

# How to run desktop applications in Azure X11 Linux virtual machines

A step-by-step walkthrough

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# Contents

Overview .....	3
Step 1: Create an Azure resource group.....	3
Step 2: Create an Azure virtual network .....	5
Step 3: Create a Linux virtual machine .....	7
Step 4: Create an Azure client virtual machine.....	10
Step 5: Install VcXsrv and PuTTY on TestClient.....	13
Step 6: Connect to your Linux virtual machine and test.....	14
Step 7: Install X11 applications.....	15
A final word on X11 and sudo sessions .....	16
Learn more .....	17

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## Overview

To use GUI applications on Azure Linux virtual machines, our customers have found it very useful to tunnel X11 traffic over SSH and display it on their workstations. Although you can run X11 remotely over the Internet, we find it works better to use a remote desktop client to connect to an Azure virtual machine running Windows Server, where you install an X Window Server. Then from a Linux virtual machine, you can connect to the Windows virtual machine as your display console. With this setup, you can easily run emacs, system management tools, and other graphical applications on Linux.

This article shows you exactly how to use Azure portal to create a Windows Server virtual machine on the same virtual network as a Linux virtual machine that you also create. We install [VcXsrv](#) Windows X server, but you can also use other X11 server applications, such as Xming or MobaXterm if you prefer. For the Azure Virtual Machines documentation on this topic, see [Install and configure Remote Desktop to connect to a Linux VM in Azure](#).

We also show how to install an SSH client to connect to the Linux machine so you can access it from the Windows machine directly. We use [PuTTY](#) but you can use another terminal emulator such as MobaXterm. Finally, we test the setup by installing xterm on the Linux virtual machine.

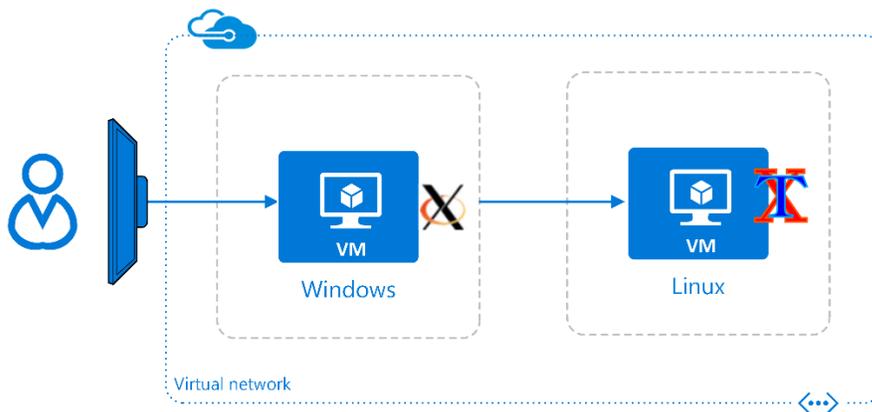


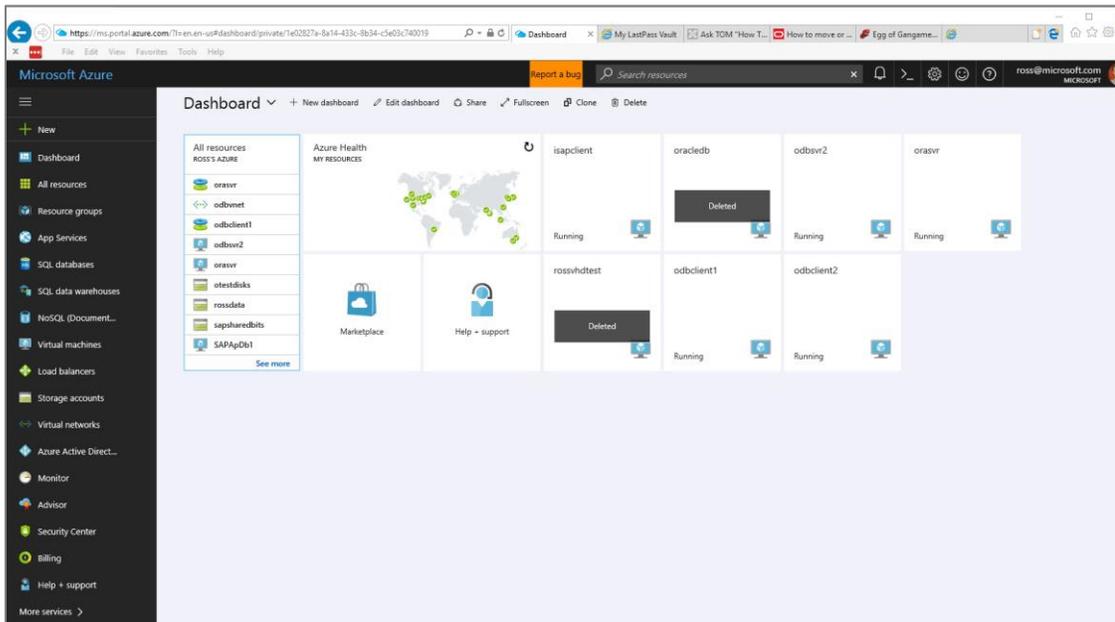
Figure 1. Windows runs VcXsrv to provide display services to the remote Linux virtual machine running MobaXterm.

## Step 1: Create an Azure resource group

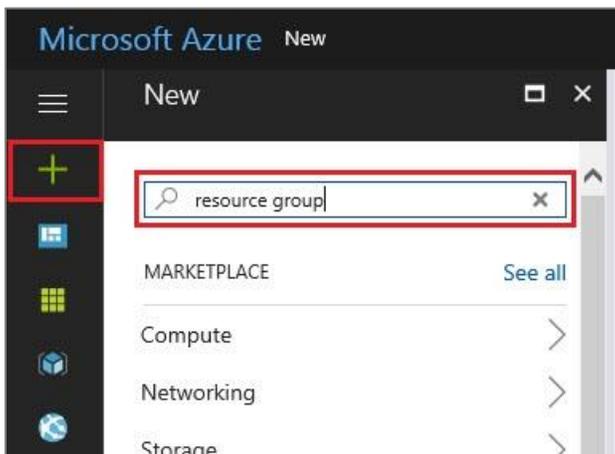
This walkthrough assumes that you're starting from scratch, so we create a new, empty Azure resource group named X11-test to hold the virtual machines and virtual network created later. If you already have a resource group and virtual network you want to use, you can skip these steps and go to [Step 3: Create a Linux virtual machine](#).

**TIP:** In Azure portal, display the resource names beside the icons by clicking **Menu** (☰) on the top left. Click again to hide the names.

1. Sign in to the Azure portal at <http://portal.azure.com>. The Dashboard appears.



2. In the upper left, click **New**, then type **resource group** in the search box and press **Enter**.



3. In the **Everything** blade under **Results**, click **Resource group**, then click **Create**.

4. In the **Resource group** blade, type a name for the resource group such as **X11-test**. Select the subscription and location you want to use, then click **Create**.

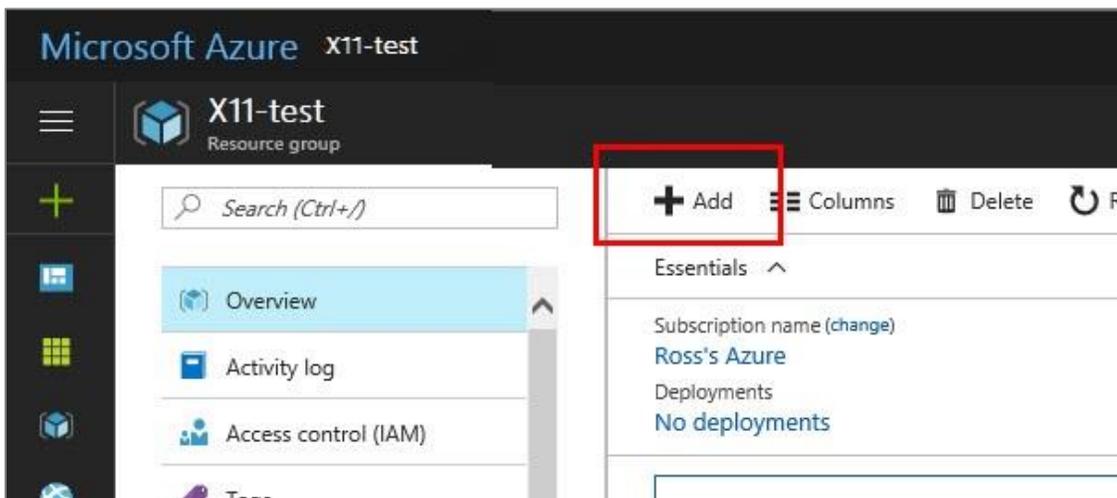


In this example, the X11-test resource group is created in the East US 2 Azure region.

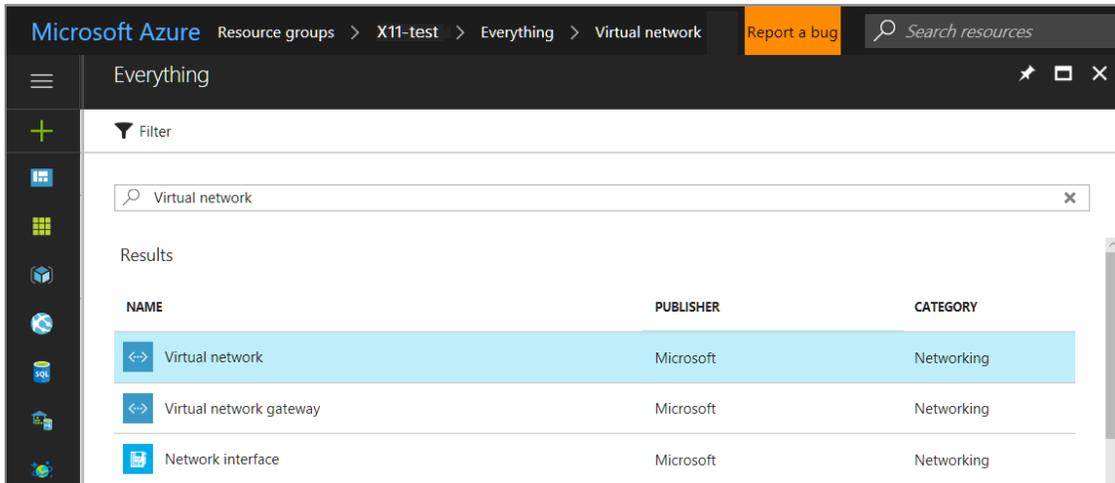
## Step 2: Create an Azure virtual network

This step creates a virtual network and adds it to the new resource group. Later, you connect your virtual machines to this virtual network.

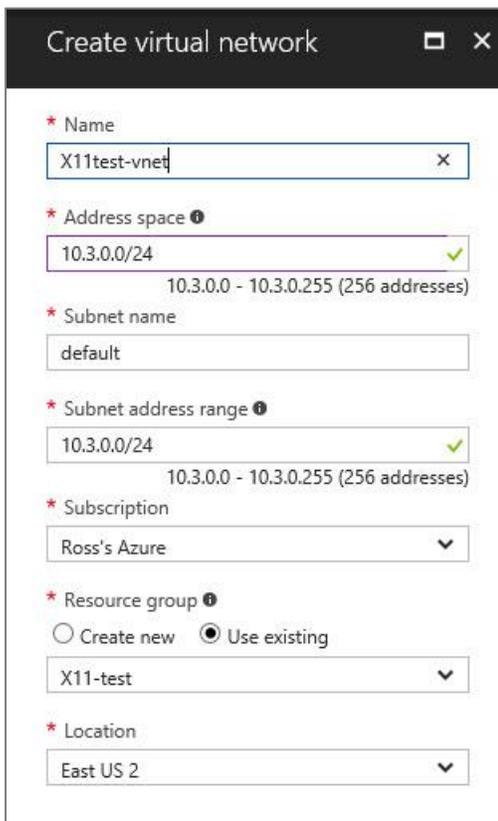
1. On the Azure portal menu, click **Resource groups** (📦) then, on the **Resource group** blade, click **X11-test** (or the name of the resource group you just created).
2. On the **X11test** blade, click **+ Add**.



- On the **Everything** blade, click **Virtual network** if it appears; otherwise, type **virtual network** in the search box and press **Enter**. Then under **Results**, click **Virtual network**.



- On the **Virtual Network** blade on the right, click **Create**.
- Type a name for your virtual network such as **X11test-vnet**. Verify the resource group name and location, review the default settings for address space and subnet, then click **Create**.

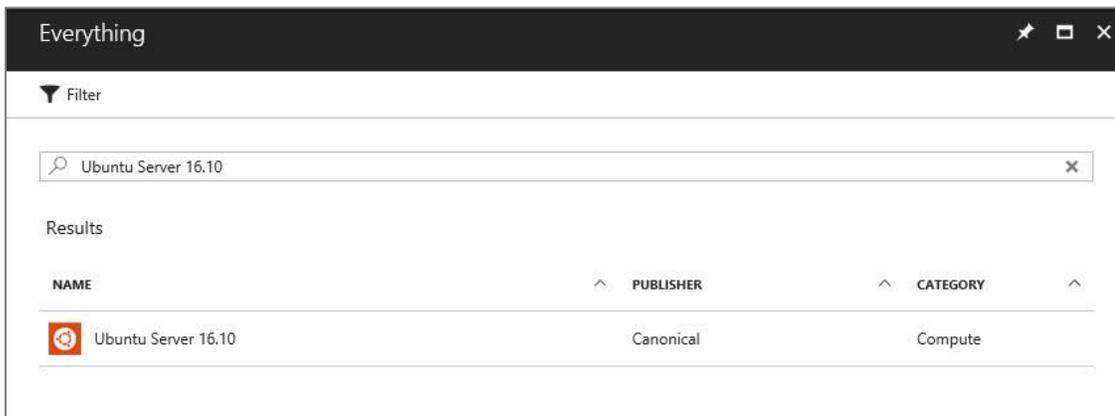


In this example, the X11test-vnet virtual network is created in the X11-test resource group.

## Step 3: Create a Linux virtual machine

In this step, we create a virtual machine running Ubuntu Linux in our resource group, but you can choose the Linux distribution you prefer. For authentication we set up a username and password, or you can create an SSH key.

1. On the Azure portal menu, click **Resource groups** (📁) then, on the **Resource group** blade, click **X11-test** or the name of the resource group you created.
2. On the **X11-test** blade, click **+ Add**.
3. In the search box, type **ubuntu** and press **Enter**. In the Results, select the Ubuntu distribution, then click **Create**.



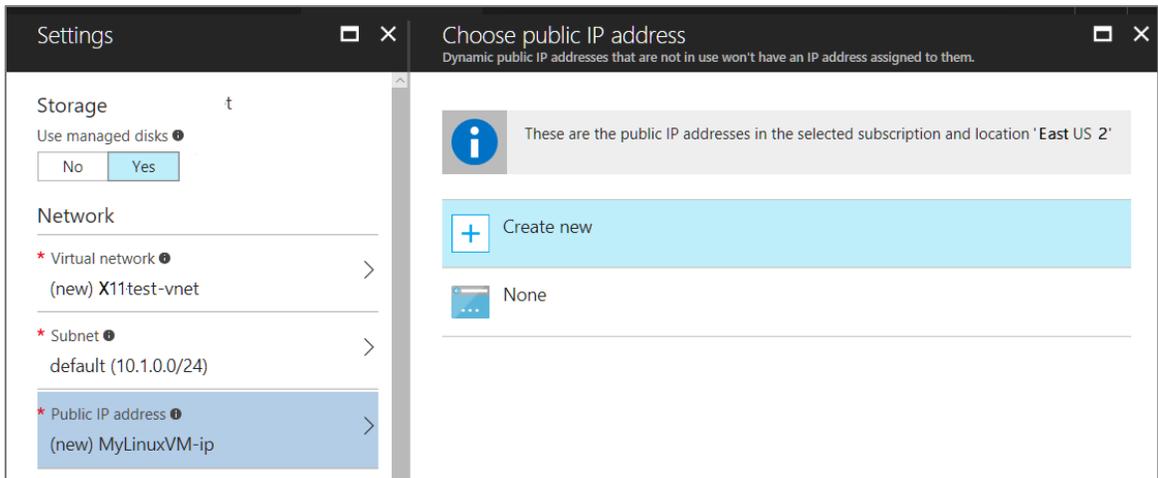
- Configure the basic settings. Type a name for your virtual machine and choose the disk type. For **Authentication type**, click **Password**, then type the username and password you want to use to log on. Verify the resource group name and location, then click **OK**.

The screenshot shows the 'Create virtual machine' wizard in the 'Basics' step. The left sidebar contains four steps: 1. Basics (Configure basic settings), 2. Size (Choose virtual machine size), 3. Settings (Configure optional features), and 4. Summary (Ubuntu Server 16.10). The main area contains the following fields:

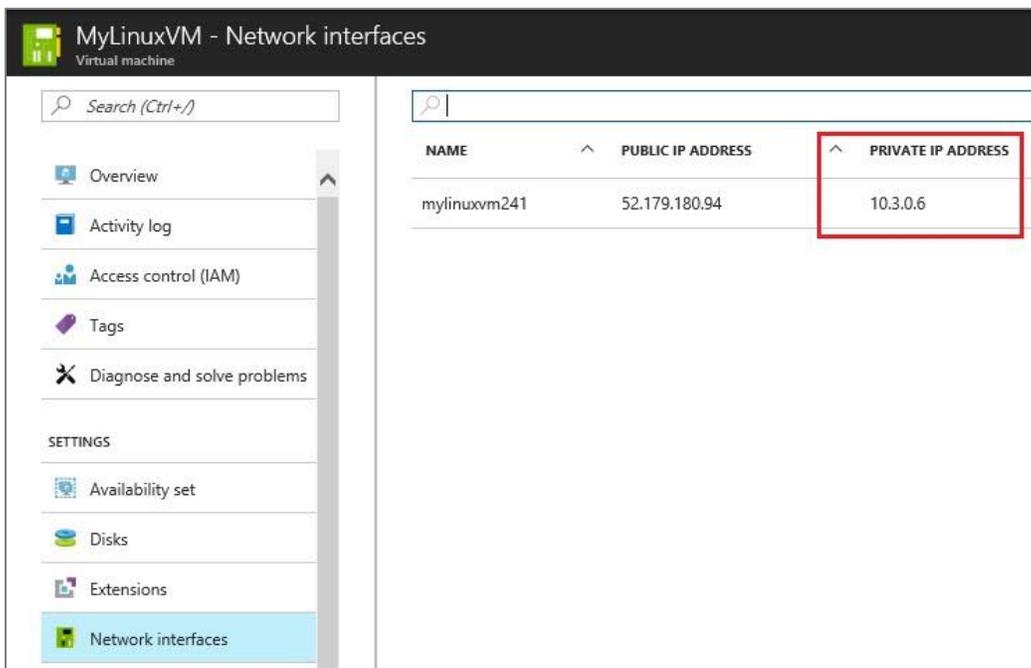
- Name:** MyLinuxVM
- VM disk type:** SSD
- User name:** ross
- Authentication type:** SSH public key (selected), Password (highlighted)
- Password:** [Redacted]
- Confirm password:** [Redacted]
- Subscription:** Ross's Azure
- Resource group:** Create new (unselected), Use existing (selected), X11-test
- Location:** East US 2

- Choose the virtual machine size you want, then click **Select**.

- For **Settings**, make sure the virtual network you created earlier is displayed, then click **Public IP address**. For test purposes, you don't need an Internet-facing IP, so click **None**, or use the default Internet-facing address if you like, or create a new configurations to fit your case.



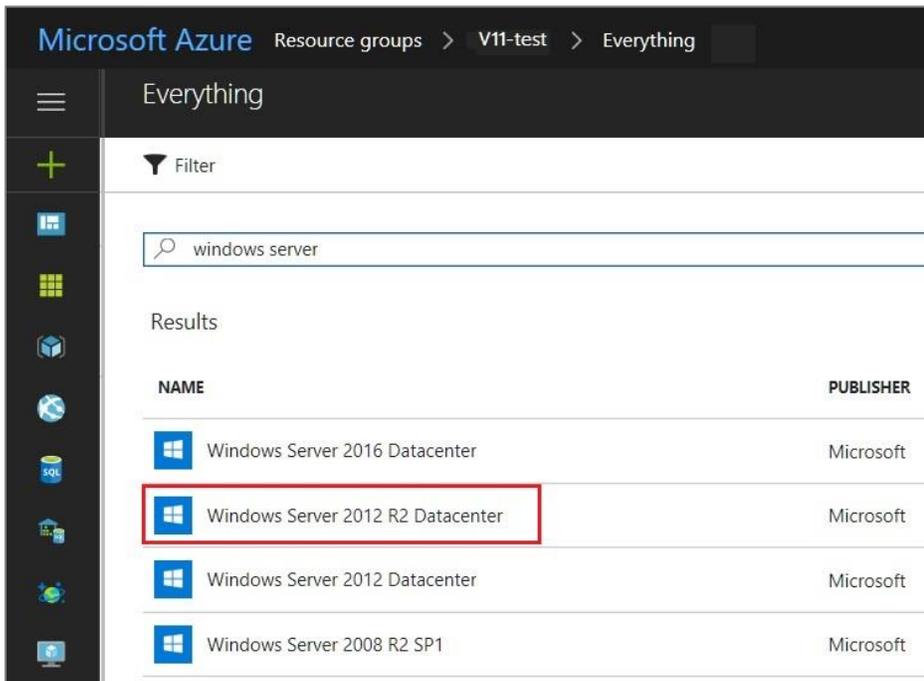
- Click **Network Security group** and choose **None** to keep this test configuration simple.
- To complete the settings, click **OK**. After the final validation, click **OK**.
- When the server is created, on the Azure portal menu, click **Virtual machines** (🖥️), then select **MyLinuxVM** or the name of the virtual machine you just created.
- On the **MyLinuxVM** blade, click **Network interfaces**. Make note of the **Private IP Address**, which you'll need later when you configure PuTTY.



## Step 4: Create an Azure client virtual machine

To access the other virtual machines in our network, a virtual machine running Windows Server is used. This step creates a virtual machine named TestClient.

1. On the Azure portal menu, click **Resource groups** (📁), then, on the **Resource group** blade, click **X11-test** or the name of the resource group you just created.
2. On the **X11test** blade, click **+ Add**.
3. In the search box, type **windows server** and press Enter. Under **Results**, choose the version of Windows Server you'd like to work with.



4. On the **Windows Server** blade on the right, click **Create**.

- Configure the virtual machine's basic settings. Type the name of your virtual machine such as **TestClient** and choose a disk type. Type the username and password you want to use later to log on to this VM. Verify the resource group and location, then choose **OK**.

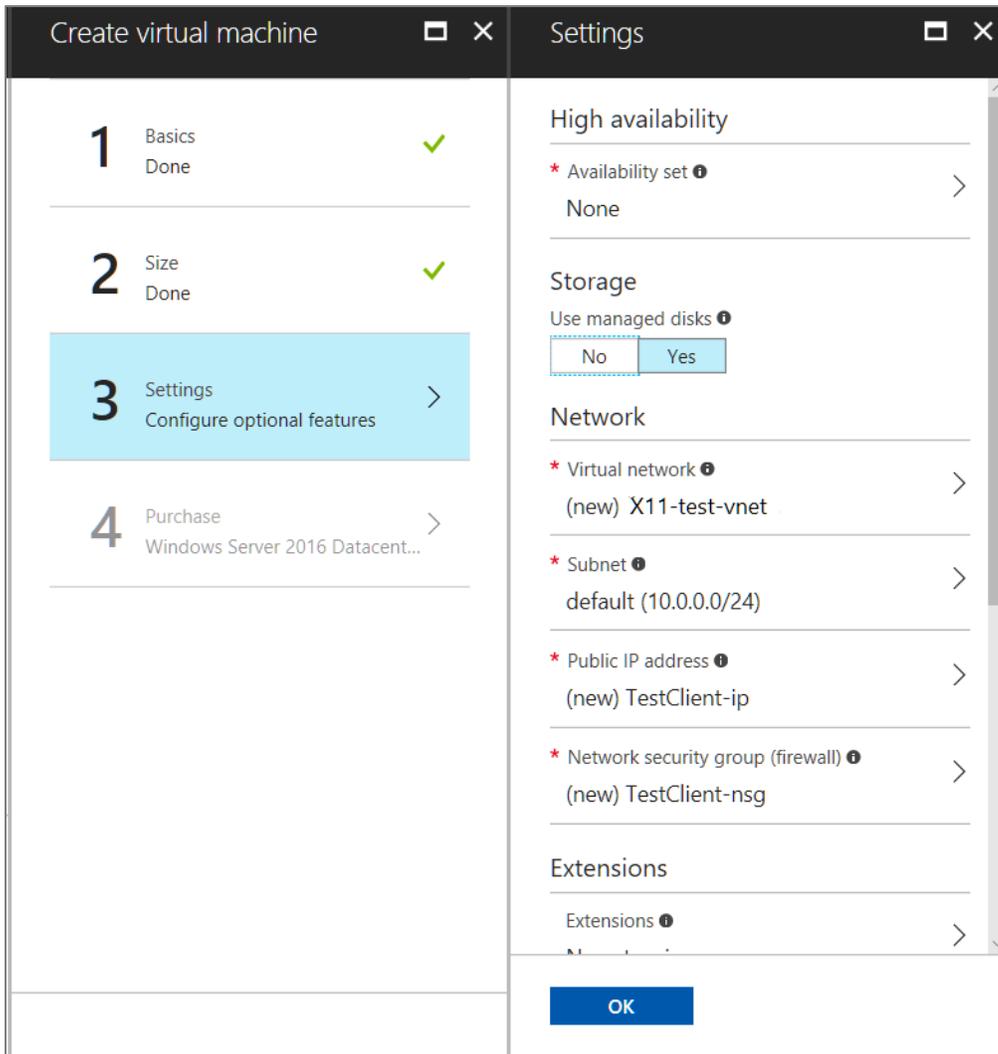
The screenshot shows the 'Create virtual machine' wizard in the 'Basics' step. The left sidebar contains four steps: 1. Basics (Configure basic settings), 2. Size (Choose virtual machine size), 3. Settings (Configure optional features), and 4. Purchase (Windows Server 2016 Datacent...). The main area is titled 'Basics' and contains the following fields:

- Name:** TestClient (with a green checkmark)
- VM disk type:** SSD (dropdown menu)
- User name:** ross (with a green checkmark)
- Password:** (masked with dots)
- Confirm password:** (masked with dots)
- Subscription:** Ross's Azure (dropdown menu)
- Resource group:** X11-test (dropdown menu, with radio buttons for 'Create new' and 'Use existing', where 'Use existing' is selected)
- Location:** East US 2 (dropdown menu)

An 'OK' button is located at the bottom right of the 'Basics' panel.

- Choose the virtual machine size you want such as **D1\_V2**, then click **Select**.

7. For **Settings**, make sure that the virtual network you created earlier is displayed. Review the settings for the default **Public IP address** that will enable this VM to connect to the others. To complete the settings, click **OK**.



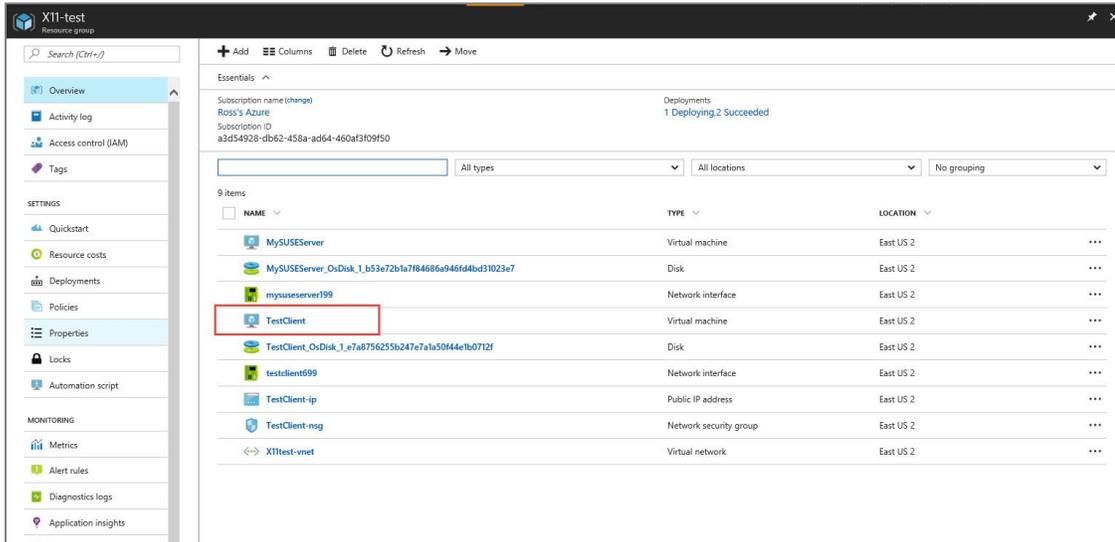
8. After the final validation, review the summary, then click **OK** to create the Windows Server virtual machine. This process typically takes 3 to 5 minutes.

Now the virtual network is set up, so it's time to create the virtual machines.

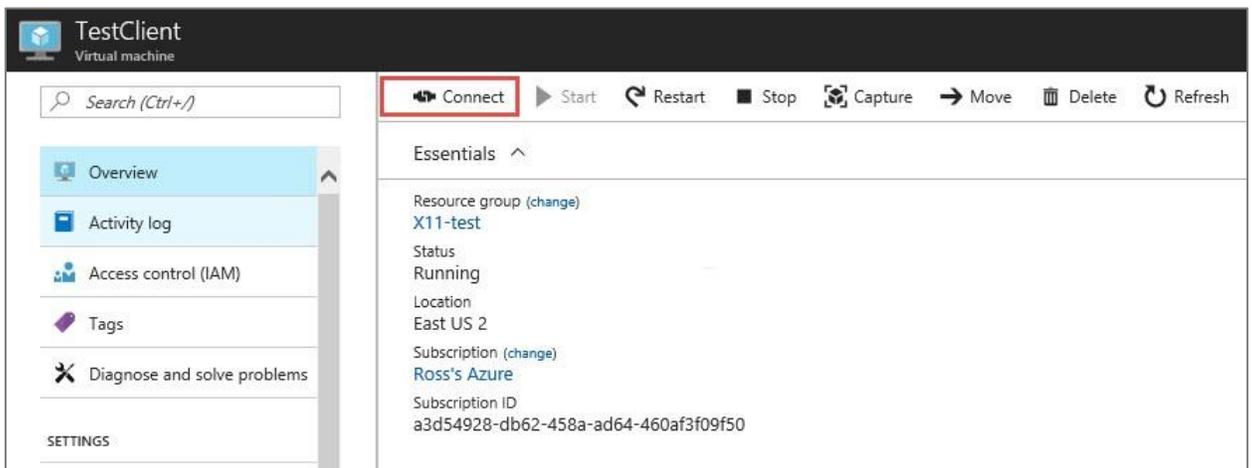
## Step 5: Install VcXsrv and PuTTY on TestClient

The next step is to log on to TestClient, the client virtual machine running Windows Server, and install the X11 server and the SSH client.

1. On the Azure portal menu, click **Resource groups** (📁) then, on the **Resource group** blade, click **TestClient** or the name of the client virtual machine you created in Step 1.



2. On the **TestClient** blade, click **Connect**.



3. When prompted, click **Open** to open the Remote Desktop Protocol file (.rdp file). You will get a warning that the .rdp is from an unknown publisher. This is normal. In the Remote Desktop window, click **Connect** to continue.
4. When prompted for your credentials, enter the username and password you created for TestClient, then click **OK**. A warning message about authenticating the remote computer appears; click **Yes** to continue.
5. When the remote connection is established, open a browser on TestClient.

- To install PuTTY, go to <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>. Select the 64-bit installer and follow the installation instructions.
- To install VcXsrv, go to <https://sourceforge.net/projects/vcxsrv/>. Click **Download** and follow the prompts.
- Keep this session open and continue with the next step.

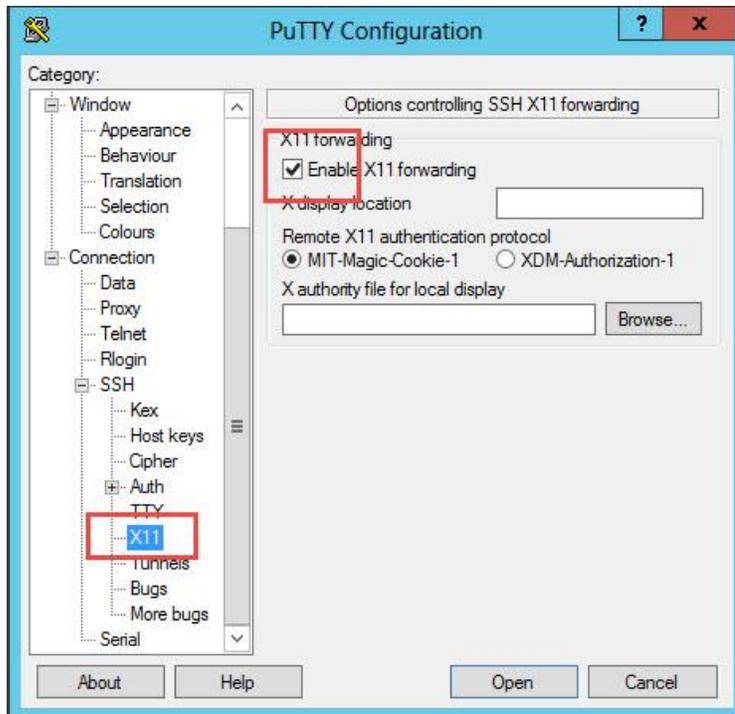
## Step 6: Connect to your Linux virtual machine and test

To make sure you can connect to your virtual machine running Linux, this step walks you through a remote desktop session from the client virtual machine and the required PuTTY configuration settings.

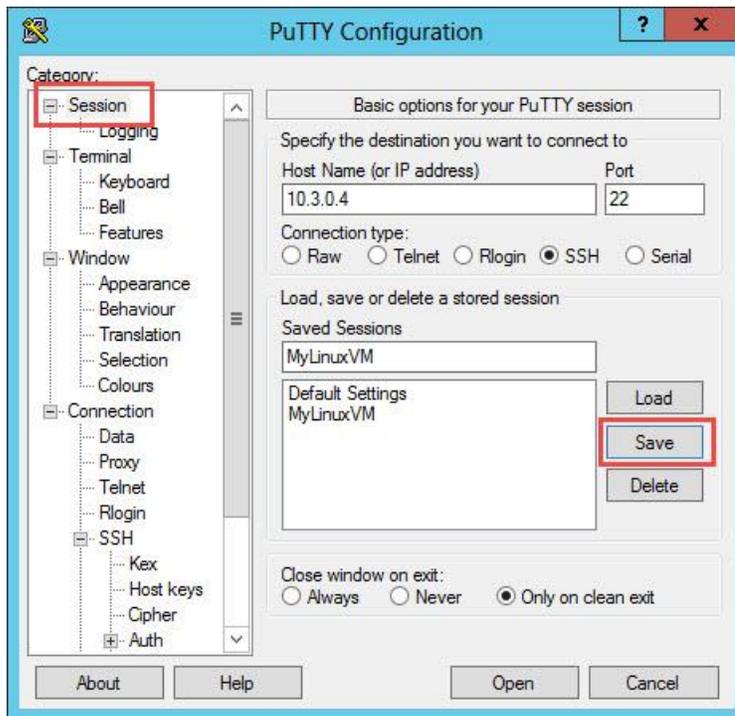
- In your remote desktop session on TestClient, run VcXsrv from the icon in the taskbar or the Windows Start menu.



- Start PuTTY. In the **PuTTY Configuration** dialog box, for **Host Name (or IP address)**, enter the IP address noted in [Step 3: Create a Linux virtual machine](#), step 11. In the **Saved Sessions** box, enter a session name such as **MyLinuxVM**.
- Under **Category**, expand **Connection** > **SSH** > **X11**, then check the **Enable X11 forwarding** box.



- Under Category, click **Session**, then click **Save** to save the session settings.



- Click **Open**, accept the SSH certificate, and enter your logon credentials using the username and password you created for MyLinuxVM.
- Keep this session open and continue with the next step.

## Step 7: Install X11 applications

Now that the connection to the Linux virtual machine is set up through TestClient, the Windows Server virtual machine, you can install the software you need. For this walk-through, we install xterm, the standard terminal emulator for the X Window System.

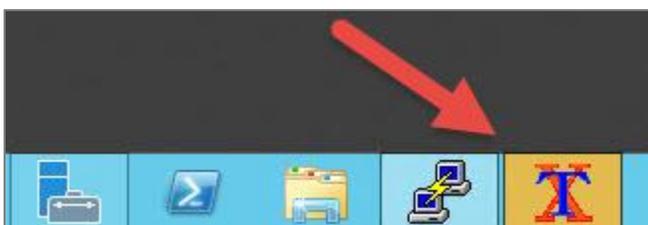
- In your remote desktop session on MyLinuxVM, install the xterm software package by executing the following, substituting your username for **ross**:

```
ross@MyLinuxVM:~$ sudo apt-get install xterm
```

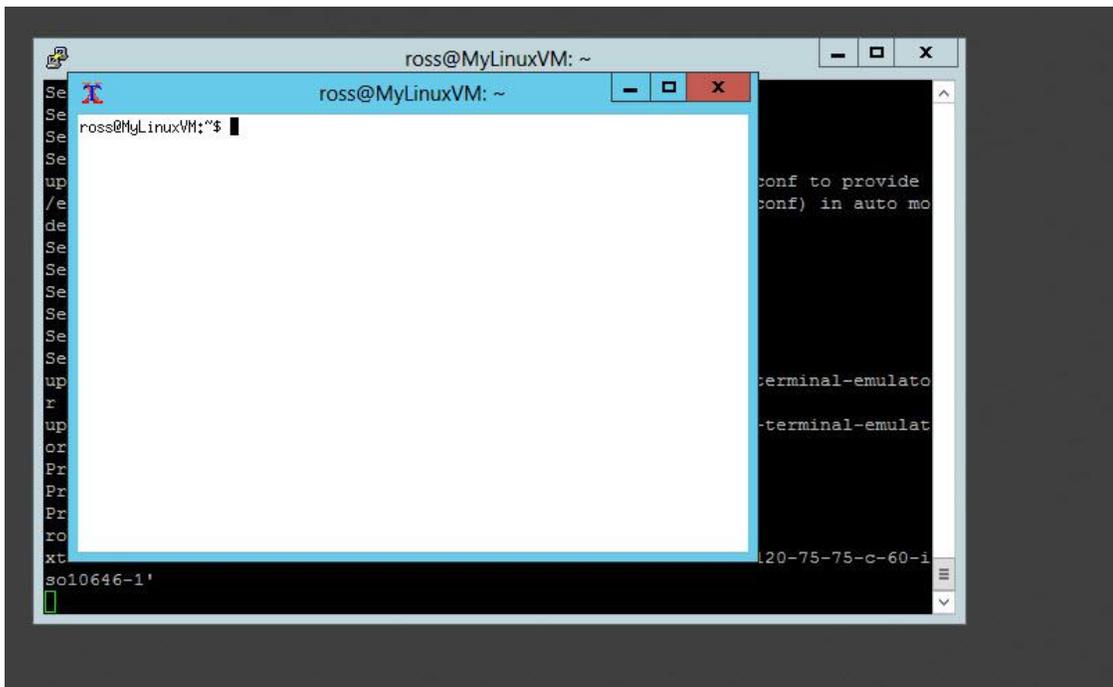
- Accept the installation of the indicated packages.
- To run xterm, execute the following, substituting your username for **ross**:

```
ross@MyLinuxVM:~$ xterm
```

The xterm icon now appears on your taskbar.



- Click the xterm icon to open an xterm window.



That's it! This test shows X11 applications are working.

## A final word on X11 and sudo sessions

This walkthrough works fine for the user you log on as, but what if you need to run an X11 application in a sudo session? For example, you may need to log on to a host as a non-root user and then create a sudo session to perform administrative functions. If you do this remotely, multiple credentials may be used. If you simply try `sudo xterm`, it won't work, because the xterm is running as root, but root doesn't have the proper X11 authentication to connect to your VcXsrv.

To run an X11-based tool, you need to set the proper X credentials in the sudo session by fixing the xauth profile for root. So copy the following in your root `.bash_profile`, substituting your logon username for **adminuser**:

```
su - adminuser -c 'xauth list' |\
  grep `echo $DISPLAY` |\
    cut -d ':' -f 2 |\
    cut -d '.' -f 1 |\
    sed -e s/^:/` |\
  xargs -n 3 xauth add
```

## Learn more

For more information, see the following resources:

- [Install and configure Remote Desktop to connect to a Linux VM in Azure](https://docs.microsoft.com/en-us/azure/virtual-machines/linux/use-remote-desktop)  
<https://docs.microsoft.com/en-us/azure/virtual-machines/linux/use-remote-desktop>
- [Download VcXsrv Windows X Server from Source Forge](https://sourceforge.net/projects/vcxsrv/)  
<https://sourceforge.net/projects/vcxsrv/>
- [Download PuTTY](https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html)  
<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>
- [Reference architecture: Run a Linux VM on Azure](https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/virtual-machines-linux/single-vm)  
<https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/virtual-machines-linux/single-vm>

