

# vtServer<sup>®</sup>

## vtAlpha/vtVAX Bare Metal

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### Running vtServer on Hypervisors

BN-0001-10

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Technical Note

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## Table of Contents

<b>1.</b>	<b>Installing vtServer on a Hypervisor .....</b>	<b>1</b>
1.1.	Impact of Running on a Virtual Host .....	2
1.2.	Virtual Host Criteria.....	3
1.3.	Performance .....	3
1.4.	Shared Resources .....	3
1.5.	CPU Requirements .....	3
1.6.	USB Port.....	4
1.7.	Storage .....	5
1.8.	Symmetric Multiprocessing (SMP).....	6
1.9.	Licensing .....	7
1.10.	vtServer Software Installation .....	7
1.11.	Hypervisor-specific Information .....	8
1.12.	VMware .....	8
1.13.	Storage .....	9
1.14.	Network .....	10
1.15.	License Key .....	11
1.16.	VMware Tools.....	12
1.17.	Hyper_V.....	12
1.18.	Storage .....	12
1.19.	Network .....	13
1.20.	USB License / Network License.....	13
1.21.	KVM.....	13

## 1. Installing vtServer on a Hypervisor

The vtServer host may be a physical system or it may be virtualized using VMware, Hyper-V, or KVM.

vtServer installs on Bare Metal. That is, there is no operating system running on the x86 host system. This is similar to other hypervisors such as VMware ESX, Citrix XenServer, and Microsoft Hyper-V. Advantages of the Bare Metal approach versus running as an application on a general purpose operating system include:

- |                        |   |
|------------------------|---|
| <b>Maintainability</b> | There is no external operating system to be updated and maintained separately from the vtServer environment.  |
| <b>Reliability</b>     | Only the necessary components are included in the bundled operating environment, which is integrated and tested with the emulation layer. There are no other users on the system to affect performance, stability, or the virtual Alpha/VAX operating environments. |
| <b>Security</b>        | At installation, vtServer has only three network ports enabled: 80 (HTTP) and 443 (HTTPS) for the vtMonitor management interface, and 22350 for license verification.<br>Users must 'opt-in' to use additional ports.   |

## 1.1. Impact of Running on a Virtual Host

Placing an x86 hypervisor between vtServer and the physical hardware negates to an extent some of the advantages of the Bare Metal environment noted above:

<b>Hardware Control</b>	The x86 hypervisor has direct control of the physical hardware. It may impose constraints that are not compatible with the way vtServer uses the hardware. Some issues of this nature and workarounds for them are discussed in the sections below.
<b>Performance</b>	The x86 hypervisor itself consumes some system resources. In addition, there are often other guest systems running at the same time as vtServer. If the resources are not allocated properly, as explained below, this can impact the performance of the virtual Alpha and VAX systems. Nevertheless, this option is reliable and popular, especially in large datacenters.
<b>Maintainability</b>	The x86 hypervisor is a software layer that can be updated independent of vtServer. While it is not expected, updates to the x86 hypervisor could impact vtServer. Always check with AVT, VERE or your reseller before upgrading hypervisors.
<b>Alpha and VAX System Stability</b>	The vtServer user interface contains safeguards to prevent the emulated Alpha and VAX systems from being shut down unintentionally when the operator is managing the vtServer host system. However, when the vtServer host is virtualized, the x86 hypervisor operator has ultimate control of the virtual host system and can shut it down unexpectedly while the virtual Alpha or VAX systems are running.

## 1.2. Virtual Host Criteria

When configuring the physical host system that the x86 virtual machine will run on, the following details should be considered.

## 1.3. Performance

The maximum achievable performance running vtServer on a virtual host will be somewhat less than that achieved when running on a physical host using the same hardware platform due to the hypervisor overhead. Typically, I/O performance will be impacted more than CPU performance.

The hypervisor overhead varies considerably depending on a number of factors, such as the hypervisor used, the virtual host configuration, and the nature of the workload. Because of this variability, we are not able to estimate the hypervisor overhead.

## 1.4. Shared Resources

When other guest systems will execute on the same x86 host system, CPU-, memory-, and network-resource reservations should be made for the VM used for the vtServer host to ensure that critical hardware resources are always available when needed.

*Sharing of these critical resources with other VMs can result in unpredictable performance and a possible unstable operation of the virtual Alpha or VAX system.*

## 1.5. CPU Requirements

The minimum CPU requirement for each virtual machine is 1.5 virtual CPU cores per virtual Alpha CPU or two cores for each virtual VAX CPU; additional cores may improve performance and avoid resource shortages on systems with heavy I/O loads.

Hyper-threaded CPUs should have *hyper-threading disabled* in the host system BIOS or UEFI. This is to prevent logical threads (which have lower and less predictable performance than the physical cores) from being assigned to a virtual machine. Performance degradation of over 75% has been observed as a result of running vtAlpha/vtVAX on hosts with hyper-threading enabled.

## 1.6. USB Port

If network license servers are not available to provide access to the vtAlpha and vtVAX license information, a dedicated USB port must be provided on the physical host and dedicated to the guest VM that will run vtServer. Please see the Licensing section below and the applicable hypervisor-specific section for considerations and restrictions pertaining to the USB port.



USB ports can also be used to connect external disks. These can be used by vtServer.

## 1.7. Storage

vtServer supports a variety of storage backends, including storage technologies that were not available on physical VAX or Alpha hardware.

The table below shows the supported storage options for various configurations when running on a physical vtServer host vs. running on a virtual host for both standalone and clustered environments:

	Standalone		Clustered same host		Clustered multi host	
	KZPBA/VTD SK	KGPS A	KZPBA/VTD SK	KGPS A	KZPBA/VTD SK	KGPSA
<b>Local Disk</b>						
Container File	Y	Y	Y	Y	X	X
Physical Disk	Y	Y	Y	Y	X	X
<b>SAN Volume</b>						
Container File	Y	Y	Y	Y	X	X
Physical Disk	Y	Y	Y	Y	P(2); V(2,3)	P(2); V(2,3)
Direct Access	X	P; V(1)	X	P;V(1)	X	P; V(1)
<b>iSCSI Volume</b>						
Container File	Y	Y	Y	Y	X	X
Physical Disk	Y	Y	Y	Y	P(2); V(2,3)	P(2); V(2,3)
<b>NFS Mount Point</b>						
Container File	Y	Y	Y	Y	Y(2)	Y(2)

### Legend:

- Y supported on both physical and virtual vtServer hosts
- P supported on physical vtServer hosts only
- V supported on virtual vtServer hosts only
- X unsupported

- 1 only FC card with PCI pass-through (VMware)
- 2 cache must be disabled
- 3 only with RAW mapping mode
- KZPBA SCSI adapter
- KGPSA Fiber Channel adapter

## 1.8. Symmetric Multiprocessing (SMP)

When running on multiprocessor configurations, OpenVMS performs frequent checks to ensure that all processors are functioning and that there are no synchronization deadlocks. If abnormal conditions are detected, the system will crash with a CPUSANITY or CPUSPINWAIT bugcheck.

When an emulated multiprocessor Alpha or VAX system is running on a virtual host, certain events, most notably a host migration (e.g., using VMware vMotion), can cause the virtual machine execution to stall long enough for the SMP sanity timers to expire when set to their default values.

To reduce the risk of OpenVMS bugchecking in these situations, we recommend that the following SYSGEN parameter (in OpenVMS) changes should be made:

**SMP\_SPINWAIT**      increase from 100000 (1 second) to a value between 3000000 (30 seconds) and 6000000 (60 seconds)

**SMP\_SANITY\_CNT**    increase from 300 (3 seconds) to a value between 3000 (30 seconds) and 6000 (60 seconds)

These changes should be added to SYS\$SYSTEM:MODPARAMS.DAT, and then AUTOGEN should be run so they will take effect the next time the system is restarted.



When using SMP it is a good idea to change the OpenVMS system parameters SMP\_SPINWAIT and SMP\_SANITY\_CNT to the recommend values.  
Not only on VMWare installations.



## 1.9. Licensing

The vtAlpha and vtVAX license information is stored on a physical USB license key. In some situations (e.g., the hardware has no available USB port or the x86 hypervisor does not support attaching USB ports to virtual machines) it may not be possible to provide a USB port for the license key on the vtServer host.



In high availability and disaster resilient configurations using live host migration features such as VMware vMotion, it is desirable for the license key to be accessible to multiple host systems.

The **vtLicense** server is a *standalone network appliance* that can host multiple license keys (both production and disaster recovery licenses), making the license content of these keys available across the network. Virtual Alpha and VAX systems can fail over or be migrated between multiple physical hosts without having to move the USB license keys.

More information about the vtLicense server is available on our web site.

## 1.10. vtServer Software Installation

A dedicated (virtual) disk of at least 40GB should be provided for the vtServer software installation. This disk should not be used for storing logical disk container files or other user data, to avoid data loss if the vtServer software must be re-installed at a later time.



If possible use a dedicated disk for vtServer. Store data and logical disk containers on other disks. This gives more flexibility.

## 1.11. Hypervisor-specific Information

vtServer can be used on many hypervisors.

vtServer is tested on the following hypervisors:

- VMware
- Hyper-V
- KVM

## 1.12. VMware

Supported versions: ESXi 4.1 and higher.



We discourage the use of a local USB license with VMware ESXi versions **prior to 5.5** because VMware occasionally loses connection to USB devices, resulting in license problems.

A vtLicense server is recommended for all VMware environments to facilitate migration of the vtServer host across VMware hosts



When using VMware prior to version 5.5 a vtLicense server is recommended to avoid license loss.

## 1.13. Storage

Supported Storage Controllers in VMware are:

- LSI Logic Parallel (recommended)
- LSI Logic SAS
- VMware Paravirtual

Unsupported Storage Controllers are:

- BusLogic Parallel

## 1.14. Network

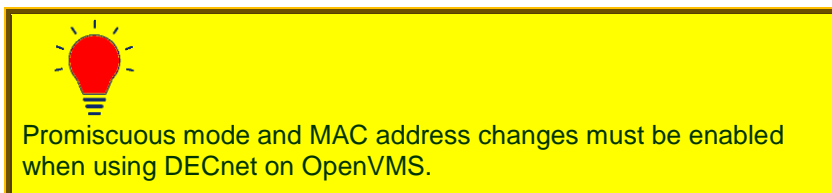
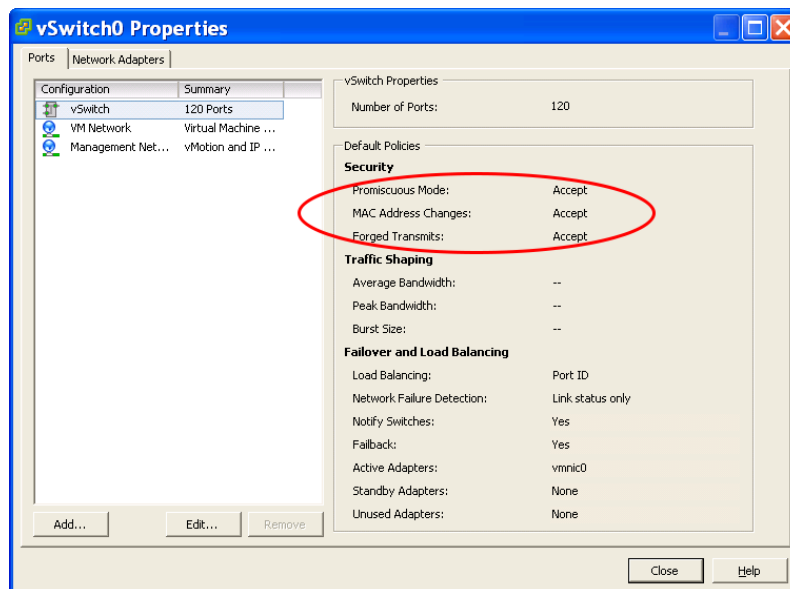
Supported Network Adapters in VMware are:

- E1000 (recommended)
- E1000E
- VMXNET 3

Unsupported Network Adapters are:

- VMXNET 2 (enhanced)

The adapters used for vtVAX or vtAlpha must have **Promiscuous Mode**, **MAC Address Changes** and **Forged Transmits** enabled on the vSwitch in VMware, as shown below.



## 1.15. License Key

When running VMware ESX 5.5 or newer, a USB port can be assigned to the vtServer host VM to use for the vtServer license key. This is not recommended with VMware ESX versions prior to 5.5 because the USB device can become detached from the VM, resulting in a loss of the vtServer license with eventual shut down of the vtAlpha or vtVAX emulations if the problem is not corrected within the allowed time (16 hours).


The VMware vMotion feature can be used to improve availability and disaster tolerance of the virtual Alpha and VAX systems by allowing the vtServer host with running emulations to be migrated between VMware host systems. When vMotion is used, we recommend the use of a vtLicense server to provide access to the license keys via the network, removing dependence on a specific host system.

## 1.16. VMware Tools

The VMware Tools package provides operations like shutdown or restart Guest OS.

When vtServer is installed on a VMware machine, the option to start or stop VMware Tools is available in the Console menu and in the vtMonitor menu.

Host Services		
Host services	Running	Auto-start
ftp	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
multipath	<input type="checkbox"/>	<input type="checkbox"/>
nfs	<input type="checkbox"/>	<input type="checkbox"/>
ssh	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
smb	<input type="checkbox"/>	<input type="checkbox"/>
snmp	<input type="checkbox"/>	<input type="checkbox"/>
vtscan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
vmware	<input type="checkbox"/>	<input type="checkbox"/>



## 1.17. Hyper\_V

Supported versions: Hyper-V 2012, Hyper-V Core, and Hyper-V 2016

## 1.18. Storage

Supported Storage Controllers in Hyper-V are:

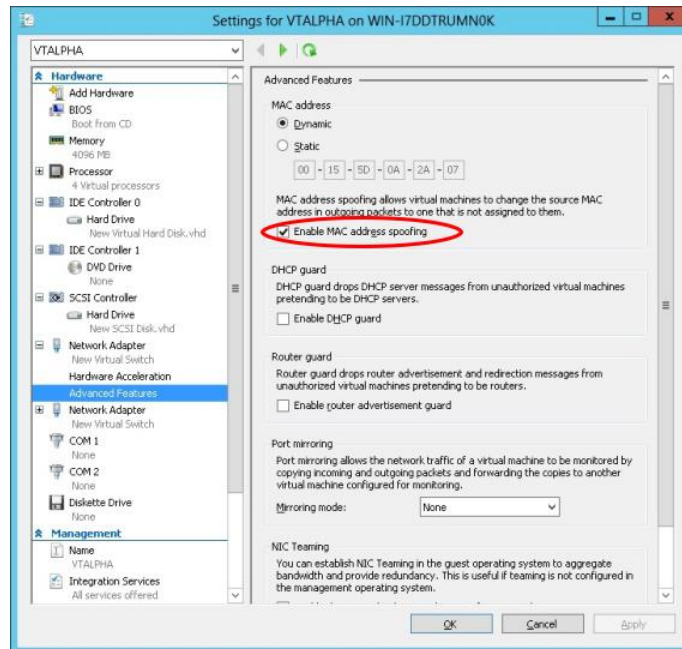
- IDE (recommended)
- SCSI (only for data; Hyper-V cannot boot from SCSI)

## 1.19. Network

Supported Network Adapters in Hyper-V are:

- Hyper-V NIC
- Legacy NIC

The adapters used for vtVAX or vtAlpha must have **MAC address spoofing** enabled on the network adapter in Hyper-V.



## 1.20. USB License / Network License

Hyper-V does not support attaching physical USB devices to virtual machines; therefore, a remote license server is required. The remote license server may be a dedicated vtLicense server or another vtServer host that has a free USB port.

## 1.21. KVM

vtServer supports **virtio** for disks, which may, in some cases, improve disk I/O performance when running vtServer on a virtual host under KVM.