

Amazon CloudWatch

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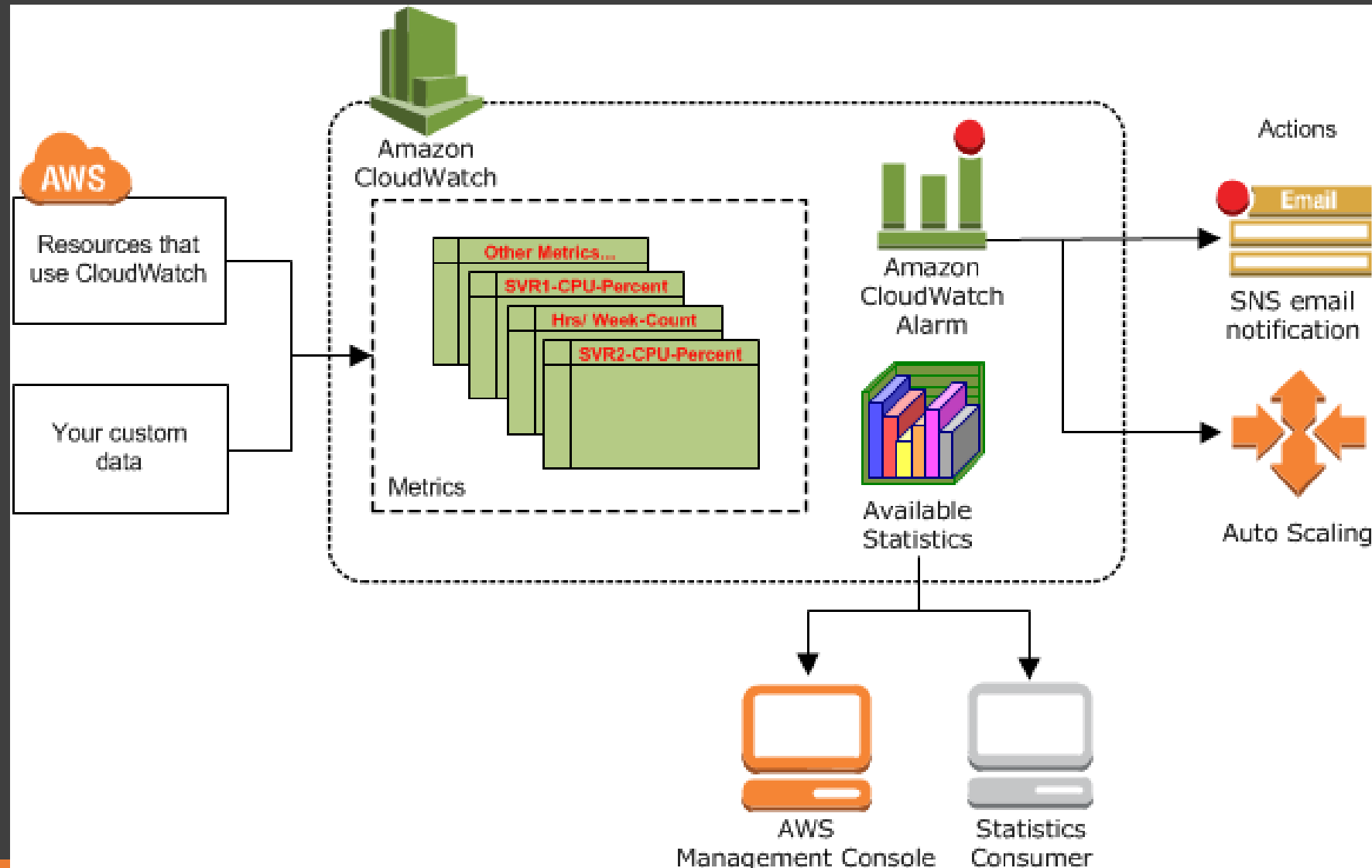
Amazon CloudWatch

- Amazon CloudWatch is a monitoring service for AWS cloud resources and the applications you run on AWS.
- You can use Amazon CloudWatch to collect and track metrics, collect and monitor log files, and set alarms.
- Amazon CloudWatch can monitor AWS resources such as Amazon EC2 instances, Amazon DynamoDB tables, and Amazon RDS DB instances, as well as custom metrics generated by your applications and services, and any log files your applications generate.
- You can use Amazon CloudWatch to gain system-wide visibility into resource utilization, application performance, and operational health. You can use these insights to react and keep your application running smoothly.

Amazon CloudWatch

- Amazon CloudWatch monitors your Amazon Web Services (AWS) resources and the applications you run on AWS in real-time.
- You can use CloudWatch to collect and track metrics, which are the variables you want to measure for your resources and applications.
- CloudWatch alarms send notifications or automatically make changes to the resources you are monitoring based on rules that you define.
- For example, you can monitor the CPU usage and disk reads and writes of your Amazon Elastic Compute Cloud (Amazon EC2) instances and then use this data to determine whether you should launch additional instances to handle increased load.
- You can also use this data to stop under-used instances to save money.
- In addition to monitoring the built-in metrics that come with AWS, you can monitor your own custom metrics.
- With CloudWatch, you gain system-wide visibility into resource utilization, application performance, and operational health.

Amazon CloudWatch Architecture



Amazon CloudWatch Concepts

- **Metrics**

- Represents a time-ordered set of data points.
- These data points can be either your custom metrics or metrics from other services in AWS.
- Metrics exist only in the region in which they are created.
- For example, the CPU usage of a particular Amazon EC2 instance is one metric, and the latency of an Elastic Load Balancing load balancer is another.

- **Namespaces**

- CloudWatch namespaces are containers for metrics.
- Metrics in different namespaces are isolated from each other, so that metrics from different applications are not mistakenly aggregated into the same statistics.
- Namespace names are strings you define when you create a metric. The names must be valid XML characters, typically containing the alphanumeric characters "0-9A-Za-z" plus "." (period), "-" (hyphen), "_" (underscore), "/" (slash), "#" (hash), and ":" (colon).
- AWS namespaces all follow the convention `AWS/<service>`, such as `AWS/EC2` and `AWS/ELB`.

Amazon CloudWatch Concepts

- **Dimensions**

- A dimension is a name/value pair that helps you to uniquely identify a metric.
- Every 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.
- Because dimensions are part of the unique identifier for a metric, whenever you add a unique name/value pair to one of your metrics, you are creating a new metric.
- For example, you can get statistics for a specific Amazon EC2 instance by calling `GetMetricStatistics` with the `InstanceID` dimension set to a specific Amazon EC2 instance ID.
- You can assign up to ten dimensions to a metric.

Dimension of EC2 and ELB

Dimension	Description
	This dimension filters the data you request for all instances in a specified capacity group. An <i>AutoScalingGroup</i> is a collection of instances you define if you're using the Auto Scaling service. This dimension is available only for EC2 metrics when the instances are in such an AutoScalingGroup. Available for instances with Detailed or Basic Monitoring enabled.
	This dimension filters the data you request for all instances running this EC2 Amazon Machine Image (AMI). Available for instances with Detailed Monitoring enabled.
	This dimension filters the data you request for the identified instance only. This helps you pinpoint an exact instance from which to monitor data.
	This dimension filters the data you request for all instances running with this specified instance type. This helps you categorize your data by the type of instance running. For example, you might compare data from an m1.small instance and an m1.large instance to determine which has the better business value for your application. Available for instances with Detailed Monitoring enabled.

Dimension	Description
	Limits the metric data to instances that are registered to the specified load balancer.
	Limits the metric data to load balancers in the specified Availability Zone.

Amazon CloudWatch Concepts

- **Time Stamps**

- With Amazon CloudWatch, each metric data point must be marked with a time stamp.
- The time stamp can be up to two weeks in the past and up to two hours into the future.
- If you do not provide a time stamp, CloudWatch creates a time stamp for you based on the time the data element was received.
- The time stamp you use in the request must be a datetime object, with the complete date plus hours, minutes, and seconds.
- we recommend you provide the time stamp in the Coordinated Universal Time (UTC or Greenwich Mean Time) time zone. When you retrieve your statistics from CloudWatch, all times reflect the UTC time zone.

Amazon CloudWatch Concepts

- **Units**

- `Units` represent your statistic's unit of measure.
- For example, the units for the Amazon EC2NetworkIn metric are Bytes because NetworkIn tracks the number of bytes that an instance receives on all network interfaces.
- You can also specify a unit when you create a custom metric.

- **Statistics**

- Statistics are metric data aggregations over specified periods of time.
- CloudWatch provides statistics based on the metric data points provided by your custom data or provided by other services in AWS to CloudWatch.
- Aggregations are made using the namespace, metric name, dimensions, and the data point unit of measure, within the time period you specify.

Statistics

Statistic	Description
Minimum	The lowest value observed during the specified period. You can use this value to determine low volumes of activity for your application.
Maximum	The highest value observed during the specified period. You can use this value to determine high volumes of activity for your application.
Sum	All values submitted for the matching metric added together. This statistic can be useful for determining the total volume of a metric.
Average	The value of $\text{Sum} / \text{SampleCount}$ during the specified period. By comparing this statistic with the Minimum and Maximum, you can determine the full scope of a metric and how close the average use is to the Minimum and Maximum. This comparison helps you to know when to increase or decrease your resources as needed.
SampleCount	The count (number) of data points used for the statistical calculation.

Amazon CloudWatch Concepts

- **Periods**

- A period is the length of time associated with a specific Amazon CloudWatch statistic. Each statistic represents an aggregation of the metrics data collected for a specified period of time.
- Although periods are expressed in seconds, the minimum granularity for a period is one minute.
- For example, to specify a period of six minutes, you would use the value 360. You can adjust how the data is aggregated by varying the length of the period. A period can be as short as one minute (60 seconds) or as long as one day (86,400 seconds).
- Periods are also an important part of the CloudWatch alarms feature. When you create an alarm to monitor a specific metric, you are asking CloudWatch to compare that metric to the threshold value that you supplied. You have extensive control over how CloudWatch makes that comparison.

Amazon CloudWatch Concepts

- **Aggregation**

- Amazon CloudWatch aggregates statistics according to the period length that you specify in calls to `Getmetricstatistics`
- You can publish as many data points as you want with the same or similar time stamps.
- CloudWatch aggregates them by period length when you get statistics about those data points with `Getmetricstatistics`
- Aggregated statistics are only available when using detailed monitoring. In addition, Amazon CloudWatch does not aggregate data across Regions.

Amazon CloudWatch Concepts

- **Alarms**

- Alarms can automatically initiate actions on your behalf, based on parameters you specify.
- An alarm watches a single metric over a specified time period, and performs one or more actions based on the value of the metric relative to a given threshold over a number of time periods.
- The action is a notification sent to an Amazon Simple Notification Service (Amazon SNS) topic or Auto Scaling policy.
- Alarms invoke actions for sustained state changes only.
- CloudWatch alarms will not invoke actions simply because they are in a particular state, the state must have changed and been maintained for a specified number of periods.
- Alarm actions must reside in the same region as the alarm. For example, any Amazon SNS message, Auto Scaling policy, etc. invoked by an alarm must exist in the same region as the alarm and the resource being monitored.

Amazon CloudWatch Concepts

- **Alarms**

- When creating an alarm, select a period that is greater than or equal to the frequency of the metric to be monitored. For example, basic monitoring for Amazon EC2 instances provides metrics every 5 minutes.
- When setting an alarm on a basic monitoring metric, select a period of at least 300 seconds (5 minutes).
- Detailed monitoring for Amazon EC2 instances provides metrics every 1 minute; when setting an alarm on a Detailed monitoring metric, select a period of at least 60 seconds (1 minute).
- Alarms exist only in the region in which they are created.

Supported AWS Services

- CloudWatch monitors the following services.
- **Auto Scaling**
 - Auto Scaling sends data to CloudWatch every 5 minutes by default. For an additional charge, you can enable detailed monitoring for Auto Scaling, which sends data to CloudWatch every minute. You can create alarms using Auto Scaling Dimensions and Metrics.
- **Amazon CloudFront**
 - Amazon CloudFront sends data to CloudWatch every minute by default. You can create alarms using Amazon CloudFront Dimensions and Metrics.
- **Amazon CloudSearch**
 - Amazon CloudSearch sends data to CloudWatch every minute by default. You can create alarms using Amazon CloudSearch Dimensions and Metrics.

Supported AWS Services

- CloudWatch monitors the following services.
- **Amazon DynamoDB**
 - Amazon DynamoDB sends data to CloudWatch every minute for some metrics and every 5 minutes for other metrics.
- **Amazon CloudFront**
 - Amazon CloudFront sends data to CloudWatch every minute by default. You can create alarms using Amazon CloudFront Dimensions and Metrics.
- **Amazon CloudSearch**
 - Amazon CloudSearch sends data to CloudWatch every minute by default. You can create alarms using Amazon CloudSearch Dimensions and Metrics.
- **Amazon EC2 Container Service**
 - Amazon EC2 Container Service sends data to CloudWatch every minute.
- **Amazon ElastiCache**
 - Amazon ElastiCache sends data to CloudWatch every minute.

Supported AWS Services

- CloudWatch monitors the following services.
- **Amazon Elastic Block Store**
 - Amazon Elastic Block Store sends data to CloudWatch every 5 minutes
- **Amazon Elastic Compute Cloud**
 - Amazon EC2 sends data to CloudWatch every 5 minutes by default. For an additional charge, you can enable detailed monitoring for Amazon EC2, which sends data to CloudWatch every minute.
- **Elastic Load Balancing**
 - Elastic Load Balancing sends data to CloudWatch every minute.
- **Amazon Elastic MapReduce**
 - Amazon Elastic MapReduce sends data to CloudWatch every 5 minutes.
- **Amazon Elasticsearch Service**
 - Amazon Elasticsearch Service sends data to CloudWatch every minute.
- **Amazon Kinesis**
 - Amazon Kinesis sends data to CloudWatch every minute.
- **AWS Lambda**
 - AWS Lambda sends data to CloudWatch every minute.

Supported AWS Services

- **Amazon Machine Learning**
 - Amazon Machine Learning sends data to CloudWatch every 5 minutes. Y
- **AWS OpsWorks**
 - AWS OpsWorks sends data to CloudWatch every minute.
- **Amazon Redshift**
 - Amazon Redshift sends data to CloudWatch every minute.
- **Amazon Relational Database Service**
 - Amazon Relational Database Service sends data to CloudWatch every minute
- **Amazon Route 53**
 - Amazon Route 53 sends data to CloudWatch every minute.
- **Amazon Simple Notification Service**
 - Amazon Simple Notification Service sends data to CloudWatch every 5 minutes.

Supported AWS Services

- **Amazon Simple Queue Service**
 - Amazon Simple Queue Service sends data to CloudWatch every 5 minutes.
- **Amazon Simple Storage Service**
 - Amazon Simple Storage Service sends data to CloudWatch once a day.
- **Amazon Simple Workflow Service**
 - Amazon Simple Workflow Service sends data to CloudWatch every 5 minutes.
- **AWS Storage Gateway**
 - AWS Storage Gateway sends data to CloudWatch every 5 minutes.
- **AWS WAF**
 - AWS WAF sends data to CloudWatch every minute.
- **Amazon WorkSpaces**
 - Amazon WorkSpaces sends data to CloudWatch every 5 minutes.

Monitor Amazon EC2

- Monitor EC2 instances automatically, without installing additional software:
 - Basic Monitoring for Amazon EC2 instances: Seven pre-selected metrics at five-minute frequency and three status check metrics at one-minute frequency, for no additional charge.
 - Detailed Monitoring for Amazon EC2 instances: All metrics available to Basic Monitoring at one-minute frequency, for an additional charge. Instances with Detailed Monitoring enabled allows data aggregation by Amazon EC2 AMI ID and instance type.
- If you use Auto Scaling or Elastic Load Balancing, Amazon CloudWatch will also provide Amazon EC2 instance metrics aggregated by Auto Scaling group and by Elastic Load Balancer, regardless of whether you have chosen Basic or Detailed Monitoring
- Monitoring data is retained for two weeks, even if your AWS resources have been terminated. This enables you to quickly look back at the metrics preceding an event of interest to you. Basic Monitoring is already enabled automatically for all Amazon EC2 instances

Monitor Amazon Compute and Network

- Auto Scaling groups: seven pre-selected metrics at one-minute frequency, optional and for an additional charge.
- Elastic Load Balancers: thirteen pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon Route 53 health checks: One pre-selected metric at one-minute frequency, for no additional charge.

Monitor Amazon Storage and Content Delivery

- Amazon EBS PIOPS (SSD) volumes: ten pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon EBS General Purpose (SSD) volumes: ten pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon EBS Magnetic volumes: eight pre-selected metrics at five-minute frequency, for no additional charge.
- AWS Storage Gateways: eleven pre-selected gateway metrics and five pre-selected storage volume metrics at five-minute frequency, for no additional charge.
- Amazon CloudFront: six pre-selected metrics at one-minute frequency, for no additional charge.

Monitor Amazon Database and Analytics

- Amazon DynamoDB tables: seven pre-selected metrics at five-minute frequency, for no additional charge.
- Amazon ElastiCache nodes: thirty-nine pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon RDS DB instances: fourteen pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon Elastic MapReduce job flows: twenty-six pre-selected metrics at five-minute frequency, for no additional charge.
- Amazon Redshift: Sixteen pre-selected metrics at one-minute frequency, for no additional charge.

Monitor Amazon Database and Platforms and Billing

- Amazon SNS topics: four pre-selected metrics at five-minute frequency, for no additional charge.
- Amazon SQS queues: eight pre-selected metrics at five-minute frequency, for no additional charge.
- AWS Opsworks: fifteen pre-selected metrics at one-minute frequency, for no additional charge.
- Amazon CloudWatch Logs: six pre-selected metrics at one-minute frequency, for no additional charge.
- Estimated charges on your AWS bill: you can also choose to enable metrics to monitor your AWS charges. The number of metrics depends on the AWS products and services that you use, and these metrics are at no additional charge.

Monitor Custom Metrics

- Submit Custom Metrics generated by your own applications and have them monitored by Amazon CloudWatch.
- You can submit these metrics to Amazon CloudWatch via a simple API request.
- All the same Amazon CloudWatch functionality will be available at up to one-minute frequency for your own custom metric data, including statistics, graphs, and alarms
- You can publish your own metrics to CloudWatch with the put-metric-data command

```
aws cloudwatch put-metric-data --metric-name PageViewCount --namespace "MyService" --value 2 --timestamp 2014-02-14T12:00:00.000Z
aws cloudwatch put-metric-data --metric-name PageViewCount --namespace "MyService" --value 4 --timestamp 2014-02-14T12:00:01.000Z
aws cloudwatch put-metric-data --metric-name PageViewCount --namespace "MyService" --value 5 --timestamp 2014-02-14T12:00:02.000Z
```

```
aws cloudwatch get-metric-statistics --metric-name PageViewCount --namespace "MyService" --statistics "Sum" "Maximum" "Minimum" "Average"
"SampleCount" --period 60 --start-time 2014-02-20T12:00:00.000Z --end-time 2014-02-20T12:05:00.000Z --output json
```

Monitor and Store Logs

- CloudWatch Logs lets you monitor and troubleshoot your systems and applications using your existing system, application, and custom log files.