EC2 Monitoring

Friday, June 22, 2018 2:19 PM

How to set up

- Add a tag to all EC2 Instances to identify which ones will be monitored
- Everything needed for the system should be in the S3 bucket
  - Bucket named aaconnorsbucket
  - Can copy contents to a different bucket
- Make sure you have permissions to create IAM Roles and policies
- Create a Cloudformation stack
  - Use the URL for the monitoringSystem.yml template in the S3 bucket
  - Fill out parameters
    - The EC2TagKey and the EC2TagValue should be the key and value of the tag that was added to the EC2 instances earlier
    - Make sure the BucketName is the name of the bucket where the template and the code is in
    - If you want to add more SNS endpoints, sign up manually to the monitorNotification SNS topic
    - RestartInstances specifies whether the instance is turned on when instance is accidentally turned off
    - RecoverStatusCheck specifies whether to recover the instance after a status check failure
      - Turns the instance on and off again
      - Will get a notification that the instance was accidentally turned off, disregard
      - For this to work, RestartInstances must be turned on
        - If not, the instance will just be stopped
  - Can ignore options page
  - In the review screen make sure to check the Capabilities box
    - "I acknowledge that AWS CloudFormation might create IAM resources with custom names."
- Done and done
  - It takes a little bit for the alarms to be attached
  - To change resource names, you have to edit the maps in the YAML template
  - Remember to confirm email

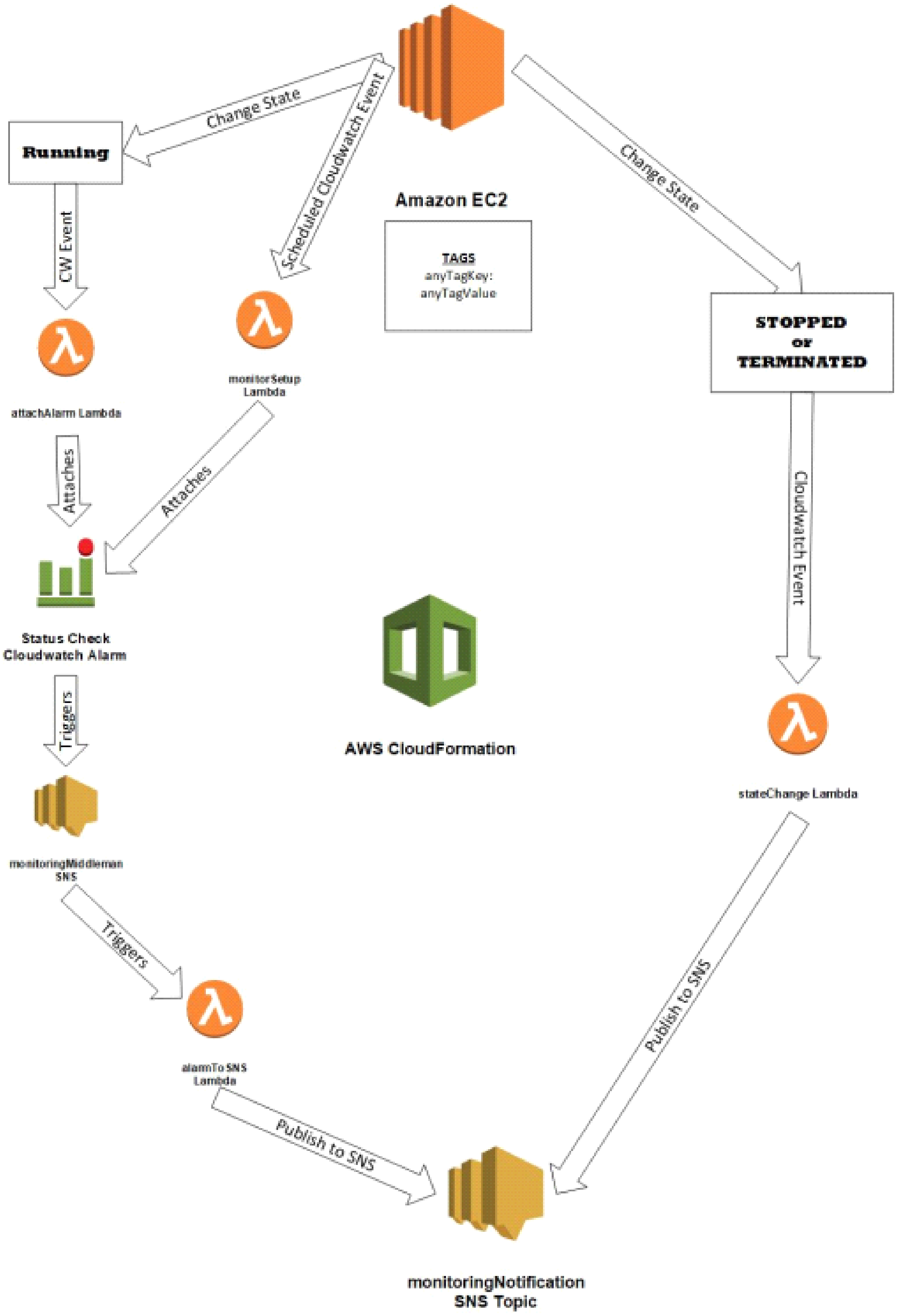
Goal

Set up and Up-Down monitoring system that sends a notification if an instance turns unhealthy or if it is accidentally turned off.
Does not add termination protection.

Two parts:

- Health check of EC2 instance
- Instance state monitoring

Here is an incredibly crude visualization of the system



Overview

All names are as in CFN template

- All lambda functions use the boto3 python SDK
- IAM Role

EC2 Instance

- Needs a specified tag for system to work

setUpRule

- Scheduled cloudwatch rule that triggers every minute (doesn't matter because rule will be disabled)
- Triggers **monitorSetupLambda**
- Exists so when the CFN template is created, a lambda function can attach an alarm to existing instances
- https://docs.aws.amazon.com/AmazonCloudWatch/latest/events/WhatIsCloudWatchEvents.html
- It's probably better practice to use custom resources or an SNS topic that activates on creation, but I wasn't able to automa te those processes

monitorSetupLambda

- Should be triggered a minute after CFN creation because of the **setUpRule**
- Function attaches a status_check alarm to all *running* instances with the identifying tag
    - ○ Checks to see if instance already has alarm of the same name
        - ■ Will overwrite an alarm of the same name
    - ○ More info about alarm can be found in **Cloudwatch Alarm** heading
- Updates the Cloudwatch dashboard when attaching an alarm if defined in CFN parameters
    - ○ Can be turned on/off on CFN creation
    - ○ Adds a widget looking at the instance status check metric
- Function then disables the scheduled cloudwatch rule
    - ○ So it doesn't keep getting invoked

attachAlarmRule

- Cloudwatch rule that is triggered when an EC2 instance changes state to running
- Invokes attachAlarmLambda
- https://docs.aws.amazon.com/AmazonCloudWatch/latest/events/WhatIsCloudWatchEvents.html

attachAlarmLambda

- When EC2 changes state to running, it triggers a Cloudwatch rule, which then triggers the attachAlarmLambda function
- Attaches status_check alarm to instance
    - ○ Will override an alarm with the same name
    - ○ More info about alarm can be found in **Cloudwatch Alarm** heading
- Updates the Cloudwatch dashboard when attaching an alarm if defined in CFN parameters
    - ○ Can be turned on/off on CFN creation
    - ○ Adds a widget looking at the instance status check metric

Cloudwatch Alarm

- Alarms are named the instance id
- Status_check alarms
- Two types of status checks
    - ○ StatusCheckFailed_System
        - ■ Cannot be simulated
    - ○ StatusCheckFailed_Instance
        - ■ Can be simulated by killing eth0
    - ○ https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/monitoring-system-instance-status-check.html
- For other services, alarms can be configured for other metrics
- Alarms can send notifications when in a defined mode {'alert', 'insufficient data', 'ok'}
- Can be configured to take EC2 action
    - ○ Recover
    - ○ Stop
    - ○ Terminate
    - ○ Reboot
- When to recover an instance in this system, the alarm stops the instance and the stateChangeLambda restarts it
    - ○ The alarm doesn't use the recover option because that only fixes system status failures
    - ○ If the restart parameter is not set to yes, the instance will just be stopped
- Lambda function will not overwrite an alarm of the same name
- Tested by entering (sudo ifconfig eth0 down) in a Linux instance or killing network connection in a windows

monitoringMiddleman (SNS)

- Alarm triggers this when instance fails health check

- Alarm triggers this when instance fails health check
- Passes the alarm message to alarmToSNSLambda
- The default message that the alarm gives doesn't have the right amount of data and the formatting cannot be customized
    - ○ So the info is passed to a Lambda to do the rest

alarmToSNSLambda

- Formats event data from monitoringMiddleman SNS topic
- Retrieves more data about the instance
- Sends a message to **monitoringNotification SNS**

stateChangeRule

- Invokes stateChangeLambda
- https://docs.aws.amazon.com/AmazonCloudWatch/latest/events/WhatIsCloudWatchEvents.html

stateChangeLambda

- Retrieves info about shut off instance
- Sends message to **monitoringNotification SNS**
- Can be configured to restart instance if stopped

monitoringNotification SNS

- Main SNS topic that sends out monitoring alerts

Dashboard

- CFN Parameter to create a dashboard
- A widget is a graph
- On creation, the dashboard has widgets for
    - ○ Number of invocations for all of the Lambda functions
    - ○ Total number of publishes for both SNS topics
- Default refresh time is 5 min
- Default history is 3 hours
    - ○ How far back the widgets go
- When a lambda function attaches an alarm to an EC2 instance
    - ○ It can update the dashboard to include a status_check data widget

CloudFormation Template

- To update code, upload a zip folder to S3 with the specified name
- Creates an IAM Role for Lambda functions
    - ○ Make sure you have permissions
- Parameters are grouped with CloudFormation::Interface
- CloudFormation passes data to Lambda with environment variables
    - ○ Passes SNS Arn
    - ○ Passes identifying tag(asked for in the parameters section)
        - ■ Tag is needed to attach an alarm or for state change to send a message
    - ○ And a lot of parameters
- Everything needed for the system is in connorsbucketbethyname S3 bucket
    - ○ If bucket name changes then things break
    - ○ Good thing its part of a map in the template so only have to change on thing
- On CloudFormation creation
    - ○ A scheduled cloudwatch event is created and sends a message to a lambda function
    - ○ Function
        - ■ Attaches alarm to all marked instances
        - ■ Deletes CW event and itself
- CFN EC2Tag to identify instances should be pre-created
- Setup lambda has to have its set up event name hardcoded to remove circular dependencies
- Link for YAML template when creating stack https://s3.amazonaws.com/connorsbucketbethyname/monitoringSystem.yml

IAM

- CFN Template creates an IAM policy and role
- One role to be used by all of the lambda functions

- Named (region)_(iamName)
    - (region) is the region of the system
    - iamName can be changed within the CFN template

Problems Encountered

- I tried to test many combinations of parameters that I could but there is almost certainly more bugs
- SNS to lambda event is weird
    - Sends a mixed event of JSON and Unicode formatting
    - Solved by changing the python runtime from 2.7 to 3.6 which make the Unicode formatting a string
        - The string could then be turned into a dictionary
- Circular dependencies in CFN template
    - Solved by putting all resource names into a map then calling the map
- The dashboard occasionally doesn't delete

!Use cases

- Security logging/monitoring
- Billing
- Termination protection

Limitations

- SNS - can only send a certain amount of SMS messages per month b/c dollar limit
- Can't have more than one monitoring system per region per account

Pricing / Costs

- Cloudwatch
    - https://aws.amazon.com/cloudwatch/pricing/
    - $0.10 per alarm per month
    - Basic metrics are free at the 5 min period

Other

- How do we expand to other services
    - Alarms can be set up with different metrics for other services
- Email me at caicon18@gmail.com if there are any game breaking problems or if nothing makes sense