



AWS Architecture Training

CloudWatch

Module 6



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CloudWatch

Monitoring for AWS cloud resources

- AWS resources (EC2, EBS, RDS, etc.)
- Custom Metrics (Applications)

Collect, track, alert on metrics

System-wide visibility

- Resource utilization
- Application performance
- Operational health

Programmatically retrieve monitoring data

CloudWatch Features

- ❏ EC2 Basic (5 min) and Detailed (1 min) monitoring
- ❏ Automatic Statistics
 - Sum, Ave, Min, Max
- ❏ Alarms
 - Simple Notification Service
 - Auto Scaling
- ❏ 2-weeks of historical graphs

CloudWatch Features (cont...)

Custom Metrics

- Automatic Statistics (Sum, Ave, Min, Max)
- SNS Alarms
- Custom Auto Scaling Events
- Metrics Immediately Available
 - Can have less than 1 minute granularity
- 2-weeks of historical graphs
- mon-scripts-perl
 - EC2 instance memory, swap, and disk space utilization metrics

<http://docs.amazonwebservices.com/AmazonCloudWatch/latest/DeveloperGuide/mon-scripts-perl.html>

CloudWatch Costs

Free Tier

- Basic Monitoring (5 min)
- 10 metrics (either Detailed or Custom)
- 10 Alarms
- 1 Million API requests/month

Costs

- | | |
|------------------------------------|-----------------------------|
| ▪ Detailed (1 min) Monitoring | \$3.50/instance/month |
| ▪ Custom Metrics | \$0.50/metric/month |
| ▪ CloudWatch Alarms | \$0.10/alarm/month |
| ▪ CloudWatch API Requests requests | \$0.01/1,000 Get, List, Put |

<http://docs.amazonwebservices.com/AmazonCloudWatch/latest/DeveloperGuide/mon-scripts-perl.html>



CloudWatch Integration with EC2

The screenshot shows the AWS Management Console interface for the 'Amazon EC2' service. The left-hand navigation pane is visible, with the 'INSTANCES' section expanded and 'Instances' highlighted. The main content area displays the 'My Instances' table, which lists the instance 'SM Load Test' (ID: i-7e98ed1c) in the 'us-east-1c' zone, running on an 'm1.small' instance type. Below the table, the 'Monitoring' tab is selected, showing the 'CloudWatch alarms' section. The 'Create Alarm' button is highlighted. The 'CloudWatch metrics' section displays five graphs: Avg CPU Utilization (Percent), Avg Disk Reads (Bytes), Avg Disk Writes (Bytes), Max Network In (Bytes), and Max Network Out (Bytes). The 'Enable Detailed Monitoring' button is also visible.

Name	Instance	Zone	Type	State	Monitoring	Security Group	Key Pair Name	Elastic IP	Virtualization	Private IP	Subnet ID
SM Load Test	i-7e98ed1c	us-east-1c	m1.small	running	basic	Load_Testing	linuxkey	--	paravirtual	10.0.1.227	subnet-6f878806

CloudWatch alarms: No alarms configured for i-7e98ed1c > View all CloudWatch alarms

CloudWatch metrics: Graphs are for 1 instance with basic monitoring enabled. Times are displayed in UTC.

Enable detailed monitoring for your Amazon EC2 instance to get these metrics at 1-minute frequency, plus additional metrics. [Learn more.](#) [Enable Detailed Monitoring](#)

Avg CPU Utilization (Percent)

Avg Disk Reads (Bytes)

Avg Disk Writes (Bytes)

Max Network In (Bytes)

Max Network Out (Bytes)

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CloudWatch EC2 Metrics

CPU Utilization

- As seen by hypervisor

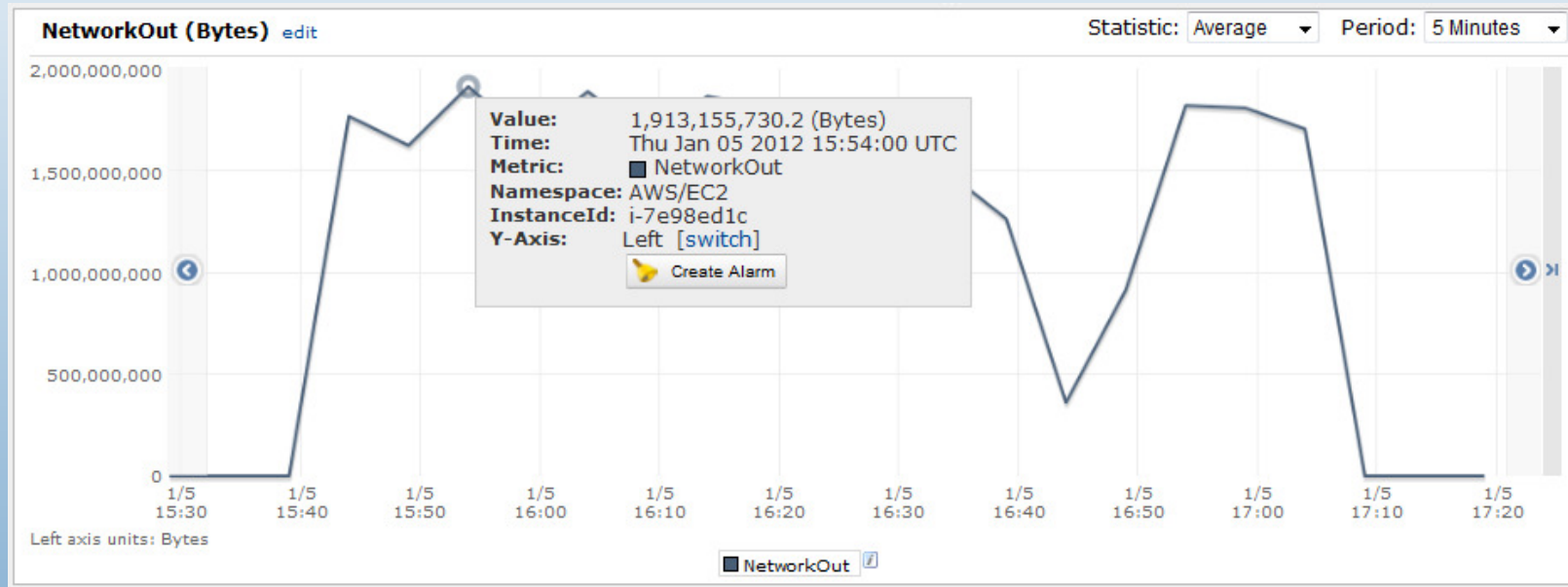
(Ephemeral) Disk Read/Writes

- Disk Read/Writes to disks attached to hypervisor (instance or “ephemeral” disks)
- Use EBS Metrics for EBS I/O

Network In/Out

- Summarized (Min, Max, Ave, Sum)
- Bytes / Time period
- Basic (5 minute) / Detailed (1 minute)
- Ave Bytes / 60 (seconds) \approx Bytes per second
 - Ave Bytes / 60 Million \approx MBps
 - Ave Bytes / 60 Million * 8 \approx Mbps

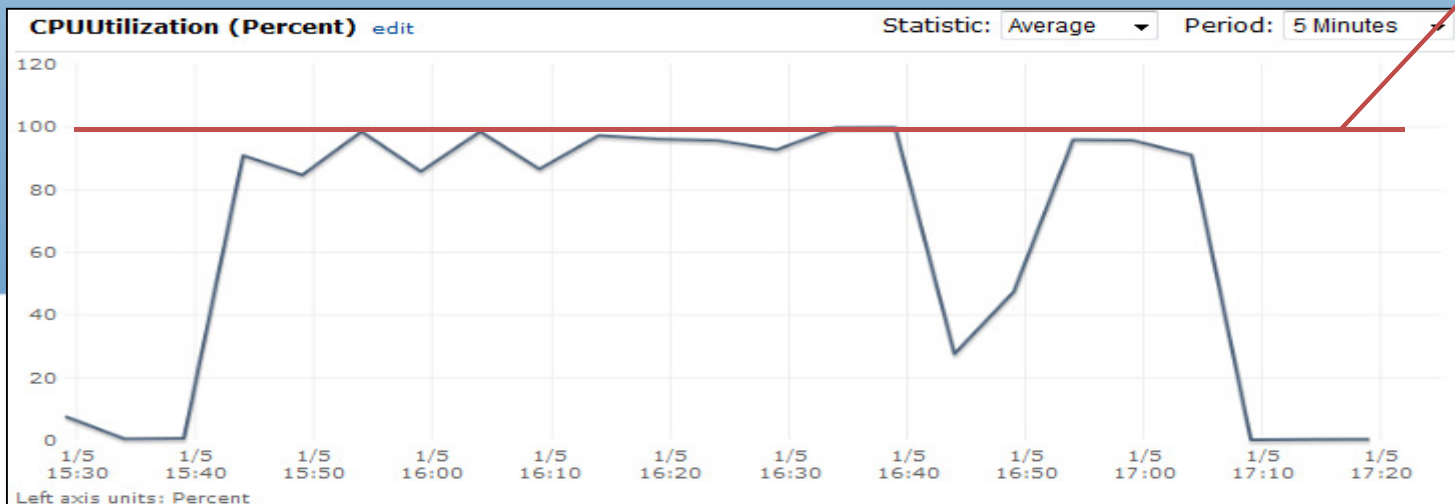
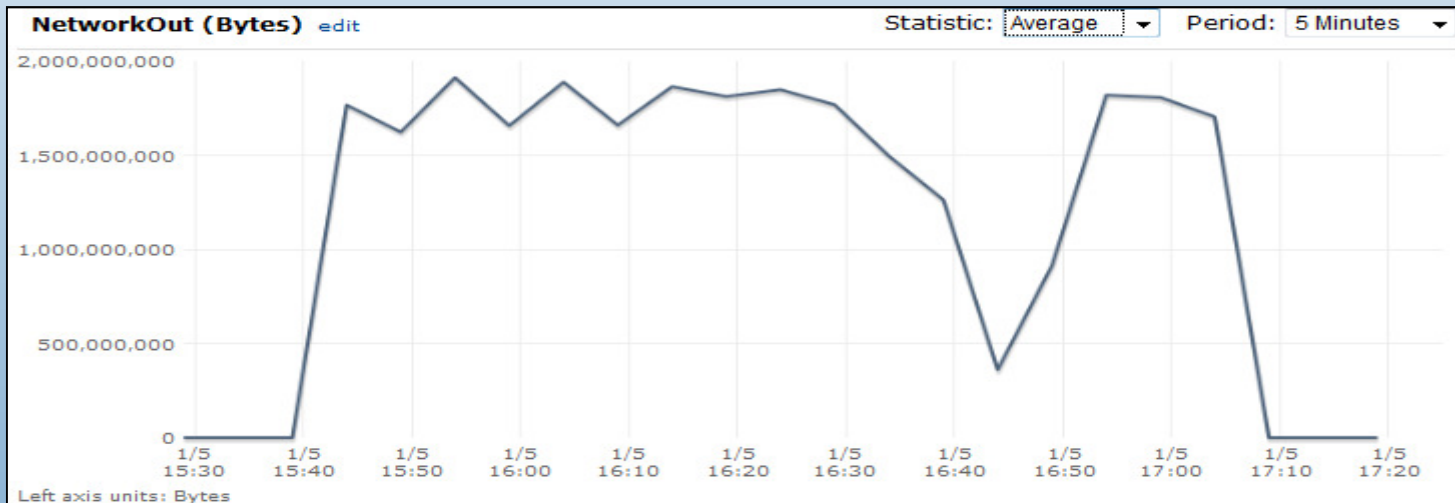
EC2 Network Out Example



- 📦 Period = 5 Minutes, Samples = 5
 - Therefore Bytes per period = Bytes per minute
- 📦 $1,913,155,730 / 60,000,000,000 \approx 32 \text{ MBps}$
- 📦 $32 \text{ MBps} * 8 \approx 256 \text{ Mbps}$

Troubleshooting Example

- What is this instance's primary constraint?
 - Network or CPU



Does this upper bound help?

CloudWatch Integration with EBS

Firefox | AWS Management Console | AWS Management Console | + | amazon.com | https://console.aws.amazon.com/ec2/home?region=us-east-1#s=Volumes | Google

AWS Management Console | Amazon EC2 | Stephen Morad | Help

Navigation | Region: US East (Virginia)

- EC2 Dashboard
- Scheduled Events
- INSTANCES
 - Instances
 - Spot Requests
 - Reserved Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes**
 - Snapshots
- NETWORK & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Load Balancers
 - Key Pairs
 - Network Interfaces

EBS Volumes

Create Volume | Delete Volume | Attach Volume | Detach Volume | Force Detach | Create Snapshot | Show/Hide | Refresh | Help

Viewing: All Volumes | Search

	Name	Volume ID	Capacity	Snapshot	Created	Zone	Status	Attachment Information
<input checked="" type="checkbox"/>	Data Transfer Test	vol-b46907de	50 GIB	--	2011-09-16T17:59:31.00	us-east-1c	in-use	i-7e98ed1c (SM Load Test)/dev/sdf (attached)
<input type="checkbox"/>	Data Transfer Test	vol-904628fa	50 GIB	--	2011-09-16T18:51:36.00	us-east-1c	in-use	i-be98eddc (Load Test Master)/dev/sdf (attached)

1 Volume selected

Volume: vol-b46907de

Detail | **Monitoring** | Tags

CloudWatch alarms: No alarms configured for vol-b46907de | View all CloudWatch alarms

CloudWatch metrics: Times are displayed in UTC.

Time Range: Last Week | Refresh

Create Alarm


The metrics section displays ten graphs for volume vol-b46907de over a time range of 1/5 to 1/9. The graphs are arranged in two rows of five. The first row contains: Read Bandwidth (KIB/s), Write Bandwidth (KIB/s), Read Throughput (Ops/s), Write Throughput (Ops/s), and Avg Queue Length (Ops). The second row contains: Time Spent Idle (Percent), Avg Read Size (KIB/op), Avg Write Size (KIB/op), Avg Read Latency (ms/op), and Avg Write Latency (ms/op). All graphs show data points for the specified time range, with most metrics showing a single data point at the end of the range.

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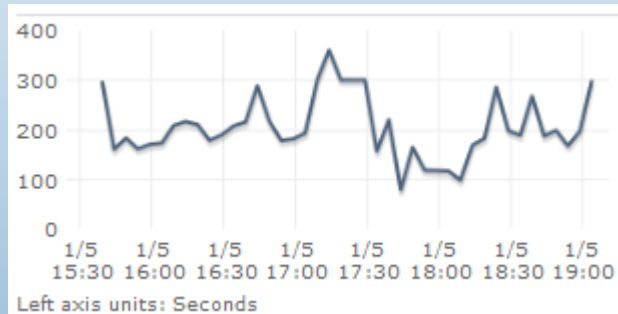
CloudWatch EBS Metrics

- 📦 Read/Write Bandwidth (KB/sec)
- 📦 Read/Write Operations (count / period)
- 📦 Idle Time (seconds)
 - Per period (e.g. 300 = 100% idle for 5 minutes)
- 📦 Average
 - Queue Length
 - Read/Write Size
 - Read/Write Latency

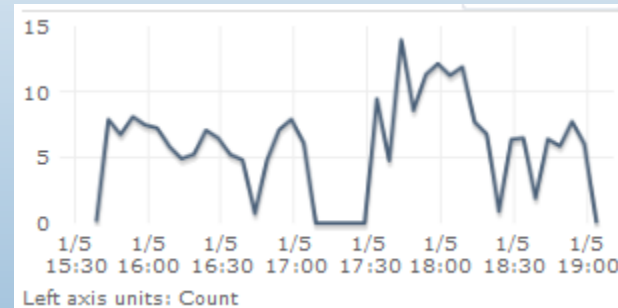
CloudWatch EBS Example

 Period = 5 Minutes

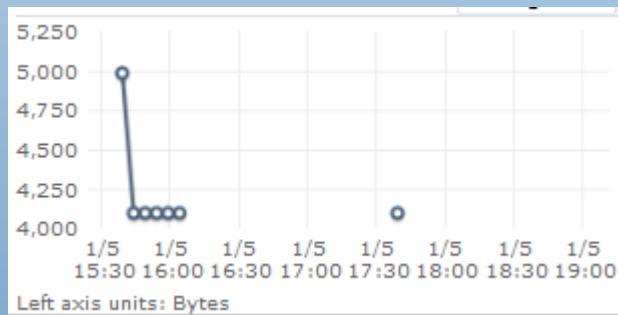
Average Idle Time



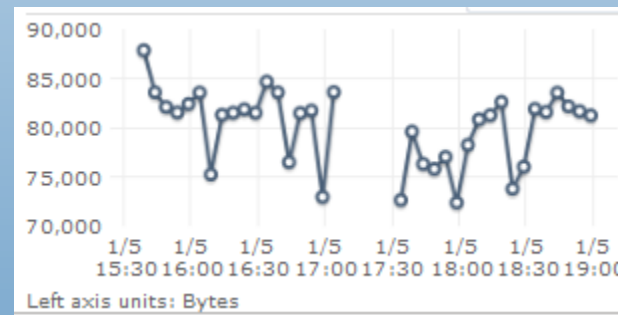
Average Queue Length



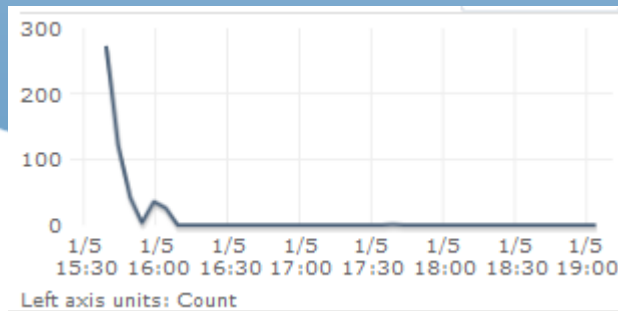
Average Read Bytes



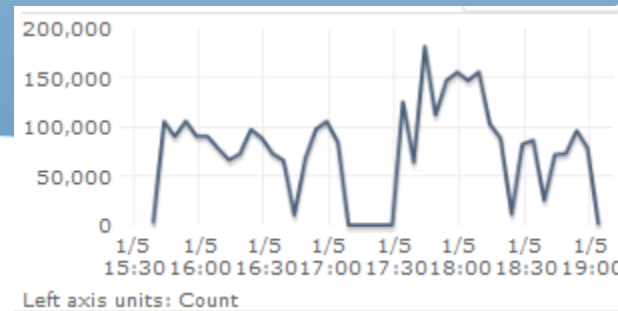
Average Write Bytes



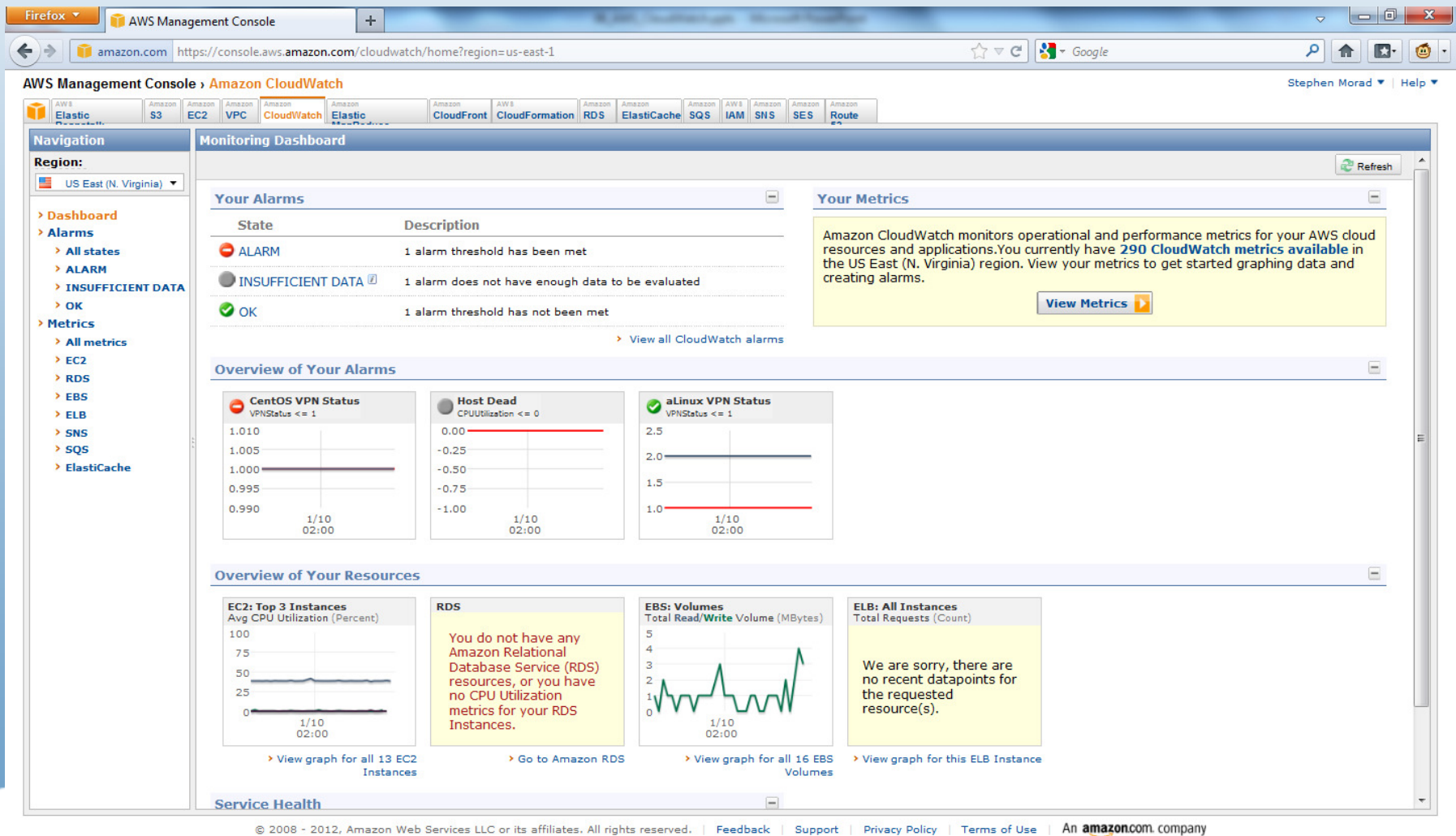
Read Operations



Write Operations



CloudWatch Dashboard



CloudWatch Alarms

Firefox

AWS Management Console

amazon.com https://console.aws.amazon.com/cloudwatch/home?region=us-east-1#s=Alarms

AWS Management Console > Amazon CloudWatch Stephen Morad | Help

Navigation

Region: US East (N. Virginia)

- > Dashboard
- > Alarms
 - > All states
 - > ALARM
 - > INSUFFICIENT DATA
 - > OK
- > Metrics
 - > All metrics
 - > EC2
 - > RDS
 - > EBS
 - > ELB
 - > SNS
 - > SQS
 - > ElastiCache

Your CloudWatch Alarms

Create Alarm Modify Delete Show/Hide Refresh Help

Viewing: All alarms 1 to 3 of 3 Items

	State	Name	Threshold
<input type="checkbox"/>	ALARM	CentOS VPN Status	VPNStatus <= 1 for 5 minutes
<input type="checkbox"/>	INSUFFICIENT_DATA	Host Dead	CPUUtilization <= 0 for 2 minutes
<input checked="" type="checkbox"/>	OK	aLinux VPN Status	VPNStatus <= 1 for 5 minutes

1 Alarm selected

Alarm: aLinux VPN Status

Description Metric

State Details:
State changed to 'OK' at 2012/01/09 21:10 UTC.
Reason: Threshold Crossed: 1 datapoint (2.0) was not less than or equal to the threshold (1.0).

Description:
VPN Status for my aLinux Instance

Threshold:
VPNStatus <= 1 for 5 minutes

Actions:
in ALARM state - Send message to topic "VPNStatus" (morad@amazon.com)

aLinux VPN Status
VPNStatus <= 1

> View metrics graph

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Integrating CloudWatch

Many customers rely on multiple monitoring tools

- Integrate/Augment existing 3rd Party tools
 - Nagios, ganglia, etc...

CloudWatch “Pulling” Plugins

- CloudWatch (like all AWS) is an API
- Get/Put Metrics

CloudWatch Notifications

- CloudWatch Alarms
 - JSON SNS notifications
 - Email, HTTP(S), SMS



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CloudWatch Create Alarm

Select Metric

Create Alarm Wizard Cancel

Set an alarm for any of your CloudWatch metrics. Your alarm will react automatically when a metric reaches your specified threshold. Available actions include sending Amazon SNS notifications and executing Auto Scaling policies. To get started, select a metric. Then preview it, select a statistic and sampling period, and click **Continue**.

Statistic: Average

Period: 5 Minutes

Important: select a sample period. A shorter period allows a more sensitive alarm. A longer period smooths out brief spikes.

See a preview by clicking on a metric

Viewing: All Metrics VPN Search 1 to 6 of 6 Metrics


TopicName	MetricName	
VPNStatus	NumberOfMessagesPublished	
VPNStatus	NumberOfNotificationsDelivered	
VPNStatus	NumberOfNotificationsFailed	
VPNStatus	PublishSize	
vpn-3b3bdc52:CGW,VGW		
VGW	CGW	MetricName
vgw-2928cf40	cgw-210ceb48	VPNStatus
vpn-3f0ee956:CGW,VGW		
VGW	CGW	MetricName
vgw-2928cf40	cgw-e91ff880	VPNStatus

Continue

CloudWatch Create Alarm

Select Metric

Create Alarm Wizard Cancel




Set an alarm for any of your CloudWatch metrics. Your alarm will react automatically when a metric reaches your specified threshold. Available actions include sending Amazon SNS notifications and executing Auto Scaling policies. To get started, select a metric. Then preview it, select a statistic and sampling period, and click **Continue**.

Statistic: Average

Period: 1 Minute

Important: select a sample period. A shorter period allows a more sensitive alarm. A longer period smooths out brief spikes.

VPNStatus (None)



Viewing: All Metrics VPN Search 1 to 6 of 6 Metrics

SNS: Topic Metrics

TopicName	MetricName
VPNStatus	NumberOfMessagesPublished
VPNStatus	NumberOfNotificationsDelivered
VPNStatus	NumberOfNotificationsFailed
VPNStatus	PublishSize

vpn-3b3bdc52:CGW,VGW

VGW	CGW	MetricName
vgw-2928cf40	cgw-210ceb48	VPNStatus

vpn-3f0ee956:CGW,VGW

VGW	CGW	MetricName
-----	-----	------------

Continue

CloudWatch Create Alarm

Define Alarm

Create Alarm WizardCancel

Provide the details and threshold for your alarm. Use the graph below to help set the appropriate threshold. Average

Identify Your Alarm

Assign your alarm a name and description.

Name:

Description:

Define Alarm Threshold

Alarms have three states: ALARM, OK, and INSUFFICIENT DATA. The state of your alarm changes according to a threshold you specify. First, define the criterion for entering the ALARM state. Later, you can specify an action to be taken when your alarm enters any of the three states.

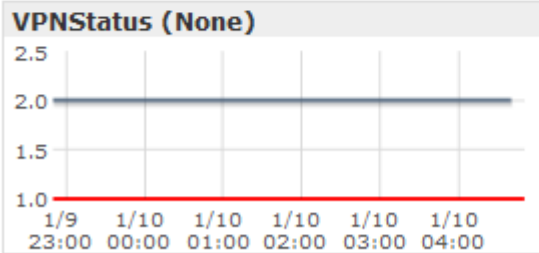
This alarm will enter the ALARM state when VPNStatus is for minutes.

Metric: VPNStatus

Period: 5 Minutes

Statistic: Average

VPNStatus (None)



< BackContinue

CloudWatch Create Alarm

Configure Actions

Create Alarm WizardCancel

✓

✓

SELECT METRICDEFINE ALARMCONFIGURE ACTIONSREVIEW

Define what actions are taken when your 'VPN Status' alarm changes.

You can define multiple actions for a single alarm. For example, you may want to scale out your fleet and send an email to your pager when this alarm enters the ALARM state, and then send another all-clear email when it returns to the OK state.

Define Your Actions

Actions define what steps you want to automate when the alarm state changes. For example, you can send a message using email via the [Simple Notification Service \(SNS\)](#). You can also execute an [Auto Scaling Policy](#), if you have one configured ([learn about policies](#)).

When Alarm state is	Take action	Action details	
ALARM	Send Notification	<div>Topic: Select or create email topic Select or create email topic... Create New Email Topic... CPU-Too-High VPNStatus</div>	<div>ADD ACTION</div>

< BackContinue

CloudWatch Create Alarm

Review & Create Alarm

Create Alarm Wizard

Cancel

SELECT METRICDEFINE ALARMCONFIGURE ACTIONSREVIEW

Please review the alarm information below. If you would like to proceed with this configuration, click **Create Alarm**. If you want to make any changes to this alarm, click **Back** or select a step on the right to edit.

Alarm Definition

Edit Definition

Name:

VPN Status

Description:

Monitor the VPN connection status

In ALARM state when:

the value is ≤ 1 for 3 minutes

Metric

Edit Metric

Namespace:

vpn-3b3bdc52

MetricName:

VPNStatus

CGW:

cgw-210ceb48

VGW:

vgw-2928cf40

Period / Statistic:

1 Minute / Average

Alarm Actions

Edit Actions

Actions:

When alarm state is "🔴 ALARM "

Action Type: Send Notification

Action: Notify topic: VPNStatus (morad@amazon.com)

< Back

Create Alarm

CloudWatch View Metrics

