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This study guide demonstrates the lesson from *Introduction to CloudWatch – Create Alarms and Notifications*.

My full AWS Architect Associate course can be found here:

<https://www.udemy.com/course/ultimateaws/?referralCode=7ED214B795C444141361>

AWS CloudWatch - Monitoring and Automation in the AWS Cloud Study Guide

1. Introduction to AWS CloudWatch

AWS CloudWatch is a monitoring and management service within the AWS ecosystem. It provides real-time data and insights into AWS services, applications, and infrastructure. By using CloudWatch, administrators can monitor metrics, collect and aggregate log files, and set up alarms to respond to predefined conditions.

2. Key Features of AWS CloudWatch

2.1 Monitoring Metrics

CloudWatch provides detailed monitoring for a variety of AWS services. Common examples include:

- **EC2 Instances:** Monitor metrics such as CPU utilization, disk I/O, and network traffic.
- **EBS Volumes:** Track disk performance metrics like read/write operations.
- **Elastic Load Balancers:** Analyze latency and request metrics to ensure traffic is being handled properly.

Metrics are organized by namespaces (e.g., `AWS/EC2` for EC2 metrics), and each metric consists of:

- **Namespace:** A container for related metrics.
- **Dimensions:** Metadata for filtering data, such as instance IDs.
- **Statistics:** Values derived from raw data, such as average, minimum, or maximum.

2.2 Aggregating Log Files

- CloudWatch Logs allows you to **collect, monitor, and store logs** from AWS services and custom applications.

- Logs from EC2 instances can be pushed to CloudWatch Logs for centralized analysis and troubleshooting.

2.3 Setting Alarms

- CloudWatch Alarms monitor metrics and take action when a threshold is breached.
 - Example: An alarm can be triggered if **CPU utilization** on an EC2 instance exceeds 90%.
- Alarms can integrate with **SNS (Simple Notification Service)** to send alerts via email, SMS, or other endpoints.

2.4 Automation with CloudWatch

- CloudWatch is not limited to monitoring—it can **trigger automated actions**:
 - Invoke AWS **Lambda** functions to execute code in response to alarms.
 - Work with **Auto Scaling** to adjust the number of instances based on workload.
 - Integrate with other AWS services for a fully automated response.

3. How CloudWatch Differs from CloudTrail and CloudFormation

- **CloudWatch**: Focuses on monitoring AWS services and applications by collecting metrics and generating alarms.
- **CloudTrail**: Tracks user activity and API usage, providing an **audit trail** of who did what and when in your AWS environment.
- **CloudFormation**: Used for provisioning AWS infrastructure using **templates** that define resources like EC2 instances, S3 buckets, or VPCs.

Quick Tip to Remember:

- **CloudWatch = Watching services** (monitoring and alerting).
- **CloudTrail = Tracking actions** (audit trails).
- **CloudFormation = Forming resources** (template-driven automation).

4. Working with CloudWatch Alarms and SNS

4.1 CloudWatch Alarms

Alarms monitor a specific metric and compare it against a threshold. If the threshold is breached, the alarm enters a triggered state.

Example: Monitoring CPU Utilization on an EC2 Instance

1. Set up a CloudWatch Alarm to monitor the `CPU Utilization` metric.
2. Define the threshold:
 - Example: Trigger the alarm if CPU utilization exceeds 90% for more than 5 minutes.
3. Specify the action:
 - Send a notification via SNS.
 - Trigger a Lambda function to handle the issue programmatically.
 - Initiate an Auto Scaling event.

4.2 Simple Notification Service (SNS)

SNS is a messaging service used by CloudWatch Alarms to notify stakeholders or trigger actions.

Components of SNS:

- **SNS Topic:** A logical access point and communication channel (e.g., a mailing list).
- **Subscribers:** Endpoints that receive notifications (e.g., email, SMS, Lambda function).

Example Workflow:

1. Create an SNS Topic (e.g., `HighCPUAlarmTopic`).
 2. Subscribe endpoints (e.g., your email or phone number) to the topic.
 3. Link the CloudWatch Alarm to the SNS Topic.
 4. When the alarm is triggered, all subscribers to the topic receive notifications.
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5. Automating Responses with CloudWatch and Auto Scaling

5.1 Auto Scaling Overview

Auto Scaling ensures that your applications have the right amount of resources to handle current traffic. By integrating Auto Scaling with CloudWatch, you can dynamically scale your infrastructure.

Example Scenario: High CPU Utilization

1. CloudWatch monitors CPU utilization across a fleet of web servers.
2. If the `CPU Utilization` metric exceeds 80% for a sustained period:
 - A CloudWatch Alarm is triggered.
 - The alarm invokes Auto Scaling to **add more EC2 instances** to the group.
3. New instances are automatically:
 - Attached to the Auto Scaling group.
 - Registered with the load balancer.
 - Begin receiving traffic without manual intervention.

5.2 Other Automation Use Cases

- **Lambda Integration:** Trigger a Lambda function to execute custom logic when an alarm is triggered.
 - **Log Analysis:** Automatically analyze logs for errors or anomalies and take corrective action.
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6. Best Practices for Using CloudWatch

1. **Leverage Tags for Metrics Filtering:** Use tags to organize and filter metrics across resources for better visibility.
2. **Set Up Alerts for Critical Metrics:** Ensure alarms are configured for vital system components like CPU, memory, and disk utilization.
3. **Implement Retention Policies:** Define how long metrics and logs should be retained to balance cost and compliance.

4. **Integrate with Other Services:** Combine CloudWatch with SNS, Lambda, and Auto Scaling to enable robust monitoring and automation.
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7. Summary

AWS CloudWatch is a powerful monitoring service that provides visibility into your AWS environment. It enables you to track performance metrics, collect logs, set alarms, and automate responses. By integrating with SNS, Lambda, and Auto Scaling, CloudWatch extends beyond monitoring to become a cornerstone of automation within the AWS ecosystem.

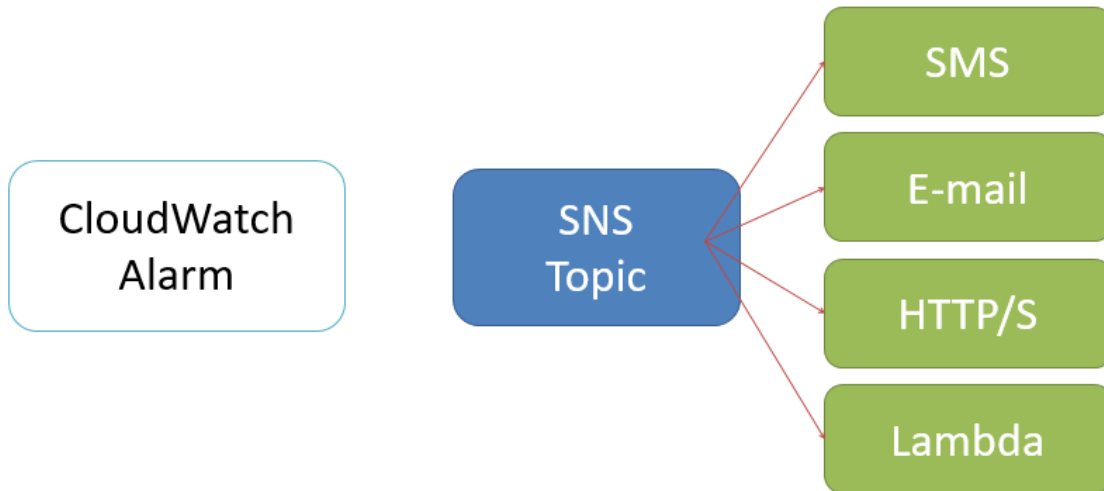
See slides below:

CloudWatch

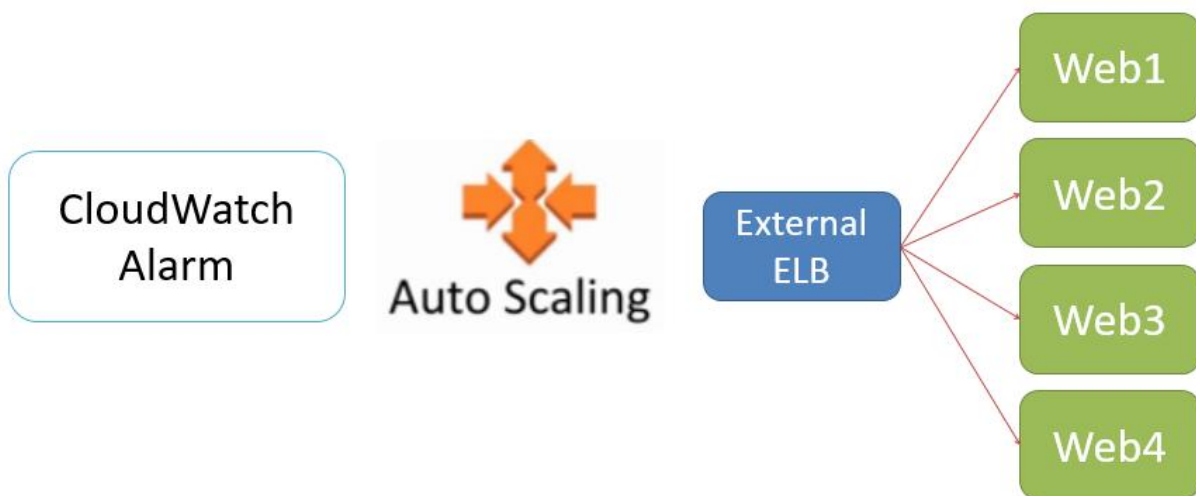


- Monitoring Service for AWS Services
- Support metrics for EC2, EBS, ELB, and other services
- Collect and aggregate log files and set alarms
- Don't confuse with CloudTrail or CloudFormation
- Uses SNS to send alerts

CloudWatch and SNS



CloudWatch and Autoscaling Groups



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