Make Your Own Cloud Security Monitoring Solution

About The Presenter

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***These opinions are mine and not my employer's**

@JohnAVentura

Alerting in the Cloud

- Build an alerting system for GCP or AWS
- Associated dangers
- Overcoming these dangers

Why Alerting?

Do you have policies?

Do people make mistakes?

Do you get attacked?

Build An Alerting System

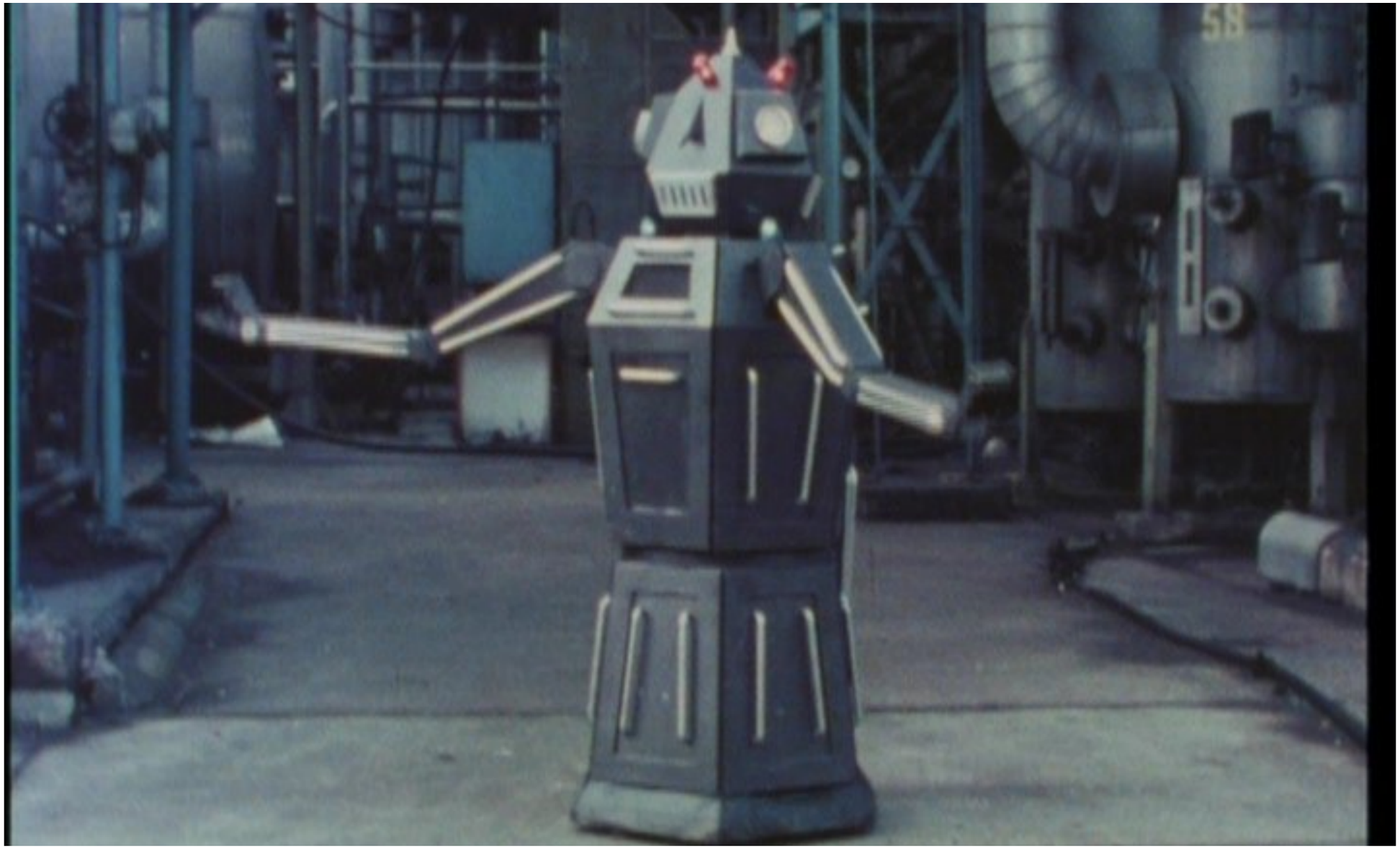
You already have the components!

Common Intrusion Detection Framework

CIDF defines four categories of components:

- **Event generators**
- **Analyzers**
- **Databases**
- **Response units**

https://tools.ietf.org/html/draft-staniford-cidf-data-formats-00



Actual Response Unit

AWS and GCP

For this talk, we will focus on the CIDF components provided by AWS and GCP.

CIDF In Public Cloud Environments

Public cloud environments provide some CIDF components as services:

- **Easy to configure**
- **Can feed into 3rd party tools**
- **Accessible by API Calls**
  (EVERYTHING is an API CALL)

Native Event Generators

AWS (CloudTrail)

- Easily configurable
- Logs ALL API calls to S3 or Lambda
- Easily consumable by third party tools

Native Event Generators

AWS (CloudWatch)

- Easily configurable
- Logs filtered API calls to anywhere
- Easily consumable by third party tools

Native Event Generators

Stackdriver (GCP)

- GCP log management platform
- Collects GCP event data
- Includes features that facilitate data management

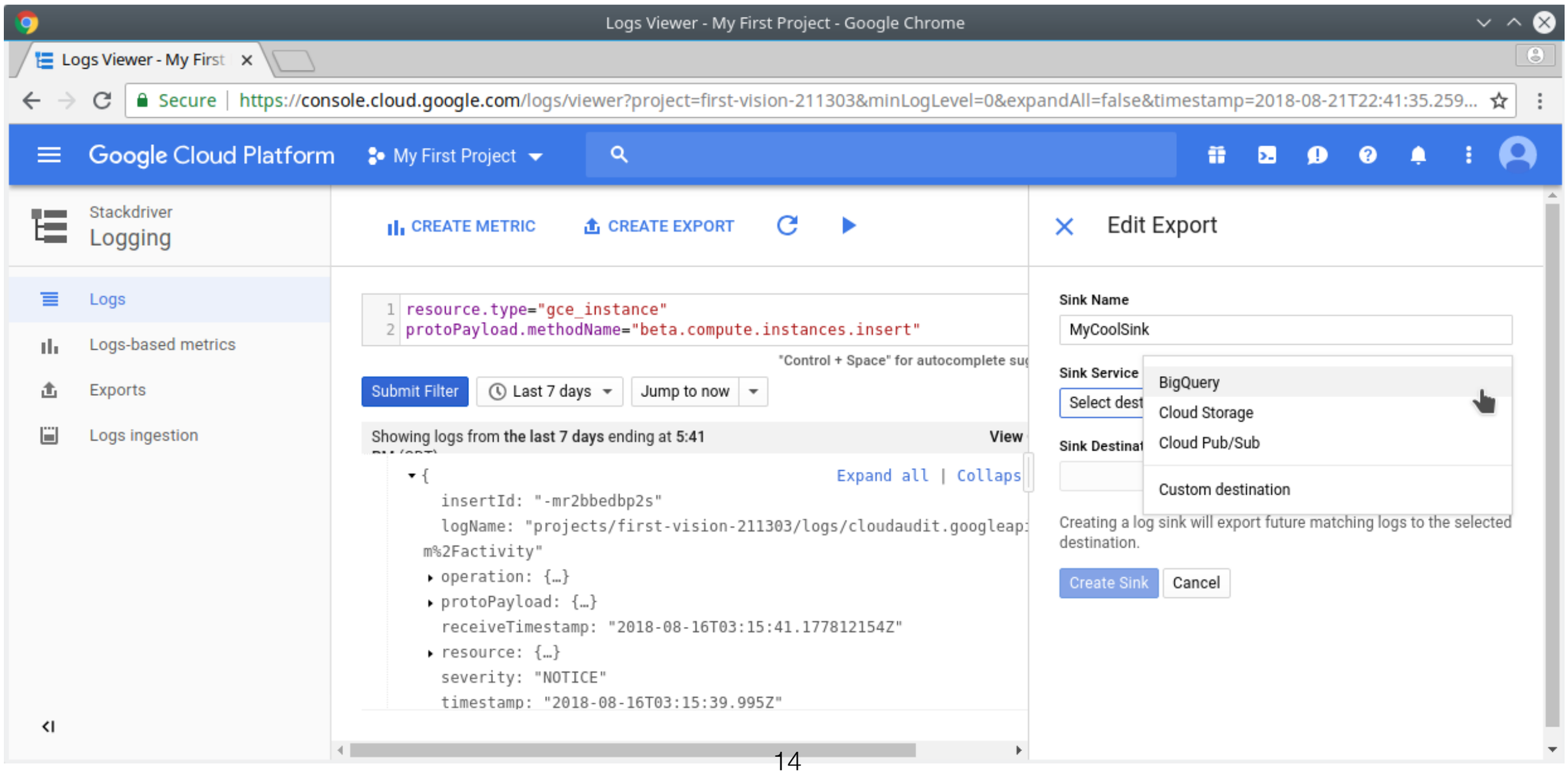
Native Analyzers

AWS and GCP both provide native analyzers

- **Accessible via the GUI**
- **Accessible via APIs**
- **Data presentations may vary considerably based on logged calls**

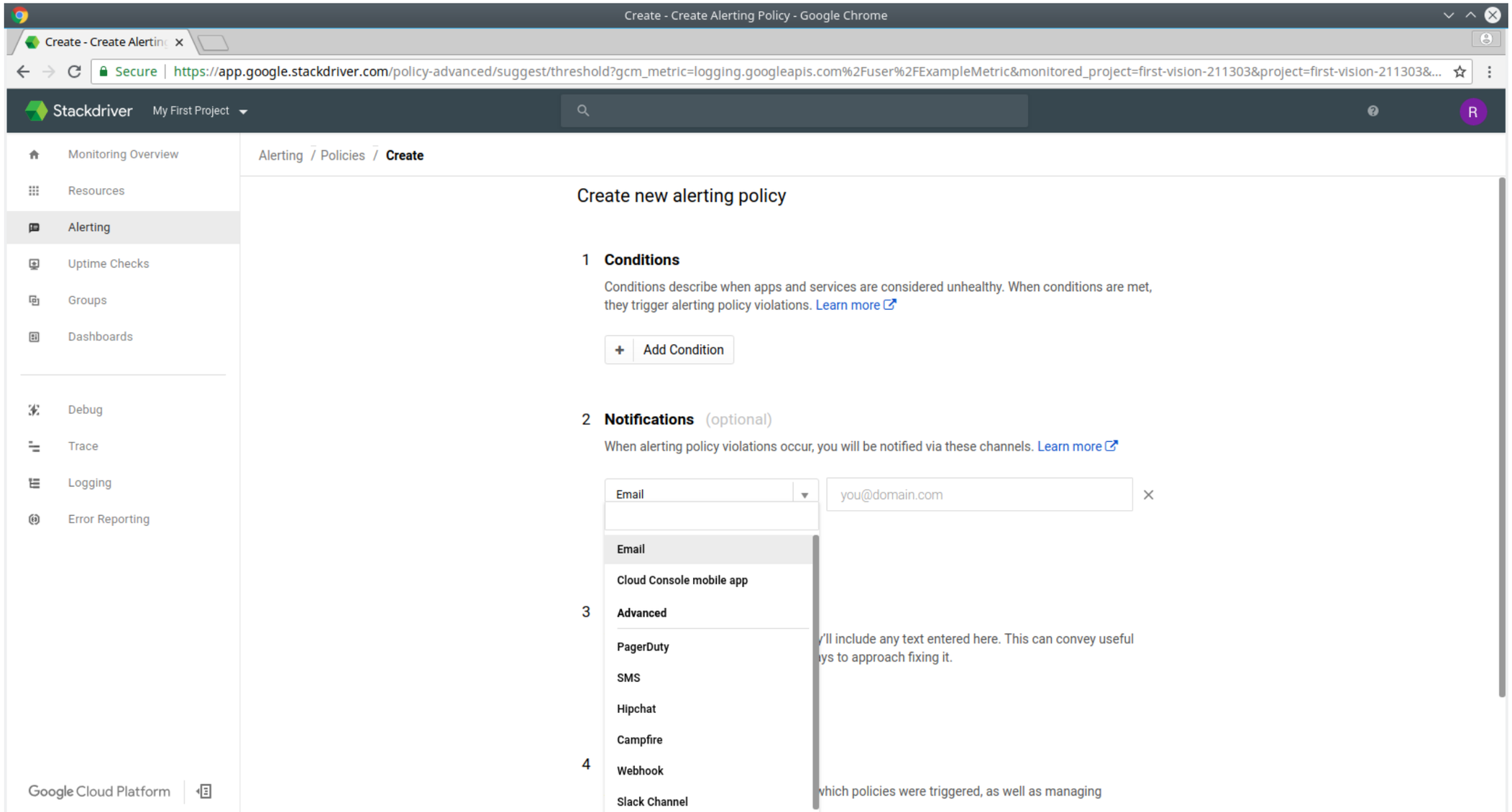
GCP's Native Analyzer

Create a filter!



GCP’s Native Response Unit

Create a policy!



AWS' Native Analyzer

CloudWatch Management Con ×

Secure https://console.aws.amazon.com/cloudwatch/home?region=us-east-1#rules:name=AlertingCW

aws Services Resource Groups demo-account N. Virginia Support

CloudWatch
Dashboards
Alarms
ALARM 7
INSUFFICIENT 15
OK 6
Billing
Events
Rules
Event Buses
Logs
Metrics

Favorites

Rules > AlertingCW

Actions

Summary

ARN arn:aws:events:us-east-1: :rule/AlertingCW

Event pattern

```
{
  "detail": {
    "eventName": [
      "AuthorizeSecurityGroupIngress",
      "CreateInstance"
    ],
    "eventSource": [
      "ec2.amazonaws.com"
    ]
  },
  "detail-type": [
    "AWS API Call Tracking"
  ],
  "source": [
    "aws.ec2"
  ]
}
```

Status Enabled

Description

Monitoring Show metrics for the rule

Targets

Filter:

Viewing 1 to 1 of 1 Targets

Type	Resource name	Input	Role	Additional parameters
Lambda function	AlertingFunction	**Matched event**		

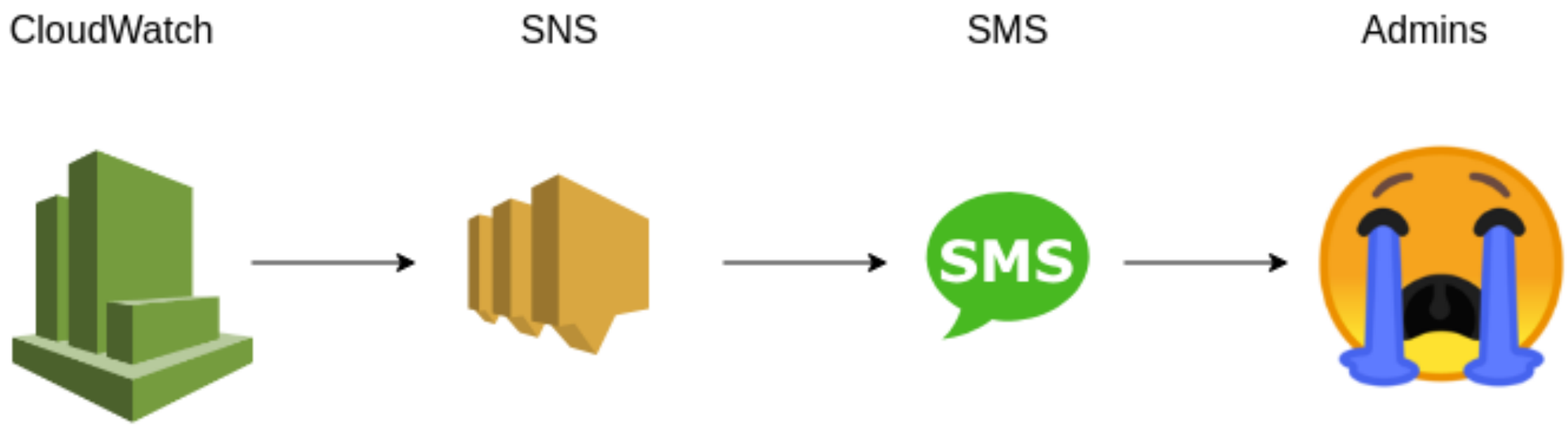
Feedback English (US)

AWS Native Response Unit

AWS offers native support for:

- SMS through SNS
- E-mail through Simple Email Service
- Much more...

Simple AWS Alerting



AWS CIDF Summary

- Configurable
- Consumable
- Spread across multiple services
- Intended for programatic access
- Log formats have inconsistent schema

GCP CIDF Summary

- Configurable
- Consolidated in single service
- Heavy focus on GUI
- Log formats have inconsistent schema

Incompleteness Theorem

BEWARE!

Information for Red Teams!

gcloud logging [metrics | sinks] list

```
$ gcloud logging metrics list
NAME                    DESCRIPTION                    FILTER
ExampleMetric           Example Metric                 resource.type="gce_instance"
                                                       logName="projects/first-vision-211303/logs/cloudaudit.googleapis.com%2Factivity"
                                                       protoPayload.methodName="beta.compute.instances.insert"
deleteinstancemetric                                   resource.type="gce_instance"
                                                       protoPayload.methodName="v1.compute.instances.delete"
deletewithlogname                                      resource.type="gce_instance"
                                                       logName="projects/first-vision-211303/logs/cloudaudit.googleapis.com%2Factivity"
```

gcloud logging metrics update [metric_name] —log-filter = “SOMETHING”

```
$ gcloud beta logging metrics update dev-insertinstance-metric --log-filter="resource.type=gce_instance AND logName=projects/cloudland/logs/cloudaud
it.google
apis.com%2Factivity AND protoPayload.methodName=beta.compute.instances.delete"
Updated [dev-insertinstance-metric].
```

Information for Red Teams!

```
# gcloud pubsub subscriptions pull --auto-ack alertSub
```

Information for Red Teams!

- aws events list-rules # for CloudWatch rules
- aws events [disable-rule | enable-rule] —name [rule name]
- aws cloudtrail describe-trails

Information for Red Teams!

```
#
```

Native Alerting Limitations

- Transparent to attackers
- Easily clobbered by admins (including you)
- Metrics/Exports/Filters can be imprecise

What Can We Do?

Build your own Alerting!

Advantages

- Less transparent to attackers
- Allows for more complicated filtering
- Enabled third-party technology
- Storage and retention...

Case Study

In this scenario

- AWS is our primary cloud
- GCP is our secondary cloud
- Shipping data out of GCP to other CIDF components
- Custom shipper “GoodCoP”

Stackdriver API

- Continuous Polling
- Lose some convenience
- Protobuf support*

*https://github.com/googleapis/googleapis/blob/master/google/cloud/audit/audit_log.proto

Application Flow

```
from google.cloud.logging import Client, ASCENDING, DESCENDING

client = Client(project = projectName)
while true:
        timeFilter = GetFilter(LastScanTime)
        entries = False
        while not entries:
                entries = client.list_entries(order_by=DESCENDING, filter_ = timeFilter)
        for entry in entries:
                DoSomething(entry.payload)
        UpdateScanTime(entry.timestamp)
```

GoodCoP Configuration

```yaml
projects:
  - cool-project
  - scorpio
  - london
calls:
  - ALL
alertcycle: 61
sinks:
  logfile:
    filename: /var/log/goodcop.log
  s3:
    bucket: gcp-bucket
    key: stackdriver-raw
```

Flip the Script

What if AWS alerting data flows into GCP?

Considerations for AWS

- **CloudTrail - Dump all your API event to S3 or Lambda**
- **CloudWatch - Dump filtered API events to Lambda, Kinesis, SQS, SNS, or elsewhere**

Consider separate accounts!

Adding Third Parties

Several third party CIDF components are available.

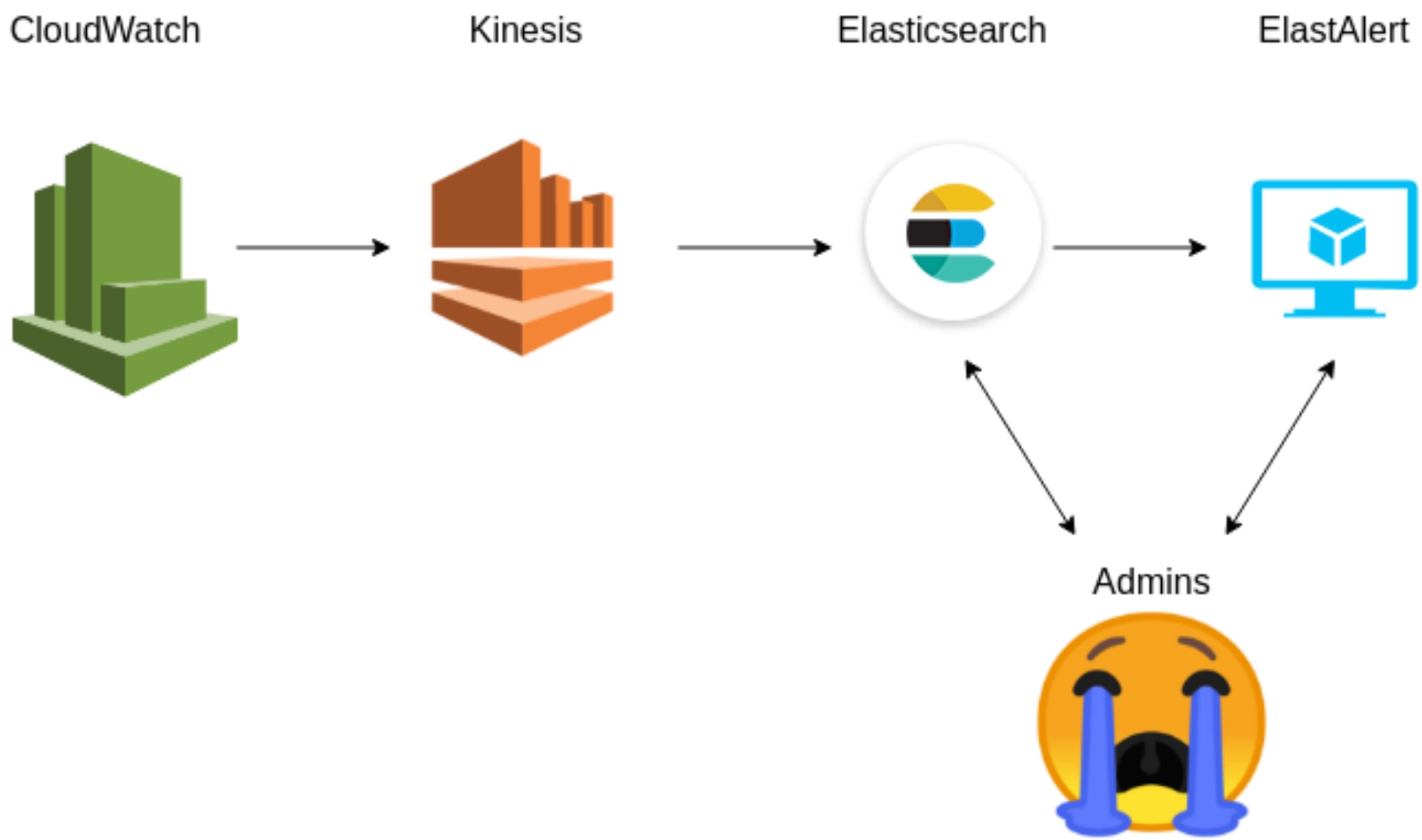
Open Source Searching and Alerting

- Elasticsearch
- Elastalert
- Streamalert

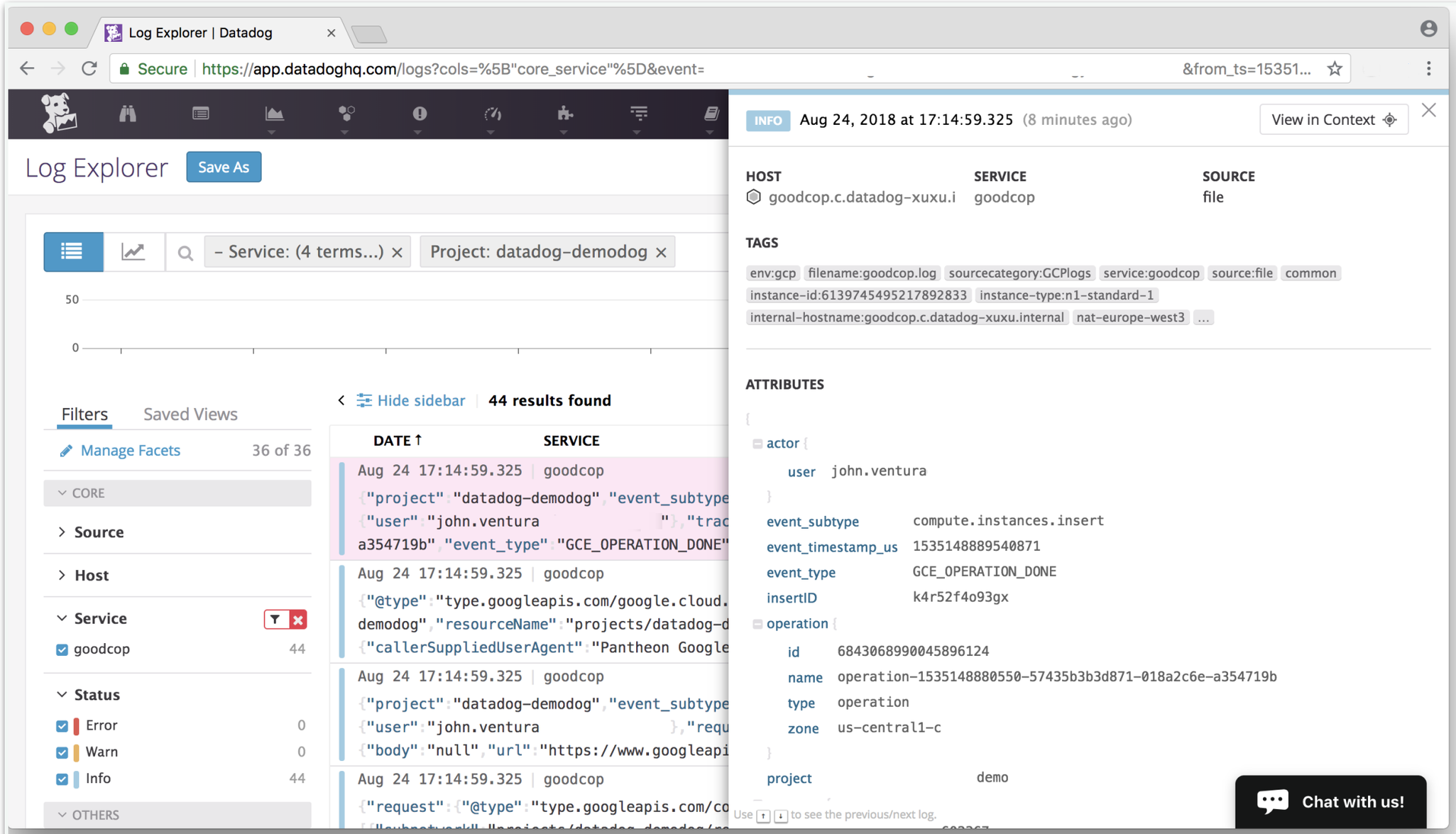
Third Party Response Units

- **Slack — https://api.slack.com/**
- **PagerDuty — https://v2.developer.pagerduty.com/**
- **SMS — Several available**
- **SMTP Email — Several available**
- **Smart bulbs — https://www.developers.meethue.com/philips-hue-api**

Simple AWS Alerting



Datadog as Datastore



Datadog as Analyzer

Monitors | Datadog

Secure https://app.datadoghq.com/monitors#create/log

1 **Define the search query**

Project: datadog-demodog × @methodName: beta.compute.instances.insert ×

2 **Set alert conditions**

Trigger when the metric is above the threshold during the last 5 minutes

Alert threshold: 1

Warning threshold: Warning threshold (optiona

3 **Say what's happening**

Use message template variables

Preview Edit Markdown supported

Example Monitor Name: Number of errors is very high for...

Someone just created an instance! STOP THEM! @john.ventura@example.com @slack-alerting-channel @pagerduty-Wake-Me-UP

Tags: Select or add related tags

4 **Notify your team**

@john.ventura@example.com ×

Chat with us!

Datadog Response Units

Monitors | Datadog

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Chat with us!

Go Build It!

- CIDF components are out there
- These systems can be fragile
- Good luck!

Thank you

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- **Github: https://github.com/johnaventura/**