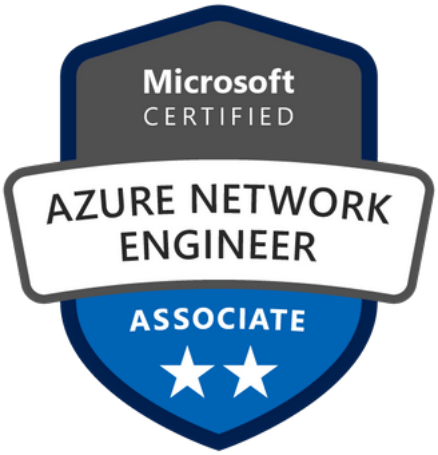

Managing IP addresses

In Azure, we can have two types of IP addresses, private and public. Public addresses can be accessed over the internet. Private addresses are from the Azure Virtual Network address space and are used for private communication on private networks. Addresses can be assigned to a resource or can exist as a separate resource.

We will cover the following recipes in this chapter:

- Creating a new public IP address in the Azure portal
- Creating a new public IP address with PowerShell
- Assigning a public IP address
- Unassigning a public IP address
- Creating a reservation for a public IP address
- Removing a reservation for a public IP address
- Creating a reservation for a private IP address
- Changing a reservation for a private IP address
- Removing a reservation for a private IP address
- Adding multiple addresses to an NIC
- Creating a public IP prefix

Technical requirements

For this chapter, the following is required:

- An Azure subscription
- Azure PowerShell

The code samples can be found at https://github.com/PacktPublishing/Azure-Networking-Cookbook-Second-Edition/tree/master/Chapter04.

Creating a new public IP address in the Azure portal

Public IP addresses can be created as a separate resource or created during the creation of some other resources (a **virtual machine** (**VM**), for example). Therefore, a public IP can exist as part of a resource or as a standalone resource. First, we are going to show you how to create a new public IP address.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To create a new public IP address, we must follow these steps:

1. In the Azure portal, select **Create a resource** and choose **Public IP address** under **Networking** services (or search for `public IP address` in the search bar).
2. The parameters we need to define for deployment are **IP Version**, **SKU**, **Name**, **IP address assignment**, **DNS name label**, **Subscription**, **Resource group**, and **Location**. Idle timeout (the amount of time that the connection will stay open with no activity) is defaulted to 4 minutes but can be increased to 30 minutes at most. An example of the required parameters is shown in *Figure 4.1*:

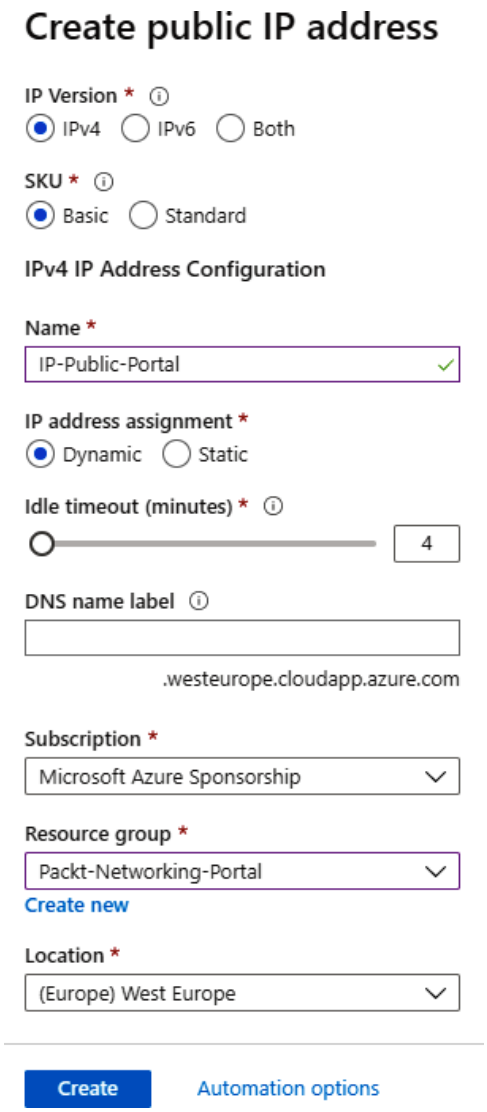

Figure 4.1: Creating a new public IP address using the Azure portal

How it works...

The **stock keeping unit** (**SKU**) can be either **Basic** or **Standard**. The main differences are that **Standard** is closed to inbound traffic by default (inbound traffic must be whitelisted in **Network Security Groups** (**NSGs**)) and that **Standard** is zone redundant. Another difference is that a **Standard** SKU public IP address has a static assignment, while a **Basic** SKU can be either static or dynamic.

You can choose either the **IPv4** or **IPv6** version for the IP address, or both, but choosing **IPv6** will limit you to a dynamic assignment for the **Basic** SKU and static assignment for the **Standard** SKU.

The **DNS name label** is optional—it can be used to resolve the endpoint if dynamic assignment is selected. Otherwise, there is no point in creating a DNS label, as an IP address can always be used to resolve the endpoint if static assignment is selected.

Creating a new public IP address with PowerShell

Alternatively, we can create a public IP address using Azure PowerShell. Again, this approach is best when we want to automate the process. Even though a public IP address can exist on its own, it's usually created to be associated with other resources and to be used as an endpoint. When using PowerShell to create a resource, we can continue to the next step and join it with a resource in a single script.

Getting ready

Open the PowerShell console and make sure you are connected to your Azure subscription.

How to do it...

To deploy a new public IP address, execute the following command:

```
New-AzPublicIpAddress -Name 'ip-public-script' -ResourceGroupName 'Packt-
Networking-Script' -AllocationMethod Dynamic -Location 'westeurope'
```

How it works...

As an outcome, a new public IP address will be created. The settings, in this case, will be a basic SKU dynamic assignment, IPv4 version, and no DNS label. Furthermore, we can use additional switches such as **`-SKU`** for selecting **`Basic`** or **`Standard`**, **`-IPAddressVersion`** for choosing between **`IPv4`** and **`IPv6`**, or **`-DomainNamelabel`** to specify the DNS label. These are optional parameters—if these aren't specified, Azure will create the public IP with the aforementioned default values.

Assigning a public IP address

A public IP address can be created as a separate resource or disassociated from another resource and exist on its own. Such an IP address can then be assigned to a new resource or another already-existing resource. If the resource is no longer in use or has been migrated, we can still use the same public IP address. In this case, the public endpoint that's used to access a service may stay unchanged. This can be useful when a publicly available application or service is migrated or upgraded, as we can keep using the same endpoint and users don't need to be aware of any change.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To assign a public IP address, we must do the following:

1. Locate the **network interface** (**NIC**) that you want the IP address to be assigned to. This can be done directly by finding the NIC, or through the VM pane that the NIC is assigned to.
2. In the **Network interface** pane, go to **IP configurations** under **Settings**, and select the configuration shown in *Figure 4.2*:

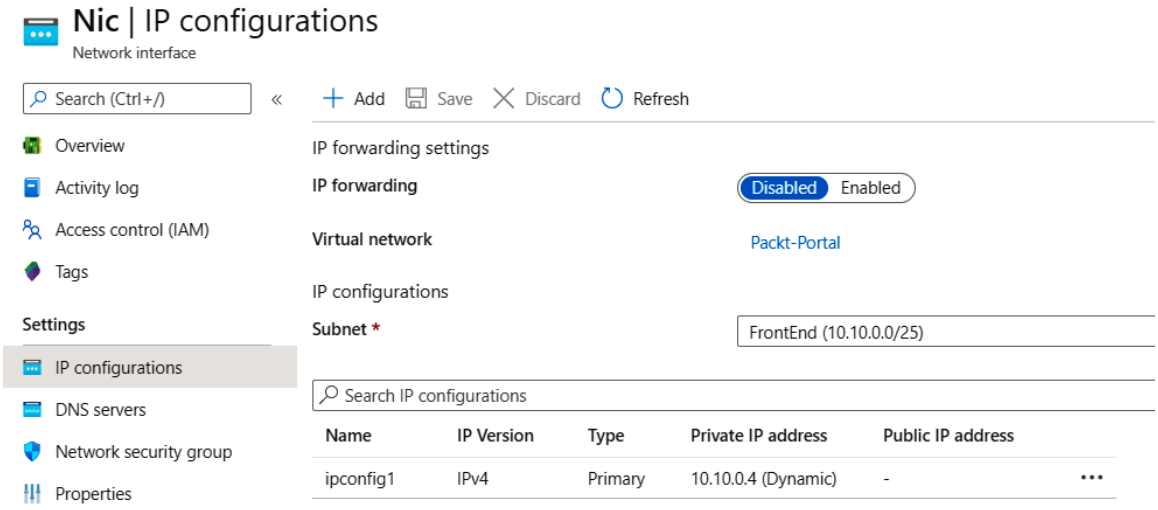

Figure 4.2: Viewing the IP configurations in the NIC pane

3. In the new pane, select **Associate** under **Public IP address** and select the **Public IP address** that you want to assign from the drop-down menu. Only unassigned IP addresses in the same region will show in the list. An example of this is shown in *Figure 4.3*:

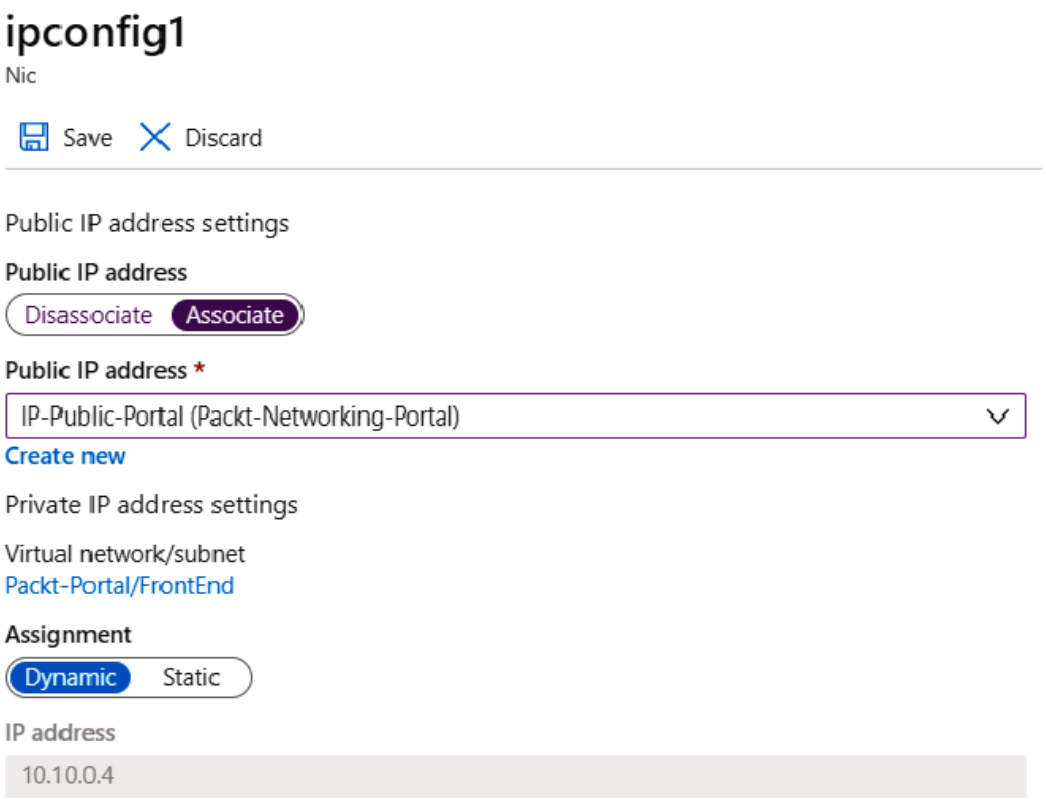

Figure 4.3: Assigning a public IP address

4. After the public IP address has been selected, click **Save** to apply the settings.

How it works...

A public IP address exists as a separate resource and can be assigned to a resource at any time. When a public IP address is assigned, you can use this IP address to access services running on a resource that the IP address is assigned to (remember that an appropriate NSG must be applied). We can also remove an IP address from a resource and assign it to a new resource. For example, if we want to migrate services to a new VM, the IP address can be removed from the old VM and assigned to the new one. This way, service endpoints running on the VM will not change. This is especially useful when static IP addresses are used.

Unassigning a public IP address

A public IP address can be unassigned from a resource in order to be saved for later use or assigned to another resource. When a resource is deleted or decommissioned, we can still put the public IP address to use and assign it to the next resource.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com. Make sure that the VM using a public IP address is not running.

How to do it...

To unassign a public IP address, we must do the following:

1. Locate the NIC that the public IP address is associated with.
2. In the **Network interface** pane, go to **IP configurations** under **Settings** and select the **IP configuration**:

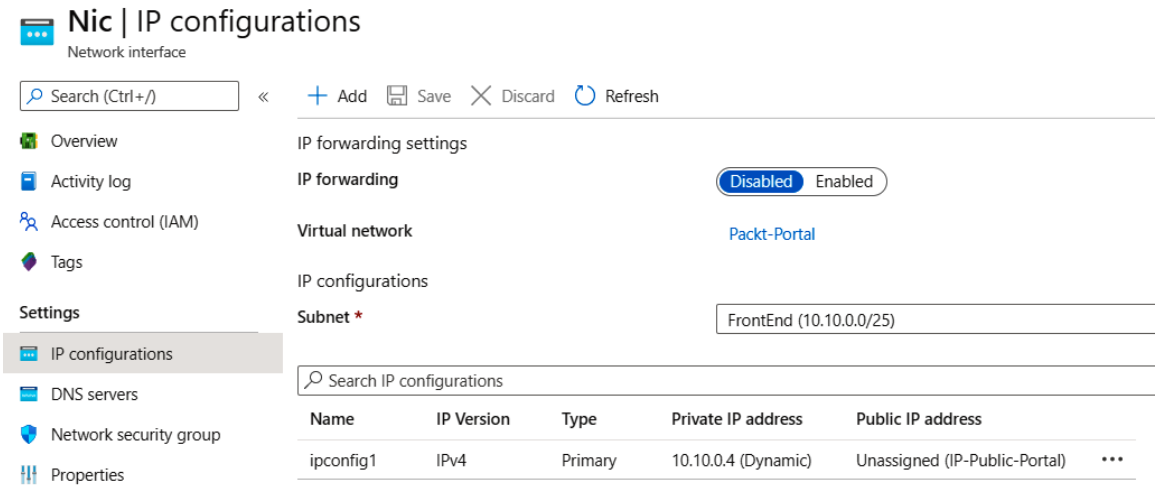

Figure 4.4: IP configurations under the NIC pane

3. In the new pane, change the **Public IP address** setting to **Disassociate**:

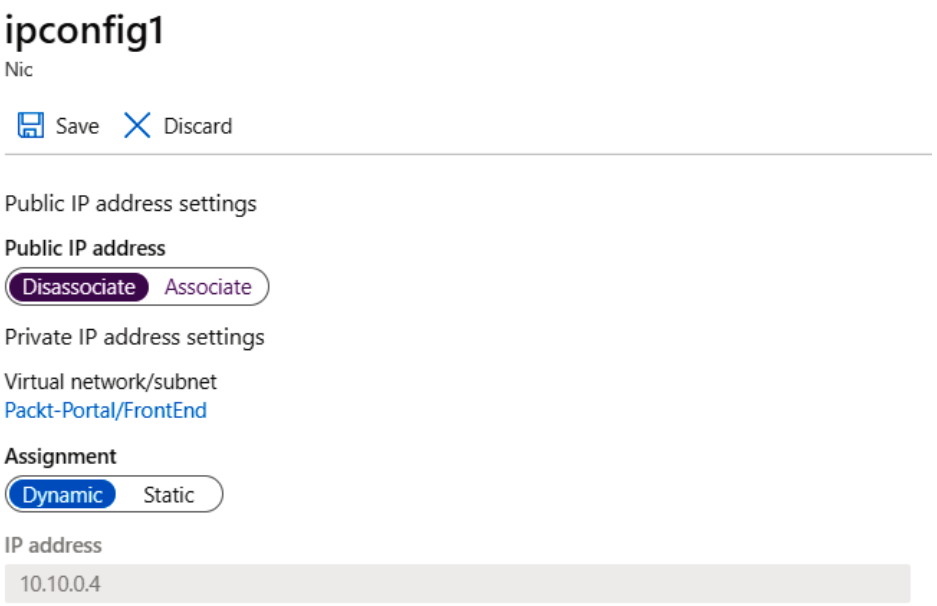

Figure 4.5: Unassigning the public IP address

4. After the changes are made, click **Save** to apply the new configuration.

How it works...

A public IP address can be assigned or unassigned from a resource in order to save it for future use or to transfer it to a new resource. To remove it, we simply disable the public IP address in the IP configuration under the NIC that the IP address is assigned to. This will remove the association but keep the IP address as a separate resource.

Creating a reservation for a public IP address

The default option for a public IP address is dynamic IP assignment. This can be changed during the public IP address creation, or later. If this is changed from dynamic IP assignment, then the public IP address becomes reserved (or static).

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To create a reservation for a public IP address, follow these steps:

1. Locate the public IP address in the Azure portal. This can be done by finding the IP address directly, or through the resource it's assigned to (either the NIC or VM).
2. In the **Public IP address** pane, go to **Configuration** under **Settings**. Change **Assignment** from **Dynamic** to **Static**, as shown in *Figure 4.6*:

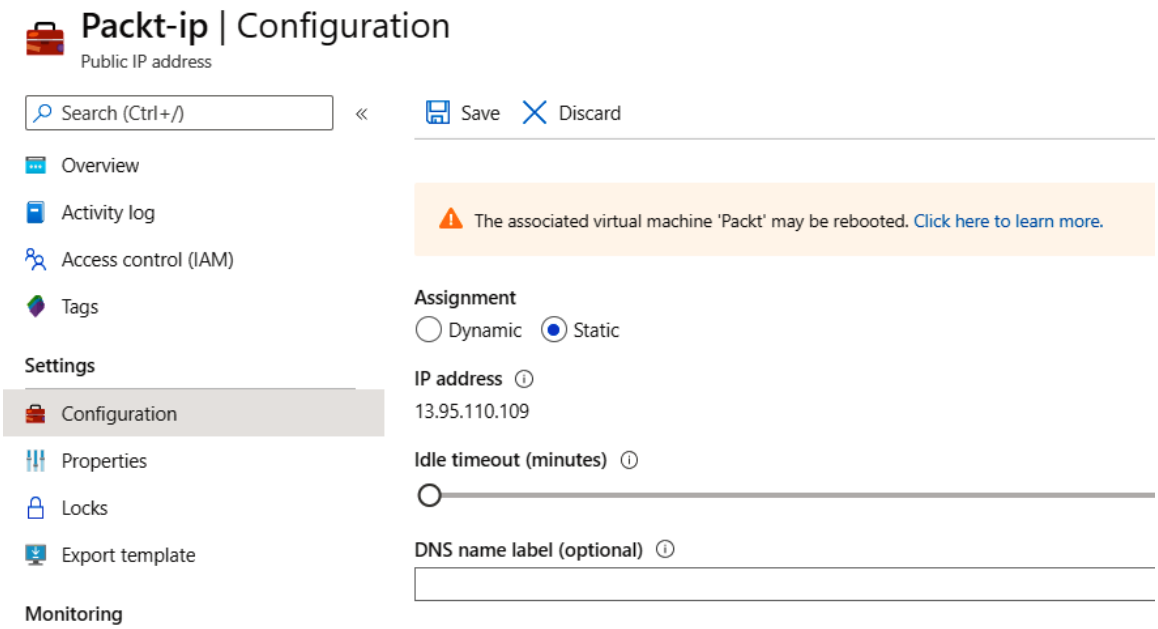

Figure 4.6: Changing the public IP address assignment to Static

3. After this change has been made, click **Save** to apply the new settings.

How it works...

A public IP address is set to dynamic by default. This means that an IP address might change in time. For example, if a VM that an IP address is assigned to is turned off or rebooted, there is a possibility that the IP address will change after the VM is up and running again. This can cause issues if services that are running on the VM are accessed over the public IP address, or if there is a DNS record associated with the public IP address.

We create an IP reservation and set the assignment to static to avoid such a scenario and keep the IP address reserved for our services.

Removing a reservation for a public IP address

If the public IP address is set to static, we can remove a reservation and set the IP address assignment to dynamic. This isn't done often as there is usually a reason why the reservation is set in the first place. But as the reservation for the public IP address has an additional cost, there is sometimes a need to remove the reservation if it is not necessary.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com. Make sure that the IP address is not associated with any resource.

How to do it...

To remove a reservation for a public IP address, follow these steps:

1. Locate the public IP address in the Azure portal.
2. In the **Public IP address** pane, go to **Configuration** under **Settings** and set **Assignment** to **Dynamic**:

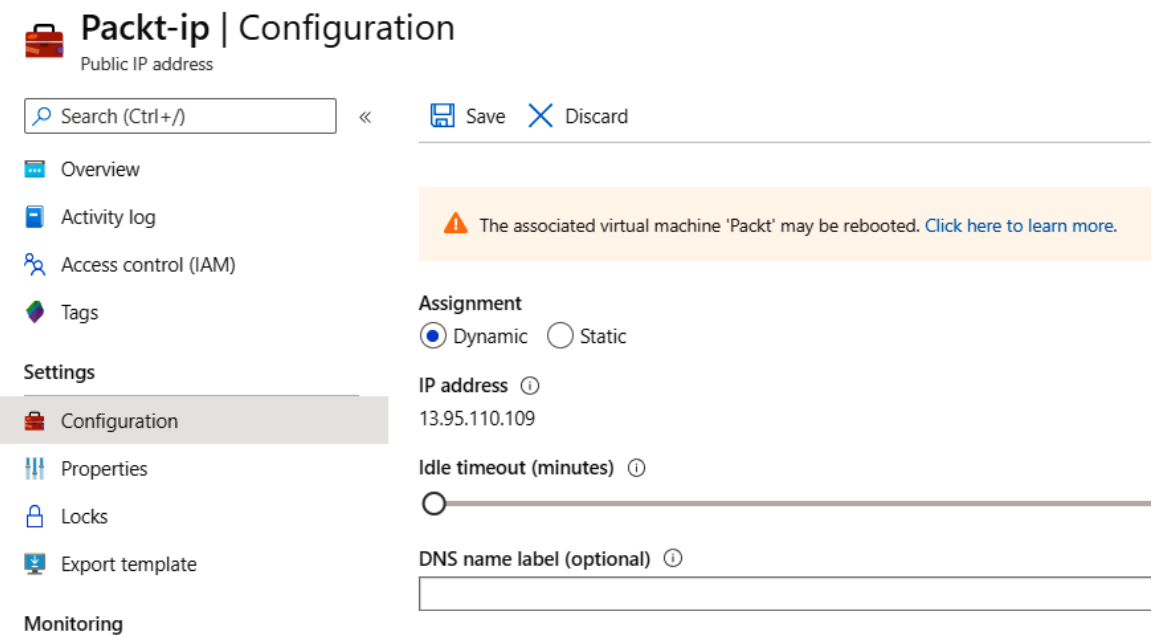

Figure 4.7: Changing the public IP address assignment to Dynamic

3. After these changes have been made, click **Save** to apply the new configuration.

How it works...

To remove an IP reservation from a public IP address, the public IP address must not be associated with a resource. We can remove the reservation by setting the IP address assignment to dynamic.

The main reason for this is pricing. In Azure, the first five public IP reservations are free. After the initial five, each new reservation is billed. To avoid paying anything unnecessary, we can remove a reservation when it is not needed or when the public IP address is not being used.

Creating a reservation for a private IP address

Similar to public IP addresses, we can make a reservation for private IP addresses. This is usually done to ensure communication between servers on the same virtual network and to allow the usage of IP addresses in connection strings.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To create a reservation for a private IP address, follow these steps:

1. In the Azure portal, locate the NIC you want to make the reservation for.
2. In the **Network interface** pane, go to **IP configurations** under **Settings** and select the IP configuration:

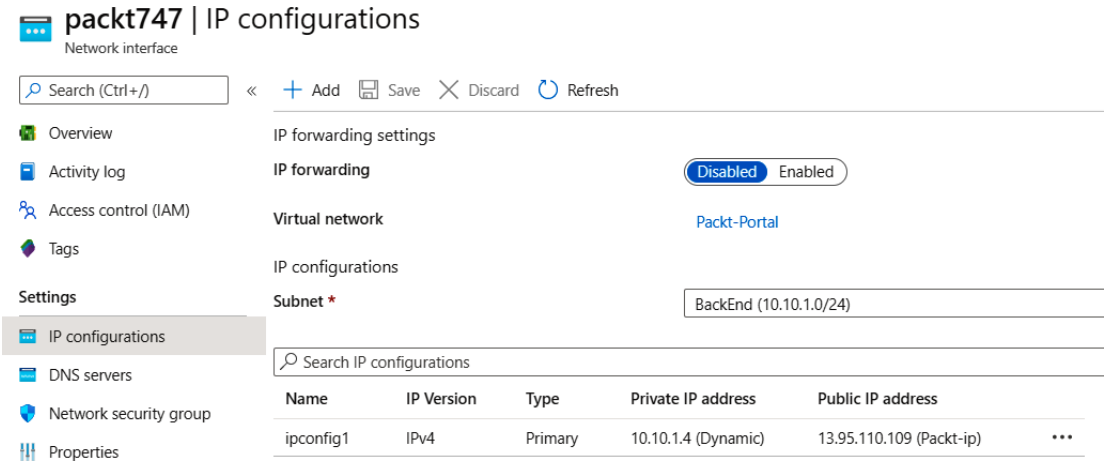

Figure 4.8: Viewing IP configurations in the NIC pane

3. In the new pane, under the **Private IP address** settings, set **Assignment** to **Static**. The current IP address value will be set automatically. If needed, you can change that value to another value, but it must be in the address space of the subnet associated with the NIC:

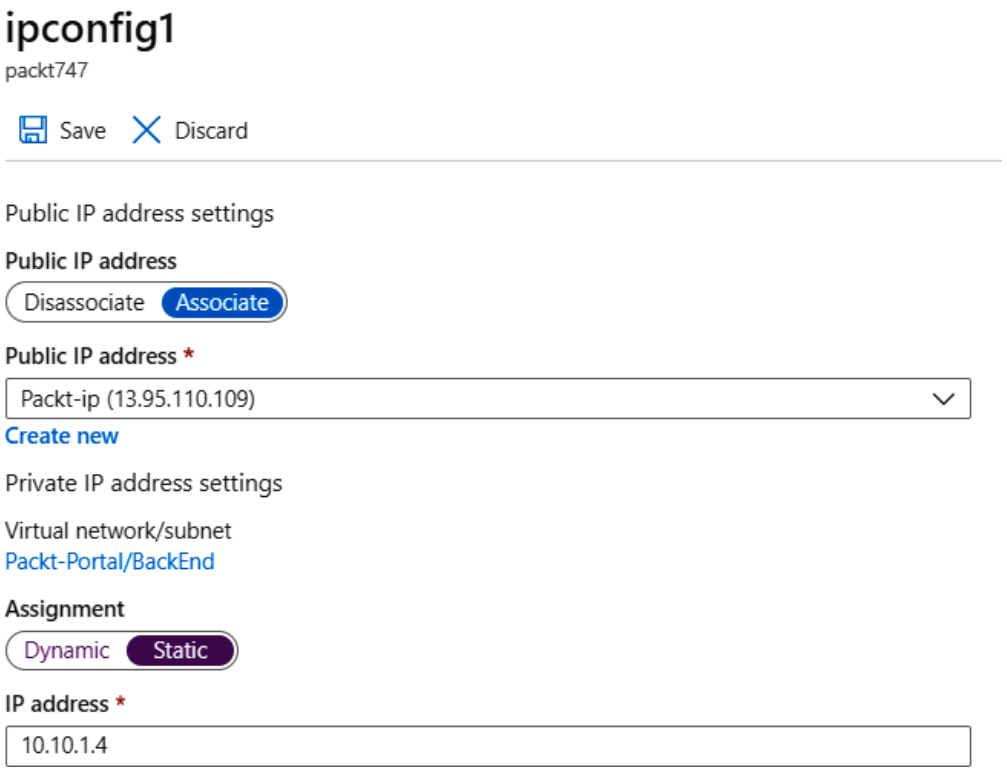

Figure 4.9: Private IP address assignment set to Static

4. After these changes have been made, click **Save** to apply the new configuration.

How it works...

A reservation can be made for private IP addresses. The difference is that a private IP address does not exist as a separate resource but is assigned to an NIC.

Another difference is that you can select a value for a private IP address. A public IP address is assigned randomly and can be reserved, but you cannot choose which value this will be. For private IP addresses, you can select the value for the IP, but it must be an unused IP from the subnet associated with the NIC.

Changing a reservation for a private IP address

For private IP addresses, you can change the IP address at any time to another value. With public IP addresses, this isn't the case, as you get the IP address randomly from a pool and aren't able to change the value. With a private IP address, you can change the value to another IP address from the address space.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To change a reservation for a private IP address, follow these steps:

1. In the Azure portal, locate the NIC you want to make changes for.
2. In the **Network interface** pane, go to **IP configurations** under **Settings** and select the IP configuration:

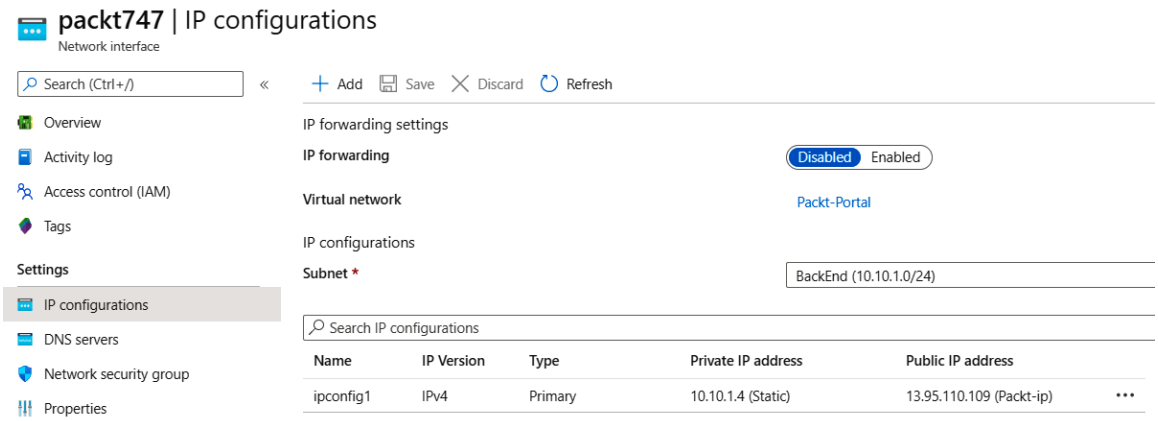

Figure 4.10: Locating the IP configuration in the Network interface pane

3. In **Private IP address settings**, enter a new value for **IP address**:

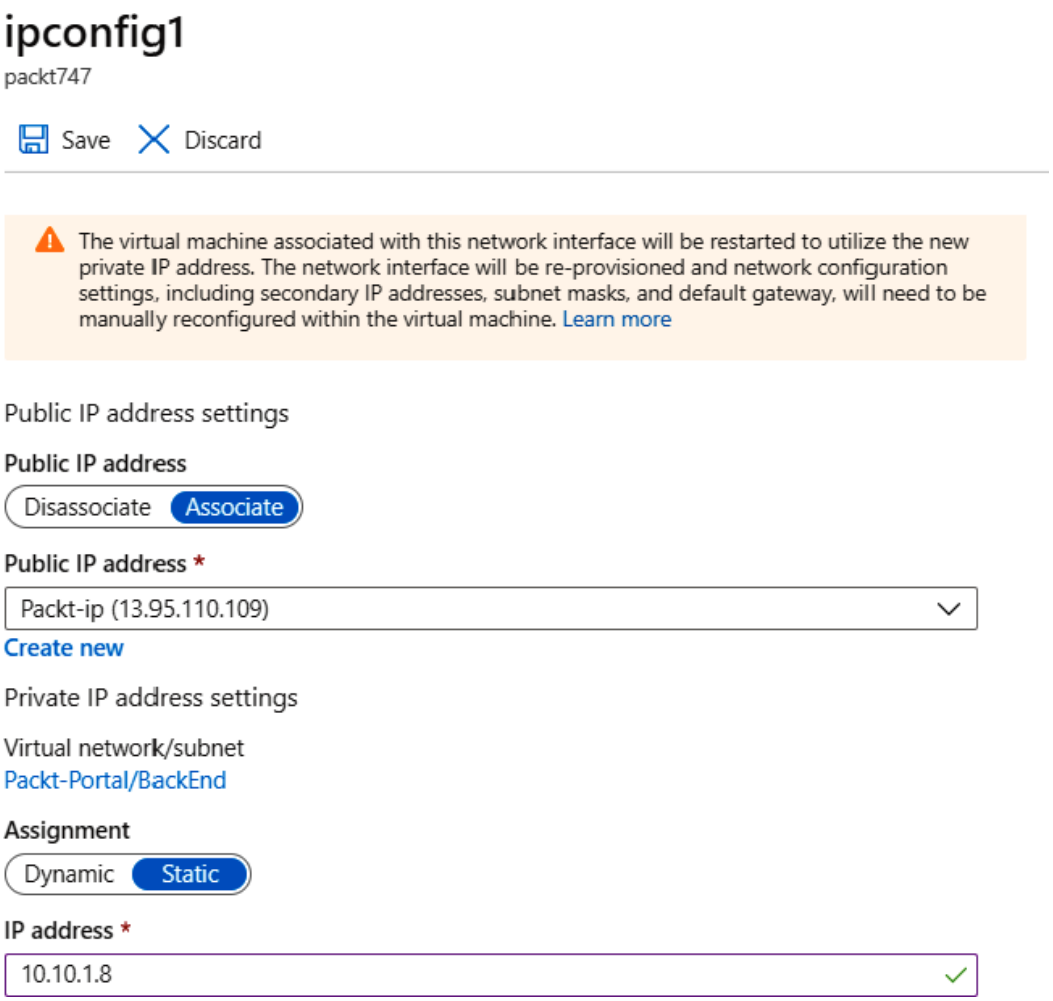

Figure 4.11: Assigning a new value for the private IP address

4. After these changes have been made, click **Save** to apply the new configuration.

How it works...

A reservation for a private IP address can be changed. Again, the value must be an unused IP address from a subnet associated with the NIC. If the VM associated with the NIC is turned off, the new IP address will be assigned upon its next startup. If the VM is running, it will be restarted to apply the new changes.

Removing a reservation for a private IP address

Similar to public IP addresses, we can remove a reservation for a private IP address at any time. A private IP address is free, so additional costs aren't a factor in this case. But there are scenarios where dynamic assignment is required, and we can set it at any time.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

To remove a reservation for a private IP address, follow these steps:

1. In the Azure portal, locate the NIC you want to make changes for.
2. In the **Network interface** pane, go to **IP configurations** under **Settings** and select the IP configuration:

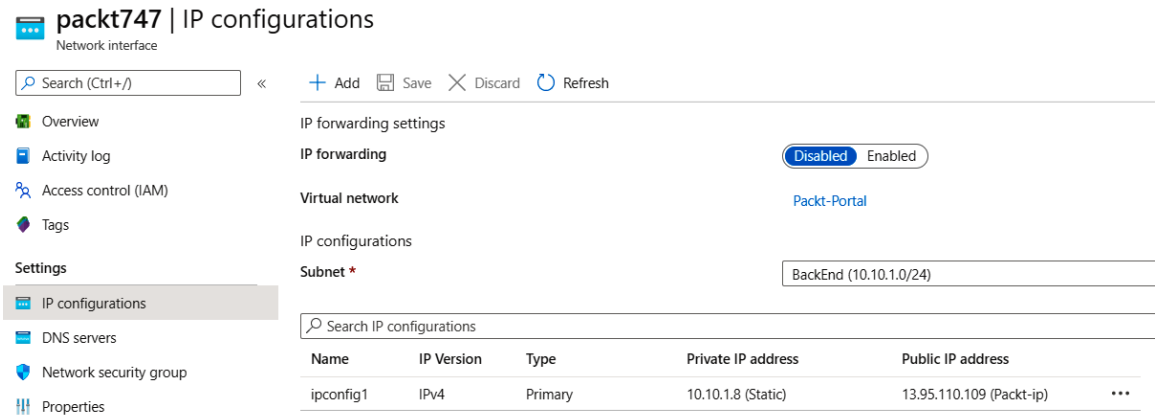

Figure 4.12: Selecting the IP configuration in the Network interface pane

3. In the new pane, under **Private IP address settings**, change **Assignment** to **Dynamic**:

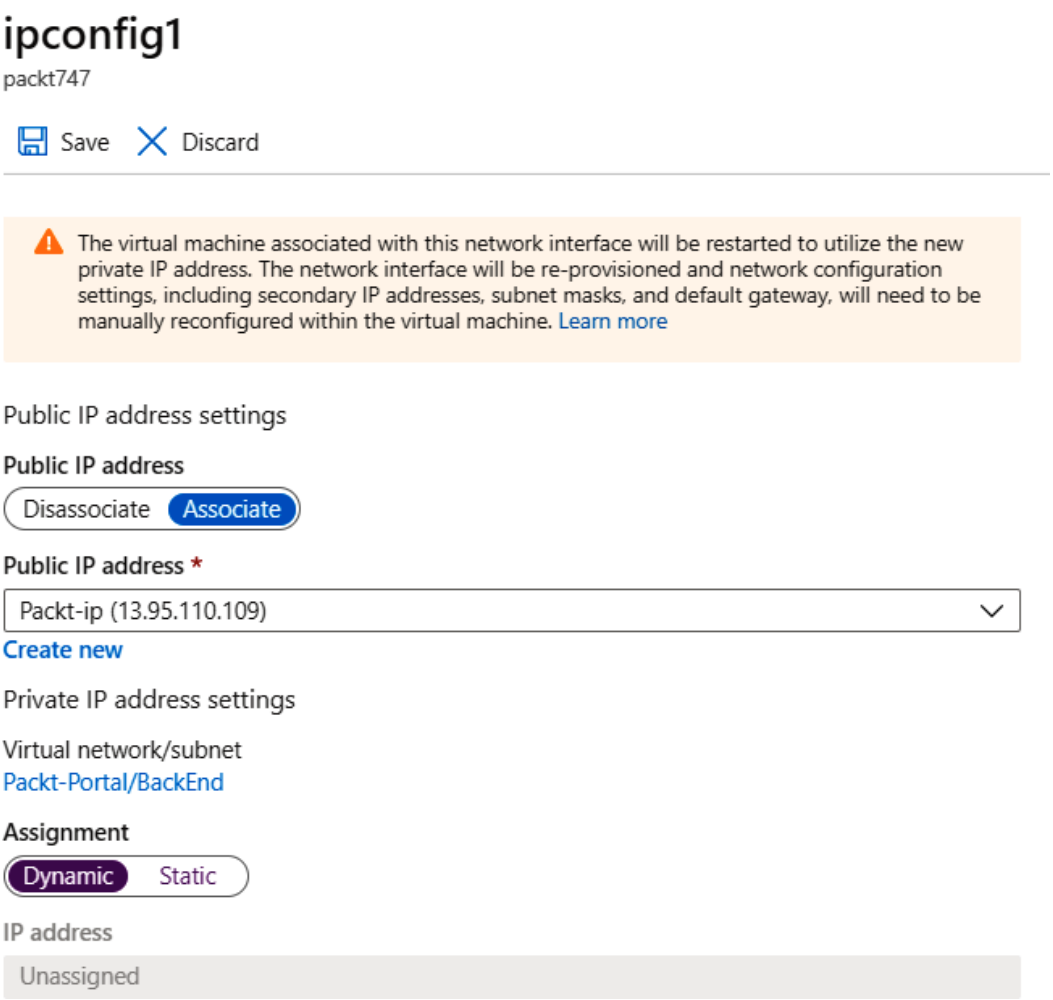

Figure 4.13: Private IP address assignment set to Dynamic

4. After these changes have been made, click **Save** to apply the new configuration.

How it works...

We can remove a private IP address reservation at any time by switching **Assignment** to **Dynamic**. When this change is made, the VM associated with the NIC will be restarted to apply the new changes. After a change is made, a private IP address may change after the VM is restarted or turned off.

Adding multiple IP addresses to an NIC

In various situations, we may need to have multiple IP addresses associated with a single NIC. In Azure, this is possible for both private and public IP addresses.

Getting ready

Before you start, open your browser and go to the Azure portal at https://portal.azure.com.

How to do it...

1. In the Azure portal, locate the NIC you want to make changes for.
2. In the **Network interface** pane, go to **IP configurations** under **Settings** and click **Add**:

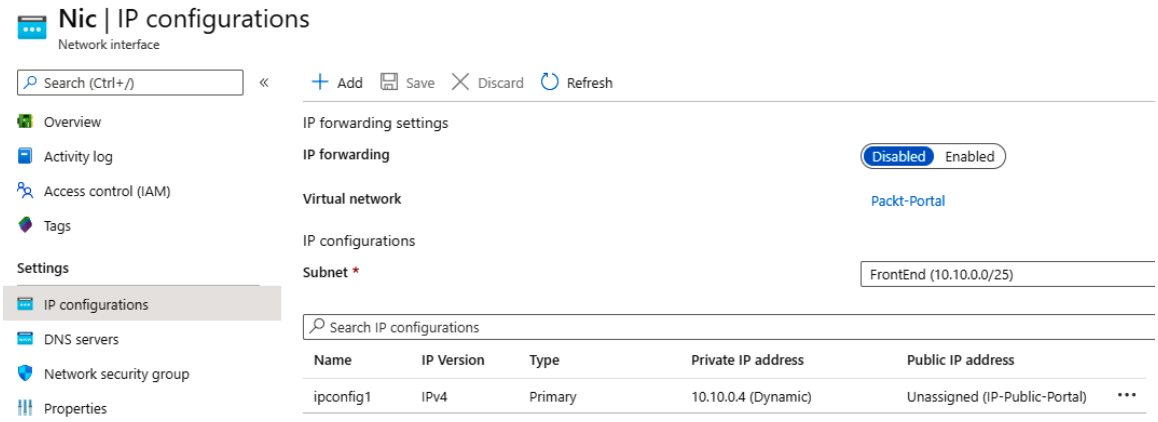

Figure 4.14: The Network interface pane

3. A new pane for IP configuration will appear. We need to provide values for the **Name** and **Type** fields (**Type** will be grayed out if another IP configuration already exists), and we need to select some IP address settings. If only a private IP address is needed, we just need to select the private address **Allocation** and click **Create**:

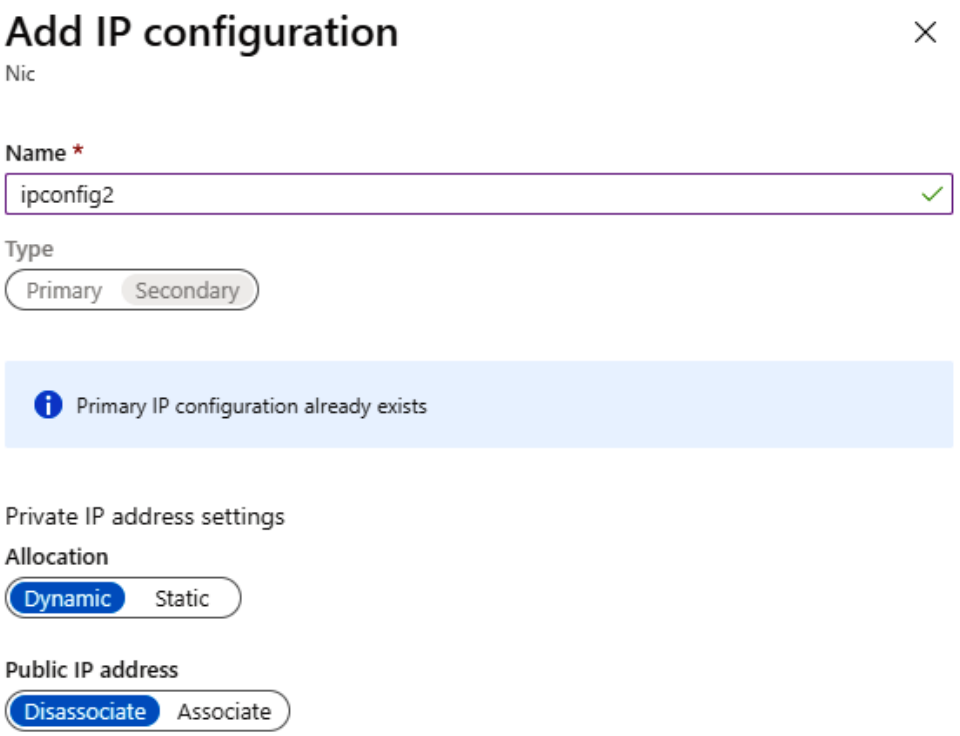

Figure 4.15: Adding IP configuration to the NIC

4. If an additional public IP address is needed, we need to select **Associate** under **Public IP address**. We are required to provide additional information for **Name**, **SKU**, and the **Assignment** type:

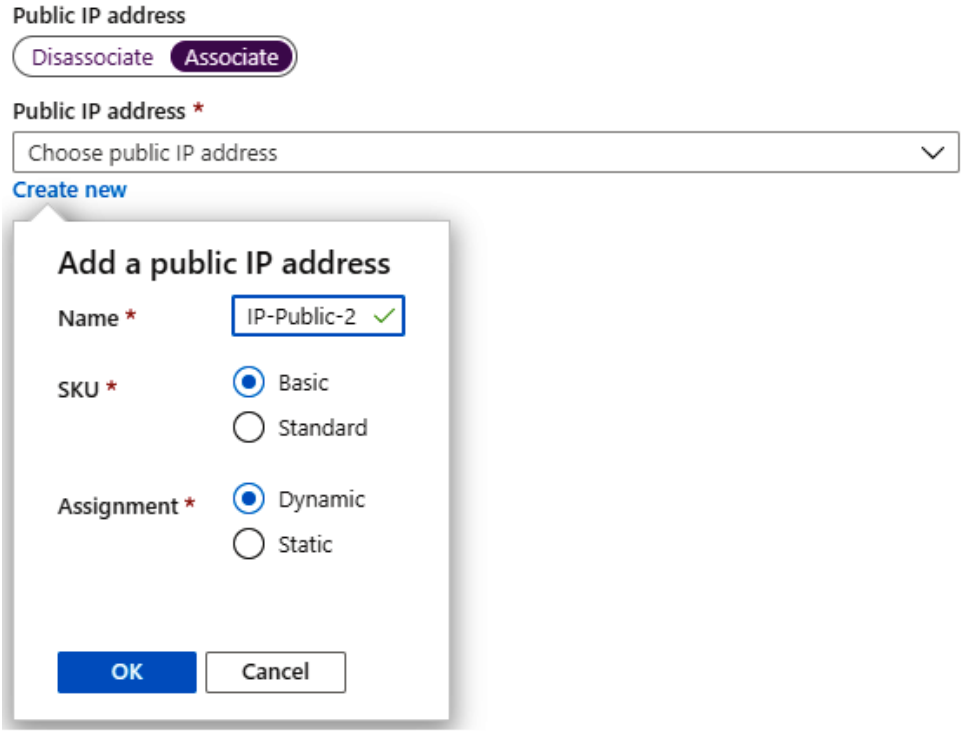

Figure 4.16: Adding a new public IP address

How it works...

Each NIC can have multiple IP configurations assigned. Each IP configuration must have a private IP address and can have a public IP address. So, it is possible to add a private IP address without a public IP address, but not the other way around. This provides us with different routing options and the ability to communicate with different applications and services over different IP addresses. Routing will be explained in more detail in *Chapter 6: DNS and routing*.

Creating a public IP prefix

Creating new resources is usually associated with creating new IP addresses. There can be issues when public IP addresses need to be associated with firewall rules or app configurations. To overcome this, we can create a public IP prefix and reserve a range of IP addresses that will be assigned to our resources.

How to do it...

To create a new public IP prefix, we must follow these steps:

1. In the Azure portal, select **Create a resource** and choose **Public IP prefix** under **Networking** services (or search for `public IP prefix` in the search bar).
2. We need to provide information for **Subscription**, **Resource group**, **Name**, **Region**, and **IP Version**. **SKU** is not selectable and is set to **Standard**. For **Prefix size**, we define how many IP addresses we want to reserve:

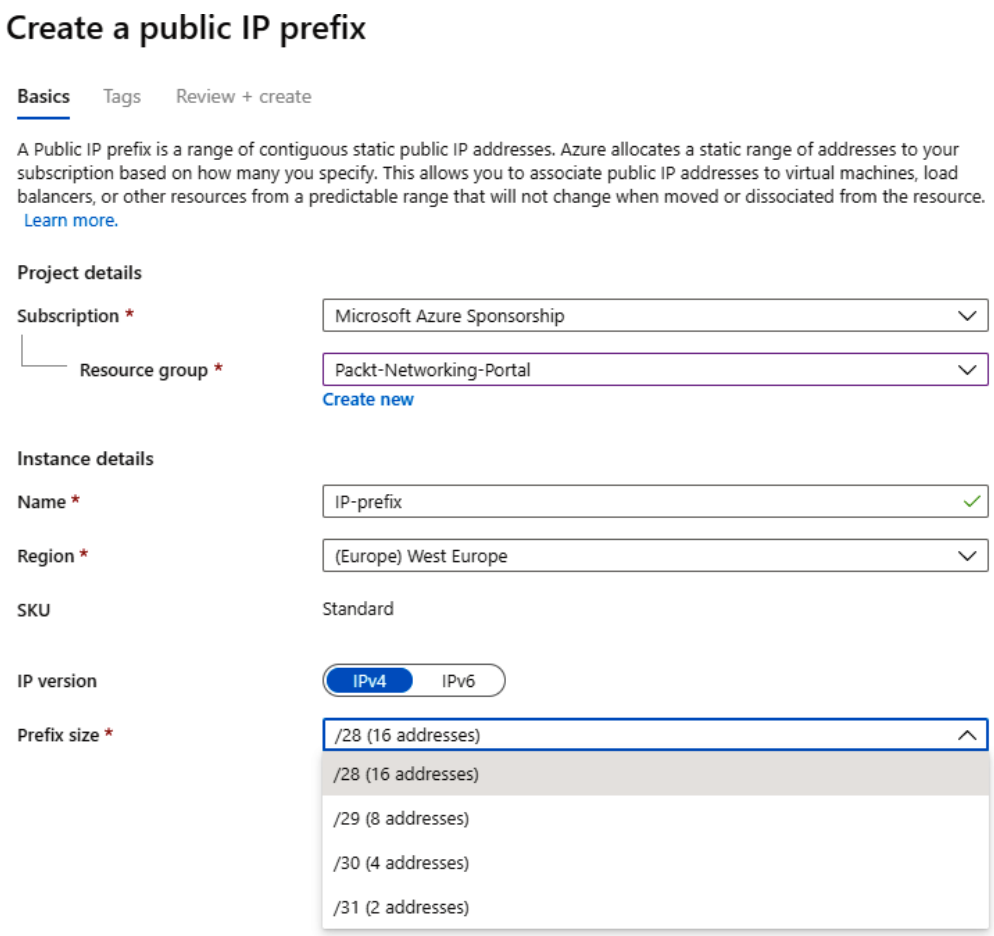

Figure 4.17: Creating a public IP prefix

How it works...

When we create a public IP prefix, public IP address association is not done randomly but from a pool of addresses reserved for us. In many ways, this acts similarly to creating a virtual network and defining a private IP address space, only with public IP addresses. This can be very useful when we need to know addresses in advance. For example, let's say we need to create a firewall rule for each service we create. That would require us to wait for each service to be deployed and get a public IP address after it has been created. With a public IP prefix, IP addresses are known in advance and we can set a rule for a range of IP addresses, rather than doing it IP by IP.