Introduction to Amazon Cloudwatch

Amazon CloudWatch is a service used for monitoring and observing resources in real-time, built for DevOps engineers, developers, site reliability engineers (SREs), and IT managers. CloudWatch provides users with data and actionable insights to monitor their respective applications, stimulate system-wide performance changes, and optimize resource utilization. CloudWatch collects monitoring and operational data in the form of logs, metrics, and events, providing its users with an aggregated view of AWS resources, applications, and services that run on AWS. The CloudWatch can also be used to detect anomalous behavior in the environments, set warnings and alarms, visualize logs and metrics side by side, take automated actions and troubleshoot issues.

Terminologies related to Amazon Cloudwatch

Metrics

- It represents a time-ordered set of data points that are published to Amazon CloudWatch
- All data point is marked with a timestamp
- Metric is a variable that is monitored and data points are the value of that variable over time
- They are uniquely defined by a name, namespace, and zero or more dimensions
- Metric math is used to query multiple cloudwatch metrics and use math expressions to create new time-series based on these metrics

Dimensions

- A dimension is a name/value pair which uniquely identifies a metric
- Dimensions are the unique identifiers for a metric, so whenever you add a unique name/value pair to one of the metrics, you are creating a new

variation of that metric.

Statistics

- Statistics are metric data aggregations over specified periods of time
- The few available statistics on Cloudwatch are maximum, minimum, s average, and sample count.

Alarm

- It is used to automatically initiate actions on our behalf
- It watches a single metric over a specified time period and performs one or more specified actions based on the value of the metric
- The estimated AWS charges can also be monitored using the alarm

Percentiles

- It represents the relative weightage of the data in a dataset
- It helps the user to get a better understanding of the distribution of metric data

Cloudwatch dashboard

- A user-friendly Cloudwatch console is available which is used for monitoring resources in a single view.
- There is no limit on the number of cloudwatch dashboards you can create.
- These dashboards are global and not region-specific

Cloudwatch agent

- It is required to be installed
- It collects logs and system-level metrics from EC2 instances and on-premises servers

Cloudwatch Events:

- Cloudwatch events help you to create a set of rules that match with any event(i.e stopping of EC2 instance).
- These events can be routed to one or more targets like AWS Lambda functions, Amazon SNS Topics, Amazon SQS queues, and other target types.
- Cloudwatch Events observes the operational events continuously and whenever there is any change in the state of the event, it performs the

action by sending notifications, activating lambda, etc.

- An **event** indicates a change in the AWS environment. Whenever there is a change in the state of AWS resources, events are generated.
- **Rules** are used for matching events and routing to targets.
- **Target** process events. They include Amazon EC2 instances, AWS Lambda functions, etc. A target receives the events in JSON format.

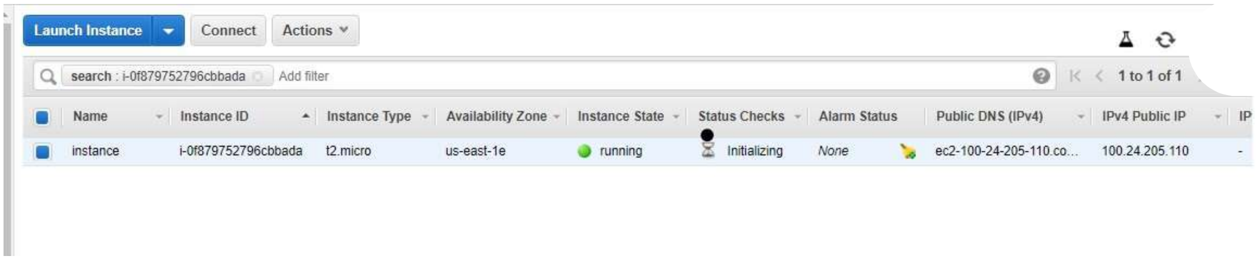
Cloudwatch logs:

- Amazon Cloudwatch logs enable you to store, monitor, and access files from AWS resources like Amazon EC2 instances, Route53, etc.
- It also helps you to troubleshoot your system errors and maintain the logs in highly durable storage.
- It also creates log of information about the DNS queries that Route 53 receives

Amazon Cloudwatch Create

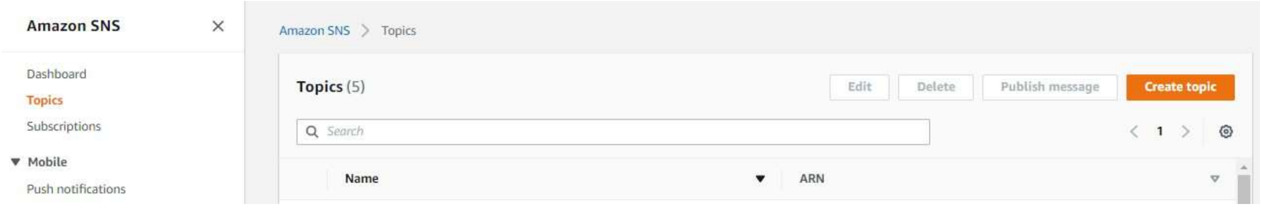
Notifying *gfg* website management team when the instance on which *gfg* website is hosted stops Whenever the CPU utilization of instance (on which GeeksForGeeks website is hosted) goes above 80%, cloudwatch event is triggered. This cloudwatch event then activates the SNS topic which sends the alert email to the attached *gfg* subscribers.

Step 1: Let us assume that you have already launched an instance with the name tag ‘instance’.

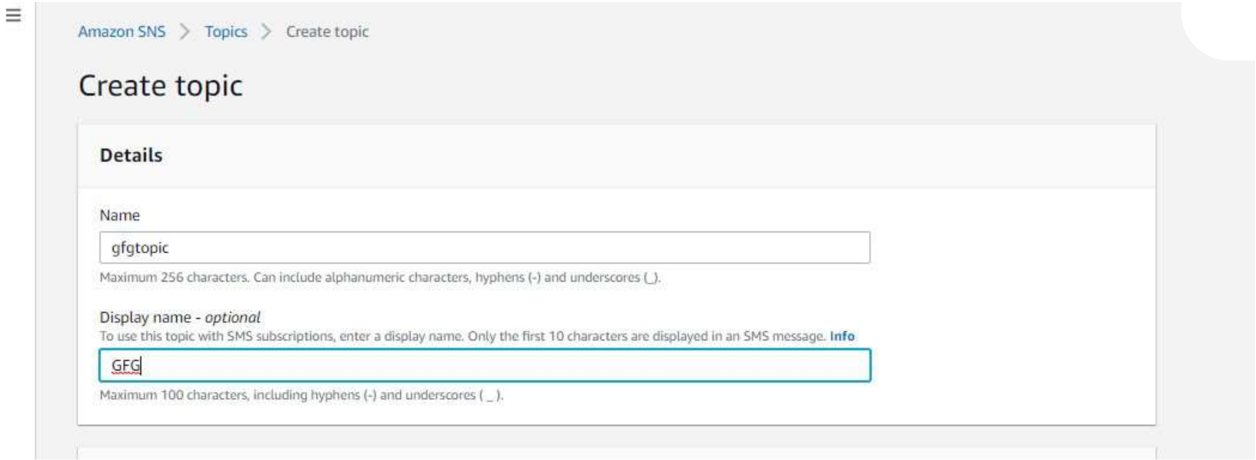


Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP	IP
instance	i-0f879752796cbbada	t2.micro	us-east-1e	● running	Initializing	None	ec2-100-24-205-110.co...	100.24.205.110	-

Step 2: Go to SNS topic dashboard and click on create a topic



Step 3: You will be directed to this dashboard. Now specify the name and display name.



Create topic

Details

Name

gfgtopic

Maximum 256 characters. Can include alphanumeric characters, hyphens (-) and underscores (_).

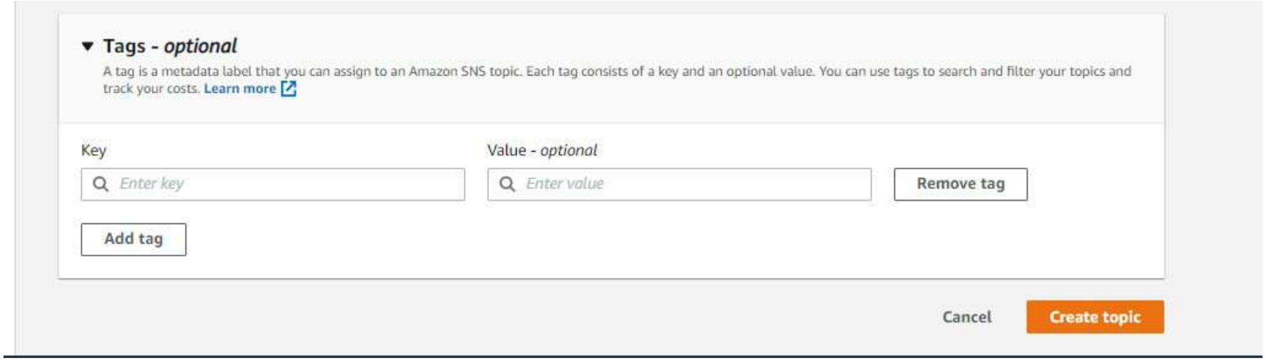
Display name - *optional*

To use this topic with SMS subscriptions, enter a display name. Only the first 10 characters are displayed in an SMS message. Info

GFG

Maximum 100 characters, including hyphens (-) and underscores (_).

Step 4: Scroll down and click on create the topic.



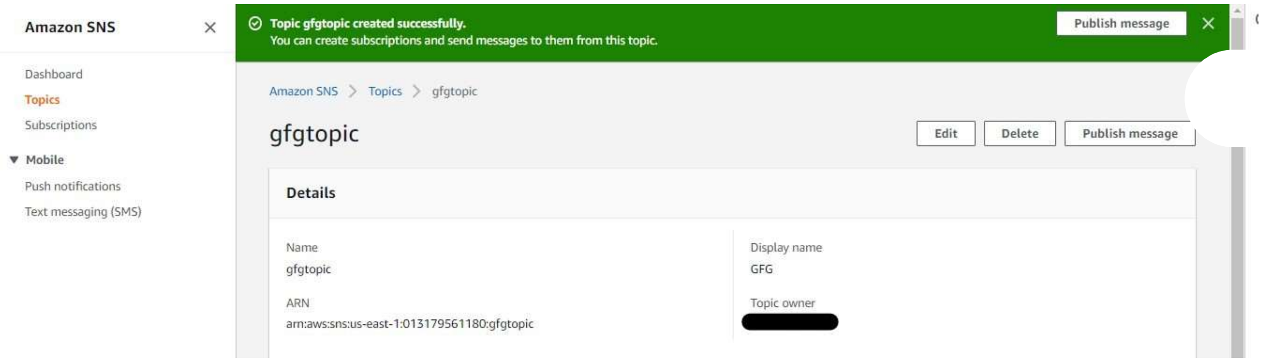
▼ Tags - *optional*

A tag is a metadata label that you can assign to an Amazon SNS topic. Each tag consists of a key and an optional value. You can use tags to search and filter your topics and track your costs. Learn more

Key

Value - *optional*

Step 5: The SNS topic is created successfully.



Topic gfgtopic created successfully.
You can create subscriptions and send messages to them from this topic.

gfgtopic

Details

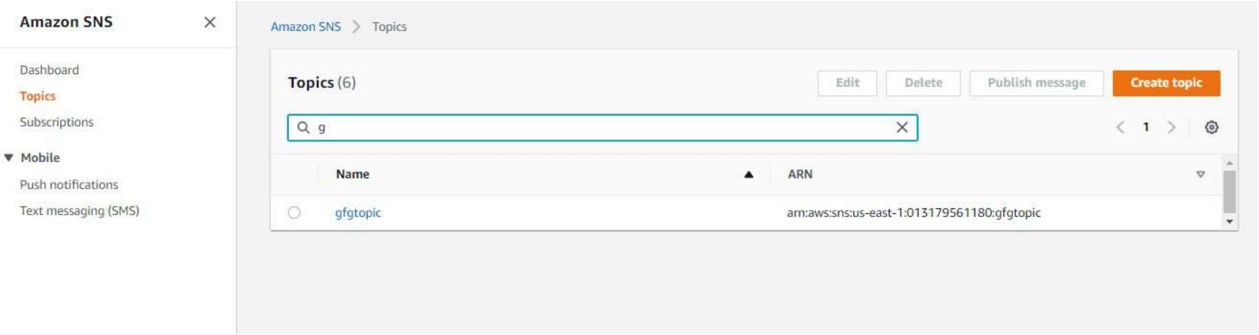
Name
gfgtopic

ARN
arn:aws:sns:us-east-1:013179561180:gfgtopic

Display name
GFG

Topic owner
[redacted]

Step 6: Go to the SNS topic dashboard and click on *gfgtopic* link.

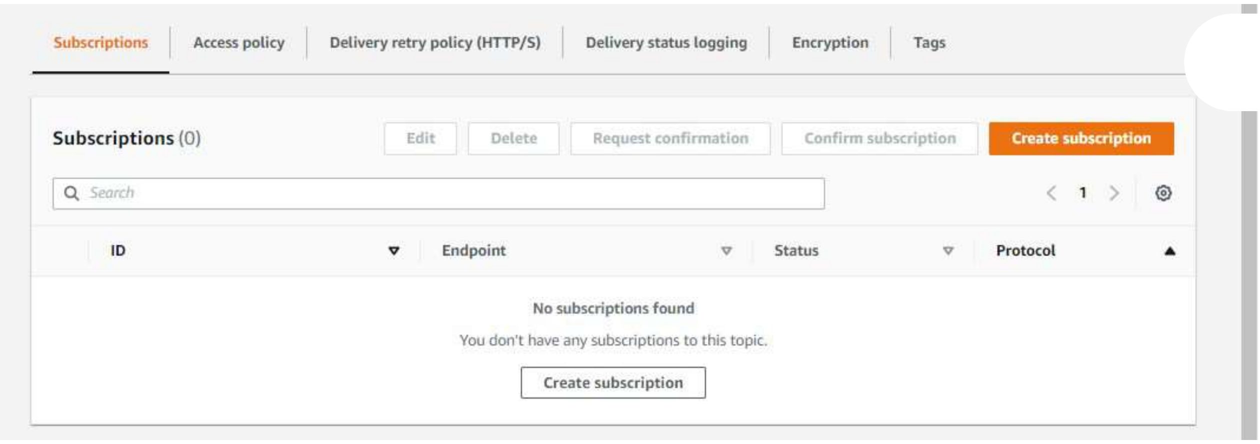


Topics (6)

g

	Name	ARN
○	gfgtopic	arn:aws:sns:us-east-1:013179561180:gfgtopic

Step 7: Under the subscriptions section, Click on Create subscription.



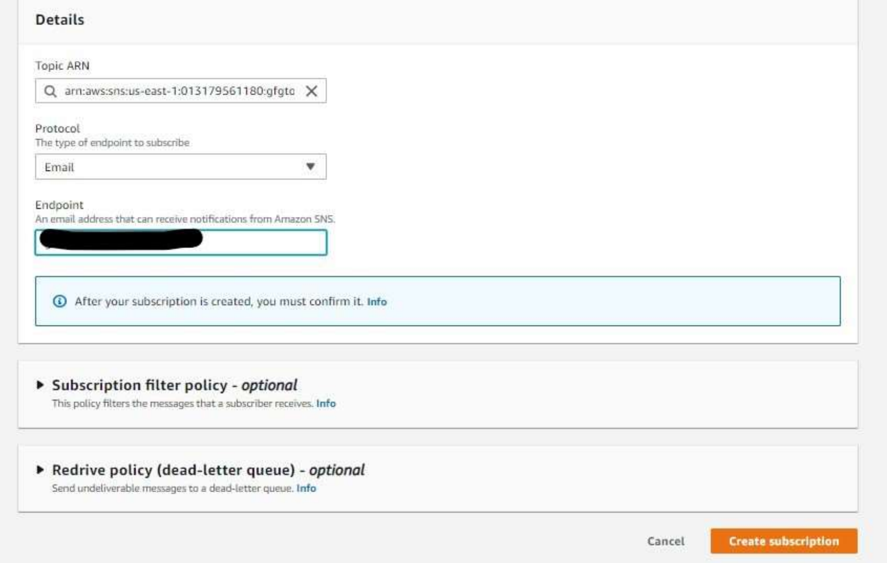
Subscriptions (0)

ID	Endpoint	Status	Protocol

No subscriptions found

You don't have any subscriptions to this topic.

Step 8: Select **Email** as protocol and specify the email address of subscribers in Endpoint. Click on create the subscription. Now Go to the mailbox of the specified email id and click on Subscription confirmed.



Details

Topic ARN
arn:aws:sns:us-east-1:013179561180:gfgto

Protocol
The type of endpoint to subscribe
Email

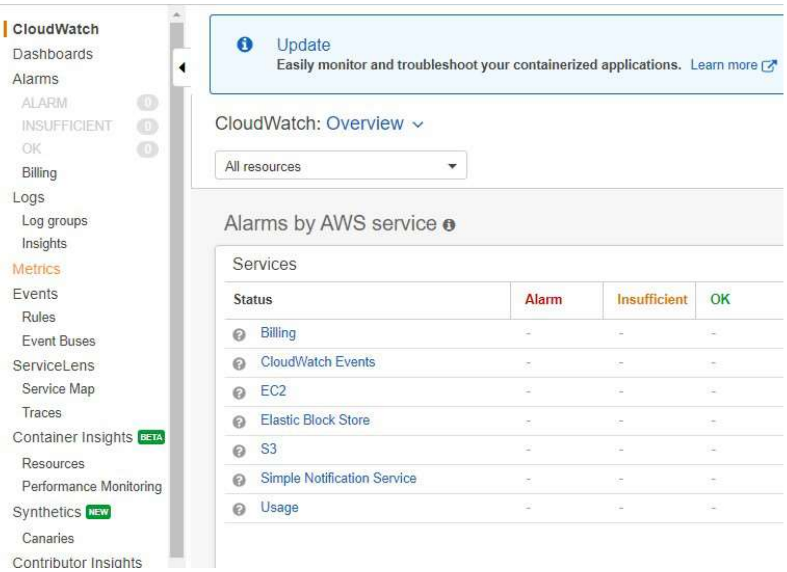
Endpoint
An email address that can receive notifications from Amazon SNS.
[redacted]

After your subscription is created, you must confirm it. Info

Subscription filter policy - *optional*
This policy filters the messages that a subscriber receives. Info

Redrive policy (dead-letter queue) - *optional*
Send undeliverable messages to a dead-letter queue. Info

Step 9: Go to the cloudwatch dashboard on the AWS management console. Click on Metrics in the left pane.



Update
Easily monitor and troubleshoot your containerized applications. Learn more

CloudWatch: Overview

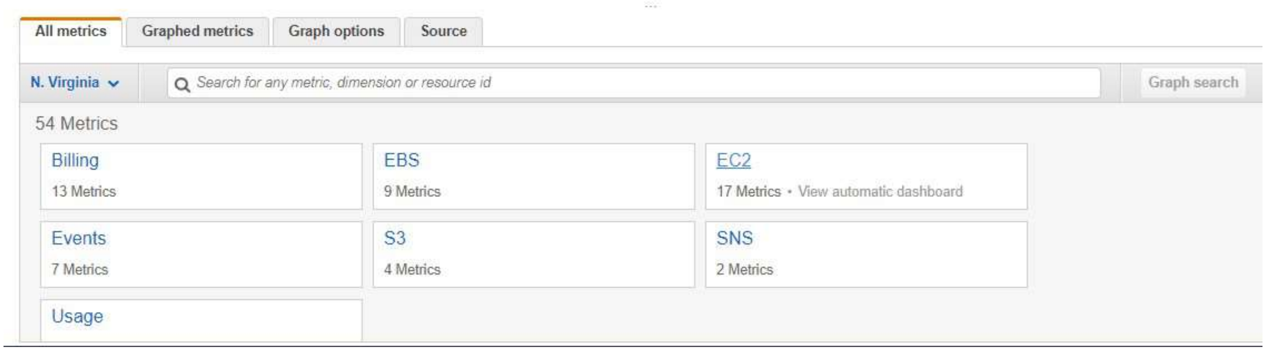
All resources

Alarms by AWS service

Services

Status	Alarm	Insufficient	OK
Billing	-	-	-
CloudWatch Events	-	-	-
EC2	-	-	-
Elastic Block Store	-	-	-
S3	-	-	-
Simple Notification Service	-	-	-
Usage	-	-	-

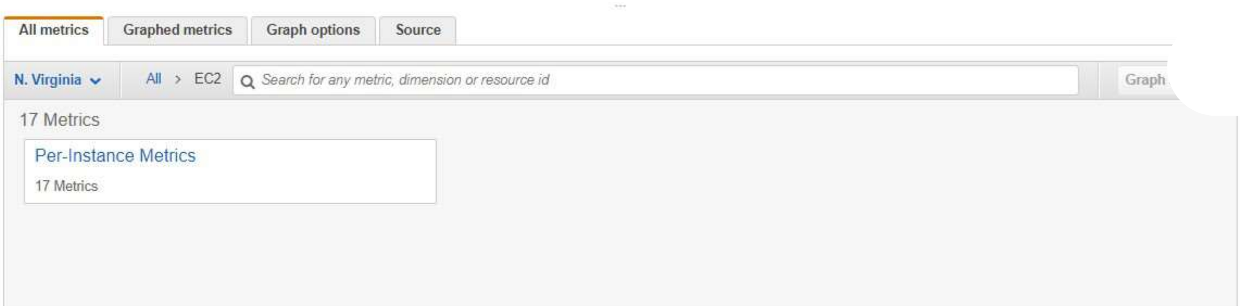
Step 10: In **All metrics** section click on EC2



54 Metrics

Billing 13 Metrics	EBS 9 Metrics	EC2 17 Metrics • View automatic dashboard
Events 7 Metrics	S3 4 Metrics	SNS 2 Metrics
Usage		

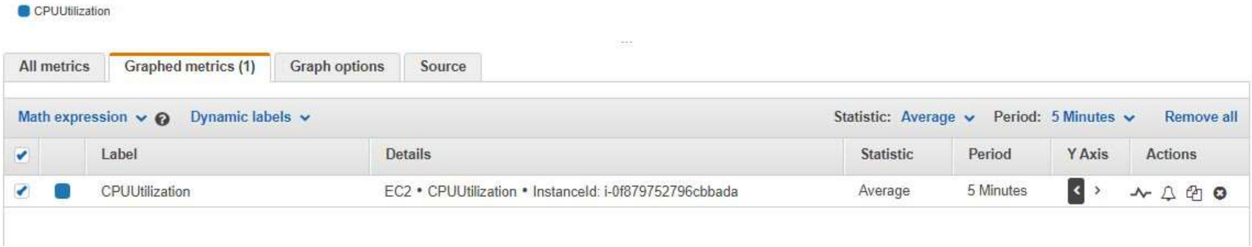
Step 11: Click on Per-instance metrics



17 Metrics

Per-Instance Metrics
17 Metrics

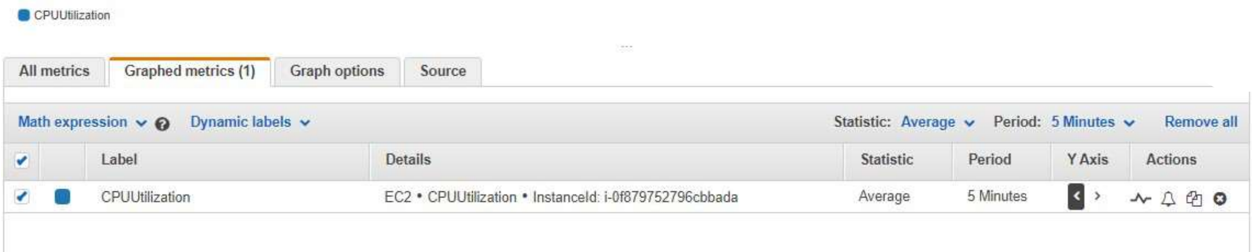
Step 12: Select the instance you launched



Statistic: Average Period: 5 Minutes

☑		Label	Details	Statistic	Period	Y Axis	Actions
☑	🟦	CPUUtilization	EC2 • CPUUtilization • InstanceId: i-0f879752796cbbada	Average	5 Minutes	< >	

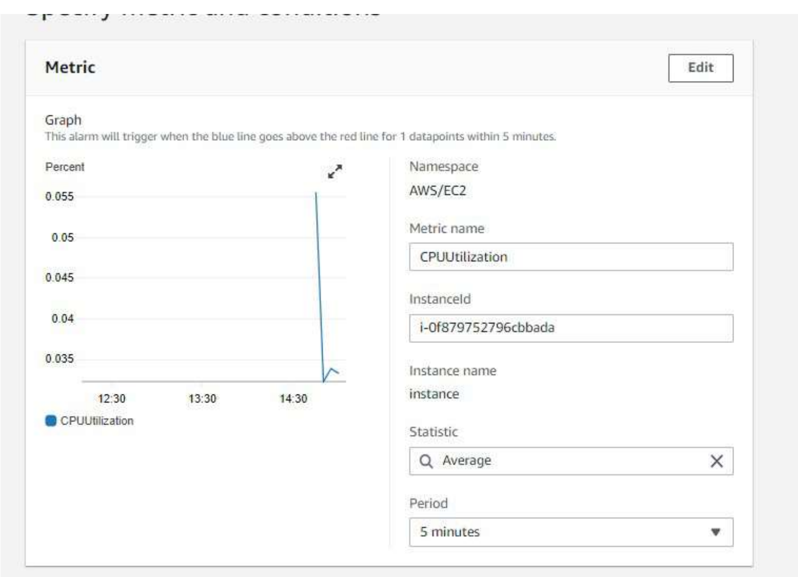
Step 13: Go to Graphed metrics, click on the bell icon



Statistic: Average Period: 5 Minutes

☑		Label	Details	Statistic	Period	Y Axis	Actions
☑	🟦	CPUUtilization	EC2 • CPUUtilization • InstanceId: i-0f879752796cbbada	Average	5 Minutes	< >	

Step 14: This dashboard shows the components of Amazon Cloudwatch such as Namespace, Metric Name, Statistics, etc



Graph
This alarm will trigger when the blue line goes above the red line for 1 datapoints within 5 minutes.

Namespace
AWS/EC2

Metric name
CPUUtilization

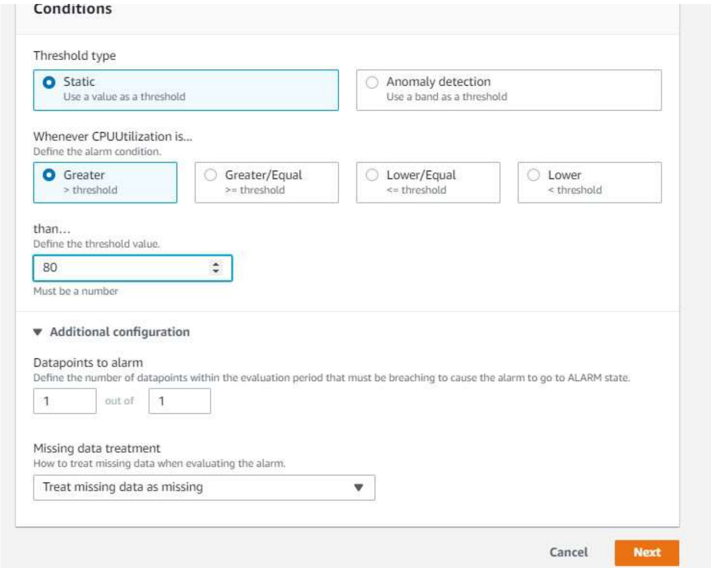
InstanceId
i-0f879752796cbbada

Instance name
instance

Statistic
Average

Period
5 minutes

Step 15: Select the greater threshold. Also, specify the amount(i.e 80) of the threshold value. Click on Next.



Conditions

Threshold type

● Static
Use a value as a threshold

○ Anomaly detection
Use a band as a threshold

Whenever CPUUtilization is...
Define the alarm condition.

● Greater
> threshold

○ Greater/Equal
>= threshold

○ Lower/Equal
<= threshold

○ Lower
< threshold

than...
Define the threshold value.

80

Must be a number

▼ Additional configuration

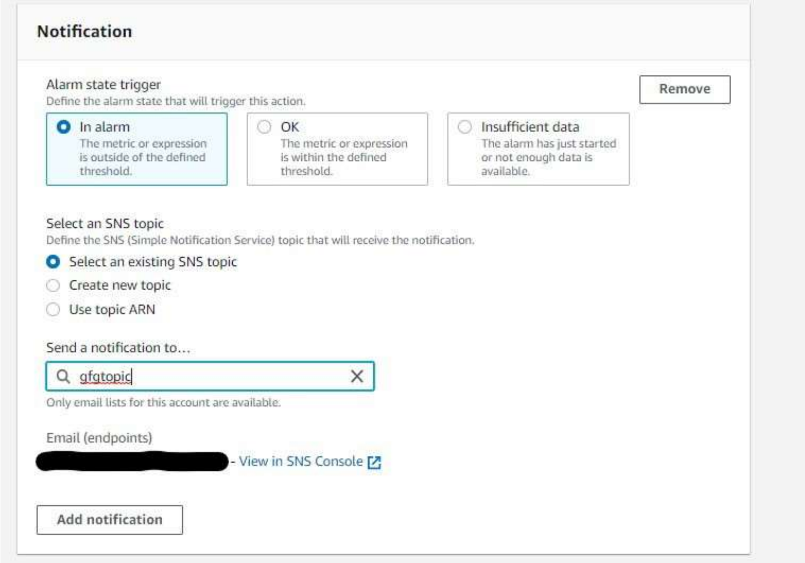
Datapoints to alarm
Define the number of datapoints within the evaluation period that must be breaching to cause the alarm to go to ALARM state.

1 out of 1

Missing data treatment
How to treat missing data when evaluating the alarm.

Treat missing data as missing ▼

Step 16: Click on Select an existing SNS topic, also mention the name of the SNS topic you created now.



Notification

Alarm state trigger
Define the alarm state that will trigger this action.

● In alarm
The metric or expression is outside of the defined threshold.

○ OK
The metric or expression is within the defined threshold.

○ Insufficient data
The alarm has just started or not enough data is available.

Select an SNS topic
Define the SNS (Simple Notification Service) topic that will receive the notification.

● Select an existing SNS topic

○ Create new topic

○ Use topic ARN

Send a notification to...

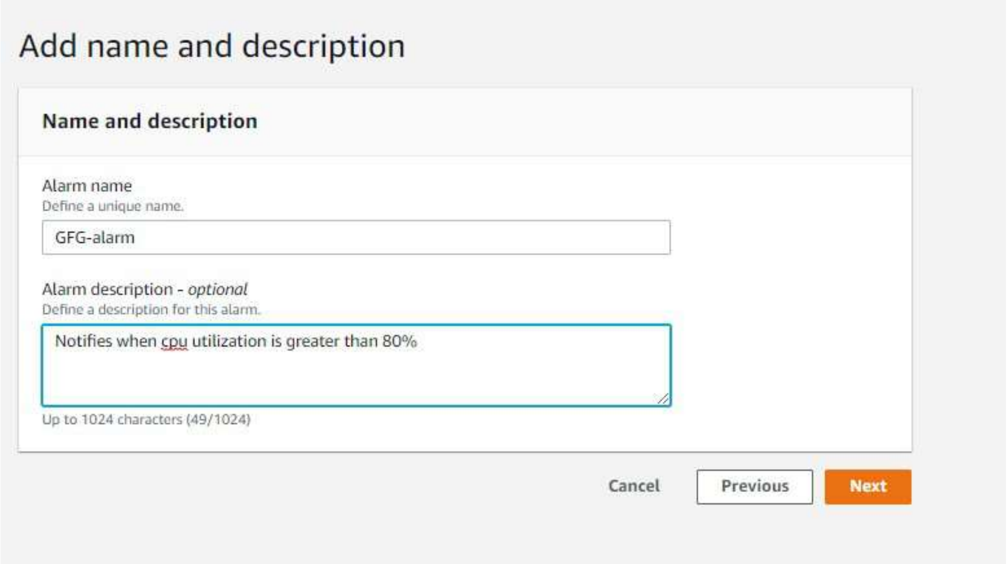
gfgtopic

Only email lists for this account are available.

Email (endpoints)

[redacted] - View in SNS Console

Step 17: Specify the name of alarm and description which is completely optional. Click on Next and then click on Create alarm.



Add name and description

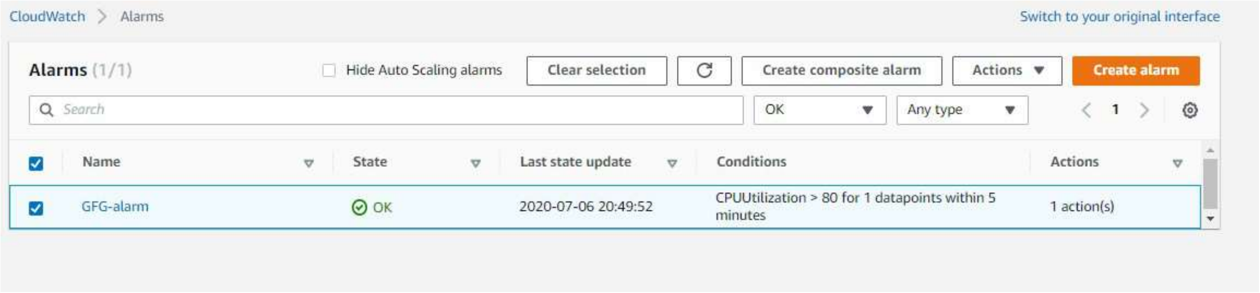
Name and description

Alarm name
Define a unique name.
GFG-alarm

Alarm description - *optional*
Define a description for this alarm.
Notifies when cpu utilization is greater than 80%

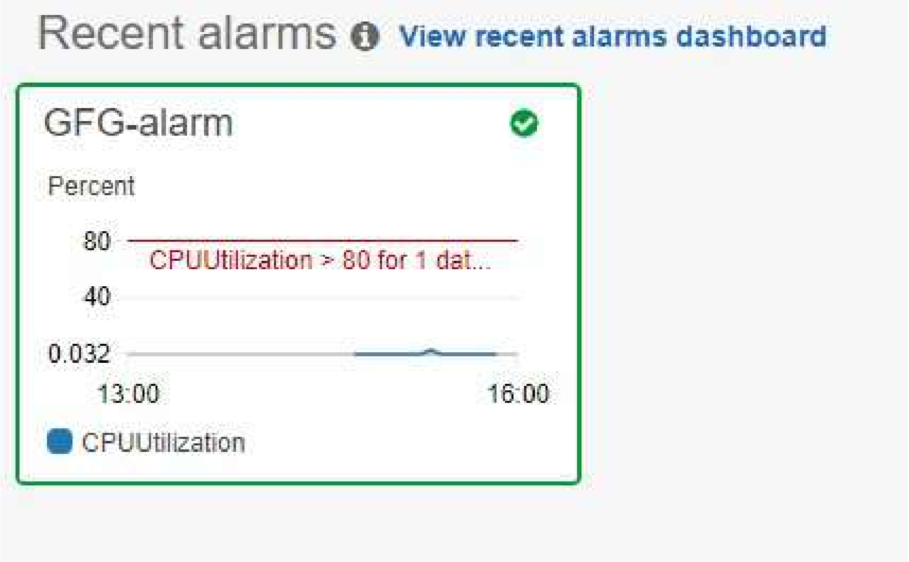
Up to 1024 characters (49/1024)

Step 18: The alarm is successfully created.



☑	Name	State	Last state update	Conditions	Actions
☑	GFG-alarm	✓ OK	2020-07-06 20:49:52	CPUUtilization > 80 for 1 datapoints within 5 minutes	1 action(s)

Step 19: You can see the graph which notifies whenever CPU utilization goes above 80%.



Use cases for CloudWatch

- CloudWatch can be used to monitor the performance of AWS resources, applications, and infrastructure components in real-time
- CloudWatch allows users to set up alarms that trigger notifications or automated actions in response to changes in the state of their resources.
- CloudWatch can be used to store, search, and analyze log data from various AWS services, applications, and infrastructure components.
- CloudWatch can be used to monitor the performance of EC2 instances, RDS databases, and other resources, which can then be used to trigger automatic scaling events.

Advantages of Amazon Cloudwatch

- A large amount of data is produced by web applications nowadays so amazon cloudwatch acts as a dashboard that contains the organized collection of whole data.
- It improves the total cost of ownership by providing alarms and also takes automated actions when there is an error in limits provided.
- Applications and resources can be optimized by examining the logs and metric data.
- Detailed Insights from the application are provided through data like CPU utilization, capacity utilization, memory utilization, etc

- It provides a great platform to compare and contrast the data produced by various AWS services.

Disadvantages of Amazon Cloudwatch

- Cloud Watch can be expensive, especially for large-scale monitoring and logging needs.
- Cloud Watch may not be able to handle large amounts of log data, especially during spikes in usage, making it difficult to maintain a consistent level of monitoring and logging.
- The monitoring and logging processes of CloudWatch can consume significant system resources, impacting the overall performance of an application.
- Integrating CloudWatch with other AWS services and third-party tools can be challenging.
- Setting up and managing CloudWatch can be complex, especially for users who are not familiar with cloud-based systems.

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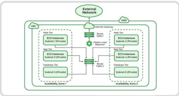

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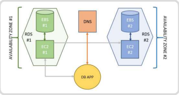

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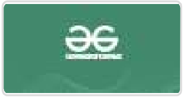

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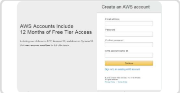

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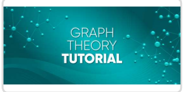

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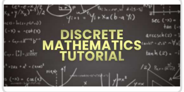

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