Virtualization Hardware and Software Requirements and Configuration Guide

PowerSchool 10.x
Student Information System

Contents

Introduction

Virtualization within IT environments has become a popular concept to reduce costs through server consolidation. VMware vSphere®, and Microsoft Hyper-V (among others) can be successfully used to virtualize PowerSchool related servers.

The purpose of this document is to provide PowerSchool customers with an understanding of the appropriate usage and valid configuration methods for utilizing virtualization with PowerSchool. Customers should be familiar with the PowerSchool environment components found in the *PowerSchool Hardware and Software Requirements*, available on **PowerSource**.

For information on how to install and configure these virtualization technologies, consult the virtualization software provider's user guides.

The following configuration scenarios are valid for utilizing virtualization with PowerSchool:

- A single school district with enrollments fewer than 3,000 students can utilize virtualization to deploy a single Microsoft Windows server solution with the Oracle database and PowerSchool Tomcat application node residing on the same virtual server.

- A single school district with enrollments of 3,000 to 7,000 students can utilize virtualization to deploy a two server Microsoft Windows solution with the Oracle database and PowerSchool Tomcat application node residing on separate virtual servers. One virtual server supports the Oracle database; the other supports the PowerSchool Tomcat application node.

- A single school district with enrollments over 7,000 students can utilize virtualization to deploy virtualized PowerSchool Tomcat application node(s), a virtualized PowerSchool database server, and a virtualized PowerSchool image server. In this scenario, one virtual server supports the Oracle database; the other virtual servers support the PowerSchool Tomcat application node(s).

- PowerSchool non-production test bed server deployments.

This document describes hardware and configuration guidelines for implementing PowerSchool within a virtualization environment, but does not provide step-by-step instructions on how to install or configure the virtualization product. The equipment and operating systems listed herein are required to ensure system usability and a quality user experience. PowerSchool Technical Support does not provide any support for configuring or troubleshooting virtualized environments.

PowerSchool does offer customers consulting services to design, integrate, and support various virtualization solutions. Contact your PowerSchool sales representative at 877-873.1550 or email **TSGHelpDesk@powerschool.com** for further details.

Additional hardware and software may be required for customized installation configurations. The requirements contained in this document may not meet specifications for future releases of PowerSchool. Please consult with a PowerSchool account representative prior to purchasing any equipment.

Important Notes:

- This document is intended for system administrators. To use this document, you must be familiar with virtualization technologies.

- This document is designed to assist customers with system configuration guidance for virtualized PowerSchool environments.

- When provisioning hardware to host support virtual PowerSchool server(s), ensure that the physical server has ample resources available to support the virtual PowerSchool server(s). Virtual PowerSchool server(s) should meet the requirements referenced in the *PowerSchool Hardware and Software Requirements*, available on **PowerSource**.

- PowerSchool has been successfully virtualized with VMware vSphere® and Microsoft Hyper-V platforms. While other third-party virtualization products may work, PowerSchool does not endorse or provide direct support for any third-party virtualization products.

- This document addresses the configuration of VMware vSphere® and Microsoft Hyper-V. The fundamentals of virtualization can be applied to other third-party virtualization products.

- This document does not cover advanced virtualization features of VMware vSphere® or additional components and configurations such as High Availability (HA), Live Migration, or Dynamic Resource Allocation (DRS). Contact your PowerSchool sales representative at 877.873.1550 or email **TSGHelpDesk@powerschool.com** for consultative services on these advanced features.

- This document does not cover advanced virtualization features of Microsoft Hyper-V or additional components and configurations such as Live Migration with Clustering. Please contact your PowerSchool sales representative at 877.873.1550 or email **TSGHelpDesk@powerschool.com** for consultative services on these advanced features.

- iSCSI and Fiber Channel Storage Area Network (SAN) may be used to store the virtual machine files.
- This document does not capture storage requirements as it relates to virtual machine snapshots or cloning. If you intend on using virtual machine snapshots or cloning, ensure you have ample storage for those requirements.

- All virtual PowerSchool server(s) must be running Windows Server 2012 R2 (English Version) as the virtual operating system.

- This document captures virtualization configurations for up to 15,000 students. While it is possible for districts with over 15,000 students to virtualize the PowerSchool database server, the PowerSchool Quality Assurance and Performance Team routinely tests server resource requirements for district over 15,000 students utilizing physical server hardware for the PowerSchool database server. For this reason, it is recommended that districts with over 15,000 students utilize physical server hardware for the PowerSchool database server to achieve greater performance. For districts with over 15,000 students that wish to deploy a virtual database server, contact your PowerSchool sales representative at 877-873-1550, or email **TSGHelpDesk@powerschool.com** for a more tailored configuration.

VMware vSphere®

VMware vSphere® is a bare metal hypervisor that is installed directly on the server hardware. VMware vSphere® offers ESX and ESXi architecture and has several editions to choose from.

VMware ESX Architecture utilizes the virtualization kernel (referred to as the vmkernel) with a management partition known as the console operating system (also known as COS or service console). The primary purpose of the Console OS is to provide a management interface into the host.

VMware ESXi Architecture removes the Console OS and all of the VMware agents run directly on the vmkernel. Infrastructure services are provided natively through modules included with the vmkernel. Only modules that have been digitally signed by VMware are allowed on the system, creating a tightly locked-down architecture that provides improvements to the security of the system.

VMware vSphere® has several editions to choose from. Each edition offers advanced features that should coincide with your desired deployment and specific needs. VMware vSphere Standard Edition is the most commonly used edition for deployments that utilize a single VMware vSphere host with local storage. VMware vSphere Enterprise Edition is the most commonly used edition for deployments that utilize a multiple VMware vSphere host(s) with shared storage.

VMware® vCenter Server™ is used to centrally manage multiple VMware vSphere hosts. VMware® vCenter Server™ also gives administrators control over key capabilities such as VMware vMotion, Distributed Resource Scheduler, High Availability and Fault Tolerance.

The VMware vSphere® environment does not need to be dedicated exclusively to virtualized PowerSchool servers but you need to ensure there are ample resources available to the virtualized PowerSchool servers.

Microsoft Hyper-V Server

Microsoft Hyper-V is a hypervisor-based server virtualization technology offered by Microsoft. Microsoft Hyper-V can be either a Server Core or Full Installation of Microsoft Windows Server that gets installed as the host operating system.

The Server Core installation option of the Windows Server operating system installs a minimal server installation of Windows Server to run the Hyper-V Server Role. With this option, Windows installs only the files that are required for the supported Hyper-V Server Role. The benefits of using the Server Core installation include a reduced attack surface, reduced management, and reduced maintenance.

The Full Installation (Server with a GUI) option of the Windows Server operating system installs the full server installation of Windows Server. The Hyper-V Server Role can be chosen as a Server Role once the full installation is complete. The benefits of using the Full Installation configuration is that it provides a traditional full graphical user interface.

Microsoft Hyper-V also offers advanced features such as Live Migration, Cluster Shared Volumes, and Dynamic Memory. Hyper-V Live Migration in conjunction with Clustering allows you to move running virtual machines from one Hyper-V physical host to another, without any disruption of service. To utilize the Hyper-V Live Migration feature you must utilize shared storage with Microsoft Clustering. With Dynamic Memory the virtual machine memory can be dynamically reallocated between different virtual machines in response to the changing workloads of the virtual machines.

System Center Virtual Machine Manager allows you to centrally manage multiple Microsoft Hyper-V hosts. Virtual Machine Manager also manages the Live Migration of virtual machines.

The Microsoft Hyper-V environment does not need to be dedicated exclusively to virtualized PowerSchool servers but you need to ensure there are ample resources available to the virtualized PowerSchool servers.

Virtual Machine Requirements

The virtual hardware assigned to virtualized PowerSchool servers must meet the requirements referenced in the PowerSchool Hardware and Software Requirements, available on **PowerSource**.

Server Type	Hardware	Minimum	Recommended
PowerSchool All-in-One Solution Server (Up 3,000 Students)	Virtual CPU	(8) vCPUs	(12) vCPUs
	Virtual RAM	16GB vRAM	16GB vRAM
	Virtual Disk	160GB vDisk	350GB vDisk
PowerSchool Application Node	Virtual CPU	(8) vCPUs	(12) vCPUs
	Virtual RAM	16GB vRAM	16GB vRAM
	Virtual Disk	60GB vDisk	100GB vDisk
PowerSchool Database Server (3,000 to 7,000 Students)	Virtual CPU	(8) vCPUs	(12) vCPUs
	Virtual RAM	16GB vRAM	16GB vRAM
	Virtual Disk	150GB vDisk	400GB vDisk
PowerSchool Database Server (7,000 to 15,000 Students)	Virtual CPU	(12) vCPUs	(16) vCPUs
	Virtual RAM	16GB vRAM	16GB vRAM
	Virtual Disk	300GB vDisk	500GB vDisk
PowerSchool Image Server	Virtual CPU	(2) vCPUs	(4) vCPUs
	Virtual RAM	4GB vRAM	8GB vRAM
	Virtual Disk	60GB vDisk	100GB vDisk
PowerSchool Non-Production Server	Virtual CPU	(4) vCPUs	(8) vCPUs
	Virtual RAM	16GB vRAM	16GB vRAM
	Virtual Disk	160GB vDisk	300GB vDisk

*Solid State Drives (SSD) recommended for optimal performance.

**Virtual Non-Production Server Virtual Disk space may vary between districts.

Appendix A – Virtualized Configuration

Planning your virtualized environment involves detailing all aspects of the hardware and software deployment as well as server resource utilization. The virtualized hardware must meet the PowerSchool system requirements regardless whether the deployment is virtualized or physical. Each district will vary in configurations, however the information listed below should be used as a guideline when provisioning hardware and software to support virtualization with PowerSchool. When provisioning hardware for virtualization you should always check with the virtualization software provider to ensure the hardware you intend to use with the virtualization hosts is compatible with the virtualization software you intend to use.

Processor Guidelines

- Ensure the virtualization software provider's licensing model covers the number of Cores per Processor you intend to use on the Virtualization host.

- Ensure the processor models you intend to use on the virtualization host are listed on the virtualization software provider's compatibility list.

- If utilizing fail over capabilities between virtualization hosts, utilize the same processor model in all of your virtualization hosts.

- Utilize processor models that support 20M Cache and at least 1600MHz Max Memory speeds.

- Utilize processor models that support Hyper-Threading Technology.

- Enable Virtualization Technology features on physical hosts that support virtual PowerSchool servers. Refer to your hardware manufacture's documentation to enable the Virtualization Technology option in the BIOS.

Network Connectivity Guidelines

For optimal network performance in a virtualized environment it is recommended that the virtualized host be configured with at least two network cards (ports).

- Utilize Gigabit (GbE) network cards that are capable of TCP Offload Engine (TOE) features on the host server whenever possible. This will offload TCP/IP check sum operations from the CPU to the network adapter.

- Configure separate network adapters or ports for virtual host management and virtual machine traffic.

- Configure separate network adapters for iSCSI connections.

- Ensure physical switch ports are set to the same speed and duplex settings as the physical NIC.

- The latest drivers from the manufacture should also be applied on the physical host.

- For VMware deployments, utilize VMXNET3 virtual network adapters or greater.

- Converged Networking deployments should utilize 10GbE.

- If at all possible, enable the use of Jumbo Frames on the interface utilized for iSCSI.

Memory Guidelines

- Ample memory should be provisioned based upon the number of virtual machines being deployed.

- Avoid over committing the amount of physical RAM in the host to the total amount of virtual machine memory being allocated.

- When provisioning the amount of physical RAM on the host be sure to include any Virtual Machine Memory overhead that may be required.

Disk Subsystem Guidelines

- When deploying the disk subsystem to house virtual machine files, consider utilizing multiple disks in a RAID configuration with the fastest disk speeds available to reduce disk contention. Utilize 15k SAS drives or solid-state drive (SSD) technology for optimal performance. Serial ATA (SATA) drives are not recommended as they will dramatically degrade virtualization performance.

- When utilizing a Storage Area Network (SAN) to house virtual machine files, utilize a traditional SAN solution with dedicated controllers that support hardware RAID levels.

- Ensure your disk controller is on the virtualization software provider's compatibility list.

- Allocate ample storage for the virtual machine guest operating systems, as well as the PowerSchool application, database, and backups. Virtual machine files are stored as virtual machine disk format (VMDK) files on the host VMFS volumes. Each virtual machine creates its own swap file when the virtual machine is initially started. For this reason be sure to allocate overhead on the host storage when creating virtual disks.

- With Microsoft Hyper-V deployments ensure ample storage is available on the host server to accommodate the Windows paging file.

- With Microsoft Hyper-V deployments ensure to deploy virtual machine files on separate NTFS partitions that are separate from the Host Windows Server operating system.

- Utilize fixed size / thick provisioned disks within the virtual machine for optimal performance.

- Do not utilize virtual SAN configurations across local server disks to house PowerSchool virtual machine files as this may impact performance due constant caching of data.

Microsoft Licensing

- Each Windows Server 2012 R2 license (Standard Edition or Datacenter Edition) covers up to two physical processors on a single server. Multiple Windows Server 2012 R2 licenses may be assigned to a single server to cover all physical processors.

- Windows Server 2012 R2 Standard edition will entitle you to run up to two (2) virtual machines per each license, per physical server.

- Windows Server 2012 R2 Datacenter edition will entitle you to run unlimited virtual machines per each license, per physical server.

- A Microsoft Windows External Connector License is also required **per physical server** since the server is a web application accessible from Internet to non-district employees (parents). A Windows External Connector License is not required for each virtual machine and does not replace actual Windows Client Access License (CAL) used by district personnel.

Appendix B – Virtualization Performance Tips

The performance tips listed below are intended to assist with configuring virtualized environments to support PowerSchool. Individual school policies and practices should be accounted for.

Virtualized Physical Host

- Utilize the fastest processors when available.

- Provision the proper amount of physical RAM to the physical server to accommodate all virtual machines plus any memory overhead required by the host.

- Utilize DDR4 memory with higher bandwidth.

- Utilize the fastest disks when provisioning the virtualized host, when possible.

- Utilize a high-performance disk controller with at least 1GB battery backed cache.

- In SAN deployments, spread I/O loads over multiple available paths to the SAN storage processors.

- Utilize GbE or 10GbE Ethernet adapters on the virtualized host.

- Ensure network card speed and duplex settings match the associated switch ports.

- Disable all power saving features on the network card(s).

- Disable any physical hardware in the server BIOS that will not be used, such as Floppy Drives, COM ports, USB ports, LPT ports, and unused storage controllers.

- Monitor and apply updates from the virtualization software provider for the host.

- After applying updates from the virtualization software provider for the host, ensure the virtual machines are updated as well (if applicable).

- Ensure the BIOS is not configured for any power saving features and should be configured for performance features.

- If utilizing VMware vSphere® ESXi, use the hardware manufacture's ESXi installation image for the installation of VMware vSphere® ESXi because it will contain the VMware vSphere® drivers that are specific to the hardware manufacturer.

- If at all possible enable the use of Jumbo Frames on the interface utilized for iSCSI SAN connections.

Virtual Machine Configurations

- Disable power management features.

- Disable any unneeded hardware on the virtual machine operating system (Device Manager) such as COM ports, LPT ports, floppy disk controllers.

- Remove any unneeded hardware on the virtual machine properties such as floppy disk controllers.

- Configure the virtual machines to power on in the proper order when the virtualized host is restarted.

- Configure virtual machine time synchronization to a valid NTP source.

- Within the virtual machine / virtual CPUs configuration mimic the physical characteristics of the host's physical processors. If the host contains (2) physical processors with multiple cores, the virtual machine should have (2) virtual processors assigned with applicable cores.

- Within the virtual machine / virtual disk(s) ensure the disks are "thick" provisioned rather than "thin" provisioned. This will essentially increases performance on the Oracle server so when the redo logs are written and database grows, it will not be affected by any latency waiting for the host Hypervisor to allocate disk space.

- For VMware deployments with the Database Server, configure the virtual machine / virtual SCSI controller to utilize Paravirtual (PVSCSI) instead of LSI Logic SAS as this will provide greater performance.

Appendix C – PowerSchool and Virtualized Server Environments

This guide outlines the virtual server environments known to be conducive with very specific large-scale implementations of PowerSchool. PowerSchool recognizes the benefits of leveraging server virtualization and the wide range of options available to our customers outside of this document as potentially viable solutions.

While we do not test and collect data for all virtualization technology solutions, we do believe that our application lends itself well to server virtualization, allowing it to make more efficient use of available hardware resources beyond what is sometimes possible with a single install on dedicated hardware. As a result, we encourage our customers to pursue virtualization technology solutions when they make sense for meeting business needs.

A note on technical support for PowerSchool in a virtualized server environment:

PowerSchool provides application support for PowerSchool when it has been deployed within a virtualized server environment. However, PowerSchool does not provide direct support for the configuration and performance of virtualization technology environment itself within the definition of PowerSchool Technical Support.

What does this mean?

If PowerSchool Support, through the course of a technical support interaction, suspects an application, performance, or stability issue related to inadequate system resources or virtualization, it would be the responsibility of the district server administrator to address these issues, whether the root of the issue be physical or virtual in nature. In the event that the cause of such an issue cannot otherwise be identified, it may ultimately become necessary to isolate the PowerSchool installation to dedicated hardware, removing virtualization from the environment, in order to rule out any virtualization-induced issues. If this becomes necessary, the customer will assume any and all responsibilities and/or costs associated with the redeployment of PowerSchool and its associated resources.

While PowerSchool promotes the use of its PowerSchool product in conjunction with server virtualization, PowerSchool assumes customer subject matter knowledge of, as well as ownership and responsibility for, the virtual-server solution on which it has been deployed.