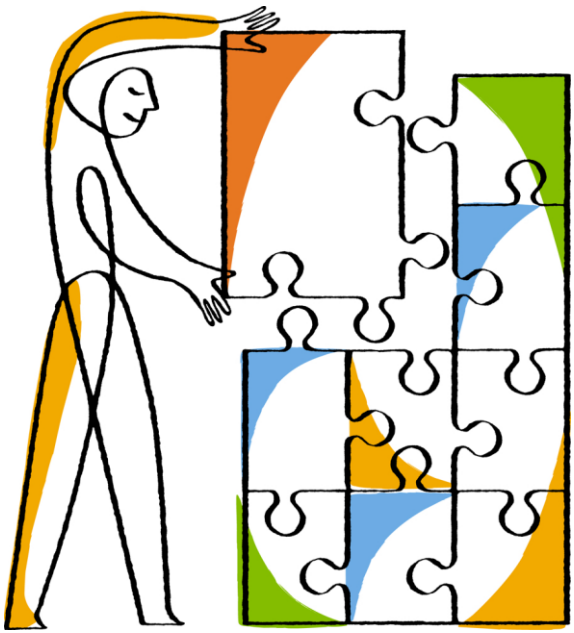
Config Advisor Plug-ins

Installation and Administration Guide



NetApp, Inc.
495 East Java Drive
Sunnyvale, CA 94089
U.S.

Telephone: +1 (408) 822-6000
Fax: +1 (408) 822-4501
Support telephone: +1 (888) 463-8277
Web: www.netapp.com
Feedback: doccomments@netapp.com

Part number: 215-11676_A0
October 2016

Contents

Overview of Config Advisor 5
Config Advisor plug-ins 6
Preparing for installation 7
Windows host requirements 7
Plug-in requirements 7
Installing Config Advisor plug-ins 8
Plug-in versions supported 8
Data collection using Config Advisor plug-in 10
Data collection using a profile 10
E-Series 11
NetApp SANtricity web services proxy 1.1 12
E-Series Host-side collection 13
E-Series ASUPs 15
Fields in E-Series ASUPS 18
Fields in E-Series AutoSupport (from File) tab 20
Managed ONTAP SAN 22
MetroCluster in clustered Data ONTAP 23
FlexPod 29
Data collection from FlexPod – ONTAP 31
Data collection from FlexPod – 7-Mode 33
Data collection from FlexPod – SolidFire 37
FlexArray 39
Viewing plug-in results in Config Advisor 42
Viewing FlexPod – ONTAP results in Config Advisor 48
Viewing FlexPod 7 – Mode results in Config Advisor 52
Generating reports from plug-in results 55
Saving plug-in credentials in Config Advisor 56
Loading saved plug-in credentials 57
Config Advisor AutoSupport for plug-in results 58
Upgrading Config Advisor plug-in 59
Uninstalling Config Advisor plug-in 60
Periodic data collection for issues diagnostic 61
Using Config Advisor through the command prompt 61
Scheduling periodic data collection 63

Email notification 63
Reporting plug-in issues in Config Advisor 65
Troubleshooting 66
E-Series data collection fails when SANtricity storage manager client is not installed 66
Appendix 67
E-Series configuration validation and health checks 67
E-Series hosts configuration validation and health checks 68
MetroCluster in clustered Data ONTAP configuration validation and health checks 72
FlexPod configuration validations & health checks 81
FlexArray configuration validations & health checks 92
Copyright information 95
Trademark information 96
How to send your comments 97

Overview of Config Advisor

Config Advisor is a tool to validate configuration and health of NetApp Systems and it is used to check a NetApp system or solution for proper hardware, cabling, software configuration, and conformance of NetApp recommended best practice settings and standards.

Config Advisor 4.0 introduced a new plug-in architecture in which new profiles can be dynamically added, upgraded, or removed from existing list of static Config Advisor profiles.

Advantage of the new plug-in architecture is that the plug-in can be independently updated and released without the need for a Config Advisor tool release.

Config Advisor supports validation of FlexPod, MetroCluster in clustered Data ONTAP, E- Series storage arrays, FlexArray configurations, and Mission Critical System Health Checks using the plug-in architecture.

Config Advisor 4.6 supports encryption of device credentials and saved queries and provides an option to require a password when launching Config Advisor.

Note: This guide includes installation and administration details for the Config Advisor plug-ins. For more information about Config Advisor, see the *Config Advisor Installation and Administration Guide.*

Config Advisor plug-ins

Plug-ins may be added, upgraded or removed from the existing list of Config Advisor plug-ins that are installed. Profiles that come along with Config Advisor might also be overridden and extended using a plug-in.

Config Advisor supports the following plug-ins:

- **E-Series plug-in**

The E-Series plug-in has both a storage array configuration validation as well as a host-side validation option.

- **Managed ONTAP SAN plug-in**

The Managed ONTAP SAN plug-in enables data collection and validation of mission critical SAN deployments.

- **MetroCluster in clustered ONTAP plug-in**

The MetroCluster in clustered ONTAP plug-in enables data collection and validation of MetroCluster in clustered ONTAP.

- **FlexPod plug-in**

The FlexPod plug-in enables you to run a detailed health check for all of the components in the FlexPod stack.

The Config Advisor plug-ins are downloaded as separate installable packages. You must have Config Advisor 4.3 or later installed for any plug-in to work. Plug-ins are installed in the data directory of the Config Advisor tool. Plug-ins installed in the Config Advisor data directory might introduce new profiles. These profiles are accessible through the Config Advisor tool **Profile** drop-down box in the main window.

Using the Config Advisor profile, a user can collect data, view and analyze results, generate PDF reports, MS Word reports, and MS Excel reports, and post Config Advisor AutoSupport results to NetApp.

- **FlexArray Plug-in**

The FlexArray plug-in enables data collection and validation of FlexArray systems.

Note: For FlexArray MetroCluster checks, MetroCluster plug-in must be used.

Preparing for installation

You must be aware of the prerequisites and requirements before installing the Config Advisor plug-ins.

Windows host requirements

Config Advisor plug-ins are supported with the following Windows operating systems:

- Windows 7 (64-bit and 32-bit)
- Windows 8 (64-bit and 32-bit)
- Windows 10 (64-bit and 32-bit)
- Windows 2008 R2 Server (64-bit and 32-bit)
- Windows 2012 R2 Server (64-bit)

Plug-in requirements

- You must have installed Config Advisor. For more information about installing Config Advisor, see the *Config Advisor Installation and Administration Guide*.
- You must have downloaded the plug-in installation package to the host machine, in which you have installed Config Advisor.

User type	Plug-in download location
External and internal users	*http:\\mysupport.netapp.com\NOW\download\tools\config_advisor*

Installing Config Advisor plug-ins

You should install Config Advisor framework and then install the desired plug-in.

Plug-in versions supported

A list of compatible versions of Config Advisor and the plug-in available on the Support Site is provided in the following table.

Config Advisor Version	Plug-in Version
Config Advisor 4.1 or 4.2	• E-Series 1.1 • MetroCluster in clustered Data ONTAP 1.1
Config Advisor 4.3	• E-Series 1.2 • MetroCluster in clustered Data ONTAP 1.2
Config Advisor 4.4	• E-Series 2.0 • MetroCluster in clustered Data ONTAP 1.3 • FlexPod 1.0 • Managed ONTAP SAN 1.1
Config Advisor 4.5	• FlexPod 1.1 • MetroCluster in clustered Data ONTAP 1.5 • Managed ONTAP SAN 2.0 • E-Series 2.0
Config Advisor 4.6	• FlexArray 1.0 • FlexPod 1.2 • MetroCluster in clustered Data ONTAP 1.6 • Managed ONTAP SAN 2.0 • E-Series 2.1

You can install any of the following Config Advisor plug-ins:

- E-Series plug-in
- Managed ONTAP SAN plug-in
- MetroCluster in clustered Data ONTAP plug-in

- FlexPod plug-in
- FlexArray plug-in

Steps

1. Unzip the plug-in installation package (*.zip file) to the host machine and place the contents of the package in the below mentioned folder location under ConfigAdvisorDataDirectory_Base\ConfigAdvisorData\plugin_eggs. Ensure that when entering the plug-in folder name under plugin_eggs you are able to see the plug-in files especially profileConfig.xml or profileExtensionConfig.xml.

Directory path to place plug-in files
C:\Users\<windows_login>\ConfigAdvisorData\plugin_eggs or {USERPROFILE}\ConfigAdvisorData\plugin_eggs

2. Relaunch Config Advisor.
3. In the Config Advisor user interface, the **Profiles** drop down list (top-left corner) displays the newly added plug-in along with other static profiles, such as **ONTAP**, **Data ONTAP 7 and 8 (7-Mode)**.
4. In the Config Advisor user interface, **Logs** window displays a message after the plug-in is installed successfully.

   For example, if you have installed the E-Series plug-in, you should see the message, Plug-in :**E-Series v2.1" loaded**.'

Data collection using Config Advisor plug-in

After you have installed the required plug-in, you can select the profile (plug-in) using which Config Advisor performs the data collection.

In the Config Advisor user interface, under **Profile**, select the required profile for the option **Choose an Execution Profile**. You can select any of the following profiles:

- E-Series
- Managed ONTAP SAN
- MetroCluster in clustered Data ONTAP
- FlexPod
- FlexArray

Data collection using a profile

Steps

1. In the Config Advisor user interface, under **Profile**, select the required profile for the option Choose an **Execution Profile**.
2. Enter the details in the profile tab and click **Collect Data**.
3. Enter the filename in which you want to save the collected data.

   The commands and their outputs are stored in a file with *.xml.gz extension in the Config Advisor data directory. Config Advisor opens the file at the end of data collection and the computed results are displayed in the Config Advisor Result Viewer interface.

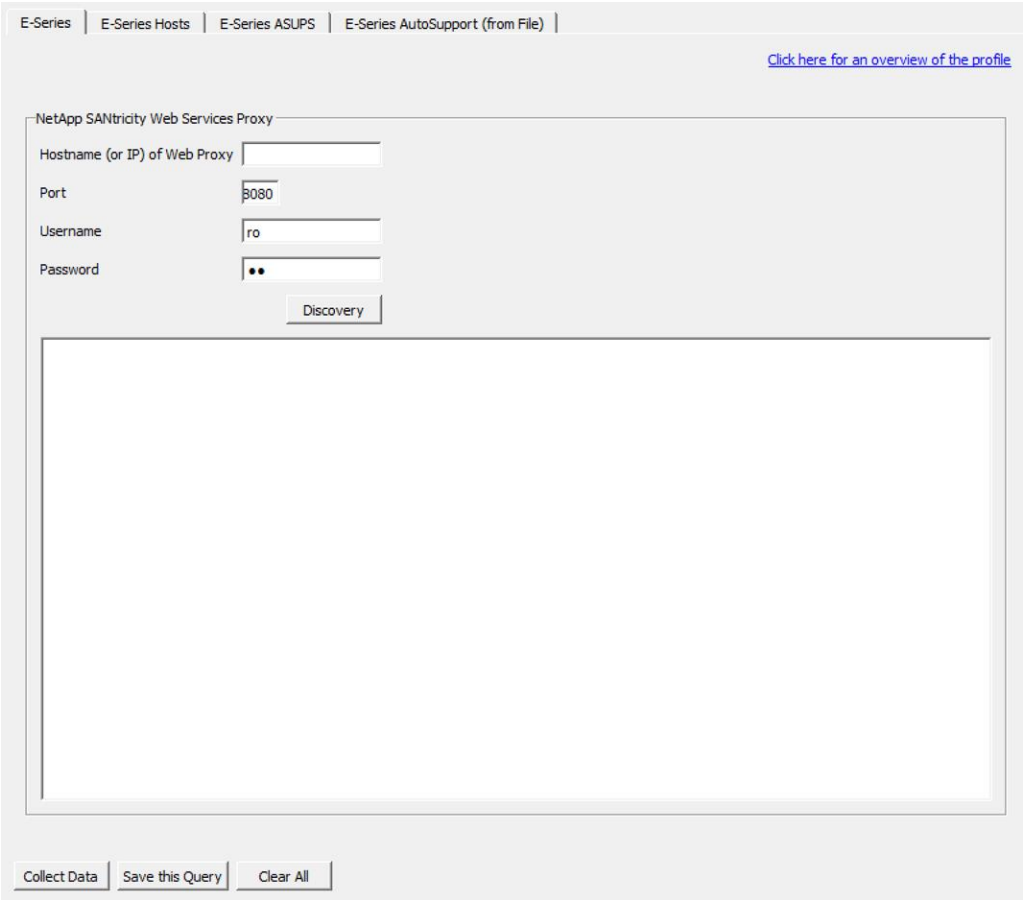
   The previous data collection files are stored in the Config Advisor data directory and these results are displayed in the Config Advisor user interface, **Recent Results** pane.

   For more information about using the **Recent Results** pane, see the *Config Advisor Installation and Administration Guide*.

   If you want to save the values entered in the sub profiles, you can use the **Save Query** option in the Config Advisor user interface.

E-Series

The E-Series profile page is shown below:



The E-Series Plug-in 2.1 is developed to work with the Config Advisor tool, to enable data collection and validation from both an E-Series Storage Array and the host systems accessing that storage array.

The storage-side E-Series profile has two data collection methods:

- NetApp SANtricity Web Services Proxy 1.1

The host-side E-Series profile has one data collection method:

- SSH (Secure Shell)

Currently, E-Series Host supports scanning and comparison with the IMT data for Linux host systems.

The latest IMT data file is updated when the Config Advisor is launched if the network access is available.

In the case of secure sites, no network access is available. You are required to manually download resource_binary.zip from *http:\\mysupport.netapp.com\public\config_advisor\bin\resources_binary.zip* and place it in the ConfigAdvisorDataDirectory_Base\ConfigAdvisorData folder. Rename the zip file remove .zip extension and replace the file with the name "resources_binary". Note that there is no extension to the file name. Restart Config Advisor for the new file to take effect.

NetApp SANtricity web services proxy 1.1

The NetApp SANtricity Web Services Proxy provides Web APIs to configure, manage, and monitor E-Series and EF-Series arrays. The proxy provides access to a collection of REST (Representational State Transfer) style interfaces to access services defined for storage arrays. The proxy can be installed on a Windows or Linux system.

Config Advisor uses NetApp SANtricity Web Services Proxy to collect data from multiple E-Series Storage Arrays that is under the management of NetApp SANtricity Web Services Proxy. For more information, see *http:\\community.netapp.com\t5\E-Series-SANtricity-and-Related-Plug-ins-Articles-and-Resources\NetApp-SANtricity-Web-Services\ta-p\86931*.

Information on how to install, configure, and uninstall NetApp SANtricity Web Services Proxy 1.2 can be found in the *NetApp SANtricity Web Services Proxy 1.2 Installation Guide*.
For more detailed information on configuring and using *NetApp SANtricity Web Services Proxy 1.2 see the NetApp SANtricity Web Services Proxy 1.2 User Guide*.
See *E-Series and EF-Series Systems Documentation Center* and look for SANtricity Web Services Proxy 1.2 that is found in the SANtricity Management Plug-ins link.

Credentials of the NetApp SANtricity Web Services Proxy are required to collect from E-Series Storage Systems that are under its management.

Field name	Description
Hostname (or IP) of Web Proxy	The full hostname or IPv4 address of the NetApp SANtricity Web Services Proxy.
Port	Port through which the REST service is available.
Username	Username is defaulted to 'ro'.
Password	Password is defaulted to 'ro'.

On clicking "Discovery" all the E-Series Storage Systems that are under the management of NetApp SANtricity Web Services Proxy are listed on a table below the "Discovery" button. Select the E-Series Storage Systems from which Config Advisor is to collect data and click on the "**Collect Data**" button.

E-Series Host-side collection

Collecting host-side information for analysis is currently limited to hosts running supported versions of the Linux operating system. This collection requires the use of a remote shell to execute commands and collect the results. Using “telnet” to collect this information is considered insecure as the connection between Config Advisor and the host is not encrypted and can be "sniffed". The alternate to 'telnet' is to use Secure Shell, also known as "SSH". This option provides improved authentication facilities and the ability to encrypt the session between Config Advisor and the host.

SecureShell is a feature provided in standard Linux distributions and may already be enabled on the hosts you intend to collect information from. For details, consult Linux documentation.

Steps

1. Enter credentials and click **Collect Data**.
2. Enter the file name in which the collected data has to be saved.

Field name	Description
Hostname (or IP)	The full hostname or IPv4 address of the E-Series host system.
Username	By default, username is ‘root’.
Password	Password of the E-Series host system.

You can run host side checks and run comparisons against IMT data for a Linux based E-Series host system. To run host side checks from a multiple host systems, you might use the **Collect from Query Group** feature. Save multiple E-Series host credentials into a single query group and click the **Collect from Query Group** button.

Rules analysis and reporting is grouped for multiple systems when using the **Collect from Query Group** feature.

The E-Series 2.1 plug-in for Config Advisor introduces support for collection of host-side information. Some of the known restrictions\limitations of host-side support are as follows:

The host-side collection is currently in Beta and known to work on the following Linux Operating Systems for Intel\AMD 64-bit systems (PowerPC architectures not tested). Additional support will be added in future releases:

- RHEL 6.6, 7.1, and 7.2
- SLES 11.3, 12.1
- OVM 6.2
- OEL 6.7
- CentOS 6.5

E-Series ASUPs

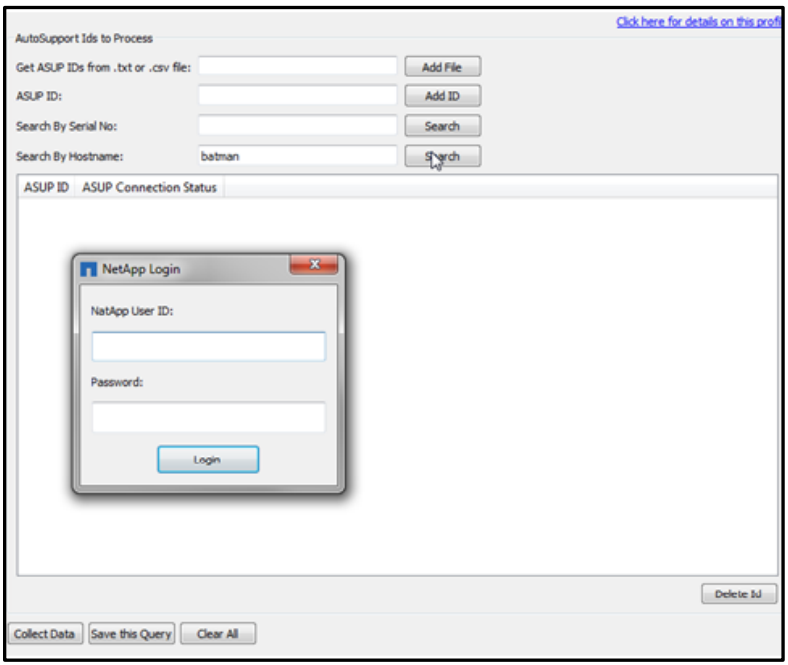
Config Advisor can perform analysis using the NetApp AutoSupport Data warehouse as a data input source. You can submit a list of AutoSupport IDs in a file or search for them interactively.

Note: This method is available only to NetApp personnel who have access to the intranet and the AutoSupport Data warehouse. It is not available to partners and NetApp customers.

Config Advisor allows loading and collecting data from ASUPs only with NetApp SSO entitlements. Before Config Advisor allows for an ASUP query, SSO login dialog box is displayed.

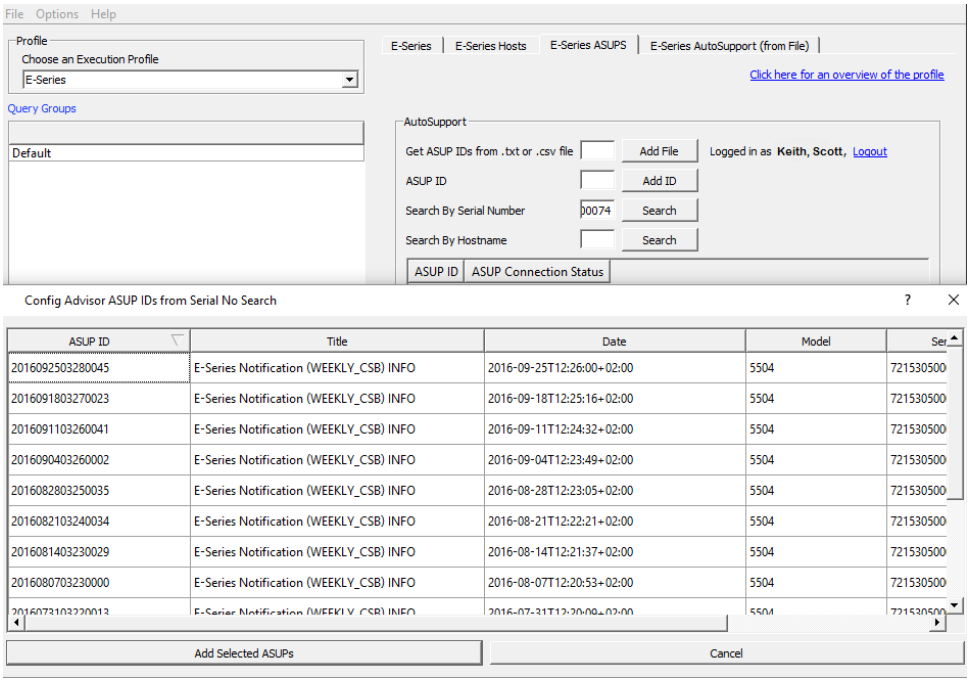
Note: Currently, only data collection is available for E-Series AutoSupports and E-Series AutoSupports from File. Rules, Results Viewer, and Config Advisor AutoSupports are not available for these profiles.

SSO login dialog box is as shown:



On successful login, the ASUP query proceeds and the user name is presented in the interface with a **Logout** link.

The **Logout** link is as shown:



Note: After a query or data collection is initiated with entitlements it will proceed even when the Logout link is clicked. Subsequent queries or data collection will again request for entitlements.

Steps

1. Click **Add File** to select a file (.csv, .txt) containing multiple AutoSupport IDs.

   Multiple AutoSupport IDs are displayed in the **ASUP ID** column along with their connection statuses.

2. Alternatively, you can add an AutoSupport ID using one of the following methods:

   a) Enter the ID in the **ASUP ID** field and click **Add ID**.

Note: The older ASUP ID format (for example, AE2010061286069) is not supported in Config Advisor 3.0 and later. You must enter the ASUP ID in the new format, for example, 2010061918120050.

b) Enter serial number of the controller in the **Search By Serial No** field, and click **Search**.

c) The Config Advisor ASUP IDs from **Serial No Search** dialog box are displayed. Select the ASUP IDs, and click **Add Selected ASUPs**.

The ASUP IDs are displayed in the **ASUP ID** column along with their connection statuses.

3. Enter host name of the controller in the **Search By Hostname** field, and click **Search**.

   The Config Advisor ASUP IDs from Hostname Search dialog box are displayed.

4. Select the appropriate ASUP IDs, and click **Add Selected ASUPs**.

   The selected ASUP IDs are displayed in the **ASUP ID** column along with their connection statuses.

Note: You can enter multiple comma-separated host names or system serial numbers, with no space.

5. To delete an ASUP ID from the displayed list, select the ID and click **Delete ID**.

   a) You can select the **Pull all ASUP sections** check box to collect from all of the sections of the AutoSupport.

6. Click **Collect Data** to start the data collection.

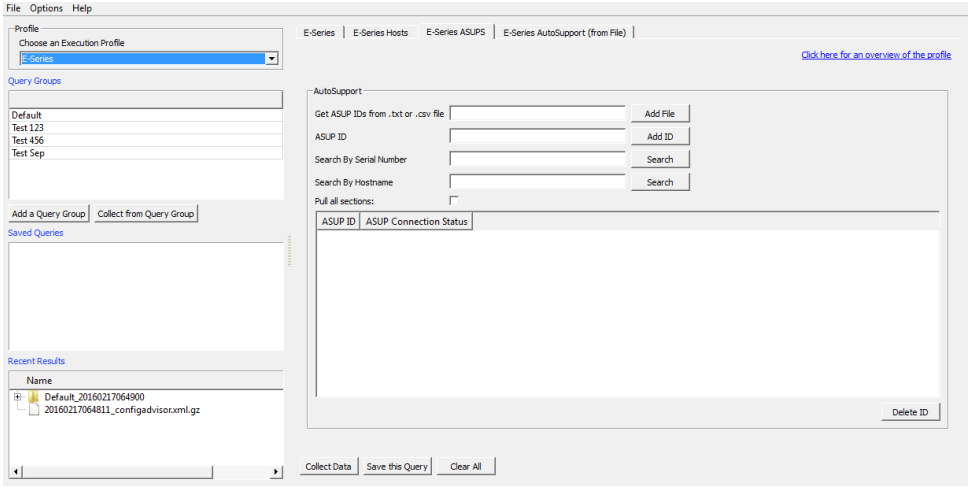
7. The **Results File** dialog box is displayed.

8. Enter a name for the result file or accept the default, and click **Ok**. After the data collection and analysis are complete, the result file is displayed in the **Recent Results** pane.

9. Click **Save this Query** to save the AutoSupport IDs as a query. For more information about saving credentials, see *Saving plug-in credentials in Config Advisor*.

Note: When collection from E-Series AutoSupports, no results viewer is displayed and an error is displayed in the log pane.

The **E-Series ASUPS** tab is as shown:



Note: This tab is visible only to users who have access to NetApp intranet and the AutoSupport Data warehouse.

Fields in E-Series ASUPS

The fields in the E-Series ASUPS tab are as follows:

GUI field/GUI button	Description
Get ASUP IDs from .txt or .csv file	.csv or .txt file containing multiple AutoSupport IDs
Add File	Adds the selected .csv or .txt file containing multiple AutoSupport IDs
ASUP ID	AutoSupport ID of a controller
Add ID	Adds the entered AutoSupport ID • The AutoSupport ID is verified and the status is displayed • You cannot make duplicate entries of the same AutoSupport ID
Search By Serial No.	Allows you to search for ASUP IDs by serial numbers of controllers
Search By Hostname	Allows you to search for ASUP IDs by host names of controllers
ASUP Connection Status	Displays the status of the AutoSupport ID
Delete Id	Deletes the selected AutoSupport ID from the list

Collect Data	Collects data from a storage controller
Save this Query	Saves the AutoSupport IDs from the table as a query for later use
Clear All	Clears all the information entered in the fields

Fields in E-Series AutoSupport (from File) tab

The fields in the E-Series AutoSupport (from File) tab are as follows:

GUI field/GUI button	Description
File Location	Displays the path from where the file was loaded
Valid File Format	Displays Verified if Config Advisor is able to validate or read the file format
Add File	Adds a file from the selected location • When you add a file, it is verified before it is added to the list • If you add an invalid file, an error message is displayed and the file is not added to the list
Remove File	Removes the AutoSupport file from the list
Collect Data	Collects data from AutoSupport files
Save this Query	Saves the file path as a query for later use

Collecting data by using the E-Series AutoSupport (from File)

Config Advisor can perform an analysis using the AutoSupport file from a NetApp storage system.

Steps

1. Click **Add File** and choose an AutoSupport file.

   AutoSupport files in the .tgz, .7z, and .txt formats are supported.

   a) Alternatively, you can select a query from the **Query Groups** pane. For more information, see *Saving plug-in credentials in Config Advisor*.

   b) You can select the **Pull all ASUP sections** check box to collect from all of the sections of the AutoSupport.

2. Click **Collect Data** to start the data collection.

   The **Results File** dialog box is displayed.

3. Enter a name for the result file or accept the default, and click **Ok**.

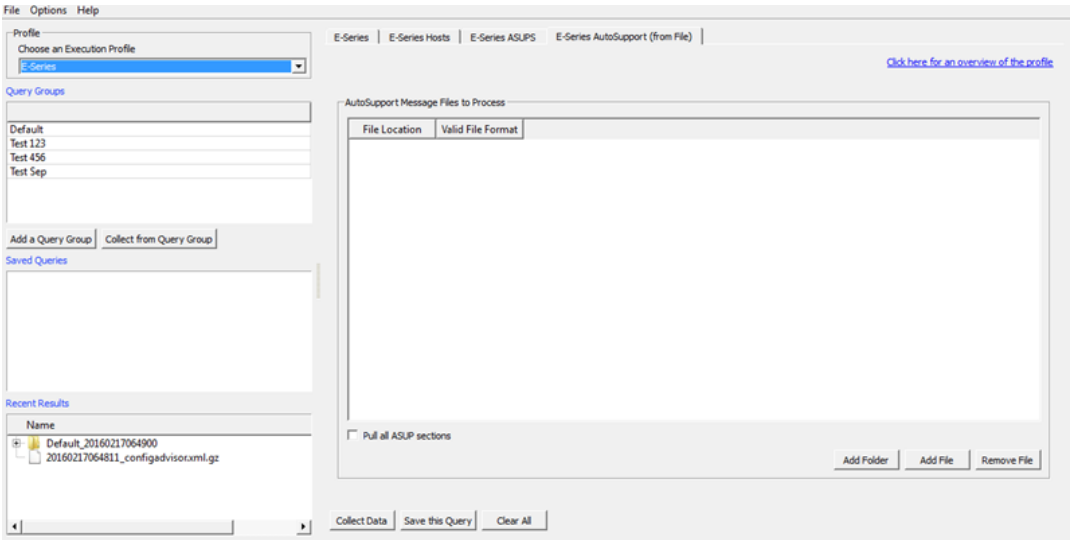
When the data collection and analysis are complete, the result file is displayed in the **Recent Results** pane.

4. Click **Save this Query** to save the file as a query.

   For more information about saving credentials, see *Saving plug-in credentials in Config Advisor*.

Note: When collecting data from the E-Series AutoSupports, no results viewer is displayed and an error is displayed in the log pane.

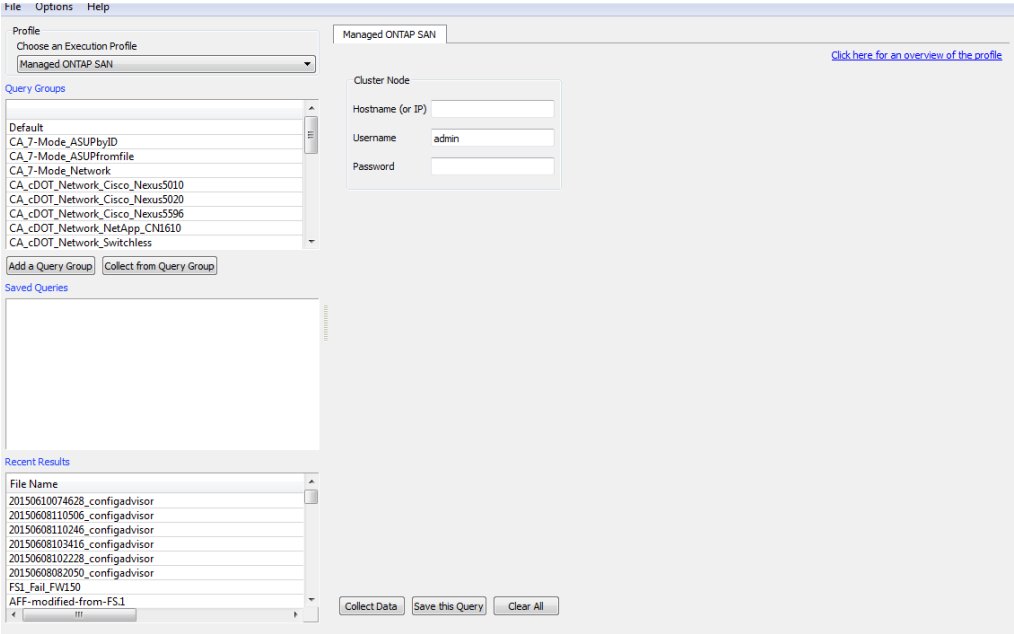
The **E-Series AutoSupport (from File)** tab is as shown:



Managed ONTAP SAN

On the Config Advisor tool, in the main window, select > **Profile** > option > **Choose an Execution Profile** > **Managed ONTAP SAN** and then the Managed ONTAP SAN page is loaded.

The Managed ONTAP SAN profile page is shown below:

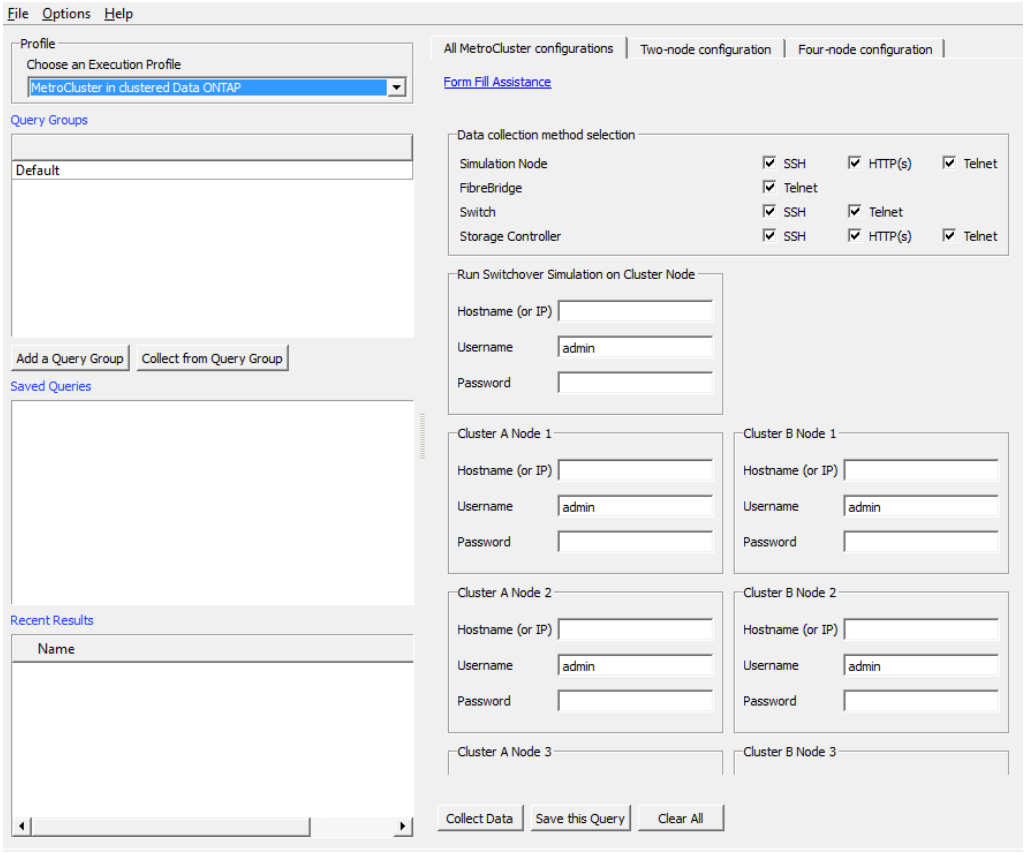


The fields in Managed ONTAP SAN sub-profiles tab are as follows:

GUI field\GUI button	Description
Hostname (or IP)	Host name or IP address of the controller.
Username	User name to access the node.
Password	Password to access the controller.
Collect Data	Initiates the collect data request from Config Advisor.
Save this Query	Saves the profile details as a query for later use.
Clear All	Clears the details entered in the fields in the profile page.

MetroCluster in clustered Data ONTAP

The MetroCluster in clustered Data ONTAP profile page is shown below:



Details of common fields in the different profile pages are as follows:

Field name	Description
Hostname (or IP)	Hostname or IP address of the node, switch, or ATTO bridge.
Username	User name to access the node, switch, or ATTO bridge.
Password	Password to access the node, switch, or ATTO bridge.
Collect Data	Initiates the collect data request from Config Advisor.
Save this Query	Saves the profile details as a query for later use.

Field name	Description
Clear All	Clears the details entered in the fields in the profile page.

Note: All switches mentioned here are the back-end Fibre Channel switches.

Note: The node that is entered in **Run Switchover Simulation on Cluster Node** must be one of the nodes that is configured in the 2Node or 4Node profile.

This profile collects data from MetroCluster in clustered Data ONTAP setup.

There are three different profiles:

- **All MetroCluster configurations**: This is a new profile in the version 1.5 of the MetroCluster plug-in and it covers all of the MetroCluster configurations regardless of the amount of nodes or topology. To use this profile, only the existing components need to be entered. The only two mandatory fields are 2 storage controllers. All other components are optional. The plug-in will determine which checks to run for the specific configuration.
- **Two-node configuration**: This profile is used to configure the various two-node configurations. It is still present so that existing data can be analyzed and existing configurations do not need to be transferred to the “All MetroCluster configurations” profile. To configure new two-node configurations it is advisable to use the “All MetroCluster configurations”. In case the two-node configuration is expanded to a four-node configuration no new profile need to be configured but the existing configurations can be expanded by two nodes and switches as needed.
- **Four-node configuration**: This profile is used to configure the various four-node configurations. It is still present so that existing data can be analyzed and existing configurations do not need to be transferred to the “All MetroCluster configurations” profile. The same applies to the use of this profile.

  It requires collecting data from nodes of the two clusters, backend Fibre Channel switches, and ATTO bridges. You can select a sub profile that best describes the MetroCluster in clustered Data ONTAP setup by clicking the appropriate tab and option buttons. If the number of ATTO bridges in MetroCluster in clustered Data ONTAP setup is fewer than available fields, extra fields can be left as-is. MetroCluster in clustered Data ONTAP plug-in 1.3 version supports NetApp ONTAP versions 8.3.0, 8.3.1, and 8.3.2.

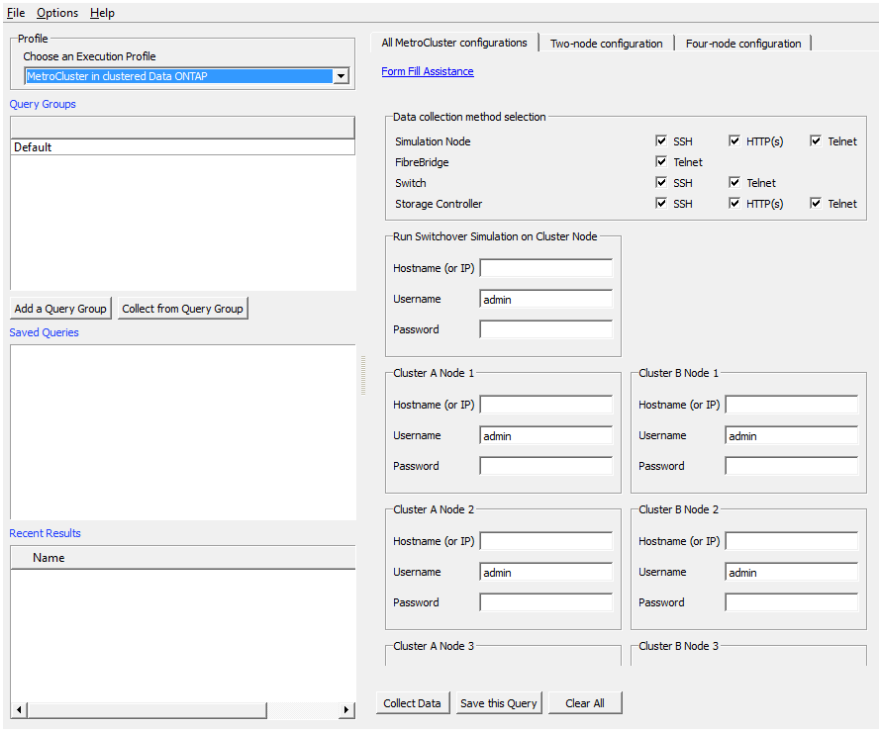
NetApp recommends performing data collection when all devices are up and running, make sure that the controllers are not in switch over or taken over state during data collection.

The following are two new features that have been implemented in the MetroCluster in clustered Data ONTAP:

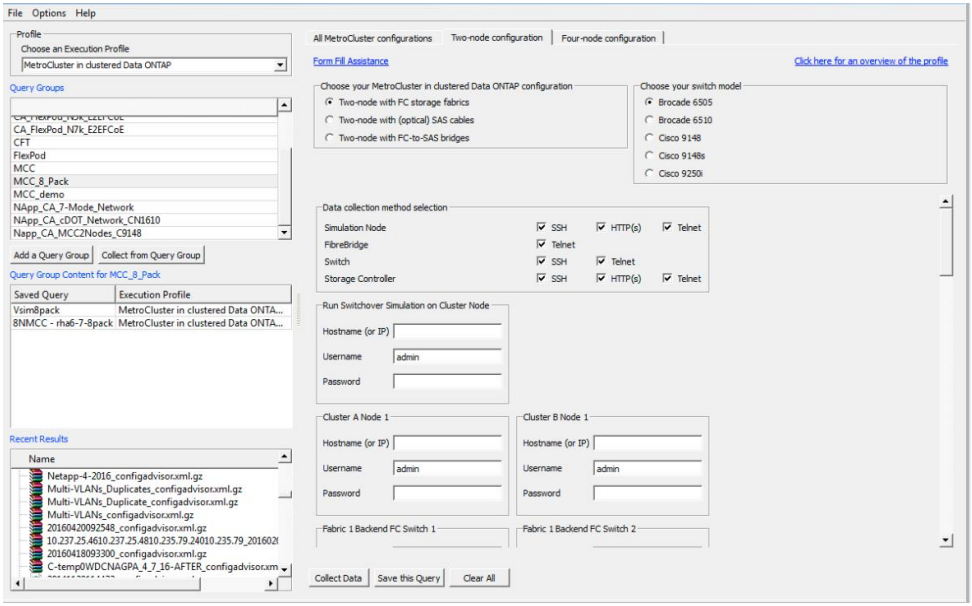
- **Form Fill Assistance**: You can enter the credential once and have them copied for all of the similar components. IP addresses entered are incremented for each component.
- **Data Collection Method Selection**: You can either select or clear the check boxes under the **Data Collection Method Selection** pane to control the data collection protocol fallback at the component level.

Note: If you are at a secure site, AutoSupport is switched off, user credentials are not collected, and Telnet is disabled. However, these settings may be revisited using **Options** > **Preferences** items.

All MetroCluster configuration:

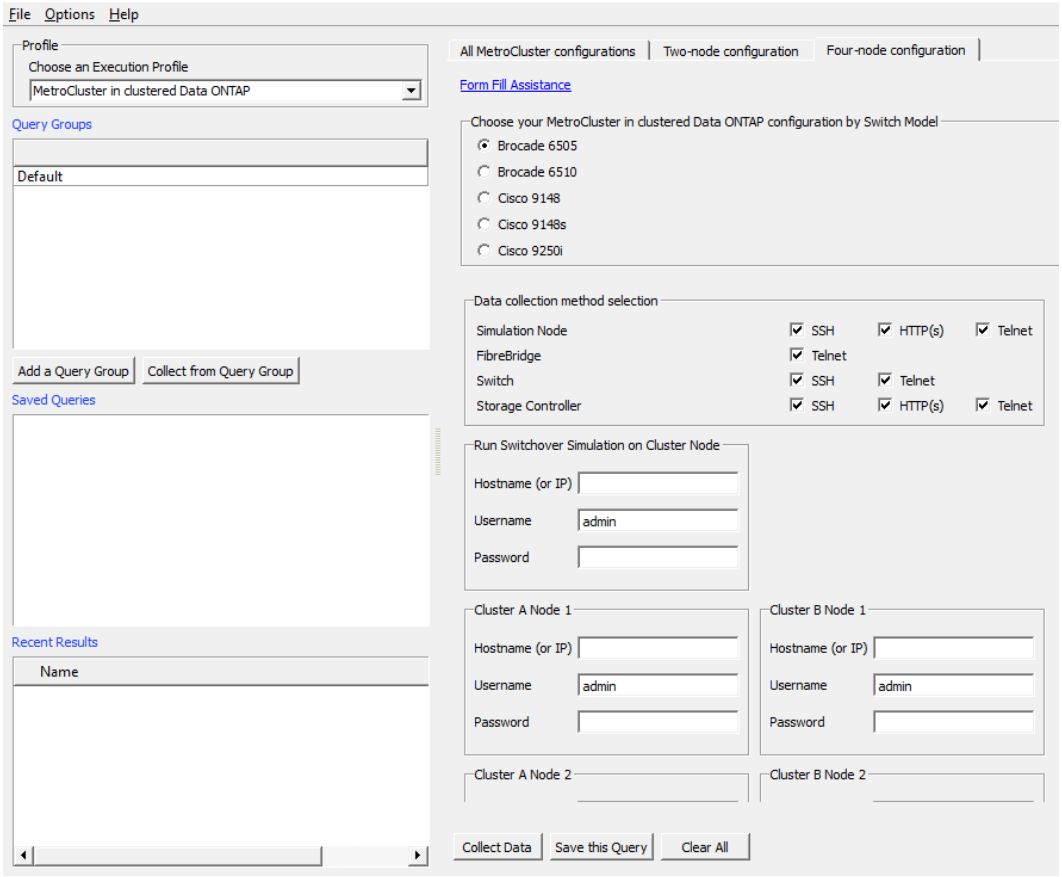


Two-node with fabric configuration:



- **Two-node with FC Storage fabrics**: This requires collecting data from the devices [Controllers, switches, and Atto bridges] based on the type of FC Switch model that is being used in the configuration.
- **Two-node with (optical) SAS cables**: This requires collecting data from both the nodes of the two clusters.
- **Two-node with FC-to-SAS- bridges**: This requires collecting data from both the nodes of the two clusters and the Atto bridges.
- **Four-node configurations**: This sub profile requires collecting data from the devices [Controllers, switches, and Atto bridges] based on the type of FC switch model that is being used in the configuration.

Four-node with fabric configuration:



Considerations for data collection

Based on the Profile selected, you can refer to the following sections. Data is collected for controllers using the SSH protocol. If connectivity fails, then the fall back mechanism selects HTTPS protocol as the alternative.

Data is collected for ATTO bridges using the Telnet protocol. If connectivity fails, then there is no fall back mechanism. The maximum number of ATTO bridges supported by Config Advisor is 40 in the two and four-node configuration profiles, 80 in the All MetroCluster configurations profile.

You can enter the data for the ATTO bridge as per the configuration. If the configuration contains less than 40 ATTO bridges, the remaining fields can be left blank.

Data collection on all sub profiles must be done in a state where all the nodes, switches, and bridges are running. If this requirement is not met, this results in some of the rules falling into the **Not Evaluated** state.

Additional data collection considerations that are dependent on the profile:

For MetroCluster in clustered Data ONTAP plug-in, the following sub profiles are supported:

- **Brocade 6510**: This profile is a four switch configuration with Brocade 6510 switches connecting all of the two or four nodes and ATTO bridges.
- **Brocade 6505**: This profile is a four switch configuration with Brocade 6505 switches connecting all of the two or four nodes and ATTO bridges.
- **Cisco 9148**: This profile is a four switch configuration with Cisco 9148 switches connecting all of the two or four nodes and ATTO bridges.
- **Cisco 9148S**: This profile is a four switch configuration with Cisco 9148S switches connecting all of the two or four nodes and ATTO bridges.
- **Cisco 9250i**: This profile is a four switch configuration with Cisco 9250i switches connecting all of the two or four nodes and ATTO bridges.

FlexPod

To verify some of the most common configuration errors in standard FlexPod setups, you must collect data from a single Cisco UCS Manager domain (two Cisco Fabric Interconnects), two Cisco Nexus 5000\7000\9000 series switches, and NetApp storage controllers. Optionally, data may be collected from VMware vCenter Server to receive recommendations on the latest supported firmware from NetApp *Interoperability Matrix Tool*. As with all FlexPod setups, the recommendations are related only to the core infrastructure and SAN boot configuration-any application workloads running on the infrastructure are not checked.

Note: Config Advisor supports only NX-OS mode for Cisco Nexus 9000 series switches.

Note: All the FlexPod device (One Cisco UCS Cluster, two Cisco Nexus Switches, one Cluster Interconnect and NetApp Storage Controllers) credentials are mandatory.

These checks are not comprehensive, and absence of failures do not indicate proper configuration of the FlexPod setups.

Config Advisor supports data collection from the controllers using Manage ONTAP Solution, SSH, or Telnet.

Note: The connections to a controller by using a Service Processor, RLM, BMC, or ACP are not supported.

Note: Config Advisor currently is tested against only a subset of the hardware. However, Config Advisor can also be used with other FlexPod configurations. Refer to NetApp Interoperability Matrix Tool and FlexPod Technical specification for FlexPod supported configurations. Config Advisor can be used only for FlexPod Datacenter and not for FlexPod Express or FlexPod Select.

You can use the Config Advisor FlexPod profile to run a detailed health check for all the components in the FlexPod stack. This profile can be used when commissioning a newly configured FlexPod system or when running the checks on the existing FlexPod stack. There are some checks that alert you about potential outage.

Note: Ensure that there are no pending configurations in FlexPod.

The FlexPod checks focus on the cabling between the FlexPod components and the configurations that run on them. The checks that focus on the cabling check for a minimum number of links that have to be present between the components as per the design. The checks that focus on the configuration collect the running configuration data of all the components and correlate them with

the validated design configuration. In addition, the checks indicate an appropriate severity level whenever there is a deviation in the cabling or configuration.

For configuration or cabling recommendations, see the Cisco Validated Design (CVD) guide available at *cisconetapp.com*, *www.cisco.com\go\flexpod*, or contact technical support.

See FlexPod configuration validations & health checks for a detailed description of all the FlexPod checks that are run.

In the FlexPod profile, you can collect data by using one of the following tabs in Config Advisor:

- FlexPod – ONTAP
- FlexPod –7-Mode
- FlexPod-SolidFire

Based on the Cisco Nexus switch model that you use, you can choose any one of the following options:

- Cisco Nexus 5000
- Cisco Nexus 7000
- Cisco Nexus 9000 (NX-OS mode only)

Select the Cisco UCS Model

- Cisco UCS
- Cisco UCS Mini

In the FlexPod – ONTAP profile, you can choose any one of the following cluster interconnects:

- Cisco NX5010/5020/5596/5596T/3132QV
- NetApp CN1610
- Switchless

Note: When you choose Cisco Nexus 7000 series switch as your switch model, the FlexPod SAN Boot Architecture can only be End-to-End FCoE.

Note: When you choose Cisco Nexus 9000 series switch as your switch model, the FlexPod SAN Boot Architecture can only be iSCSI.

Based on the FlexPod SAN Boot architecture used, you can choose any one of the following options in the tab:

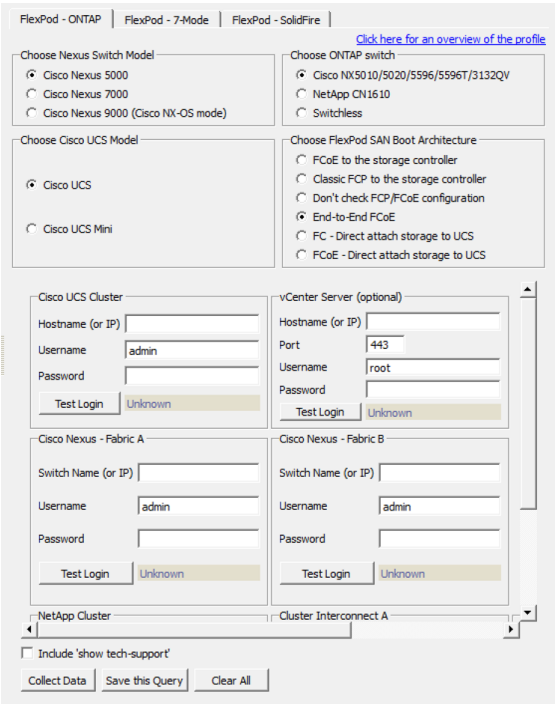
- FCoE to the storage controller
- Classic FCP to the storage controller
- Do not check FCP\FCoE configuration
- End-to-End FCoE
- iSCSI
- FC – Direct attach storage to UCS
- FCoE – Direct attach storage to UCS

Note: The process of collecting data from any one of the FlexPod profiles is the same.

Data collection from FlexPod – ONTAP

The process of collecting data from any one of the FlexPod profiles is the same. For more information see, Data collection from FlexPod – 7-Mode.

The **FlexPod – ONTAP** profile tab is as shown:



Fields in FlexPod – ONTAP profile tab

The fields in FlexPod setup profile tab are as follows:

GUI field\GUI button	Description
Admin VDC name (or IP)	Name of the Admin VDC or IP address (for a Cisco Nexus 7000 series switch)
Ethernet VDC name	Name of the Ethernet VDC (for a Cisco Nexus 7000 series switch)
Storage VDC name	Name of the Storage VDC (for a Cisco Nexus 7000 series switch)
Hostname (or IP)	Host name or IP address of the Cisco UCS Cluster, VMware vCenter Server, and NetApp Cluster
Switch Name (or IP)	Name or IP address of the Cisco Nexus Fabric A and B and Cisco Nexus Cluster Interconnect switches
Username	User name to access the Cisco UCS Cluster, VMware vCenter Server, Cisco Nexus Fabric A and B, NetApp Cluster, and Cisco Nexus Cluster Interconnect switches
Password	Password to access the Cisco UCS Cluster, VMware vCenter Server, Cisco Nexus Fabric A and B, NetApp Cluster, and Cisco Nexus Cluster Interconnect switches

GUI field\GUI button	Description
Test Login	Displays the connection status Config Advisor attempts to connect using Cisco UCS API for Cisco UCS Cluster in the following order: HTTPS > HTTP Config Advisor attempts to connect using VMware vSphere SDK for VMware vCenter Server Config Advisor attempts to connect to Cisco Nexus in the following order: SSH >Telnet Config Advisor uses the network fallback mechanism to connect to the cluster node in the following order: Manage ONTAP Solution > SSH >Telnet The statuses are as follows: **Insufficient Data**: Displayed if the device name and credentials are not entered **Click on 'Test Login' to verify**: Displayed if all the necessary details are entered **Valid <login type> Login**: Displayed if the connection is valid, where the login type is HTTPS, HTTP, SSH, or Telnet **Connection Failed**: Displayed if the connection to the device fails **Note**: The connection to a device fails if the host name or IP details are wrong, or if the device type is wrong, or if the device is powered off. Additional information about the failure is displayed in the **Config Advisor Logs** pane.
Collect Data	Collects data from FlexPod setup
Save this Query	Saves the login credentials as a query for later use
Clear All	Clears all the information entered in the fields

Note: The Config Advisor Log that is at the bottom of the main Config Advisor window has two tabs, Info and Errors. These tabs display details of data collection and connection testing processes. The Config Advisor Log also shows log details for Status, Invalid Credentials, and Connection Failure (along with the reasons for failure).

Data collection from FlexPod – 7-Mode

Steps

1. Enter the login details for two NetApp storage system nodes, two Cisco Nexus switches, and one Cisco UCS cluster.

Note: For a Cisco Nexus 7000 series switch you have to enter the Admin VDC name (or IP); Ethernet VDC name and Storage VDC name to collect data.

2. Alternatively, you can select the login credentials from the **Query Groups** pane.
3. Click Test Login to test the network connection for each system.
4. Click Collect Data to start the data collection.

The **Results File** dialog box is displayed.

5. Enter a name for the result file or accept the default name, and click OK.

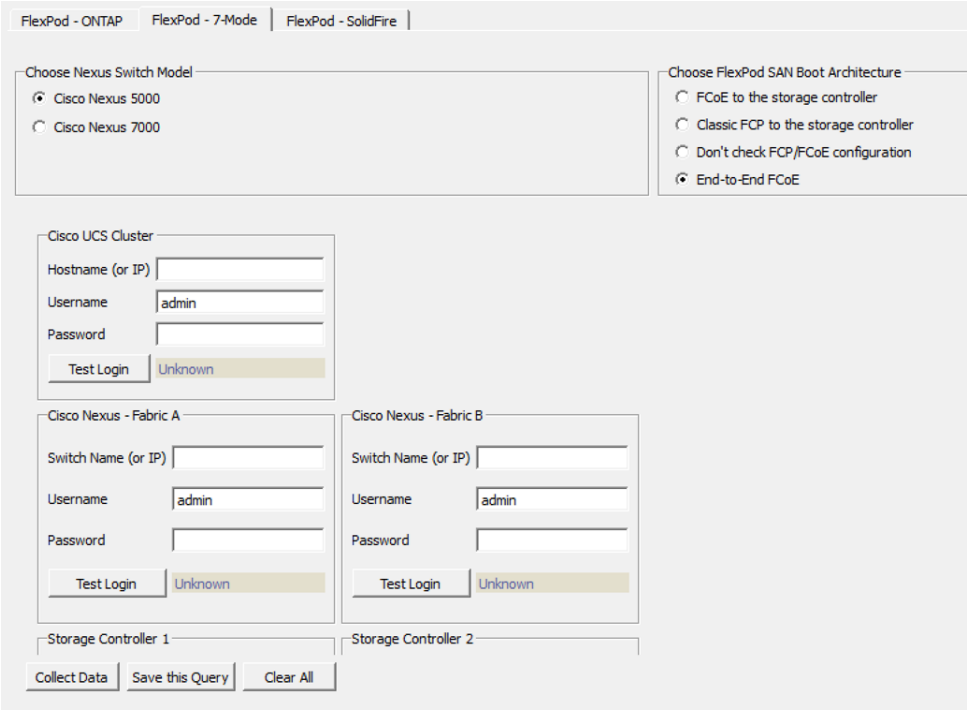
The data collection starts and a progress bar is displayed. The command exceptions are displayed in the **Config Advisor Logs** pane.

After the data collection and analysis are complete, the result file is displayed in the **Recent Results** pane.

Note: Data collection takes place and a Config Advisor result file is displayed even if the status check fails.

6. Click Save this Query to save the credentials as a query.

The **FlexPod – 7-Mode** profile tab is as shown:



Fields in FlexPod – 7-Mode profile tab

The fields in FlexPod setup profile tab are as follows:

GUI field\GUI button	Description
Admin VDC name (or IP)	Name of the Admin VDC or IP address (for a Cisco Nexus 7000 series switch)
Ethernet VDC name	Name of the Ethernet VDC (for a Cisco Nexus 7000 series switch)
Storage VDC name	Name of the Storage VDC (for a Cisco Nexus 7000 series switch)
Hostname (or IP)	Host name or IP address of the Cisco UCS Cluster and NetApp storage HA pair
Switch Name (or IP)	Name or IP address of the Cisco Nexus Fabric A and B
Username	User name to access the Cisco UCS Cluster, Cisco Nexus Fabric A and B, and NetApp storage HA pair

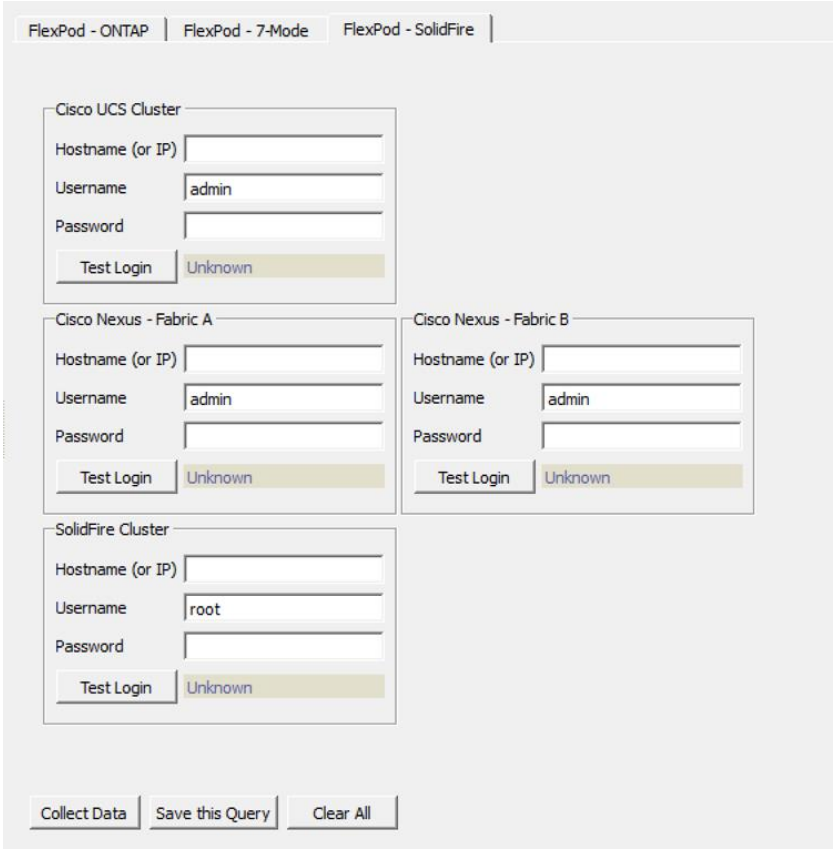
GUI field\GUI button	Description
Password	Password to access the Cisco UCS Cluster, Cisco Nexus Fabric A and B, and NetApp storage HA pair
Test Login	Displays the connection status Config Advisor attempts to connect using Cisco UCS API for Cisco UCS Cluster in the following order: HTTPS > HTTP Config Advisor attempts to connect to Cisco Nexus in the following order: SSH >Telnet Config Advisor uses the network fallback mechanism to connect to the cluster node in the following order: Manage ONTAP Solution > SSH >Telnet The statuses are as follows: **Insufficient Data**: Displayed if the device name and credentials are not entered **Click on 'Test Login' to verify**: Displayed if all the necessary details are entered **Valid <login type> Login**: Displayed if the connection is valid, where the login type is HTTPS, HTTP, SSH, or Telnet **Connection Failed**: Displayed if the connection to the device fails **Note**: The connection to a device fails if the host name or IP details are wrong, or if the device type is wrong, or if the device is powered off. Additional information about the failure is displayed in the **Config Advisor Logs** pane.
Collect Data	Collects data from FlexPod setup
Save this Query	Saves the login credentials as a query for later use
Clear All	Clears all the information entered in the fields

Note: The Config Advisor Log that is at the bottom of the main Config Advisor window has two tabs, Info and Errors. These tabs display details of data collection and connection testing processes. The Config Advisor Log also shows log details for Status, Invalid Credentials, and Connection Failure (along with the reasons for failure).

Data collection from FlexPod – SolidFire

This profile checks for the NetApp-SolidFire best practice configuration errors in FlexPod deployments, which include connectivity and configuration checks. It collects data from single UCS Manager (Cisco Fabric Interconnect cluster), two Cisco Nexus 5000/9000 series switches, and SolidFire cluster. These checks are not comprehensive and absence of failure does not indicate proper configuration of the FlexPod with SolidFire.

The **FlexPod – SolidFire** profile tab is as shown:



Fields in FlexPod – SolidFire profile tab

The fields in **FlexPod – SolidFire** profile tab are as follows:

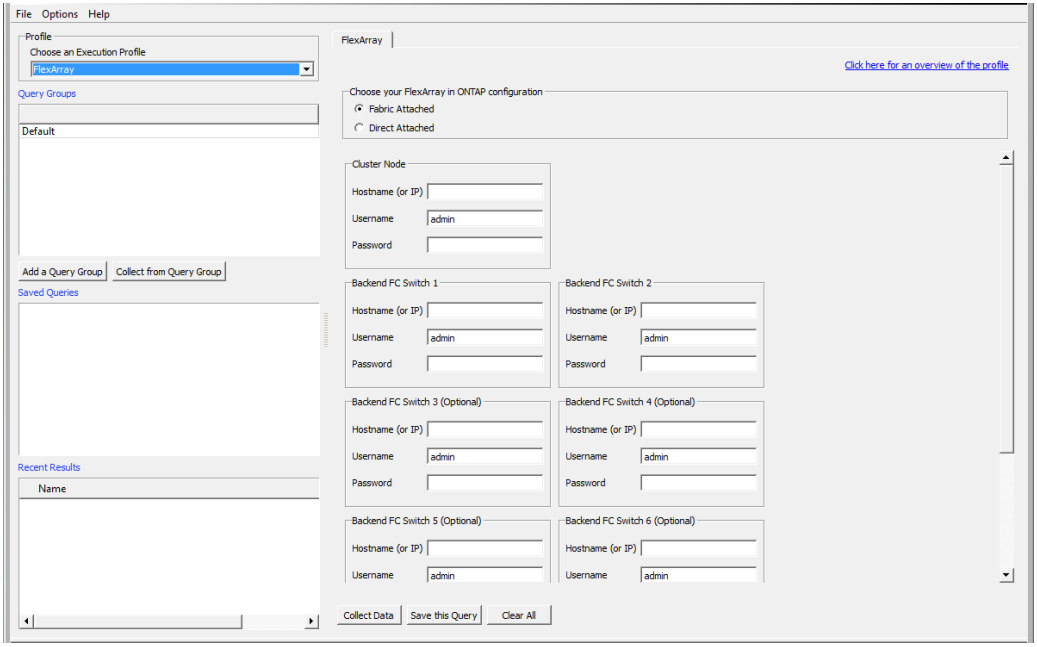
GUI field\GUI button	Description
Hostname (or IP)	Host name or IP address of the Cisco UCS Cluster, and NetApp-SolidFire Cluster
Switch Name (or IP)	Name or IP address of the Cisco Nexus Fabric A and B
Username	User name to access the Cisco UCS Cluster, Cisco Nexus Fabric A, and B, NetApp-SolidFire Cluster
Password	Password to access the Cisco UCS Cluster, Cisco Nexus Fabric A and B, NetApp-SolidFire Cluster
Test Login	Displays the connection status Config Advisor attempts to connect using Cisco UCS API for Cisco UCS Cluster in the following order: HTTPS > HTTP Config Advisor attempts to connect to Cisco Nexus in the following order: SSH >Telnet Config Advisor uses SolidFire API to connect NetApp Solid-Fire cluster The statuses are as follows: **Insufficient Data**: Displayed if the device name and credentials are not entered **Click on 'Test Login' to verify**: Displayed if all the necessary details are entered **Valid <login type> Login**: Displayed if the connection is valid, where the login type is HTTPS, HTTP, SSH, or Telnet **Connection Failed**: Displayed if the connection to the device fails **Note**: The connection to a device fails if the host name or IP details are wrong, or if the device type is wrong, or if the device is powered off. Additional information about the failure is displayed in the **Config Advisor Logs** pane.
Collect Data	Collects data from FlexPod setup
Save this Query	Saves the login credentials as a query for later use
Clear All	Clears all the information entered in the fields

Note: The Config Advisor Log that is at the bottom of the main Config Advisor window has two tabs, Info and Errors. These tabs display details of data collection and connection testing processes. The Config Advisor Log also shows log details for Status, Invalid Credentials, and Connection Failure (along with the reasons for failure).

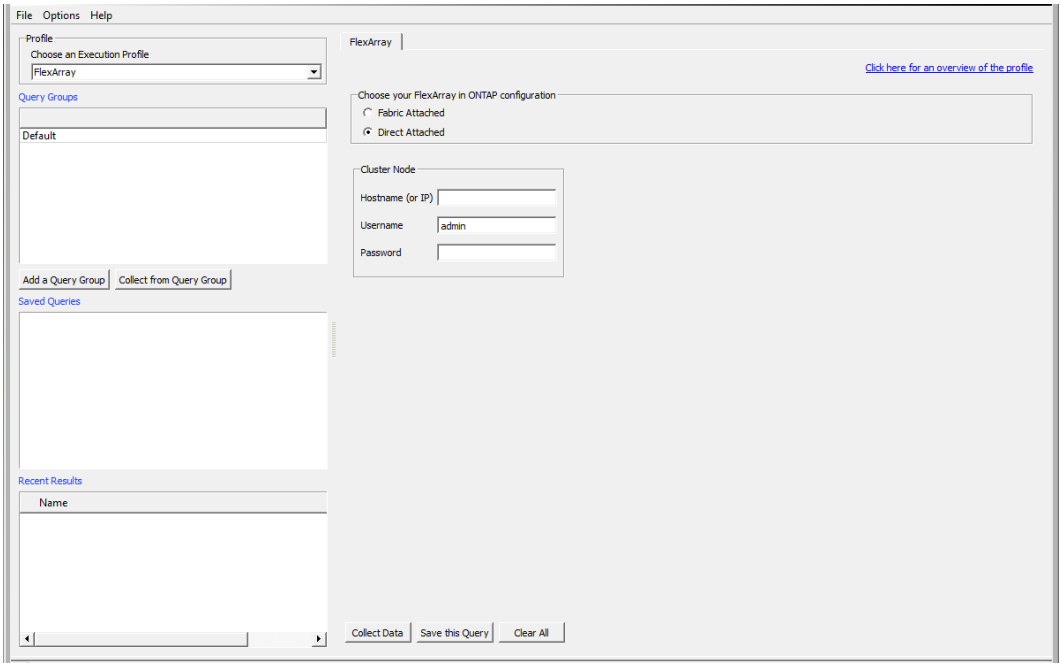
FlexArray

The FlexArray plug-in profile page is shown below:

FlexArray plug-in profile page for Fabric Attached configuration.



FlexArray plug-in profile page for Direct Attached configuration.



Details of fields in the profile pages are as follows:

Field name	Description
Hostname (or IP)	Hostname or IP address of the node, User can provide cluster/nodename or cluster management/node management IP (nodename can be of any node in the cluster).
Username	User name to access the cluster/node or backend switches.
Password	Password to access the cluster/node or backend switches.
Collect Data	Initiates the collect data request from Config Advisor.
Save this Query	Saves the profile details as a query for later use.
Clear All	Clears the details entered in the fields in the profile page.

Note: All switches mentioned here are the back-end Fibre Channel switches.

This profile collects data from two FlexArray configurations.

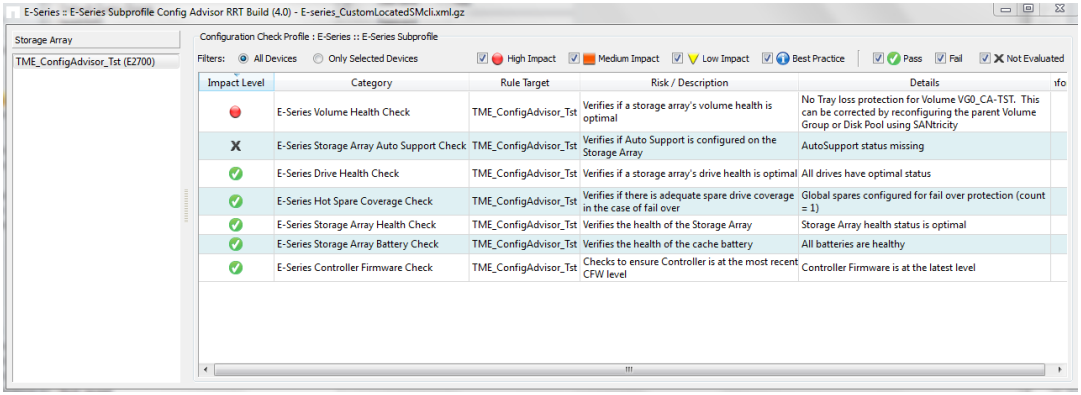
There are two different profiles:

- **Fabric Attached**: This profile collects and analyzes data from FlexArray configurations where backend storage array is connected through backend FC switches. This profile can take up to eight backend FC switches details. Details of two backend switches are mandatory and rest are optional.
- **Direct Attached**: This profile collects and analyzes data from FlexArray configurations in which backend storage array is connected directly without any backend FC switches.

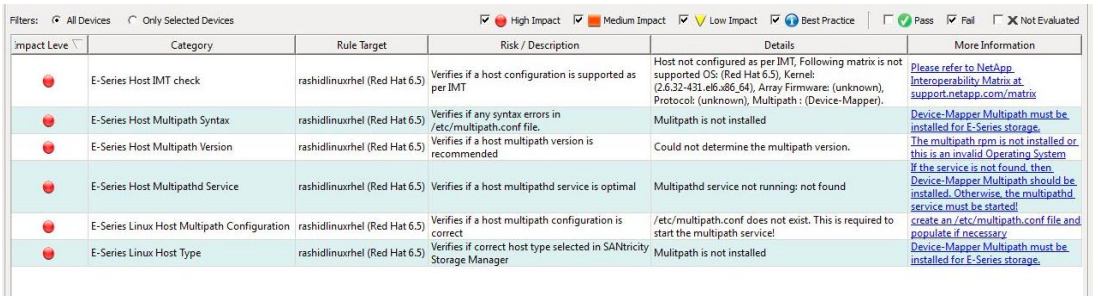
Viewing plug-in results in Config Advisor

Using the selected Config Advisor plug-in (profile), the Config Advisor Result Viewer opens are the end of data collection displaying the computed results.

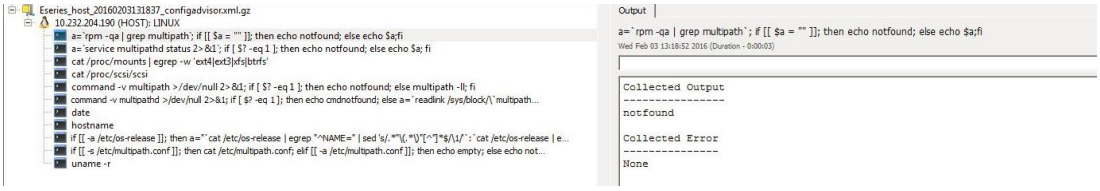
Example of data collection results from E-Series Storage Array



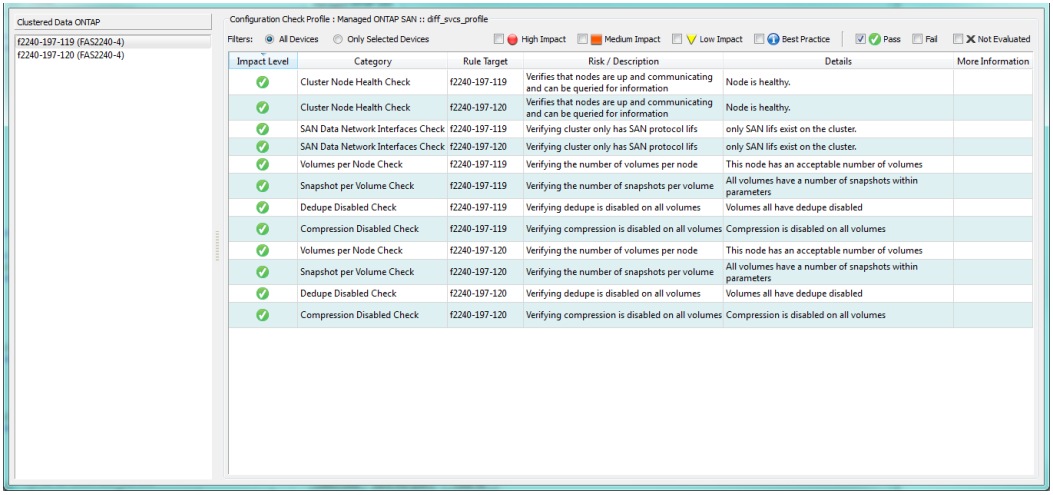
Example of data collection results from E-Series Host (Result Viewer)



Example of data collection results from E-Series Host (Command Viewer)

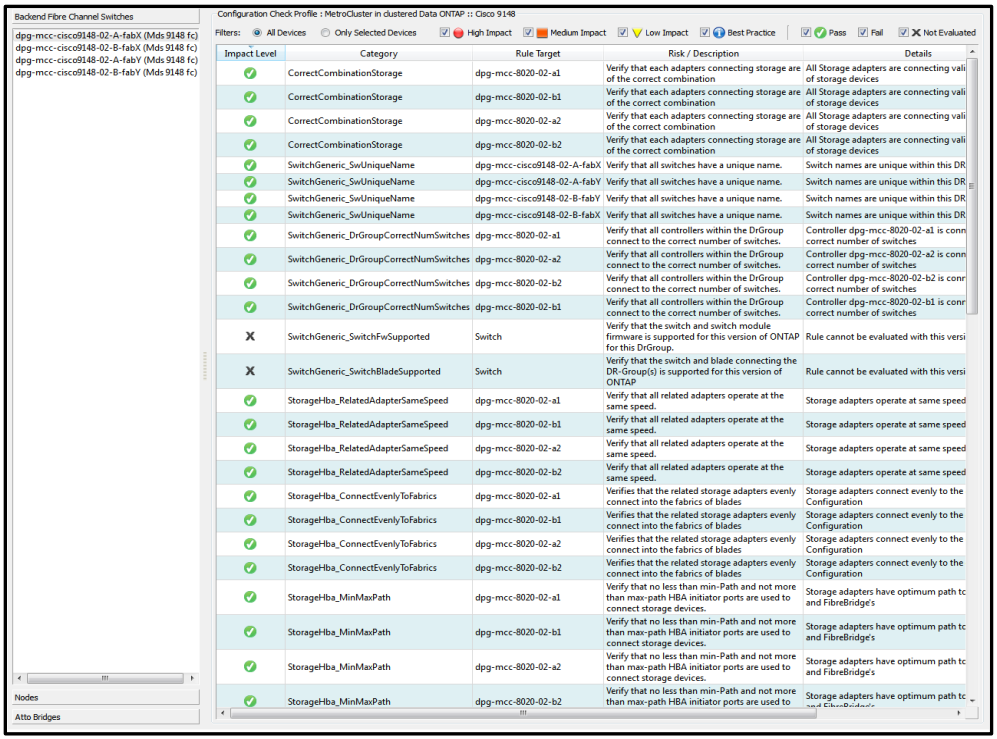


Example of data collection results from Managed ONTAP SAN



Impact Level	Category	Rule Target	Risk / Description	Details	More Information
✓	Cluster Node Health Check	f2240-197-119	Verifies that nodes are up and communicating and can be queried for information	Node is healthy.	
✓	Cluster Node Health Check	f2240-197-120	Verifies that nodes are up and communicating and can be queried for information	Node is healthy.	
✓	SAN Data Network Interfaces Check	f2240-197-119	Verifying cluster only has SAN protocol lifs	only SAN lifs exist on the cluster.	
✓	SAN Data Network Interfaces Check	f2240-197-120	Verifying cluster only has SAN protocol lifs	only SAN lifs exist on the cluster.	
✓	Volumes per Node Check	f2240-197-119	Verifying the number of volumes per node	This node has an acceptable number of volumes	
✓	Snapshot per Volume Check	f2240-197-119	Verifying the number of snapshots per volume	All volumes have a number of snapshots within parameters	
✓	Dedupe Disabled Check	f2240-197-119	Verifying dedupe is disabled on all volumes	Volumes all have dedupe disabled	
✓	Compression Disabled Check	f2240-197-119	Verifying compression is disabled on all volumes	Compression is disabled on all volumes	
✓	Volumes per Node Check	f2240-197-120	Verifying the number of volumes per node	This node has an acceptable number of volumes	
✓	Snapshot per Volume Check	f2240-197-120	Verifying the number of snapshots per volume	All volumes have a number of snapshots within parameters	
✓	Dedupe Disabled Check	f2240-197-120	Verifying dedupe is disabled on all volumes	Volumes all have dedupe disabled	
✓	Compression Disabled Check	f2240-197-120	Verifying compression is disabled on all volumes	Compression is disabled on all volumes	

Example of data collection results from MetroCluster in Clustered Data ONTAP



Backend Fibre Channel Switches

- dpg-mcc-cisco9148-02-A-fabX (Mds 9148 fc)
- dpg-mcc-cisco9148-02-B-fabX (Mds 9148 fc)
- dpg-mcc-cisco9148-02-A-fabY (Mds 9148 fc)
- dpg-mcc-cisco9148-02-B-fabY (Mds 9148 fc)

Nodes

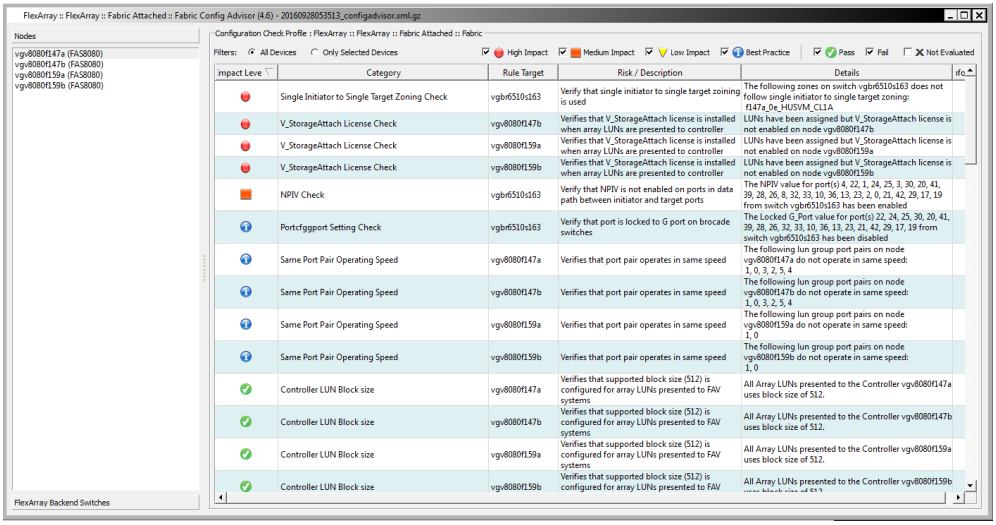
Atto Bridges

Configuration Check Profile : MetroCluster in clustered Data ONTAP :: Cisco 9148

Filters: All Devices | Only Selected Devices | High Impact | Medium Impact | Low Impact | Best Practice | Pass | Fail | Not Evaluated

Impact Level	Category	Rule Target	Risk / Description	Details
✓	CorrectCombinationStorage	dpg-mcc-8020-02-a1	Verify that each adapters connecting storage are of the correct combination	All Storage adapters are connecting vali of storage devices
✓	CorrectCombinationStorage	dpg-mcc-8020-02-b1	Verify that each adapters connecting storage are of the correct combination	All Storage adapters are connecting vali of storage devices
✓	CorrectCombinationStorage	dpg-mcc-8020-02-a2	Verify that each adapters connecting storage are of the correct combination	All Storage adapters are connecting vali of storage devices
✓	CorrectCombinationStorage	dpg-mcc-8020-02-b2	Verify that each adapters connecting storage are of the correct combination	All Storage adapters are connecting vali of storage devices
✓	SwitchGeneric_SwUniqueName	dpg-mcc-cisco9148-02-A-fabX	Verify that all switches have a unique name.	Switch names are unique within this DR
✓	SwitchGeneric_SwUniqueName	dpg-mcc-cisco9148-02-A-fabY	Verify that all switches have a unique name.	Switch names are unique within this DR
✓	SwitchGeneric_SwUniqueName	dpg-mcc-cisco9148-02-B-fabY	Verify that all switches have a unique name.	Switch names are unique within this DR
✓	SwitchGeneric_SwUniqueName	dpg-mcc-cisco9148-02-B-fabX	Verify that all switches have a unique name.	Switch names are unique within this DR
✓	SwitchGeneric_DrGroupCorrectNumSwitches	dpg-mcc-8020-02-a1	Verify that all controllers within the DrGroup connect to the correct number of switches.	Controller dpg-mcc-8020-02-a1 is conn correct number of switches
✓	SwitchGeneric_DrGroupCorrectNumSwitches	dpg-mcc-8020-02-a2	Verify that all controllers within the DrGroup connect to the correct number of switches.	Controller dpg-mcc-8020-02-a2 is conn correct number of switches
✓	SwitchGeneric_DrGroupCorrectNumSwitches	dpg-mcc-8020-02-b2	Verify that all controllers within the DrGroup connect to the correct number of switches.	Controller dpg-mcc-8020-02-b2 is conr correct number of switches
✓	SwitchGeneric_DrGroupCorrectNumSwitches	dpg-mcc-8020-02-b1	Verify that all controllers within the DrGroup connect to the correct number of switches.	Controller dpg-mcc-8020-02-b1 is conr correct number of switches
✗	SwitchGeneric_SwitchFwSupported	Switch	Verify that the switch and switch module firmware is supported for this version of ONTAP for this DrGroup.	Rule cannot be evaluated with this versi
✗	SwitchGeneric_SwitchBladeSupported	Switch	Verify that the switch and blade connecting the DR-Group(s) is supported for this version of ONTAP	Rule cannot be evaluated with this versi
✓	StorageHba_RelatedAdapterSameSpeed	dpg-mcc-8020-02-a1	Verify that all related adapters operate at the same speed.	Storage adapters operate at same speed
✓	StorageHba_RelatedAdapterSameSpeed	dpg-mcc-8020-02-b1	Verify that all related adapters operate at the same speed.	Storage adapters operate at same speed
✓	StorageHba_RelatedAdapterSameSpeed	dpg-mcc-8020-02-a2	Verify that all related adapters operate at the same speed.	Storage adapters operate at same speed
✓	StorageHba_RelatedAdapterSameSpeed	dpg-mcc-8020-02-b2	Verify that all related adapters operate at the same speed.	Storage adapters operate at same speed
✓	StorageHba_ConnectEvenlyToFabrics	dpg-mcc-8020-02-a1	Verifies that the related storage adapters evenly connect into the fabrics of blades	Storage adapters connect evenly to the Configuration
✓	StorageHba_ConnectEvenlyToFabrics	dpg-mcc-8020-02-b1	Verifies that the related storage adapters evenly connect into the fabrics of blades	Storage adapters connect evenly to the Configuration
✓	StorageHba_ConnectEvenlyToFabrics	dpg-mcc-8020-02-a2	Verifies that the related storage adapters evenly connect into the fabrics of blades	Storage adapters connect evenly to the Configuration
✓	StorageHba_ConnectEvenlyToFabrics	dpg-mcc-8020-02-b2	Verifies that the related storage adapters evenly connect into the fabrics of blades	Storage adapters connect evenly to the Configuration
✓	StorageHba_MinMaxPath	dpg-mcc-8020-02-a1	Verify that no less than min-Path and not more than max-path HBA initiator ports are used to connect storage devices.	Storage adapters have optimum path tc and FibreBridge's
✓	StorageHba_MinMaxPath	dpg-mcc-8020-02-b1	Verify that no less than min-Path and not more than max-path HBA initiator ports are used to connect storage devices.	Storage adapters have optimum path tc and FibreBridge's
✓	StorageHba_MinMaxPath	dpg-mcc-8020-02-a2	Verify that no less than min-Path and not more than max-path HBA initiator ports are used to connect storage devices.	Storage adapters have optimum path tc and FibreBridge's
✓	StorageHba_MinMaxPath	dpg-mcc-8020-02-b2	Verify that no less than min-Path and not more than max-path HBA initiator ports are used to	Storage adapters have optimum path tc

Example of data collection results from FlexArray



The results window is divided into the following panes:

- **Device Listing**: You can view the details of the devices from the results pane.
- **Configuration Validations** and **Health Checks**: You can use filters to view the rules that were run on the collected data and the results. For more information about the results, see the *Config Advisor Installation and Administration Guide*.

Details of fields in the Config Advisor **Result Viewer** pane are as follows:

Field name	Description
Configuration Check Profile	Displays the profile on which the configuration check was done. For example, if Managed ONTAP SAN is selected as the execution profile, then the value is Managed ONTAP SAN: diff_svcs_profile.
Filters	Provides an option to filter the results in the configuration check pane. You can use the following options to filter the results: • All Devices: Displays the configuration checks for all the controllers and switches

Field name	Description
	• Only Selected Devices: Displays the configuration checks for only the selected controllers or switches • High Impact: Critical impact potential, and should be addressed immediately • Medium Impact: Disruptive impact potential, and should be addressed as soon as possible • Low Impact: Low impact potential, and should be addressed in the next maintenance window • Best Practice: Best practice recommendations • Pass: Displays the rules that have passed the configuration checks • Fail: Displays the rules that have failed • Not evaluated: Displays the rules that have not been evaluated
Dashboard failures	Can be activated by clicking 'View Details' link on a FlexPod Dashboard. Displays configuration checks related to that link. To revert to normal view select 'All Devices'.
Impact Level	Displays the impact level of the configuration checks and can be set to any one of the following values: • High Impact • Medium Impact • Low Impact • Best Practice • Pass • Fail: • Not evaluated
Category	Displays the name of the configuration check.

Field name	Description
Rule Target	Displays the name of the E-Series storage array, or Managed ONTAP SAN node of interest, or MetroCluster in clustered Data ONTAP.
Risk\Description	Displays the short description of the configuration check.
Details	Displays the details of the configuration check describing the outcome of the rule check.
More Information	Displays additional information or links, if any.

The Config Advisor result details from previous data collections are displayed in the Config Advisor main window, **Recent Results** pane. You can right-click any one of the results to view the available options.

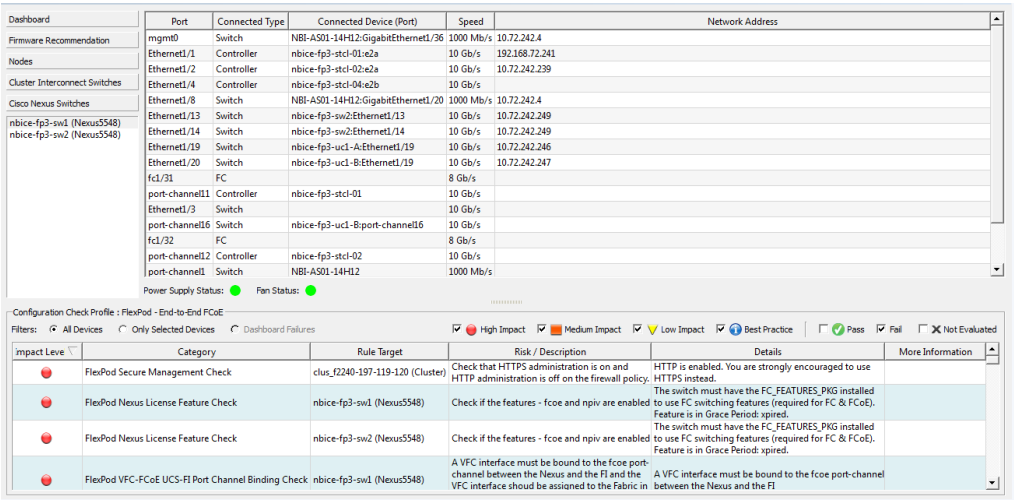
For more information on Saving and Loading credentials, see *Config Advisor Installation and Administration Guide*.

Viewing FlexPod – ONTAP results in Config Advisor

Steps

1. In the **Recent Results** pane, right-click the required file.
2. Select **View Analysis**.

Following is the Config Advisor (FlexPod Results) window is displayed:

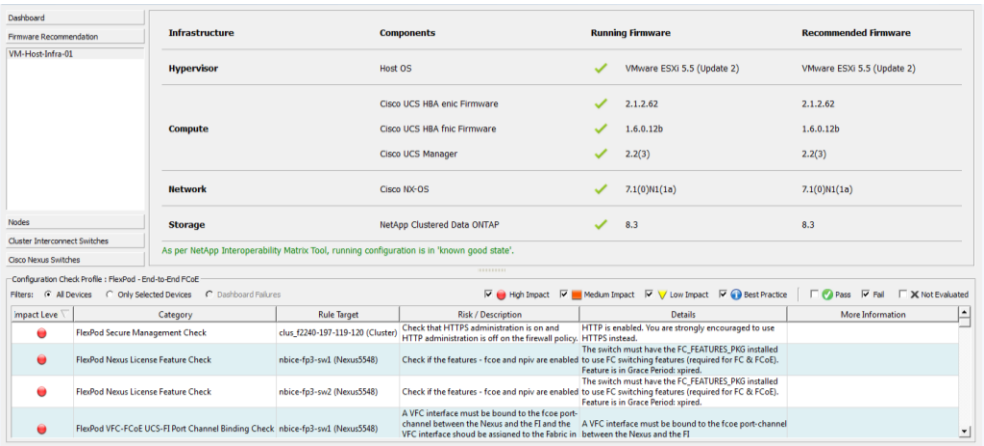


The **Config Advisor (FlexPod Results)** window is divided into the following panes:

- **Dashboard, Firmware Recommendation, Nodes, Cluster Interconnect Switches, and Cisco Nexus Switches**:
- **Nodes** - Network Interfaces, Cabling, System Config Summary, Aggregate Info tabs
- **Cluster Interconnect Switches** – (port, Connected Type, Connected Host, Speed, Network Interface) tab
- **Cisco Nexus Switches** – (port, Connected Type, Connected Host, Speed, Network Interface) tab
- **Configuration Validations & Health Checks**: You can use filters to see the rules that were run on the collected data and the results.

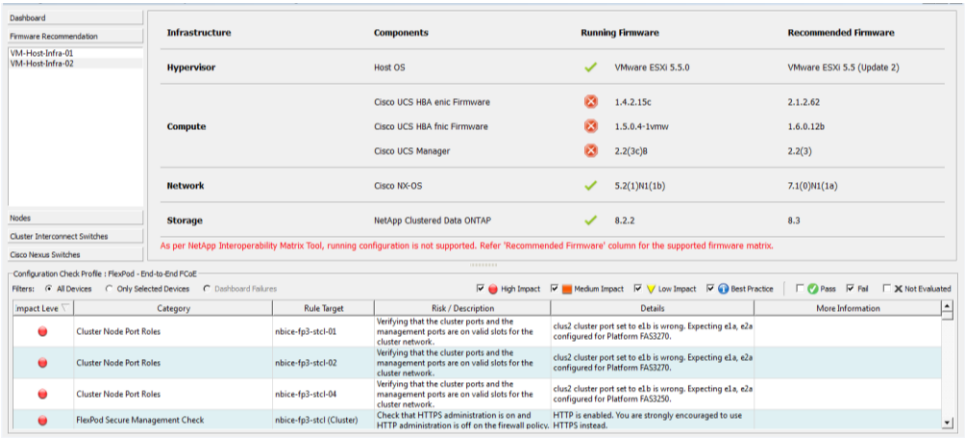
- **Navigation pane**: The navigation pane allows the user to navigate between Dashboard, Firmware Recommendation, Nodes, Cluster Interconnect Switches, and Cisco Nexus Switches of the FlexPod setup. By default, Dashboard is selected.
- **Dashboard tab:** The **Dashboard** tab lists the inventory of FlexPod categorized by Compute, Network and Storage. Each category has the following sections:
- **Hardware Validated:** This section checks for minimum hardware requirement as per FlexPod technical specifications (*TR-4036*).
- **Cabling Validated:** This section checks for minimum cabling requirement as per FlexPod technical specifications (*TR-4036*). The possible values in this section are highlighted in green check mark (✓) and a red cross mark (x). In case of any failure, the cross mark is displayed and upon clicking **View Details** it shows the corresponding errors.The filter **Dashboard failures** is selected by default when you click the **View Details** link. This filter cannot be selected otherwise. To revert, select the **All Devices** filter.
- **Firmware Recommendation tab :** On the left pane, a list of Cisco UCS blade servers running VMware is displayed. You can select any one of the blade servers to receive the latest recommended firmware versions for the entire FlexPod stack. The first blade server is selected by default.

  Firmware Recommendation tab lists the current running and latest recommended firmware version for Hypervisor (VMware), Compute, Network, and Storage. The latest recommended firmware revision is received from IMT at the time of Config Advisor launch if the network access is available.



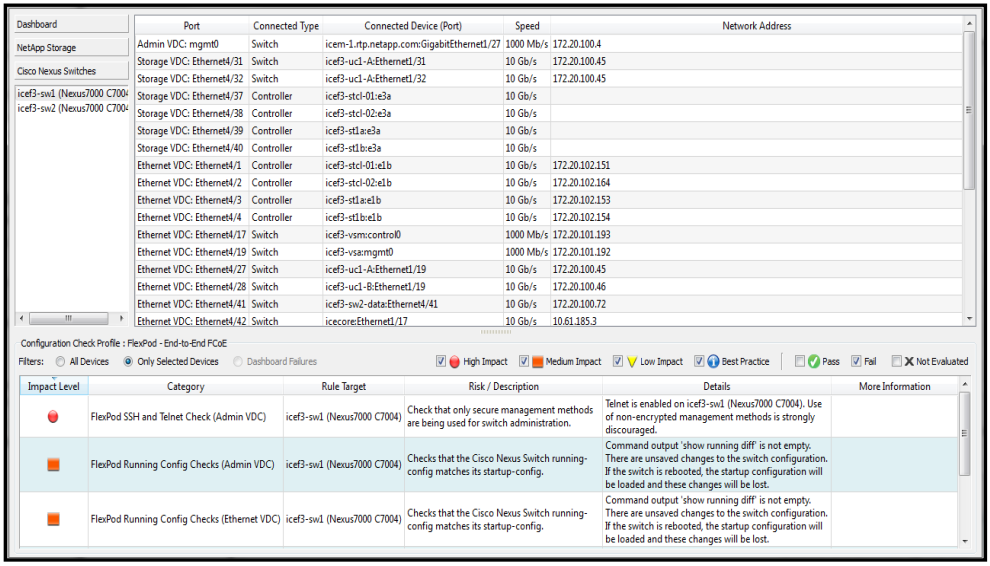
In the case of secure sites, no network access is available. You are required to manually download *resource_binary.zip* from *http:\\mysupport.netapp.com\public\config_advisor\bin\resources_binary.zip* and place it in the C:\Users\<windows_login> \ConfigAdvisorData folder and replace any existing file with the same name. Restart Config Advisor for the new file to take effect.

If the current running Firmware version is unsupported, a red (x) is displayed next to the Firmware version. If the current running Firmware version is supported, a green check mark (✓) is displayed.



- **Nodes tab**: You can view the details such as Network Interfaces, Cabling, System Config Summary, and Aggregate Info of the nodes of the ONTAP system.

- **Cisco Nexus Switches tab:** You can view the details of a switch by selecting a switch from the **Cisco Nexus Switches** tab. The **Config Advisor (FlexPod Results)** window for Cisco Nexus Switches is as shown:



The fields in the Cisco Nexus Switches are as follows:

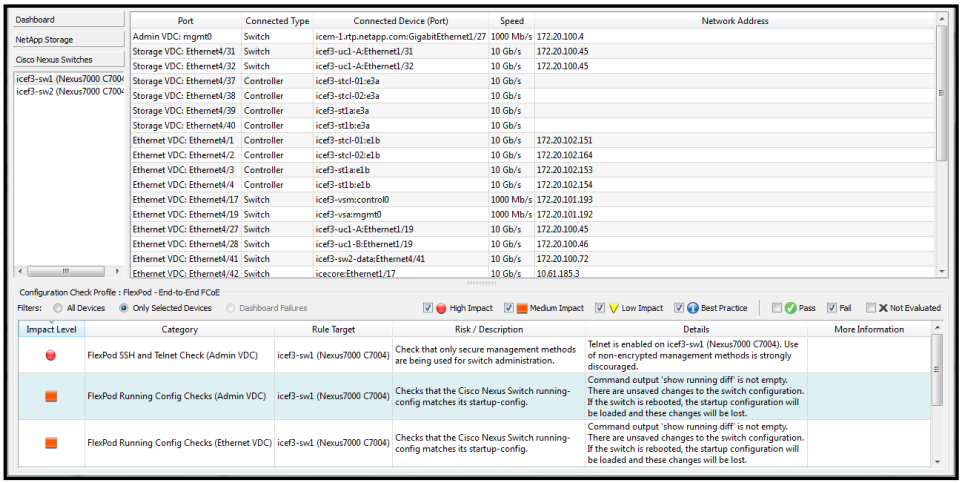
Fields	Description
Port	Displays the interfaces on the cluster switches that are physically connected to the cluster nodes or the management switches, or an Inter-Switch Link (ISL) to the other cluster switch
Connected Type	Displays the type of the device to which the cluster switch interface is connected (Controller or ISL)
Connected Host (Port)	Displays the host name and interface name of the cluster node or switch (cluster switch or management switch) to which the interface of the cluster switch is connected
Speed	Displays the speed of the interfaces of the cluster switch
Network Address	Displays the network IP address configured on the interfaces of the cluster switch
	Displays that the power supply or fan has errors
	Displays that the power supply or fan works without errors

Viewing FlexPod 7 – Mode results in Config Advisor

Steps

1. In the **Recent Results** pane, right-click the required file.
2. Select **View Analysis**. The Config Advisor (FlexPod Results) window is displayed.

The **Config Advisor (FlexPod Results)** window is as shown:



The **Config Advisor (FlexPod Results)** window is divided into the following panes:

- Dashboard, NetApp Storage, and Cisco Nexus Switches:
- NetApp Storage: Cabling, System Config Summary, Aggregate Info, Volume Info, LUN Info tabs
- Cisco Nexus Switches: Network Interfaces tab
- Configuration Validations & Health Checks: You can use filters to see the rules that were run on the collected data and the results.
- **Navigation pane**

The navigation pane allows the user to navigate between the **Dashboard, NetApp Storage** and **Cisco Nexus Switches** of the FlexPod setup. By default, **Dashboard** is selected.

- **Dashboard tab**

The Dashboard tab lists the inventory of FlexPod categorized by **Compute**, **Network**, and **Storage**. Each category has the following sections:

- **Hardware Validated**

  This section checks for minimum hardware requirement as per FlexPod technical specifications (*TR-4036*).

- **Cabling Validated**

This section checks for minimum cabling requirement as per FlexPod technical specifications (*TR-4036*).

The possible values in this section are highlighted in green check mark (√) and a red cross mark (x). In case of any failure, the cross mark is displayed and upon clicking **View Details** it shows the corresponding errors.

The filter **Dashboard failures** is selected by default when you click the **View Details** link. This filter cannot be selected otherwise. To revert, select the **All Devices** filter.

- NetApp Storage tab

You can view the details of the 7-Mode HA pair nodes with the host name (model) of each controller.

- **Cabling tab**

You can view the details of a controller from the nodes pane.

The controller stack diagram is displayed in the **Cabling** tab.

If you are viewing the details of an HA pair, the partner controller details are displayed in a separate tab.

Note: If the partner controller details of an HA pair are not available in the Config Advisor file, they are not displayed.

You can view shelf and disk information by clicking the icon in the **Cabling** tab and expanding the stack tree. For more information on the fields in this tab, see *Cabling tab*.

- **System Config Summary tab**

You can view the hardware overview, module details, shelf details, and disk overview in the **System Config Summary** tab. For more information on the fields in this tab, see *System Config Summary tab*.

- **Aggregate Info tab**

You can view the aggregate information in the **Aggregate Info** tab. For more information on the fields in this tab, see *Aggregate Info tab*.

- **Volume Info tab**

You can view the volume information by clicking the **Volume Info** tab. For more information on the fields in this tab, see *Volume Info tab*.

- **LUN Info tab**

You can view the LUN information by clicking the **LUN Info** tab. For more information on the fields in this tab, see *LUN Info tab*.

- **Cisco Nexus Switches tab**

You can view the details of a switch by selecting a switch from the **Cisco Nexus Switches** tab.

The **Config Advisor (FlexPod Results)** window for Cisco Nexus Switches is as shown:

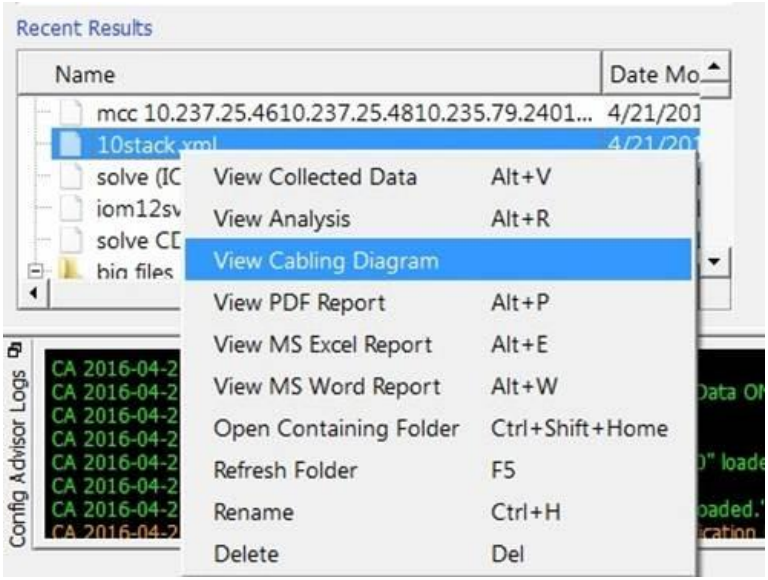
The fields in the **Cisco Nexus Switches** are as follows:

Fields	Description
Port	Displays the interfaces on the cluster switches that are physically connected to the cluster nodes or the management switches, or an Inter-Switch Link (ISL) to the other cluster switch.
Connected Type	Displays the type of the device to which the cluster switch interface is connected (Controller or ISL).
Connected Host (Port)	Displays the host name and interface name of the cluster node or switch (cluster switch or management switch) to which the interface of the cluster switch is connected.
Speed	Displays the speed of the interfaces of the cluster switch.
Network Address	Displays the network IP address configured on the interfaces of the cluster switch.
	Displays that the power supply or fan has errors.
	Displays that the power supply or fan works without errors.

Generating reports from plug-in results

You can generate PDF, MS, Word, or MS Excel reports from the Config Advisor plug-in results file, which contains the summary of the configuration and the failed checks.

In the Config Advisor main window, **Recent Results** pane, on any of the results file, right-click and select either **View PDF Report, View MS Excel Report,** or **View MS Word Report** to generate report of the results.



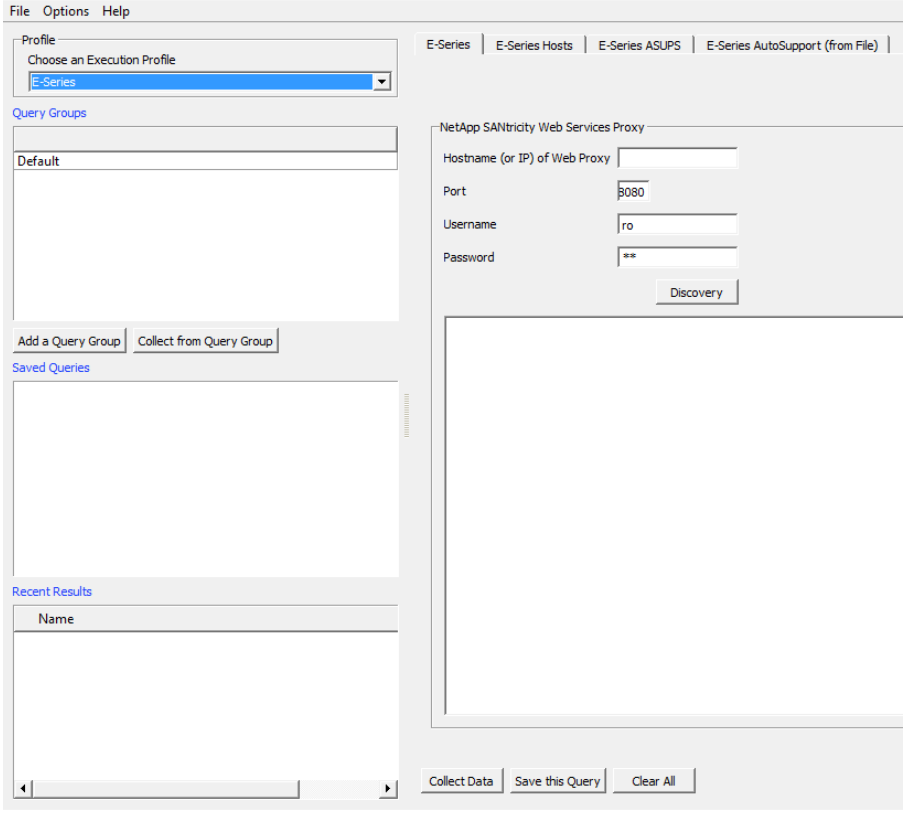
The generated reports are stored in the Config Advisor data directory under the folders pdf_files, doc_files, or excel_files.

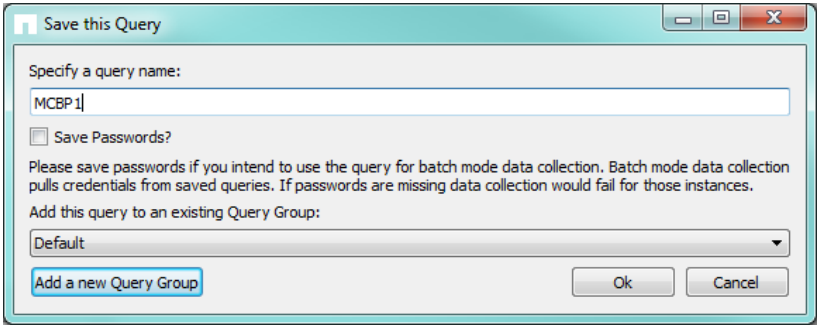
Saving plug-in credentials in Config Advisor

You can save the plug-in credentials entered for data collection for later use.

Steps

1. Enter the credentials in the plug-in page for which you want save the details, and click **Save** this **Query**.
2. A dialog box appears, enter the name with which the plug-in credentials have to be saved. You can specify a query name or use the default name.
3. Click **Ok**.
4. You can select the option **Save Passwords** to save the plug-in credentials with a password. The passwords are encrypted when saved.



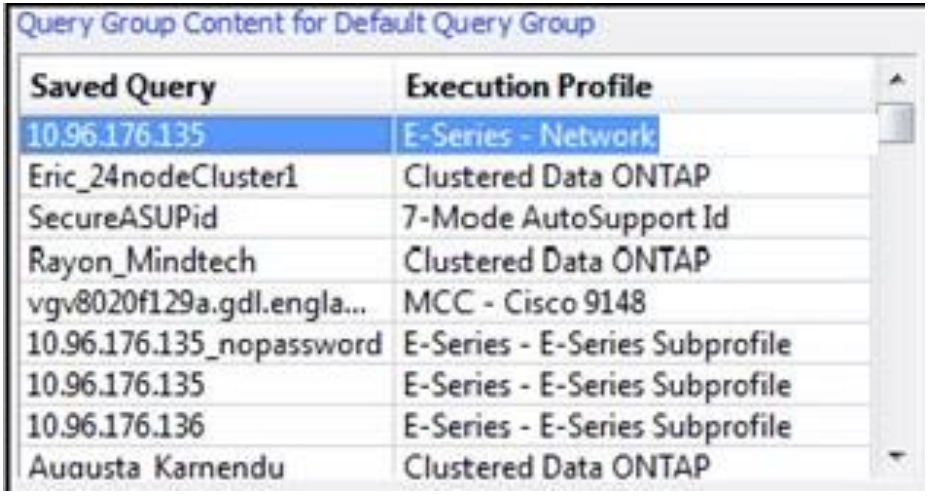


Loading saved plug-in credentials

You can view the saved credentials query name and the associated profiles from the Config Advisor main window.

Steps

1. Navigate to the Config Advisor main window.
2. Double-click a name from the list to load the saved credentials to the specific plug-in page.
3. The **Saved Query** with the **Execution Profile** is displayed.



Note: You can right-click the query name and choose to modify or delete a saved plug-in query.

Config Advisor AutoSupport for plug-in results

If the Config Advisor AutoSupport option is enabled, then at the end of each plug-in data collection, Config Advisor sends an AutoSupport message to the NetApp AutoSupport WareHouse.

The Config Advisor AutoSupport message generated contains details of data collected by the plug-in and the computed results. The log window provides details of when the Config Advisor AutoSupport is generated and posted.

For more information on Config Advisor AutoSupport configuration, see the *Config advisor Installation and Administration Guide.*

Upgrading Config Advisor plug-in

If a new version of Config Advisor plug-in for E-Series or Managed ONTAP SAN or MetroCluster clustered Data ONTAP is available, when you launch Config Advisor, a notification is displayed in the tool.

You can download the new plug-in version and follow the installation steps mentioned in the Installing Config Advisor plug-in section.

The upgrade notification can be hidden for two weeks using the Remind Me Later option.

Optionally, you can check for updates from the Config Advisor **Main Menu** > **Help** > **Check for Updates**.

Uninstalling Config Advisor plug-in

You must delete the plug-in specific folder from the Config Advisor DATA directory to uninstall a Config Advisor plug-in from the host machine.

- For E-Series, plug-in folder is eseries
- For Managed ONTAP SAN, plug-in folder is ONTAP_SAN
- For MetroCluster in clustered Data ONTAP, plug-in folder is MCC_plugin

You can access the plug-in folders from the following locations:

Config Advisor DATA directory location
ConfigAdvisorDataDirectory_Base\ConfigAdvisorData\plugin_eggs

Periodic data collection for issues diagnostic

Support staff requires periodic data collection for troubleshooting complex customer issues. There are certain CAP\Escalation cases and other potential support engagements in which periodic data collection is required to debug the root cause.

To support periodic data collection, a Command Line Interface (CLI) is provided to launch and execute Config Advisor. This along with Microsoft Task Scheduler allows you to periodically collect, execute rules, and store results in a chronological folder structure.

Note: For getting help on creating scheduled tasks, refer to MSDN articles.

Using Config Advisor through the command prompt

For a typical installation, Config Advisor is installed in C:\Program Files (x86)\ConfigAdvisor\ or C:\Program Files\ConfigAdvisor\. This folder contains the configadvisor.exe executable file. If no command line arguments are specified in the executable file, Graphical User Interface is launched.

The CLI for Config Advisor requires the following three command line arguments.

configadvisor.exe –query <absolute_path_to_the_crypt_file> [--password <USER_DEFINED_PASSWORD> --destination <absolute_path_to save_files_generated]

- -q or –query is a mandatory argument for the CLI. Here you must specify the location of the .crypt file containing the credentials saved from the plug-in profile. For details on the .crypt file, see Working with credentials in the *Config Advisor Installation and Administration Guide*.
- The query saved in the .crypt file knows which plug-in was used to create the query. The same plug-in profile is then used to determine the data collection commands and rules that require execution.
  If there are more than one query within the .crypt file, data collection will not proceed and an error is displayed in the log file.
- -p or –password is a mandatory argument if the .crypt file specified as a value for –query is encrypted with a user defined password. If you do not provide the password, then it is presumed that the .crypt file was encrypted using the default password.

- -d or –destination is an optional argument. It specifies the directory location to save the collected data, PDF report, log information and AutoSupport file. AutoSupport file also contains the rule results in XML.
  If the argument is not specified, ConfigAdvisorDataDirectory_Base is set as the destination folder.
  You must ensure that the destination folder specified has sufficient space and is writable.
  For every instance of data collection, sub folders are created inside the destination folder before placing the result files. The sub folders are created automatically using the following format: <ProfileName>\Year\Month\Day\Time. For example<destination>\ MetroCluster in clustered Data ONTAP \2014\08\10\21_30\.

If you specify a valid query, data collection will proceed and the following files will be created in the destination folder.

- **Collected data file** – This is a .gzip file that contains the collected raw data in XML. This same file can be reopened using the Config Advisor GUI. Navigate through the GUI menu, click **File > Open Config Advisor File**.
- **AutoSupport file**. – The AutoSupport file is not posted, but pasted into the same directory location. This file is a tgz (tar.gz) file containing the **Collected Data**, **Rules Results** in XML, **Equipment Details**, **Manifest File**, and a **header**. You should send this file back to NetApp for support.
- **PDF report** – A PDF report is generated by evaluating and presenting the **Rule Results** in a PDF format.

Note: The PDF file is not automatically opened. You must locate the file inside the destination folder to view the contents.

- **Log data** – A plain text log is also provided that specifies the command line execution status. Here, the exceptions are also recorded.

If data collection fails and equipment is not correctly identified, then the AutoSupport File and PDF report is not generated. The Collected Data File and Log Data will be available. If the plug-in is not identified and Data Collection is not even initiated, only the Log Data will be present. The Log Data file will be available in either of the following locations depending on the execution progress:

- ConfigAdvisorDataDirectory_Base\logs
- <DESTINATION_FOLDER_SPECIFIED>\<ProfileName>\Year\Month\Day\Time

If you execute Config Advisor on the CLI, you will be redirected to the command prompt. Standard output and errors are not captured on the console. When using the CLI, you can rely only on the log data file created in the destination folder, or ConfigAdvisorDataDirectory_Base\logs as specified in the preceding section. The log file is named as <timestamp>_log.txt where timestamp is the Greenwich Mean Time of the system.

With CLI, you can execute the Config Advisor through the command prompt and generate the preceding four files into the destination folder location. You can execute multiple instances of Config Advisor using CLI and they do not conflict with each other.

Scheduling periodic data collection

For scheduling periodic data collection, you need to use the Windows Task Scheduler. Task Scheduler is a Microsoft Windows component. You can use Task Scheduler to run programs or scripts at a time that is most convenient for you. The Windows Event Log service must run before the Task Scheduler starts up.

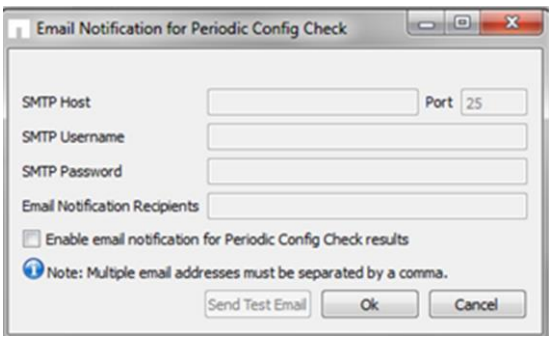
For creating a basic task or an advanced task, see Windows Task Scheduler documentation that can help you invoke the Config Advisor Command Line interface based on a predetermined schedule (for example, hourly or daily).

Email notification

You can enable an Email Notification feature if you encounter high impact issues during Periodic Data Collection. This feature is enabled through the Graphical User Interface.

Steps

1. Navigate to **GUI Menu** > **Options** > **Email Notification for Periodic Config Check**.



2. Enter the SMTP server host, port, username, password, and email addresses. Select the check box if you want to receive email notification periodically.
3. Use the **Send Test Email** button to test the SMTP server. A test email will be send to the email notification recipients.

SwitchOver Simulation

MetroCluster 1.2 supports performing switchover simulation in all of the sub profiles of MetroCluster in clustered Data ONTAP setup as a use case, this check can be run on any node in a cluster.

This feature ensures that all of the 10 essential checks are performed and MetroCluster setup is in a good state if disaster strikes. However, you must not run this rule with periodic data collection and also very frequently. Running this check can tentatively impair switchover capabilities (by a few minutes).

Note: Discretion is advised in using this feature.

Reporting plug-in issues in Config Advisor

You can report any issues with the Config Advisor plug-ins, from the Config Advisor **Main Menu** > **Help** > **Open Support Ticket**.

For more information on reporting in Config Advisor, see the *Config advisor Installation and Administration Guide*.

Troubleshooting

You can find information about how to troubleshoot some of the issues that you might come across when you use the Config Advisor plug-ins. You can find details of the issue, possible cause and workaround for the issue.

You can find information about how to troubleshoot some of the issues that you might come across when you use the Config Advisor plug-ins. You can find details of the issue, possible cause and workaround for the issue.

E-Series data collection fails when SANtricity storage manager client is not installed

E-Series data collection failure when SANtricity Storage Manager Client is not installed is as shown:

Issue

E-Series data collection fails when SANtricity Storage Manager Client is not installed.

Possible Cause

SANtricity Storage Manager Client is not installed on the same system as Config Advisor.

Work Around

Install SANtricity Storage Manager Client by following *NetApp SANtricity web services proxy 1.1* section.

Appendix

E-Series configuration validation and health checks

Check name	Description
E-Series Volume Health Check	Verifies if a storage array's volume health is optimal.
E-Series Drive Health Check	Verifies if a storage array's drive health is optimal.
E-Series Hot Spare Coverage Check	Verifies if there is adequate spare drive coverage in case of fail over.
E-Series Storage Array Auto Support Check	Verifies if Auto Support is configured on the storage array.
E-Series Storage Array Health Check	Verifies the health of the storage array.
E-Series Storage Array Battery Check	Verifies the health of the cache battery.
E-Series Controller Firmware Check	Checks to ensure the Controller is at its most recent CFW level.
E-Series Thin Provisioning with SSD	Checks to ensure that E-Series Thin Provisioned Volumes are not created when SSDs are configured as a DDP.
E-Series Drive Location in DE6600	Verifies if drives are properly located by slot position within a DE6600 Enclosure.
E-Series SSD Wear Leveling	Checks SSD's lifecycle. Warns when >80% wear, recommending replacement.

FDE and Non FDE Drives co-existing in same RAID Group	Verifies if FDE and Non FDE Drives are configured in the same RAID Group or DDP.
E-Series Tray Loss Check	Checks for Tray Loss when using DE6600 Shelves.
E-Series Thin Provisioned Volume Check	Checks to ensure that E-Series Thin Provisioned Volumes are not created when SSDs are configured as a DDP.
E-Series Drive/Slot Location	Checks to make sure Drives are populated in the front 20 slots on DE6600.
E-Series FDE/NON-FDE Check	Verifies if FDE and Non FDE Drives are configured in the same RAID Group or DDP.

Note: The preceding section provides high-level rules and each rule has one or more triggers. For more details on the E-Series checks\triggers, visit *https:\\fieldportal.netapp.com\configadvisor.aspx#139861*.

E-Series hosts configuration validation and health checks

Check name	Description
E-Series Host Multipath Service	Verifies if a host multipathed service is optimal
E-Series Host Multipath Version	Verifies if a recommended host multipath service is installed
E-Series Host Multipath Configuration	Verifies if a host multipath configuration is correct
E-Series Host Multipath Configuration File	Verifies if any syntax errors in the multipath configuration file
E-Series Host Type Check	Verifies if the correct host type is selected in SANtricity Storage Manager

E-Series Host IMT Check[1]	Verifies if a host configuration is supported as per IMT
E-Series Host File System Checks	Verifies if host file systems are configured properly

[1] Because this is the first beta release of the host IMT check for E-Series, there are limited fields in IMT being checked at this point. A successful pass on this rule does NOT mean that the configuration is in total compliance with IMT. That functionality will be built out in future versions of the E-Series plug-in.

Managed ONTAP SAN configuration validation and health checks

Check name	Description
Node Health Check	Verifies the nodes are healthy and can be queried for information.
Differentiated Services and All Flash Optimized Bit Check	Verifies that all nodes have been marked for differentiated services and are Optimized for All Flash.
Model Check	Verifies that all nodes are of supported models for the managed ONTAP SAN program.
Network Interfaces Check	Ensures that only SAN LIFs exist on the cluster.
Aggregates per Node Check	Verifies there are between 1 and 10 data aggregates on each node.
Aggregates at Home Check	Verifies all Aggregates are currently being serviced by their owning node.
Aggregates Utilization Check	Verifies that no aggregates exceed 75% utilization.
Aggregate Raid Group Size Check	Verifies that raid groups do not exceed 16 disks.
SSDs per Aggregate Check	Verifies that data aggregates have at least 4 SSDs.
Volumes per Node Check	Verifies no nodes owning more than 200 volumes.
Snapshots per Volume Check	Verifies no volumes have more than 40 snapshots.
Offline Dedupe with one stream maximum (runs only on 8.3.1 or later versions and earlier than 9.x versions)	Verifies Offline Dedupe is restricted to one stream.
Inline Compression is Enabled	Verifies Inline compression is enabled.
Disk Type check	Verifies all disks are of type SSD.
SFO check	Verifies that all nodes have SFO enabled.
SAN SVM (formerly Vserver) QOS check	Verifies QOS is enabled on all SVMs.

Check name	Description
LUNs per Node Check	Earlier than ONTAP 9.x versions: Verifies nodes owning less than 4096 LUNs. Later than ONTAP 9.x versions: Verifies nodes owning less than 8192 LUNs.
LUN Space Allocation Check	Verifies that space-allocation is disabled for all LUNs.

Note: The preceding section provides high level rules and each rule has one or more triggers. For more details on the Managed ONTAP SAN checks\triggers, visit *https:\\fieldportal.netapp.com\configadvisor.aspx#139861*.

MetroCluster in clustered Data ONTAP configuration validation and health checks

Rule Name	Rule Description	2Node Direct Connect		2Node, 4Node and 8Node Fabric Configurations			
		Direct SAS	ATTO FibreBridge	Brocade		Cisco	
				NetApp Disk	Storage Array	NetApp Disk	Storage Array
Rules that run for every configuration							
PreCheck	Prepares the environment and determine checks to run.	✓	✓	✓	✓	✓	✓
Switchover _Simulate	Verifies if switchover simulation succeeds.	✓	✓	✓	✓	✓	✓
ControllerP latformSup ported	Verifies that the hardware platform is supported.	✓	✓	✓	✓	✓	✓
DrGroupSa meControll erType	Verifies that all nodes in the DrGroup are of the same platform type.	✓	✓	✓	✓	✓	✓
NodeInDrG roupSameO ntap	Verifies that all nodes in the DrGroup are running the same version of ONTAP.	✓	✓	✓	✓	✓	✓
DrGroupSy sIdMatch	Verifies that the hardware SysID and HaSysID match, and that the node SysIds match the table SysIds.	✓	✓	✓	✓	✓	✓
DrGroupNa meMatch	Verifies that the names in the tables	✓	✓	✓	✓	✓	✓

	match on all nodes.						
DrGroupBIOSFwMatch	Verifies that all nodes in the DrGroup run the same BIOS firmware.	✓	✓	✓	✓	✓	✓
DrGroupSPFwMatch	Verifies that all nodes in the DrGroup run the same Service Processor firmware.	✓	✓	✓	✓	✓	✓
HaConfigChassisControllerSetting	Verifies that the correct HAOSC setting is configured for chassis on controller	✓	✓	✓	✓	✓	✓
AdapterWithMixedHbaAndFcviPersonality	Verifies that the Quad port HBA using 2 ports in FCVI mode is only supported on the FAS8020 platform	✓	✓	✓	✓	✓	✓
StorageHba_RelatedAdapterSameSpeed	Verifies that all related adapters operate at the same speed.	✓	✓	✓	✓	✓	✓
CorrectCombinationStorage	Verifies that each adapters connecting storage are of the correct combination.	✓	✓	✓	✓	✓	✓
StorageHba_MinMaxPath	Verifies that no less than min-Path and not more than max-path HBA initiator ports are used to connect storage devices.	✓	✓	✓	✓	✓	✓

FcViAdapterSameSpeed	Verifies that all FCVI adapters operate at the same speed.	✓	✓	✓	✓	✓	✓
StackShelfCombinationSupported	Verifies that the combination of shelves in each stack is supported.	✓	✓	✓	✓	✓	✓
ShelfUniqueID	Verifies that all shelves in the DrGroup have a unique shelf ID.	✓	✓	✓	✓	✓	✓
DiskVisibleOnAllRelAdapters	Verifies that all storage devices (NetApp disk or Array LUN) are visible on all related adapters, that no failed disks, no disks with invalid serial number and no disk 'found in scan' are present.	✓	✓	✓	✓	✓	✓
AllPlexMirrored	Verifies that all plexes are mirrored.	✓	✓	✓	✓	✓	✓
AllPlexOnePoolOnly	Verifies that all plexes consist of disks from one pool only.	✓	✓	✓	✓	✓	✓
Rules that run if a fabric switch is present to connect storage							
MccConsistentOODSetting	Verifies that the OOD setting on the controllers are matching for all controllers.			X	X	X	X
SwitchGeneric_SwitchBladeSupported	Verifies that the switch and blade connecting the DR-Group(s) is			✓	✓	✓	✓

	supported for this version of ONTAP.						
SwitchGeneric_SwitchFwSupported	Verifies that the switch and switch module firmware is supported for this version of ONTAP for this DrGroup.			✓	✓	✓	✓
SwitchGeneric_SwUniqueName	Verifies that all switches have a unique name.			✓	✓	✓	✓
SwitchGeneric_DrGroupCorrectNumSwitches	Verifies that all controllers within the DrGroup connect to the correct number of switches.			✓	✓	✓	✓
SwitchGeneric_Topology	Verifies that all controllers within the DrGroup have a consistent view of the fabric topology.			✓	✓	✓	✓
StorageHba_ConnectEvenlyToFabrics	Verifies that the related storage adapters evenly connect into the fabrics of blades.			✓	✓	✓	✓
FcViSamePortBothSwitches	Verifies that a FCVI Adapter in one node connects to the same ports on both switches\blades.			✓	✓	✓	✓
FCVIMaxCommonSpeed	Verifies that the FCVI adapter and switch port it is connected to is operating at the max common speed.			✓	✓	✓	✓
DiskAssignedPoolsCorrectSite	Verifies that all disks are assigned at the correct site. All disk assigned to Pool0 must be assigned to switches local the controller, all disks assigned to Pool1 must be			✓	✓	✓	✓

	assigned to switches at the remote site.						
Rules that run if Brocade switches are found to connect storage							
SwBrocade_VfDisabled	Verify that the virtual fabric (VF) feature is disabled.			✓	✓		
SwBrocade_RoutingPolicies	Verifies that the routing in the fabric and on the controllers in the DrGroup are consistent and matching the OOD settings on the controllers.			✓	✓		
HBAEncryptionCompression	Verifies that a switch port connecting a storage initiator (HBA) port has valid Encryption and Compression settings.			✓	✓		
SwitchportToHBAFixedSpeedCheck	Verifies that a switchport connecting storage initiator (HBA) is set to fixed speed.			✓	✓		
HBADistanceSettingCheck	Verifies that a switchport connecting a storage initiator HBA has a distance setting of L0.			✓	✓		
FCVIEncryptionCompression	Verifies that a switch port connecting an FCVI interconnect port has valid Encryption and Compression settings.			✓	✓		
FCVIFixedSpeed	Verifies that a switchport connecting FCVI interconnect is set to fixed speed.			✓	✓		

FCVIDistanceOfL0	Verifies that a switchport FCVI interconnect is connected to is set to L0 distance.			✓	✓		
BrocadeFCSwitchISLSameDistanceModeCheck	Verifies that the ISL ports operate at the same distance mode.			✓	✓		
BrocadeFCSwitchISLSameDistanceCheck	Verifies that the ISL ports operate at the same distance.			✓	✓		
BrocadeFCSwitchISLPortSameSpeedCheck	Verifies that the ISL ports in one fabric operate at the same speed.			✓	✓		
BrocadeFCSwitchISLPortSpeedCheck	Verifies that the ISL ports have their speed set to a fixed speed and not auto-negotiate.			✓	✓		
BrocadeFCSwitchISLPortTrunkingCheck	Verifies that the ISLs are trunked.			✓	✓		
SwBrocadeIslEncryptionCompression	Verifies that the ISL ports have a valid setting for Encryption and compression.			✓	✓		
BrocadeISLQosEnabledCheck	Verifies that all ISLs have QoS enabled and active.			✓	✓		
BrocadeISLMinSpeedCheck	Verifies that the ISL ports are operating at the minimal supported speed.			✓	✓		
NoTrafficIsolationZone	Verifies that no TrafficIsolation (TI) zone exist on any of the back-end switches.			✓	✓		

FCVIZoneCheck	Verifies that a zone exists in the effective configuration containing all FCVI ports from one DrGroup in one fabric that this zone is a QoS zone with high priority and all zone members are represented by domain\port and not by WWN.			✓	✓		
Rules that run if Atto FibreBridges are found that are connected to a Brocade fabric							
AttoEncryptionCompression	Verifies that a switchport connecting ATTO FibreBridge has valid settings for Encryption and Compression.			✓			
ATTOMaxCommonSpeed	Verifies that a switchport connecting ATTO FibreBridge is set to fixed speed of 8G\16G based on the ATTO bridge type (6500N\7500N) used.			✓			
ATTODistanceof L0	Verifies that a switchport connecting ATTO FibreBridge has a distance setting of L0.			✓			
FASStorageZoningCheck	Verifies that zones exist in the effective configuration where each zone contains the correct number of storage initiator ports (this number may vary for ATO 7500N			✓			

	configurations and depends on the number of FC ports used on the FibreBridge) and one single target port connecting ATTO FibreBridge. All zone members must be represented by domain\port and not by WWN.						
Rules that run if storage arrays are found that are connected to a Brocade fabric							
VStorageZoningCheck	Verifies that the zoning is correct to connect storage arrays.				✓		
Rules that run if ATTO FibreBridges are found							
ListOrphanedBridges	List FibreBridges that are configured in ConfigAdvisor and not seen by any node, or FibreBridges that are seen by at least one node and are not configured in ConfigAdvisor.		✓	✓		✓	
AttoFW	Verify that the ATTO bridges running the minimum required firmware.		✓	✓		✓	
AttoSpeedSetting	Verifies that the speed of the connected FC port on the Atto FibreBridge is set to fixed speed.		✓	✓			
AttoTopology	Verifies that the topology of the connected FC port on the Atto FibreBridge is set to		✓	✓		✓	

	the correct topology.						
AttoCorrectFcPort	Verifies that the Atto FibreBridge is connected via the correct FC ports.		✓	✓		✓	
AttoSNMP	Verifies SNMP feature is disabled if Atto FibreBridge is running firmware version is 1.60\1.61.		✓	✓		✓	
Rules that run if storage arrays are found							
VSeriesLicense	Verifies that if Array LUNs are connected to the controller a V_StorageAttach license is present and if one controller in the DrGroup has Array LUNS connected, then all controllers in this DrGroup require a V_StorageAttach license.				✓		✓
V_SharedInitiatorsTargets	Verifies that there are no shared HBA Initiator and target array ports or that the shared HBA and target ports is according to the guidelines for the version of ONTAP.				✓		✓

FlexPod configuration validations & health checks

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Running Config Check	Checks that the Cisco Nexus Switch running-config matches its startup-config.	✓	✓	✓
FlexPod SSH and Telnet Check (Cisco Nexus)	Checks that only secure management methods are being used for switch administration.	✓	✓	✓
FlexPod SSH and Telnet Check (Storage)	Checks that Telnet is off and SSH is on, on the storage controllers.	✓	✓	
FlexPod LACP and VPC Check	Checks if LACP is enabled on the switches. LACP and Virtual Port Channels are used on the Cisco Nexus switches to provide redundant connectivity within the FlexPod.	✓	✓	✓
FlexPod UCSM HA Check	Ensures high availability for the UCS Manager by checking that both fabric interconnects are operable and in a cluster relationship.	✓	✓	✓
FlexPod Service Profile vNICs Check	Checks the service profile for HA configuration on the vNICs. (Either failover or multipath)	✓	✓	✓
FlexPod VPC Health Check	Checks that the Virtual Port Channel domain is healthy: peer is alive, peer-link is up, and all vPCs are consistent and online.	✓	✓	✓
FlexPod 10GbE Uplinks Check	Checks that each fabric interconnect has at least 2 10GbE uplinks. Does not check connectivity or confirm that they are configured for high availability.	✓	✓	
FlexPod Service Profile HA	Checks that assigned service profiles should have at least one vHBA on each SAN fabric.	✓	✓	
FlexPod Maintenance Policy	Checks that the default maintenance policy is set to something other than ‘immediate’.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Storage Switch Network Correlation Check	Checks that storage controller has an ifgroup connected to a Virtual Port Channel (vPC) on the Cisco Nexus 5k switches (using CDP).	✓	✓	
FlexPod Storage Protocols Check	Checks that storage protocols features are enabled: fcoe, npiv, fport-channel-trunk.	✓	✓	
FlexPod FCP Check (Storage)	Checks that FCP is licensed and enabled on the controller.	✓	✓	
FlexPod UCS Switch Network Correlation Check	Checks that fabric interconnect has an uplink port channel connected to a Virtual Port Channel (vPC) on the Cisco Nexus 5k switches (using CDP).	✓	✓	✓
FlexPod SAN port channel Check	Checks that each Fabric Interconnect has an uplink SAN port channel with at least 2 links.	✓	✓	
FlexPod Service Profile State Check	Reports service profiles in the 'config-failure' state.	✓	✓	
FlexPod Blades\Servers Discovery	Verifies that all physical blades\servers are discovered.	✓	✓	
FCoE QoS Configuration	Checks that minimum QoS configuration is in place to support FCoE: 1. Check for missing CoS value 2. Check for missing class-fcoe in network-qos, Queuing policy 3. Check for 'mtu 2158' for FCoE	✓	✓	
FlexPod Chassis Discovery Policy	Checks the chassis discovery policy. 1. Checks for aggregate links 2. Checks for at least 2-link	✓	✓	✓
FlexPod FEX Uplink Check	Checks that each FEX has at least 2 10GbE uplinks to the fabric interconnect.	✓	✓	
FlexPod Device Online	Checks that the FlexPod devices were online and data collection successful.	✓	✓	
FlexPod Redundant Cisco Nexus Switch	Exactly 2 Cisco Nexus 5000 or 7000 series switches (must be same model).	✓	✓	✓

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Redundant FAS	Checks for FAS controllers in HA pair.	✓	✓	
FlexPod UCS Server Config	Checks for at least 1 blade chassis with at least 2 blades or at least 2 Fabric Extenders with at least 2 servers.	✓	✓	✓
FlexPod UCS IO Module Check	Blade Chassis requires exactly 2 IO modules.	✓	✓	✓
FlexPod Storage FC Uplinks	FAS must be directly connected to Cisco Nexus using Fibre Channel links.	✓	✓	
FlexPod Redundant UCS-FI Check	Exactly 2 UCS fabric interconnects in cluster (HA) relationship.	✓	✓	✓
FlexPod Cisco Nexus vPC Peer Link	Checks that Cisco Nexus switches has a working peer-link for vPC failover traffic. At least 2 10GbE links must be connected between the two Cisco Nexus switches in a port channel for use as a vPC peer-link.	✓	✓	✓
FlexPod SAN Boot Features	Ensures features necessary for SAN boot are licensed and enabled on the Cisco Nexus switches.	✓	✓	
FlexPod UCS Server KVM Addresses	Checks that there is a KVM IP address pool with at least as many addresses as KVM-IP-less blades in the environment.	✓	✓	✓
FlexPod FC Zoning Check	Ensures that FC zones are configured correctly. 1. Check the initiator WWPN is zoned in Cisco Nexus 2. Check for the initiator WWPN is part of the igroup 3. Check for active zonesets 4. Check for 1 initiator WWPN present in a zone 5. Check for LUN is mapped and online 6. Check for 2 initiators are present in igroup.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Firmware recommendations (All components)	All components must be running at least the minimum validated software versions.	✓	✓	
FlexPod UCS Ethernet End-Host Mode	UCS must be configured in End-Host mode for Ethernet.	✓	✓	✓
FlexPod VLAN Correlation Check	Checks that allowed VLAN lists are consistent across the infrastructure.	✓	✓	
FlexPod Cisco Nexus VSAN-FCoE VLAN Mapping Check	Each Cisco Nexus switch must have a VSAN configured for the respective Fabric and FCoE vlan mapped to it.	✓	✓	
FlexPod VFC-FCoE UCS-FI Port Channel Binding Check	A vfc interface must be binded to the fcoe port-channel between the Cisco Nexus and the FI and the VFC interface should be assigned to the Fabric in the vsan database.	✓	✓	
FlexPod VFC-Storage Interface Binding Check	A vfc interface must be bound to all the Ethernet interfaces that are connected to the Storage, the VFC interfaces should have the Fabric vsan as the allowed VSAN and the VFC interface should be assigned to Fabric in vsan database.	✓	✓	
FlexPod VFC-Storage Interface Binding Check	A vfc interface must be bound to all the Ethernet interfaces that are connected to the Storage, the VFC interfaces should have the Fabric vsan as the allowed VSAN and the VFC interface should be assigned to Fabric in vsan database.	✓	✓	
FlexPod vPC Peer-Link no FCoE VLAN Check	The FCoE VLAN in each Cisco Nexus should not be in the allowed VLANs list in the vPC peer-link port-channel.	✓	✓	
FlexPod Cisco Nexus-FI FCoE Port Channel- no vPC Check	The fcoe port-channel between the Cisco Nexus and the FI should not be configured as a vpc.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod UCS FCoE Uplink Ports Check	For FCoE traffic, a minimum of 2 interfaces must be configured as FCoE Uplink Ports in each FI and Admin State of the interfaces must be Enabled.	✓	✓	
FlexPod UCS VSAN-FCoE VLAN Mapping Check	Each FI must have a VSAN configured for the respective Fabric and FCoE vlan should be mapped to it.	✓	✓	
FlexPod UCS VSAN-FCoE VLAN Mapping Check	Each FI must have a VSAN configured for the respective Fabric and FCoE vlan should be mapped to it.	✓	✓	
FlexPod UCS-FI FCoE Port-Channel Check	Each FI must have a FCoE Port-channel configured	✓	✓	
FlexPod UCS FCoE Uplink Check	Each FI must uplink into the northbound Cisco Nexus in the same FCoE Fabric.	✓	✓	
FlexPod Cisco Nexus Spanning Tree Portfast Check	The end-host ports should have the spanning tree portfast feature to enable Bridge assurance.	✓	✓	
FlexPod Running Config Check (Admin VDC)	Checks that the running-config matches its startup-config.	✓	✓	
FlexPod Running Config Check (Ethernet VDC)	Checks that the running-config matches its startup-config.	✓	✓	
FlexPod Running Config Check (Storage VDC)	Checks that the running-config matches its startup-config.	✓	✓	
FlexPod SSH and Telnet Check (Admin VDC)	Checks that only secure management methods are being used for switch administration.	✓	✓	
FlexPod SSH and Telnet Check (Ethernet VDC)	Checks that only secure management methods are being used for switch administration.	✓	✓	
FlexPod SSH and Telnet Check (Storage VDC)	Checks that only secure management methods are being used for switch administration.	✓	✓	
FlexPod LACP Check (Ethernet VDC)	Checks if LACP is enabled on Ethernet VDC of the switches.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod LACP Check (Storage VDC)	Checks if LACP is enabled on Ethernet VDC of the switches.	✓	✓	
FlexPod VPC Check (Ethernet VDC)	Checks if VPC is enabled on the Ethernet VDC of switches. Virtual Port Channels are used on the Nexus switches to provide redundant connectivity within the FlexPod.	✓	✓	
FlexPod UDLD Check	Checks if UDLD is enabled on Ethernet VDC of the switches.	✓	✓	
FlexPod Nexus 7K VPC Health Check	Checks that the Virtual Port Channel domain is healthy: peer is alive, peer-link is up, and all vPCs are consistent and online.	✓	✓	
FlexPod Nexus 7K Storage Protocols Check	Checks that storage protocols features are enabled: fcoe, npiv, lldp.	✓	✓	
FlexPod Jumbo Frames Check	Ensures jumbo frames are enabled on the Nexus switches.	✓	✓	✓
FlexPod Nexus 7K vPC Peer Link Check	The Nexus switches must have a working peer-link for vPC failover traffic. At least 2 10GbE links must be connected between the two Nexus switches in a port channel for use as a vPC.	✓	✓	
FlexPod Nexus 7000 - FCoE VLAN allowed on the vFC port-channel between Nexus and UCS FI check	The FCoE vlan should be allowed in vFC port channel between Nexus and UCS FI.	✓	✓	
FlexPod Nexus 7000 - UCS FI FCoE port channel bound to vFC port channel check	The FCoE port-channel should be bound to a vFC port channel between Nexus and UCS FI.	✓	✓	
FlexPod Nexus 7000 - vFC port-channel between Nexus and UCS FI added to vsan database check	The vFC port-channel between Nexus and UCS FI should be added to VSAN database.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Nexus 7000 Ethernet VDC Check	The Nexus Switch must have an Ethernet VDC.	✓	✓	
FlexPod Nexus 7000 Ethernet VDC Interfaces Check	A minimum of eight Ethernet interfaces have to be allocated to the Ethernet VDC to facilitate all the configurations.	✓	✓	
FlexPod Nexus 7000 F2-series module license check	F2-series module should be licensed to use FCoE.	✓	✓	
FlexPod Nexus 7000 FCoE QoS check	Checks for system wide FCoE QoS and define the QoS policy to be used.	✓	✓	
FlexPod Nexus 7000 F-series module Compliance Check	The Ethernet VDC should be compliant for F-series module(s) being used.	✓	✓	
FlexPod Nexus 7000 global FCoE feature-set check	Checks for FCoE feature-set installed globally.	✓	✓	
FlexPod Nexus 7000 Global MTU Check	The Ethernet VDC in the Nexus Switch must be enabled for jumbo frame support.	✓	✓	
FlexPod Nexus 7000 spanning tree defaults check	The spanning tree defaults should be enabled on Ethernet VDC to enable Bridge assurance.	✓	✓	
FlexPod Nexus 7000 spanning tree portfast enabled on ports connected to FAS storage check	The end-host ports should have the spanning tree portfast feature to enable Bridge assurance.	✓	✓	
FlexPod Nexus 7000 Storage Switch Network Correlation Check	Checks each storage controller is directly connected to each Nexus switch.	✓	✓	
FlexPod Nexus 7000 Storage VDC Check	The Nexus Switch must have a Storage VDC.	✓	✓	
FlexPod Nexus 7000 Storage VDC fcoe feature-set Check	Checks if the FCoE feature-set is enabled in the Storage VDC.	✓	✓	
FlexPod Nexus 7000 Storage VDC FCoE VLAN Check	There must be a FCoE VLAN configured in the Storage VDC of the Nexus Switch.	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Nexus 7000 Storage VDC FCoE VLAN range Check	A FCoE VLAN has to be allocated to the Storage VDC.	✓	✓	
FlexPod Nexus 7000 Storage VDC FCoE VSAN Check	The Storage VDC VSAN must be set as the FCoE VSAN in the Nexus Switch.	✓	✓	
FlexPod Nexus 7000 Storage VDC Interfaces Check	A minimum of four Ethernet interfaces have to be allocated to the Storage VDC to facilitate all the configurations.	✓	✓	
FlexPod Nexus 7000 Storage VDC VLAN FCoE VSAN Mapping Check	The IDs of the FCoE VLAN and VSAN must be the same in the Storage VDC of the Nexus Switch.	✓	✓	
FlexPod Nexus 7000 Storage VDC VSAN Check	The Storage VDC in the Nexus Switch must have a VSAN configured.	✓	✓	
FlexPod Nexus 7000 Switch Storage Portchannel MTU Check	The Ethernet Portchannels between the Ethernet VDC of the Nexus Switch and NetApp Storage must have an MTU value of 9216.	✓	✓	
FlexPod Nexus 7000 Switch UCS FCoE Uplink Check	Each FI must uplink into Storage VDC of the northbound Nexus7000 switch in the same FCoE Fabric.	✓	✓	
FlexPod Nexus 7000 Switch UCS Portchannel MTU Check	The Ethernet Portchannels between the Ethernet VDC of the Nexus Switch and Cisco UCS Fabric Interconnects must have a MTU value of 9216.	✓	✓	
FlexPod UCS Nexus 7000 Switch Network Correlation Check	Checks that fabric interconnect has an uplink port channel connected to a Virtual Port Channel (vPC) on the Nexus 7K switches (using CDP).	✓	✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod Cisco UCS C-Series Server Connectivity Check	C-Series servers can be connected to the Fabric Interconnects either directly or via a pair of Fabric Extenders. While running UCS Manager version lower than 2.2 the servers can only be connected via the Fabric Extenders."	✓	✓	
FlexPod FAS8000-UTA2 Port Mode Check	The UTA2 ports type must be in 'fc' mode and in 'target' type to support the 'Classic FCP to the storage controller' SAN boot architecture.	✓	✓	
FlexPod UCS iSCSI Initiators in Storage igroup Check	Checks if the UCS initiators are present in storage igroup.	✓		
FlexPod Storage iSCSI Feature Check	Checks if iSCSI is licensed and enabled on the controller.	✓		
FlexPod Storage iSCSI LUN Map Check	Checks if LUN is provisioned and mapped to igroup.	✓		
FlexPod Lifecycle Management	Checks if running configuration is supported as per *NetApp Interoperability Matrix Tool*.	✓		
FlexPod FCoE Storage Port check – Direct attach UCS	Checks if Cisco UCS Fabric Interconnect should have a minimum of 2 ports configured as FCoE storage ports.		✓	
FlexPod FCoE Uplinks – Direct attach UCS	Minimum of 2 FCoE links from each NetApp FAS storage node should be directly connected to Cisco UCS Fabric Interconnect.		✓	
FlexPod UCS FC switching Mode – Direct attach UCS	Ensures the Cisco UCS Fabric Interconnect is in FC switching mode.		✓	
FlexPod FC Storage Port check – Direct attach UCS	Cisco UCS Fabric Interconnect should have a minimum of 2 ports configured as FC storage ports.		✓	
FlexPod FC Uplinks – Direct attach UCS	Minimum of 2 FC links from each NetApp FAS storage node should be directly connected to Cisco UCS Fabric Interconnect.		✓	

Check Name	Description	Supports ONTAP	Supports 7-Mode	Supports SolidFire
FlexPod UCS FC switching Mode – Direct attach UCS	Ensures the Cisco UCS Fabric Interconnect is in FC switching mode.		✓	
FlexPod – UCS Service profile iSCSI vNIC(s) presence Check	Checks the UCS service profile for HA configuration on the iSCSI vNICs. (Either failover or multipath).	✓		
FlexPod Nexus no fabricpath feature check	Checks the UCS service profile boot policy is configured with type "iSCSI."	✓		
Cisco Nexus VPC Domain Feature check	Each Cisco Nexus switch must have the VPC Domain features enabled.	✓		
FlexPod UCS - iSCSI vNIC target check	Checks the UCS iSCSI vNIC A and B has same target name.	✓		
FlexPod UCS iSCSI boot policy check	Checks the UCS service profile boot policy is configured with type "iSCSI."	✓		
SolidFire –Number of nodes in a cluster check	Checks for minimum of 4 nodes in a cluster.			✓
SolidFire – Nodes Version check	Checks that all the nodes have the same version (Element OS).			✓
Solidfire - Bond 10G port status check	Checks that the 10G ports are up.			✓
FlexPod FAS End-of-Support Check	Checks the platform end-of-support date.	✓	✓	
FlexPod UCS Fabric Interconnect End-of-Support Check	Checks the UCS Fabric Interconnect end-of-support date.	✓	✓	
FlexPod UCS Blade/Rackmount Server End-of-Support Check	Checks the UCS Blade/Rackmount Server end-of-support date.	✓	✓	
FlexPod Cisco Nexus End-of-Support Check	Checks the Cisco Nexus end-of-support date.	✓	✓	

Note: The preceding checks are applicable to all of the FlexPod profiles except for FlexPod – SolidFire.

FlexArray configuration validations & health checks

Check name	Description	Fabric Attached	Direct Attached
Minimum Paths to Array LUN	Verifies that minimum of 2 Paths are available from given controller to an array LUN.	✓	✓
Redundant Fabric connectivity 2 path	Verifies that redundant fabric connectivity is available for given FC port pair from each controller in a 2 path configuration.	✓	X
Initiator Max LUN count	Verifies that the max array LUN count visible on given FC initiator does not exceed ONTAP support limit.	✓	✓
Port Pair LUN Count	Verifies that all related adapters have the same disk (array LUN) count as per LUN Grouping.	✓	✓
FC Initiator Device Type Check	Verifies that separate FC initiator port is used to connect each of the following : Disk shelves, Array LUNs & Tape devices.	✓	✓
Multiple Initiator from Single Controller to Single Target	Verifies that multiple initiators from the same controller is not connected to a single array target port.	✓	X
Multiple Initiators to Single Target Limit	Verifies that only maximum of two initiator ports (from different controllers) share a given target port.	✓	X
Shared Target Outside HA Pairs	Verifies that Array target port is not shared Outside HA Pairs in the cluster.	✓	X
Fillword Settings - NetApp Initiators	Verifies that for all 8G switches the fillword is set to '3' for all ports that are connected to NetApp controllers.	✓	X

Fillword Settings - Non-HDS arrays	Verifies that for all 8G switches the fillword is set to '3' for all ports that are connected to non-HDS Backend storage arrays.	✓	X
Fillword Settings - HDS arrays	Verifies that for all 8G switches the fillword is set to '2' for all ports that are connected to HDS Backend storage arrays.	✓	X
Single Initiator to Single Target Zoning Check-Brocade	Verifies that only 1:1 zoning is used for each initiator/target pair.	✓	X
Single Initiator to Single Target Zoning Check-Cisco	Verifies that only 1:1 zoning is used for each initiator/target pair	✓	X
NPIV Check- Brocade	Verifies that NPIV is not used in the data path between Initiator & target ports in Brocade Fabric.	✓	X
NPIV Check- Cisco	Verifies that NPIV is not used in the data path between Initiator & target ports in Cisco Fabric.	✓	X
Inter VSAN Routing Check	Verifies that inter-VSAN routing is not used in the data path between Initiator & target ports.	✓	X
Controller LUN Block size	Verifies that supported block size (512) is configured for array LUNs.	✓	✓
V_StorageAttach License Check	Verifies that proper V_storage attach licenses exist for controllers with only array LUNs or both NetApp disks & array LUNs.	✓	✓
Controller Root Volume Location	Verifies that root volume is on NetApp disks when system has both NetApp disks & Array LUNs connected.	✓	✓
Redundant Fabric connectivity 4 Paths	Verifies that redundant fabric connectivity is available for given FC port pair from each controller in a 4 path configuration.	✓	X

Single Initiator to Multiple Arrays Limits	Verifies that no more than 4 target ports from separate storage arrays are connected to an FC initiator.	✓	X
Portcfggport Setting Check	Verifies that all of the storage ports have 'portcfggport' set to 1.	✓	X
LUN IDs Misconfiguration Check	Consolidate error reports from 'storage errors show' for error : 'The LUN IDs for the same LDEV do not match on all target ports over which the LDEV will be visible' and throw appropriate impact & resolution if reported.	✓	✓
Same Port Pair Operating Speed	Verifies that all related adapters (port pairs) operate at the same speed.	✓	X
RDAC/AP array connected for ONTAP 8.3 and higher	Verifies that there are no RDAC/AP arrays connected to ONTAP 8.3 and higher systems.	✓	✓

Copyright information

Copyright © 1994–2016 NetApp, Inc. All rights reserved. Printed in the U.S

No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark information

NetApp, the NetApp logo, Go Further, Faster, ASUP, AutoSupport, Campaign Express, Cloud ONTAP, clustered Data ONTAP, Customer Fitness, Data ONTAP, DataMotion, Fitness, Flash Accel, Flash Cache, Flash Pool, FlashRay, FlexArray, FlexCache, FlexClone, FlexPod, FlexScale, FlexShare, FlexVol, FPolicy, GetSuccessful, LockVault, Manage ONTAP, Mars, MetroCluster, MultiStore, NetApp Insight, OnCommand, ONTAP, ONTAPI, RAID DP, SANtricity, SecureShare, Simplicity, Simulate ONTAP, Snap Creator, SnapCopy, SnapDrive, SnapIntegrator, SnapLock, SnapManager, SnapMirror, SnapMover, SnapProtect, SnapRestore, Snapshot, SnapValidator, SnapVault, StorageGRID, Tech OnTap, Unbound Cloud, and WAFL are trademarks or registered trademarks of NetApp, Inc., in the United States, and\or other countries. A current list of NetApp trademarks is available on the web at *http:\\www.netapp.com\us\legal\netapptmlist.aspx*.

Cisco and the Cisco logo are trademarks of Cisco in the U.S. and other countries. All other brands or products are trademarks or registered trademarks of their respective holders and should be treated as such.

How to send your comments

You can help us to improve the quality of our documentation by sending us your feedback.

Your feedback is important in helping us to provide the most accurate and high-quality information. If you have suggestions for improving this document, send us your comments by email to *doccomments@netapp.com*. To help us direct your comments to the correct division, include in the subject line the product name, version, and operating system.

You can also contact us in the following ways:

- NetApp, Inc., 495 East Java Drive, Sunnyvale, CA 94089 U.S
- Telephone: +1 (408) 822-6000
- Fax: +1 (408) 822-4501
- Support telephone: +1 (888) 463-8277