Important Information

**ESMON**

Quick Start Guide

**Version 0.0.1 | ref.no tbd | Revision A0**



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# Introduction to DDN EXAScaler Monitoring System

*ESMON* is a monitoring system which can collect system statistics of DDN EXAScaler for performance monitoring and analysis. It is based on multiple widely used open-source software. Some extra plugins have been developed by DDN for enhancement.

One of the main components of *ESMON* is **сollectd**. **collectd** is a daemon which collects system performance statistics periodically and provides mechanisms to store the values in a variety of ways. *ESMON* is based on the open-source **collectd**, yet includes more plugins, such as Lustre, GPFS, Ganglia, Nagios, Stress, Zabbix and soon.

## Terminology

|  |  |
| --- | --- |
| **ESMON** | Abbreviation for DDN EXAScaler Monitoring System. |
| **DDN EXAScaler** | Software stack developed by DDN to overcome the toughest storage and data management challenges in extreme, data-intensive environments. |
| **Installation Server** | The server on which the installation process is triggered. |
| **Monitoring Server** | The server on which the database (Influxdb) and web server (Grafana) of the monitoring system will run. |
| **Monitoring Client(s)** | The servers from which the monitor system will collect metrics from. The metrics includes information about CPU, memory, Lustre, SFA storage, and so on. A collectd daemon will run on each monitoring client. |
| **DDN IME** | DDN’s Infinite Memory Engine (IME) is a flash-native, software-defined, storage cache that streamlines application IO, eliminating system bottlenecks. |
| **Lustre** | The Lustre file system is an open-source, parallel file system that supports many requirements of leadership class HPC simulation environments. |

## collectd plugins of DDN

Several additional plugins are added to **collectd** in ESMON to support various functions.

* **Filedata plugin**: The Filedata plugin is able to collect data by reading and parsing a set of files. An XML-formatted definition file is required for the Filedata plugin to understand which files to read and how to parse these files. The most common usage of the Filedata plugin is to collect metrics through /proc interfaces of a running Lustre system.
* **Ganglia plugin**: The Ganglia plugin can send metrics collected by a сollectd client daemon to Ganglia server.
* **GPFS plugin**: The GPFS plugin can collect performance information through “mmpmon” commands provided by GPFS. The GPFS plugin shares the same definition file format with the Filedata plugin. The configuration format of GPFS in collectd.conf is also similar to the Filedata plugin.
* **IME Plugin**: The IME plugin can collect performance information from DDN IME. Like the GPFS plugin, the IME plugin shares the similar definition file format and configuration format with the Filedata plugin.
* **SSH plugin**: The SSH plugin is able to collect metrics by running commands on remote hosts by using SSH connections. The SSH plugin is used to collect metrics from DDN SFA Storage. Like the GPFS plugin and the IME plugin, the IME plugin shares the similar definition file format and configuration format with the Filedata plugin.
* **Stress plugin**: The Stress plugin can push a large amount of metrics to server from collectd client in order to benchmark the performance of the collecting system under high pressure.
* **Zabbix plugin**: The Zabbix plugin is able to send metrics from collectd to Zabbix system.

# Installation Requirements

## Installation Server

* **OS distribution:**CentOS7/RHEL7
* **Free disk space:**>500MB.TheInstallation Server will save all installation logs to the /var/log/esmon\_install directory, which requires some free disk space.
* **Network:** The Installation Server must be able to start SSH connections to the Monitoring Server and Monitoring Clients without a password prompt.
* **ESMON ISO image:** The ESMON ISO image must be available on the Installation Server.

## Monitoring Server

* **OS distribution:** CentOS7/RHEL7
* **Free disk space:**> 5GB. Influxdb will be running on this server. More disk space is required to keep more data in Influxdb
* **Network:** SSHD should be running on the Monitoring Server. The Installation Server must be able to connect to the Monitoring Server without a password prompt.

## Monitoring Client

* **OS distribution:** CentOS7/RHEL7 or CentOS6/RHEL6
* **Free disk space:**> 200MB. The installation server will save necessary RPMs in directory /var/log/esmon\_install, which requires some free disk space.
* **Network:** SSHD should be running on the Monitoring Client. The Installation Server must be able to connect to the Monitoring Client without a password prompt.

# Installation Process

## Preparing the Installation Server

1. Copy the ESMON ISO image file to the Installation Server, for example, to /ISOs/esmon.iso.
2. Mount the ESMON ISO image:

mount -o loop /ISOs/esmon.iso /media

1. Install the ESMON RPM on the installation server:

rpm -ivh /media/RPMS/rhel7/esmon\*.rpm

## Updating the configuration file on the installation server

After the ESMON RPM has been installed on the Installation Server, update the configuration file/etc/esmon\_install.conf, which includes all the necessary information for installation. Define the following parameters:

* **iso\_path** — The path where the ESMON ISO image is saved.
* In the section **ssh\_hosts**, specify details necessary to log in to the Monitoring Server and to each Monitoring Client using SSH connection:
  + **host\_id** — The unique ID of the host. Two hosts should not share the same **host\_id**.
  + **hostname** — The host name to use when connecting to the host using SSH.
  + **ssh\_identity\_file** — The SSH key file used for connecting to the host. The parameter **ssh\_identity\_file** can be omitted if the default SSH identity file works.

Note: **host\_id** and **hostname** can be different for a host, because there can be multiple ways to connect to the same host.

* In the section **client\_hosts**, specify information about all of the hosts where ESMON client packages should be installed and configured:
  + **host\_id** — The unique ID of the host. Two hosts should not share the same **host\_id**.
  + **lustre\_oss** — Define whether to enable (**true**) or disable (**false**)metrics collection of Lustre OSS.
  + **lustre\_mds** — Define whether to enable (**true**) or disable (**false**)metrics collection of Lustre MDS.
  + **ime** —Define whether to enable (**true**) or disable (**false**) metrics collection of DDN IME.
* In the section **server\_hosts**, specify information about all of the hosts where ESMON server packages should be installed and configured:
  + **host\_id** — The unique ID of the host.
  + **drop\_database** — If the parameter is set to **true**, the ESMON database in Influxdb will be dropped. If the parameter is set to **false**, the ESMON database in Influxdb will be kept as it is.
  + **erase\_influxdb** — If the parameter is enabled (set to **true**), all the data and metadata of Influxdb will be completely erased. By enabling **erase\_influxdb**, some corruption problems of Influxdb could be fixed. If the parameter is disabled (set to **false**), the data and metadata of Influxdb will not be completely erased.

**Important: erase\_influxdb** and **drop\_database** should only be enabled when the data or metadata in Influxdb is not needed anymore.

Below is an example of /etc/esmon\_install.conf:

**Example:**

iso\_path: /work/ISOs/esmon.iso

ssh\_hosts:

- host\_id: Monitoring-Server

hostname: Monitoring-Server

ssh\_identity\_file: /root/.ssh/id\_rsa

- host\_id: Monitoring-Client1

hostname: Monitoring-Client1

ssh\_identity\_file: /root/.ssh/id\_rsa

- host\_id: Monitoring-Client2

hostname: Monitoring-Client2

ssh\_identity\_file: /root/.ssh/id\_rsa

client\_hosts:

- host\_id: Monitoring-Client1

lustre\_oss: true

lustre\_mds: true

ime: false

- host\_id: Monitoring-Client2

lustre\_oss: false

lustre\_mds: true

ime: false

server\_host:

- host\_id: Monitoring-Server

drop\_database: true

erase\_influxdb: true

## Running installation on the cluster

After the */etc/esmon\_install.conf* file has been updated correctly on the Installation Server, run the following command to start the installation on the cluster:

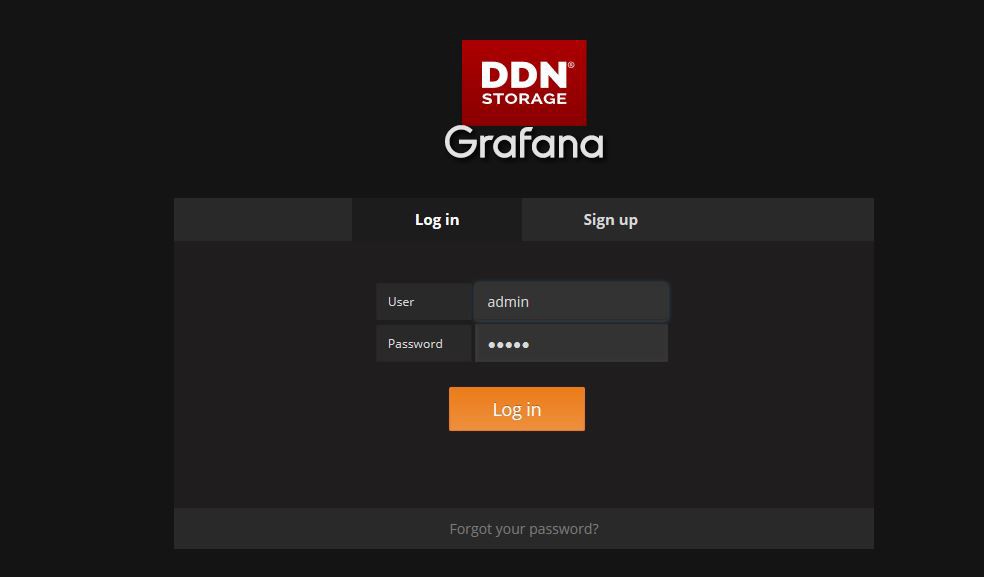
esmon\_install

All the logs which are useful for debugging are saved under /var/log/esmon\_install directory of the Installation Server.

## Accessing the Monitoring Web Page

The Grafana service is started on the Monitoring Server automatically. The default HTTP port is 3000. A login web page will be shown through that port (see below). The default user and password are both “admin”.

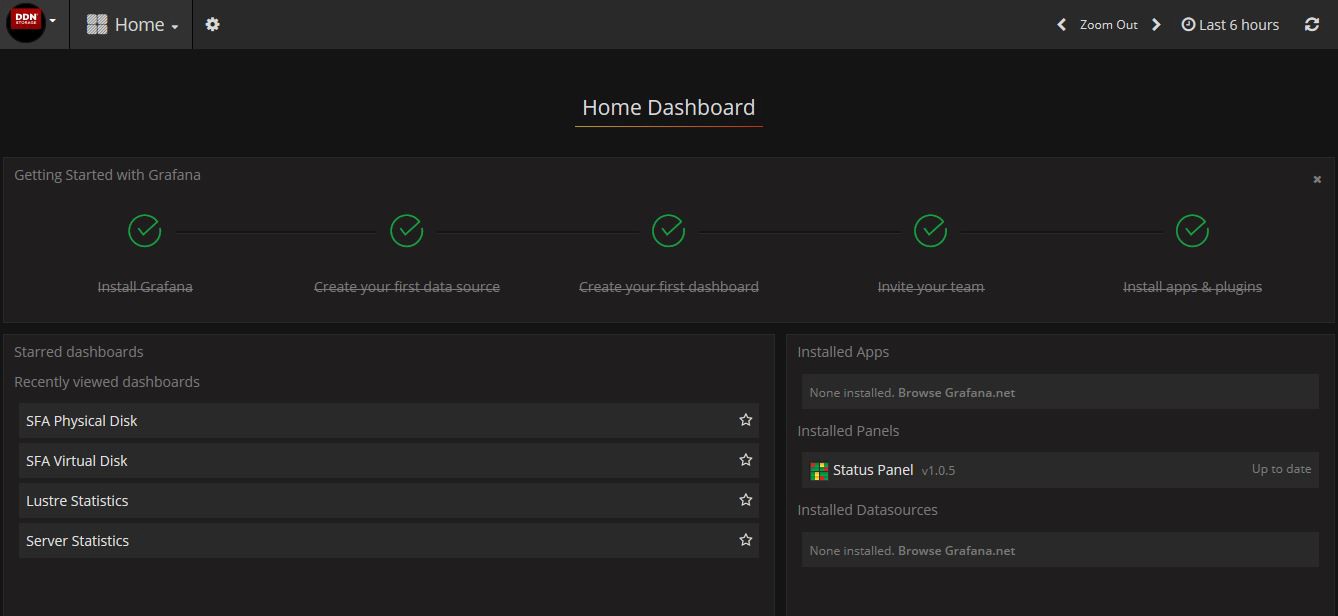
Figure : Grafana Login Web Page



# Dashboards

From the Home dashboard (see ) different dashboards can be chosen from to view different metrics collected by ESMON.

Figure : Home Dashboard

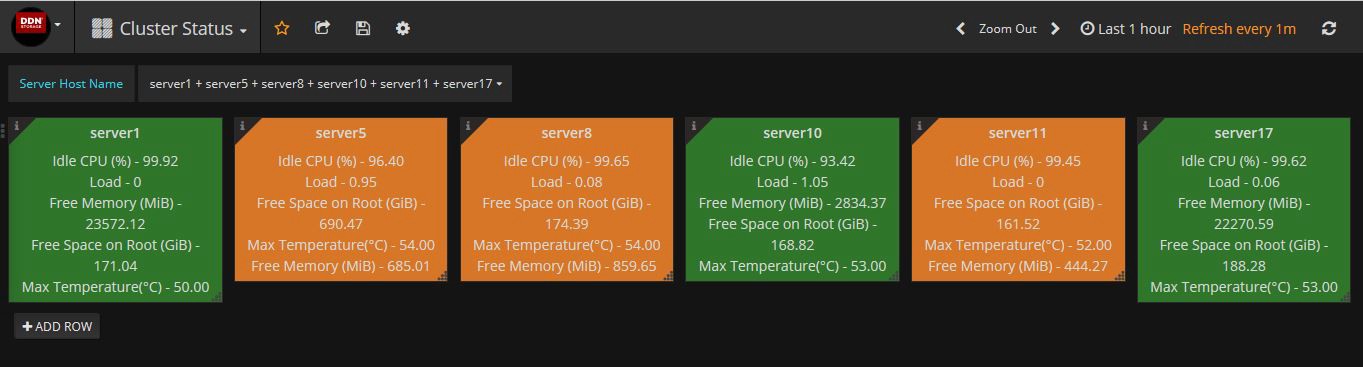


## Cluster Status Dashboard

The **Cluster Status** dashboard (see below) shows a summarized status of the servers in the cluster. The background color of panels show the servers’ working status:

* If the color of the panel is green, it means the server is under normal condition.
* If the color of the panel is yellow, it means the server is under warning status due to one or more of the following conditions:
  + Idle CPU is less than 20%
  + Load is higher than 5
  + Free memory is less than 1000 MiB
  + Free space of “/” is less than 10 GiB
* If the color of the panel is red, it means the server is under critical status due to one or more of the following conditions:
  + Idle CPU is less than 5%
  + Load is higher than 10
  + Free space of “/” is less than 1 GiB
  + Free memory is less than 100 MiB

Figure : Cluster Status Dashboard



## Lustre Status Dashboard

The Lustre Statistics dashboard () show metrics of Lustre file systems.

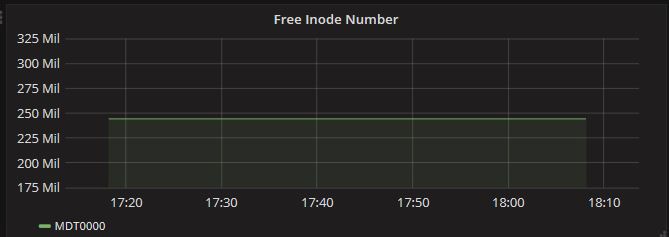
Figure : Lustre Statistics Dashboard



Following pictures are some of the panels in *Lustre Statistics* Dashboard

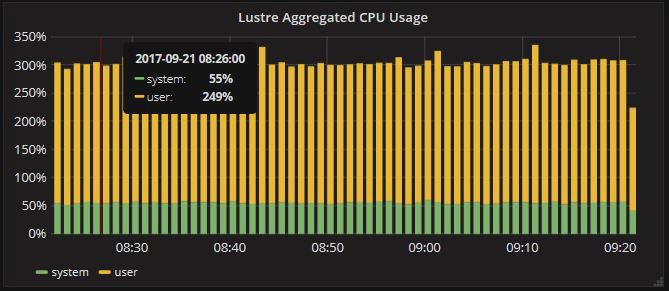
* The Free Inode Number panel () shows how many inodes remained in the system.

Figure : Free Inode Number Panel



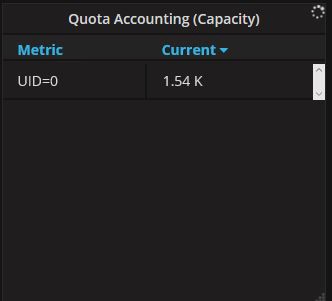
* The Lustre Aggregated CPU Usage panel () shows the proportion of system and users usage of CPU

Figure : Lustre Aggregated CPU Usage Panel



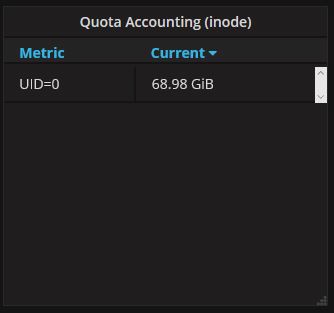
* The Quota Accounting(Capacity) panel () shows the capacity usages of users.

Figure : Quota Accounting (Capacity) Panel



* The Quota Accounting(Inode) panel () shows the inode usages of users.

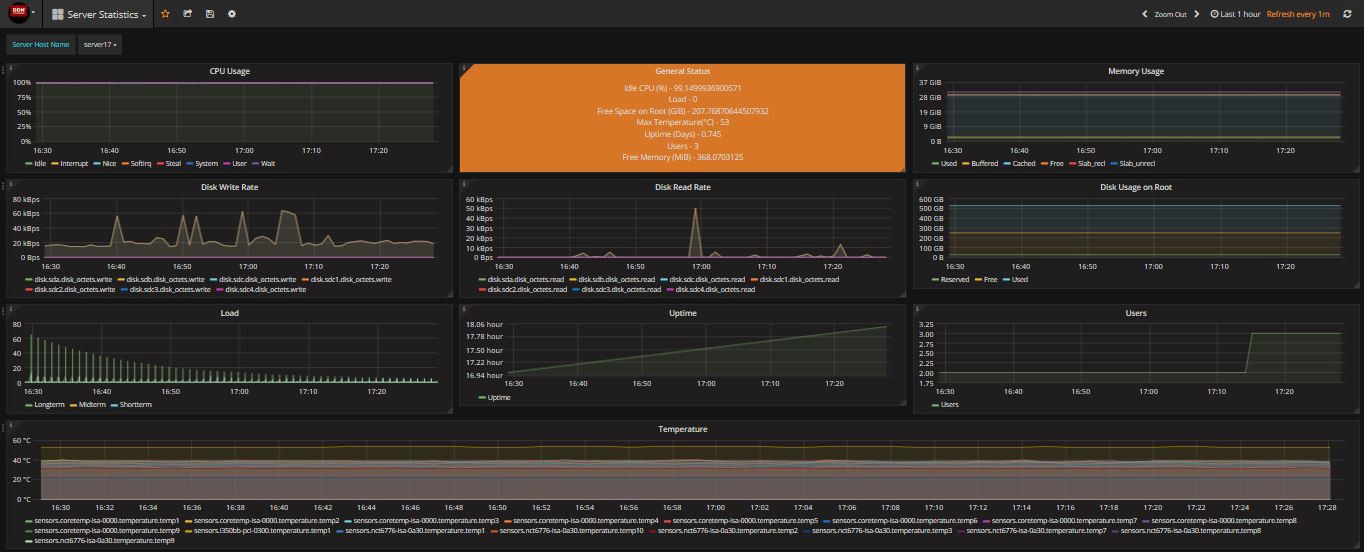
Figure : Quota Accounting (Inode) Panel



## Server Statistics

The Server Statistics dashboard () shows detailed information about a server.

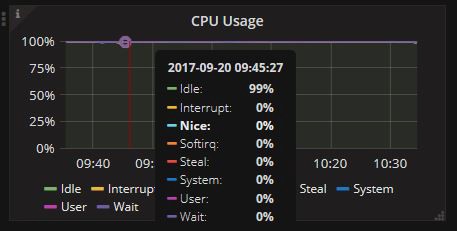
Figure : Server Statistics Dashboard



Below you will find description of some of the panels in the **Server Statistics** dashboard:

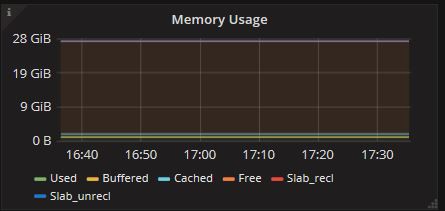
* The CPU Usage panel () shows amount of time spent by the CPU in various states, most notably executing user code, executing system code, waiting for IO-operations and being idle.

Figure : CPU Usage Panel



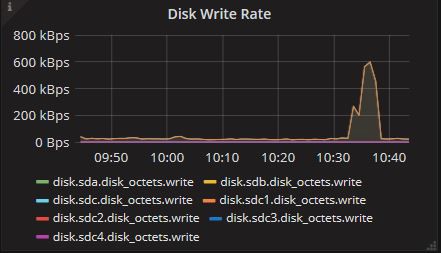
* The Memory Usage panel () shows how much memory has been used. The values are reported by the operating system. The categories are: **Used**, **Buffered**, **Cached**, **Free**, **Slab\_recl**, **Slab\_unrecl**.

Figure : Memory Usage Panel



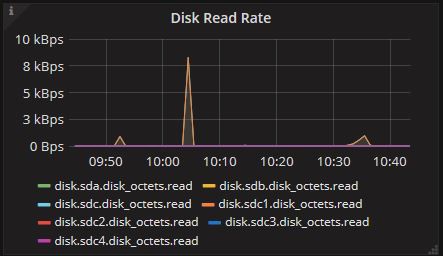
* The Disk Write panel() shows the disk write rate of the server.

Figure : Disk Write Rate Panel



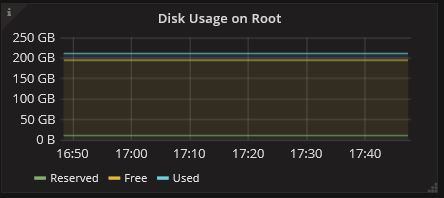
* The Disk Read panel (Figure 13) shows the disk read rate of the server.

Figure : Disk Read Rate Panel



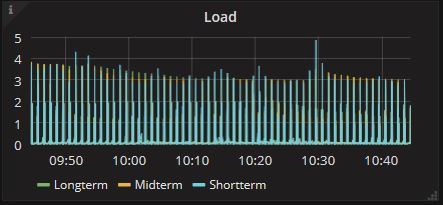
* The Disk Usage on Root panel(Figure 14) shows free space, used space and reserved space on the disk that is mounted as Root. A warning message will be generated when there’s little free space left.

Figure : Disk Usage on Root Panel



* The Load panel (Figure 15) shows the load on the server. The system load is defined as the number of runnable tasks in the run-queue and is provided by many operating systems as follows:
  + **Shortterm**— one minute average
  + **Midterm**— five minutes average
  + **Longterm**— fifteen minutes average

Figure : Load Panel



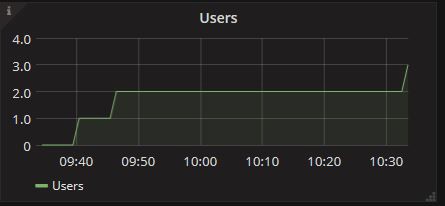
* The Uptime panel (Figure 16) shows how long the server is working. It keeps track of the system uptime.

Figure : Uptime Panel



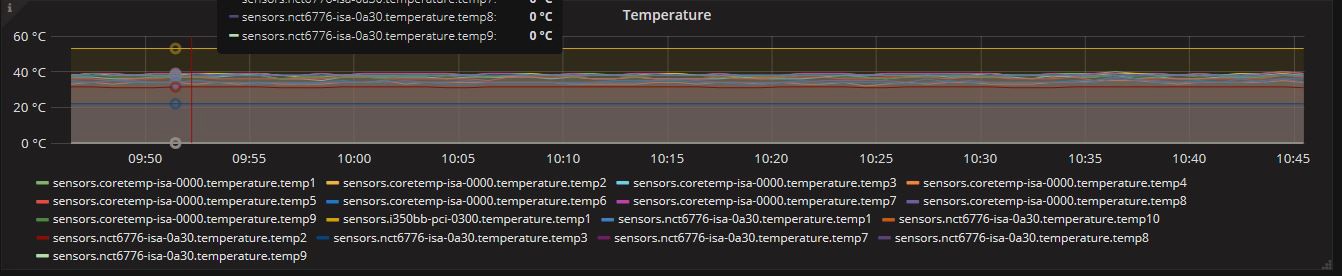
* The User panel (Figure 17) shows the number of users currently logged into the system.

Figure : User Panel



* The Temperature panel (Figure 18) shows the temperature collected from sensors.

Figure : Temperature Panel



## SFA Physical Disk Dashboard

The **SFA Physical Disk** dashboard shown in displays information about DDN SFA physical disks.

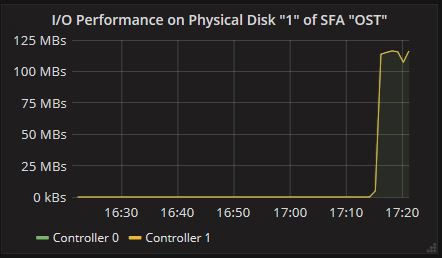
Figure : SFA Physical Disk Dashboard



Below you will find description of some of the panels in the **SFA Physical Disk** dashboard:

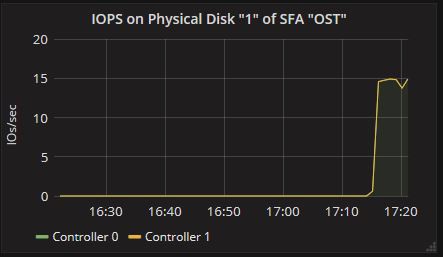
* The I/O Performance panel (Figure 20) shows I/O speed at a specific time.

Figure : I/O Performance on Physical Disk Panel



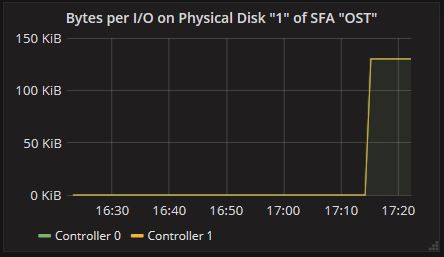
* The IOPS panel (Figure 21) shows I/O operations per second on Physical Disk.

Figure : IOPS on Physical Disk Panel



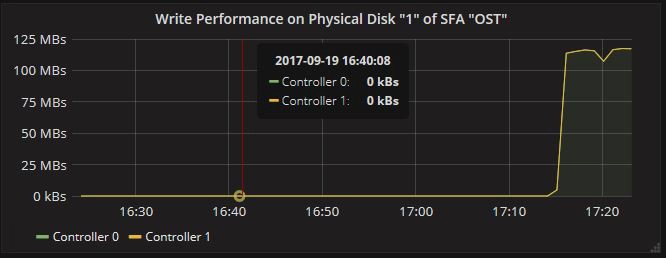
* The Bytes per I/O panel (Figure 22) shows the I/O bytes per second on each controller.

Figure : Bytes per I/O on Physical Disk Panel



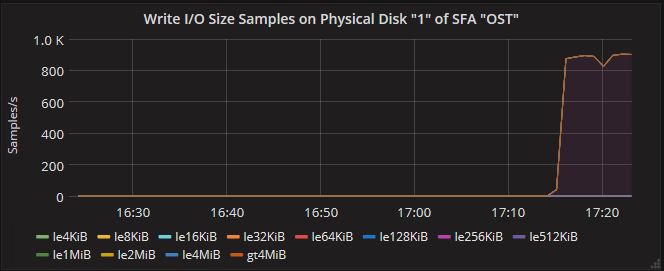
* The Write Performance panel (Figure 23) shows the write performance on each controller.

Figure : Write Performance on Physical Disk Panel



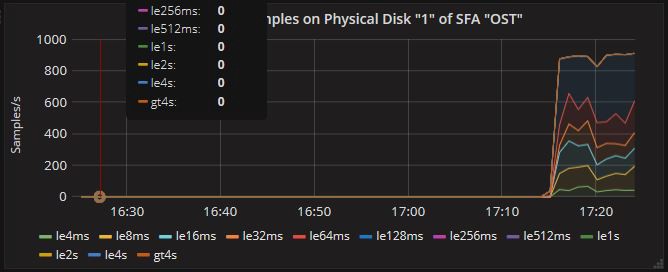
* The Write I/O Size Samples panel (Figure 24) shows the account of writing operation on each size.

Figure : Write I/O Size Samples on Physical Disk Panel



* The Write Latency Samples panel (Figure 25) shows the account of writing operation on each latency.

Figure : Write Latency Samples on Physical Disk Panel



## SFA Virtual Disk Dashboard

The **SFA Virtual Disk** dashboard ( ) shows information about DDN SFA virtual disks:

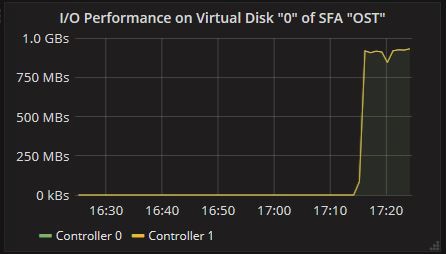
Figure : SFA Virtual Disk Dashboard



Below you will find description of some of the panels in the **SFA Virtual Disk** dashboard:

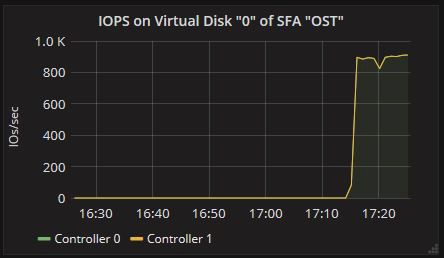
* The I/O Performance panel (Figure 27) in shows the I/O speed at a specific time.

Figure : I/O Performance on Virtual Disk Panel



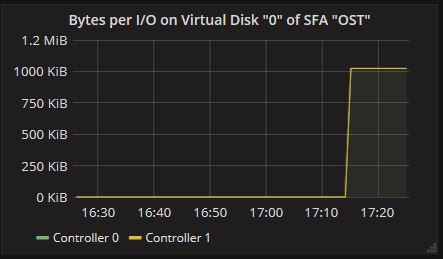
* The IOPS panel (Figure 28) shows I/O operations per second on Virtual Disk.

Figure : I/O Operations per Second on Virtual Disk Panel



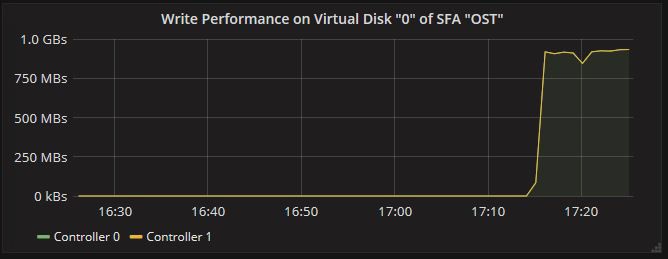
* The Bytes per I/O panel (Figure 29) shows I/O bytes per second on each controller.

Figure : Bytes per I/O on Virtual Disk Panel



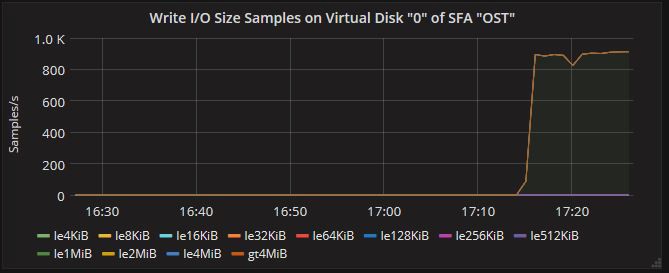
* The Write Performance panel (Figure 30) shows write performance on each controller.

Figure : Write Performance on Virtual Disk Panel



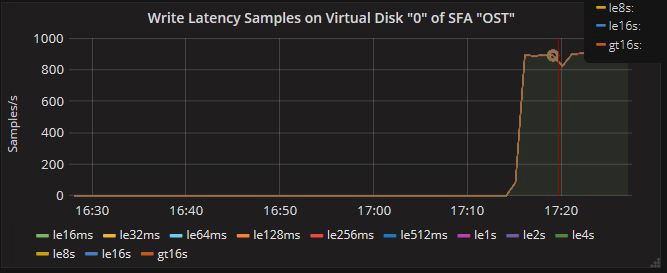
* The Write I/O Size Samples panel (Figure 31) shows the size distributions of write I/Os.

Figure : Write I/O Size Samples on Virtual Disk Panel



* The Write Latency Samples panel () shows the latency distributions of write I/Os.

Figure : Write Latency Samples on Virtual Disk Panel



# Troubleshooting

The directory*/var/log/esmon\_install/[installing\_date]* on the Installation Servergathersallthelogsthatisusefulfordebugging.Ifafailurehappens,someerror messageswillbeprintedtofile*/var/log/esmon\_install/[installing\_date]/error.log*. The first error message usually contains the information about the cause of failure.