IAM

Typical identity management in the cloud

- You have resources in the cloud (examples - a virtual server, a database etc)
- You have identities (human and non-human) that need to access those resources and perform actions
- For example: launch (stop, start or terminate) a virtual server
- How do you identify users in the cloud?
- How do you configure resources they can access?
- How can you configure what actions to allow?
- In GCP: Identity and Access Management (Cloud IAM) provides this service

Cloud Identity and Access Management (IAM)

- Authentication (is it the right user?) and
- Authorization (do they have the right access?)
- Identities can be
- A GCP User (Google Account or Externally Authenticated User)

- A Group of GCP Users
- An Application running in GCP
- An Application running in your data center
- Unauthenticated users
- Provides very granular control
- Limit a single user:
- to perform single action
- on a specific cloud resource
- from a specific IP address
- during a specific time window

Cloud IAM Example

- I want to provide access to manage a specific cloud storage bucket to a colleague of mine:
- Important Generic Concepts:
- Member: My colleague
- Resource: Specific cloud storage bucket
- Action: Upload/Delete Objects
- In Google Cloud IAM:
- Roles: A set of permissions (to perform specific actions on specific resources)
- Roles do NOT know about members. It is all about permissions!

- How do you assign permissions to a member?
- Policy: You assign (or bind) a role to a member
- 1: Choose a Role with right permissions (Ex: Storage Object Admin)
- 2: Create Policy binding member (your friend) with role (permissions)
- IAM in AWS is very different from GCP (Forget AWS IAM & Start FRESH!)
- Example: Role in AWS is NOT the same as Role in GCP

IAM – Roles

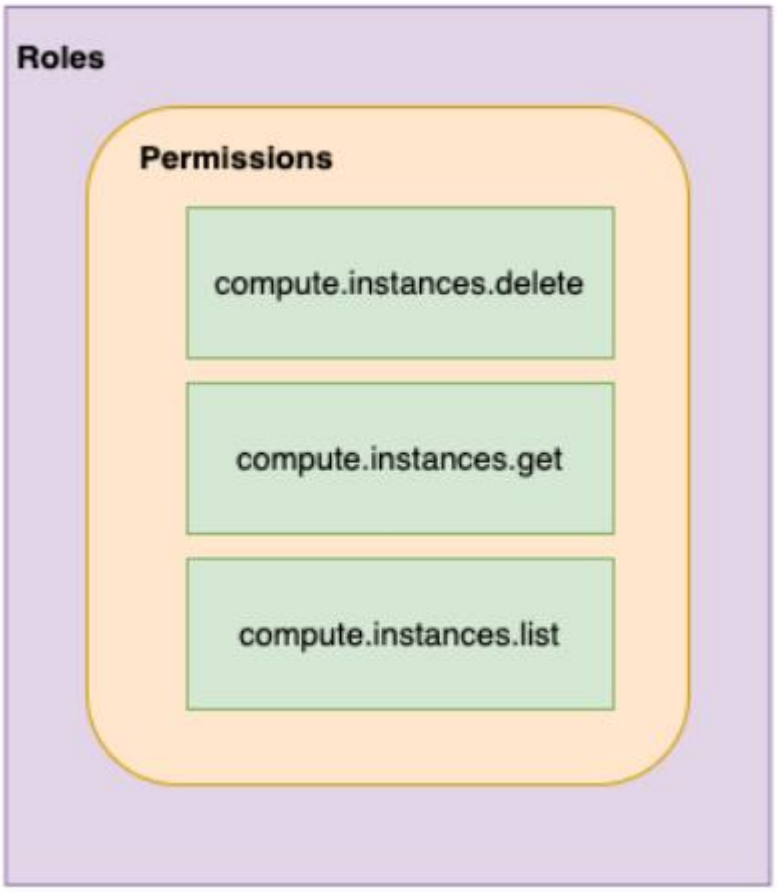
- Roles are Permissions:
- Perform some set of actions on some set of resources.
- Three Types:
- Basic Roles (or Primitive roles) - Owner/Editor/Viewer
- Viewer(roles.viewer) - Read-only actions
- Editor(roles.editor) - Viewer + Edit actions
- Owner(roles.owner) - Editor + Manage Roles and Permissions + Billing
- EARLIEST VERSION: Created before IAM
- NOT RECOMMENDED: Don't use in production
- Predefined Roles - Fine grained roles predefined and managed by Google

- Different roles for different purposes Examples: Storage Admin, Storage Object Admin, Storage Object Viewer, Storage Object Creator
- Custom Roles - When predefined roles are NOT sufficient, you can create your own custom roles

IAM - Predefined Roles - Example Permissions

- Important Cloud Storage Roles:
- Storage Admin (roles/storage.admin)
- storage.buckets.*
- storage.objects.*
- Storage Object Admin (roles/storage.objectAdmin)
- storage.objects.*
- Storage Object Creator (roles/storage.objectCreator) storage.objects.create
- Storage Object Viewer (roles/storage.objectViewer)
- storage.objects.get
- storage.objects.list
- All four roles have these permissions:
- resourcemanager.projects.get
- resourcemanager.projects.list

IAM - Most Important Concepts - A Review



* Member : Who?

- Roles : Permissions (What Actions? What Resources?)
- Policy : Assign Permissions to Members Map Roles (What?) , Members (Who?) and Conditions (Which Resources?, When?, From Where?)

- Remember: Permissions are NOT directly assigned to Member
- Permissions are represented by a Role
- Member gets permissions through Role!
- A Role can have multiple permissions
- You can assign multiple roles to a Member

IAM policy

* Roles are assigned to users through IAM Policy documents.

- Represented by a policy object.
- Policy object has list of bindings.
- A binding, binds a role to list of members
- Member type is identified by prefix:
- Example: user, serviceaccount, group or domain

IAM policy – Example

```
{
  "bindings": [
    {
      "role": "roles/storage.objectAdmin",
       "members": [
         "user:you@in28minutes.com",
         "serviceAccount:myAppName@appspot.gserviceaccount.com",
         "group:administrators@in28minutes.com",
         "domain:google.com"
       ]
    },
    {
      "role": "roles/storage.objectViewer",
      "members": [
        "user:you@in28minutes.com"
      ],
      "condition": {
        "title": "Limited time access",
        "description": "Only upto Feb 2022",
        "expression": "request.time < timestamp('2022-02-01T00:00:00.000Z')",
      }
    }
  ]
}
```


Playing With IAM

- gcloud: Playing with IAM.
- gcloud compute project-info describe - Describe current project.
- gcloud auth login - Access the Cloud Platform with Google user credentials.
- gcloud auth revoke - Revoke access credentials for an account.
- gcloud auth list - List active accounts
- gcloud projects

- gcloud projects add-iam-policy-binding - Add IAM policy binding
- gcloud projects get-iam-policy - Get IAM policy for a project
- gcloud projects remove-iam-policy-binding - Remove IAM policy binding
- gcloud projects set-iam-policy - Set the IAM policy
- gcloud projects delete - Delete a project
- gcloud iam
- gcloud iam roles describe - Describe an IAM role
- gcloud iam roles create - create an iam role(--project, --permissions, --stage)
- gcloud iam roles copy - Copy IAM Roles

Service Accounts

- Scenario: An Application on a VM needs access to cloud storage
- You DONT want to use personal credentials to allow access
- (RECOMMENDED) Use Service Accounts
- Identified by an email address (Ex: id-compute@developer.gserviceaccount.com)
- Does NOT have password
- Has a private/public RSA key-pairs

- Can't login via browsers or cookies
- Service account types:
- Default service account - Automatically created when some services are used
- (NOT RECOMMENDED) Has Editor role by default
- User Managed - User created
- (RECOMMENDED) Provides fine grained access control
- Google-managed service accounts - Created and managed by Google
- Used by GCP to perform operations on user's behalf
- In general, we DO NOT need to worry about them

Use case 1 : VM <-> Cloud Storage

- 1: Create a Service Account Role with the right permissions
- 2: Assign Service Account role to VM instance
- **Uses Google Cloud-managed keys:** Key generation and use are automatically handled by IAM when we assign a service account to the instance
- Automatically rotated
- No need to store credentials in config files
- Do NOT delete service accounts used by running instances:

- Applications running on those instances will lose access!

Use case 2 : On Prem <-> Cloud Storage (Long Lived)

- You CANNOT assign Service Account directly to an On Prem App
- 1: Create a Service Account with right permissions
- 2: Create a Service Account User Managed Key
- gcloud iam service-accounts keys create
- Download the service account key file
- Keep it secure (It can be used to impersonate service account)!
- 3: Make the service account key file accessible to your application
- Set environment variable GOOGLE_APPLICATION_CREDENTIALS
- export GOOGLE_APPLICATION_CREDENTIALS="/PATH_TO_KEY_FILE"
- 4: Use Google Cloud Client Libraries
- Google Cloud Client Libraries use a library - Application Default Credentials (ADC)
- ADC uses the service account key file if env var GOOGLE_APPLICATION_CREDENTIALS exists!

Use case 3 : On Prem <-> Google Cloud APIs (Short Lived)

- Make calls from outside GCP to Google Cloud APIs with short lived permissions.
- Few hours or shorter
- Less risk compared to sharing service account keys!
- Credential Types:
- OAuth 2.0 access tokens
- OpenID Connect ID tokens
- Self-signed JSON Web Tokens (JWTs)
- Examples:
- When a member needs elevated permissions, he can assume the service account role (Create OAuth 2.0 access token for service account)
- OpenID Connect ID tokens is recommended for service to service authentications:
- A service in GCP needs to authenticate itself to a service in other cloud

Service Account Use case Scenarios

Scenario	Solution
Application on a VM wants to talk to a Cloud Storage bucket	Configure the VM to use a Service Account with right permissions
Application on a VM wants to put a message on a Pub Sub Topic	Configure the VM to use a Service Account with right permissions
Is Service Account an identity or a resource?	It is both. You can attach roles with Service Account (identity). You can let other members access a SA by granting them a role on the Service Account (resource).
VM instance with default service account in Project A needs to access Cloud Storage bucket in Project B	In project B, add the service account from Project A and assign Storage Object Viewer Permission on the bucket

ACL (Access Control Lists)

- ACL: Define who has access to your buckets and objects, as well as what level of access they have
- How is this different from IAM?
- IAM permissions apply to all objects within a bucket
- ACLs can be used to customized specific accesses to different objects
- User gets access if he is allowed by either IAM or ACL!
- (Remember) Use IAM for common permissions to all objects in a bucket
- (Remember) Use ACLs if you need to customize access to individual objects

Access Control – Overview

- How do you control access to objects in a Cloud Storage bucket?
- Two types of access controls:
- Uniform (Recommended) - Uniform bucket level access using IAM
- Fine-grained - Use IAM and ACLs to control access:
- Both bucket level and individual object level permissions
- Use Uniform access when all users have same level of access across all objects in a bucket
- Fine grained access with ACLs can be used when you need to customize the access at an object level
- Give a user specific access to edit specific objects in a bucket

Cloud Storage - Signed URL

- You would want to allow a user limited time access to your objects:
- Users do NOT need Google accounts
- Use Signed URL functionality
- A URL that gives permissions for limited time duration to perform specific actions
- To create a Signed URL:

- 1: Create a key (YOUR_KEY) for the Service Account/User with the desired permissions
- 2: Create Signed URL with the key:
- gsutil signurl -d 10m YOUR_KEY gs://BUCKET_NAME/OBJECT_PATH

Cloud Storage - Static website

- 1: Create a bucket with the same name as website name (Name of bucket should match DNS name of the website)
- Verify that the domain is owned by you
- 2: Copy the files to the bucket
- Add index and error html files for better user experience
- 3: Add member all Users and grant Storage Object Viewer option
- Select Allow Public Access