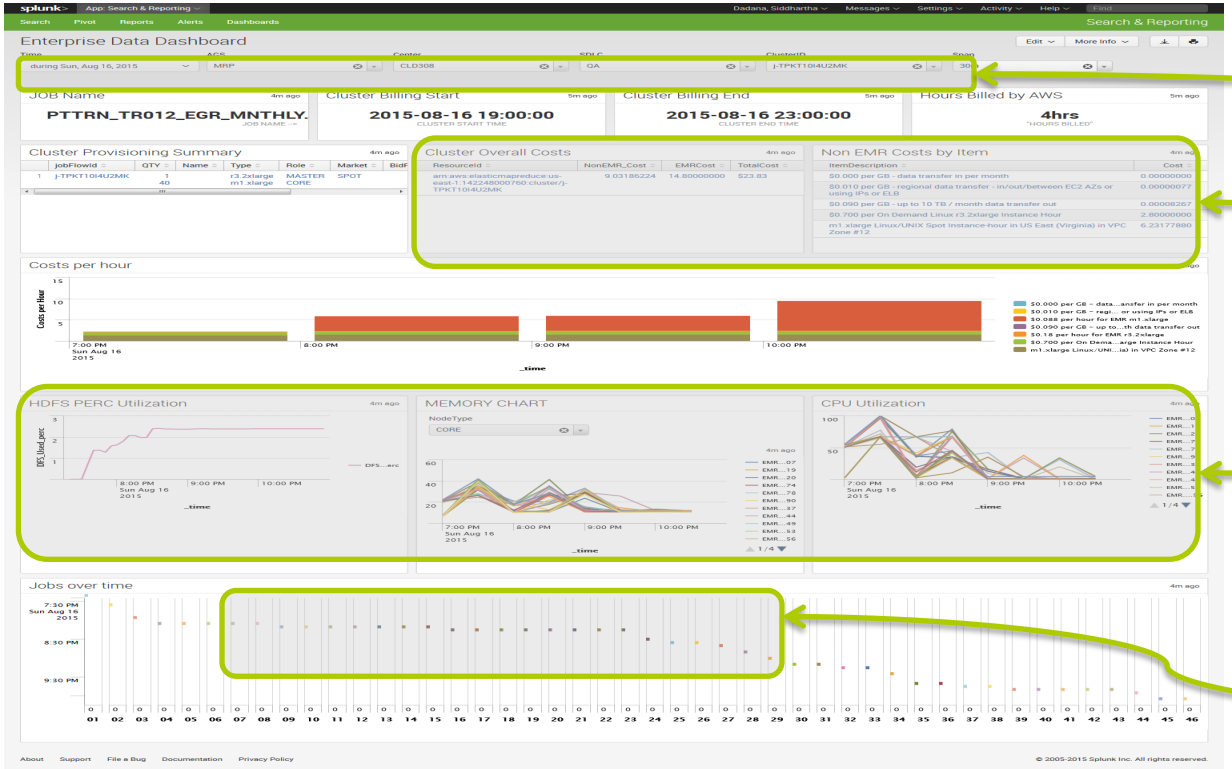
Inputs.conf Example

inputs.conf

```
[default]
host = EMRAPP1-MASTERED-j-YQQU43YEHG4X:1.1.1.1
_meta=jobflow-id::"j-YQQU43YEHG4X" instancegroup-
id::"ig-3JBIDJGYVSD4N" instance-id::"i-22f7f3f0"
instance-role::"MASTER" ags_hostname::"EMRAPP1-
MASTERED-j-YQQU43YEHG4X:1.1.1.1"  ags::“ABCD"
cost_center::"CLDABC" creator::“APP1_Team"
name::"AWSLXAPP1-CLED01-YR" owner::“USERIDABC"
purpose::“APP1_QUERY_CL" sdlc::"DEV"
```



EMR Cluster Analyzer –> Summary Dashboard



SELECT THE CLUSTER

AWS Billing

Splunk for *NIX

Jobs running

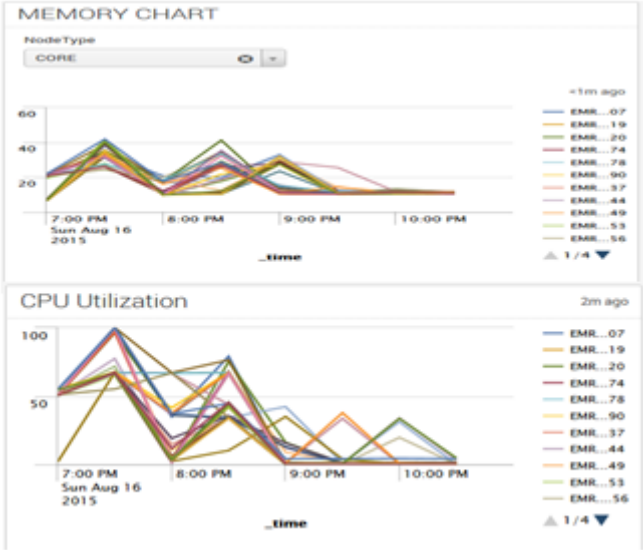
Potential EC2 Provisioning Cost Savings

- m1.xlarge
  - 4 vCPUs with 8 ECUs
  - 15 GB memory
  - 4 x 420 GB disk
  - $0.35 per hour

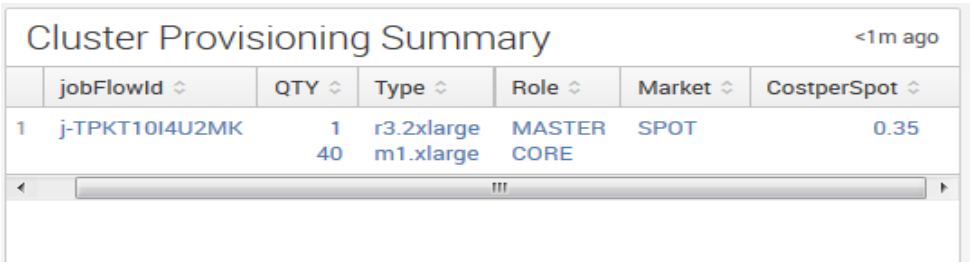
- c3.xlarge
  - 4 vCPUs with 14 ECUs
  - 7.5 GB memory
  - 2 x 40 GB disk (SSD)
  - $0.27 per hour

Potential 23% savings in EMR costs

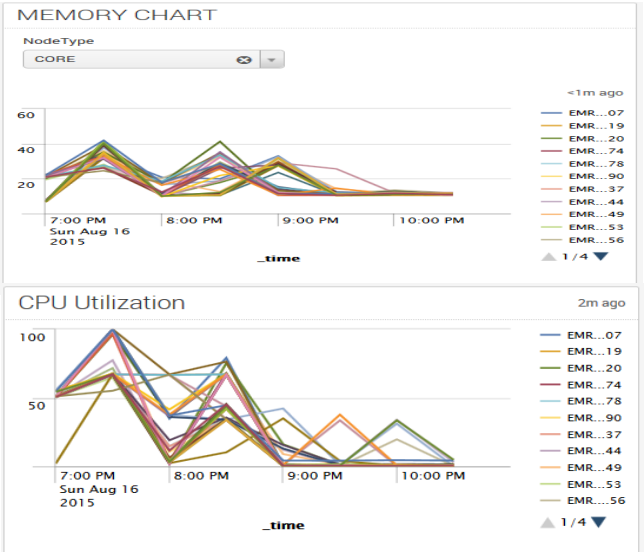
With additional ECUs and SSD disks, the c3.xlarge may be more performant than the m1.xlarge instances at a better price point
RESIZING***



Resizing Analysis



Summary provides
the information of number of Nodes



1. Less than 80% utilization overall

2. After 70mins utilization at less than 50% (cpu)

Conclusion:
The cluster be resized after the two hours

Resizing Analysis – Scenario 1

All instances running for full duration of the job

1st Hour	2nd Hour	3rd Hour	4th Hour
40	40	40	40

Cost Analysis:

Cost = (Price per instance) * (No of Instances) * (No of hours)

Price = 0.35 * 40 * 4 = $56

Resizing Analysis – Scenario 2

Resizing after the 1st hour and 2nd hour

1st Hour	2nd Hour	3rd Hour	4th Hour
40	35	20	20

Cost Analysis:

Cost = (Price per instance) * (No of Instances) * (No of hours)

Price = (0.35*40*1) + (0.35*35*1)+(0.35*20*2) = 14 + 12.25 + 14 = $40.25

Savings Compared to Scenario 1 = 28.2%

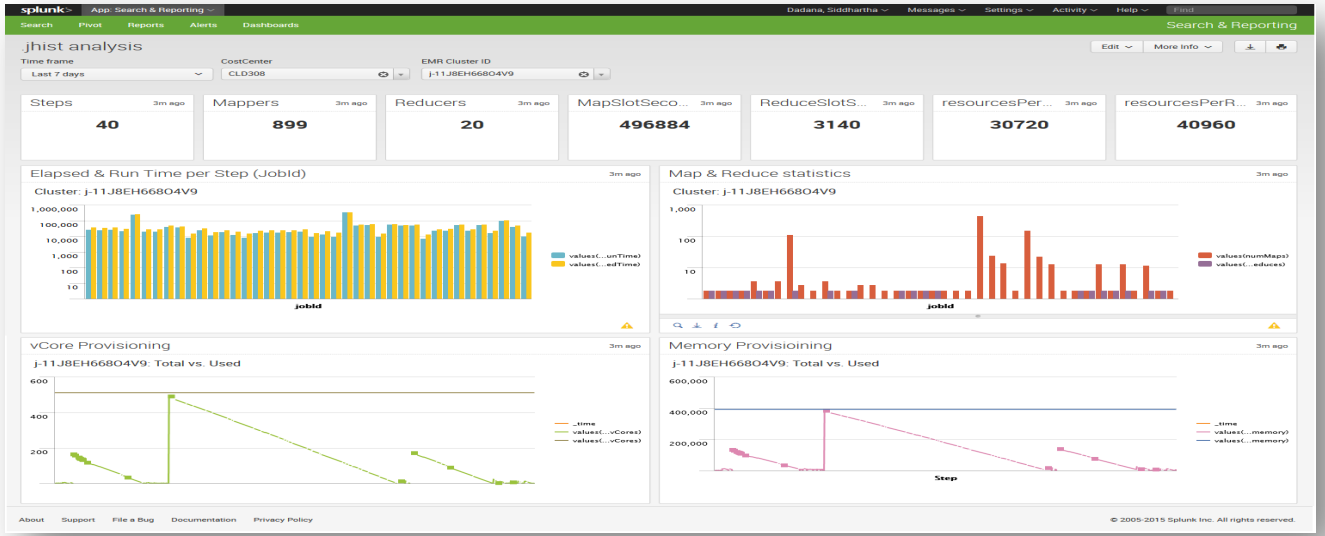
Combined EC2 Provisioning & Resizing Analysis

- Combined Savings
  - Original Cost = $56
  - Price After Combined Analysis = $31.05
  - Job Savings = $24.95 = 55.44%
- Job Runs 5x/day ($24.95 * 5 = $124.75)
- Every Business day/week ($124.75 * 5 = $623.75)
- Every Week of the Year ($623.75 * 52 = $32,435)
- And….We Haven't Affected Performance
  - Just More Efficient Provisioning

Job History

Cluster Summary

Per Cluster



.jhist file Analysis:

- Cluster level statistics
- Run Time, Map/Reduce Stats per Steps

Futures/Other Uses

- Grade Clusters
  - Identify under utilized clusters for faster resizing
- ITSI Integration
  - KPI's based auto analysis on Cloud
- Additional Input Variables
  - Size of Data Sets
  - Number of Runs
- Metrics Correlation
  - Analyze Steps
  - Jobs Impact on System

THANK YOU

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