Create your first virtual network

Learn how to create a virtual network (VNet) with two subnets, create two virtual machines (VM), and connect each VM to one of the subnets, as shown in the following picture:

An Azure virtual network (VNet) is a representation of your own network in the cloud. You can control your Azure network settings and define DHCP address blocks, DNS settings, security policies, and routing. To learn more about VNet concepts, read the [Virtual Network overview](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-overview)article. Complete the following steps to create the resources shown in the picture:

1. [Create a VNet with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet)
2. [Create two VMs, each with one network interface (NIC)](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vms), and associate a network security group (NSG) to each NIC
3. [Connect to and from the VMs](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#connect-to-from-vms)
4. [Delete all resources](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#delete-resources). You incur charges for some of the resources created in this exercise while they're provisioned. To minimize the charges, after you complete the exercise, be sure to complete the steps in this section to delete the resources you create.

You will have a basic understanding of how you can use a VNet after completing the steps in this article. Next steps are provided so you can learn more about how to use VNets at a deeper level.

Create a virtual network with two subnets

To create a virtual network with two subnets, complete the steps that follow. Different subnets are typically used to control the flow of traffic between subnets.

1. Log in to the [Azure portal](https://portal.azure.com/). If you don’t already have an account, you can sign up for a [free one-month trial](https://azure.microsoft.com/free).
2. In the **Favorites** pane, of the portal, click **New**.
3. In the **New** blade, click **Networking**. In the **Networking** blade, click **Virtual network**, as shown in the following picture:
4. In the **Virtual network** blade, leave *Resource Manager* selected as the deployment model, and click **Create**.
5. In the **Create virtual network blade** that appears, enter the following values, then click **Create**:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Name** | *MyVNet* | The name must be unique within the resource group. |
| **Address space** | *10.0.0.0/16* | You can specify any address space you like in CIDR notation. |
| **Subnet name** | *Front-end* | The subnet name must be unique within the virtual network. |
| **Subnet address range** | *10.0.0.0/24* | The range you specify must exist within the address space you defined for the virtual network. |
| **Subscription** | *[Your subscription]* | Select a subscription to create the VNet in. A VNet exists within a single subscription. |
| **Resource group** | **Create new:***MyRG* | Create a resource group. The resource group name must be unique within the subscription you selected. To learn more about resource groups, read the [Resource Manager](https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-overview?toc=%2fazure%2fvirtual-network%2ftoc.json#resource-groups) overview article. |
| **Location** | *West US* | Typically the location that is closest to your physical location is selected. |

1. The VNet takes a few seconds to create. Once it’s created, you see the Azure portal dashboard.
2. With the virtual network created, in the Azure portal **Favorites** pane, click **All resources**. Click the **MyVNet** virtual network in the **All resources** blade. If the subscription you selected already has several resources in it, you can enter *MyVNet* in the **Filter by name…** box to easily access the VNet.
3. The **MyVNet** blade opens and displays information about the VNet, as shown in the following picture:
4. As shown in the previous picture, click **Subnets** to display a list of the subnets within the VNet. The only subnet that exists is **Front-end**, the subnet you created in step 5.
5. In the MyVNet - Subnets blade, click **+ Subnet** to create a subnet with the following information and click **OK** to create the subnet:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Name** | *Back-end* | The name must be unique within the virtual network. |
| **Address range** | *10.0.1.0/24* | The range you specify must exist within the address space you defined for the virtual network. |
| **Network security group** and **Route table** | *None*(default) | Network security groups (NSG)s are covered later in this article. To learn more about user-defined routes, read the [User-defined routes](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-udr-overview) article. |

1. After the new subnet is added to the VNet, you can close the **MyVNet – Subnets** blade, then close the **All resources** blade.

Create virtual machines

With the VNet and subnets created, you can create the VMs. For this exercise, both VMs run the Windows Server operating system, though they can run any operating system supported by Azure, including several different Linux distributions.

Create the web server VM

To create the web server VM, complete the following steps:

1. In the Azure portal favorites pane, click **New**, **Compute**, then **Windows Server 2016 Datacenter**.
2. In the **Windows Server 2016 Datacenter** blade, click **Create**.
3. In the **Basics** blade that appears, enter or select the following values and click **OK**:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Name** | *MyWebServer* | This VM serves as a web server that Internet resources connect to. |
| **VM disk type** | *SSD* |  |
| **User name** | *Your choice* |  |
| **Password and Confirm password** | *Your choice* |  |
| **Subscription** |  | The subscription must be the same subscription that you selected in step 5 of the [Create a virtual network with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet) section of this article. The VNet you connect a VM to must exist in the same subscription as the VM. |
| **Resource group** | **Use existing:**Select *MyRG* | Though we’re using the same resource group as we did for the VNet, the resources don’t have to exist in the same resource group. |
| **Location** | *West US* | The location must be the same location that you specified in step 5 of the [Create a virtual network with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet) section of this article. VMs and the VNets they connect to must exist in the same location. |

1. In the **Choose a size** blade, click *DS1\_V2 Standard*, then click **Select**. Read the [Windows VM sizes](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/sizes?toc=%2fazure%2fvirtual-network%2ftoc.json) article for a list of all Windows VM sizes supported by Azure.
2. In the **Settings** blade, enter or select the following values and click **OK**:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Storage: Use managed disks** | *Yes* |  |
| **Virtual network** | Select *MyVNet* | You can select any VNet that exists in the same location as the VM you’re creating. To learn more about VNets and subnets, read the [Virtual network](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-overview) article. |
| **Subnet** | Select *Front-end* | You can select any subnet that exists within the VNet. |
| **Public IP address** | Accept the default | A public IP address enables you to connect to the VM from the Internet. To learn more about public IP addresses, read the [IP addresses](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-ip-addresses-overview-arm#public-ip-addresses) article. |
| **Network security group (firewall)** | Accept the default | Click the **(new) MyWebServer-nsg** default NSG the portal created to view its settings. In the **Create network security group** blade that opens, notice that it has one inbound rule that allows TCP/3389 (RDP) traffic from any source IP address. |
| **All other values** | Accept the defaults | To learn more about the remaining settings, read the [About VMs](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/overview?toc=%2fazure%2fvirtual-network%2ftoc.json) article. |

1. Network security groups (NSG) enable you to create inbound/outbound rules for the type of network traffic that can flow to and from the VM. By default, all inbound traffic to the VM is denied. You might add additional inbound rules for TCP/80 (HTTP) and TCP/443 (HTTPS) for a production web server. There is no rule for outbound traffic because by default, all outbound traffic is allowed. You can add/remove rules to control traffic per your policies. Read the [Network security groups](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-nsg) article to learn more about NSGs.
2. In the **Summary** blade, review the settings and click **OK** to create the VM. A status tile is displayed on the portal dashboard as the VM creates. It may take a few minutes to create. You don’t need to wait for it to complete. You can continue to the next step while the VM is created.

Create the database server VM

To create the database server VM, complete the following steps:

1. In the Favorites pane, click **New**, **Compute**, then **Windows Server 2016 Datacenter**.
2. In the **Windows Server 2016 Datacenter** blade, click **Create**.
3. In the **Basics blade**, enter or select the following values, then click **OK**:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Name** | *MyDBServer* | This VM serves as a database server that the web server connects to, but that the Internet cannot connect to. |
| **VM disk type** | *SSD* |  |
| **User name** | Your choice |  |
| **Password and Confirm password** | Your choice |  |
| **Subscription** |  | The subscription must be the same subscription that you selected in Step 5 of the [Create a virtual network with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet) section of this article. |
| **Resource group** | **Use existing:**Select *MyRG* | Though we’re using the same resource group as we did for the VNet, the resources don’t have to exist in the same resource group. |
| **Location** | *West US* | The location must be the same location that you specified in step 5 of the [Create a virtual network with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet) section of this article. |

1. In the **Choose a size** blade, click *DS1\_V2 Standard*, then click **Select**.
2. In the **Settings** blade, enter or select the following values and click **OK**:

| **Setting** | **Value** | **Details** |
| --- | --- | --- |
| **Storage: Use managed disks** | *Yes* |  |
| **Virtual network** | Select *MyVNet* | You can select any VNet that exists in the same location as the VM you’re creating. |
| **Subnet** | Select *Back-end*by clicking the **Subnet** box, then selecting **Back-end** from the **Choose a subnet** blade | You can select any subnet that exists within the VNet. |
| **Public IP address** | None – Click the default address, then click **None** from the **Choose public IP address** blade | Without a public IP address, you can only connect to the VM from another VM connected to the same VNet. You cannot connect to it directly from the Internet. |
| **Network security group (firewall)** | Accept the default | Like the default NSG created for the MyWebServer VM, this NSG also has the same default inbound rule. You might add an additional inbound rule for TCP/1433 (MS SQL) for a database server. There is no rule for outbound traffic because by default, all outbound traffic is allowed. You can add/remove rules to control traffic per your policies. |
| **All other values** | Accept the defaults |  |

1. In the **Summary** blade, review the settings and click **OK** to create the VM. A status tile is displayed on the portal dashboard as the VM creates. It may take a few minutes to create. You don’t need to wait for it to complete. You can continue to the next step while the VM is created.

Review resources

Though you created one VNet and two VMs, the Azure portal created several additional resources for you in the MyRG resource group. Review the contents of the MyRG resource group by completing the following steps:

1. In the **Favorites** pane, click **More services**.
2. In the **More services** pane, type *Resource groups* in the box that has the word *Filter* in it. Click **Resource groups** when you see it in the filtered list.
3. In the **Resource groups** pane, click the *MyRG* resource group. If you have many existing resource groups in your subscription, you can type *MyRG* in the box that contains the text *Filter by name…* to quickly access the MyRG resource group.
4. In the **MyRG** blade, you see that the resource group contains 12 resources, as shown in the following picture:

To learn more about VMs, disks, and storage accounts, read the [Virtual machine](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/overview?toc=%2fazure%2fvirtual-network%2ftoc.json), [Disk](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/about-disks-and-vhds?toc=%2fazure%2fvirtual-network%2ftoc.json), and [Storage account](https://docs.microsoft.com/en-us/azure/storage/common/storage-introduction?toc=%2fazure%2fvirtual-network%2ftoc.json) overview articles. You can see the two default NSGs the portal created for you. You can also see that the portal created two network interface (NIC) resources. A NIC enables a VM to connect to other resources over the VNet. Read the [NIC](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-network-interface) article to learn more about NICs. The portal also created one Public IP address resource. Public IP addresses are one setting for a public IP address resource. To learn more about public IP addresses, read the [IP addresses](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-ip-addresses-overview-arm#public-ip-addresses) article.

Connect to the VMs

With your VNet and two VMs created, you can now connect to the VMs by completing the steps in the following sections:

Connect to the web server VM from the Internet

To connect to the web server VM from the Internet, complete the following steps:

1. In the portal, open the MyRG resource group by completing the steps in the [Review resources](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#review) section of this article.
2. In the **MyRG** blade, click the **MyWebServer** VM.
3. In the **MyWebServer** blade, click **Connect**, as shown in the following picture:
4. Allow your browser to download the *MyWebServer.rdp* file, then open it.
5. If you receive a dialog box informing you that the publisher of the remote connection cannot be verified, click **Connect**.
6. When entering your credentials, ensure you login with the user name and password you specified in step 3 of the [Create the web server VM](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-web-server-vm) section of this article. If the **Windows Security** box that appears doesn’t list the correct credentials, you may need to click **More choices**, then **Use a different account**, so you can specify the correct user name and password). Click **OK** to connect to the VM.
7. If you receive a **Remote Desktop Connection** box informing you that the identity of the remote computer cannot be verified, click **Yes**.
8. You are now connected to the MyWebServer VM from the Internet. Leave the remote desktop connection open to complete the steps in the next section.

The remote connection is to the public IP address assigned to the public IP address resource the portal created in step 5 of the [Create a virtual network with two subnets](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-vnet) section of this article. The connection is allowed because the default rule created in the **MyWebServer-nsg** NSG permitted TCP/3389 (RDP) inbound to the VM from any source IP address. If you try to connect to the VM over any other port, the connection fails, unless you add additional inbound rules to the NSG allowing the additional ports.

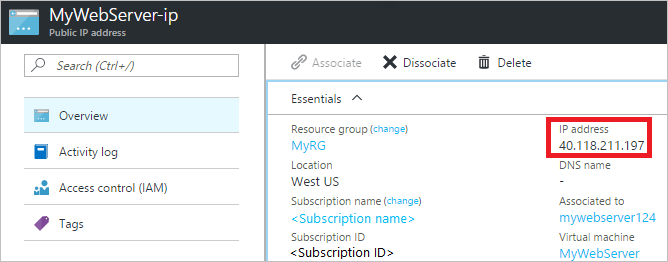
Note

If you add additional inbound rules to the NSG, ensure that the same ports are open on the Windows firewall, or the connection fails.

Connect to the Internet from the web server VM

To connect outbound to the Internet from the web server VM, complete the following steps:

1. If you don’t already have a remote connection to the MyWebServerVM open, make a remote connection to the VM by completing the steps in the [Connect to the web server VM from the Internet](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#connect-from-internet) section of this article.
2. From the Windows desktop, open Internet Explorer. In the **Setup Internet Explorer 11**dialog box, click **Don’t use recommended settings**, then click **OK**. It’s recommended to accept the recommended settings for a production server.
3. In the Internet Explorer address bar, enter [bing.com](http://www.bing.com/). If you receive an Internet Explorer dialog box, click **Add**, then **Add** in the **Trusted sites** dialog box and click **Close**. Repeat this process for any other Internet Explorer dialog boxes.
4. At the Bing search page, enter *whatsmyipaddress*, then click the magnifying glass button. Bing returns the public IP address assigned to the public IP address resource created by the portal when you created the VM. If you examine the settings for the **MyWebServer-ip** resource, you see the same IP address assigned to the public IP address resource, as shown in the picture that follows. The IP address assigned to your VM is different however.



1. Leave the remote desktop connection open to complete the steps in the next section.

You are able to connect to the Internet from the VM because all outbound connectivity from the VM is allowed by default. You can limit outbound connectivity by adding addition rules to the NSG applied to the NIC, to the subnet the NIC is connected to, or both.

If the VM is put in the stopped (deallocated) state using the portal, the public IP address can change. If you require that the public IP address never change, you can use the static allocation method for the IP address, rather than the dynamic allocation method (which is the default). To learn more about the differences between allocation methods, read the [IP address types and allocation methods](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-ip-addresses-overview-arm) article.

Connect to the database server VM from the web server VM

To connect to the database server VM from the web server VM, complete the following steps:

1. If you don’t already have a remote connection to the MyWebServer VM open, make a remote connection to the VM by completing the steps in the [Connect to the web server VM from the Internet](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#connect-from-internet) section of this article.
2. Click the Start button in the lower-left corner of the Windows desktop, then start typing *remote desktop*. When the Start menu list displays **Remote Desktop Connection**, click it.
3. In the **Remote Desktop Connection** dialog box, enter *MyDBServer* for the computer name and click **Connect**.
4. Enter the user name and passwords you entered in step 3 of the [Create the database server VM](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-database-server-vm) section of this article, then click **OK**.
5. If you receive a dialog box informing you that the identity of the remote computer cannot be verified, click **Yes**.
6. Leave the remote desktop connection to both servers open to complete the steps in the next section.

You are able to make the connection to the database server VM from the web server VM for the following reasons:

* TCP/3389 inbound connections are enabled for any source IP in the default NSG created in step 5 of the [Create the database server VM](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#create-database-server-vm) section of this article.
* You initiated the connection from the web server VM, which is connected to the same VNet as the database server VM. To connect to a VM that doesn’t have a public IP address assigned to it, you must connect from another VM connected to the same VNet, even if the VM is connected to a different subnet.
* Even though the VMs are connected to different subnets, Azure creates default routes that enable connectivity between subnets. You can override the default routes by creating your own however. Read the [User-defined routes](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-networks-udr-overview) article to learn more about routing in Azure.

If you try to initiate a remote connection to the database server VM from the Internet, as you did in the [Connect to the web server VM from the Internet](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#connect-from-internet) section of this article, you see that the **Connect** option is grayed out. Connect is grayed out because there is no public IP address assigned to the VM, so inbound connections to it from the Internet are not possible.

Connect to the Internet from the database server VM

Connect outbound to the Internet from the database server VM by completing the following steps:

1. If you don’t already have a remote connection to the MyDBServer VM open from the MyWebServer VM, complete the steps in the [Connect to the database server VM from the web server VM](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#webserver-to-dbserver) section of this article.
2. From the Windows desktop on the MyDBServer VM, open Internet Explorer and respond to the dialog boxes as you did in steps 2 and 3 of the [Connect to the Internet from the web server VM](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#connect-to-internet) section of this article.
3. In the address bar, enter [bing.com](http://www.bing.com/).
4. Click **Add** in the Internet Explorer dialog box that appears, then **Add**, then **Close** in the **Trusted** sites dialog box. Complete these steps in any additional dialog boxes appear.
5. At the Bing search page, enter *whatsmyipaddress*, then click the magnifying glass button. Bing returns the public IP address currently assigned to the VM by the Azure infrastructure. 6. Close the remote desktop to the MyDBServer VM from the MyWebServer VM, then close the remote connection to the MyWebServer VM.

The outbound connection to the Internet is allowed because all outbound traffic is allowed by default, even though a public IP address resource is not assigned to the MyDBServer VM. All VMs, by default, are able to connect outbound to the Internet, with or without a public IP address resource assigned to the VM. You are not able to connect to the public IP address from the Internet however, like you were able to for the MyWebServer VM that has a public IP address resource assigned.

Delete all resources

To delete all resources created in this article, complete the following steps:

1. To view the MyRG resource group created in this article, complete steps 1-3 in the [Review resources](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#review) section of this article. Once again, review the resources in the resource group. If you created the MyRG resource group, per previous steps, you see the 12 resources shown in the picture in step 4.
2. In the MyRG blade, click the **Delete** button.
3. The portal requires you to type the name of the resource group to confirm that you want to delete it. If you see resources other than the resources shown in step 4 of the [Review resources](https://docs.microsoft.com/en-us/azure/virtual-network/virtual-network-get-started-vnet-subnet#review) section of this article, click **Cancel**. If you see only the 12 resources created as part of this article, type *MyRG* for the resource group name, then click **Delete**. Deleting a resource group deletes all resources within the resource group, so always be sure to confirm the contents of a resource group before deleting it. The portal deletes all resources contained within the resource group, then deletes the resource group itself. This process takes several minutes.