# Architecting for Greater Security in AWS

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Director of Ops, Totango.

amazon web services

# 1) Why does security come first in cloud adoption?

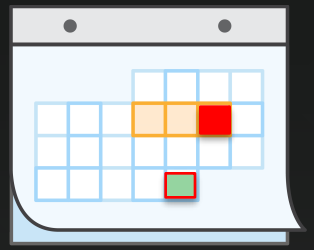
AWS Job Zero

New Territory

IT Security is Traditionally Hard

# 2) Why is security traditionally so hard?

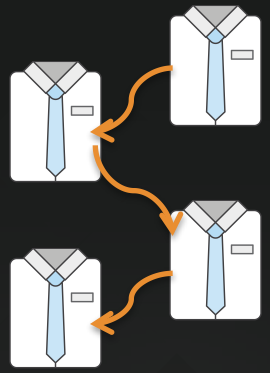
So much planning



Slows down feature flow

# 3) Why so much planning which takes so long?

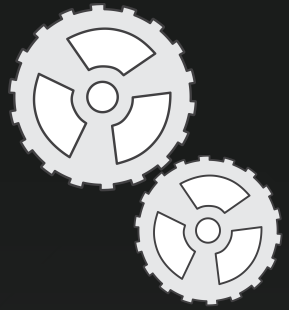
So many processes



So many hand-offs

Built-in pauses

# 4) Why so many processes?



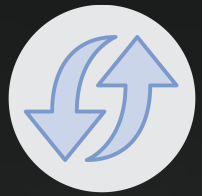
Processes detect unwanted change

Visibility, control and quality are essential

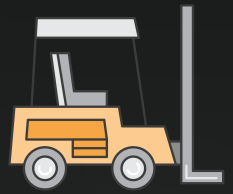
Reduce impact of failure

# 5) Why are change detection and low-risk changes so difficult?

Lack of visibility



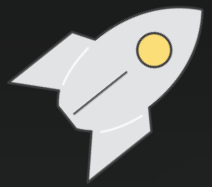
No stimulus+response



Low degree of automation

# So where does AWS come in?

AWS makes security faster



Lets you move fast but stay safe

# 1) Secure, Sensible Defaults - Access

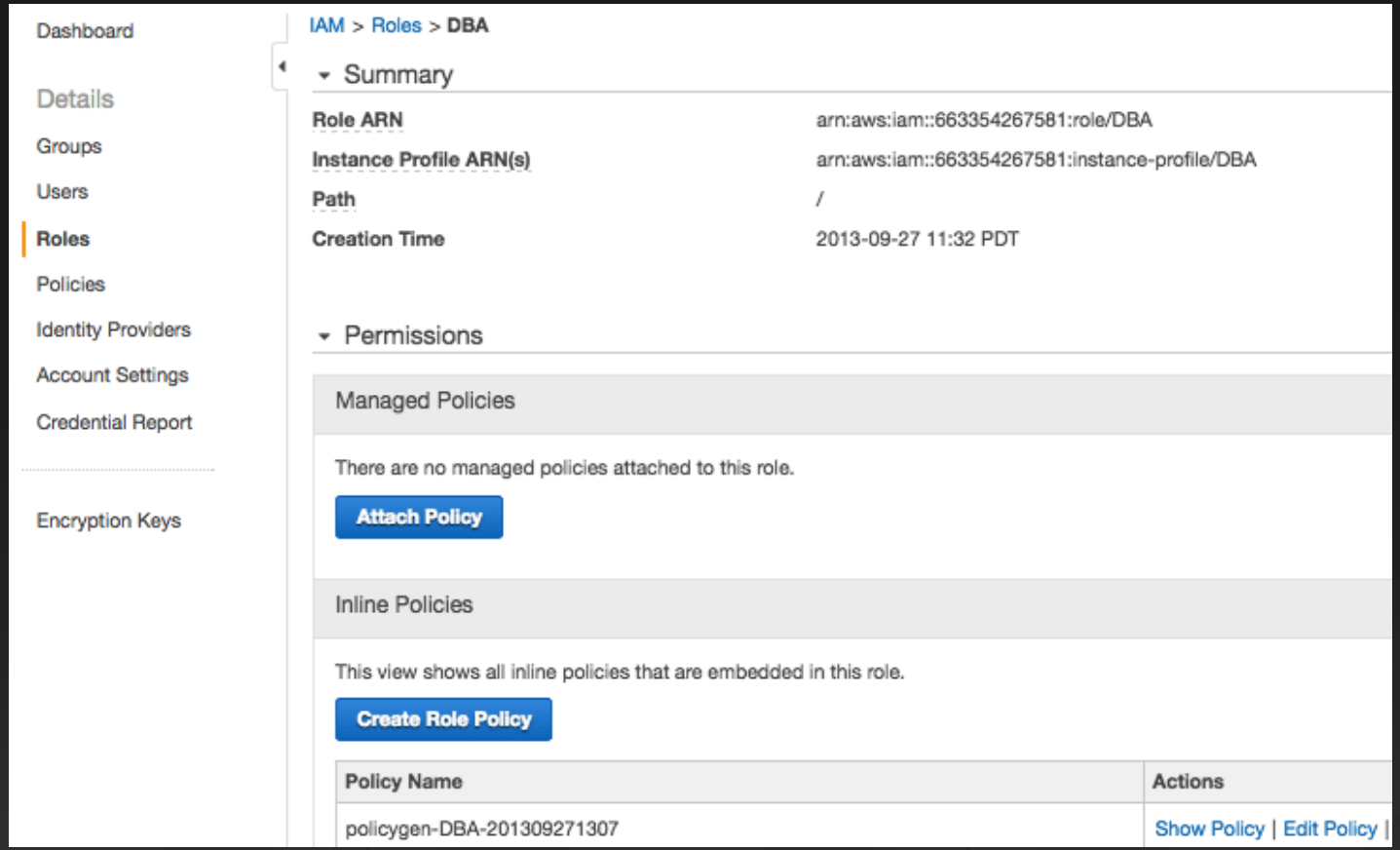
**IAM Users, Groups, Roles**

**Managed and inline policies**

**Versioned IAM policies**

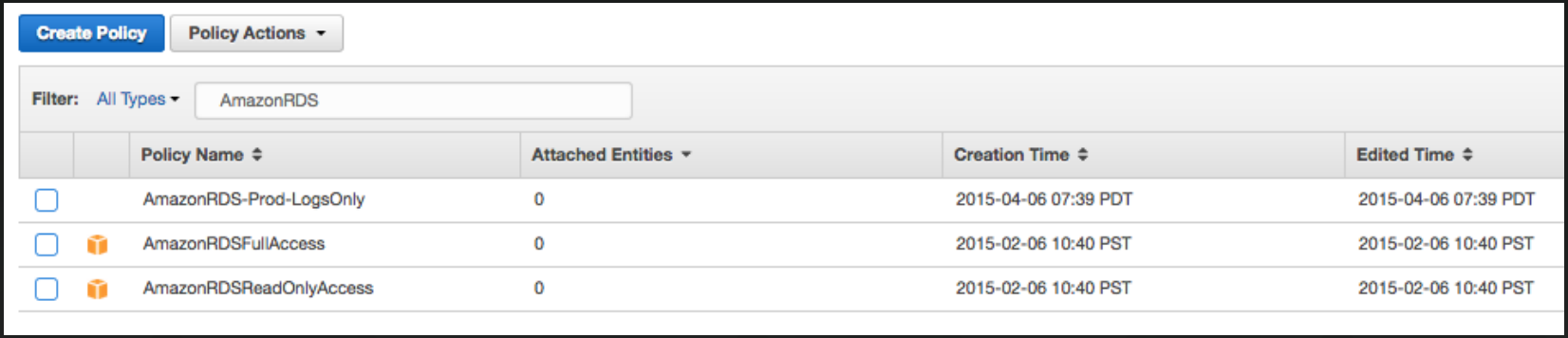
*Multi-factor authentication*

*Workforce lifecycle management (SAML Federation, Connected Directory)*



**Show Policy**

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "rds:DescribeDBInstances",
        "rds:DescribeDBLogFiles",
        "rds:DescribeDBParameterGroups",
        "rds:DescribeDBParameters",
        "rds:DownloadDBLogFilePortion"
      ],
      "Resource": [
        "*"
      ],
      "Condition": {
        "StringEquals": {
          "rds:db-tag/environment": [
            "prod",
            "dr"
          ]
        }
      }
    }
  ]
}
```



IAM > Roles > **DBA**

## Summary

| | |
|---|---|
| **Role ARN** | arn:aws:iam::663354267581:role/DBA |
| **Instance Profile ARN(s)** | arn:aws:iam::663354267581:instance-profile/DBA |
| **Path** | / |
| **Creation Time** | 2013-09-27 11:32 PDT |

## Permissions

### Managed Policies

The following managed policies are attached to this . You can attach up to Infinity managed policies.

**Attach Policy**

| Policy Name | Actions |
|---|---|
| AmazonRDS-Prod-LogsOnly | Show Policy \| Detach Policy \| Simulate Policy |

### Inline Policies

## Policy Versions

Each time you update a policy, you create a new version. You can have up to 5 versions. Learn more.

Set as Default | Delete

| | Version | Creation Time |
|---|---|---|
| | Version 2 (default) | 2015-04-06 07:07 PDT |
| ☑ | Version 1 | 2015-03-27 10:29 PDT |

# 1) Secure, Sensible Defaults - Access

*IAM Users, Groups, Roles*

*Managed and inline policies*

*Versioned IAM policies*

Multi-factor authentication

Workforce lifecycle management (SAML Federation, Connected Directory)

# 1) Secure, Sensible Defaults - Network

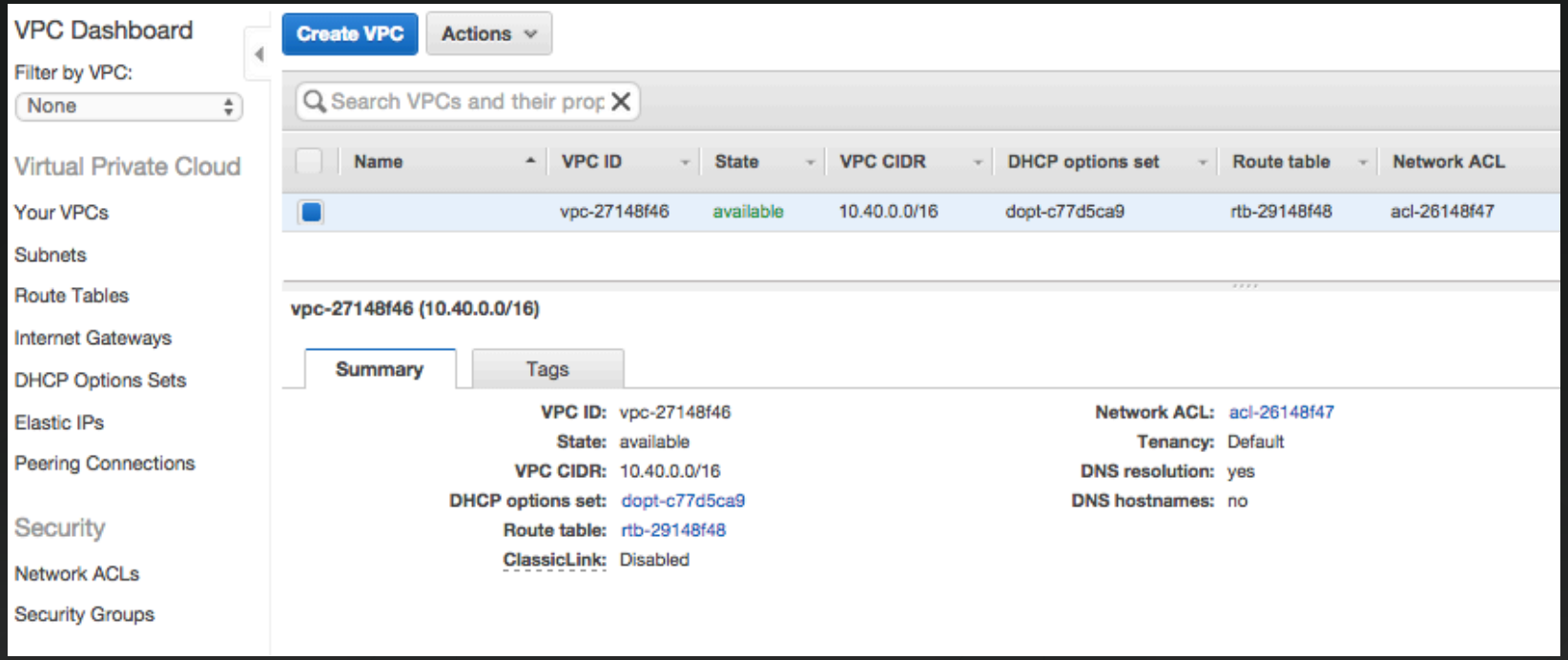
Virtual Private Cloud

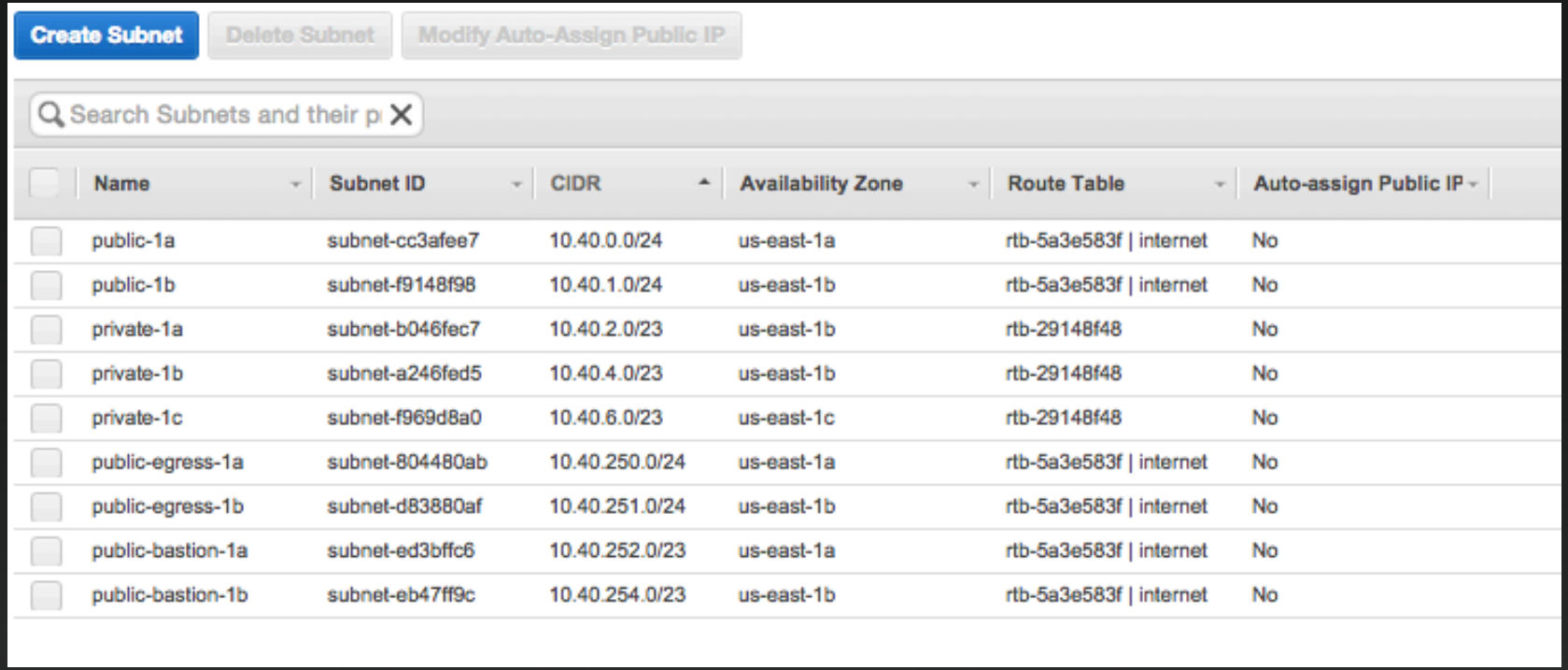
DirectConnect & Virtual Private Gateway

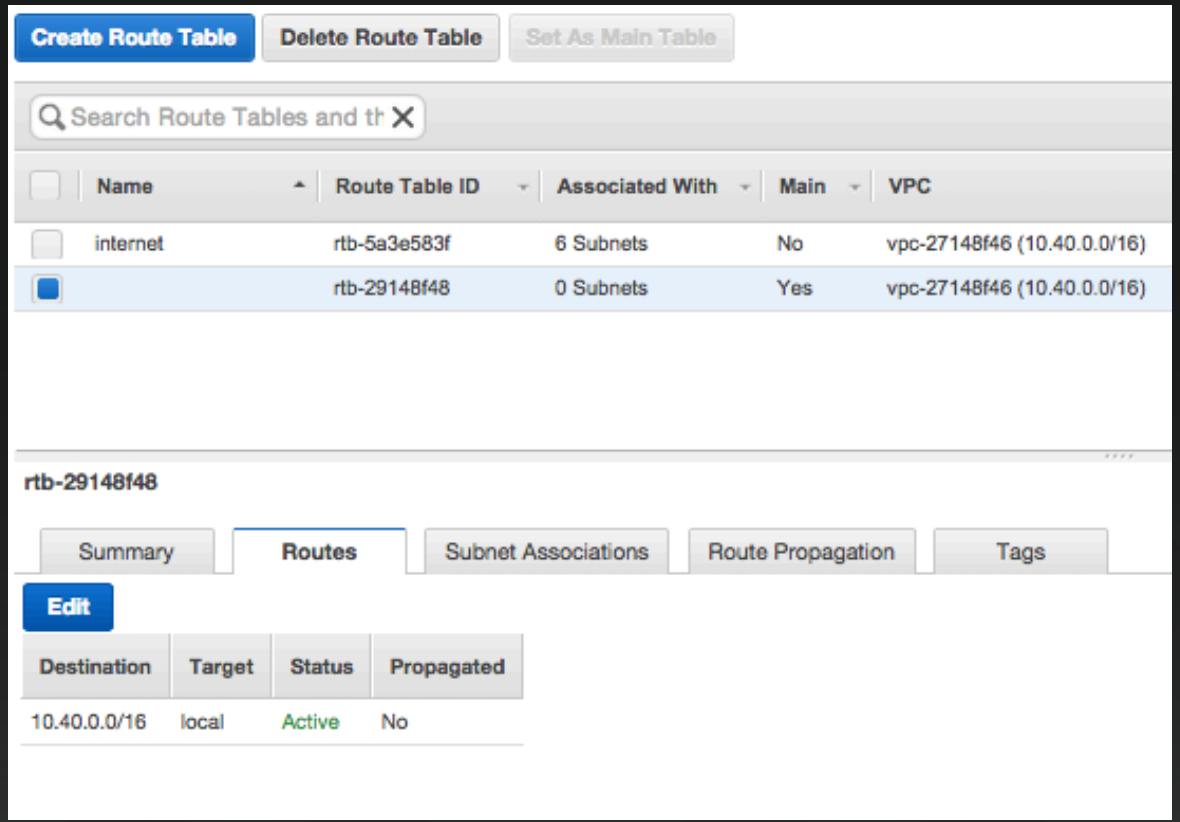
Routing control – private and public subnets

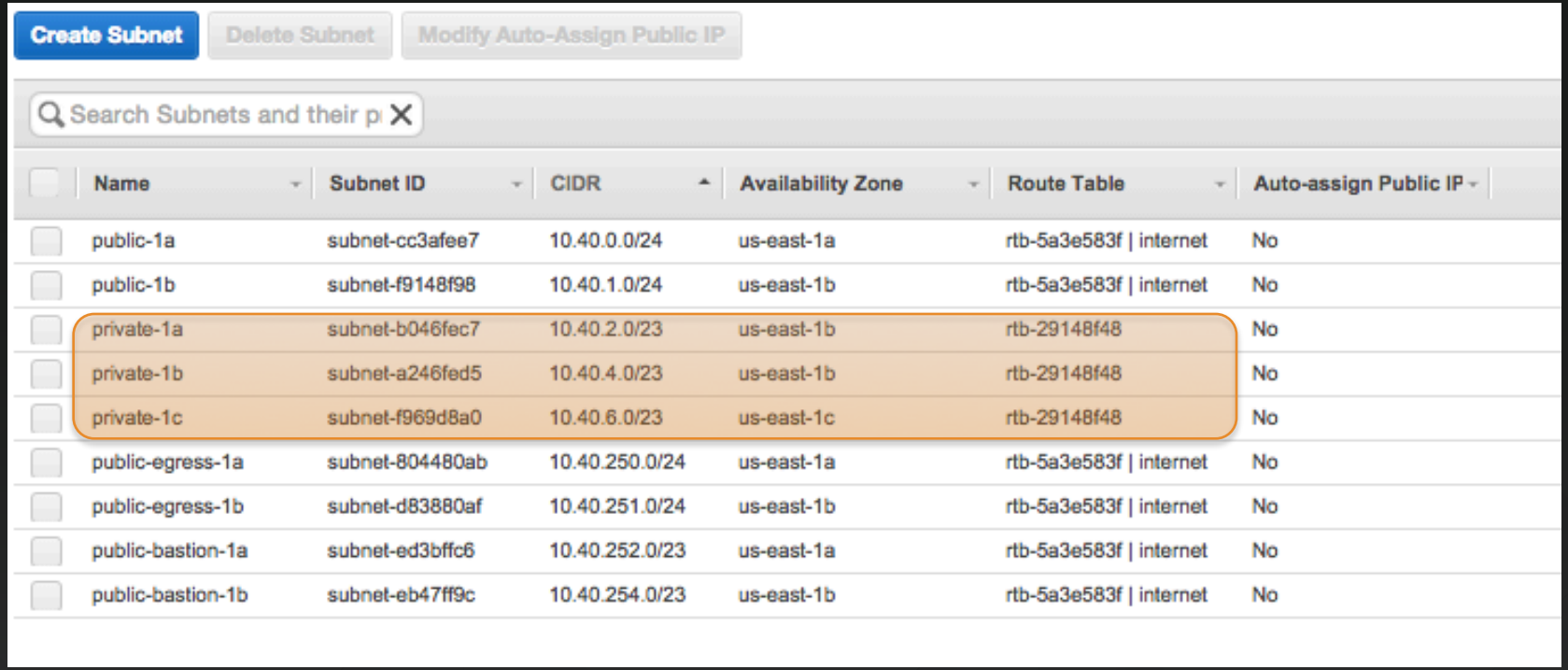
IAM policies limit who can launch instances by trust zone

Security Groups









# 2) Improve Trust & Accountability with Better Visibility

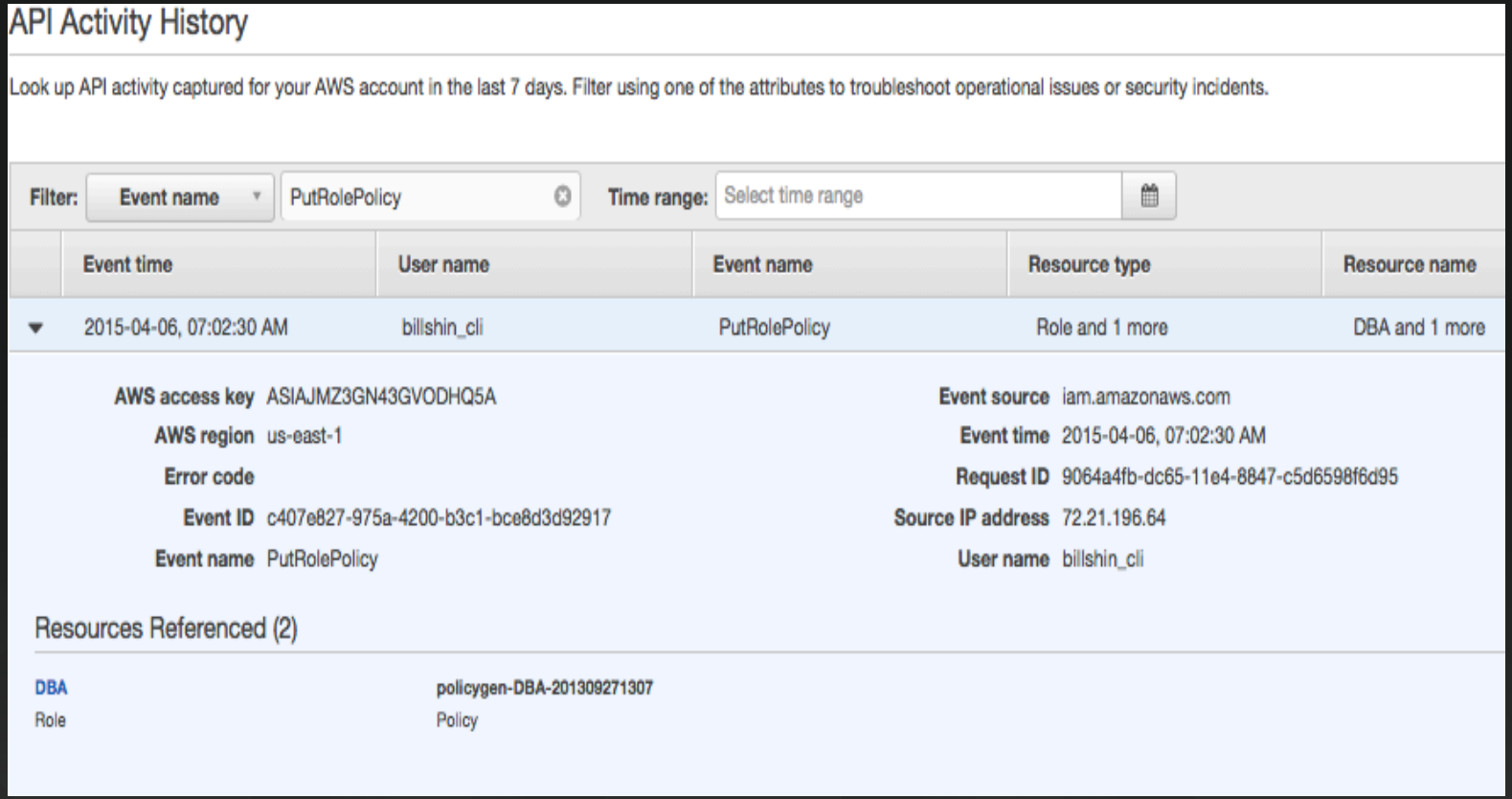
**AWS CloudTrail**

**AWS CloudWatch Logs**

*AWS Config*

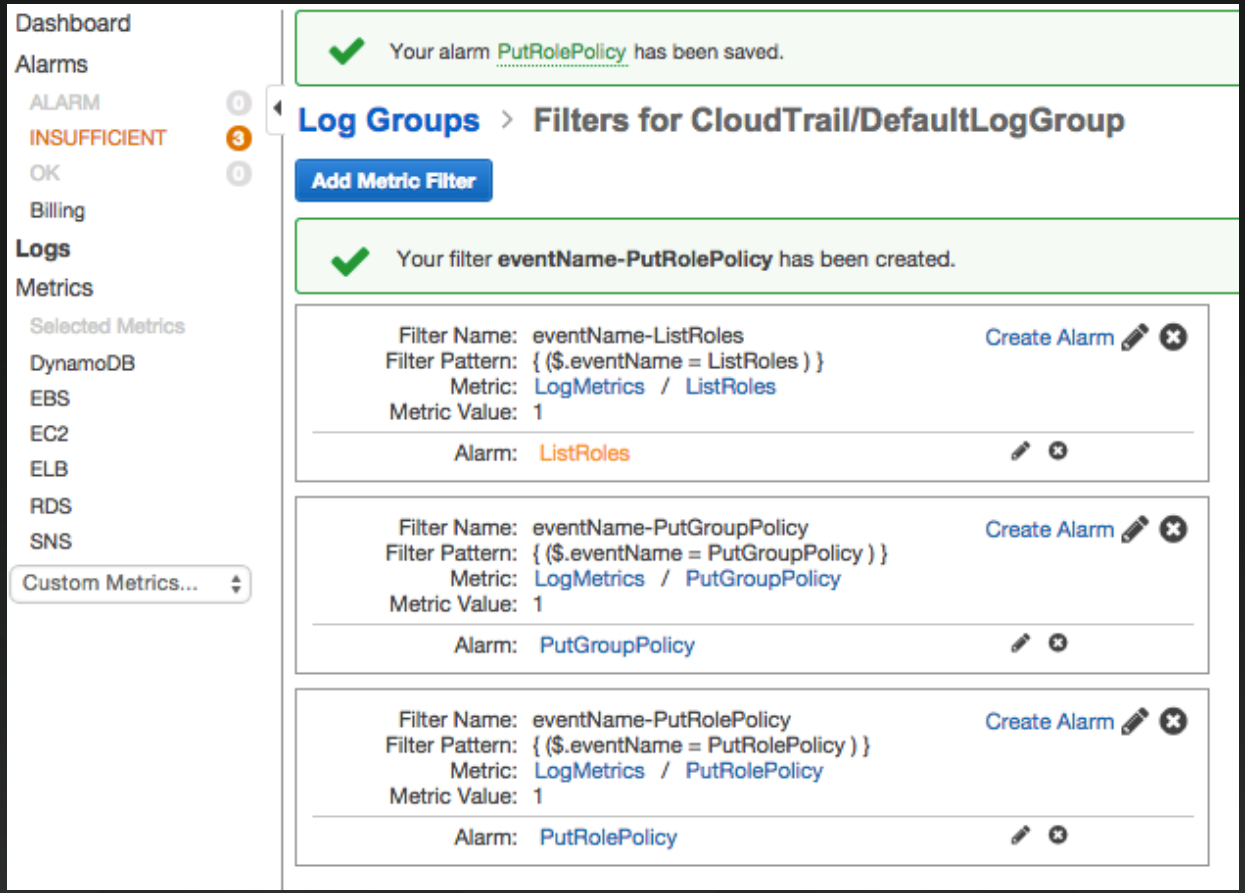
*Tagging*

*Asset Management*


API Activity History
Look up API activity captured for your AWS account in the last 7 days. Filter using one of the attributes to troubleshoot operational issues or security incidents.
Filter:
Event name
PutRolePolicy
Time range:
Select time range
Event time
User name
Event name
Resource type
Resource name
2015-04-06, 07:02:30 AM
billshin_cli
PutRolePolicy
Role and 1 more
DBA and 1 more
AWS access key ASIAJMZ3GN43GVODHQ5A
AWS region us-east-1
Error code
Event ID c407e827-975a-4200-b3c1-bce8d3d92917
Event name PutRolePolicy
Event source iam.amazonaws.com
Event time 2015-04-06, 07:02:30 AM
Request ID 9064a4fb-dc65-11e4-8847-c5d6598f6d95
Source IP address 72.21.196.64
User name billshin_cli
Resources Referenced (2)
DBA
Role
policygen-DBA-201309271307
Policy

View Event


```
{
    "eventVersion": "1.02",
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "AIDAIL4BLJTMNQJVCGK56",
        "arn": "arn:aws:iam::663354267581:user/billshin_cli",
        "accountId": "663354267581",
        "accessKeyId": "ASIAJMZ3GN43GVODHQ5A",
        "userName": "billshin_cli",
        "sessionContext": {
            "attributes": {
                "mfaAuthenticated": "true",
                "creationDate": "2015-04-06T04:35:08Z"
            }
        },
        "invokedBy": "signin.amazonaws.com"
    },
    "eventTime": "2015-04-06T14:02:30Z",
    "eventSource": "iam.amazonaws.com",
    "eventName": "PutRolePolicy",
    "awsRegion": "us-east-1",
```



## ALARM: "PutRolePolicy" in US-West-2

AWS Notifications

**Sent:** Monday, April 6, 2015 at 7:05 AM

**To:** Shinn, Bill

You are receiving this email because your Amazon CloudWatch Alarm "PutRolePolicy" in the US-West-2 region has entered the ALARM state, because "Threshold Crossed: 1 datapoint (1.0) was greater than or equal to the threshold (0.0)." at "Monday 06 April, 2015 14:05:11 UTC".

View this alarm in the AWS Management Console:
https://console.aws.amazon.com/cloudwatch/home?region=us-west-2#s=Alarms&alarm=PutRolePolicy

Alarm Details:
- Name: PutRolePolicy
- Description: Role Policy Changed
- State Change: INSUFFICIENT_DATA -> ALARM
- Reason for State Change: Threshold Crossed: 1 datapoint (1.0) was greater than or equal to the threshold (0.0).
- Timestamp: Monday 06 April, 2015 14:05:11 UTC
- AWS Account: 663354267581

Threshold:
- The alarm is in the ALARM state when the metric is GreaterThanOrEqualToThreshold 0.0 for 60 seconds.

Monitored Metric:
- MetricNamespace: LogMetrics
- MetricName: PutRolePolicy
- Dimensions:
- Period: 60 seconds
- Statistic: Sum
- Unit: not specified

State Change Actions:
- OK:
- ALARM: [arn:aws:sns:us-west-2:663354267581:CloudTrailNotifer]

# 2) Improve Trust & Accountability with Better Visibility

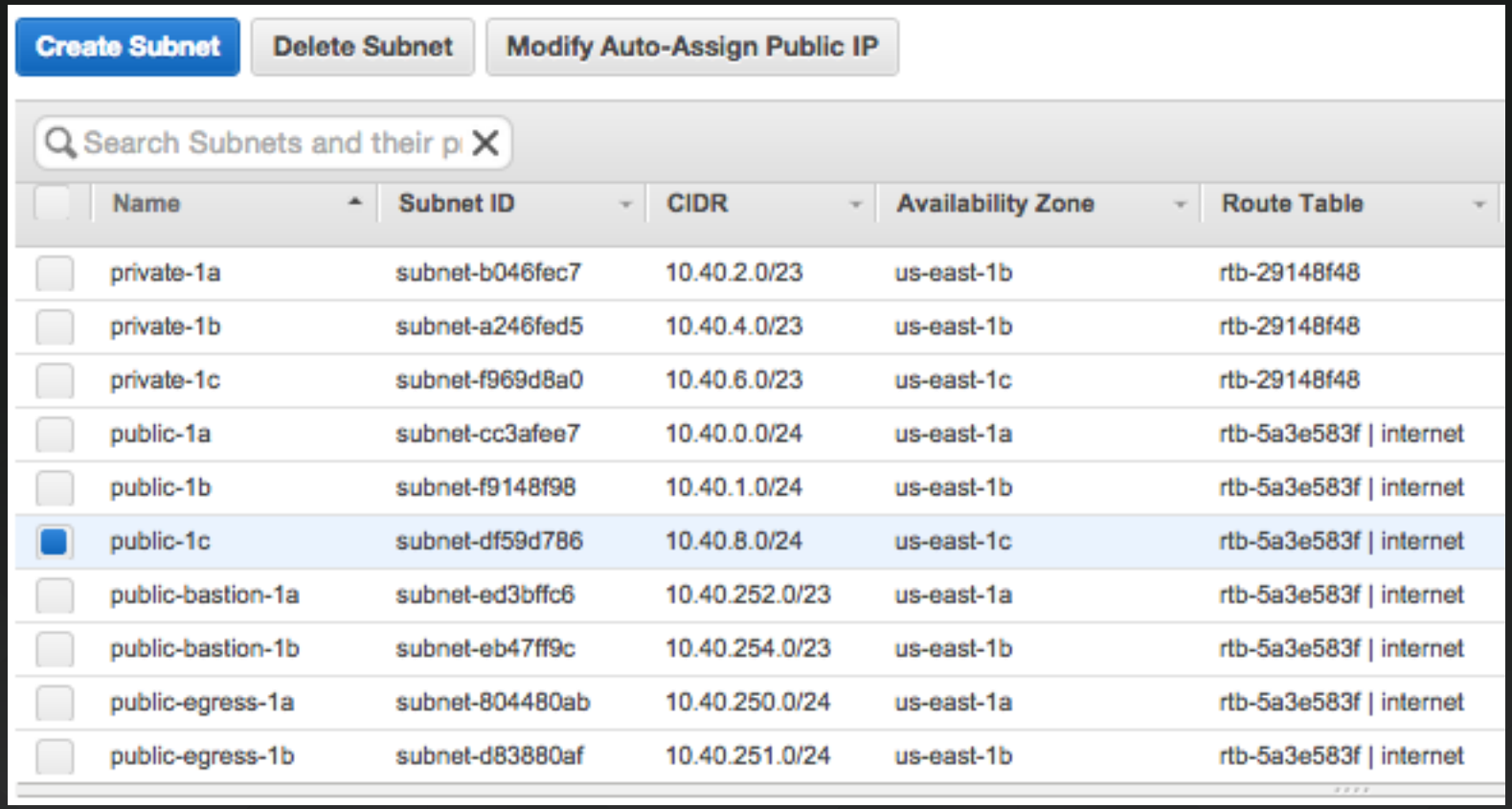
*AWS CloudTrail*

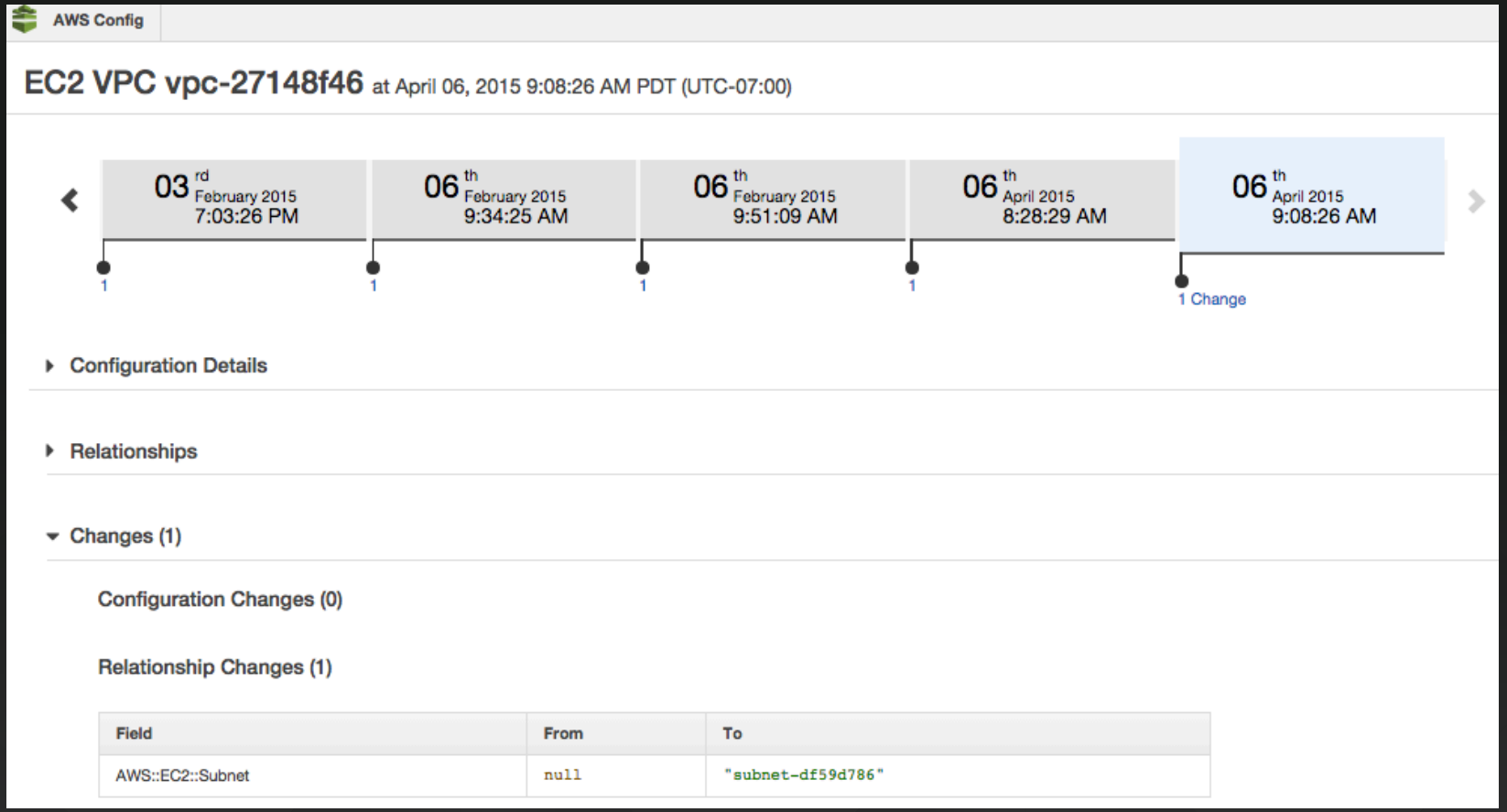
*AWS CloudWatch Logs*

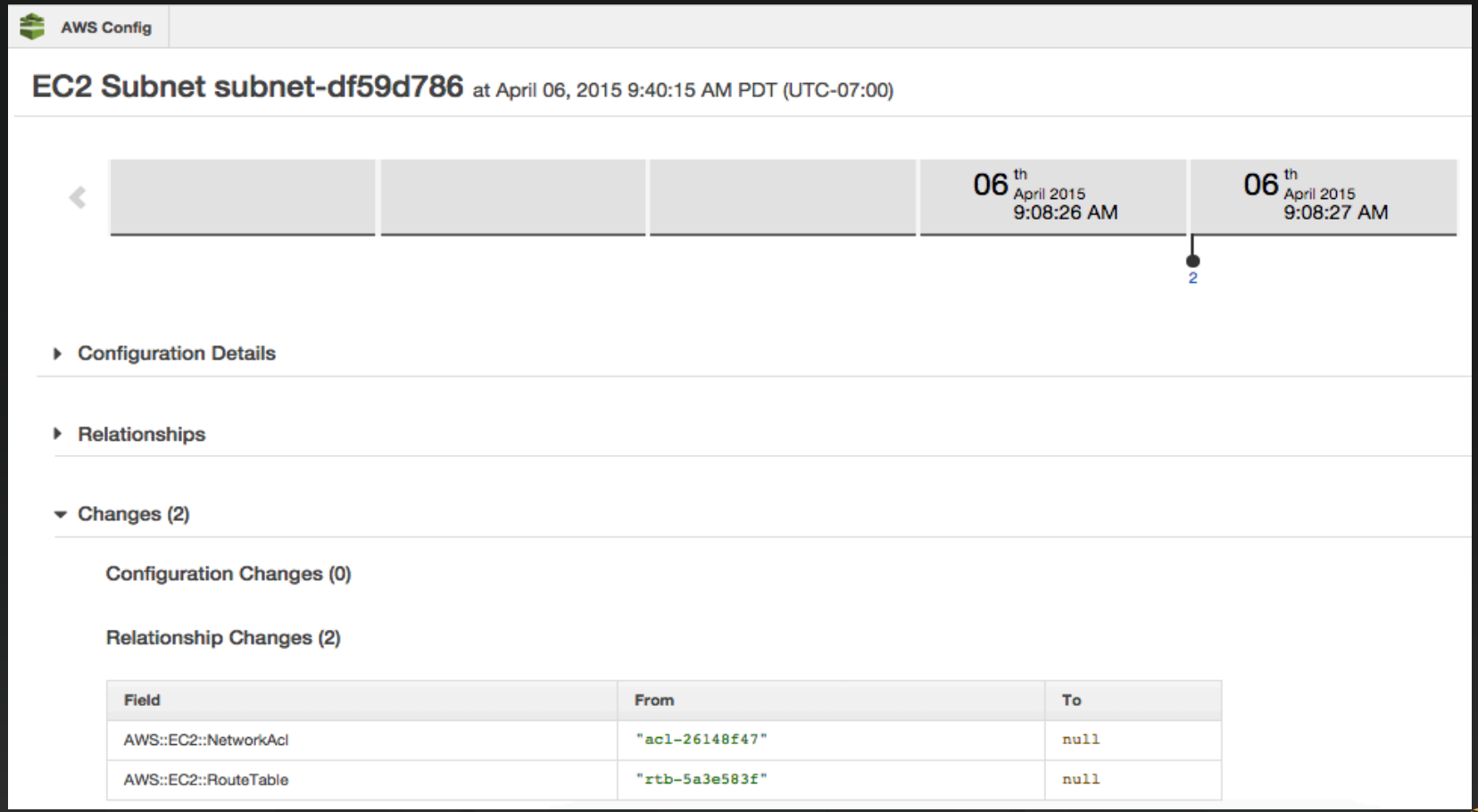
**AWS Config**

*Tagging*

*Asset Management*






AWS Config
EC2 Subnet subnet-df59d786 at April 06, 2015 9:40:15 AM PDT (UTC-07:00)
06 th April 2015 9:08:26 AM
06 th April 2015 9:08:27 AM
2
Configuration Details
Relationships
Changes (2)
Configuration Changes (0)
Relationship Changes (2)
Field
From
To
AWS::EC2::NetworkAcl
"acl-26148f47"
null
AWS::EC2::RouteTable
"rtb-5a3e583f"
null

# 2) Improve Trust & Accountability with Better Visibility

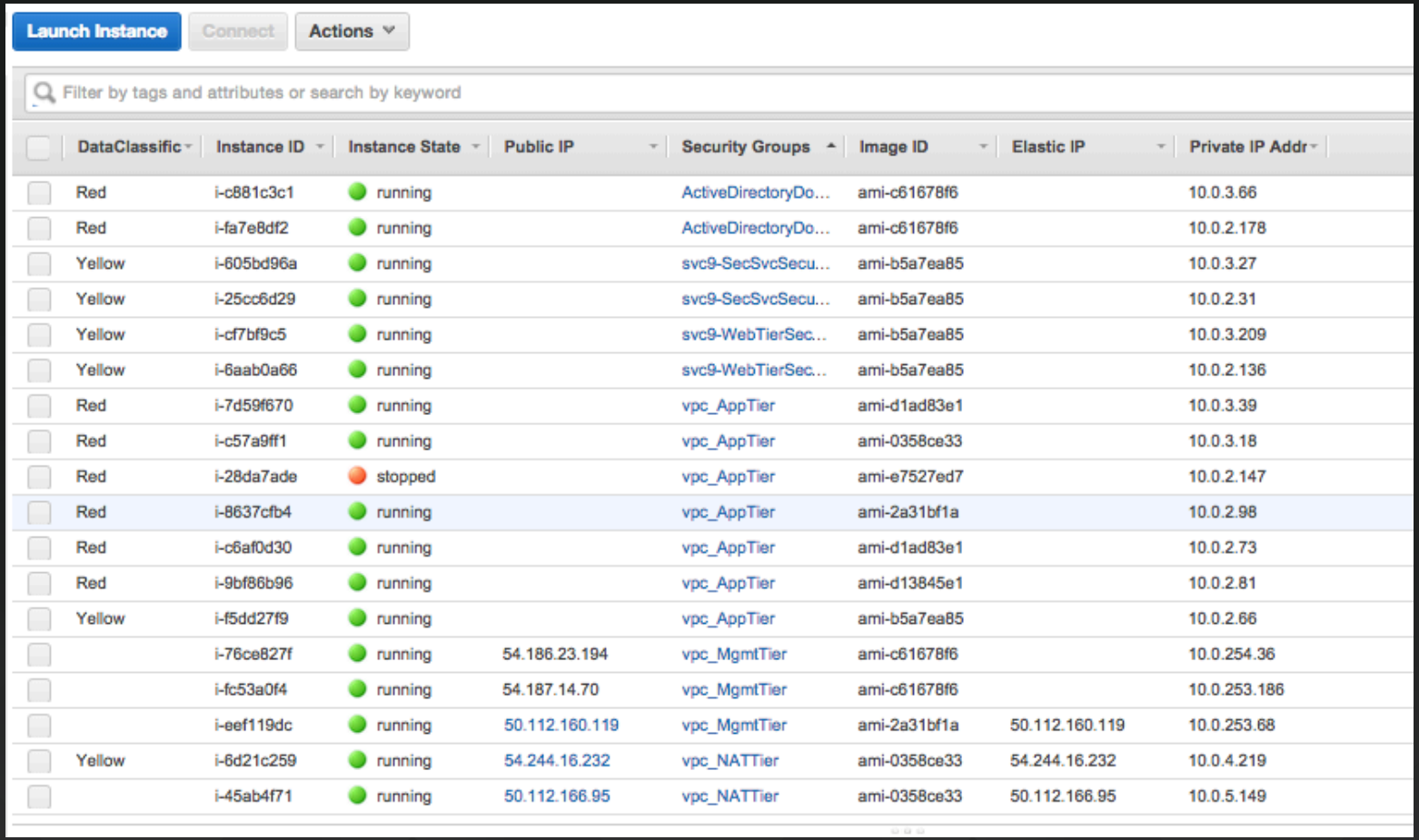
*AWS CloudTrail*

*AWS CloudWatch Logs*

*AWS Config*

**Tagging**

**Asset Management**




| DataClassific | Instance ID | Instance State | Public IP | Security Groups | Image ID | Elastic IP | Private IP Addr |
|---|---|---|---|---|---|---|---|
| Red | i-c881c3c1 | running | | ActiveDirectoryDo... | ami-c61678f6 | | 10.0.3.66 |
| Red | i-fa7e8df2 | running | | ActiveDirectoryDo... | ami-c61678f6 | | 10.0.2.178 |
| Yellow | i-605bd96a | running | | svc9-SecSvcSecu... | ami-b5a7ea85 | | 10.0.3.27 |
| Yellow | i-25cc6d29 | running | | svc9-SecSvcSecu... | ami-b5a7ea85 | | 10.0.2.31 |
| Yellow | i-cf7bf9c5 | running | | svc9-WebTierSec... | ami-b5a7ea85 | | 10.0.3.209 |
| Yellow | i-6aab0a66 | running | | svc9-WebTierSec... | ami-b5a7ea85 | | 10.0.2.136 |
| Red | i-7d59f670 | running | | vpc_AppTier | ami-d1ad83e1 | | 10.0.3.39 |
| Red | i-c57a9ff1 | running | | vpc_AppTier | ami-0358ce33 | | 10.0.3.18 |
| Red | i-28da7ade | stopped | | vpc_AppTier | ami-e7527ed7 | | 10.0.2.147 |
| Red | i-8637cfb4 | running | | vpc_AppTier | ami-2a31bf1a | | 10.0.2.98 |
| Red | i-c6af0d30 | running | | vpc_AppTier | ami-d1ad83e1 | | 10.0.2.73 |
| Red | i-9bf86b96 | running | | vpc_AppTier | ami-d13845e1 | | 10.0.2.81 |
| Yellow | i-f5dd27f9 | running | | vpc_AppTier | ami-b5a7ea85 | | 10.0.2.66 |
| | i-76ce827f | running | 54.186.23.194 | vpc_MgmtTier | ami-c61678f6 | | 10.0.254.36 |
| | i-fc53a0f4 | running | 54.187.14.70 | vpc_MgmtTier | ami-c61678f6 | | 10.0.253.186 |
| | i-eef119dc | running | 50.112.160.119 | vpc_MgmtTier | ami-2a31bf1a | 50.112.160.119 | 10.0.253.68 |
| Yellow | i-6d21c259 | running | 54.244.16.232 | vpc_NATTier | ami-0358ce33 | 54.244.16.232 | 10.0.4.219 |
| | i-45ab4f71 | running | 50.112.166.95 | vpc_NATTier | ami-0358ce33 | 50.112.166.95 | 10.0.5.149 |

# Totango And Dome9

Success Story

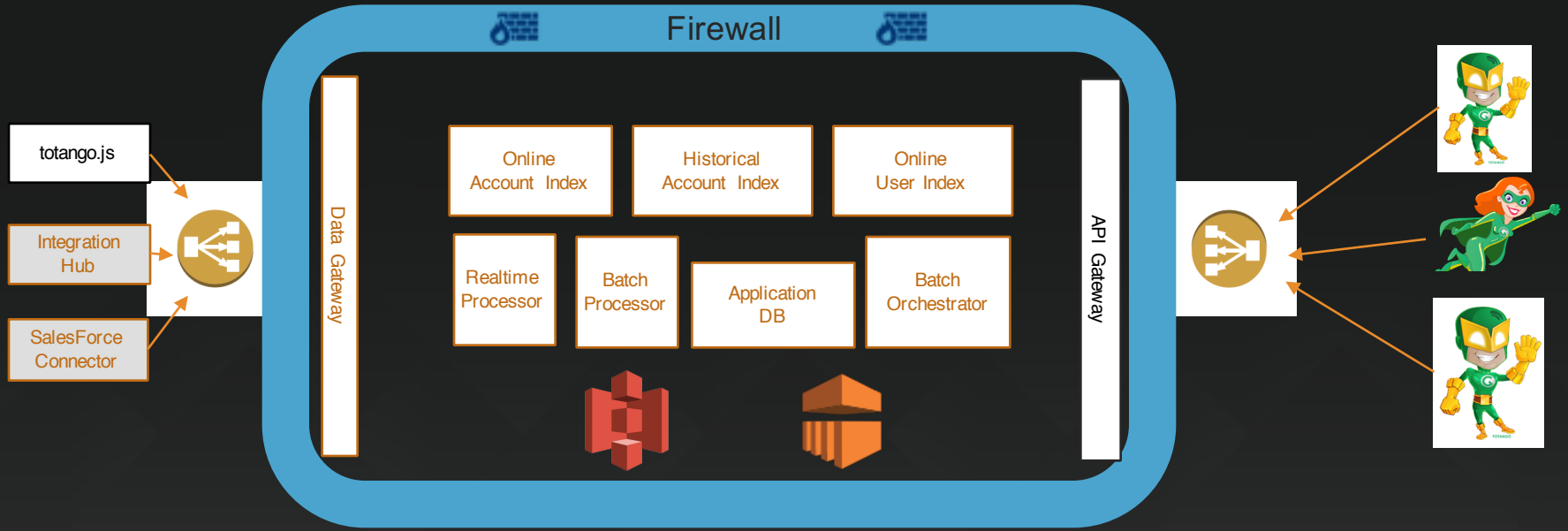
Guy Tzur
Director of OPS @ Totango

amazon web services

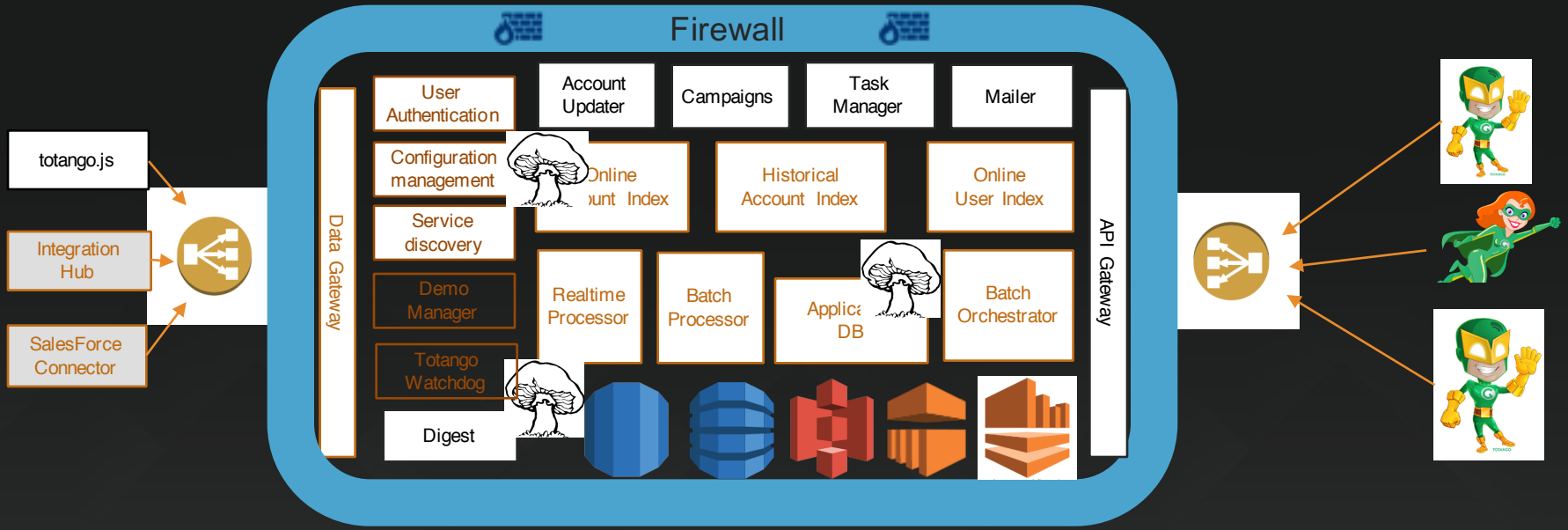
# About Totango

- A Customer Success platform
- What is Customer Success?
- A SaaS solution that provides analytics for Saas companies
- About 150 Customers

# Totango's Architecture In the Past



# Then Came The “Microservices”



# The Problem

- P: Service creation/removal becomes a daily proces s – heavy load on OPS team
- S: OPS team enables automated service creation (p owered by AWS
  - CLI, Fabric and Chef)

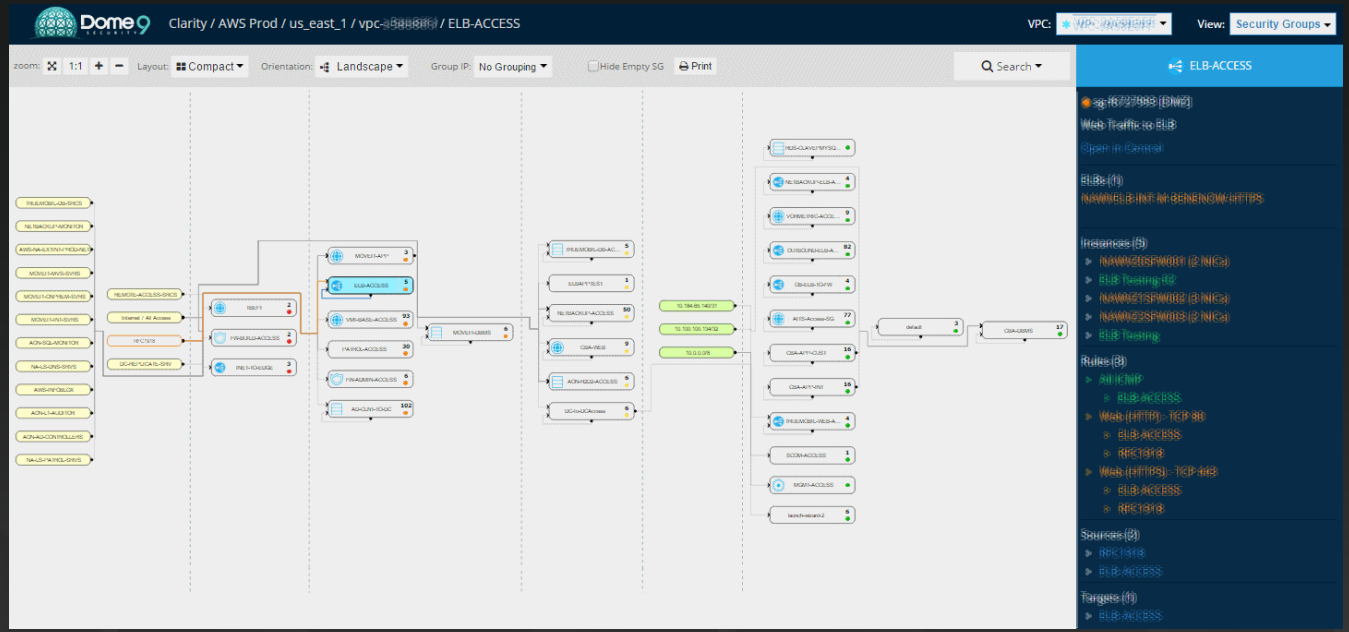
That leads to a bigger problem…

# The Problem!!!

- Configuration mistakes can lead to severe sec urity risks.
  - What happens if a service created is unsecured to the internet?

# What is Dome9

- Security Visualization, Monitoring and Management for AWS
  - Agentless; SaaS; Security focused UI; Made in Israel



# The solution by Dome9

- Simplified Security State Visualization
  - Unified Security UI for multiple AWS accounts
  - Developer logins for self-service dynamic access

- Continues Alerting and Monitoring
  - “Alert when Instance tagged PROD has RDP/SSH open to new external IPs”
  - “Alert and Revert network changes, that are NOT done through Dome9 UI”
  - “Alert and Revert changes to non-active AWS regions”

# Summery

# 3) Inherit compliance and controls

Map AWS certifications into your enterprise GRC

Recognized industry audit standards

Jurisdiction

Regulatory and contractual options (FedRAMP, HIPAA Business Associate Addendum, EU DPD Data Protection Addendum, PCI Attestation of Compliance)

# 4) Ride the pace of innovation

Find projects in your 3-year strategy where we are innovating and let us do it

Most companies do not encrypt content internally

Encryption is built into EBS, S3, RDS, Redshift, Glacier, Elastic MapReduce, and more

Key Management Service give you more control and visibility at cloud scale

We launched ~190 security-related features last year

# 5) Much Smaller Batch, Faster Changes

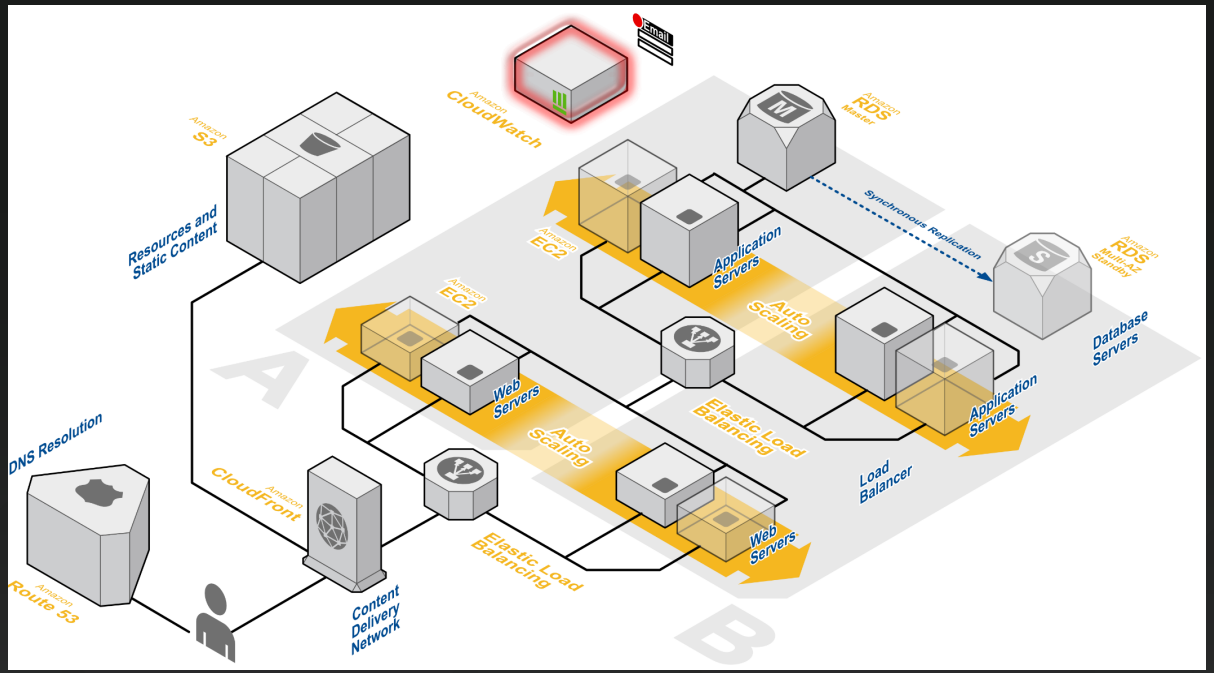
CloudFormation

Infrastructure as code, checked into source code control

Route53 or ELB cutover in deployments

Elastic Beanstalk application versions

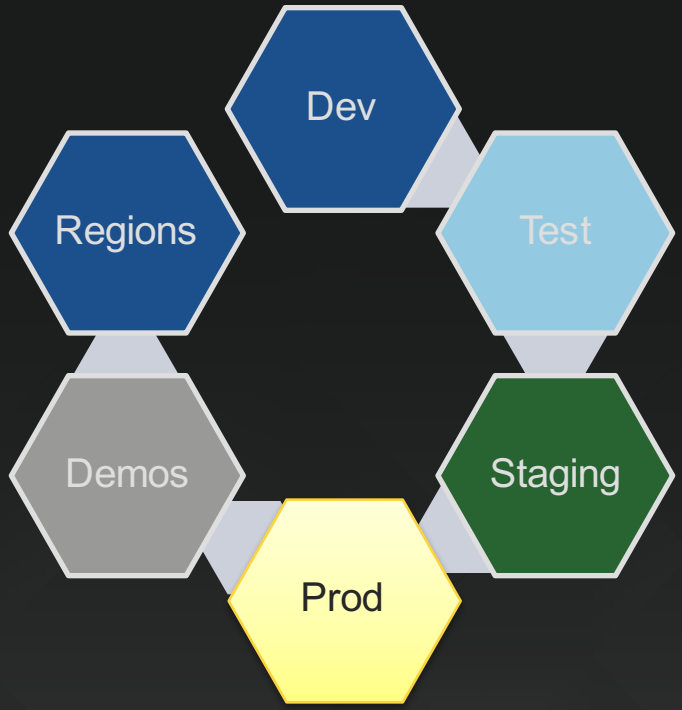
Integrate teams across functions - less hand-offs between teams, but far greater awareness and control of lower-risk changes




JSON Template

Stack Stack Stack

amazon web services



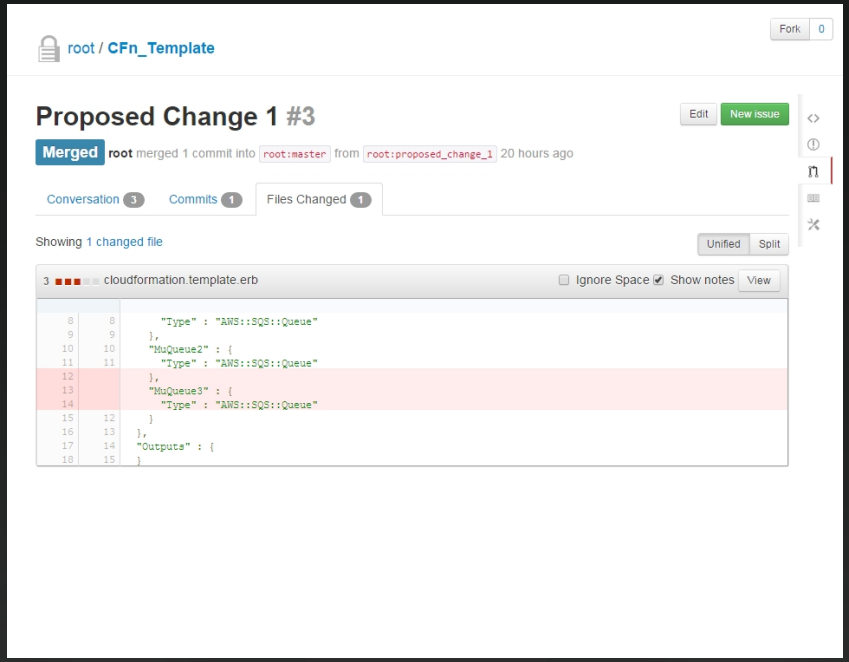

Version Control

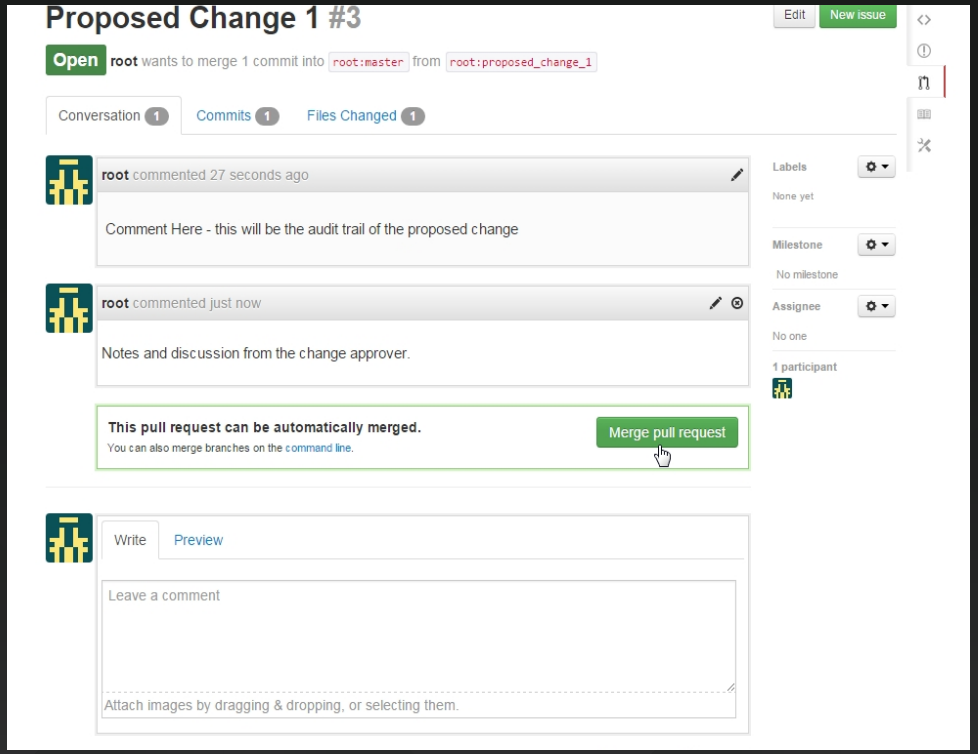
Replicate

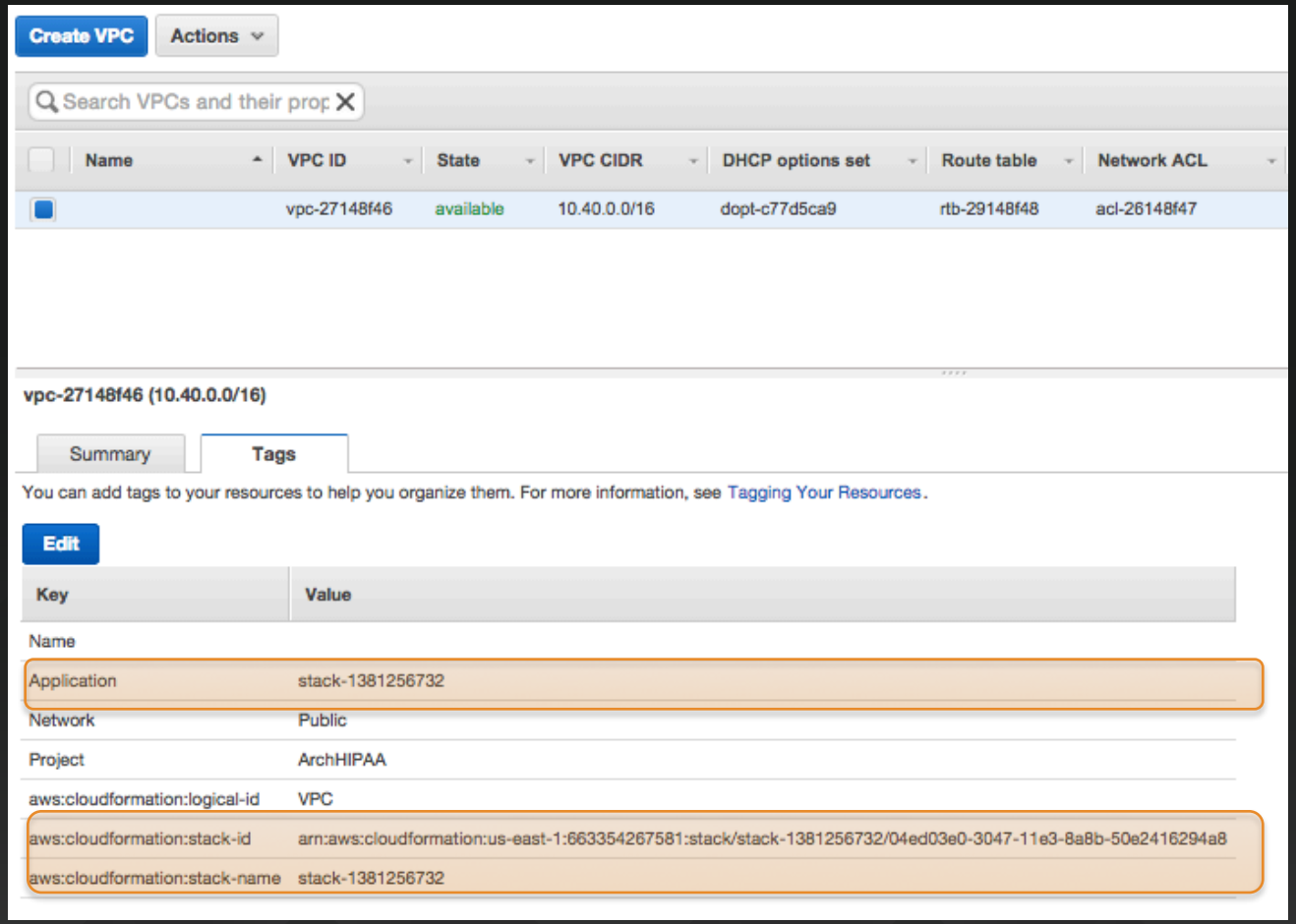
Standardization

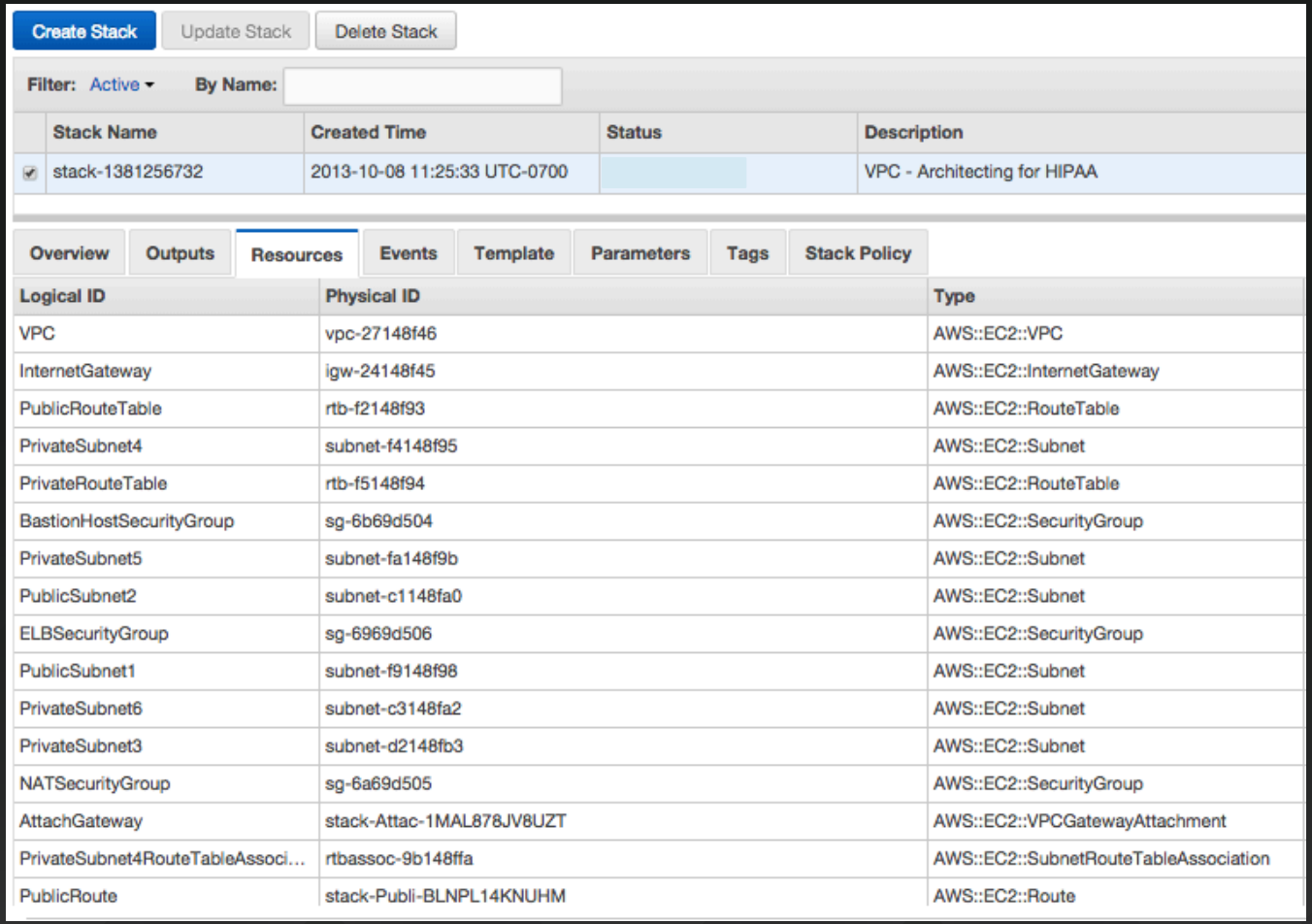
Service Catalog

amazon web services


root / CFn_Template
Fork 0
Proposed Change 1 #3
Edit
New issue
Merged
root merged 1 commit into root:master from root:proposed_change_1 20 hours ago
Conversation 3
Commits 1
Files Changed 1
Showing 1 changed file
Unified
Split
3 cloudformation.template.erb
Ignore Space
Show notes
View
"Type" : "AWS::SQS::Queue"
},
"MuQueue2" : {
"Type" : "AWS::SQS::Queue"
},
"MuQueue3" : {
"Type" : "AWS::SQS::Queue"
}
},
"Outputs" : {
}







Create Stack | Update Stack | Delete Stack

Filter: Active ▾ By Name:

| Stack Name | Created Time | Status | Description |
|---|---|---|---|
| stack-1381256732 | 2013-10-08 11:25:33 UTC-0700 | | VPC - Architecting for HIPAA |

Overview | Outputs | Resources | Events | Template | Parameters | Tags | Stack Policy

| Logical ID | Physical ID | Type |
|---|---|---|
| VPC | vpc-27148f46 | AWS::EC2::VPC |
| InternetGateway | igw-24148f45 | AWS::EC2::InternetGateway |
| PublicRouteTable | rtb-f2148f93 | AWS::EC2::RouteTable |
| PrivateSubnet4 | subnet-f4148f95 | AWS::EC2::Subnet |
| PrivateRouteTable | rtb-f5148f94 | AWS::EC2::RouteTable |
| BastionHostSecurityGroup | sg-6b69d504 | AWS::EC2::SecurityGroup |
| PrivateSubnet5 | subnet-fa148f9b | AWS::EC2::Subnet |
| PublicSubnet2 | subnet-c1148fa0 | AWS::EC2::Subnet |
| ELBSecurityGroup | sg-6969d506 | AWS::EC2::SecurityGroup |
| PublicSubnet1 | subnet-f9148f98 | AWS::EC2::Subnet |
| PrivateSubnet6 | subnet-c3148fa2 | AWS::EC2::Subnet |
| PrivateSubnet3 | subnet-d2148fb3 | AWS::EC2::Subnet |
| NATSecurityGroup | sg-6a69d505 | AWS::EC2::SecurityGroup |
| AttachGateway | stack-Attac-1MAL878JV8UZT | AWS::EC2::VPCGatewayAttachment |
| PrivateSubnet4RouteTableAssoci... | rtbassoc-9b148ffa | AWS::EC2::SubnetRouteTableAssociation |
| PublicRoute | stack-Publi-BLNPL14KNUHM | AWS::EC2::Route |

# 6) Reduce the impact of failure

Multi-Availability Zone deployments

Use multiple regions

Replicate data – S3, EBS, RDS

Lifecycle policies

Auto-scaling

Auto-recovery

# 7) Further improve automation

Access and deployments are no longer performed by people

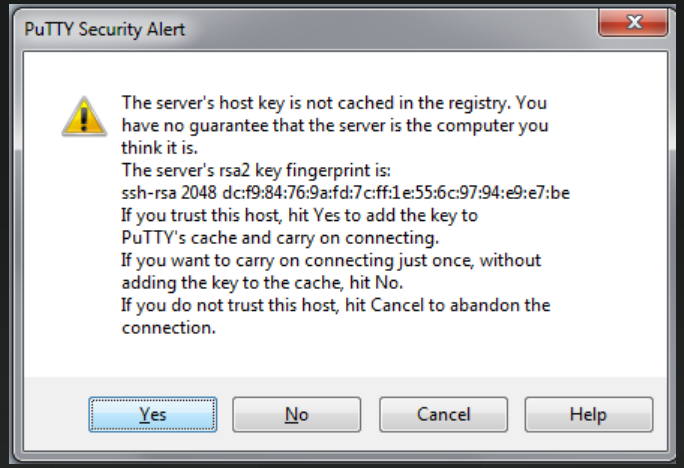
EC2 Instance Profiles and service roles (Security Token Service)

AWS CodeDeploy

Amazon EC2 Container Service

Continuous Integration & Deployment

Extends to on-premises workloads



## CodeDeploy package specification

```
os: linux
files:
  - source: Config/config.txt
    destination: webapps/Config
  - source: source
    destination: /webapps/myApp
hooks:
  BeforeInstall:
    - location: Scripts/UnzipResourceBundle.sh
    - location: Scripts/UnzipDataBundle.sh
  AfterInstall:
    - location: Scripts/RunResourceTests.sh
      timeout: 180
  ApplicationStart:
    - location: Scripts/RunFunctionalTests.sh
      timeout: 3600
  ValidateService:
    - location: Scripts/MonitorService.sh
      timeout: 3600
      runas: codedeployuser
```

## Amazon EC2 Container Service Task Definition

```
{
  "containerDefinitions": [
    {
      "name": "wordpress",
      "links": [
        "mysql"
      ],
      "image": "wordpress",
      "essential": true,
      "portMappings": [
        {
          "containerPort": 80,
          "hostPort": 80
        }
      ],
      "memory": 500,
      "cpu": 10
    },
    {
      "environment": [
        {
          "name": "MYSQL_ROOT_PASSWORD",
          "value": "password"
        }
      ],
      "name": "mysql",
      "image": "mysql",
      "cpu": 10,
      "memory": 500,
      "essential": true
    }
  ],
  "family": "hello_world"
}
```

Automate security operations

- Secret and configuration management.
- Test backup and restore
- Perform intrusion detection on launch/retire
- Validate running deployments against expectations and human approvals

On success: retire instance.
On failure: call a human.

# 8) Make security actionable

Review what matters

- Internet Gateway
- Identity and Access Management
- VPC – Subnet and NACL changes
- Security Groups

Shut things down automatically

Assess what changes

Roll-back automatically

Use Lambda for event-driven security

# Benefits of IT Security on AWS

*Higher degree of visibility, transparency and accountability (secure and can prove it)*

*Higher degree of trust and autonomy*

*Significant reductions in long-term, privileged access*

*Focus a greater portion of limited security resources toward application security*

*Have a much higher rate of successful change and changes are delivered more quickly*

# Thank you!