Choosing a network adapter for your virtual machine (1001805)

Details

Network adapter choices depend on the version number and the guest operating system running on the virtual machine. This article discusses the different network adapter options available for virtual machines.

For more information on network types, see Understanding networking types in hosted products (1006480).

Solution

Available Network Adapters

Only those network adapters that are appropriate for the virtual machine you are creating are available configuration options in the Choose Networks window.

- **Vlance**: This is an emulated version of the AMD 79C970 PCnet32- LANCE NIC, and it is an older 10 Mbps NIC with drivers available in most 32-bit guest operating systems except Windows Vista and later. A virtual machine configured with this network adapter can use its network immediately.
- **VMXNET**: The VMXNET virtual network adapter has no physical counterpart. VMXNET is optimized for performance in a virtual machine. Because operating system vendors do not provide built-in drivers for this card, you must install VMware Tools to have a driver for the VMXNET network adapter available.
- **Flexible**: The Flexible network adapter identifies itself as a Vlance adapter when a virtual machine boots, but initializes itself and functions as either a Vlance or a VMXNET adapter, depending on which driver initializes it. With VMware Tools installed, the VMXNET driver changes the Vlance adapter to the higher performance VMXNET adapter.
- **E1000**: An emulated version of the Intel 82545EM Gigabit Ethernet NIC. A driver for this NIC is not included with all guest operating systems. Typically Linux versions 2.4.19 and later, Windows XP Professional x64 Edition and later, and Windows Server 2003 (32-bit) and later include the E1000 driver.

  Note: E1000 does not support jumbo frames prior to ESXi/ESX 4.1.

- **E1000e**: This feature emulates a newer model of Intel Gigabit NIC (number 82574) in the virtual hardware. This is known as the "e1000e" vNIC. e1000e is available only on hardware version 8 (and newer) virtual machines in vSphere 5. It is the default vNIC for Windows 8 and newer (Windows) guest operating systems. For Linux guests, e1000e is not available from the UI (e1000, flexible vmxnet, enhanced vmxnet, and vmxnet3 are available for Linux).
- **VMXNET 2 (Enhanced)**: The VMXNET 2 adapter is based on the VMXNET adapter but provides some high-performance features commonly used on modern networks, such as jumbo frames and hardware offloads. This virtual network adapter is available only for some guest operating systems on ESXi/ESX 3.5 and later. Because operating system vendors do not provide built-in drivers for this card, you must install VMware Tools to have a driver for the VMXNET 2 network adapter available.

  VMXNET 2 is supported only for a limited set of guest operating systems:

  - 32- and 64-bit versions of Microsoft Windows 2003 (Enterprise, Datacenter, and Standard Editions).

    Note: You can use enhanced VMXNET adapters with other versions of the Microsoft Windows 2003 operating system, but a workaround is required to enable the option in the VMware Infrastructure (VI) Client or vSphere Client. If Enhanced VMXNET is not offered as an option, see Enabling enhanced vmxnet adapters for Microsoft Windows Server 2003 (1007195).
  - 32-bit version of Microsoft Windows XP Professional
  - 32- and 64-bit versions of Red Hat Enterprise Linux 5.0

- o 32- and 64-bit versions of SUSE Linux Enterprise Server 10
- o 64-bit versions of Red Hat Enterprise Linux 4.0
- o 64-bit versions of Ubuntu Linux

In ESX 3.5 Update 4 or higher, these guest operating systems are also supported:

- o Microsoft Windows Server 2003, Standard Edition (32-bit)
- o Microsoft Windows Server 2003, Standard Edition (64-bit)
- o Microsoft Windows Server 2003, Web Edition
- o Microsoft Windows Small Business Server 2003

Note: Jumbo frames are not supported in the Solaris Guest OS for VMXNET 2.

- **VMXNET 3**: The VMXNET 3 adapter is the next generation of a paravirtualized NIC designed for performance, and is not related to VMXNET or VMXNET 2. It offers all the features available in VMXNET 2, and adds several new features like multiqueue support (also known as Receive Side Scaling in Windows), IPv6 offloads, and MSI/MSI-X interrupt delivery. For information about the performance of VMXNET 3, see Performance Evaluation of VMXNET3 Virtual Network Device. Because operating system vendors do not provide built-in drivers for this card, you must install VMware Tools to have a driver for the VMXNET 3 network adapter available.

  VMXNET 3 is supported only for virtual machines version 7 and later, with a limited set of guest operating systems:

  - o 32- and 64-bit versions of Microsoft Windows 7, 8, XP, 2003, 2003 R2, 2008, 2008 R2, Server 2012 and Server 2012 R2
  - o 32- and 64-bit versions of Red Hat Enterprise Linux 5.0 and later
  - o 32- and 64-bit versions of SUSE Linux Enterprise Server 10 and later
  - o 32- and 64-bit versions of Asianux 3 and later
  - o 32- and 64-bit versions of Debian 4
  - o 32- and 64-bit versions of Debian 5
  - o 32- and 64-bit versions of Debian 6
  - o 32- and 64-bit versions of Ubuntu 7.04 and later
  - o 32- and 64-bit versions of Sun Solaris 10 and later
  - o 32- and 64-bit versions of Oracle Linux 4.9 and later

  Notes:
  - o In ESXi/ESX 4.1 and earlier releases, jumbo frames are not supported in the Solaris Guest OS for VMXNET 2 and VMXNET 3. The feature is supported starting with ESXi 5.0 for VMXNET 3 only. For more information, see Enabling Jumbo Frames on the Solaris guest operating system (2012445).
  - o Fault Tolerance is not supported on a virtual machine configured with a VMXNET 3 vNIC in vSphere 4.0, but is fully supported on vSphere 4.1.
  - o Windows Server 2012 is supported with e1000, e1000e, and VMXNET 3 on ESXi 5.0 Update 1 or higher.

Adapter Caveats

- **Migrating virtual machines that use enhanced VMXNET**

  VMXNET 2 was introduced with ESX 3.5. Virtual machines configured to have VMXNET 2 adapters cannot migrate to earlier ESX hosts, even though virtual machines can usually migrate freely between ESX 3.0 and ESX 3.0.x.

  If you must migrate a virtual machine between later and earlier hosts, do not choose VMXNET 2.

- **Upgrading from ESX 2.x to ESX 3.x**

  When a virtual hardware upgrade operation transforms a virtual machine created on an ESX 2.x host to an ESX 3.x host, Vlance adapters are automatically upgraded to Flexible. In contrast, VMXNET adapters are not upgraded automatically because most Linux guest operating system versions do not reliably preserve network settings when a network adapter is replaced. Since the guest operating system thinks a Flexible adapter is still Vlance, it retains the settings in that case. If the upgrade replace a VMXNET adapter with a Flexible adapter, the guest operating

system erroneously discards the settings.

After the virtual hardware upgrade, the network adapter is still VMXNET, without the fall back compatibility of the Flexible adapter. Just as on the original earlier host, if VMware Tools is uninstalled on the virtual machine, it cannot access its network adapters.

- **Adding virtual disks**

  Adding an existing earlier (ESX 2.x) virtual disk to an ESX 3.x virtual machine results in a de facto downgrade of that virtual machine to ESX 2.x. If you are using ESX 3.x features, such as enhanced VMXNET or Flexible network adapters, the virtual machine becomes inconsistent. When you add an existing ESX 2.x virtual disk to an ESX 3.x machine, immediately use the `Upgrade Virtual Hardware` command to restore the virtual machine to the ESX 3 version. This problem does not arise when you add earlier virtual disks to an ESXi/ESX 4.0 virtual machine.

  Note: Executing the `Upgrade Virtual Hardware` command changes the ESX 2 virtual disk so that it is no longer usable on an ESX 2 virtual machine. Consider making a copy of the disk before you upgrade one of the two copies to ESX 3 format.

For related information, see:

- Guest operating systems, see the VMware Compatibility Guide.
- Setting flow control, see Configuring Flow Control on ESX and ESXi (1013413).
- VMXNET3 performance evaluation, see this whitepaper.
- Windows Server 2008 R2 and Windows 7 require patches. For more information, see Deploying Windows 2008 R2 and Windows 7 templates with vmxnet3 renames the NIC as #2 (1020078).

See also: Troubleshooting virtual machine network connection issues (1003893)
http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1003893