SAN Insights, Release 12.2.2/12.2.3

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New and Changed Information

The following table provides an overview of the significant changes up to this current release. The table does not provide an exhaustive list of all changes or of the new features up to this release.

Release Version	Feature	Description
There were no major changes from the previous release.		

Understanding SAN Insights

The SAN Insights feature enables you to configure, monitor, and view the flow analytics in fabrics. SAN Insights features of SAN Controller enable you to visualize the health-related indicators in the interface so that you can quickly identify issues in fabrics. Also, the health indicators enable you to understand the problems in fabrics. The SAN Insights feature also provides more comprehensive end-to-end flow-based data from the host to storage.

SAN Controller supports SAN Telemetry Streaming (STS) using compact GPB transport, for better telemetry performance and to improve the overall scalability of SAN Insights.

For SAN Insights streaming stability and performance, see Server Properties for SAN Insights for SAN Controller deployment. Ensure that the system RAM, vCPU, and SSDs are used for deploying SAN Insights. Use of NTP is recommended to maintain the required time synchronization between the SAN Controller and the switches. Enable PM collection for viewing counter statistics.

From Release 12.0.1a, you can create policy based alarms generation for SAN ITL/ITN flow. From Web UI, choose **Analyze > Event Analytics > Alarms > Alarm Policies** to create policies. See the section " SAN Insights Anomaly Policy" in Event Analytics for more information.

Configuring Persistent IP Address

Before you install or upgrade to SAN Controller Release 12.1.1e or later, you must configure persistent IP addresses on Cisco Nexus Dashboard.

Ensure that the services are allocated with IP pool addresses on the Cisco Nexus Dashboard. For more information, refer to the *Cluster Configuration* section in Cisco Nexus Dashboard User Guide.

To configure SAN Insights on one node for SAN Controller deployment, the SAN Insights receiver requires one available Persistent IP. Similarly, to configure SAN Insights on three nodes for SAN Controller deployment, it requires three available Persistent IP addressees.

To configure Persistent IP addresses on Cisco Nexus Dashboard, perform the following steps:

1. Click **Admin Console > Admin > System Settings**.
2. On the **General** tab, in the **External Service Pools** card, click the **Edit** icon.

   The **External Service Pools** window appears.
3. To configure IP addresses for the SAN Controller, in Data Service IP's, click **Add IP Address**, enter required IP addresses and click **check** icon.
4. Click **Save**.

Changing Persistent IP Address

From Cisco NDFC Release 12.1.2e, you can change persistent IP addresses which are assigned for mandatory pods such as POAP-SCP and SNMP trap. To change the persistent IP address, perform the following steps:

1. On Cisco NDFC Web UI, navigate to **Admin > System Settings > Server Settings > Admin** under **LAN Device Management Connectivity** drop-down list change **Management** to **Data** or conversely.

   Changing option results in migration of SNMP and POAP-SCP pods to the persistent IP addresses associated with **External Service Pool** on Nexus Dashboard connected with the new **LAN Device Management Connectivity** option. After the completion of this process, the following message is displayed:

   Some features have been updated. Reload the page to see latest changes.

   Click **Reload the page**.

2. On Cisco Nexus Dashboard Web UI, navigate to **Admin Console > Admin > System Settings > General**.
3. In the **External Service Pools** card, change the required IP addresses for **Management Service IP Usage** or **Data Service IP Usage**.
4. Navigate to the NDFC Web UI **Server Settings** page, change the option in **LAN Device Management Connectivity** drop-down list to its initial selection.

   Restoring this option to initial settings, results in migration of the SNMP and POAP-SCP pods to use the updated persistent IP address from the appropriate External Service IP pool.

Guidelines and Limitations

- Prior to the NDFC 12.1.3 release, SAN Insights was supported on physical and data nodes. Beginning with the NDFC 12.1.3 release, the SAN Insights feature is also supported on app node deployments for Nexus Dashboard.
- Single node and three nodes deployments of Nexus Dashboard are supported for deploying SAN Insights.
- If SAN Insights streaming was configured with KVGPB encoding using versions of Cisco SAN Insights older than 11.2(1), the switch continues to stream with KVGPB encoding while configuring streaming with SAN Insights versions 11.2(1) and above. Compact GPB streaming configuration for SAN Insights is supported starting from SAN Controller 11.2(1). To stream using Compact GPB, disable the old KVGPB streaming before configuring SAN Insights newly, after the upgrade. To disable analytics and telemetry, on the Cisco SAN Controller Web UI, choose **Manage > Fabrics**, select a fabric, choose **Actions > Configure SAN Insights** and click **Next**. On the Switch Configuration screen, select required switch, choose **Actions > Disable Analytics** to clear all the analytics and telemetry configuration on the selected switches.
- The SAN Insights feature is supported for Cisco MDS NX-OS Release 8.3(1) and later.
- Ensure that the time configurations in SAN Controller and the supported switches are synchronized to the local NTP server for deploying the SAN Insights feature.
- Any applicable daylight time savings settings must be consistent across the switches and SAN Controller.
- To modify the streaming interval, use the CLI from the switch, and remove the installed query for SAN Controller. Modify the **san.telemetry.streaming.interval** property in the SAN Controller server properties. The allowed values for the interval are 30-300 seconds. The default value is 30 seconds. If there is an issue with the default value or to increase the value, set default value to 60

seconds. You can change the default value while configuring SAN Insights. On **Switch configuration** wizard in **Interval(s)** column select required value from drop-down list.

- The port sampling window on the switch side should have all ports (default).
- Use the ISL query installation type only for the switches that have storage connected (storage-edge switches).
- For the ISL query installation type, in the Configure SAN Insights wizard, analytics cannot be enabled on interfaces that are members of port-channel ISL to non-MDS platform switches.
- After installing the switch-based FM_Server_PKG license, the Configure SAN Insights wizard may take up to 5 minutes to detect the installed license.

For information about the SAN Insights dashboard, see the *SAN Insights* section in the *Cisco NDFC-SAN Controller Configuration Guide*.

For information about configuring the SAN Insights, see Configuring SAN Insights.

Server Properties for SAN Insights

To modify server settings values, navigate to **Admin > System Settings > Server Settings > Insights** on the Web UI.

If you change the server properties, ensure that you restart the SAN Controller to use the new properties value.

The following table describes the field names, descriptions, and its default values.

Server Properties for SAN Insights

Field Name	Description	Default Value
SAN Telemetry training timeframe (days)	Specifies the training time frame for flows ECT baseline.	7 days
ECT Data limit	Specifies the ECT Data limit.	14 Note: The value of ECT data limit must be less than or equal to the value of SAN Telemetry retention policy - baseline / post processed.
SAN Telemetry deviation low threshold	Specifies the value that is the change point between normal and low.	1
SAN Telemetry deviation high threshold for NVMe	Specifies the value that is the change point between medium and high for NVMe.	5
Active Anomaly Capture	Specify maximum number of actively tracked anomalies per post processor.	500

Field Name	Description	Default Value
SAN Telemetry deviation high threshold	Specifies the value that is the change point between medium and high.	30
SAN Telemetry retention policy – baseline / post processed (days)	Specifies the retention policy – baseline / post processed.	3 days
SAN Telemetry retention policy – hourly rollups (days)	Specifies the retention policy – hourly rollups	30 days
Telemetry Gap Reset Interval (seconds)	Specifies the maximum valid time gap between records (before drop). The time is in seconds.	750
Baseline training include NOOP frames	Specify if the baseline learning should reference noop frames.	Not selected
Use telemetry Gap Reset Interval	Specifies the use telemetry reset based on time gap between records	Selected
SAN Telemetry deviation med threshold for NVMe	Specifies the value that is the change point between low and medium for NVMe.	2
Number of hours of data that the dashboard will show on the top N graphs	Specifies the number of hours of data that the dashboard will show on the top N graphs.	1
Baseline training include negative deviation	Specify if the baseline deviation must include negatives.	Not selected
SAN Telemetry deviation low threshold for NVMe	Specifies the value that is the change point between normal and low for NVMe.	1
Number of days of data that the dashboard will show on the line graphs	Specifies the number of days of data that the dashboard will show on the line graphs.	1
SAN Telemetry training reset timeframe (days)	Specifies the time duration to periodically restart the ECT baseline training after number of days.	14 days
SAN Telemetry deviation med threshold	Specifies the value that is the change point between low and medium.	15
Telemetry pages default protocol scsi/nvme	Specifies the required default protocol selection in the SAN Insights UI pages to view corresponding data: SCSI or NVMe.	SCSI

The following table describes the system requirement for installation of SAN Controller:

Required System Memory for SAN Controller with SAN Insights

Node Type	vCPUs	Memory	Storage
Virtual App Node	16	64 GB	550 GB SSD
Virtual Data Node	32	128 GB	3 TB SSD
Physical Data Node	40	256 GB	4*2.2 TB HDD, 370G SSD, 1.5 TB NVMe

Verified limit for SAN Insights deployment: Data Node

Deployment Type	Verified Limit [1] [2]
Cisco Virtual Nexus Dashboard (1 Node)	1M ITLs/ITNs
Cisco Physical Nexus Dashboard (1 Node)	120K ITLs/ITNs
Cisco Virtual Nexus Dashboard (3 Node)	240K ITLs/ITNs
Cisco Physical Nexus Dashboard (3 Node)	500K ITLs/ITNs

Verified limit for SAN Insights deployment: App Node

Deployment Type	Verified Limit [3]
Cisco Virtual Nexus Dashboard (1 Node)	40K ITs
Cisco Virtual Nexus Dashboard (3 Node)	100K ITs

[1] Initiator-Target-LUNs (ITLs)

[2] Initiator-Target-Namespace ID (ITNs)

[3] Initiator-Targets (ITs)

For one Node vND to support 1M ITLs/ITNs, it requires 3TB of SSD and 128 GB of memory Nexus Dashboard as system requirement.

Configuring SAN Insights

From SAN Controller Release 12.0.1a, you can configure SAN fabrics on topology window, apart from configuring on fabric window.

On topology window, right-click on a SAN fabric, choose **Configure SAN Insights** and follow procedure to configure.

Before you begin:

Ensure that you configure persistent IP addresses before you configure SAN Insights. Refer to Configuring Persistent IP Address.

Ensure that you have enabled SAN Insights feature for SAN Controller. Choose **Admin > System Settings > Feature Management**, choose check box **SAN Insights**.

You must configure with sufficient system requirements and IP addresses. For more information on scale limits, refer to table Required System Memory for SAN deployment in Server Properties for SAN Insights.

To configure SAN Insights on the SAN Controller Web UI, perform the following steps:

1. Choose **Manage > Fabrics**.
2. Choose required fabric, click **Actions > Configure SAN Insights**.

   The **SAN Insights Configuration** wizard appears.
3. In the **SAN Insights Configuration** wizard, click **Next**.

   The **Switch Configuration** wizard appears.
4. Select the switches where SAN Insights analytics and telemetry streaming need to be configured, after you select the appropriate values from the drop-down list as mentioned below.
   - If the switches don't have a SAN Insights license, the status in the Licensed column shows **No (install licenses)**. Click on **Install licenses** to apply license to the switch.

     

     SAN Controller time is displayed on this UI and switch time is marked in RED if the switch time is found to be deviating from the SAN Controller time.
   - With the support for app nodes beginning with NDFC release 12.1.3, because there are different types of queries for app nodes and for data nodes, if you go to an app node for switches that have a data node query installed, a warning message similar to the following is displayed:

     > Installed queries for ITL and ITN are not valid on the ND App node for these switches: sw-1 , sw-2

     Streamed data from invalid queries will not be processed. In this case, select the necessary switches, then click **Actions > Disable Analytics** to clear the query configuration on these switches.
   - For the selected SAN Controller Receiver in the last column, the receiver can subscribe to telemetry: SCSI only, NVMe only, both SCSI & NVMe, or None. This allows you to configure one SAN Controller server to receive SCSI telemetry and another SAN Controller server to receive NVMe telemetry.
   - In SAN Controller deployment, the IP address assigned to eth0 or eth1 can be used for receiving SAN Insights streaming from the switch. However, ensure that streaming is configured to the SAN Controller interface having IP reachability from the respective switches. In the **Receiver** column all the discovered interfaces are listed. Choose the corresponding interface IP address that is configured while installing SAN Controller for streaming analytics data from the switch.
   - You can provide management IP eth0 and data IP eth1 for fabric access to bootstrap the SAN Controller. Therefore, the streaming must be configured to the persistent IP assigned in the data-IP subnet. Refer to the Configuring Persistent IP Address section for more information.

- To configure promiscuous mode to have multiple persistent IPs reachable on the same port group. See *Cluster Configuration section in Nexus Dashboard Guide.*
- The Subscription column allows you to specify which protocol to which the Receiver subscribes. You can choose from SCSI, NVMe, SCSI & NVMe, or None from the drop-down list.

  If you choose **None for Subscription**, a warning message is displayed to select an appropriate Subscription before you proceed. Select the desired protocols for Subscription.

- You can click the **i** icon in the **Switch Name** column to get the configuration details for analytics and telemetry features from the switch (if Analytics Query and Telemetry features are configured).
- If an Analytics Query of type:
  - dcnminitLIT or dcnminitNIT (for App node)
  - dcnminitlTL, dcnmtgtlTL, dcnmislpclTL, dcnminitlTN, dcnmtgtlTN, or dcnmislpclTN (for Data node)

  isn't configured on the switch, the telemetry configurations won't be displayed.

  If there is more than a single receiver for an example in a cluster mode, click dropdown icon next to the receiver to select required receiver.

5. Click **Next**. The switches that are capable of streaming analytics are listed in the **Select Switches** page.
6. Select the switches on which SAN Insights must be configured.

   Both SAN Controller and Switch time are recorded and displayed when you navigate to the **Select Switches** page. This helps you to ensure that the clocks of SAN Controller and switch are in sync.

   Choose single or multiple switches, click **Actions > Disable Analytics** to clear all the analytics and telemetry configuration on the selected switches.

   Compact GPB streaming configuration for SAN Insights is supported. To stream using Compact GPB, the old KVGPB streaming must be disabled and removed before configuring SAN Insights, newly after the upgrade.

   In the **Install Query** column, type of port per switch is displayed. The port types are: **ISL**, **host**, or **storage**.

   - **host**-lists all ports where hosts or initiators are connected on the switch.
   - **storage**-lists all ports where storage or targets are connected on the switch.
   - **ISL**-lists all ISL and port channel ISL ports on the switch.
   - **None**-indicates that no query is installed.

     The following queries are used:

- For the data nodes:
  - dcnmtgtITL/dcnmtgtITN - This is the storage-only query.
  - dcnminitITL/dcnminitITN - This is the host-only query.
  - dcnmislpcITL/dcnmislpcITN - This is the ISL and pc-member query.
- For the app nodes:
  - dcnmtgtNIT/dcnmtgtLIT - This is the storage-only query
  - dcnminitNIT/dcnminitLIT - This is the host-only query
  - dcnmislpcNIT/dcnmislpcLIT - This is the ISL and pc-member query

- ISL based queries must be added when you use the ISL query installation type for the switches that has connected to storage (storage-edge switches).
- SAN Controller doesn't manage duplicate ITLs\ITNs\ITs. If you configure both host and storage queries (on the switches where their Hosts and Storage are connected respectively), the data is duplicated for the same ITL\ITN\IT. This results in inconsistencies in the computed metrics.

+ When the administrator selects the ISL\Host\Storage on the configure wizard, the respective ports are filtered and listed on the next step.

7. Click **Next**.

   You can see all the analytics supported modules on the switches selected in the previous view, listed with the respective instantaneous NPU load in the last column. Port-sampling configuration (optional) and port-sampling rotation interval for the module can be specified in this step. The default configuration on the switch is to monitor all analytics-enabled ports on the switch for analytics.

   

   If port sampling is enabled on multiple ISL ports with ISL query installed, the metrics aggregation isn't accurate. Because all exchanges won't be available at the same time, the metrics aggregation isn't accurate. We recommend that you don't use port sampling with ISL queries, with multiple ISLs.

8. In the **Module Configuration** tab, configure the module(s) for SAN Insights functionality.

   Beginning with Release 12.1.1e, Cisco NDFC supports discovery of 64G modules and can be selected during SAN Insights configuration. Port-sampling is not supported on these modules and NPU load is not applicable for 64G SAN analytics. Therefore, you cannot configure sample window and rotation interval for 64G modules.

   To change the values for **Sample Window (ports)** and **Rotation Interval (seconds)**, click the row and enter the desired values.

   - To undo the changes, click **Cancel**.
   - To save changes, click **Save**.

   The **NPU Load** column displays the network processing unit (NPU) within a module.

9. Click **Next**.

10. In the **Interface Selection** tab, select the interfaces that generate analytics data within the fabric.

    For each interface, you can enable or disable metrics. Choose check box in SCSI Metrics and NVMe Metrics column to enable or disable analytics on the desired port.

11. Click **Next**, and then review the changes that you have made.
12. Click **Commit**. The CLI is executed on the switch.
13. Review the results and see that the response is successful.

    

    Some SAN Insights window can take up to 2 hours to display data.

14. Click **Close** to return to the home page.

    Close icon appears only after all CLI commands are executed on the switch.

    Navigate to the **Manage > Fabrics** or topology page again, to modify the SAN Insights configurations.

Viewing SAN Insights Dashboard Information

SAN Insights visually displays fabric-level information in a holistic view from end-to-end.

On the SAN Insights dashboard page, you can select protocol, fabric, and switches from protocol, fabric, and switches drop-down lists. The dashlets display insight data based on the selected scope.

The dashboard displays the data over the last 24 hours. However, the Flow Summary and the Enclosure Summary donuts display the last 15 minutes from the latest updated time.

You can increase the default dashlets display value. It is recommended to retain the default value of dashlets. SAN Controller allows you to view SAN Insights metrics based on fabrics, switches, and two protocols namely SCSI and NVMe.

Ensure that you have enabled SAN Insights feature for SAN Controller. Choose **Admin > System Settings > Feature Management**, choose check box **SAN Insights**.

Ensure that you have configured SAN Insights, to view information on Dashboard. See Configuring SAN Insights.

Viewing SAN Insights

To view the SAN Insights Dashboard, choose **Dashboard > SAN Insights**. The SAN Insights Dashboard provides visibility for overall read/write IO operations/latency.

SAN Insights Dashboard

Field	Description
Fabric	Click **Fabric** to select required fabric, and click **Save**.
Switch	Click **Switch** to select required switch.
Protocol	Choose **SCSI** or **NVMe** check box to select required protocol. By default, **SCSI** protocol is selected.
Active SCSI	Displays total active ITL/IT.
Active NVMe	Displays total active ITN/IT.
Last Record Time	Displays last record time for selected options.
Custom Graphing	Click **Custom Graphing**, SAN Insights Metrics Custom Graphing window is displayed. For more information, see Viewing Custom Graphing.
Monitor Metrics	Click **Monitor Metrics**, SAN Insights Monitor window is displayed. For more information, see Monitoring Metrics.
Refresh	Click **Refresh** icon to Refresh and load screen.

Ensure that you restart the SAN Insights service to use the new properties.

The active SCSI and active NVMe counts from the trained baseline is displayed at the top center of the dashboard.

The SAN Insights dashboard contains the following dashlets.

- **Flow Summary (ECT)**

  From the drop-down list, select Read Completion Time or Write Completion Time, based on which the donuts show IT Pairs . These data-points are computed based on the last available hourly roll updata in the Elasticsearch.

- **Enclosure Summary (ECT)**

  From the drop-down list, select Read Completion Time or Write Completion Time, based on which the donuts display Storage and Hosts. These data-points are computed based on the last available hourly roll up data in the Elasticsearch.

- **Top 10 Host**

  Represents the top 10 Host Enclosures/WWN/Device Alias in the selected Protocol/Fabric/Switch scope based on the metric that is selected in the drop-down list. The data can be sorted by Read/Write IOPS, Throughput, Exchange Completion Time or Data Access Latency. These metrics are computed for the last one hour. By default, data is displayed for Avg. Read ECT value.

- **Top 10 Storage**

  Represents the top 10 Storage Enclosures/WWN/Device Alias in the selected Protocol/Fabric/Switch scope based on the metric that is selected in the drop-down list. The data can be sorted by Read/Write IOPS, Throughput, Exchange Completion Time or Data Access Latency. These metrics are computed for the last one hour. By default, data is displayed for Avg. Read ECT value.

- The top 10 host and top 10 storage are computed over the last 24 hours, based on hourly data collected for the selected protocol, fabric(s), and switch(es). If you change the enclosure names for specific WWPNs, the names of the old enclosures names are visible until the data ages out after 24 hours.
- In the **Top 10 Host** and **Top 10 Storage** dashlets, the bars for the write metrics do not display the value always due to restricted space. To view all the values on the graph, you can either hover the mouse over the bar or hide the read or the write bar using the legend at the bottom of the dashlet.

- **Anomalies**

  Displays the number of anomalies policy and their severity levels in pie-chart and list. The pie chart displays the severity levels in different color modes and the list next to the chart displays the severity level and the number of anomaly policies in that level.

  Click on Anomalies dashlet to navigate to Alarms window. You can edit, manage, view, acknowledge, and clear these anomalies. Choose **Analyze > Event Analytics > Alarms**.

- **Throughput**

  Displays the Read and Write throughput rate. Hover the mouse on the graph to view the value at that instance. The metrics in these line charts are computed based on the data during the last 24 hours.

- **IOPS**

Displays the Read and Write IOPs trend. The metrics in these line charts are computed based on the data during the last 24 hours.

- **Aborts**

  Displays the Read and Write Aborts trend. The metrics in these line charts are computed based on the data during the last 24 hours. This metric is computed based on the **read_io_aborts** and **write_io_aborts** metric reported by the Cisco MDS SAN Analytics infrastructure.

  Select a switch to see more details, to view the custom graphing for READ IO Aborts/Failures for the switch IP address that is selected on the Dashboard page.

- **Failures**

  Displays the Read and Write Failures trend. The metrics in these line charts are computed based on the data during the last 24 hours. This metric is computed based on the **read_io_failures** and **write_io_failures** metric reported by the Cisco MDS SAN Analytics infrastructure.

  Select a switch to see more details, to view the custom graphing for READ IO Aborts/Failures for the switch IP address that is selected on the Dashboard page.

A warning message may appear as **HIGH NPU LOAD Detected** on top of the **Dashboard > SAN Insights** window. The warning implies that one or more switches has an unacknowledged Syslog event during the previous week. The event may affect the availability of the analytics data stored or displayed. You must acknowledge these events to remove the warning.

Several warning messages may appear on top of the **Dashboard > San Insights** window that are resolved the same way, where a warning message may appear as:

- **4k ITL Limit Hit**
- **HIGH ITL LOAD Detected**
- **HiGH NPU LOAD**

To capture the ITL limits on the 64gig ItL limit if the **4k ITL Limit Hit** message appears, or to capture NPU and ITL loads if the **HiGH NPU LOAD** or **HIGH ITL LOAD Detected** message appears, ensure that you have configured Syslog on the SAN Controller Device Manager as follows:

1. Choose **Manage > Inventory > Switches**.
2. Click on the switch, a slide-out panel is displayed, click the **Launch** icon to view switch information.
3. On the **Device Manager** tab, choose **Logs > Syslog > Setup**.
4. Click **Create** and enter the required parameters.
5. Ensure that you choose the **syslog** radio button in the **Facility** area.
6. Click **Create** to enable Syslog on the SAN Controller server.

To resolve the high NPU and high ITL loads, and 4k ItL limit Hit, do the following:

1. Click on the **HIGH NPU LOAD Detected**, **HIGH ITL LOAD Detected**, or **4k ItL Limit Hit** link.

   The **Monitor > Switch > Events** page appears. The list of events is filtered for:

- **Type: HIGH_NPU_LOAD**
- **Type: HIGH_ITL_LOAD**
- **Type: 4K_ITL_LIMIT_HIT**

2. Select all the switches and click **Acknowledge**.

   This removes the **HIGH NPU LOAD Detected**, **HIGH ITL LOAD Detected**, and **4k ItL Limit Hit** warnings.

Viewing Custom Graphing

To view the SAN Insights metrics, choose **Dashboard > SAN Insights**. The SAN Insights Dashboard page appears. Click **View Custom Graphing** to view SAN Insights Metrics Custom Graphing window.

The refresh interval for Custom Graphing page is 5 minutes. Click on the **Play** icon to refresh every 5 minutes automatically. Cisco SAN Controller allows you to view SAN Insights metrics based on two protocols, SCSI and NVMe. By default, the SCSI protocol is selected. However, you can change this setting from on the **Web UI > Admin > System Settings > Server Settings > Insights**.

Ensure that you restart the SAN Insights service to use the new properties.

Viewing Custom Graph and Table

This is a freestyle dashboard where multiple metrics can be selected and the real-time data for the selected metrics is shown in multiline graph which is configured to Refresh every 5 minutes and corresponding raw data will be shown in the data table.

You can also add multiple graphs for comparison by clicking on the **Add Graph** the top right.

The Auto Refresh option is disabled by default. You must click the **Play** icon to enable the Auto Refresh feature.

SAN Insights Metrics has two tabs.

- Graph
- Table

Graph

The graph is plotted with corresponding metrics with from and to date selected. It’s dynamic in nature as the data can be refreshed every 5 minutes and can be converted into a static graph using the pause button. Click **Add Graph** to create graph. You can add maximum of three graphs at a time on this page.

SAN Controller allows the user to view data for more than two weeks' timeframe (up to a default maximum of 30 days. You can configure this timeframe in the server properties. Click drop down button next to Time Range and select date.

The Custom graphing metrics are enhanced to include the Write IO Failures, Read IO Failures, Write IO Aborts and Read IO Aborts to the drop-down metrics list.

The ECT Baseline for each type of Flow (Reads and Writes):

- ITL/ITN Flows (Data node)
- IT Flows (APP Node)

is calculated using weighted average learned continuously over a training period:

- The ECT Baseline computation consists of two parts: the training period and the recalibration time.
- The training period for ECT Baseline is seven days by default (configurable).
- After the training is completed, the ECT Baseline remains the same until the recalibration is triggered after 7 days by default (configurable).
- By default every 14 days training runs for seven days (cyclic).
- The percentage (%) deviation shows the deviation of the current normalized ECT compared to the ECT Baseline.

Table

When you select a failure or abort from **Metrics** drop-down list, the table list is filtered to show only the rows that have at least one of the selected failure or abort metrics as a nonzero entry. The table displays only 100 records. However, to help find their nonzero failures that you can filter the table to show the last 100 records with an Abort or Failure that is nonzero. When you select failure or aborts, the table label changes to depict this behavior.

To view, input any of the seven dimensions (Initiator Enc, Initiator, Target Enc, Target, LUN(Specific to data node), Switch IP Address, Port, Timestamp, Read IOPs, Write IOPs) in the filter by attributes field (separated by comma), and select an associated metric.

Click **Download** button to download the table in .csv format. You can download the table of maximum 100 rows.

Hover the mouse on information (i)icon in the Initiator column. The **Show Flow VMs** text displayed. Click the icon **Flow VMs** window is displayed. You can view related VM Names and IP addresses.

Monitoring Metrics

UI Path: **Dashboard > SAN Insights > Monitor Metrics**

The SAN Insights Monitor page displays the health-related indicators in the interface so that you can quickly identify issues in your environment. You can use health indicators to understand where problems are in your fabrics.

SAN Controller allows you to view SAN Insights monitor based on two protocols, SCSI and NVMe. By default, the SCSI protocol is selected. However, you can change this setting from the **Admin > System Settings > Server Settings > Insights**.

From Release 12.0.1a, you can view SAN Insights Monitor on dashboard. From SAN Controller Web UI, perform the following steps:

1. Choose **Dashboard > SAN Insights**.
2. Click **Monitor Metrics**.

The **SAN Insights Monitor** window is displayed.

The color of the status is as an hourly average of Read and Write deviation for the respective Initiator Target Pairs.

3. Choose **SCSI** or **NVMe** metrics using **Viewing** drop-down list to view to select the data type.
4. Choose **Host Enclosure**, **Storage Enclosure**, or **IT Pairs** using **On** drop-down list to view required data.
5. Click **Refresh** icon, to view current time.

   The system time is displayed at the right corner of the window.

   Specify a time interval using the time setting icon. Click **Setting** icon, enter appropriate time in hours and click **Apply** to view data of selected time.

   The switch interface counters display when you choose green circle icon on the switch on the topology page.

6. Click on the required name to view details.

   A slide-in panel is displayed with the associated I-T pairs.

7. Click **Launch** icon to view the window.

   Similarly, you can click thrice on the name to navigate to the detailed view.

   The SAN Insights Monitor page displays the initiator-target pairs for the selected enclosure or IT Pairs. The flow table shows the details of all metrics on ECT/DAL/read/write times, ECT (%dev) information.

   Similarly, you can view SAN Insights Monitor, from host and storage tabs on dashboard.

   - Choose **Dashboard > Host**, click **i** icon on required host name. For more information on host enclosure, refer to the "Viewing Host Enclosures" section in the Overview and Initial Setup of Cisco NDFC: SAN.
   - Choose **Dashboard > Storage**, click **i** icon on required storage name. For more information on storage enclosure, refer to the "Viewing Storage Enclosure" section in the Overview and Initial Setup of Cisco NDFC: SAN.

   For more information on Initiator-Target (IT) Pairs, refer to Viewing IT Pairs section.

Viewing IT Pairs

Before you begin:

UI Path: **Dashboard > SAN Insights > Monitor Metrics**

Cisco Nexus Dashboard Fabric Controller allows you to view SAN Insights metrics based on two protocols, SCSI and NVMe. By default, the SCSI protocol is selected. However, you can change this setting from the **Admin > System Settings > Server Settings > Insights**. Ensure that you restart the SAN Insights service to use the new properties

To view the IT Pair from the Cisco Nexus Dashboard Fabric Controller Web UI, perform the following steps:

1. Choose **Dashboard > SAN Insights > Monitor Metrics**

   The SAN Insights Monitor page appears. Refer to Monitoring Metrics for more information.

2. Choose **SCSI** or **NVMe** metrics using **Viewing** drop-down list to view to select the data type.
3. Choose **IT Pairs** using **On** drop-down list to view data.
4. Click on required IT pair name.

   The IT pair slide-in panel appears.

5. Click on **Launch** icon to view IT pairs window.

   The IT pairs window appears.

   The IT pair window displays the Initiator-Target (IT) pairs, Topology, average ECT/DAL/read/write times, and Switch Interface for the selected IT pair.

   - **Initiator Target Pairs** - This table lists all the IT pairs for the selected IT pair name. The flow table shows the details of all metrics on ECT/DAL/read/write times, active I/Os, aborts, failures etc. along with their 1-hour average and the baseline information.
   - **Topology** - Provides an end-to-end topology layout and path information between IT pairs. On **View** card click **+** or **-** to zoom-in and zoom-out. Similarly, you can use the mouse scroll wheel to zoom-in and zoom-out. Click **Refresh** icon to refresh the topology view. Choose **Select layout** drop-down list to view topology. This can be either **Hierachical** or **Hierachical Left-Right** view.
   - The flow table shows the details of all metrics on ECT/DAL/read/write times, active I/Os, IOPS, Throughput etc. along with their 1-hour average and the baseline information.
   - **Switch Interface** - This table displays data for the last hour period selected for the selected interface. The switch name and the interface name are displayed on top of the switch interface table.

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