Classless Inter-Domain Routing (**CIDR** /ˈsaɪdər, ˈsɪ-/) is a method for allocating **IP addresses** and for **IP** routing. The Internet Engineering Task Force introduced **CIDR** in 1993 to replace the previous classful network addressing architecture on the Internet.

Private address designed by IANA : Internet Assigned Numbered Authority

Private IPs allow communication between resources in Azure.

Resources can be:

* Azure Services such as:
  + Virtual machine network interfaces
  + Internal load balancers (ILBs)
  + Application gateways
* In a [virtual network](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-overview).
* On-premises network through a VPN gateway or ExpressRoute circuit.

Private IPs allow communication to these resources without the use of a public IP address.

**Allocation method**

Azure assigns private IP addresses to resources from the address range of the virtual network subnet where the resource is.

Azure reserves the first four addresses in each subnet address range. The addresses can't be assigned to resources. For example, if the subnet's address range is 10.0.0.0/16, addresses 10.0.0.0-10.0.0.3 and 10.0.255.255 are unavailable. IP addresses within the subnet's address range can only be assigned to one resource at a time.

There are two methods in which a private IP address is given:

* **Dynamic**: Azure assigns the next available unassigned or unreserved IP address in the subnet's address range. For example, Azure assigns 10.0.0.10 to a new resource, if addresses 10.0.0.4-10.0.0.9 are already assigned to other resources.

Dynamic is the default allocation method. Once assigned, dynamic IP addresses are released if a network interface is:

* + Deleted
  + Reassigned to a different subnet within the same virtual network.
  + The allocation method is changed to static, and a different IP address is specified.

By default, Azure assigns the previous dynamically assigned address as the static address when you change the allocation method from dynamic to static.

* **Static**: You select and assign any unassigned or unreserved IP address in the subnet's address range.

For example, a subnet's address range is 10.0.0.0/16 and addresses 10.0.0.4-10.0.0.9 are assigned to other resources. You can assign any address between 10.0.0.10 - 10.0.255.254. Static addresses are only released if a network interface is deleted.

Azure assigns the static IP as the dynamic IP when the allocation method is changed. The reassignment occurs even if the address isn't the next available in the subnet. The address changes when the network interface is assigned to a different subnet.

To assign the network interface to a different subnet, you change the allocation method from static to dynamic. Assign the network interface to a different subnet, then change the allocation method back to static. Assign an IP address from the new subnet's address range.

**Virtual machines**

One or more private IP addresses are assigned to one or more **network interfaces**. The network interfaces are assigned to a [Windows](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/overview?toc=/azure/virtual-network/toc.json) or [Linux](https://docs.microsoft.com/en-us/azure/virtual-machines/linux/overview?toc=/azure/virtual-network/toc.json) virtual machine. You can specify the allocation method as either dynamic or static for each private IP address.

**Internal DNS hostname resolution (for virtual machines)**

Azure virtual machines are configured with [Azure-managed DNS servers](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-name-resolution-for-vms-and-role-instances#azure-provided-name-resolution) by default. You can explicitly configure custom DNS servers. These DNS servers provide internal name resolution for virtual machines that are within the same virtual network.

A mapping for the hostname to a virtual machine's private IP address is added to the Azure-managed DNS servers.

A hostname is mapped to the primary IP of the main network interface when a VM has:

* Multiple network interfaces
* Multiple IP addresses
* Both

VMs configured with Azure-managed DNS resolve the hostnames within the same virtual network. Use a custom DNS server to resolve host names of VMs in connected virtual networks.

**Internal load balancers (ILB) & Application gateways**

You can assign a private IP address to the **front-end** configuration of an:

* [Azure internal load balancer](https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-internal-overview?toc=/azure/virtual-network/toc.json) (ILB)
* [Azure Application Gateway](https://docs.microsoft.com/en-us/azure/application-gateway/application-gateway-introduction?toc=/azure/virtual-network/toc.json)

This private IP address serves as an internal endpoint. The internal endpoint is accessible only to the resources within its virtual network and the remote networks connected to it. A dynamic or static IP can be assigned.

**At-a-glance**

The following table shows the property through which a private IP can be associated to a resource.

The possible allocation methods that can be used are also displayed:

* Dynamic
* Static

| **AT-A-GLANCE** | | | |
| --- | --- | --- | --- |
| **Top-level resource** | **IP address association** | **Dynamic** | **Static** |
| Virtual machine | Network interface | Yes | Yes |
| Load balancer | Front-end configuration | Yes | Yes |
| Application gateway | Front-end configuration | Yes | Yes |

**Limits**

The limits on IP addressing are found in the full set of [limits for networking](https://docs.microsoft.com/en-us/azure/azure-resource-manager/management/azure-subscription-service-limits?toc=/azure/virtual-network/toc.json#networking-limits) in Azure. The limits are per region and per subscription. [Contact support](https://portal.azure.com/#blade/Microsoft_Azure_Support/HelpAndSupportBlade) to increase the default limits up to the maximum limits based on your business needs.

# Public IP addresses

Public IP addresses allow Internet resources to communicate inbound to Azure resources. Public IP addresses enable Azure resources to communicate to Internet and public-facing Azure services. The address is dedicated to the resource, until it's unassigned by you. A resource without a public IP assigned can communicate outbound. Azure dynamically assigns an available IP address that isn't dedicated to the resource. For more information about outbound connections in Azure, see [Understand outbound connections](https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-outbound-connections?toc=/azure/virtual-network/toc.json).

In Azure Resource Manager, a [public IP](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-public-ip-address) address is a resource that has its own properties. Some of the resources you can associate a public IP address resource with:

* Virtual machine network interfaces
* Internet-facing load balancers
* VPN gateways
* Application gateways
* Azure Firewall

## IP address version

Public IP addresses are created with an IPv4 or IPv6 address.

## SKU

Public IP addresses are created with one of the following SKUs:

**Standard**

Standard SKU public IP addresses:

* Always use static allocation method.
* Have an adjustable inbound originated flow idle timeout of 4-30 minutes, with a default of 4 minutes, and fixed outbound originated flow idle timeout of 4 minutes.
* Secure by default and closed to inbound traffic. Allow list inbound traffic with a [network security group](https://docs.microsoft.com/en-us/azure/virtual-network/security-overview#network-security-groups).
* Assigned to network interfaces, standard public load balancers, or Application Gateways. For more information about Standard load balancer, see [Azure Standard Load Balancer](https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-standard-overview?toc=/azure/virtual-network/toc.json).
* Can be zone-redundant or zonal (can be created zonal and guaranteed in a specific availability zone). To learn more about availability zones, see [Availability zones overview](https://docs.microsoft.com/en-us/azure/availability-zones/az-overview?toc=/azure/virtual-network/toc.json) and [Standard Load Balancer and Availability Zones](https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-standard-availability-zones?toc=/azure/virtual-network/toc.json).

**Basic**

All public IP addresses created before the introduction of SKUs are Basic SKU public IP addresses.

With the introduction of SKUs, specify which SKU you would like the public IP address to be.

Basic SKU addresses:

* Assigned with the static or dynamic allocation method.
* Have an adjustable inbound originated flow idle timeout of 4-30 minutes, with a default of 4 minutes, and fixed outbound originated flow idle timeout of 4 minutes.
* Are open by default. Network security groups are recommended but optional for restricting inbound or outbound traffic.
* Assigned to any Azure resource that can be assigned a public IP address, such as:
  + Network interfaces
  + VPN Gateways
  + Application Gateways
  + Public load balancers
* Don't support Availability Zone scenarios. Use Standard SKU public IP for Availability Zone scenarios. To learn more about availability zones, see [Availability zones overview](https://docs.microsoft.com/en-us/azure/availability-zones/az-overview?toc=/azure/virtual-network/toc.json) and [Standard Load Balancer and Availability Zones](https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-standard-availability-zones?toc=/azure/virtual-network/toc.json).

**Allocation method**

Basic and standard public IPs support **static** assignment. The resource is assigned an IP address at the time it's created. The IP address is released when the resource is deleted.

Basic SKU public IP addresses support a **dynamic** assignment. Dynamic is the default assignment method. The IP address **isn't** given to the resource at the time of creation when selecting dynamic.

The IP is assigned when you associate the public IP address resource with a:

* Virtual machine
* The first virtual machine is associated with the backend pool of a load balancer.

The IP address is released when you stop (or delete) the resource.

For example, a public IP resource is released from a resource named **Resource A**. **Resource A** receives a different IP on start-up if the public IP resource is reassigned.

The IP address is released when the allocation method is changed from **static** to **dynamic**. To ensure the IP address for the associated resource remains the same, set the allocation method explicitly to **static**. A static IP address is assigned immediately.