

# Configuration Maximums

## VMware® vSphere 4.1

When you select and configure your virtual and physical equipment, you must stay at or below the maximums supported by vSphere 4.1. The limits presented in the following tables represent tested, recommended limits, and they are fully supported by VMware.

- [“Virtual Machine Maximums”](#) on page 1
- [“ESX Host Maximums”](#) on page 2
- [“vCenter Server Maximums”](#) on page 6
- [“vCenter Server Extensions”](#) on page 6

The limits presented in this document can be affected by other factors, such as hardware dependencies. For more information about supported hardware, see the appropriate ESX hardware compatibility guide. Consult individual solution limits to ensure that you do not exceed supported configurations for your environment.

The *Configuration Maximums for vSphere 4.1* covers ESX, ESXi, and vCenter Server.

## Virtual Machine Maximums

[Table 1](#) contains configuration maximums related to virtual machines.

**Table 1.** Virtual Machine Maximums

Item	Maximum
<b>Compute</b>	
Virtual CPUs per virtual machine (Virtual SMP)	8
<b>Memory</b>	
RAM per virtual machine	255GB
Virtual machine swap file size	255GB
<b>Storage Virtual Adapters and Devices</b>	
Virtual SCSI adapters per virtual machine	4 <sup>1</sup>
Virtual SCSI targets per virtual SCSI adapter	15 <sup>2</sup>
Virtual SCSI targets per virtual machine	60
Disk size	2TB minus 512 bytes
IDE controllers per virtual machine	1 <sup>3</sup>
IDE devices per virtual machine	4
Floppy controllers per virtual machine	1
Floppy devices per virtual machine	2
<b>Networking Virtual Devices</b>	
Virtual NICs per virtual machine	10
<b>Virtual Peripheral Ports</b>	
USB controllers per virtual machine	1

**Table 1.** Virtual Machine Maximums (Continued)

Item	Maximum
USB devices connected to a virtual machine	20
Parallel ports per virtual machine	3
Serial ports per virtual machine	4
<b>Miscellaneous</b>	
Concurrent remote console connections to a virtual machine	40
<ol style="list-style-type: none"> <li>Any combination of supported SCSI virtual storage controllers. Four Paravirtual SCSI adapters may be used only if the virtual machine boots from a device attached to an IDE controller, or from the network.</li> <li>Any combination of disk, CD-ROM or VMDirectPath SCSI target.</li> <li>Supports two channels (primary and secondary) each with a master and slave device.</li> </ol>	

## ESX Host Maximums

The following tables contain configuration maximums related to ESX hosts.

- [“Compute Maximums”](#) on page 2
- [“Memory Maximums”](#) on page 3
- [“Storage Maximums”](#) on page 3
- [“Networking Maximums”](#) on page 4
- [“Resource Pool and Cluster Maximums”](#) on page 5

## Compute Maximums

[Table 2](#) contains configuration maximums related to ESX host compute resources.

**Table 2.** Compute Maximums

Item	Maximum
<b>Host CPU maximums</b>	
Logical CPUs per host	up to 160 <sup>1</sup>
<b>Virtual machine maximums</b>	
Virtual machines per host	320
Virtual CPUs per host	512
Virtual CPUs per core	25 <sup>2</sup>
<b>Fault Tolerance maximums</b>	
Virtual disks	16
Virtual CPUs per virtual machine	1
RAM per FT VM (GB)	64
Virtual machines per host	4
<ol style="list-style-type: none"> <li>vSphere 4.1 supports up to 128, and vSphere 4.1 Update 1 supports up to 160.</li> <li>The achievable number of vCPUs per core depends on the workload and specifics of the hardware. For more information see the latest version of <i>Performance Best Practices for VMware vSphere</i>.</li> </ol>	

## Memory Maximums

Table 3 contains configuration maximums related to ESX host memory.

**Table 3.** Memory Maximums

Item	Maximum
RAM per host	1TB
Maximum RAM allocated to service console	800MB
Minimum RAM allocated to service console	272MB
Number of swap files	1 per virtual machine
Swap file size	Same as maximum virtual machine RAM

## Storage Maximums

Table 4 contains configuration maximums related to ESX host storage.

**Table 4.** Storage Maximums

Item	Maximum
<b>iSCSI Physical</b>	
LUNs per server	256
Qlogic 1Gb iSCSI HBA initiator ports per server	4
Broadcom 1Gb iSCSI HBA initiator ports per server	4
Broadcom 10Gb iSCSI HBA initiator ports per server	4
NICs that can be associated or port bound with the software iSCSI stack per server	8
Number of total paths on a server	1024
Number of paths to a LUN (software iSCSI and hardware iSCSI)	8
Qlogic iSCSI: dynamic targets per adapter port	64
Qlogic iSCSI: static targets per adapter port	62
Broadcom 1Gb iSCSI HBA targets	64
Broadcom 10Gb iSCSI HBA targets	64
Software iSCSI targets	256 <sup>1</sup>
<b>NAS</b>	
NFS mounts per host	64
<b>Fibre Channel</b>	
LUNs per host	256
LUN size	2TB minus 512 bytes
LUN ID	255
LUNs concurrently opened by all virtual machines	256
Number of paths to a LUN	32
Number of total paths on a server	1024
Number of HBAs of any type	8
HBA ports	16
Targets per HBA	256

**Table 4. Storage Maximums (Continued)**

Item	Maximum
<b>VMFS</b>	
Raw device mapping (RDM) size	2TB minus 512 bytes
Volume size	64TB
Volumes per host	256
Hosts per volume	64
<b>VMFS-3</b>	
Block size	8MB
File size (1MB block size)	256GB
File size (2MB block size)	512GB
File size (4MB block size)	1TB
File size (8MB block size)	2TB minus 512 bytes
Files per volume	Approximately 30,720
1. The sum of static targets (manually assigned IP addresses) and dynamic targets (IP addresses assigned to discovered targets) may not exceed this number.	

## Networking Maximums

The following limits represent achievable maximum configuration limits for networking in environments where no other more restrictive limits apply (for example, vCenter Server limits, the limits imposed by features such as HA or DRS, and other configurations that might impose restrictions must be considered when deploying large scale systems).

For additional information about these maximums, see [KB 1020808](#).

[Table 5](#) contains configuration maximums related to ESX host networking.

**Table 5. Networking Maximums**

Item	Maximum
<b>Physical NICs</b>	
e1000 1GB Ethernet ports (Intel PCI-x)	32
e1000e 1GB Ethernet ports (Intel PCI-e)	24
igb 1GB Ethernet ports (Intel)	16
tg3 1GB Ethernet ports (Broadcom)	32
bnx2 1GB Ethernet ports (Broadcom)	16 <sup>1</sup>
forcedeth 1GB Ethernet ports (NVIDIA)	2
s2io 10GB Ethernet ports (Neterion)	4
nx_nic 10GB Ethernet ports (NetXen)	4
ixgbe Oplin 10GB Ethernet ports (Intel)	4
bnx2x 10GB Ethernet ports (Broadcom)	4
Infiniband ports (refer to VMware Community Support)	N/A <sup>2</sup>
<b>VMDirectPath limits</b>	
VMDirectPath PCI/PCIe devices per host	8
VMDirectPath PCI/PCIe devices per virtual machine	4 <sup>3</sup>

**Table 5.** Networking Maximums (Continued)

Item	Maximum
<b>vNetwork Standard and Distributed Switch</b>	
Total virtual network switch ports per host (vDS and vSS ports)	4096 <sup>4</sup>
Maximum ACTIVE ports per host (vDS and VSS)	1016
Virtual network switch creation ports per standard switch	4088
Port groups per standard switch	512
Static or Dynamic Port groups per distributed switch	5000
Ephemeral Port groups per distributed switch	1016
Ports per distributed switch	20000
Distributed virtual network switch ports per vCenter	20000
Static or Dynamic Port groups per vCenter	5000
Ephemeral Port groups per vCenter	1016
Distributed switches per vCenter	32
Distributed switches per Host	16
Hosts per distributed switch	350
<ol style="list-style-type: none"> <li>1. Recommended number of ports for bnx2 when in MSI-X mode and jumbo configuration is 6. This value takes precedence over recommendations in <a href="#">KB 1020808</a> for this configuration.</li> <li>2. Mellanox Technologies InfiniBand HCA device drivers are available directly from Mellanox Technologies. Refer to Mellanox for support status of InfiniBand HCAs with ESX. <a href="http://www.mellanox.com">http://www.mellanox.com</a></li> <li>3. A virtual machine can support 6 devices, if 2 of them are Teradici devices.</li> <li>4. Default is 256 with a maximum of 15 VDS's running concurrently. If the number of ports is increased to 4096, then only one VDS can exist on the host.</li> </ol>	

## Resource Pool and Cluster Maximums

[Table 6](#) contains configuration maximums related to ESX host resource pools and clusters.

**Table 6.** Cluster Maximums

Item	Maximum
<b>Cluster (all clusters including HA and DRS)</b>	
Hosts per cluster	32
Virtual machines per cluster	3000
Virtual machines per host	320
Maximum concurrent host HA failover	4
Failover as percentage of cluster	50%
Resource pools per cluster	512
<b>Resource Pool</b>	
Resource pool tree depth	8 <sup>1</sup>
Resource pools per host	4096
Children per resource pool	1024
<ol style="list-style-type: none"> <li>1. Additional 4 resource pools are used by system internals</li> </ol>	

## Using Maximum Values for More than One Configuration Option

If any one of the configuration options listed in the above tables is used at its maximum limit value, the ESX host and vCenter Server with default configuration should be able to withstand the values.

If more than one configuration options (such as, number of virtual machines, number of LUNs, number of vDS ports etc.) are used at their maximum limit, some of the processes running on the host might run out of memory. This might cause the host to keep disconnecting from the vCenter Server. In such a case, you need to increase the memory pool for these host processes so that the host can withstand the workload you are planning. You need to increase your memory pool size in correlation to the number of configuration options you are using at the maximum value.

## vCenter Server Maximums

Table 7 contains configuration maximums related to vCenter Server.

**Table 7.** vCenter Server Maximums

Item	Maximum
<b>vCenter Server Scalability</b>	
Hosts per vCenter Server	1000
Powered on virtual machines per vCenter Server	10000
Registered virtual machines per vCenter Server	15000
Linked vCenter Servers	10
Hosts in linked vCenter Servers	3000
Powered on virtual machine in linked vCenter Servers	30000
Registered virtual machine in linked vCenter Servers	50000
Concurrent vSphere Clients	100
Number of host per datacenter	400
<b>Default Concurrent Operations</b>	
Concurrent provisioning operations per host	4
Concurrent vMotion operations per host (1Gb/s network)	4 <sup>1</sup>
Concurrent vMotion operations per host (10Gb/s network)	8 <sup>1</sup>
Concurrent vMotion operations per VMFS3 datastore <sup>2</sup>	128
Concurrent Storage vMotion operations per host	2
Concurrent Storage vMotion operations per datastore <sup>2</sup>	8
<ol style="list-style-type: none"> <li>1. Concurrent vMotion operation is currently supported only when source and destination hosts are in the same cluster.</li> <li>2. Implement these limits to prevent overloading the hosts and datastores. The limit values are configurable. The default limits listed are based on typical virtual machine and typical host and storage configurations. Customers with high-end hosts and storage or small virtual machines might want to increase these default limits after validating their environment is capable of supporting the higher loads.</li> </ol>	

## vCenter Server Extensions

The following tables contain configuration maximums related to vCenter Server extensions.

- [“VMware vCenter Update Manager”](#) on page 7
- [“VMware vCenter Orchestrator”](#) on page 7
- [“VMware vCenter Converter”](#) on page 8
- [“vSphere Storage Management Initiative - Specification \(SMI-S\)”](#) on page 8

## VMware vCenter Update Manager

Table 8 contains configuration maximums for vCenter Update Manager.

**Table 8.** vCenter Update Manager Maximums

Item	Maximum
<b>vCenter Update Manager Scalability</b>	
Host scans in a single vCenter Server	1000
Virtual machine scans in a single vCenter Server	10000
Cisco VDS update and deployment	70
<b>Concurrent Operations</b>	
Virtual machine remediation per ESX host	5
Powered-on Windows virtual machine scans per ESX host	5
Powered-off Windows virtual machine scans per ESX host	5
Powered-on Linux virtual machine scans per ESX host	2
VMware Tools scan per ESX host	24
VMware Tools upgrade per ESX host	24
Virtual machine hardware scan per host	24
Virtual machine hardware upgrade per host	24
Virtual machine remediation per VUM server	48
Powered-on Windows virtual machine scan per VUM server	17
Powered-off Windows virtual machine scan per VUM server	10
Powered-on Linux virtual machine scan VUM server	8
VMware Tools scan per VUM server	75
VMware Tools upgrade per VUM server	75
Virtual machine hardware scan per VUM server	75
Virtual machine hardware upgrade per VUM server	75
ESX host scan per VUM server	70
ESX host remediation per VUM server	8
ESX host upgrade per VUM server	44
ESX host upgrade per cluster	1

## VMware vCenter Orchestrator

Table 9 contains configuration maximums for vCenter Orchestrator.

**Table 9.** vCenter Orchestrator Maximums

Item	Maximum
Connected vCenter Server systems	10
Connected ESX/ESXi instances	100
Connected virtual machines	15000 <sup>1</sup>
Concurrent running workflows	150
1. Virtual machines spread across 10 vCenter Servers	

## VMware vCenter Converter

[Table 10](#) contains configuration maximums for vCenter Converter.

**Table 10.** vCenter Converter Maximums

Item	Maximum
Concurrent virtual machine to virtual machine import or export tasks	8
Concurrent physical machine to virtual machine import or export tasks	20

## vSphere Storage Management Initiative - Specification (SMI-S)

[Table 11](#) contains configuration maximums for vSphere SMI-S.

**Table 11.** vSphere SMI-S Maximums

Item	Maximum
Number of vCenter Server systems connected	1
Number of ESX/ESXi hosts connected	1000
Number of ESX/ESXi hosts managed by vCenter Server	320
Number of virtual machines registered in vCenter Server	15000

---

If you have comments about this documentation, submit your feedback to: [docfeedback@vmware.com](mailto:docfeedback@vmware.com)

**VMware, Inc. 3401 Hillview Ave., Palo Alto, CA 94304 [www.vmware.com](http://www.vmware.com)**

Copyright © 2010, 2011 VMware, Inc. All rights reserved. This product is protected by U.S. and international copyright and intellectual property laws. VMware products are covered by one or more patents listed at <http://www.vmware.com/go/patents>. VMware is a registered trademark or trademark of VMware, Inc. in the United States and/or other jurisdictions. All other marks and names mentioned herein may be trademarks of their respective companies.

Item: EN-000385-03

---