GOOGLE CLOUD PLATFORM

IP ADDRESSES

IP ADDRESSES FOR RESOURCES

- In GCP, you can assign an IP address to certain resources.
- Each VM instance can have one primary internal IP address, one or more secondary IP addresses, and one external IP address.
- To communicate between instances on the same Virtual Private Cloud (VPC) network, you can use an instance's internal IP addresses.
- To communicate with the Internet, you must use the instance's external IP address unless you have configured a proxy of some kind.
- Use the external IP address to connect to instances outside of the same VPC network (unless the networks are connected via VPN).
- Both external and internal primary IP addresses can be either ephemeral or static.

EXTERNAL IP ADDRESSES

- You can assign an external IP address to an instance if you need to communicate with the Internet, or with resources in another network
- Static external IP addresses are assigned to a project long term until they are explicitly released, and remain attached to a resource until they are explicitly detached. i.e. they stay with stopped instances
  - A regional static IP address allows resources of that region or resources of zones within that region to use the IP address.
  - Global static external IP addresses are available only to global forwarding rules, used for global load balancing.
- Ephemeral external IP addresses remain attached to a VM instance only until the VM is stopped and restarted or the instance is terminated.
  - When a stopped instance is started again, a new ephemeral external IP address is assigned to the instance.

PRIMARY INTERNAL IP ADDRESSES

- Every VM instance can have one primary internal IP address that is unique to the VPC network and must belong to the IP range of the subnet

- Auto mode VPC network: The address comes from the region's subnet
- Custom mode VPC network: You must specify which subnet the IP comes from
- legacy network: The IP is assigned from the network's global internal IP range

- Static internal IP addresses are assigned to a project long term until they are explicitly released, and remain attached to a resource
- Ephemeral internal IP addresses remain attached to a VM instance only until the VM is stopped and restarted or the instance is terminated
- For internal load balancers, you can assign a static internal IP address, specify an explicit ephemeral internal IP address, or let GCP assign an ephemeral internal IP address randomly

DEMO: STATIC EXTERNAL IP ADDRESS

Assigning a static external IP address to a new VM instance

1. In the GCP Console, go to the VM Instances page. Click **Create instance**.
2. On the **Create a new instance** page, fill in the desired properties for your instance.
3. Expand the **Management, security, disks, networking, sole tenancy** section.
4. Click **Networking**.
5. Under **Network interfaces**, click on the default network interface to edit it.
6. Under the **External IP** section, select the static external IP address that you reserved from the drop-down menu.
7. Click **Done** to finish modifying the default network interface.
8. Click **Create** to create the instance.

DEMO: CHANGE EXTERNAL IP ADDRESS

Changing or assigning an external IP address to an existing instance

1. Go to the VM instances page in the GCP Console.
2. Click the name of the instance that you want to assign an external IP to.
3. Click the **Edit** button at the top of the page.
4. Under **External IP**, select either an ephemeral or static external IP address to assign to the instance.
5. Click the **Save** button to save your changes.

Promoting an ephemeral external IP address

1. In the **Type** column, change the address type to **Static** for the IP address you want to promote.
2. Provide a name for the new static IP address and click **Reserve**.

DEMO: NEW STATIC INTERNAL IP ADDRESS

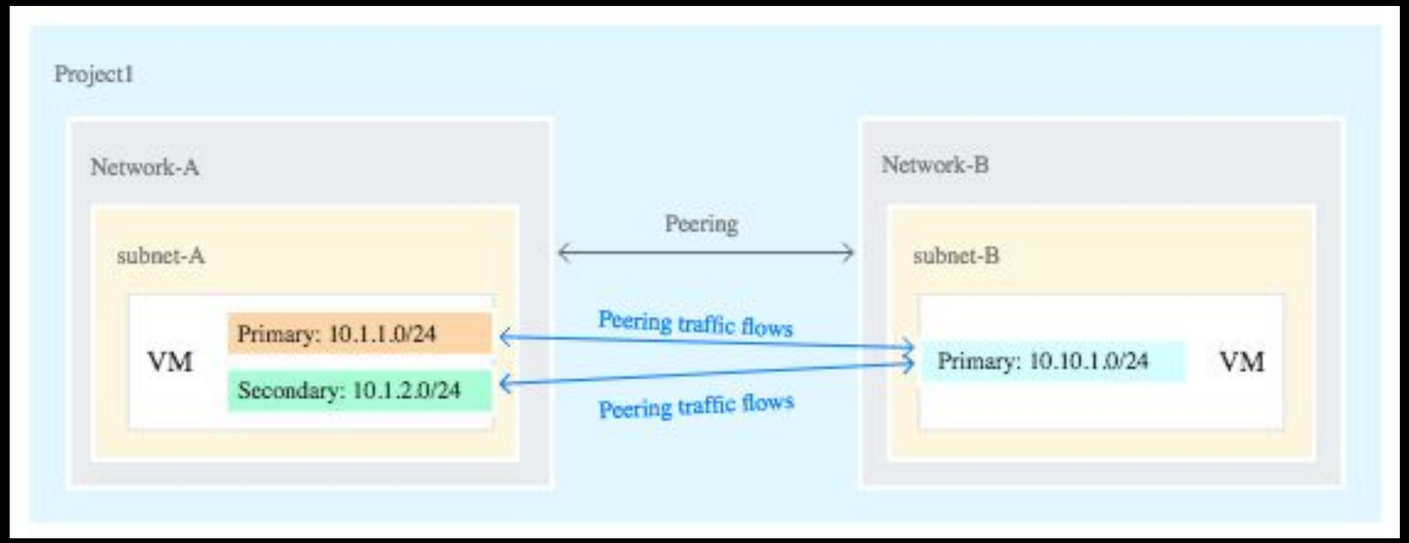
1. Identify the VPC network that you want to associate with your instance.
2. Go to the VM instances page. Select your project.
3. Click **Create an Instance** and specify a name for your instance.
4. Select the **Region** where your VPC network is located.
5. Select a **Zone** within that region.
6. Complete the other fields for your instance.
7. Expand the **Management, security, disks, networking, sole tenancy** menu.
8. Click on **Networking**, **Networking interfaces** to edit.
9. Under **Network**, select the VPC network you created.
10. Choose the subnet.
11. Under **Primary Internal IP** select **Reserve static IP address**.
12. Click **Create**.

ALIAS IP RANGES

- Using IP aliasing, you can configure multiple internal IP addresses, representing containers or applications hosted in a VM, without having to define a separate network interface
- You can allocate alias IP ranges from the subnet's primary CIDR range, or you can add a secondary range to the subnet and allocate alias IP ranges from the secondary range
- When alias IP ranges are configured, GCP automatically installs VPC network routes for primary and alias IP ranges for the subnet of the primary network interface
- E.g. Using alias IP ranges, container IP addresses can be allocated from a secondary CIDR range – this separates infrastructure (VMs) from services (containers) and allows for separate firewall controls

ALIAS IP RANGES

- GCP does not associate alias IP addresses on the primary interface with the host name, and it does not associate any IP addresses of secondary interfaces with the host name.
- Firewall source tags are not supported for alias IP addresses.
- An alias IP address is not supported as the next-hop IP address.
- Both primary and secondary IP ranges of a subnet are reachable by VM instances in a peered network.



ALIAS IP – AUTO MODE VPC/CUSTOM

- Auto mode VPC network:
  - You can allocate alias IP ranges from the automatically created subnet's primary CIDR range or add a secondary range to the automatically created subnet and allocate alias IP ranges from the new secondary range.
  - You can create a new subnet with secondary ranges in the auto mode VPC network, create VM instances in the new subnet and allocate alias IP ranges from any range on that subnet.
  - A VPC network can have up to 7000 alias IP ranges across all VMs.

- Custom-mode networks:
  - All of the subnets are created manually
  - One primary CIDR range is mandatory.
  - You can optionally create secondary CIDR ranges.

DEMO: CREATING A VM WITH AN ALIAS IP

Creating a VM with an alias IP range in the primary CIDR range

1. Go to the VM instances page in the Google Cloud Platform Console. Click **Create instance**.
2. Enter a **Name** for the new instance.
3. Specify a **Zone**.
4. Click **Management, security, disks, networking, sole tenancy**.
5. Click the **Networking** tab.
6. Click the edit (pencil icon) button next to the primary interface in the **Network interfaces** section.
7. Click **Show alias IP ranges**.
8. Leave **Subnet range** set to **Primary**.
9. Enter an **Alias IP range** in CIDR notation. This range must be an unused subrange of the primary range.
10. Click **Create**.

DEMO: ADD AN ALIAS IP TO A VM

Adding alias IP ranges to an existing instance

- Go to the VM instances page in the Google Cloud Platform Console.
- Click on the name of an existing instance.
- Click **Edit**.
- Click on the network interface **nic0** (or the network interface you will modify).
- Click **Show alias IP ranges**.
- Click **Add Alias IP range**.
- Specify the subnet CIDR range.
- Enter and alias IP range.
- Click **Done**.
- Click **Save**.