Amazon CloudWatch

Week 5.4

Amazon CloudWatch

What you will Learn

- Describe an AWS monitoring service, Amazon CloudWatch.
- Describe the three components of AWS CloudWatch.

Why Amazon CloudWatch?

- To use AWS resources efficiently, you need insight into your resources. You should understand:
  - How to know when you should launch more Amazon Elastic Compute Cloud (Amazon EC2) instances
  - Whether your application's performance or availability being affected because of insufficient capacity
  - How much of your infrastructure is actually being used
- Large volumes of data in the form of metrics, logs, and events are generated by applications.
- Amazon CloudWatch allows you to collect, access, and correlate this data on a single platform from across all your AWS resources, applications, and services running on AWS and on-premises.

Introduction to Amazon CloudWatch

Amazon CloudWatch

Monitors the state and utilization of most resources that you can manage under AWS

- Key concepts:
  - Standard metrics
  - Custom metrics
  - Alarms
  - Notifications

CloudWatch agent collects system-level metrics:

- EC2 instances
- On-premises servers

Amazon CloudWatch Terms

Metric

Alarm

Events

Events

Introduction to Amazon CloudWatch

- The primary function of Amazon CloudWatch to monitor the performance and health of your AWS resources and applications.
- You can also use CloudWatch to collect and monitor log files from EC2 instances, AWS CloudTrail, EBS volumes and other sources.
- Amazon CloudWatch is a distributed statistics-gathering system. It collects and tracks your metrics from your applications. You can also create and use your own custom metrics and receive notifications when an alarm goes off.

Introduction to Amazon CloudWatch

- CloudWatch has two different monitoring options:
  - Basic Monitoring: Seven pre-selected metrics at a 5-minute frequency and three status check metrics at a 1-minute frequency, for no additional charge.
  - Detailed Monitoring: All metrics that are available to Basic Monitoring at a 1-minute frequency, for an additional charge.
- CloudWatch retains metrics for 15 months, free of charge.
- CloudWatch metrics support the following three retention schedules:
  - 1-minute data points are available for 15 days.
  - 5-minute data points are available for 63 days.
  - 1-hour data points are available for 455 days.

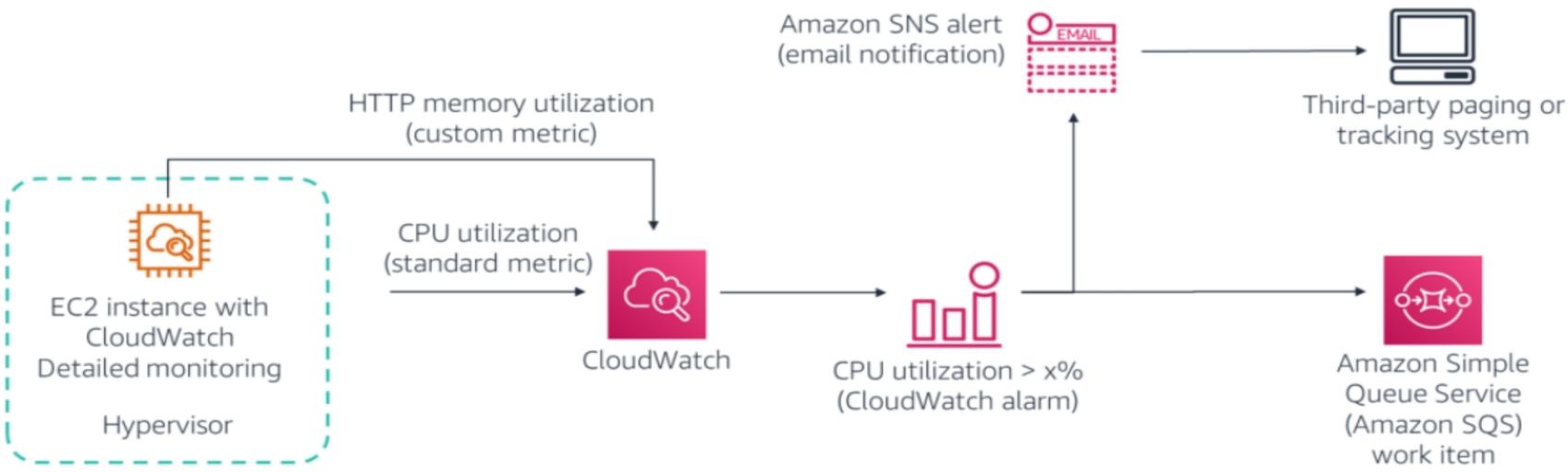
Amazon CloudWatch Actions

Amazon CloudWatch Alarms

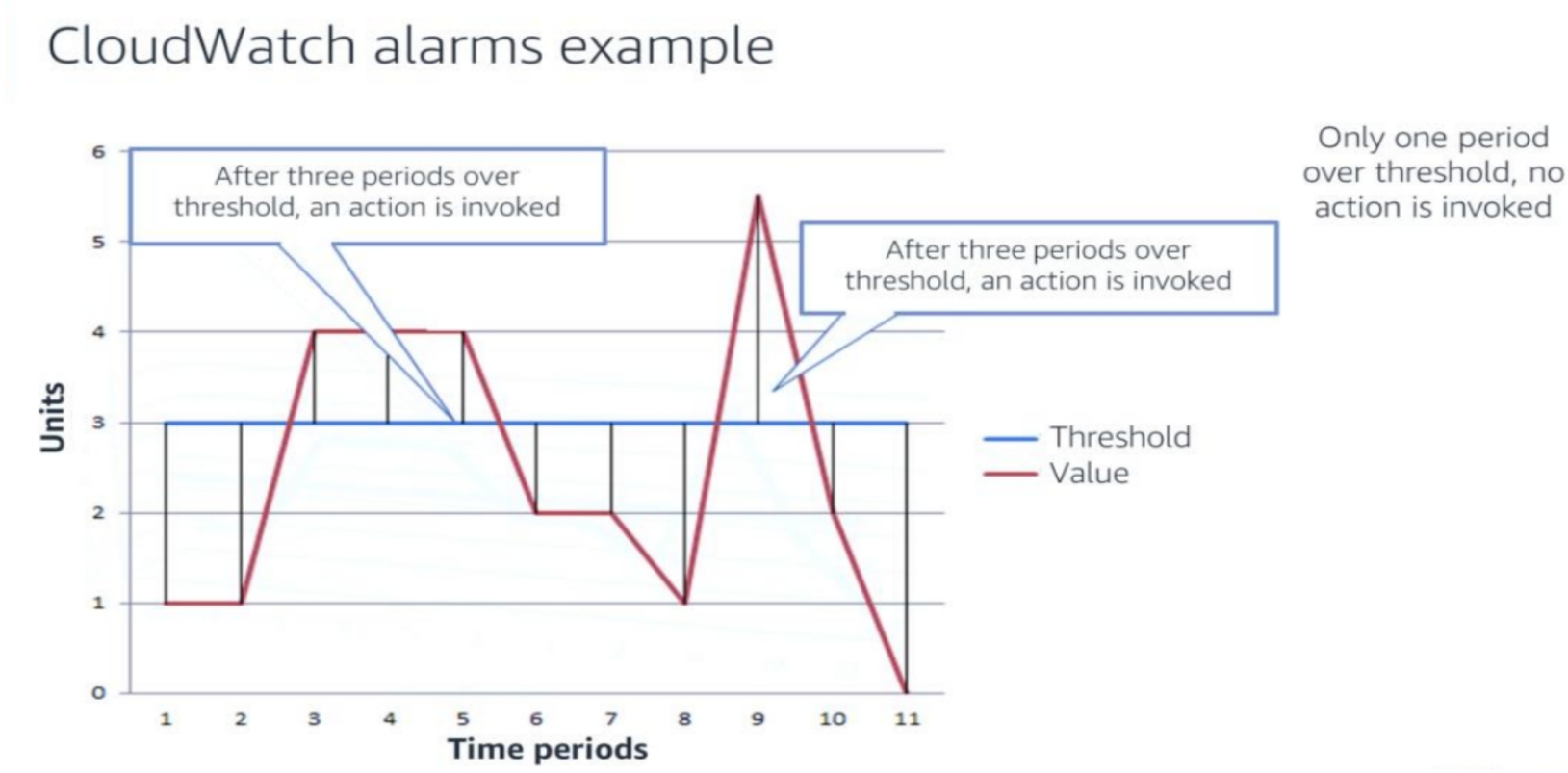
- CloudWatch alarm watches a single CloudWatch metric or the result of a math expression that is based on multiple CloudWatch metrics.
- The alarm performs one or more actions based on the value of the metric or expression relative to a threshold over several time periods.
- An alarm has three possible states:
  - OK – The metric is within the defined threshold.
  - ALARM – The metric is outside the defined threshold.
  - INSUFFICIENT_DATA – The alarm has just started, the metric is not available, or not enough data is available for the metric to determine the alarm state.
- Note that ALARM is only a name that is given to the state, and does not necessarily signal an emergency condition that requires immediate attention.
- It means that the monitored metric is equal to, greater than, or less than a specified threshold value.

CloudWatch Monitoring Example

CloudWatch monitoring example



CloudWatch Alarms Example



CloudWatch Metrics

- Metrics are the fundamental concept in CloudWatch.
- A metric represents a time-ordered set of data points that are published to CloudWatch.
- Think of a metric as a variable to monitor, and the data points represent the values of that variable over time.
- For example, the CPU usage of a particular EC2 instance is one metric that Amazon EC2 provides.
- The data points themselves can come from any application or business activity that you collect data from.
- Metrics are uniquely defined by a name, a **namespace**, and zero or more **dimensions**.
- Each data point has a timestamp, and (optionally) a unit of measure.
- When you request statistics, the returned data stream is identified by namespace, metric name, dimension, and (optionally) the unit.
- Metrics exist only in the region where they are created.

CloudWatch Metric Components

Metric components

Metric	Name and value
Namespace	Groups related metrics together
Dimensions	Name-value pairs that further categorize metrics
	Example: InstanceId is a dimension of CPU utilization
	Metric name + dimension = a new, unique metric
Period	Specified time (in seconds) over which metric was collected

CloudWatch Metric Components - Namespace

- A namespace is a container for CloudWatch metrics.
- Metrics in different namespaces are isolated from each other, so that metrics from different applications are not mistakenly aggregated into the same statistics.
- The AWS namespaces use the naming convention `AWS/<service>`. For example, Amazon EC2 uses the `AWS/EC2` namespace.

CloudWatch Metric Components - Dimensions

- A dimension is a name-value pair that uniquely identifies a metric.
- You can assign up to 10 dimensions to a metric.
- Each metric has specific characteristics that describe it, and you can think of dimensions as categories for those characteristics.
- Dimensions help you design a structure for your statistics plan.
- You can use dimensions to filter the results that CloudWatch returns. For example, when you search for metrics, you can get statistics for a particular EC2 instance by specifying the `` `InstanceId` `` dimension

CloudWatch Metric Components - Period

- A period is the length of time that is associated with a specific CloudWatch statistic.
- Periods are defined in numbers of seconds.
- You can adjust how the data is aggregated by varying the length of the period.
- A period can be as short as 1 second or as long as 1 day (86,400 seconds)

CloudWatch Metric Components

Metric components

Namespace:

Groups related metrics together

```
{
    "Metrics": [
        {
            "Namespace": "AWS/S3",
            "Dimensions": [
                {
                    "Name": "StorageType",
                    "Value": "GlacierStorage"
                },
                {
                    "Name": "BucketName",
                    "Value": "DOC-EXAMPLE-BUCKET"
                }
            ],
            "MetricName": "BucketSizeBytes"
        }
    ]
}
```

Standard and Custom Metrics

Standard and custom metrics

Standard metrics:

- Grouped by service name
- Display graphically so that selected metrics can be compared
- Only appear if you have used the service in the past 15 months
- Reachable programmatically through the AWS Command Line Interface (AWS CLI) or application programming interface (API)

Custom metrics:

- Grouped by user-defined namespaces
- Publish to CloudWatch by using the AWS CLI, an API, or a CloudWatch agent

CloudWatch Automatic Dashboards

- Amazon CloudWatch dashboards are customizable homepages in the CloudWatch console that you can use to monitor your resources in a single view.
- You can create customized views of the metrics and alarms for your AWS resources.
- You can get aggregated views of the health and performance of all AWS resources through CloudWatch automatic dashboards.
- This feature enables you to monitor and explore account-based and resource-based views of metrics and alarms.
- You can drill down to figure out the root cause of performance issues.
- Automatic dashboards are prebuilt with recommended best practices for AWS services.
- They remain resource aware, and they dynamically update to reflect the latest state of important performance metrics.

Benefits of CloudWatch

- Use a single platform for observability: Amazon CloudWatch allows you to collect, access, and correlate data on a single platform from across all your AWS resources, applications, and services running on AWS and on-premises.
- Collect metrics on AWS and on premises: CloudWatch can be used in hybrid environments by using the CloudWatch Agent or API to monitor your on-premises resources.
- Improve operational performance and resource optimization: Easily set alarms and automate actions based on predefined thresholds or on machine learning algorithms that identify anomalous behavior in your metrics.
- Get operational visibility and insight: To optimize performance and resource utilization, CloudWatch provides a unified operational view, real-time granular data, and historical reference.
- Derive actionable insights from logs: With CloudWatch, you can explore, analyze, and visualize your logs to troubleshoot operational problems with ease.

Key Takeaways

- Amazon CloudWatch tracks and monitors the performance and health of your resources and applications.
- It enables you to:
  - Track resource and application performance
  - Collect and monitor log files
  - Get notified when an alarm goes off
- CloudWatch consists of three primary components:
  - Metrics
  - Alarms
  - Events