EXECUTIVE SUMMARY

Hewlett Packard Enterprise has always pioneered in providing exceptional experiences to customers through end-to-end solutions with comprehensive compute, network, and storage products. HPE Network Orchestrator has been developed to accelerate the process of configuring, monitoring, and managing different types of SAN fabrics in different configurations, through a single dashboard along with additional features of self-healing, fabric interoperability, naming zones, and predefined templates to simplify configuration of switches, ports, fabrics, and containers. It also includes Single Point of Connectivity Knowledge (SPOCK) validation for SAN, which automates error-prone manual steps for validation of updated or new devices.

FIGURE 1. HPE NetO features

In the networking space, managing and incorporating changes to a network is hard because most networks are made up of different types of devices from potentially different vendors and adding to the complexity and support are different governing protocols. Some devices are accompanied by software to manage them, but there are no valid approaches for end-to-end compute to storage network testing and validation. The architecture of enterprise infrastructure has created networks, which don’t easily connect, and as a result, enterprise IT professionals spend a lot of time planning and performing upgrades or migrations. Even after careful planning, such upgrades can take weeks or months to be completed to ensure minimum downtime or data disruption. Human errors have become one of the leading causes of downtime, which can be prevented.

HPE NetO cuts these issues and lets users see the end-to-end topology on a port-by-port basis with provision of automatic SPOCK validation, which is also capable of preupgrade check, eliminating the chances of human error during an upgrade or adding a device. Assisting in end-to-end visualization is the feature that allows addition and deletion of device managers on a single screen. Streamlining the network orchestration process further, is the offering of templates by HPE NetO, simplifying creation of configurations with similar or identical properties. All these features can be accessed by simply installing this software-based solution on the server side.

FIGURE 2. HPE Network Orchestrator across multiple protocols
HOW IT IMPACTS MY BUSINESS?

Business managers believe that their organizations IT deployment processes are too complex and/or too time consuming. In a survey conducted by Enterprise Strategy Group, 68% of the respondents (N=651) agreed that their organization’s IT environment had grown more complex over the last 2 years, with 35% attributing the increase in complexity to the increase in number and type of applications used by their employees. This creates an opportunity to significantly streamline or reduce costs of managing a SAN without increasing the complexity for IT professionals. NetO has successfully identified this opportunity and provides you a framework for centralized orchestration with diagnostic abilities, scalable from startup to enterprise. By minimizing the amount of time for diagnostics, monitoring, and orchestration of a storage network, with fine-grain visibility, HPE NetO would ensure increased SAN resiliency.

Moreover, IT storage costs are a concern for enterprises as the diversity and volume of data increases. Indeed, budget challenges were a top challenge for 35% of IT pros surveyed at VMworld® 2017. HPE NetO optimizes the use of existing storage infrastructure of the enterprise. It can cut operating costs by decreasing the downtime of the network with efficient upgrade using automatic SPOCK validation. It also provides timely diagnostic data from attached devices, thus optimizing the existing resources with minimum investment.

This paper is designed to help HPE storage solution architects, storage administrators, and system administrators who are considering HPE NetO to understand this technology, its various applications and features, and functionalities in order to increase storage efficiency using any storage configuration.
DASHBOARD

Dashboard lets you visualize the key performance indicators and other strategic data for your storage network at a glance. An amalgamation of movable panels, each panel summarizing an important data point, provides the fine-grain visibility into storage fabrics (Fibre Channel and Ethernet).

![Dashboard](image)

**FIGURE 5.** Dashboard

The **Notifications Ticker** option enhances the experience of keeping track of important and critical tasks, at all times, by providing a context-sensitive pane available throughout the HPE Network Orchestrator that lists:

- Recent operations performed by HPE NetO, such as adding or removing an element manager. When any operation is being performed, its progress can be tracked through a progress bar
- Recent actions for managing HPE NetO, such as updating **Settings**

![Notifications Ticker](image)

**FIGURE 6.** Notifications Ticker
TEMPLATE-BASED DEPLOYMENT

Templates provide cookie cutter configurations that have identical or similar properties.

- Quickly generate customized configuration templates
- Deploy them consistently on specific devices
- Reduce configuration errors and share best practices

Templates can be applied to B-series switches, M-series switches, M-series ports, and B-series Fabric. User has the option to pre-define NetO templates to assist with deployment in HPE Complete Partner Products environments as well. You can refer to the HPE NetO SPOCK document for a complete list of compatible products.

![Figure 7: Types of templates](image1)

For defining templates, we have Enable, Disable, and Ignore options for all possible features/protocols. Also, a port template can be included while defining a switch template, providing a more logical application process.

![Figure 8: Configuration using commands versus templates](image2)

Templates can be used for:

- M-series switches: Enabling or disabling different protocols, specify default Virtual Local Area Network (VLAN), auto log-out time, buffer allocation percentage, select required port reboot templates
- B-series switches: Enable or disable Target Driven Peer Zoning (TDPZ)
- M-series ports or Port Channels: Specify speed, port state, set Spanning Tree options, enable breakout cable feature to configure specified ports for a 4 port Direct Attach (DAC) splitter cable, set port mode, specify VLAN, flow control, set Maximum Transmission Unit (MTU)
- B-series Fabric: Conveniently create aliases in the fabric based on the combination of World Wide Name (WWN) and hostname, fabric and adapter serial number
**FIGURE 9.** Switch template

**FIGURE 10.** Fabric reports screen

**FIGURE 11.** Types of reports

**FABRIC REPORTS**

HPE NetO reports can be generated by the user either to check the status of template application or to identify any complaint element existing in the topology.

The **Smart Fabric compliance check** SPOCK report will check your SAN environment for compliance with HPE recommendations according to the support matrix. The **Smart Fabric preupgrade check** report will check your SAN environment to determine what component needs an update to meet the specified version requirements.
The template report is a system-generated report that is automatically created when a template is applied, identifying which configurations were successfully applied as per the template.

User can also save the report in either CSV or PDF formats for easy sharing and access later.

![HPE Network Orchestrator](image)

**FIGURE 12. HPE Template report example**

**FABRIC COMPLIANCE: INTEROP VALIDATION WITH HPE SPOCK**

HPE Network Orchestrator validates the integrity, interoperability, and compliance of HPE storage, servers, and network fabric infrastructure before or during deployment, eliminating the possibility for human errors during any configuration update or adding new devices.

- Keep the SAN and fabric infrastructure in ideal health by making informed decisions with better supportability and predictability.
- The preupgrade check option verifies and reports what components in your SAN need an update to meet the specified version requirement.
- The SPOCK checks are done against the HPE SPOCK database file currently installed in the HPE Network Orchestrator. HPE provides periodic updates to SPOCK data and NetO can import the latest information.
- Compliance checks have been made easy by a simple mouse hover over the components. For all SAN components which are compliant, a green mouse-hover icon is shown. An amber or red mouse-hover icon indicates that SAN component is failing at the compliance check. The mouse-hover notes would detail the information in both the cases.
- HPE NetO also provides you the options of viewing the topology with only specific components. This will result in a new topology diagram with only filtered SAN components as requested.
HPE NetO supports several Fibre Channel Switched (FC-SW) fabric, Ethernet switches, and storage configurations.

**FABRIC TOPOLOGY: VISUALIZE MANAGED ELEMENTS OF THE FABRIC END-TO-END**

HPE Network Orchestrator allows the administrator to understand what devices are connected end-to-end and get fabric visibility while launching a sequence of steps to create the topology view of the managed elements. Easy way for an administrator to quickly understand what’s connected and leverage that information for reports, auditing, troubleshooting, deployment, and verification.

Discover managed elements include HPE Storage, HPE StoreFabric M-series Ethernet switches, HPE StoreFabric B-series Fibre Channel switches, HPE StoreFabric C-series Fibre Channel switches, HPE Complete Partner Products, adapters (host bus adapters, network interface controller, converged network adapter), cables, and optical transceivers. You can refer to the [HPE NetO SPOCK document](#) for a complete list of compatible products.

The **Fabric Topology** screen also provides visual coordination with HPE SPOCK for SAN and Fabric interoperability validation and support.
END-TO-END MONITORING WITH SELF-HEALING CAPABILITIES

HPE Network Orchestrator monitors activities and generates an event for action, auditing, and reporting. Administrators can monitor various parameters end to end to make informed decisions based on alerts with other fabric services to remedy a situation delivering an easy way for administrators to be alerted about storage networking issues.

It builds on the basic diagnostic-ready fabric capabilities with advanced diagnostic assessment to monitor and quickly identify states of physical ports for root cause analysis, failure impact assessment, and self-healing for improved performance. It provides hands off way for an administrator to diagnose storage networking physical issues and implement solutions for best performance.

As specified earlier, the Notifications Ticker assists in end-to-end monitoring. It contributes to the self-healing functionality by providing notifications, which require approval of a self-healing operation on your part.

The self-healing features give two options:

- Notify and take confirm action
- Notify and take automatic action

The Activities option on the left panel summarizes user- and system-generated alerts and tasks for all connected entities in the Network Orchestrator, with the option to configure which activities to be viewed.
Further, properties and status of device managers can be checked, along with the capability to add, edit, and delete device managers from the Managed Elements option. The list of providers of these device managers include B-series, M-series, C-series, HPE Storage, and HPE Complete Partner Products. You can refer to the NetOS SPOCK document for a complete list of compatible products. Following discovery, the Managed Elements screen summarizes key properties and status of device managers. Drill down screen shows additional properties and allows you to manage elements such as switched and ports identified in the environment.
**MANAGED ELEMENT REFRESH**

Periodic Refresh directs Orchestrator to scan for changes in the Managed Elements.

- Default: 30 minutes
- Minimum: 15 minutes

**LOG LEVEL**

HPE Network Orchestrator logs information as it runs to capture the behavior and status of the Orchestrator application itself. If requested by HPE Support, you may change the logging level for the application to capture additional information for troubleshooting.

- Default: ERROR: Captures only important information in the Orchestrator logs.
- INFO: This option stores additional information in the logs and should be enabled only when needed to assist HPE Support.

**SMTP NOTIFICATIONS**

The Simple Mail Transfer Protocol (SMTP) configuration options allow you to specify the information to enable HPE Network Orchestrator to send out notifications by email.

It gives you the option to customize notification settings, specifying Notification Levels options, which control what types of email notifications are sent and at what frequency. Improving the track of errors and critical events further are the following options, which can be enabled at the discretion of the user.

<table>
<thead>
<tr>
<th>TABLE 1. SMTP notification options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option</strong></td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Send critical events immediately</td>
</tr>
<tr>
<td>Send error events immediately</td>
</tr>
<tr>
<td>Send daily digest of critical and</td>
</tr>
<tr>
<td>error events</td>
</tr>
</tbody>
</table>

**SYSTEM LOG**

For HPE NetO to act on events coming from managed elements, Syslog must be set. It adds Syslog IP and port information to the device managers as they are discovered. When you update the Syslog IP or port, HPE NetO updates the managed elements with the new information.

**LICENSE SETTINGS**

License configuration options allow you to view installed licenses and also add new licenses. By default HPE Network Orchestrator come with InstantOn license, which is valid for 120 days with full feature support.

The License Summary displays details for all installed licenses.

- License type is the type of license installed.
- Capacity is the number of supported switches.
- Description contains details about the installed license.
- Activation date is the date from which the installed license is activated.
- Expiration date is the date on which the license will expire.
- Status is the status of the installed license. A valid status indicates that the license is working.
FIGURE 19. License settings example

**ORCHESTRATOR ECOSYSTEM: MANAGE APPLICATIONS THROUGH REST API**

Orchestrator and HPE Partner apps handshake and exchange information over published HTTPS REST APIs.

FIGURE 20. REST API
CONCLUSION

HPE NetO supports our customer’s preference for multivendor storage network environment while ensuring availability and business continuity. It decreases the time taken and errors made during the orchestration process, without enormously impacting the orchestration expenses, ensuring high return on investment in HPE NetO. It lets you build on the basic diagnostic-ready fabric capabilities with advanced diagnostic assessment to monitor and quickly identify states of physical ports for root cause analysis, failure impact assessment, and self-healing for improved performance. By minimizing the amount of time for diagnostics, monitoring, and orchestration of a storage network, with fine-grain visibility, HPE NetO would ensure increased SAN resiliency. This ecosystem has the capability to let network managers define a high level business policy and then easily manipulate the network resource to create the desired state and enforce policies.

LEARN MORE AT

hpe.com/us/en/storage/networking.html