Table of contents

Executive summary .......................................................................................................................... 2
Features and benefits of HP 3PAR Service Processor ................................................................. 2
Physical vs. virtual deployment of Service Processor ................................................................. 3
VSP requirements .......................................................................................................................... 3
VSP deployment best practices ..................................................................................................... 4
  Service Processor deployment mode ......................................................................................... 4
  Local notification service ......................................................................................................... 4
  System support information .................................................................................................... 5
  Remote support ....................................................................................................................... 6
Backup and restore for the VSP .................................................................................................... 7
Synchronizing clocks on the network .......................................................................................... 7
Account setup and usage for VSP access .................................................................................... 8
Protecting your VSP using VMware HA or Microsoft Failover Clustering .................................. 8
Hyper-V Integration Services and VMware tools deployment .................................................. 9
VSP networking configuration .................................................................................................... 9
Placement of the VSP in your environment ................................................................................. 9
  VSP and Hypervisor VM mobility .......................................................................................... 9
Summary ..................................................................................................................................... 10
Terminology .................................................................................................................................. 10
Executive summary

This technical white paper describes the best practices for implementing the HP 3PAR Virtual Service Processor (VSP) in an HP 3PAR StoreServ 7000 Storage environment. The technical audience of this document is intended for individuals who perform deployment or manage the VSP.

The HP 3PAR Service Processor (SP) software is available in both physical and virtual versions. The SP is designed to provide remote error detection, and reporting and to support diagnostic and maintenance activities involving the HP 3PAR Storage system. The data collected by the SP is used to maintain, troubleshoot, and upgrade the SP and HP 3PAR Storage system at the customer’s operating site.

The SP software is built on top of a Linux distribution. A custom distribution has been created that contains only those packages which are required to be included in the SP release. The physical SP is a hardware device mounted in the rack of HP 3PAR Storage system. If the customer chooses a physical SP, each storage system installed at the operating site includes a physical SP installed in the same cabinet as the system’s controller nodes. A physical SP uses two physical network connections; one interface requires a connection from the customer’s network in order to communicate with the HP 3PAR StoreServ Storage system. The other SP connection is for maintenance purposes only and is not connected to the customer’s network.

The Service Processor leverages the industry-standard HTTP over Secure Sockets Layer (SSL) protocol to protect and encrypt data communication.

The HP 3PAR Virtual Service Processor is deployed as a virtual machine (VM). It functions as the communication interface between the customer’s IP network and HP 3PAR Central by managing all service-related communications in both directions. The VSP is provided in an Open Virtual Format (OVF) for VMware vSphere Hypervisor and self-extractable virtual hard disk (VHD) package for Microsoft® Hyper-V. VSP is tested and supported on the VMware vSphere Hypervisor and the Microsoft Hyper-V. The VSP runs on a customer-owned and customer-provided server, and communicates with an HP 3PAR StoreServ 7000 Storage over its ethernet connection that has improved security features.

Features and benefits of HP 3PAR Service Processor

The HP 3PAR Service Processor is an integral component in the HP 3PAR Secure Service Architecture. The HP 3PAR Service Processor provides secure service communication between the HP 3PAR Storage system at a customer’s site and HP 3PAR Central, enabling secure diagnostic data transmission and remote service connections. Diagnostic data can be transferred frequently and maintained centrally on a historical basis. As a result, manual intervention in the support process is minimized and proactive fault detection and analysis is enhanced. Furthermore, with remote service connectivity for troubleshooting, HP 3PAR Technical Support can deliver faster, with more reliable response and quicker resolution time.

Remote diagnostics—key diagnostic information maintained centrally on a historical basis
Key diagnostic information such as system health statistics, configuration data, performance data, and system events can be transferred frequently and maintained centrally on a historical basis. As a result, proactive fault detection and analysis are maximized and manual intervention is minimized.

Remote serviceability—provides fast predictive response and remediation
HP 3PAR Technical Support delivers rapid, proactive response with complete 24x7 remote monitoring and analysis to identify issues and proactively communicate them back to the customer. As an integrated support model, HP 3PAR Technical Support can remotely connect to a customer’s HP 3PAR StoreServ system through a secure IP connection to solve issues quickly and reducing on-site visits.

Remote online software upgrade—upgrade software with no application disruption
Changes to the HP 3PAR OS software are released for new functionality, maintenance updates, and software patches. The ability to apply these updates can be serviced as an online upgrade, where the arrays capability to process customer data does not need to be disrupted during the software upgrade.
Other features of the HP 3PAR Service Processor include:

- Collects periodic data from the HP 3PAR StoreServ (e.g., alert, configuration, events, performance, status, etc.)
- Performs hourly health checks on the HP 3PAR StoreServ Storage
- Provides remote support capabilities over Ethernet
- Serves as a local maintenance terminal for on-site support
- Serves as a remote maintenance terminal for remote support
- Contains guided maintenance scripts used for guided parts replacement activities
- Fully automated Upgrade Wizard within the Service Process SPOCC user interface. For further information on the 3PAR OS and SP upgrade process, please refer to the “HP 3PAR OS Upgrade” white paper.

**Physical vs. virtual deployment of Service Processor**

Since the release of HP 3PAR SP 4.1, the option to deploy the VSP is available to users for the HP 3PAR StoreServ 7000 Storage. Running a VSP brings many advantages such as the cost saving associated without having to purchase physical SP server and management of those servers. Other advantages are the flexibility of resources that can be assigned to the VM, protection with the hypervisor high availability (HA) and snapshot capabilities.

The dependency on the hypervisor and challenges to provide access to the VSP should be considered when deciding if a physical SP is the right option for certain customer environment. Lack of a supported hypervisor host in the customer environment or accessibility for certain specific service options such as serial port connectivity are points that customers should consider as well that would require the use of a physical SP.

One major measure that should guide the selection of the physical vs. virtual SP is the accessibility of the SP to the HP support personnel.

**VSP requirements**

- HP 3PAR OS 3.1.2 or higher
- HP 3PAR SP 4.1 or later
- VMware vSphere 4.1 or higher
- Microsoft Hyper-V Server 2008 R2 or higher
- See Single Point of Connectivity Knowledge (SPOCK) for official support matrix

In terms of VM resources needed to run the VSP:

- Disk capacity of 256 GB
- RAM 2 GB
- Network connectivity
VSP deployment best practices

Service Processor deployment mode

The HP 3PAR Service Processor can be deployed in two modes: the SP mode or the Secure Network mode (recommended). SP mode enables communication between an SP and the HP 3PAR connection portal server located at HP. The server provides software updates and HP 3PAR Service Processor Onsite Customer Care (SPOCC) service tool applications. In SP mode, the SP and any connected system is supported and maintained using the Service Processor Maintenance (SPMAINT) utility.

In Secure Network mode, the SP communicates with the HP 3PAR Collector Server using the HP 3PAR Secure Service Agent (SSA). The Collector Server provides software updates, access to service tool applications such as SPOCC, and access to resources such as HP Support Center. Rather than using a connection portal to connect to HP 3PAR Central, an SP in Secure Network mode requires HP 3PAR Secure Service Agent for the connection. The HP 3PAR Secure Service Agent facilitates communication between the SP and Collector Server. Communications are done with HTTPS.

This is the preferred method of transfer as it is secure, easy for end users to implement in the firewall, and offers the most access control options. Use Port 443 for this bi-directional communication when using the (VSP) in Secure Network Mode.

It is recommended to deploy the HP 3PAR VSP using the Secure Network mode.

Local notification service

The Service Processor local notification features enable users to request that they be notified of important storage system events and alerts on a subscription basis. Notifications are sent through email to all subscribers, with each subscriber specifying up to three email addresses. When Real-time Alert Processing (RAP) forwarding is enabled, copies of all notification messages sent to subscribers are automatically forwarded to HP 3PAR Central as well.

There are two types of local notification messages that you might receive: standard notifications and grouped low-urgency notifications.

- Standard notification messages—standard notification is a text-based email message that alerts you to an important event or alert generated by a storage system.
- Grouped low-urgency notification messages—A grouped low-urgency notification is a text-based email message that informs you of noncritical events generated by a storage system.

Low-urgency notification messages are informational and do not typically require any corrective action be taken. When a situation or event reported in a low-urgency notification message becomes urgent, a standard notification message is issued to alert subscribers.
System support information

It is critical that the VSP contains correct system support information. The installation site information and customer contact information are critical to the delivery of support for the user system. Having correct and updated information will help ensure that service calls are completed without any issues due to incorrect or outdated contact information.

User should have processes in place to review and update contact info and system information on regular basis.

Figure 3. Service Processor system support information setup
Remote support
Remote support enables HP to provide you with the best possible support for your storage system, including the following:

- Timely remote service
- Remote online software updates
- Accelerated troubleshooting and issue resolution

Remote support sends diagnostic information, such as system health statistics, configuration data, performance data, and system events to HP 3PAR Central. These diagnostics are required for HP to perform fault detection and analysis on your HP 3PAR StoreServ Storage system that help maximize your storage availability.

All remote communications are encrypted and transferred securely to HP 3PAR Central, and no customer application data is ever transferred. No other business information is collected, and the data is managed according to the HP Data Privacy policy.

Remote support can be configured during the initial setup of the HP 3PAR StoreServ 7000 Storage using the HP 3PAR SmartStart in the Service Processor setup wizard. The user can validate and test the connectivity using the SPOCC.

It is highly recommended to have remote support deployed and configured for your system.

Figure 5. Service Processor—Configure SP to HQ connection portal
Backup and restore for the VSP

An advantage of the VSP in a virtual environment is the ability to leverage the hypervisor snapshots. Users can take advantage and use VMware or Hyper-V snapshots before making any changes to the VSP to restore the VSP to a previous state if needed. Such an option can be very useful in case of unexpected configuration changes with any specific task on the VSP. Users should follow VMware and Microsoft guidelines for taking and restoring snapshots, and how many can be kept at any given time.

After system installation and everyday thereafter a rescue file for the VSP will be generated and saved on the SP (SPOCC access) under files/files/rescue. The rescue file contains moment of birth (MOB) information and can be used in case of an SP replacement or rebuild if the version of SP code is not changing. If outbound access is enabled, rescue file is automatically transferred from the SP back to HP 3PAR Central.

Rebuilding the VSP can also be an option. It is recommended that you contact HP Support for assistance in case you need to rebuild your VSP instance.

Synchronizing clocks on the network

When deploying the VSP, users should ensure the hypervisor host has the correct date and time and that clocks are synchronized.

This task can be achieved either through the Network Time Protocol (NTP) server or manually. The manual setup is error prone and adds burden to the system administrators, so it is highly recommended to use NTP whenever possible. Setting the correct date and time enables VSP real-time monitoring and access.

Failing to have the correct time and date on the hypervisor might cause file system check error during initial deployment that would require to run the system utility file system check (fsck) for checking the consistency of the file system to resolve. It is also very important to set the correct date and time during the setup of the VSP.

Figure 6. Service Processor NTP notification

![Service Processor NTP notification](image)
**Account setup and usage for VSP access**

Only individuals with a need to manage the HP 3PAR StoreServ should have access to the VSP. There are multiple options for logging audit within the VSP that can be leveraged by the organization.

HP 3PAR SP audit information is contained in the SP_USER_ACTIVITY log file which provides audit information such as list of users who accessed the VSP and their logon/logoff times, etc.

Configuration of the SP OS takes place at SP application installation, and at initial system bring-up called SP moment of birth (SPMOB). The security relevant portions of SPMOB include:

- Disabling root login (except on the serial console)
- Secure shell (SSH) client configuration to allow only keyed authentication

The remainder of the security relevant hardening for SP is enforced by the application suite including an IP tables packet filter. The filter allows only incoming SSH and HTTP connections, as well as outgoing conversations to an associated HP 3PAR StoreServ, and configured support servers (such as SMTP for outgoing alerts and NTP). The filter also allows, at customer option, the SP to send home telemetric and diagnostic information related to the associated HP 3PAR StoreServ. The filter can also be configured to restrict incoming SSH and HTTP access to only a set of defined IP addresses, as opposed to any source address.

*Figure 7. Service Processor user activity log*

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**Protecting your VSP using VMware HA or Microsoft Failover Clustering**

Users should consider running the VSP on a VMware HA cluster or Microsoft Failover Cluster as applicable. VMware HA clusters enable a group of ESX/ESXi hosts to work together so that, as a group, they provide higher levels of availability for VMs than each one of the ESX/ESXi host could provide individually. This option would give a level of redundancy against host failure. In the case of a host failure, the VSP would restart on another ESX/ESXi host in the HA cluster within a short period of time. Given that the SP is not in the user data path, such unavailability for few minutes can be tolerated. The recommendation to use VMware HA would dictate where to place the VM in terms of storage. Users should consider making setting the startup priority to high (Default is medium.). It is also important to ensure that the VSP VM gets enough resources by setting the shares for both memory and CPU to “high.”

A failover cluster is a group of Windows® hosts working together to increase the availability of an application or clustered services. To make VSP highly available in a Hyper-V environment, users would implement failover clustering on the Hyper-V host servers. Windows Hyper-V comes with a number of features for Hyper-V HA and VM mobility.

It is recommended that users leverage VMware HA or the Microsoft Failover Cluster when possible to protect VSP against host failures.
**Hyper-V Integration Services and VMware tools deployment**

VMware tools is a collection of utilities that improves the management and the performance of the VM’s guest OS. The tools would reduce issues or improves performance like video resolution, inadequate color depth, restricted movement of the mouse, and missing sounds.

The current version of VSP 4.2 comes with VMware tools installed. It is highly recommended to use the included version of VMware tools and not to upgrade to any newer version unless directed by HP Support.

Hyper-V Integration Services is a collection of utilities in Microsoft Hyper-V, designed to enhance the performance and management of the VM’s guest OS. HP is still in the testing and qualification of these tools, and at this time does not support tools deployment on the VSP virtual machine (VM).

**VSP networking configuration**

It is recommended that the VSP is configured with a static IP address. If the user is using Dynamic Host Configuration Protocol (DHCP), the user should ensure the address for the VSP that persists across reboot.

Providing network redundancy to the virtual network cards of the VSP will enable availability in case of different failure scenarios. Users should consider using network card teaming in the hypervisor when supported. It is also recommended to consider using multiple network cards and physical network switches to avoid single point of failure on the hypervisor which may impact the VSP network connectivity.

**Placement of the VSP in your environment**

Users should consider separating the VSP from the same HP 3PAR StoreServ system that is managing. This would help ensure that the VSP is available to troubleshoot any issues with the array. One could deploy the VSP on the local disk of the hypervisor or put it on another array that the VSP is not managing. Putting the VSP on shared storage would give the user options to leverage hypervisor HA options or mobility features. Running the VSP from the local disk has its advantage to the latest storage VMotion’s enhancements in vSphere 5.1 and later gives mobility to the VSP VM, but it does not protect against hardware failure of the host itself.

It is also recommended that the user consider using thin provisioning when deploying the disk for the VSP. It will reduce that amount of disk space that the VSP would consume.

**VSP and Hypervisor VM mobility**

At the time of the writing of this paper and with the release of HP 3PAR SP 4.2, the VMware VMotion or Microsoft Live Migration are not supported. It is recommended that users do not attempt to use such features with the current VSP release.
Summary

Deploying the HP 3PAR Service Processor as a VM has many advantages. Rather than using a dedicated physical server to deploy SP, it can be installed in a VM leveraging the user hypervisor environment. The consolidation opportunity for running multiple VSP on the same hypervisor brings cost saving and management efficiency. Leveraging the hypervisor HA and snapshot features helps provide protection for the VSP instances.

Terminology

SP—Service Processor
VSP—Virtual Service Processor
Physical SP—Dedicated physical server attached to the HP 3PAR array
SPOCC—Service Processor Onsite Customer Care (menu driven software on Service Processor)
VM—Virtual Machine

Resources

HP 3PAR documents
HP 3PAR Service Processor software User’s Guide
HP 3PAR Service Processor Onsite Customer Care (SPOCC) User’s Guide
HP 3PAR StoreServ 7000 Storage Installation Guide
HP 3PAR StoreServ 7450 Storage Installation Guide
HP 3PAR StoreServ 7000 Storage SmartStart software User’s Guide

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