ESG Lab Review

Accelerating Time to Value: Automated SAN and Federated Zoning with HPE 3PAR and Smart SAN for 3PAR

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Abstract

This ESG Lab Review documents hands-on testing of HPE 3PAR StoreServ Storage and HPE Smart SAN for 3PAR Software solution to verify its ability to automate and simplify SAN and Federated SAN zoning configuration. We focused on how Smart SAN for 3PAR leverages industry standards based FCIA T11 (Peer Zoning) with target-driven peer zoning (TDPZ), transforming the complex, time-consuming, and error-prone manual zoning process into a 3PAR-orchestrated, simple, rapid, automated, and error free process.

Increasing Data Center Complexity

The shift in the data center to virtualization-based private clouds has increased the complexity of data center architectures. Indeed, according to recent ESG research, 68% of surveyed organizations said that their IT environment has gotten more complex in the last two years (see Figure 1). These organizations indicate that some of the biggest reasons for this increased complexity are higher data volumes (41% of respondents) and the increase in the number and type of applications used by employees (35% of respondents), with these responses representing two of the three most-cited reasons.[1]

Figure 1. Change in Level of IT Complexity

In general, how complex is your organization's IT environment relative to two years ago? (Percent of respondents, N=651)
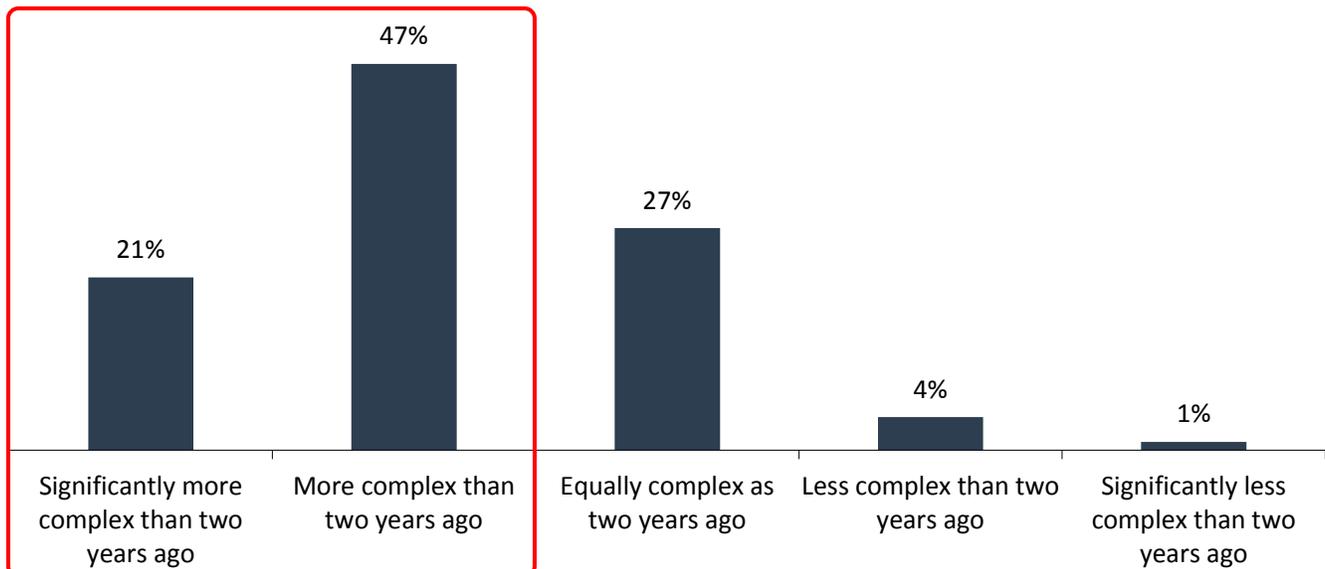

Source: Enterprise Strategy Group

Thirty-seven percent of respondents indicated that there is an opportunity to significantly streamline or reduce costs in their storage infrastructure, while 32% said there is an opportunity for streamlining their networking infrastructure.[2]

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[1] Source: ESG Master Survey Results, *2018 IT Spending Intentions Survey*, December 2017.
[2] ibid.

HPE 3PAR and Smart SAN

HPE 3PAR & Smart SAN
Target-Driven Peer Zoning

HPE 3PAR

Servers

One-Click Zoning

FC Switch
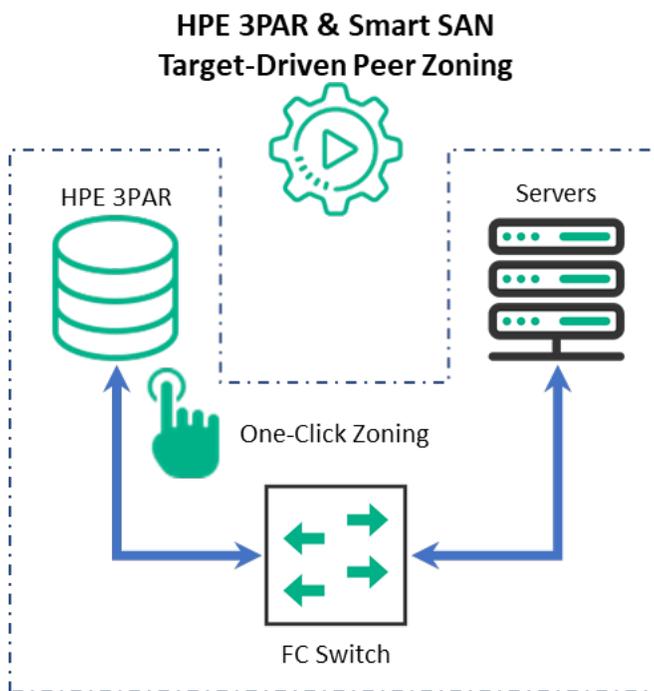
Smart SAN for 3PAR is a component of HPE's Smart Fabric vision—a single data fabric with full fabric services, providing high performance, low latency, resiliency, self-healing, scalability, and security. Smart Fabrics are multi-protocol (Fibre Channel and Ethernet, NVMe over FC, and NVMe over RoCE), supporting block, file, object, HCI, scale-out, NVMe, and backup primary and secondary storage solutions.

The Smart SAN for 3PAR ecosystem is a collaborative HPE OEM Partner initiative and includes Smart SAN-enabled devices: HPE StoreFabric B-series FC switches and directors (Brocade), HPE FlexFabric 5900 Switch Series, HPE StoreFabric Optics (Finisar & Avago), and StoreFabric FC HBAs (Broadcom/Emulex, Cavium/QLogic). Smart SAN for 3PAR works within HPE Synergy, BladeSystems, and Rack Servers enabling automatic host discovery and end-to-end zoning of storage across host initiators and 3PAR. Smart SAN alleviates the complexity of managing SAN environments by enabling a 3PAR storage administrator with little or no FC expertise to leverage 3PAR orchestration to automatically zone a SAN.

Smart SAN for 3PAR is integrated with the 3PAR Management Console (SSMC) and provides a graphical simplification for the automatic provisioning of hosts via 3PAR and HPE StoreFabric Fibre Channel SAN infrastructures. 3PAR SSMC automates zoning and host provisioning so that all components of the FC SAN critical to zoning the switch from 3PAR are visible and are working in unison for seamless, supported, end-to-end configuration. Smart SAN for 3PAR performs the in-band registration of HBA and target ports that are connected to the SAN. This information is provided to the user and provides an overall view of the SAN topology. Smart SAN-enabled HBAs and target ports perform device registrations based on the FC standard Fabric Device Management Interface (FDMI) protocol. These registrations are performed automatically and include data specific to Smart SAN to provide more meaningful information about these end devices.

Target-driven peer zones (TDPZ) are a variant of Fibre Channel peer zones as defined in the FCIA T11 standards and are configured and managed by 3PAR SSMC (the target). The target is the principal device in the zone, and the initiators are secure peers. SSMC defines the TDPZ and simultaneously configures the storage (target), host (initiators), and all switches in the path between hosts and storage.

HPE 3PAR SSMC can also automatically perform zone creation for 3PAR Storage Federation using the 3PAR TDPZ feature. As long as the 3PAR storage devices and associated switches are Smart SAN-enabled there is no need to access the switch to create the 3PAR Storage Federation zones. This reduces the overhead of implementing 3PAR peer motion because zones are automatically reconfigured when LUNs or volumes are migrated across arrays.

ESG Lab Tested

ESG Lab started by reviewing the infrastructure and manual steps used to create Fibre Channel zones with traditional zoning schemes. The infrastructure consisted of a two-controller, 18-port 3PAR array and a set of HPE servers, each with a two-port 16 GFC adapter, connected by an HPE FC switch, as shown in Figure 2.

Figure 2. ESG Lab Test Bench
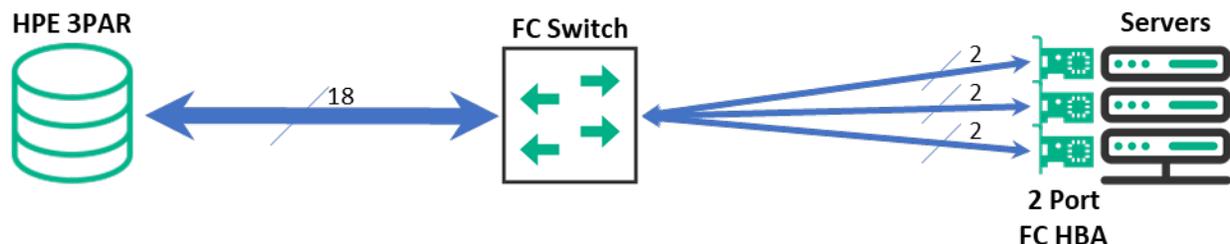
Source: Enterprise Strategy Group

In traditional FC zoning, the administrator creates a separate zone for each target-initiator port pair on each switch in the fabric, provisions LUNs on the target storage, and configures the initiator ports on the host. This is a manual, time-consuming, and error-prone process. Administrators often create scripts to zone large and complex environments; however, the scripting process itself is also time-consuming and error-prone.

We logged in to the FC switch using SSH and executed the commands to create the zones for one target port connecting to both initiator ports, as shown in Figure 3. This required manually typing each of the 23-character WWNs multiple times. A single mistake requires deleting the zone and starting over again. We repeated the same process to provision the 3PAR storage system and configure the initiator ports on the server. It took us between five and 10 minutes to type and verify the commands and WWNs for this simple configuration.

Figure 3. FC Switch Commands to Create Zones for One Target Port to Both Initiator Ports

```
admin> zonecreate zone1, "10:00:14:02:ec:ec:8d:42;21:21:00:02:ac:01:98:7f"
admin> zonecreate zone2, "10:00:14:02:ec:ec:6d:16;21:21:00:02:ac:01:98:7f"
admin> cfgadd tdz cfg auto, zone1
admin> cfgadd tdz cfg auto, zone2
admin> cfgenable tdz cfg auto
```

Source: Enterprise Strategy Group

When maximizing load balancing capabilities using traditional zoning schemes, administrators create separate zones between each initiator port and each target port. For the simple test environment used by ESG Lab, we would have to manually create a total of 36 zones (18 target ports connecting to two initiator ports). We would have to repeat similar processes to provision the volumes on all paths on the storage array, and configure the initiator ports, greatly increasing the number of commands required and the time to enter and verify the WWNs.

The process becomes even more complex and prone to errors as more servers and storage are added to the environment. Thus, SAN administrators often resort to static spreadsheets to track configurations, and must manually maintain multiple, separate scripts to configure servers, storage, and switches, resulting in a set of tedious processes.

Next, ESG Lab used the 3PAR CLI to configure a target-driven peer zone between one storage port and the two server ports. As shown in Figure 4, creating a TDPZ required just one command (*createhost*), specifying the target port (1:2:1 in N:S:P, or node, slot, port format), the server name (*R127-01*), and the initiator port WWNs (*10001402ECEC8D42* and *10001402ECEC6D16*).

Figure 4. 3PAR CLI Commands to Create TDPZ for One Target Port to Both Initiator Ports

```
root@MXN601277B-2:~# createhost -port 1:2:1 R127-01 10001402ECEC8D42 10001402ECEC6D16
```

Source: Enterprise Strategy Group

Although we logged in to the 3PAR SSMC using SSH, SSMC provisioned the 3PAR storage, created and activated zones on the FC switch, and configured the server initiators using in-band Fibre Channel communication.

Once the TDPZ was created, we used the switch command *zoneshow* to display the configured zones. As shown in Figure 5, the effective configuration included the zone *tdz3par_21210002ar01087f_00*. The WWN for the 3PAR was the primary zone member, and the WWNs for the server were peer members.

Figure 5. 3PAR Configured Zones

```
root@MXN601277B-2:~# zoneshow
Defined configuration:
 cfg:   tdz___cfg___auto
                 tdz___zone___auto;
                 tdz3par_21210002ac01987f_00
 zone: tdz3par_21210002ar01087f_00
                 21:21:00:02:ac:01:98:7f;
                 10:00:14:02:ec:ec:6d:16;
                 10:00:14:02:ec:ec:8d:42;
 zone: tdz___zone___auto
                 00:00:00:00:00:00:00:01
Effective configuration:
 cfg:   tdz___cfg___auto
 zone:  tdz3par_21210002ar01087f_00
                 21:21:00:02:ac:01:98:7f
                 10:00:14:02:ec:ec:6d:16
                 10:00:14:02:ec:ec:8d:42
 zone:  tdz___zone___auto
                 00:00:00:00:00:00:00:01
```

Source: Enterprise Strategy Group

Next, we used the 3PAR command *showportdev* to display details of the WWNs zoned to the 3PAR target port 1:2:1, as shown in Figure 6. Smart SAN for 3PAR uses in-band communication for configuration and management and provided a wealth of information about the WWNs in the zone. Obtaining critical information such as HBA driver and firmware versions enables 3PAR storage administrators to verify their configuration without having to resort to using multiple management systems or remotely logging in to each host and switch.

Figure 6. Meaningful Details of All WWNs Zoned to 3PAR Target Port

```
root@MXN601277B-1:~# showportdev tzone -d 1:2:1
Zone Name:          tdz3par_21210002ac01987f_00
Zone Entry Count: 3
Zone State:         up_to_date
Principal Member: 21210002AC01987F

Port WWN:    1001402ECE6D16        Port WWN:    1001402ECE8D42
    Alias Name:                        Alias Name:
    Port Hostname:          R12          Port Hostname:          R127-S01
    HBA Manufacturer:       Emu          HBA Manufacturer:       Emulex Corporation
    HBA Model:              HPE          HBA Model:              HPE SN1200E 16Gb p2 FC HBA
    HBA Driver Version:     11.          HBA Driver Version:     11.4.225.9
    HBA Firmware Version:   11.          HBA Firmware Version:   11.4.225.9
    HBA OS Name/Version:    Wind         HBA OS Name/Version:    Windows 2012 R2
    Port Supported Speed:   4Bk          Port Supported Speed:   4Bbps 8Gbps 16Gbps
    Port Current Speed:     16G          Port Current Speed:     16Gbps
    Port OS Device Name:                 Port OS Device Name:
    Port SSAN QoS Support:      Not Supported   Port SSAN QoS Support:      Not Supported
    Port SSAN Security Support: tier 1          Port SSAN Security Support: tier 1
```

Source: Enterprise Strategy Group

Next, ESG Lab used the 3PAR SSMC to create another target-driven peer zone for a second host. From the 3PAR SSMC pulldown, we selected *hosts* to bring up the list of connected hosts. We then selected *Create* to create a new host definition on the 3PAR storage and connect that host to the storage.

Using Smart SAN for 3PAR in-band management, 3PAR SSMC discovered all hosts physically attached to the Fibre Channel fabric. The list of hosts was displayed in a searchable pulldown box, as shown in Figure 7. After selecting the host *R127-S07.snesanbox.lab*, the 3PAR SSMC displayed all available paths from the 3PAR to the server. We were given the option to modify the default zone configuration (deleting a path using the *X* on the far right or editing path details using the pencil icon).

Figure 7. 3PAR SSMC Host and TDPZ Creation
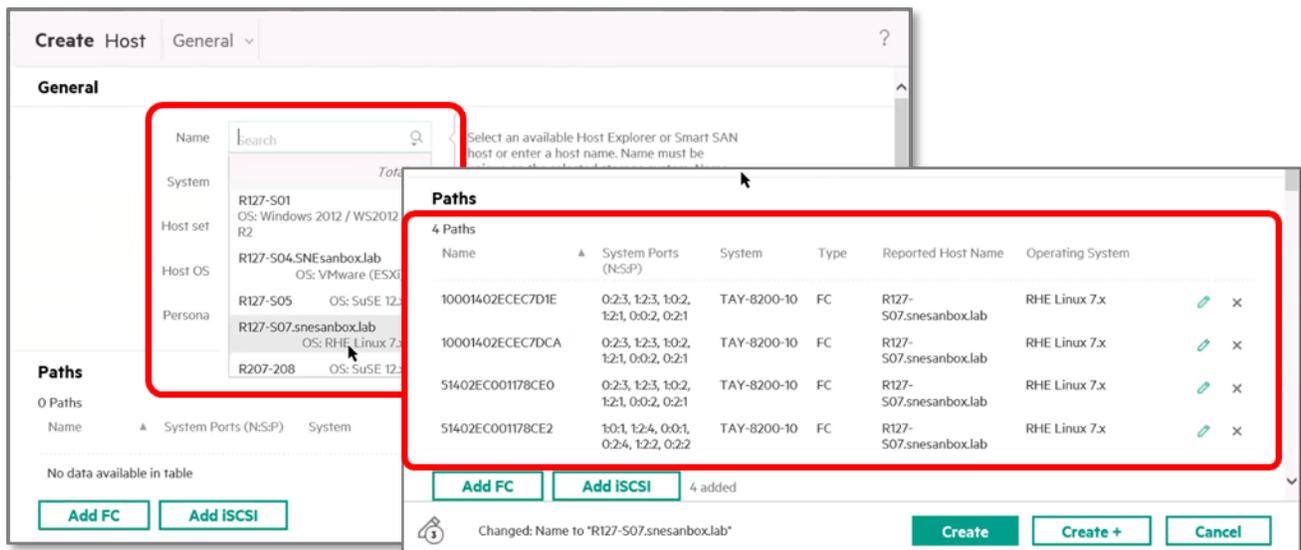
Source: Enterprise Strategy Group

As the last step in the configuration process, we clicked on *Create*, and 3PAR SSMC created the necessary target-driven peer zones. When the process was complete, the host was added to the list of configured hosts, and the paths were displayed, as shown in Figure 8.

Figure 8. SSMC Host with Target-driven Peer Zones

Source: Enterprise Strategy Group

To compare 3PAR SSMC's one-click TDPZ creation process with the manual zoning process, we went back to the switch CLI and used the *zoneshow* to display the zones, as shown in Figure 9. The 3PAR SSMC one-click process created six zones, one for each of the selected target ports in just under 30 seconds.

Figure 9. 3PAR CLI Display of Target-drive Peer Zones Created by 3PAR SSMC

Source: Enterprise Strategy Group

Just as with the 3PAR CLI, we used the 3PAR SSMC pulldown next to the host name, selecting *Host Details*, to display host Fibre Channel details, as shown in Figure 10.

Figure 10. Host Fibre Channel Details

Source: Enterprise Strategy Group

Details available through the 3PAR SSMC, CLI, and API include Fibre Channel zoning, HBA configuration, and SFP diagnostic information such as temperature, voltage, current, laser type, and connector type. 3PAR storage administrators can leverage this information to simplify automation and orchestration, and use the diagnostic information for monitoring and troubleshooting link issues.

Next, ESG reviewed the ease with which 3PAR SSMC creates 3PAR Storage Federations. Federation logically groups multiple 3PAR systems for concurrent, non-disruptive, bidirectional data mobility.

From the 3PAR SSMC pulldown, we selected *Federation* to bring up the list of federated storage. We then selected *create* to create a federation. We selected two systems from the list of available 3PAR storage systems and clicked on *create*. 3PAR SSMC created the federation, joining the two systems, and creating all the necessary target-driven peer zones to ensure full connectivity. We then selected the new federation to display the details of the zones, as shown in Figure 11.

Figure 11. Automatically Created TDPZ in Federated Systems
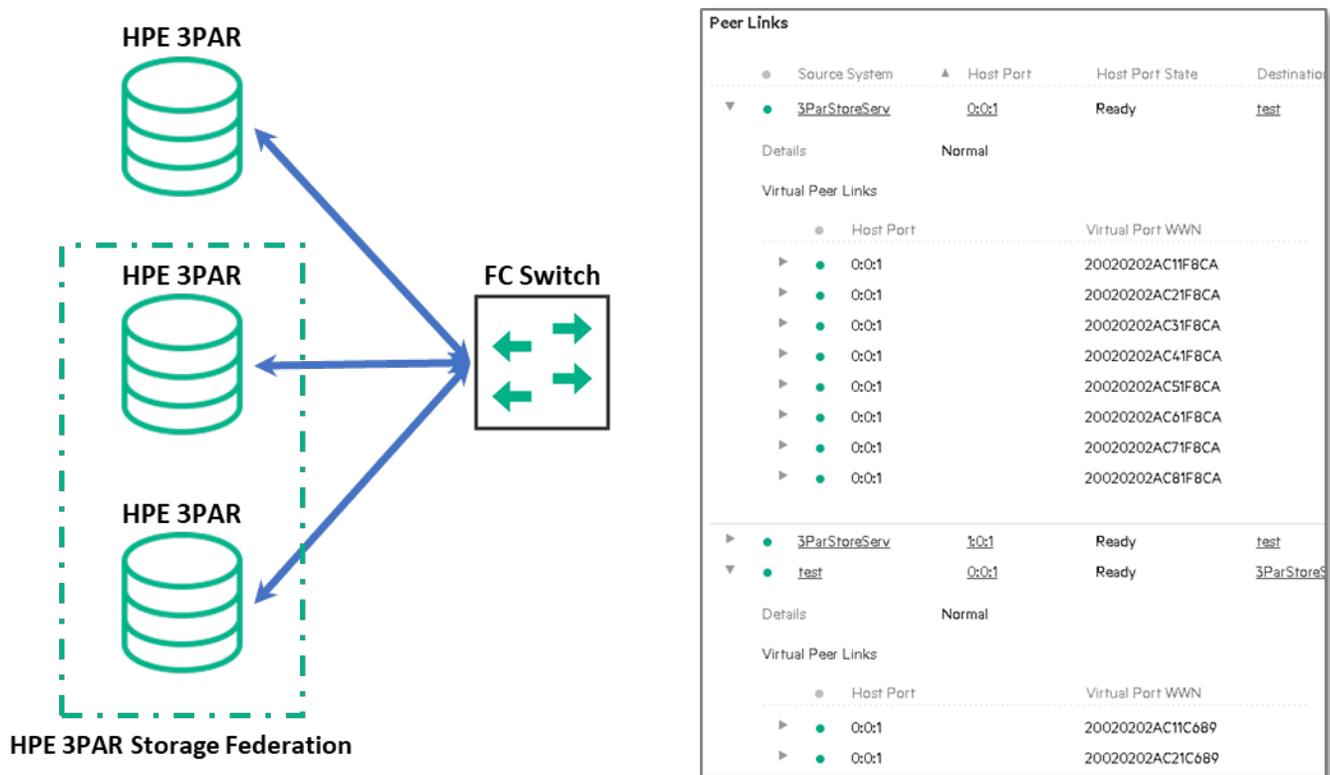
As with hosts, 3PAR SSMC transforms the complex, error-prone manual process of zoning a 3PAR Federation into a single step. The automation ensures that peer links are correctly zoned. Once federated, a 3PAR administrator can migrate volumes or LUNs across storage arrays without having to reconfigure zones.

The Bigger Truth

IT organizations face numerous challenges when deploying ever-increasingly complex IT infrastructures. When asked to identify their most important considerations when justifying IT investments, IT professionals and managers cited increased employee productivity, return on investment, and business process improvement.[3]

ESG Lab validated that HPE 3PAR with Smart SAN for 3PAR accelerates time to value by simplifying, automating, and orchestrating the previously complex, error prone and tedious manual Fibre Channel zoning and storage provisioning processes. Using traditional SAN configuration principles, administrators must create individual zones for each initiator target pair on each FC switch in the fabric, provision LUNs on the target storage, and configure the initiator ports on the host. This manual process requires repeated entry of long WWNs and is prone to errors and confusion. Even in simple environments, administrators often resort to static spreadsheets and manually created and maintained scripts to manage WWNs and zones, and this process can consume hours to days of effort and double-checking to eliminate errors.

We observed that with HPE 3PAR and Smart SAN for 3PAR, HPE has replaced the arduous manual processes to zone a switch and provision hosts into a simple, automated, and elegant method to orchestrate a 3PAR SAN or 3PAR Federation with little or no FC expertise required. One click with 3PAR SSMC or a single command in the 3PAR CLI creates all requisite end-to-end target-driven peer zones and provisions storage in all three locations (storage, server, and FC switch).

Hewlett Packard Enterprise accomplishes this feat using FCIA T11 standards for Peer Zoning, (TDPZ) and FC Standard FDMI protocol using secure in-band management, obviating the need for pre-configuration and out-of-band Ethernet management. The Smart SAN for 3PAR architecture also provides a diagnostic-ready framework for capturing physical layer diagnostic information for FC link monitoring and troubleshooting. This architecture lays the foundation for HPE to expand its Smart Fabric vision to other protocols and offer future fabric services for participation with other Hewlett Packard Enterprise storage infrastructure environments.

As private cloud environments continue to mature, and complex storage, server, and VM deployments become the norm to support private clouds, simplicity of deployment and management becomes equally critical as performance. Fibre Channel SAN environments need to provide more than data transport. They must be smart, automated, and more predictable, forgoing manual configuration for automation and orchestration. Organizations looking to increase employee productivity, improve their IT processes, and increase their return on investment would be well served to take a closer look at the HPE 3PAR and Smart SAN for 3PAR solution.

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[3] ibid.