Dell Connectrix® Cisco Nexus Dashboard Fabric Controller

Version 12.2.1

Release Notes

Rev 05
April 29, 2024

The Dell Connectrix Cisco Nexus Dashboard Fabric Controller (NDFC) Release Notes contains information that is exclusive to NDFC Storage (SAN) functionality as a management tool for NX-OS MDS 9000 Family switches. Use this document in conjunction with related Nexus Dashboard Fabric Controller documentation located on http://cisco.com.

Topics include:

DELL Technologies

Revision history

The following table presents the revision history of this document.

Revision	Release	Date	Description
Rev 05	12.2.1	April 29, 2024	New Release
Rev 04	12.1.3b	October 23, 2023	New Release
Rev 03	12.1.2e	May 1, 2023	New Release
Rev 02	12.1.1e	June 27, 2022	New Release
Rev 01	12.0(2f)	February 07, 2022	New Release

Product description

Cisco Data Center Network Manager (DCNM) is renamed as Cisco Nexus Dashboard Fabric Controller (NDFC) from Release 12.0.1a.

Cisco Nexus Dashboard Fabric Controller is the comprehensive management solution for all NX-OS deployments spanning LAN Fabric, SAN, and IP Fabric for Media (IPFM) networks in data centers powered by Cisco. Cisco Nexus Dashboard Fabric Controller also supports other devices, such as IOS-XE switches, IOS-XR routers, and non-Cisco devices. Being a multi-fabric controller, Cisco Nexus Dashboard Fabric Controller manages multiple deployment models like VXLAN EVPN, Classic 3-Tier, Routed based fabrics for LAN while providing ready-to-use control, management, monitoring, and automation capabilities for all these environments. In addition, Cisco NDFC when enabled as a SAN Controller, automates Cisco MDS Switches and Cisco Nexus Family infrastructure in NX-OS mode.

Nexus Dashboard Fabric Controller primarily focuses on Control and Management for three primary market segments:

- LAN networking including VXLAN, Multi-site, Classic Ethernet, and External Fabrics supporting Cisco Nexus switches running standalone NX-OS, with additional support for IOS-XR, IOS-XE and adjacent Host, Compute, Virtual Machine, and ContainerManagement systems.
- SAN networking for Cisco MDS and Cisco Nexus switches running standalone NX-OS, including support for integration with storage arrays and additionally Host, Compute, Virtual Machine, and Container Management systems.
- Media Control for Multicast Video production networks running Cisco Nexus switches operated as standalone NX-OS, with additional integrations for 3rd party media control systems.

Previously, DCNM was an application server running on a VM deployed via OVA or ISO, a physical appliance deployed via ISO, or software installed on a qualified Windows or Linux machine.

Cisco Nexus Dashboard Fabric Controller, Release 12 is available as an application running exclusively on top of the Cisco Nexus Dashboard Virtual or Physical Appliance.

Virtual Nexus Dashboard deployment with OVA is also referred to as virtual Nexus Dashboard (vND) deployment, while deployment of Nexus Dashboard on physical appliance (Service Engine) is known as physical Nexus Dashboard (pND) deployment. To deploy Nexus Dashboard based on your requirement, refer to *Cisco Nexus Dashboard Deployment Guide*.

The following table shows the compatible versions for Nexus Dashboard and services.

Table 1 Nexus Dashboard and Services Compatible Versions

Services	Compatible Versions
Nexus Dashboard	3.1.1k
Nexus Dashboard Fabric Controller	12.2.1

Note: Cisco will no longer support the deployment of Nexus Dashboard (ND) on Red Hat Enterprise Linux (RHEL) in any future releases. Cisco Nexus Dashboard release 3.0.1 and Cisco Nexus Fabric Controller (NDFC) 12.1.3b will be the last releases that this form factor will support. Work with partners or Cisco representative to leverage other supported form factors for future releases.

Cohosting of NDFC-Managed mode with Nexus Dashboard Insights (NDI)

For information about supported scale for NDFC and NDI co-hosted on the same Nexus Dashboard Cluster, see the *Verified Scalability Guide* for Cisco Nexus Dashboard Fabric Controller.

For information about the supported scale for NDFC on Nexus Dashboard Cluster and Insights and Orchestrator services on a different Nexus Dashboard Cluster, see *Verified Scalability Limits for Nexus Dashboard Insights*.

For more information, see Cisco Nexus Dashboard Fabric Controller (Formerly DCNM).

As always in a Dell environment, refer to the Dell Support Matrix available through E-Lab™ Interoperability Navigator at: https://elabnavigator.dell.com/eln/elnhome for the latest information on supported configurations.

The answers to many DCNM or NDFC related questions can be found in the Dell Knowledgebase located at Dell Online Support at:

http://www.dell.com/support.

New features and changes

New Features and Enhancements in Cisco NDFC, Release 12.2.1

This section provides information about the new features, enhancements, and hardware support introduced in this release.

Common Enhancements to all Personas

The following features are new in Cisco NDFC Release 12.2.1 for all personas in Cisco Nexus Dashboard Fabric Controller.

Table 1 **Features in Cisco NDFC Release 12.2.1**

Product Impact	Features	Description
Base Functionality	Added support for new Cisco Nexus switches	Support added for the Cisco Nexus N9K-C93400LD-H1 and Cisco Nexus N9K-C93108TC-FX3 switches. For more information, see the "New Hardware Features" section in the *Nexus Dashboard Fabric Controller Release Notes, Release 12.2.1*.
Ease of Use	Updates to navigation menu	Beginning with NDFC release 12.2.1, all the navigation menu items have been clubbed into four categories: Overview, Manage, Analyze, and Admin. Every sub- menu option that was available in prior releases has been re-mapped to one of these main categories.
Ease of Use	Added an NDFC journey for the first- time setup of the Fabric Controller	When the Fabric Controller is enabled during the Nexus Dashboard (ND) bootstrap process, the ND cluster is brought up with the corresponding service already enabled. However, for the first-time setup of the Fabric Controller, the user is led through a guided step-by-step workflow (journey) for the initial bring-up of the Fabric Controller persona and the corresponding feature/feature-sets and pre-requisites that need to be enabled.
Ease of Use	Upgraded groups for switches in a fabric	Beginning with NDFC release 12.2.1, for LAN deployments, you can now perform image updates at a fabric level using a simple two-step workflow: Prepare & Install. NDFC can optionally automatically generate an upgrade plan for an existing fabric by assigning switches into different update groups based on the switch role and operational state. Users are free to customize the groups as they deem appropriate before they can proceed with the actual update. The **Image Management page** is now: **Fabric Software**. The navigation path to the new Fabric Software is now: **Manage > Fabric Software** For more information, see the section "Upgrade or Downgrade Switches in a Fabric" in Nexus Dashboard Fabric Controller Fabric Software.

LAN Controller Enhancements

Table 2 **LAN Controller Enhancements (page 1 of 3)**

Product Impact	Features	Description
Security	Security for VXLAN EVPN fabrics using security groups	Security for VXLAN EVPN fabrics using security groups is a beta feature that is visible in the Cisco NDFC GUI. This feature is not supported in this release. Contact Cisco for information about this feature.
Ease of Use	Ability to export switch inventory information to a .csv format	Beginning with NDFC release 12.2.1, you can export switch inventory information to a .csv format. For more information, see the "Switches" section in About Fabric Overview for LAN Operational Mode Setups.
Ease of Use	Custom time range and real-time options available for monitoring performance data	Beginning with NDFC release 12.2.1, for the **Interface** and **Link** tabs on the **Metrics** page, you can filter performance data that is shown using new **Real time** and **Custom** options. For more information, see the "Metrics" section in About Fabric Overview for LAN Operational Mode Setups.
Ease of Use	Support added for automatically importing a pre-provisioned device to a fabric using PowerOn Auto Provisioning (POAP)	When you enable this feature, NDFC automatically imports the pre-provisioned device to the fabric using POAP. You enable this feature using the **Auto admit pre- provisioned switches during re-poap** option on the **Admin > System Settings > Server Settings > LAN- Fabric** tab. With this feature, you can avoid having to reenter a username, password, and the bootstrap parameters on the **Add Switches (Bootstrap)** page. For more information, see the "Automatically Importing a Pre-provisioned Device Using POAP" section in Add Switches for LAN Operational Mode.
Ease of Use	Support added for both synchronous and asynchronous options for moving a device from normal to maintenance mode and vice versa	When you enable this feature and you perform a switch change mode request from NDFC, the specified switch goes to maintenance mode and the NDFC GUI waits until the mode is completely changed on the switch. After the NDFC GUI completes the switch change mode request, the switch changes mode to maintenance or normal mode based on your selection. You enable the **Wait for switch mode change to maintenance on deploy** option from the **Fabric Overview > Switches** page, the Actions drop-down list on the **Manage > Inventory > Switches** page, or by double-clicking on a fabric to access a switch on the **Topology** page. You can then right-click on the switch and click **More > Change Mode** to access the **Change Mode** dialog box. For more information, see the "Waiting for a Switch to Change Modes" section in Add Switches for LAN Operational Mode.
Ease of Use	Support for import or export of NDFC templates to or from a Git repository	With this feature, you can import or export your non-default NDFC templates to or from your Git repository. For more information, see the "Importing a Template from Git" and "Exporting a Template to Git sections in Templates.

Table 2 **LAN Controller Enhancements (page 2 of 3)**

Product Impact	Features	Description
Security	Support for NDFC discovery of IOS-XR devices without requiring SNMP configuration	With this feature, you can discover an IOS-XR device without having to configure the Simple Network Management Protocol version 3 (SNMPv3) on the device. NDFC uses the Secure Shell (SSH) CLI option for IOS-XR device discovery. For more information, see the "VRF Lite Between Cisco Nexus 9000 Based Border and Non-Nexus Device" section in VRF Lite. For more information, see the "Managing Cisco IOS-XR Devices using NDFC" section in External Connectivity Networks.
Security	Support authentication, authorization, and accounting (AAA) remote authentication passthrough	With this feature enabled, when you log on to ND, the user's login credentials are copied to the LAN switch settings in **Admin > Switch Credentials > LAN Credentials Management > Default Credentials**. When you log on to ND for the first time, you are no longer prompted to enter the LAN switch credentials, as NDFC automatically copies the user login credentials to the LAN switch credentials. You can still set per user per switch credentials. Enable this feature by navigating to **Admin > System Settings > LAN-Fabric** and selecting the check box for the **Enable AAA Passthrough feature**. For more information, see the "LAN-Fabric" section in Overview and Initial Setup of Cisco NDFC LAN.
Base Functionality	Added support for additional Cisco Catalyst 9000 switches	Support added for Cisco Catalyst switches for LAN deployments. For more information, see the "New Hardware Features > Cisco Catalyst Switches for LAN Deployments" section in the Nexus Dashboard Fabric Controller Release Notes, Release 12.2.1.
Ease of Use	Support for border gateway (BGW) in BGP fabrics for VXLAN EVPN Multi-Site	Beginning with NDFC release 12.2.1, border gateway (BGW) support is available in eBGP-based fabrics. The supported roles are Border Gateway, Border Gateway Spine, and Border Gateway Super Spine. Furthermore, the eBGP-based fabric can now participate in a VXLAN EVPN Multi-Site domain (MSD). For more information, see the "Border Gateway Support" section in BGP Fabric.
Ease of Use	Support for Layer 3 VNI in VXLAN EVPN fabrics without requiring a core-facing VLAN/SVI	Beginning with NDFC release 12.2.1, in a VXLAN BGP EVPN fabric, support is available for configuring a Layer 3 VNI (also known as a VRF on a NX-OS device) without needing a VLAN/SVI. This is available for the following fabric types: • BGP (eBGP EVPN) • Campus VXLAN EVPN • Data Center VXLAN EVPN A new field is available when creating or editing these fabric types to enable this feature. For more information, see the "Layer 3 VNI Without VLAN" section in BGP Fabric, in Campus VXLAN EVPN, and in Data Center VXLAN EVPN.

Table 2 **LAN Controller Enhancements (page 3 of 3)**

Product Impact	Features	Description
Ease of Use	Support for AI/ML QoS and queuing policies	Beginning with NDFC release 12.2.1, support is available for configuring artificial intelligence (AI) and machine learning (ML) QoS and queuing policies when creating or editing the following fabric types: • BGP (with or without VXLAN EVPN enabled) • Data Center VXLAN EVPN A new field is available when creating or editing these fabric types to enable this feature. For more information, see the "AI/ML QoS Classification and Queuing Policies" section in BGP Fabric and in Data Center VXLAN EVPN.
Performance and Scalability	Support for 250 switches with NDFC plus NDI in a three-node physical ND (pND) deployment	This feature increases the scale limits for cohosting Nexus Dashboard Insights (NDI) with NDFC on a three- node physical Nexus Dashboard cluster. The scale limit has been increased from 50 to 250 switches. For more information on the verified scalability values for NDFC, see the Verified Scalability Guide for Cisco Nexus Dashboard Controller.
Base Functionality	Support for Nexus 3000 switches at the Layer 2 access layer for the Enhanced Classic LAN fabric	Cisco Nexus 3000 Series switches with an access role are now supported in the Enhanced Classic LAN fabric. For more information, see Managing Legacy/Classic Networks in Cisco Nexus Dashboard Fabric Controller.
Base Functionality	Support for IP ACLs using native NDFC policies for existing as well as new VXLAN EVPN and Enhanced Classic LAN fabrics	In earlier releases, IP/IPv6 based ACLs were learnt into switch freeform policies. From NDFC release 12.2.1, these ACLs will be learnt into native ACL policies for VXLAN EVPN and Enhanced Classic LAN fabrics. For more information, see Enabling Freeform Configurations on Fabric Switches.

SAN Controller Enhancements

Table 3 **SAN Controller Enhancements (page 1 of 2)**

Product Impact	Features	Description
Ease of Use	Ability to monitor zone, Fibre Channel Name Server (FCNS), and Fabric login (FLOGI) limitations	Support is now available to monitor zone, Fibre Channel Name Server (FCNS), and Fabric login (FLOGI) limitations. For more information, see the "Monitoring Zone/FCNS/FLOGI Limitations" section in About Switch Overview for SAN Operational Mode Setups.
Ease of Use	Support for viewing power utilization	With this feature, you can view the power utilization for each switch and power module. You can view a graph of power usage data per day, week, or month based on the selected data type. For more information, see the "Metrics" sections in About Switch Overview for SAN Operational Mode Setups and in About Fabric Overview for SAN Operational Mode Setups.
Ease of Use	Configure VSAN port membership and port trunking allowed VSAN membership directly from the Interface tab	With this feature, you can edit VSAN port membership and port trunking allowed VSAN membership directly from the **Interface** tab for the specified interface. For more information, see the "Edit Port VSAN Membership" and the "Edit VSAN Membership with Port Trunking" sections in About Switch Overview for SAN Operational Mode Setups. For more information, see the "Edit Port VSAN Membership" and the "Edit Port Trunking VSAN Membership" sections in About Fabric Overview for SAN Operational Mode Setups.
Ease of Use	Support for clearing FICON RNID status	With this feature, you can clear the fiber connectivity (FICON) Request Node Identifier (RNID) status by replacing a value of old with invalid. For more information, see the "Clear FICON RNID Old Value" section in About Switch Overview for SAN Operational Mode Setups and in About Fabric Overview for SAN Operational Mode Setups.
Ease of Use	Configure AAA servers for Cisco MDS switches	With this feature, you can view or configure authentication, authorization, and accounting (AAA) servers, Lightweight Directory Access Protocol (LDAP), RADIUS, or TACACS+, for Cisco MDS switches. You can also create a search map for attaching an LDAP server group and for managing your LDAP switches. For more information, see the "AAA" and the "Configuring an AAA Server, a Server Group, a Search Map, and an Authentication Type" sections in About Fabric Overview for SAN Operational Mode Setups.

Table 3 **SAN Controller Enhancements (page 2 of 2)**

Product Impact	Features	Description
Ease of Use	Custom time range and real-time options available for performance data	Beginning with NDFC release 12.2.1, you can filter performance data that is shown using new Real time and Custom options. For more information, see the "Viewing Interfaces" section in in About Fabric Overview for SAN Operational Mode Setups and the "Dashboard Overview" section in Overview and Initial Setup of Cisco NDFC SAN. For more information, see the "Viewing Performance Information for FC Ports" and "Viewing Performance Information for Ethernet Ports" sections in Add Interfaces for SAN Operational Mode.
Ease of Use	Allow expansion of network elements in SAN topology	With this feature, when you click on a switch or a zone with host and storage devices, you can view the interface nodes connected to that host, storage, or switch. You can toggle a **Show Interfaces** option from the **View** drop-down list that allows you to view the connected interfaces. For more information, see the "Show Interfaces Option" section in Overview and Initial Setup of Cisco NDFC SAN.
Ease of Use	Navigate to specific pages from the top dashlets on the Overview dashboard	With this feature, you can navigate to specific pages after clicking a row in the **TOP** dashlets from the **Overview** dashboard page. For more information, see the "Dashboard Overview" section in Overview and Initial Setup of Cisco NDFC SAN.
Ease of Use	Add grouping to SAN topology	With this feature, you can single-click on a VSAN on the **SAN Controller > Topology** page to display the **VSANs** slide-in pane. You can filter based on VSAN attributes or based on search criteria. If you click on a VSAN in the slide-in pane, you can see the grouping of hosts, switches, and storage devices connected to the VSAN in the fabric topology. Click on the **Status** column to view a tooltip displaying the connected switch. Click on a VSAN name to view the number of zones connected to the VSAN. Click a zone name to view the connected host and storage devices for the zone. For more information, see the "Viewing Elements in SAN Topology" section in Overview and Initial Setup of Cisco NDFC SAN.
Ease of Use	Make SAN Web Device Manager optional	With this feature, you can disable the **SAN Web Device Manager in Admin > System Settings > Feature Management**. For more information, see the "Device Manager" section in Add Switches for SAN Operational Mode.

Fabric Controller with IP Fabric for Media (IPFM) Enhancements

Table 4 **Fabric Controller with IPFM Enhancements (page 1 of 2)**

Product Impact	Features	Description
Ease of Use	IGMP host proxy configuration	The Internet Group Management Protocol (IGMP) host proxy feature helps you connect a Protocol Independent Multicast (PIM)-enabled multicast network domain to a domain that does not understand PIM. This feature configures an interface as a proxy interface that proxies PIM join or prune requests that are received on the internal PIM network to IGMP join or leave requests. Enable the IGMP source group proxy in the Layer 3 interface using the following policy: **int_ipfm_l3_port**. You can filter by proxy groups, or you can add a new proxy group. For more information, see the "Editing an Interface for IPFM Fabrics" section in IPFM and Classic IPFM.
Ease of Use	IS-IS support added as a link-state IGP for an IPFM fabric template	This feature adds support for the Intermediate System- to-Intermediate System (IS-IS) link-state Interior Gateway Protocol (IGP) in an IPFM fabric template. You configure the IS-IS IGP when creating or editing an IPFM fabric template. NOTE: Once devices are imported into an IPFM fabric, you cannot change the IGP unless you delete and re-add the devices. For more information, see the "General Parameters" and "Protocols" sections in IPFM and Classic IPFM.
Performance and Scalability	Extend support for up to 120 switches in a Classic IPFM fabric	This feature extends support for up to 120 switches in a Classic IPFM fabric. For more information on the verified scalability values for NDFC, see Verified Scalability Guide for Cisco Nexus Dashboard Controller.
Ease of Use	IP Fabric for Media (IPFM) for Layer 2 port visibility	In previous releases of NDFC, you could view the IPFM flow status only at the Layer 3 boundary, as a physical interface, or as a switch virtual interface (SVI). Layer 2 physical interface visibility was not possible. Beginning with the NDFC 12.2.1 release, visibility into the Layer 2 VLAN is possible below the SVI. You can identify the receiver connected Layer 2 interface. View the Layer 2 port and the Layer 3 SVI in the **Receiver Interface** column, or by clicking on the **active** link under the **Flow Link State** column on the **Fabric Overview > Flows > Flow Status** page. If you click on the active link, you can view the Layer 2 port in the topology diagram with an updated tooltip and a table that includes the Layer 2 port. You can view the Layer 2 receiver port along with the SVI details by navigating to the **Overview > Topology** page. For more information, see the "IPFM and Generic Multicast Flow Status" section in About Fabric Overview for LAN Operational Mode Setups.

Table 4 **Fabric Controller with IPFM Enhancements (page 2 of 2)**

Product Impact	Features	Description
Ease of Use	IPFM critical event notifications	With this release, you can view IPFM critical events by navigating to **Fabric Overview > Event Analytics > IPFM Events**. You can click on a **Distinguished Name (DN)** to view additional information about the DN or to filter information by **Identifier**, **Reason**, **Time**, or **Status**. You configure IPFM event notification retention history and other options from the **Fabric Controller > Admin > System Settings > Server Settings > IPFM** tab. For more information, see the "IPFM Events" section in About Fabric Overview for LAN Operational Mode Setups and in Overview and Initial Setup of Cisco NDFC LAN.

New Hardware Features

The following is the list of new hardware supported with this release:

- N9K-C93400LD-H1 — Cisco Nexus 9300 series TOR chassis with 48 50g ports and 4 400g ports
- N9K-C93108TC-FX3 — Cisco Nexus 9300 series 1RU TOR chassis with 48x100M/1G/10G BASE-T downlinks and 6x40/100G uplinks

Cisco Catalyst Switches for LAN Deployments

- Cisco Catalyst 9500X-28C8D - Cisco Catalyst 9500 series
- Cisco Catalyst 9600X-Sup2 - Cisco Catalyst 9600 series supervisor 2 module
- Cisco Catalyst C9600-LC-40YL4CD - Cisco Catalyst 9600 series line-card module

Changes in Behavior

- Beginning with the NDFC 12.2.1 release, you can import alarm policies from a .txt file using the Import Policy dialog box from the Actions > Import drop-down list. For more information, see the "Alarm Policies" section in Event Analytics.
- Beginning with Nexus Dashboard release 3.1(1), all services have been unified into a single deployment image. You no longer need to download, install, and enable each service individually. Instead, you can simply choose which services to enable during the Nexus Dashboard platform deployment process. As a result, we recommend deploying Nexus Dashboard release 3.1(1) with the unified installation for all new installations. Upgrading to this release also automatically upgrades all services on your existing cluster. For more information, see the Cisco Nexus Dashboard and Services Deployment Guide.

Licensing Model

Two types of Cisco DCNM-SAN licenses are available:

- Cisco DCNM-SAN Essentials Edition (comparable to Cisco Fabric Manager) is included at no charge with every Cisco MDS 9000 hardware purchase. No license is required to use these features because they are unlocked with the image.
- Cisco DCNM-SAN Advanced Edition (comparable to Cisco Fabric Manager Server) provides additional capabilities and is required to use the Virtual Machine Topology and Performance feature and the Performance Forecasting Charts feature.The Advanced Edition licenses have the following part numbers:

Product Name	Part Number
DCNM for SAN Advanced Edition for MDS 9700	DCNM-SAN-M97EK9
DCNM for SAN Advanced Edition for MDS 9500	DCNM-SAN-M95EK9
DCNM for SAN Advanced Edition for MDS 9200	DCNM-SAN-M92EK9
DCNM for SAN Advanced Edition for MDS 9100	DCNM-SAN-M91EK9

For a description of the license differences between Fabric Manager and Data Center Network Manager, refer to the following tech note:

https://www.cisco.com/c/en/us/td/docs/dcn/ndfc/1201/licensing/smart-licensing-using-policy-for-cisco-ndfc-1201.html

Fixed problems

Cisco-specific caveats for resolved problems can be found in the Cisco release-noted documentation at the following Cisco website:

http://www.cisco.com/en/US/products/ps9369/tsd_products_support_series_home.html

Environment and system requirements

The following sections describes the various system requirements for the proper functioning of your Cisco Nexus Dashboard Fabric Controller, Release 12.1:2.

- “Cisco Nexus Dashboard Version Compatibility” on page 13
- “Nexus Dashboard Server Resource (CPU/Memory) Requirements” on page 13
- “Nexus Dashboard Networks” on page 14
- “Virtual Nexus Dashboard (vND) Prerequisites” on page 15
- “Supported Latency” on page 15
- “Cisco Nexus Dashboard Version Compatibility” on page 13

Cisco Nexus Dashboard Version Compatibility

NDFC 12.2.1 is bundled with the ND 3.1.1k image. There is no longer any separate option for upload of applications into the Nexus Dashboard. Nexus Dashboard is now a single unified product.

Nexus Dashboard Server Resource (CPU/Memory) Requirements

The following table provides information about Server Resource (CPU/Memory) Requirements to run NDFC on top of Nexus Dashboard. Refer to Nexus Dashboard Capacity Planning to determine the number of switches supported for each deployment.

Cisco Nexus Dashboard can be deployed using number of different form factors. NDFC can be deployed on the following form factors:

- pND - Physical Nexus Dashboard
- vND - Virtual Nexus Dashboard
- rND - RHEL Nexus Dashboard

Table 5 **Server Resource (CPU/Memory) Requirements to run NDFC on top of ND**

Deployment Type	Node Type	CPUs	Memory	Storage (Throughput: 40-50MB/s)
Fabric Discovery	Virtual Node (vND) - app OVA	16vCPUs	64GB	550GB SSD
	Physical Node (pND) (PID: SE-NODE-G2)	2x 10-core 2.2G Intel Xeon Silver CPU	256 GB of RAM	4x 2.4TB HDDs 400GB SSD 1.2TB NVME drive
Fabric Controller	Virtual Node (vND) - app OVA	16vCPUs	64GB	550GB SSD
	Physical Node (pND) (PID: SE-NODE-G2)	2x 10-core 2.2G Intel Xeon Silver CPU	256 GB of RAM	4x 2.4TB HDDs 400GB SSD 1.2TB NVME drive
SAN Controller	Virtual Node (vND) - app OVA (without SAN Insights)	16vCPUs	64GB	550GB SSD
	Data Node (vND) - Data OVA (with SAN Insights)	32vCPUs	128GB	3TB SSD
	Physical Node (pND) (PID: SE-NODE-G2)	2x 10-core 2.2G Intel Xeon Silver CPU	256 GB of RAM	4x 2.4TB HDDs 400GB SSD 1.2TB NVME drive

Nexus Dashboard Networks

When first-configuring Nexus Dashboard, on every node, you must provide two IP addresses for the two Nexus Dashboard interfaces-one connected to the Data Network and the other to the Management Network. The data network is typically used for the nodes' clustering and north-south connectivity to the physical network. The management network typically connects to the Cisco Nexus Dashboard Web UI, CLI, or API.

For enabling the Nexus Dashboard Fabric Controller, the Management and Data Interfaces on a Nexus Dashboard node must be in different subnets. The interfaces between different nodes that belong to the same Nexus Dashboard cluster, must be within the same Layer-2 Network and Layer-3 subnet.

Connectivity between the Nexus Dashboard nodes is required on both networks with the round-trip time (RTT) not exceeding 50ms. Other application running on the same Nexus Dashboard cluster may have lower RTT requirements and you must always use the lowest RTT requirement when deploying multiple applications in the same Nexus Dashboard cluster. We recommend consulting the *Cisco Nexus Dashboard Deployment Guide* for more information.

Table 6 **Network Requirements for NDFC on Nexus Dashboard**

Management Interface	Data Interface	Persistent IPs
Layer 2 adjacent	Layer 2 adjacent	One of the following for LAN: • 2 IPs in management network if using the default LAN Device Management Connectivity setting • 2 IPs in data network if setting LAN Device Management Connectivity to Data Plus one IP per fabric for EPL in data network Plus one IP for Telemetry receiver in data or management network if IP Fabric for Media is enabled. For SAN: • 2 IPs in data network Plus one IP per node in data network for SAN Insights receiver if enabled.
Layer 3 adjacent	Layer 3 adjacent	For LAN: • LAN Device Management Connectivity on NDFC must be set to Data • 2 IPs for SNMP/Syslog and SCP/POAP services • Plus one IP per fabric for EPL These IPs must be part of a subnet that is different from Nexus Dashboard management and Nexus Dashboard data subnets associated with any of Nexus Dashboard nodes. These IPs must belong to the Layer-3 External Persistent Service Pool. **Note:** SAN Controller and IP Fabric for Media modes are not supported in this deployment.

Virtual Nexus Dashboard (vND) Prerequisites

For virtual Nexus Dashboard deployments, each vND node has 2 interfaces or vNICs. The Data vNIC maps to bond0 (also known as bond0br) interface and Management vNIC maps to bond1 (also known as bond1br) interface. The requirement is to enable/accept promiscuous mode on the port groups associated with the Nexus Dashboard Management and/or Data vNICs where IP stickiness is required. The Persistent IP addresses are given to the pods (e.g., SNMP Trap/Syslog receiver, Endpoint Locator instance per Fabric, SAN Insights receiver, etc.). Every POD in Kubernetes can have multiple virtual interfaces. Specifically for IP stickiness, an extra virtual interface is associated with the POD that is allocated an appropriate free IP from the external service IP pool. The vNIC has its own unique MAC address that is different from the MAC addresses associated with the vND virtual vNICs. Moreover, all North-to-South communication to and from thesethese PODs go out of the same bond interface. By default, the VMware ESXi systems check if the traffic flows out of a particular VM vNIC matches the Source-MAC associated with that vNIC. In the case of NDFC pods with an external service IP, the traffic flows are sourced with the Persistent IP addresses of the given PODs that map to the individual POD MAC associated with the virtual POD interface. Therefore, we need to enable the required settings on the VMware side to allow this traffic to flow seamless in and out of the vND node.

When vND nodes are deployed with the new Layer-3 HA feature, you need not enable Promiscuous mode on the vND vNIC interfaces. Promiscuous mode is required only for vND deployments when the vNDs are layer-2 adjacent from each other.

For more information, refer to *Cisco Nexus Dashboard Deployment Guide*.

Supported Latency

As Cisco Nexus Dashboard Fabric Controller is deployed atop Cisco Nexus Dashboard, the latency factor is dependent on Cisco Nexus Dashboard. Refer to *Cisco Nexus Dashboard Deployment Guide* for information about latency.

Supported Web Browsers

Cisco Nexus Dashboard Fabric Controller is supported on the following web browsers:

- Google Chrome version 109.0.5414.87 (64 bit)
- Microsoft Edge version 109.0.1518.61 (64 bit)
- Mozilla Firefox version 108.0.1 (64 bit)

Other Supported Software

The following table lists the other software that is supported by Cisco Nexus Dashboard Fabric Controller Release 12.2.1.

Table 7 **Other software supported by Cisco Nexus Fabric Controller Release 12.2.1**

Component	Features
Security	• ACS versions 4.0, 5.1, 5.5, and 5.8 • ISE version 2.6 • ISE version 3.0 • Telnet Disabled: SSH Version 1, SSH Version 2, Global Enforce SNMP Privacy Encryption. • Web Client: HTTPS with TLS 1, 1.1 and 1.2 • TLS 1.3

In addition, Cisco NDFC supports the following types of events: Dell Call Home events, fabric change events, and events that are forwarded by traps and email.

Hardware supported

The following table lists the products and components that Cisco NDFC Release 12.2.1 supports.

Table 8 **Hardware features supported by Cisco NFDC Release 12.2.1 (page 1 of 3)**

Product/Component	Part Number
Cisco MDS 9718 Supervisor-1E Modules	DS-X97-SF1-K9
Cisco MDS 9710 Crossbar Fabric-3 Switching Module	DS-X9710-FAB3
Cisco MDS 9700 Series Supervisor-4 Module	DS-X97-SF4-K9
MDS 9706 Crossbar Switching Fabric-3 Module	DS-X9706-FAB3
Cisco MDS 9396T 32 Gbps 96-Port Fibre Channel Switch	DS-C9396T-K9
Cisco MDS 9148T 32 Gbps 48-Port Fibre Channel Switch	DS-C9148T-K9
Cisco MDS 9700 48-Port 32-Gbps Fibre Channel Switching Module	DS-X9648-1536K9
Cisco MDS 9700 64-Gbps 48-port Fibre Channel Switching Module	DS-X9748-3072K9
Cisco MDS 9250i Multilayer Fabric Switch	DS-9250I-K9
Cisco MDS 9124 24-Port Multilayer Fabric Switch	DS-C9124-K9
Cisco MDS 9134 34-Port Multilayer Fabric Switch	DS-C9134-K9
Cisco MDS 9148 48-Port Multilayer Fabric Switch	DS-C9148-K9
Cisco MDS 9148 48-Port Multilayer Fabric Switch	DS-C9148S-K9
Cisco MDS 9216i Multilayer Fabric Switch	DS-C9216i-K9
Cisco MDS 9222i Multilayer Fabric Switch	DS-C9222i-K9

Table 8 **Hardware features supported by Cisco NFDC Release 12.2.1 (page 2 of 3)**

Product/Component	Part Number
Hardware features supported by Cisco NDFC Release 12.0.(2f)	DS-C9220I-K9
MDS 9506 Multilayer Director	DS-C9506
Cisco MDS 9509 Multilayer Director	DS-C9509
Cisco MDS 9513 Multilayer Director	DS-C9513
Cisco MDS 9706 Multilayer Director	DS-C9706
Cisco MDS 9710 Multilayer Director	DS-C9710
Cisco MDS 9718 Multilayer Director	DS-C9718
Cisco MDS 9000 32-Port 2-Gbps Fibre Channel Switching Module	DS-X9032
Cisco MDS 9000 32-Port Storage Services Module	DS-X9032-SSM
Cisco MDS 9000 12-port 4-Gbps Fibre Channel Switching Module	DS-X9112
Cisco MDS 9000 12-port 4-Gbps Fibre Channel Switching Module	DS-X9112
Cisco MDS 9000 12-port 4-Gbps Fibre Channel Switching Module	DS-X9112
Cisco MDS 9000 24-port 4-Gbps Fibre Channel Switching Module	DS-X9124
Cisco MDS 9000 48-port 4-Gbps Fibre Channel Switching Module	DS-X9148
Cisco MDS 9000 24-Port 8-Gbps Fibre Channel Switching Module	DS-X9224-96K9
Cisco MDS 9000 32-port 8-Gbps Advanced Fibre Channel Switching Module	DS-X9232-256K9
Cisco MDS 9000 48-port 8-Gbps Advanced Fibre Channel Switching Module	DS-X9248-256K9
Cisco MDS 9000 4/44-Port Host-Optimized 8-Gbps Fibre Channel Switching Module	DS-X9248-48K9
Cisco MDS 9000 48-Port 8-Gbps Fibre Channel Switching Module	DS-X9248-96K9
Cisco MDS 9000 Family 14-Port Fibre Channel and 2-port Gigabit Ethernet Module	DS-X9302-14K9
Cisco MDS 9000 18/4-Port Multiservice Module (MSM-18/4)	DS-X9304-18K9
Cisco MDS 9000 4-port 1-Gbps IP Storage Module	DS-X9304-SMIP
Cisco MDS 9000 8-port 1-Gbps IP Storage Module	DS-X9308-SMIP
Cisco MDS 9000 Family 16-Port Storage Services Node (SSN-16)	DS-X9316-SSNK9
Cisco MDS 9000 Family 24/10 SAN Extension Module	DS-X9334-K9

Table 8 **Hardware features supported by Cisco NFDC Release 12.2.1 (page 3 of 3)**

Product/Component	Part Number
Cisco MDS 9000 48-port 16-Gbps Fibre Channel Switching Module with SFP LC connectors	DS-X9448-768K9
Cisco MDS 9500 Series Supervisor-1 Module	DS-X9530-SF1-K9
Cisco MDS 9500 Series Supervisor-2 Module	DS-X9530-SF2-K9
Cisco MDS 9500 Series Supervisor-2A Module	DS-X9530-SF2A-K9
Cisco MDS 9000 Family 4-Port 10-Gbps Fibre Channel Switching Module	DS-X9704
Cisco MDS 9000 8-port 10-Gbps Fibre Channel over Ethernet (FCoE) Module	DS-X9708-K9
Cisco MDS 48-Port 10-Gigabit Fibre Channel over Ethernet (FCoE) Module with SFP LC connectors	DS-X9848-480K9
Cisco MDS 9132T 32-Gbps 32-Port Fibre Channel Switch	DS-C9132T-K9
Cisco MDS 9148V 64-Gbps 48-Port Fibre Channel Switch	DS-C9148V-K9
Cisco MDS 9124V 64-Gbps 24-Port Fibre Channel Switch	DS-C9124V-K9
Cisco MDS 9396V 64-Gbps 96-Port Fibre Channel Switch	DS-C9396V-K9

Compatibility with Cisco MDS 9000 Family Switches

The following table shows the Cisco NDFC Compatibility Matrix for Release 12.2.1.

Table 9 **Cisco NDFC Compatibility Matrix**

Switches	Supported Switch Releases
Cisco MDS 9100	9.2(1), 8.4(2c), 8.5(1), 6.2(33), 8.4(2b), 8.1(1b), 6.2(31), 6.2(29), 8.4(2a), 8.4(2), 8.4.(1a), 6.2(29), 8.4(1), 6.2(27), 8.3(2), 8.3(1), 8.2(2), 8.2(1), 8.1(1a), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 6.2(11c), 6.2(11b), 6.2(11), 6.2(9c), 6.2(9b), 6.2(9a), 6.2(9), 6.2(7), 6.2(5a), 6.2(5), 6.2(3), 6.2(1), 5.2(8i), 5.2(8h), 5.2(8g) , 5.2(8f), 5.2(8e), 5.2(8d), 5.2(8c), 9.2(2), 8.4(2d) 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)
Cisco MDS 9200	8.5(1), 8.3(2), 8.3(1), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 6.2(11c), 6.2(11b), 6.2(11), 6.2(9c), 6.2(9b), 6.2(9a), 6.2(9), 6.2(7), 6.2(5a), 6.2(5), 6.2(3), 6.2(1), 5.2(8h), 5.2(8c), 5.2(8d), 5.2(8e), 5.2(8f), 5.2(8g), 9.2(2), 8.4(2d), 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)
Cisco MDS 9250i	9.2(1), 8.4(2c), 8.5(1), 8.4(2b), 8.4(2a), 8.4(2), 8.1(1b), 8.4.(1a), 6.2(31), 6.2(29), 8.4(1), 6.2(27), 8.3(2), 8.3(1), 8.2(2), 8.2(1), 8.1(1a), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 6.2(11c), 6.2(11b), 6.2(11), 6.2(9c), 6.2(9b), 6.2(9a), 6.2(9), 6.2(7), 6.2(5a), 6.2(5), 9.2(2), 8.4(2d), 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)
Cisco MDS 9220i	9.2(1), 8.5(1), 9.2(2), 8.4(2d) 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)

Table 9 **Cisco NDFC Compatibility Matrix**

Switches	Supported Switch Releases
Cisco MDS 9300	9.2(1), 8.4(2c), 8.5(1), 6.2(33), 8.4(2b), 8.1(1b), 6.2(31), 6.2(29), 8.4(2a), 8.4(2), 8.4(1a), 6.2(29), 8.4(1), 6.2(27), 8.3(2), 8.3(1), 8.2(2), 8.2(1), 8.1(1a), 8.1(1), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 9.2(2), 8.4(2d), 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)
Cisco MDS 9500	6.2(33), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(31), 6.2(29), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 6.2(11c), 6.2(11b), 6.2(11), 6.2(9c), 6.2(9b), 6.2(9a), 6.2(9), 6.2(7), 6.2(5a), 6.2(5), 6.2(3), 6.2(1), 5.2(8h), 5.2(8c), 5.2(8d), 5.2(8e), 5.2(8f), 5.2(8g)
Cisco MDS 9700	9.2(1), 8.4(2c), 8.5(1), 6.2(33), 8.4(2b), 8.1(1b), 6.2(31), 6.2(29), 8.4(2a), 8.4(2), 8.4(1a), 6.2(29), 8.4(1), 6.2(27), 8.3(2), 8.3(1), 8.2(2), 8.2(1), 8.1(1a), 8.1(1), 7.3(1)DY(1), 7.3(1)D1(1), 7.3(0)DY(1), 7.3(0)D1(1), 6.2(25), 6.2(23), 6.2.(21), 6.2(19), 6.2(17), 6.2(15), 6.2(13b), 6.2(13a), 6.2(13), 6.2(11c), 6.2(11b), 6.2(11), 6.2(9c), 6.2(9b), 6.2(9a), 6.2(9), 6.2(7), 6.2(5a), 6.2(5), 6.2(3), 6.2(1), 9.2(2), 8.4(2d), 8.4(2f), 9.3(1), 9.3(2), 9.4(1), 9.4(1a)

Known problems and limitations

For a list of problems with this release, please refer to the Cisco release notes located at:

https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html

Technical notes

This section contains technical notes.

Dell Email Home for Cisco MDS switches

Configuration and troubleshooting instructions, prerequisites, and other caveats can be found in the Dell Connectrix Procedure Generator. The Connectrix Procedure Generator can be downloaded from Dell Online Support, https://www.dell.com/support. Search for **Connectrix Procedure Generator**.

Customers requiring installation of this solution should contact their Dell Customer Engineer to assist with the installation and provide the documentation.

Documentation

Send documentation comments to www.cisco.com.

Location of Cisco NDFC documentation

The Cisco NDFC documentation is available at the following URL:

https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html

The documentation set for Cisco NDFC includes the following Cisco NDFC release 12.x documents:

- Release Notes:
  - Cisco NDFC Release Note, release 12.2.1
  - Cisco NDFC Release Note, release 12.1.3b
  - Cisco NDFC Release Notes, release 12.1.2x
  - Cisco NDFC Release Notes, release 12.1.1x
  - Cisco NDFC Release Notes, Release 12.0.2.x
- Installation and Licensing
  - Cisco NDFC OVA Installation Guide, Release 12.2.1
- Cisco NDFC Fundamentals Guide
  - Cisco NDFC Configuration, Release 12.2.1
- Cisco NDFC REST API Guide
  - Cisco NDFC REST API Guide, Release 12.2.1
- Cisco NDFC Troubleshooting Guide

https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html

Software media, organization, and files

For information on related software environment and system requirements refer to the *Dell Support Matrix* located on E-Lab Interoperability Navigator at https://elabnavigator.dell.com/eln/modernHomeSSM, under the **PDFs and Guides** tab.

To download the latest Nexus Dashboard Fabric Controller software, navigate to Dell Online Support, https://www.dell.com/support. Search for **Nexus Dashboard Fabric Controller**.

Deployment Options

The following deployment options are available for Cisco Nexus Dashboard Fabric Controller

NDFC on Single node (non-HA Cluster)

On Single node Nexus Dashboard, you can deploy NDFC with the following personas:

- Fabric Discovery for lab/non-production environments (<= 25 switches)
- Fabric Controller for lab/non-production environments (<= 25 switches)
- Fabric Controller in IP Fabric for Media controller mode for production environments
- SAN Controller for production environments (<= 80 switches)

Note: Fabric Controller/Fabric Discovery deployment is for Lab purposes only. Do not deploy this in your production environment.

NDFC on a 3-node virtual (vND) or physical (pND) Nexus Dashboard Cluster (Active-Active HA mode)

On 3-Node Nexus Dashboard, you can deploy NDFC with the following personas:

- Fabric Discovery
- Fabric Controller
- SAN Controller with or without SAN Insights

Note: For NDFC deployments, the Nexus Dashboard node should have a different subnet on the management interface and the data/fabric interface. In addition, in a 3-node Nexus Dashboard cluster, all Nexus Dashboard nodes should be layer-2 adjacent. In other words, the 3 Nexus Dashboard nodes must all belong to the same management and data networks respectively. In summary, Nexus Dashboard Fabric Controller is not supported on Nexus Dashboard nodes that are deployed with management and data networks using overlapping subnets.

NDFC on a 5-node vND Cluster (Active-Active HA mode)

In release 12.1.1e and later, on 5-Node Nexus Dashboard, you can deploy NDFC with the following personas:

- Fabric Discovery
- Fabric Controller

NDFC on a 3-node virtual (vND) or physical (pND) Nexus Dashboard Cluster (Active-Active HA mode)

On 3-Node Nexus Dashboard, you can deploy NDFC with the following personas:

- Fabric Discovery
- Fabric Controller
- SAN Controller with or without SAN Insights

Note: For NDFC deployments, the Nexus Dashboard node should have a different subnet on the management interface and the data/fabric interface. In addition, in a 3-node Nexus Dashboard cluster, all Nexus Dashboard nodes should be layer-2 adjacent. In other words, the 3 Nexus Dashboard nodes must all belong to the same management and data networks respectively. In summary, Nexus Dashboard Fabric Controller is not supported on Nexus Dashboard nodes that are deployed with management and data networks using overlapping subnets.

NDFC on a 5-node vND Cluster (Active-Active HA mode)

In release 12.1.1e and later, on 5-Node Nexus Dashboard, you can deploy NDFC with the following personas:

- Fabric Discovery
- Fabric Controller

On a 4-node or 5-node Nexus Dashboard, you can deploy Nexus Dashboard Insights (NDI) along with NDFC with the following personas:

- NDI and NDFC in Fabric Discovery persona (NDFC-Monitored mode) – 4 pND nodes
- NDI and NDFC in Fabric Controller persona (NDFC-Managed mode) – 5 pND nodes

NDFC on a Nexus Dashboard running on top of Red Hat Enterprise Linux (RHEL)

From Release 12.1.2e, on a 1-node or 3-node Nexus Dashboard on the RHEL server, you can deploy NDFC with the following persona:

- SAN Controller with or without SAN Insights

NDFC on a virtual Nexus Dashboard (vND) with KVM hypervisor

NDFC on a virtual Nexus Dashboard (vND) with KVM hypervisor supports Fabric Controller, Fabric Discovery, and SAN Controller personas.

In the 3-node and 5-node deployment, there are 3 Nexus Dashboard master nodes. In the 5-node deployment, the additional 2 nodes serve as worker nodes. The 3-node or 5-node cluster deployment is an active-active solution, that is, all nodes are utilized to run micro-services of Nexus Dashboard Fabric Controller. When a node fails, microservices running on the node, are moved to the other nodes. Nexus Dashboard Fabric Controller will perform normally under one node failure scenarios. However, it is expected that there will be a brief disruption to services that must be migrated on node failure. After the migration of services is complete, the supported scale will continue to function albeit at degraded performance. To restore optimal NDFC performance, a system running with one failed node is not the desired situation and must be rectified at the earliest. A 3-node or 5-node cluster cannot tolerate failure of two nodes and all NDFC services will be disrupted.

For virtual Nexus Dashboard OVA deployments on ESXi environments, it is imperative that promiscuous mode is enabled on the port groups associated with Nexus Dashboard management and Nexus Dashboard data/fabric interfaces. Otherwise, some of the functionality such as SNMP trap, Image management, Endpoint Locator, SAN Insights and so on will not work.

For more information on Installation, refer to

https://www.cisco.com/c/en/us/td/docs/dcn/ndfc/1202/installation/cisco-ndfc-install-and-upgrade-guide-1202.html

Troubleshooting and getting help

Dell support, product, and licensing information can be obtained on the Dell Online Support site as described next.

Note: To open a service request through the Dell Online Support site, you must have a valid support agreement. Contact your Dell sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

Product information

For documentation, release notes, software updates, or for information about Dell products, licensing, and service, go to the Dell Online Support site (registration required) at:

https://support.dell.com

Technical support

Dell offers a variety of support options.

Support by Product — Dell offers consolidated, product-specific information on the Web at:

https://support.dell.com/products

The Support by Product web pages offer quick links to Documentation, White Papers, Advisories (such as frequently used Knowledgebase articles), and Downloads, as well as more dynamic content, such as presentations, discussion, relevant Customer Support Forum entries, and a link to Dell Live Chat.

Dell Live Chat — Open a Chat or instant message session with a Dell Support Engineer.

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