Logging and Alerting

Cloud Security

About me

- Senior Security Engineer at King
- Telecommunications Engineer
- Network and Network Security Background
- Native from Romania
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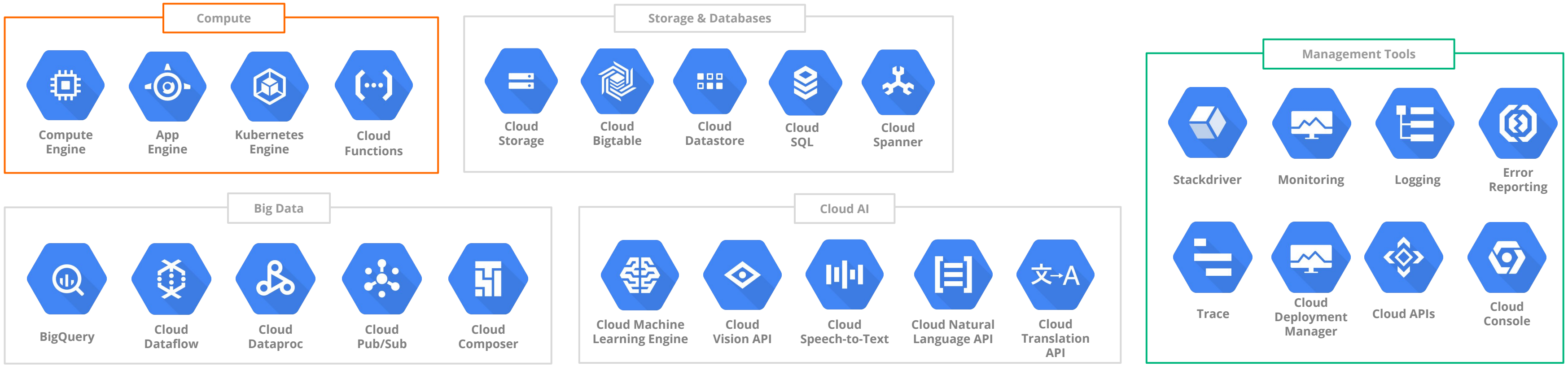
Content

- GCP Overview
- The Problem
- Logs
- Alerts
- Automation
  - Google Cloud Functions
- Conclusions

Google Cloud Platform



Compute

Compute Engine, App Engine, Kubernetes Engine, Cloud Functions

Storage & Databases

Cloud Storage, Cloud Bigtable, Cloud Datastore, Cloud SQL, Cloud Spanner

Management Tools

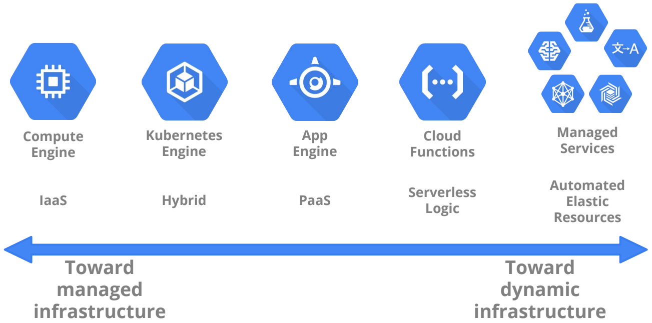
Stackdriver, Monitoring, Logging, Error Reporting, Trace, Cloud Deployment Manager, Cloud APIs, Cloud Console

Big Data

BigQuery, Cloud Dataflow, Cloud Dataproc, Cloud Pub/Sub, Cloud Composer

Cloud AI

Cloud Machine Learning Engine, Cloud Vision API, Cloud Speech-to-Text, Cloud Natural Language API, Cloud Translation API



Compute Engine	Kubernetes Engine	App Engine	Cloud Functions	Managed Services
IaaS	Hybrid	PaaS	Serverless Logic	Automated Elastic Resources

Toward managed infrastructure ⟷ Toward dynamic infrastructure

King collaborates with Google Cloud for next-generation analytics and machine learning

Google Cloud

King

https://medium.com/@TechKing

The Problem

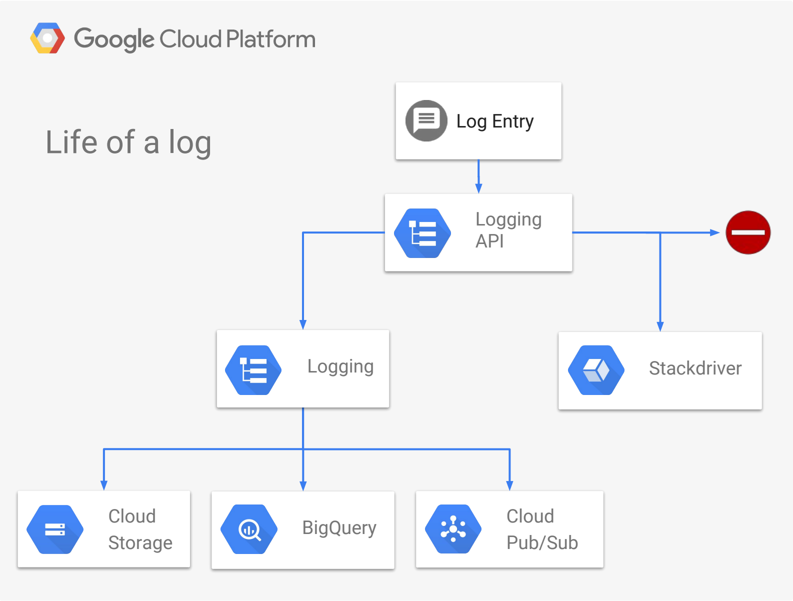
- Cloud environment
  - Different stack than on-prem
  - Lack of visibility
- DevOps
  - No centralized management
- Data leak news

How do we solve it?

- GCP native tools
- Practice

Logging and Telemetry

- Google Stackdriver



- Cloud Audit Logging
  - Cloud Audit Logs
  - Data Access Logs
  - System Activity
- Telemetry
  - Load Balancer Telemetry
  - VPC Flows
  - FW Logs
- Application Specific
  - AppEngine Access Logs
  - BigQuery Logs

Admin Activity

- Activity performed by users over resources
  - Resource creation, permissions, etc.
- Information
  - User

```
protoPayload.authenticationInfo.principalEmail
```

  - Source IP

```
protoPayload.requestMetadata.callerIp
```

  - Method name

```
protoPayload.methodName
```

  - Resource name

```
protoPayload.resourceName
```

  - Project name

```
resource.labels.project_id
```

- IAM change fields

```
protoPayload.serviceData.policyDelta.bindingDeltas.member
protoPayload.serviceData.policyDelta.bindingDeltas.role
```

- VPC Firewall Rules

```
protoPayload.request.alloweds.ports
protoPayload.request.direction
protoPayload.request.sourceRanges
protoPayload.request.targetTags
```

- Compute Engine VM Instances

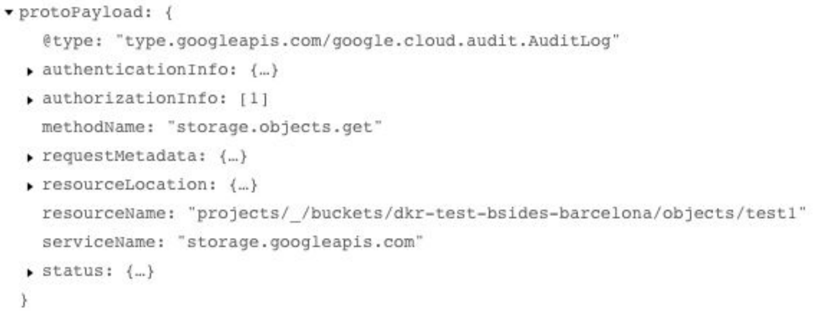
```
resource.type = "gce_instance"
protoPayload.request.networkInterfaces.subnetwork=
"projects/{#project_id}/regions/{#region}/subnetworks/
{#subnet_name}"
logName  =
"projects/{#project_id}/logs/cloudaudit.googleapis.com
%2Factivity"
```

Data Access

- Data accessed by user
  - Not enabled by default
  - API calls that create, modify or read user-provided data
    - Which users and accounts performed various GCP calls/actions?
    - When/where the calls occurred?
    - What called/made them?
- Information
  - User
  - methodName
  - resourceName
  - projectName

- Data Access logs for a single GCS Bucket by a user

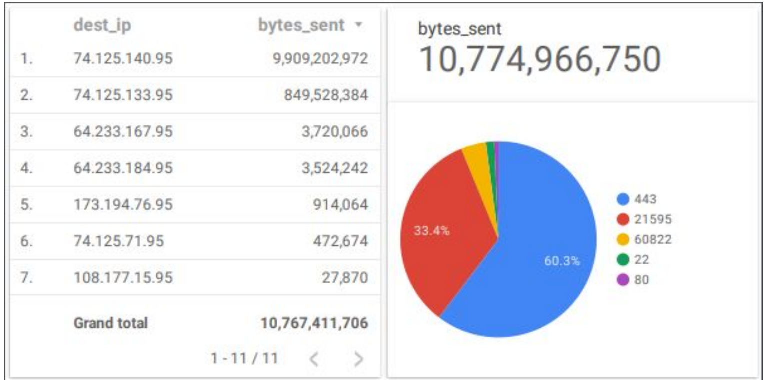
```
resource.type = ”gcs_bucket"
resource.labels.bucket_name ="{#bucket_name}"
authenticationInfo.principalEmail ="{#email}"
logName  =
"projects/{#project_id}/logs/cloudaudit.googleapis.com
%2F data_access"
```



```
▾ protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
  ▸ authenticationInfo: {…}
  ▸ authorizationInfo: [1]
    methodName: "storage.objects.get"
  ▸ requestMetadata: {…}
  ▸ resourceLocation: {…}
    resourceName: "projects/_/buckets/dkr-test-bsides-barcelona/objects/test1"
    serviceName: "storage.googleapis.com"
  ▸ status: {…}
  }
```

VPC Flows

- Connection
  - `src_ip, src_port, dest_ip, det_port, protocol`
- Traffic volume
  - `bytes_sent, packets_sent`
- VPC Network Details
  - `project_id, vpc_name, subnetwork_name`



	dest_ip	bytes_sent ▾
1.	74.125.140.95	9,909,202,972
2.	74.125.133.95	849,528,384
3.	64.233.167.95	3,720,066
4.	64.233.184.95	3,524,242
5.	173.194.76.95	914,064
6.	74.125.71.95	472,674
7.	108.177.15.95	27,870
	Grand total	10,767,411,706

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bytes_sent

10,774,966,750

- Traffic for a specific VM

```
resource.type="gce_subnetwork"
logName="projects/{#project_id}/logs/compute.googleapi
s.com%2Fvpc_flows"
jsonPayload.src_instance.vm_name="{#vm_name}”
```

- Trafic for a specific port and protocol

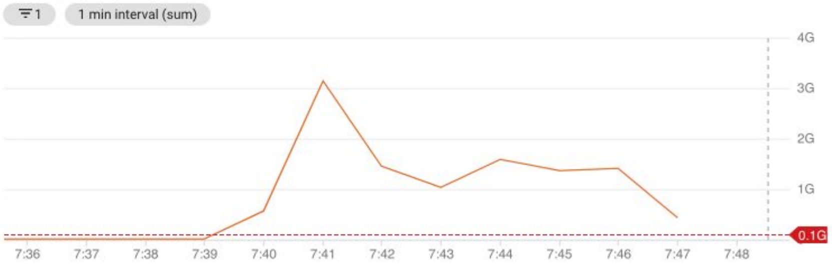
```
resource.type="gce_subnetwork"
logName="projects/{#project_id}/logs/compute.googleapi
s.com%2Fvpc_flows"
jsonPayload.src_instance.vm_name="{#vm_name}”
```

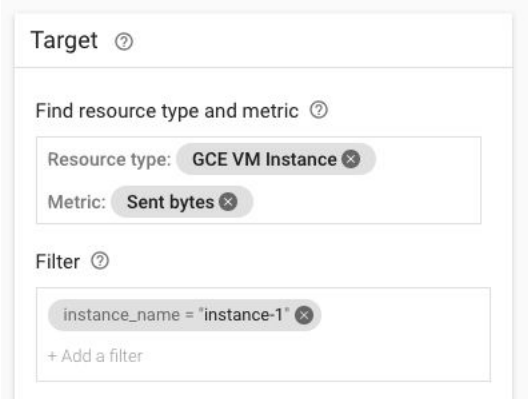
- Traffic for a specific subnet

```
resource.type="gce_subnetwork"
logName="projects/{#project_id}/logs/compute.googleapi
s.com%2Fvpc_flows"
ip_in_net(jsonPayload.connection.dest_ip, {#subnet})
```

Alerts

- Metrics or logs
  - Firewall and VPC flow state
  - IAM on selected projects
  - Creation of non compliant VM
  - High resource consumption
  - Non-domain account accessing GCP
  - Traffic volume
- Problem
  - Difficult to manage at scale
  - High operation overhead
  - Reactive approach




Target ⓘ

Find resource type and metric ⓘ

Resource type: GCE VM Instance ⊗

Metric: Sent bytes ⊗

Filter ⓘ

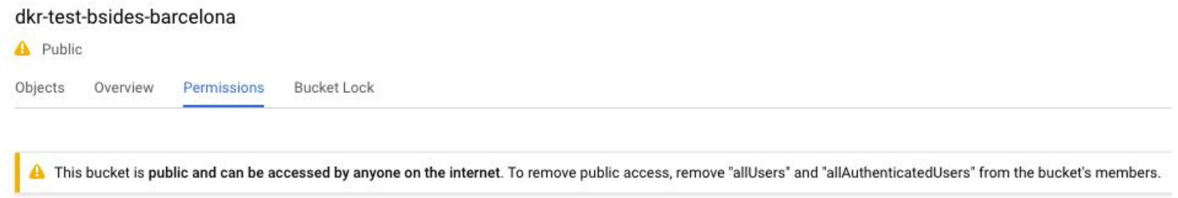
instance_name = "instance-1" ⊗

+ Add a filter

Public Bucket

- Special member identifiers
  - allUsers
  - allAuthenticatedUsers

- Alert created in Stackdriver
  - User-Defined Metric
  - Alert Policy based on the metric



dkr-test-bsides-barcelona

⚠ Public

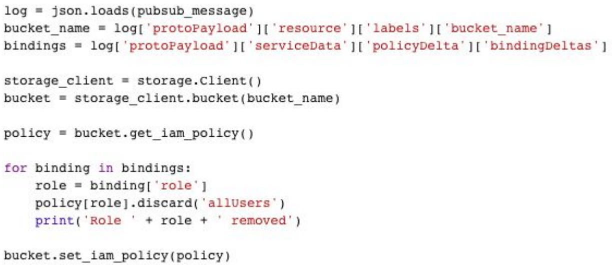
Objects Overview Permissions Bucket Lock

⚠ This bucket is **public and can be accessed by anyone on the internet**. To remove public access, remove "allUsers" and "allAuthenticatedUsers" from the bucket's members.

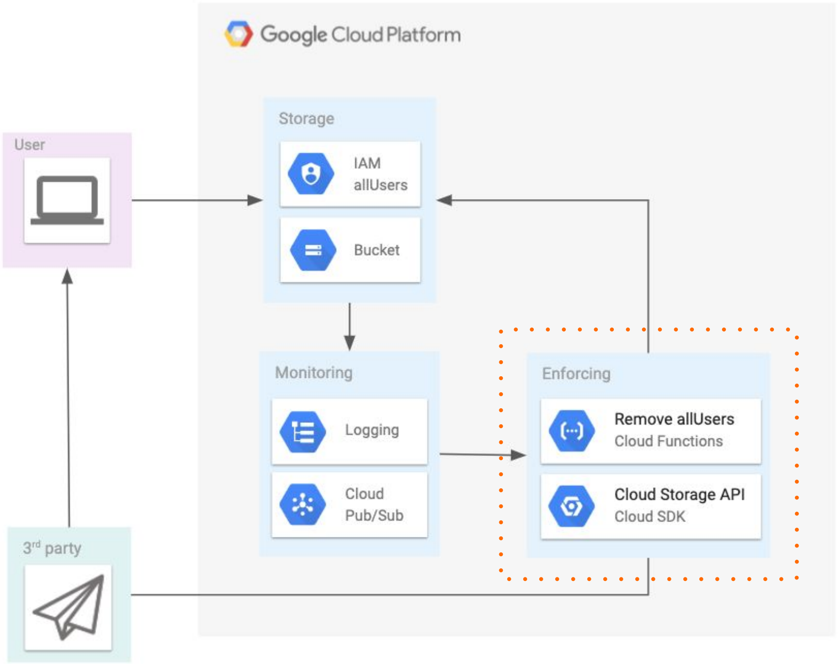
```
logName="projects/dkr-test-bsides-barcelona/logs/cloudaudit.googleapis.com%2Factivity"
protoPayload.serviceData.policyDelta.bindingDeltas.member="allUsers"
protoPayload.serviceData.policyDelta.bindingDeltas.action="ADD"
resource.type="gcs_bucket"
```

Automation with Cloud Functions

- Filter in Stackdriver
- Export to sink in a Pub/Sub topic
- Function listening to the topic
  - All information in the log
    - Bucket name
    - Roles added
    - Cloud Storage API

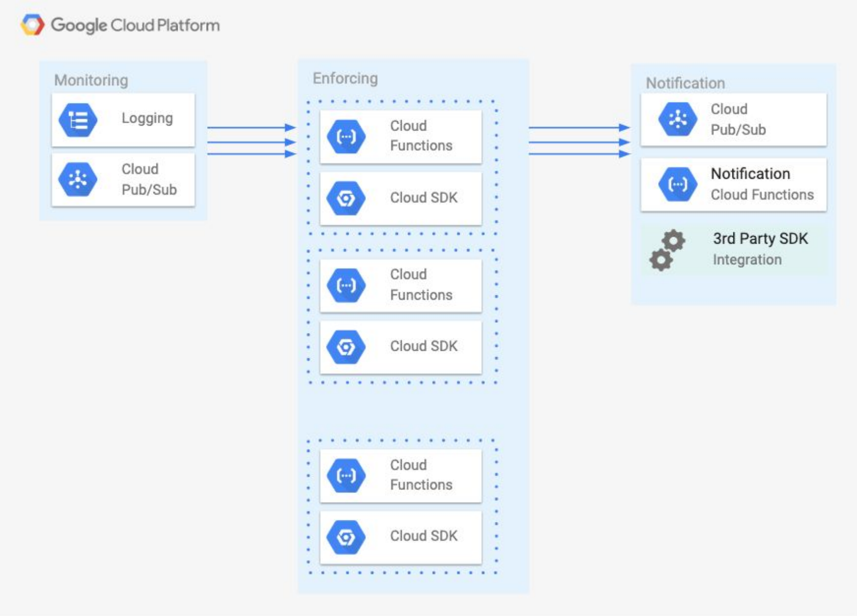


```
log = json.loads(pubsub_message)
bucket_name = log['protoPayload']['resource']['labels']['bucket_name']
bindings = log['protoPayload']['serviceData']['policyDelta']['bindingDeltas']

storage_client = storage.Client()
bucket = storage_client.bucket(bucket_name)

policy = bucket.get_iam_policy()

for binding in bindings:
    role = binding['role']
    policy[role].discard('allUsers')
    print('Role ' + role + ' removed')

bucket.set_iam_policy(policy)
```



Automation Framework

- Modules
  - Cloud function for each functionality
  - GCP services and APIs
- Communication
  - Pub/Sub topics
- Integrations
  - Notifications
  - Tickets



Conclusions

- We have log information for every activity
  - Visibility
- We have API for every service
  - Control
- User freedom and reactive enforcing of security policies
  - Automation
- Starting point for the transition from on-prem to cloud mindset

Cloud Security: Logging and Alerting

Thank you!

Questions?