Nutanix Integration

Configuring and Monitoring with Nagios

NUTANIX

Version 1.0

May 2015

1 Executive Summary

Nagios is a web-based IT infrastructure monitoring solution: http://www.nagios.com. It monitors all mission-critical infrastructure components—including applications, services, operating systems, network protocols, systems metrics, and network infrastructure—using built-in capabilities and third-party extensions. This document describes configuring Nagios to monitor Nutanix clusters using SNMP.

The End User License Agreement to use this document is included in the Appendix: 9.3.Introduction

1.1 Audience

This document is intended for users who configure and monitor Nutanix clusters with Nagios. Consumers of this document should already be familiar with Nagios and the Nutanix Virtual Computing Platform.

1.2 Purpose

This document provides an overview of the Nutanix architecture and the procedures for configuring Nagios to monitor Nutanix clusters. The intent of this document is to enable the Nagios community to get started on monitoring Nutanix; this guide will reduce the time to configure Nutanix in Nagios significantly and make it easier to integrate Nutanix in the datacenters.

NOTE: This document does not address the use of third-party extensions and "addons" in Nagios.

2 Nutanix Overview

2.1 The Nutanix Architecture

The Nutanix Virtual Computing Platform is a scale-out, hyper-converged system of high-performance nodes, or servers, each running a standard hypervisor and containing processors, memory, and local storage (consisting of SSD Flash and high capacity SATA disk drives). Each node runs virtual machines just like a standard virtual machine host.

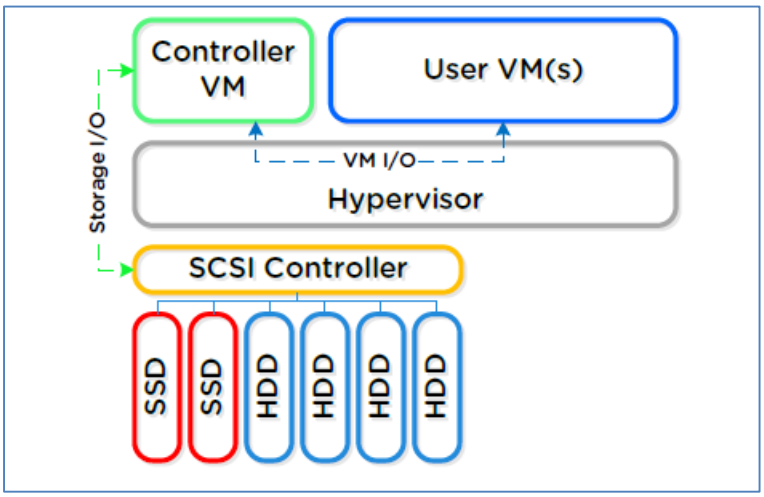


Figure 1: Nutanix Node Architecture

In addition, local storage from all nodes is virtualized into a unified pool by the Nutanix Distributed File System (NDFS). In effect, NDFS acts like an advanced networked or shared storage system that uses local SSDs and disks from all nodes to store virtual machine data. Virtual machines running on the cluster write data to NDFS as if they were writing to shared storage.

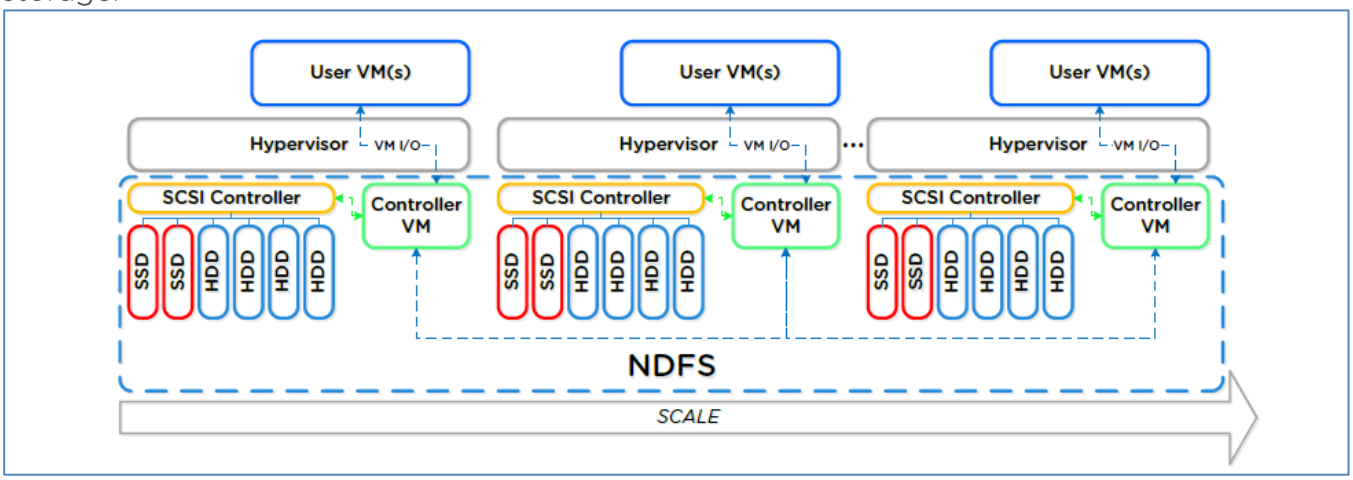


Figure 2: Nutanix Architecture

3 Prerequisites

The Nagios software must be installed and be functional before proceeding with monitoring a Nutanix cluster.

The installation and configuration of Nagios is outside the scope of this document. If you require any information on installing Nagios, refer to the “Reference Section” of this document.

3.1 Installed Reference Environment

The following software versions were used to create this document:

Nagios XI 2014R2.4 installed on CentOS.

Nutanix OS version 3.5.4

NOTE: Nagios is available in two different editions: an open-source, community-supported version, referred to as “Nagios Core Management Server,” and a commercially licensed version, referred to as “Nagios XI Management Server.” Nagios XI can be installed on Ubuntu 12+, Fedora 14+, Debian 6+, and CentOS 5+.

The key difference between Nagios XI and Nagios Core is that the SNMP plugins have to be manually installed in the Core version.

4 Configuration of a Device to Monitor

A network device can be monitored in Nagios XI using SNMP. The Nutanix management information base (MIB) must be imported into Nagios for it to reference the object identifiers, or OIDs. There are three categories of OIDs as applicable to Nutanix:

1. Scalar attributes for the cluster—e.g., name, status, capacity, IOPS, and latency.
2. Table attributes—e.g., Controller VMs, containers, and storage pools.
3. Traps from the Nutanix cluster.

The key configuration processes include the following:

- Define an SNMP user on the Nutanix cluster.
- Associate the SNMP user to each of the objects (for example, a cluster or table) to be monitored.
- Specify the OIDs for each of the attributes to be monitored.

Once configured, the Nutanix cluster information is displayed in the web console, called Prism.

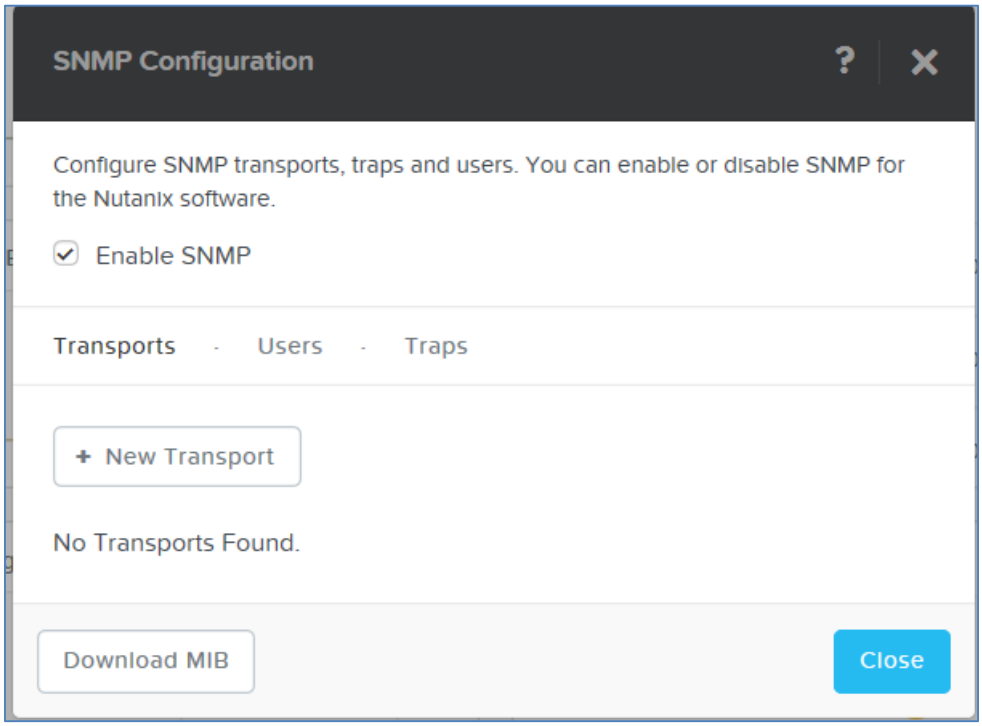
NOTE: The Nutanix cluster monitoring in Nagios XI included in this document is based on a user-defined configuration. We did not develop any addons or plugins when authoring this document.

4.1 Import the Nutanix MIB

The Nutanix MIB needs to be uploaded into Nagios setup. The MIB file can be downloaded from the Nutanix web console (Prism) and then imported into Nagios as described below:

Downloading the MIB:

Log on to Prism. Go to the gear icon, then click **SNMP**; this will display the following dialog box:

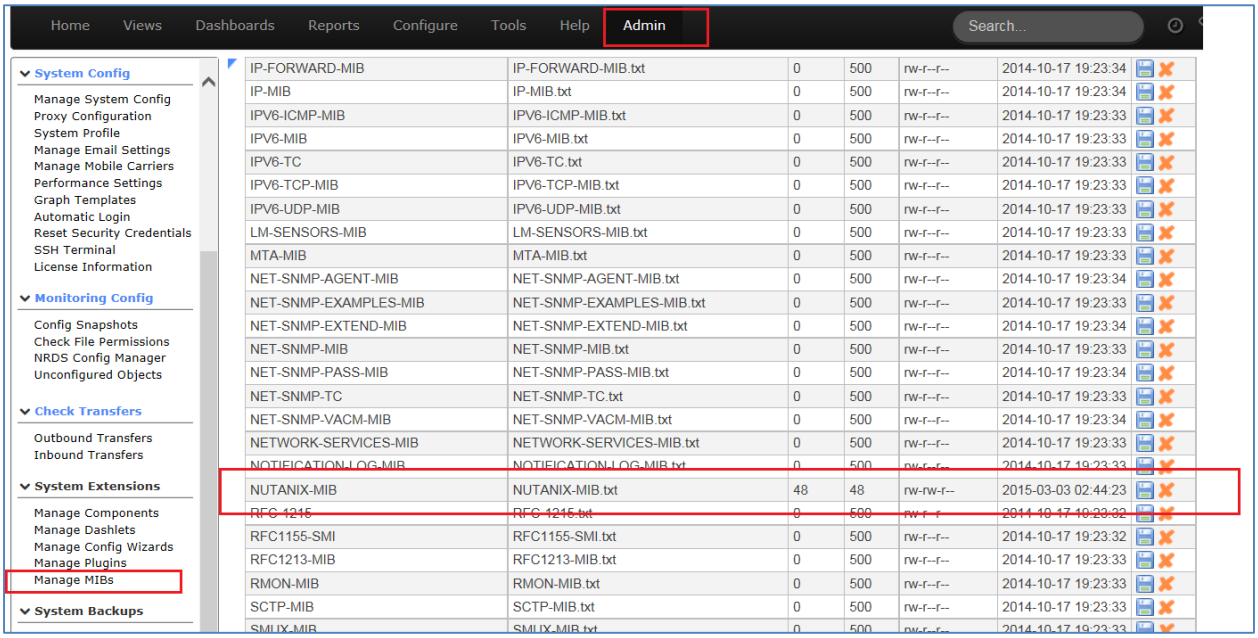


Then click **Download MIB** and save the MIB to a file: e.g., "NUTANIX-MIB.txt."

Importing the MIB in Nagios:

In the Nagios XI console, **Admin**. Click **System Extensions**, then the **Manage MIBs** link, which is on the bottom left of the page.

1. Click **Choose file**.
2. Select the downloaded "NUTANIX-MIB.txt" file from the previous step.
3. Click **Upload MIB**.



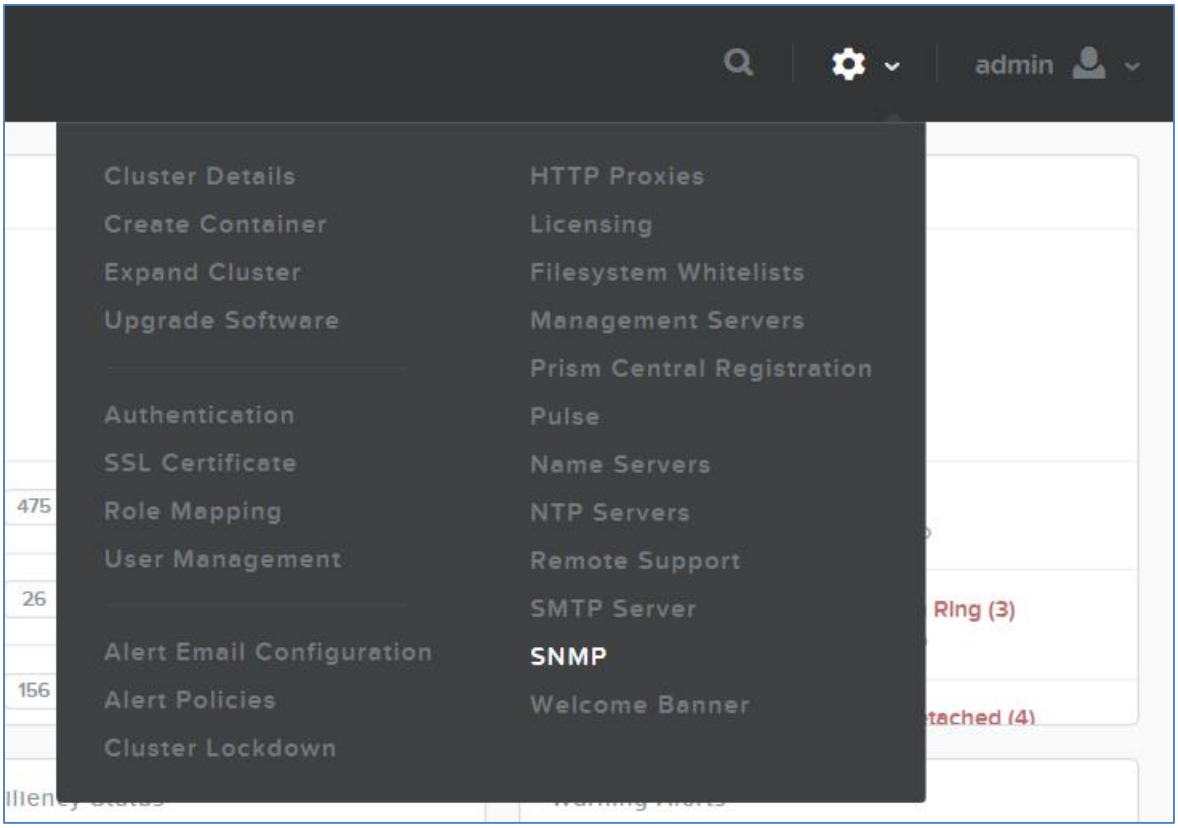
After successful upload, the Nutanix MIB will be shown in the list of available MIBs, as shown in the above snapshot.

NOTE: Please do not proceed further unless you have verified the Nutanix MIB import in Nagios as above.

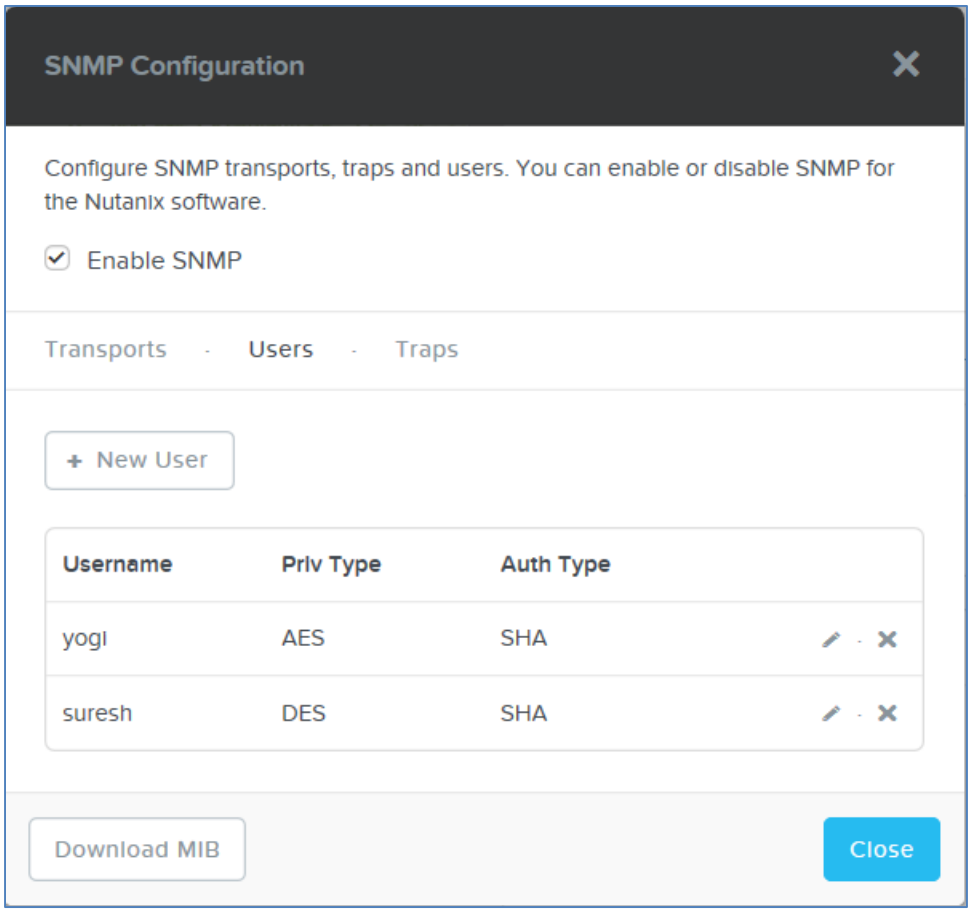
4.2 Add an SNMP User on a Nutanix Cluster

An SNMP V3 user needs to be defined on the Nutanix cluster. This is done by using the Prism UI.

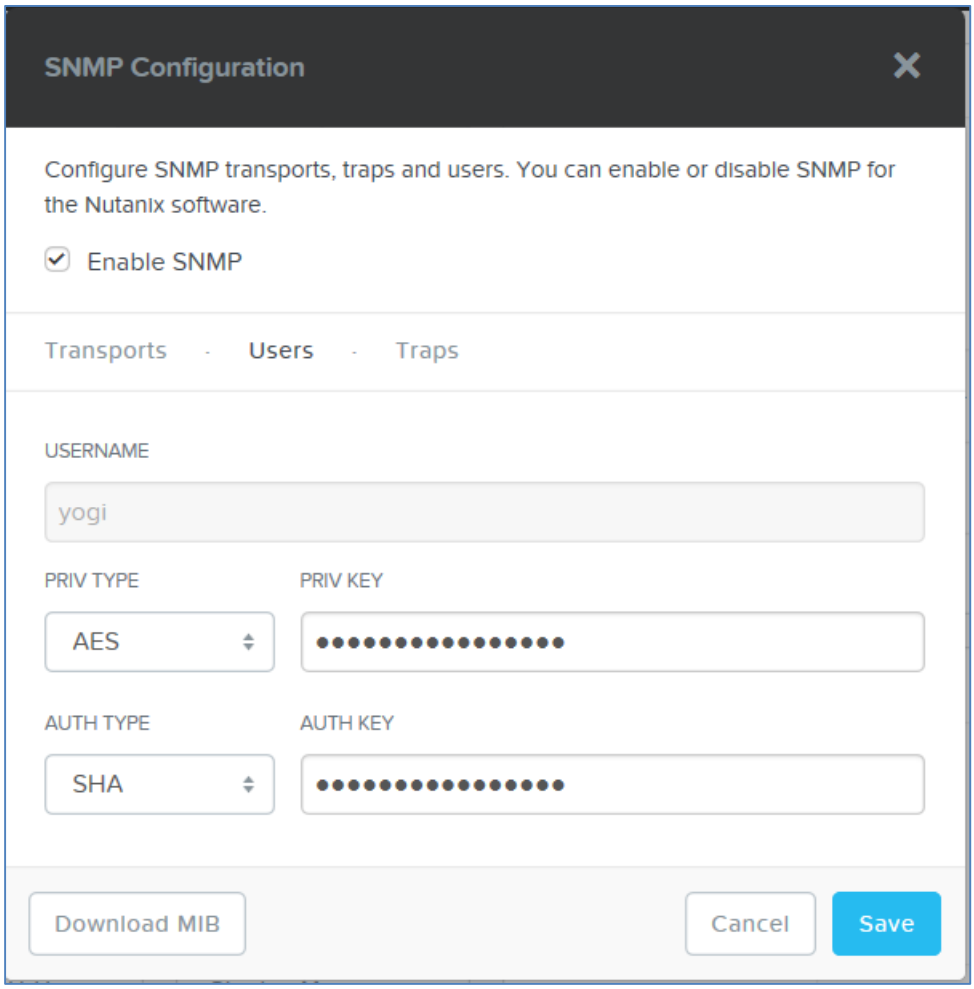
1. Log on to Prism UI and go to the **gear box icon** (**Settings**) and then click **SNMP**:



2. After you click **SNMP**, you will see the **SNMP Configuration** dialog box:



3. Define a new user by designating the appropriate PRIV Type and AUTH Type:



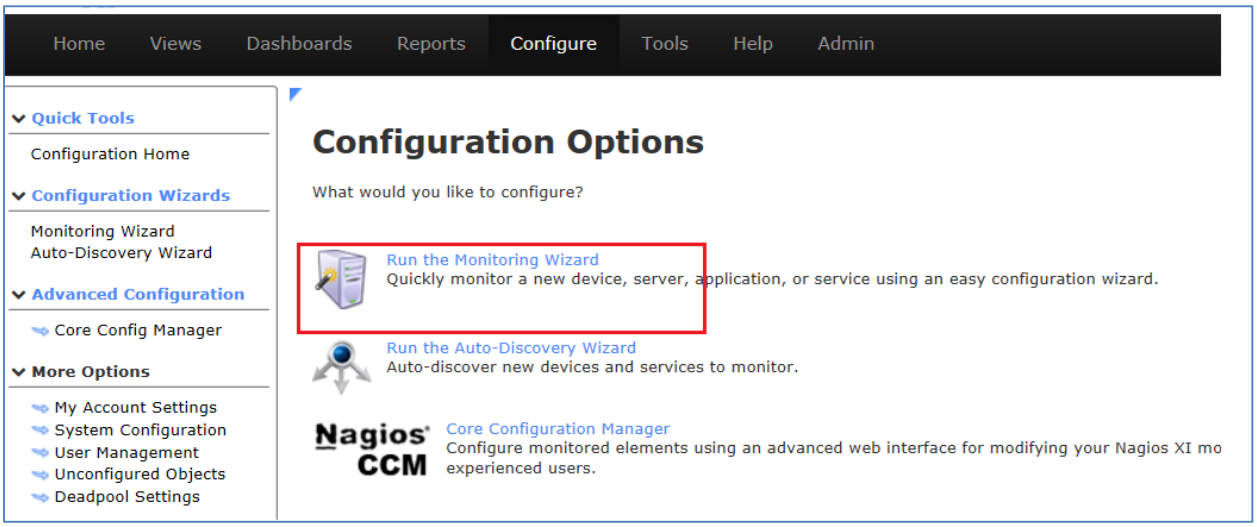
4. The Transport is UDP with port 161.
5. This user will be used in Nagios to connect to the Nutanix cluster.

NOTE: NOS 4.1.1 and above support only AES and SHA.

4.3 Configure Cluster Scalar Attributes

The Nutanix cluster has scalar attributes, including name, status, capacity, IOPS, and latency. These can be added using the SNMP Monitoring Wizard.

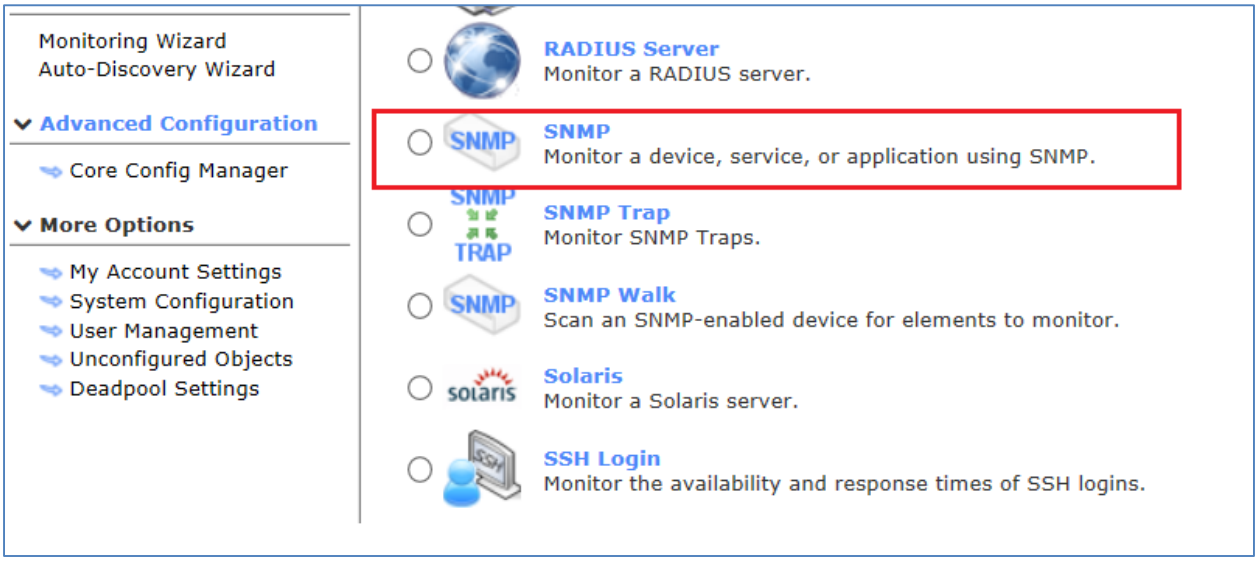
Go to **Configure**, then click **Run the Monitoring Wizard**.



The Wizard has six steps, which we describe below:

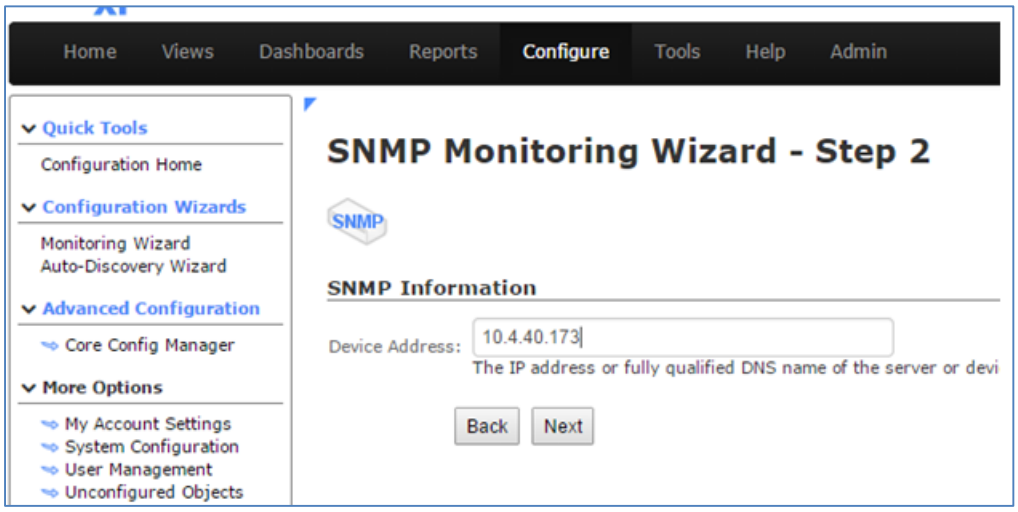
Monitoring Wizard - Step 1:

There are many different types of configuration wizards available. Scroll down to locate and click the option **SNMP**:



SNMP Monitoring Wizard – Step 2:

Specify the Nutanix cluster IP address:

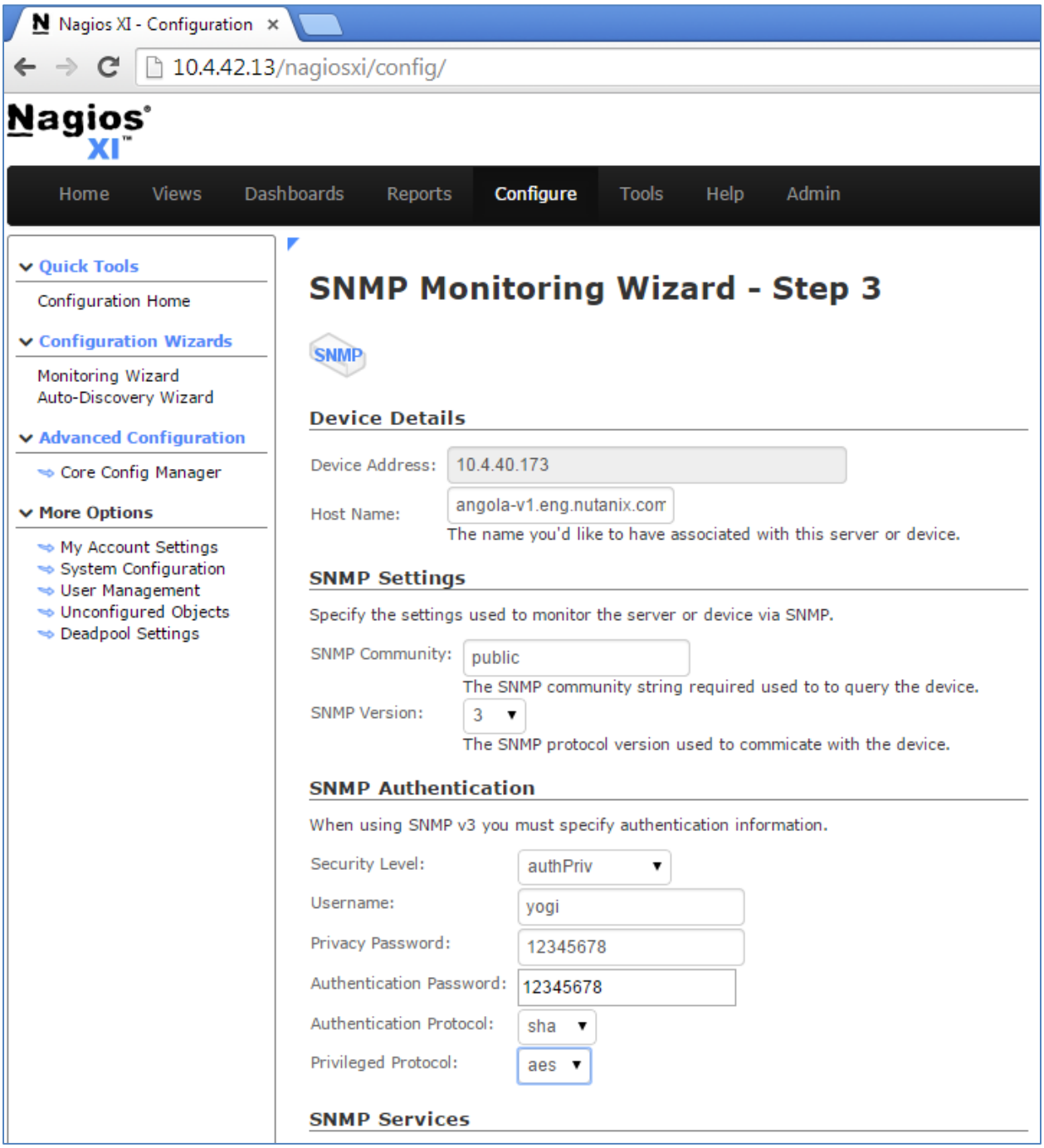


NOTE: We highly recommend using the cluster virtual IP address. If one is not configured, then use a CVM IP address.

Click **Next**.

SNMP Monitoring Wizard – Step 3:

On this page, specify all SNMP details:



Enter the SNMP credentials as follows:

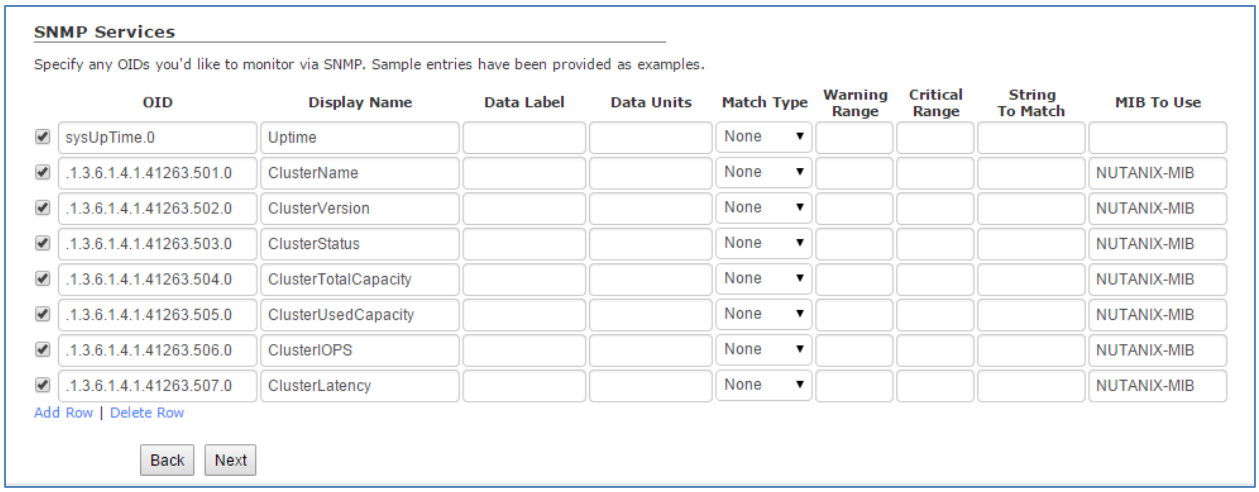
Under **SNMP Settings,** designate the SNMP Version as **3** (Nutanix supports only v3).

For SNMP Authentication, the user credentials must match those defined in section 5.2 "Add an SNMP User on a Nutanix Cluster."

- Security Level: click **authPriv**.
- Username: enter the user name.
- Privacy Password: enter the privacy password.
- Authentication Password: enter the authentication password.
- Authentication Protocol: click **SHA**.
- Privileged Protocol: click **AES**.

After adding the SNMP credentials, add the cluster's scalar attributes for monitoring under **SNMP Services**. Add the following OIDs for the cluster:

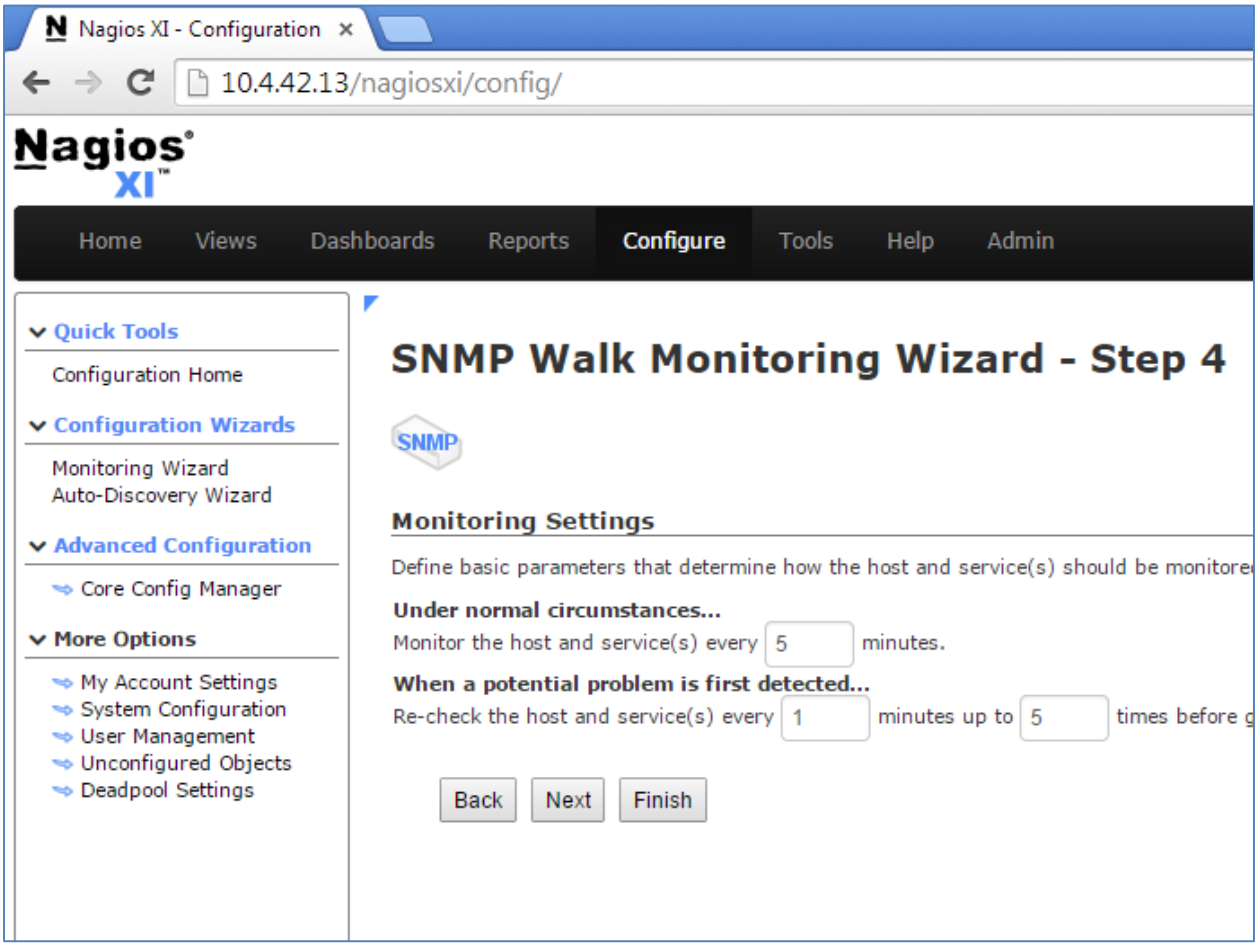
.1.3.6.1.4.1.41263.501.0	clusterName	NUTANIX-MIB
.1.3.6.1.4.1.41263.502.0	clusterVersion	NUTANIX-MIB
.1.3.6.1.4.1.41263.503.0	clusterStatus	NUTANIX-MIB
.1.3.6.1.4.1.41263.504.0	clusterTotalStorageCapacity	NUTANIX-MIB
.1.3.6.1.4.1.41263.505.0	clusterUsedStorageCapacity	NUTANIX-MIB
.1.3.6.1.4.1.41263.506.0	clusterIops	NUTANIX-MIB
.1.3.6.1.4.1.41263.507.0	clusterLatency	NUTANIX-MIB



After adding all the OIDs, click **Next**. If additional rows are needed, click **Add Row**.

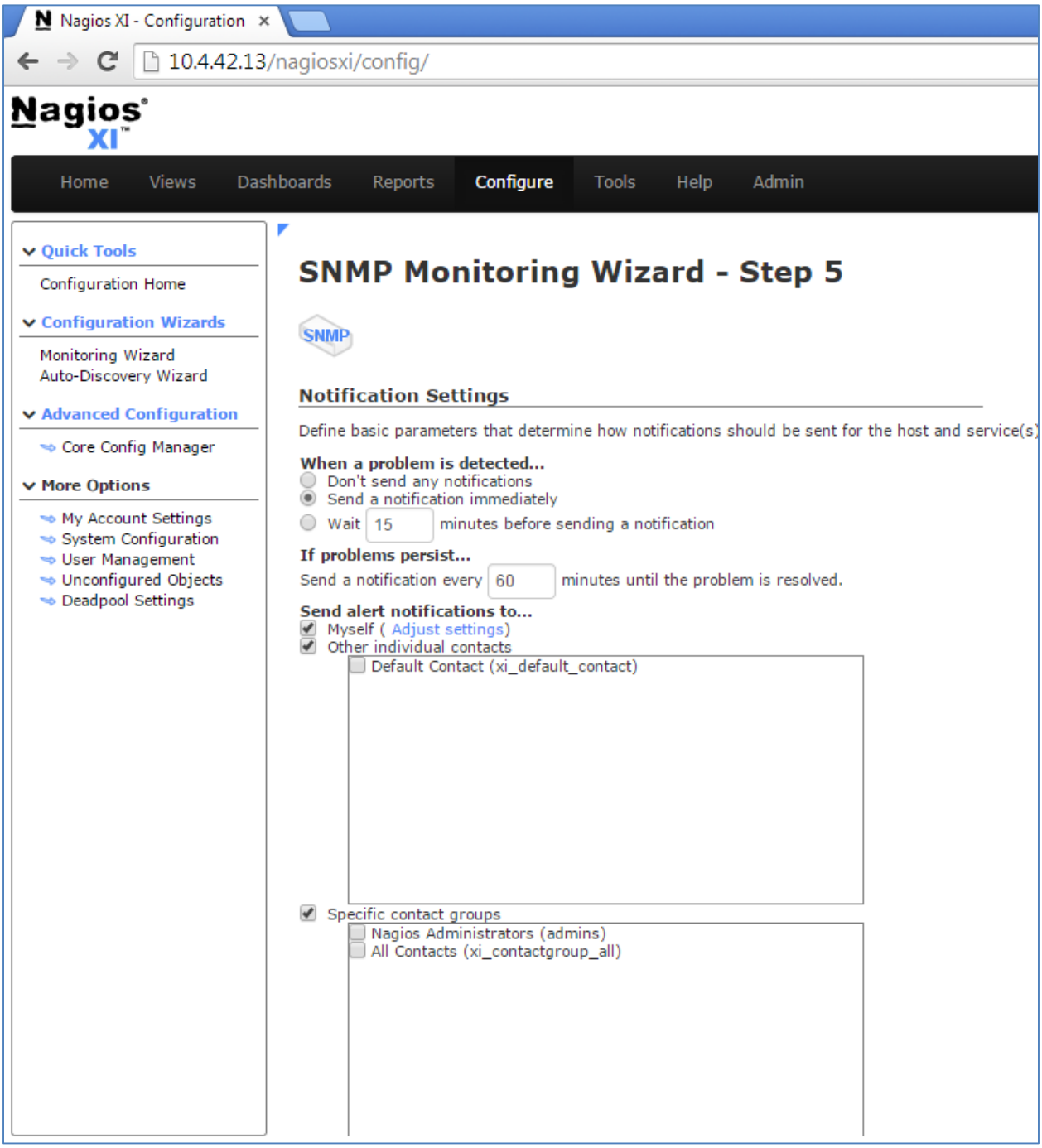
SNMP Monitoring Wizard - Step 4:

Change the configurations as needed and then click **Next**.



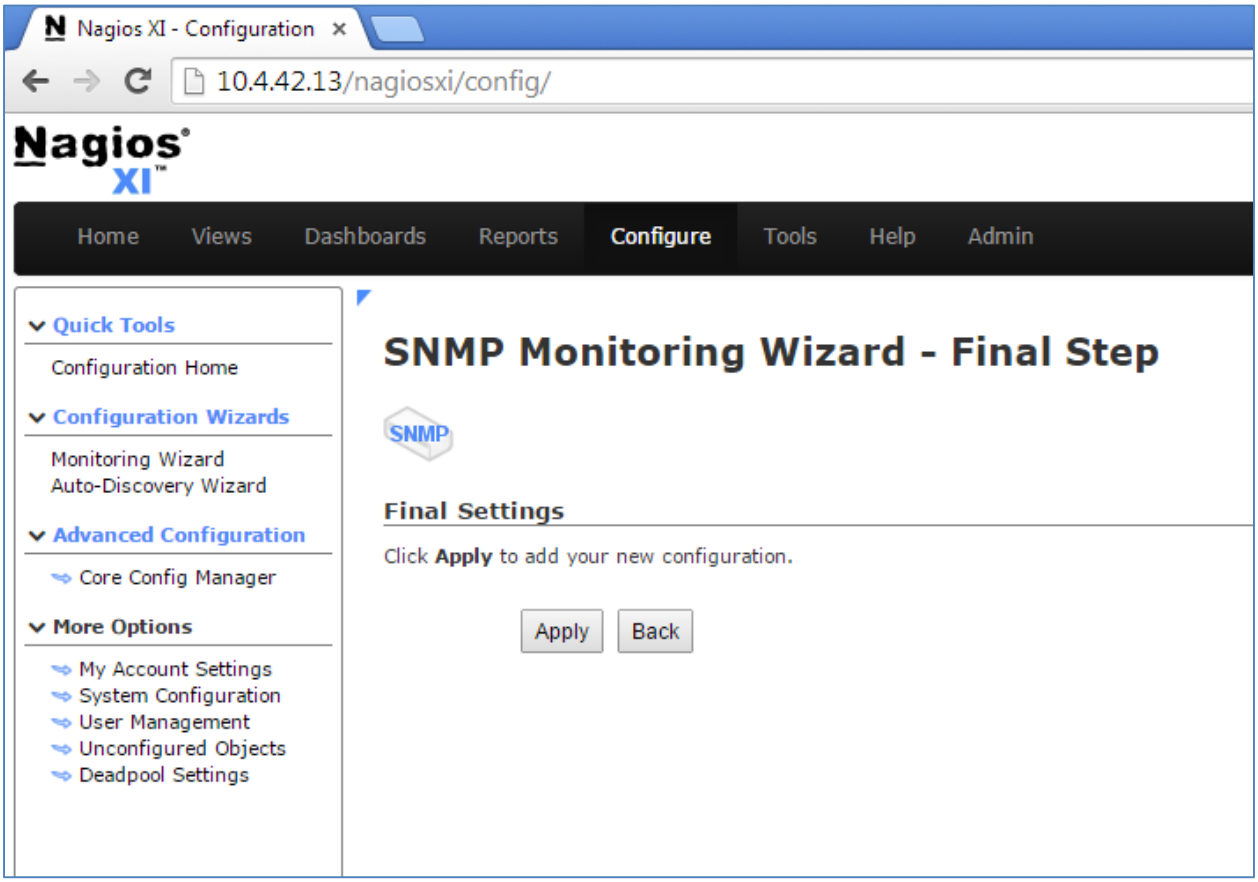
SNMP Monitoring Wizard – Step 5:

Change the configurations as needed and click **Next**.



SNMP Monitoring Wizard – Step 6:

When you arrive at **SNMP Monitoring Wizard - Final Step**, click **Apply** to add your new configuration.



4.4 Configure Table Attributes

The Nutanix cluster MIB has tables for the following objects:

- Controller VMs
- Containers
- Storage Pools
- Disks
- Service Status

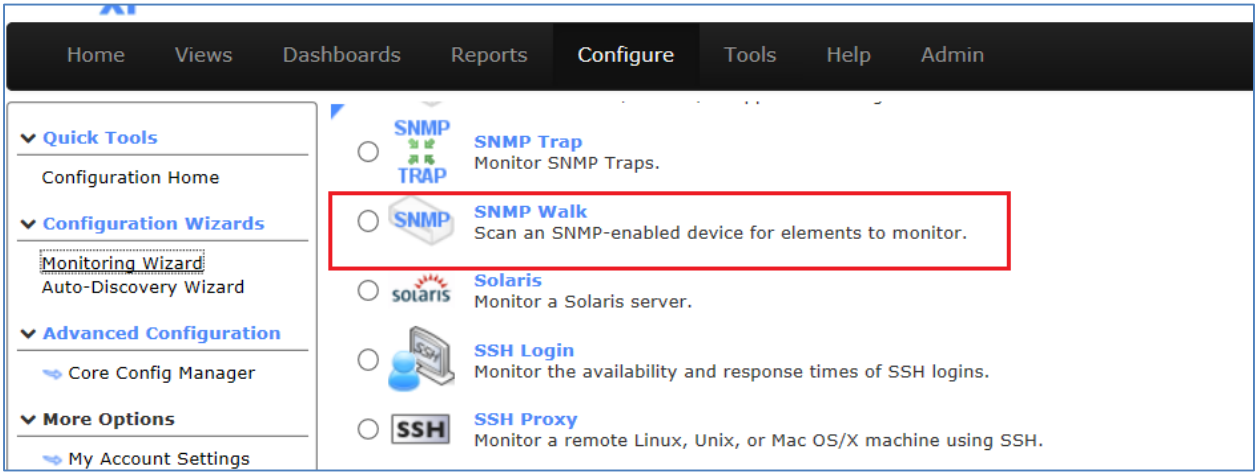
We describe how to configure a table-object below. In this example, we use the storage pools table, but other table objects are configured using a similar process.

NOTE: For each table, you need to configure the SNMP user account separately, using the wizard. This is required because each SNMP table is considered a separate entity for an SNMP Walk connection.

The wizard has six steps, which we describe below:

SNMP Walk Monitoring Wizard - Step 1:

Go to **Configure**; click **Run the Monitoring Wizard**. Scroll down to locate and then select **SNMP Walk**.



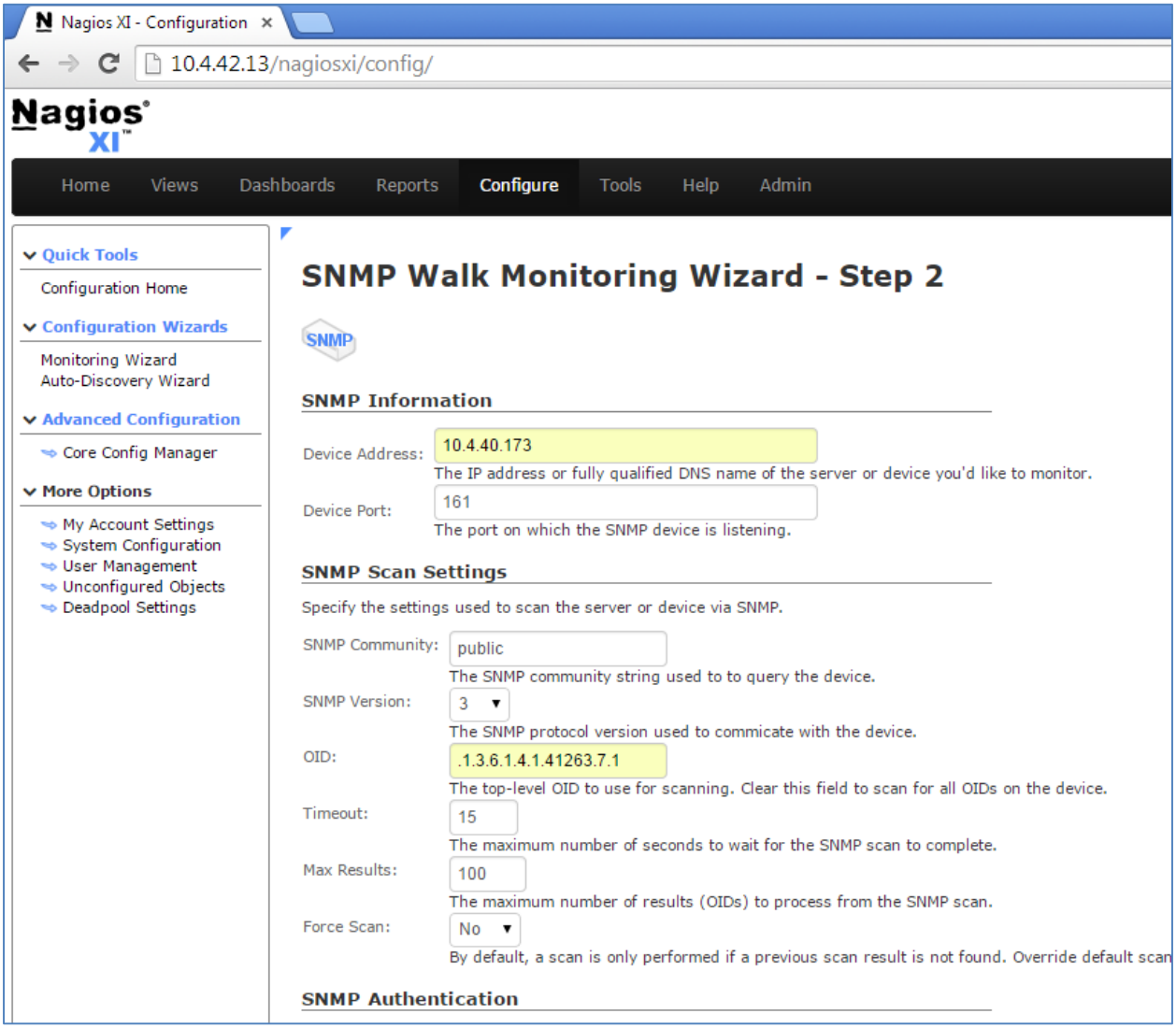
SNMP Walk Monitoring Wizard – Step 2:

Specify SNMP connection details, as we did in the previous section for SNMP v3 user and authentication.

OID: Enter the OID of the table object to be monitored. As an example, "storagePoolInformationTable" specifies the OID as {nutanix 7}—see Appendix B for the Nutanix MIB.

OID for Storage Pool table: .1.3.6.1.4.1.41263.7.1

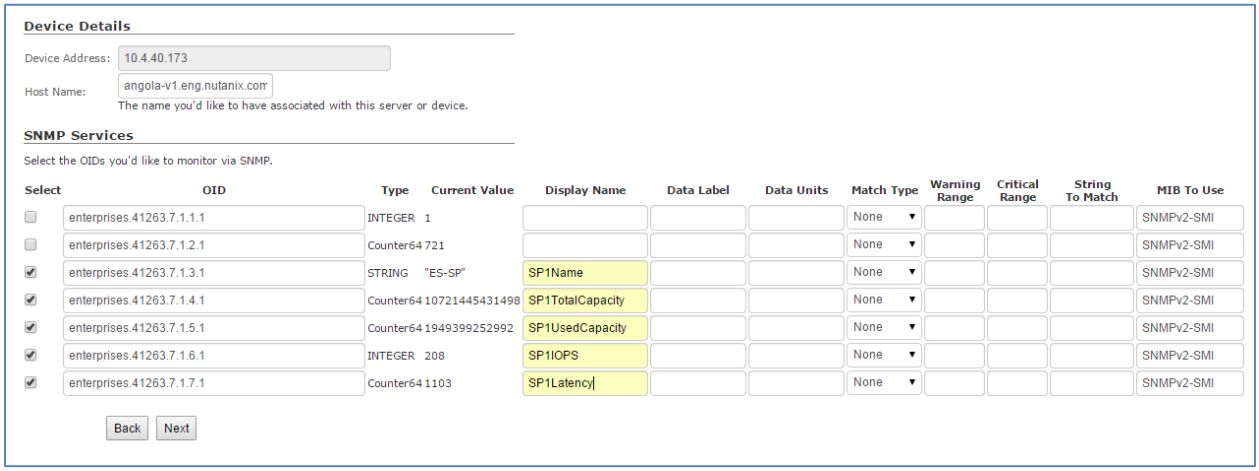
NOTE: The key item in this step is the OID specification.



SNMP Walk Monitoring Wizard - Step 3:

This step specifies the columns (table-attributes) to be monitored.

1. Select the columns to be monitored from the checkbox on the left side.
2. Specify the *Display Name* for all the selected columns.



Device Details

Device Address: 10.4.40.173

Host Name: angola-v1.eng.nutanix.com

The name you'd like to have associated with this server or device.

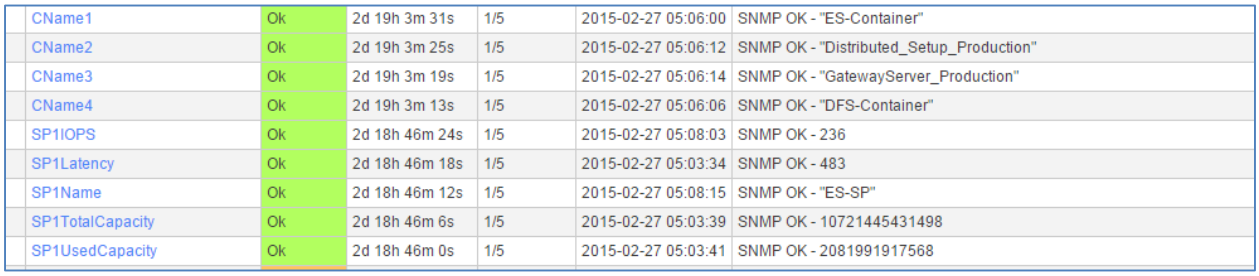
SNMP Services

Select the OIDs you'd like to monitor via SNMP.

Select	OID	Type	Current Value	Display Name	Data Label	Data Units	Match Type	Warning Range	Critical Range	String To Match	MIB To Use
☐	enterprises.41263.7.1.1.1	INTEGER	1				None				SNMPv2-SMI
☐	enterprises.41263.7.1.2.1	Counter64	721				None				SNMPv2-SMI
☑	enterprises.41263.7.1.3.1	STRING	"ES-SP"	SP1Name			None				SNMPv2-SMI
☑	enterprises.41263.7.1.4.1	Counter64	10721445431498	SP1TotalCapacity			None				SNMPv2-SMI
☑	enterprises.41263.7.1.5.1	Counter64	1949399252992	SP1UsedCapacity			None				SNMPv2-SMI
☑	enterprises.41263.7.1.6.1	INTEGER	208	SP1IOPS			None				SNMPv2-SMI
☑	enterprises.41263.7.1.7.1	Counter64	1103	SP1Latency			None				SNMPv2-SMI

Back Next

When you have multiple rows (that is, multiple instances), the name has to be specified for each occurrence—e.g., CName1 and CName2 for container-names.



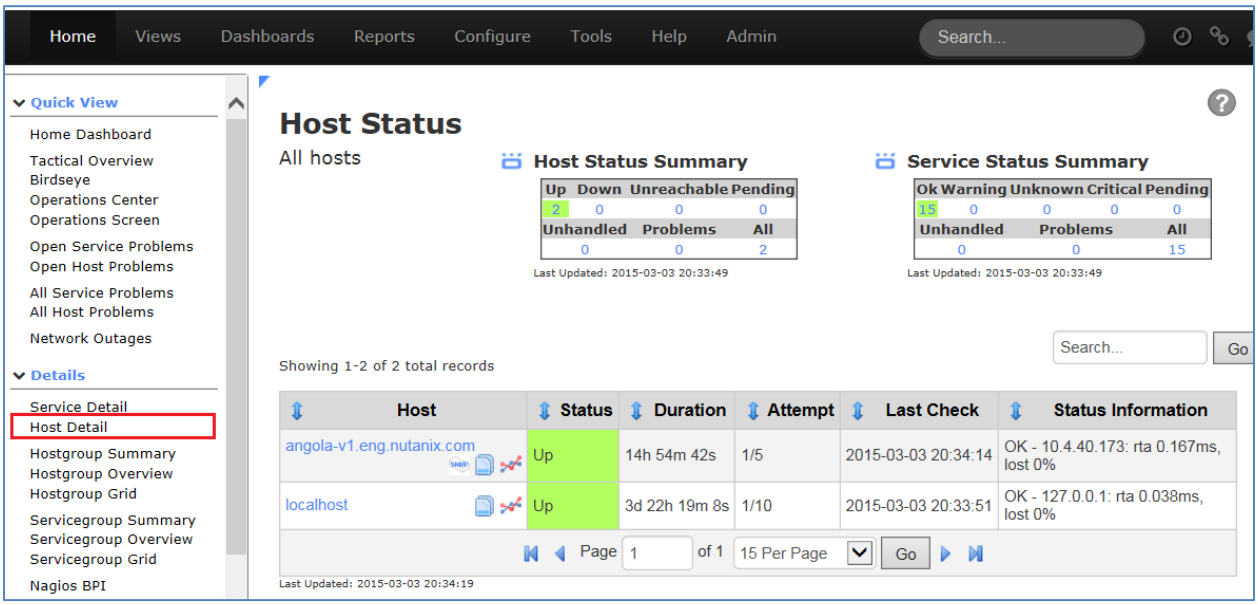
	CName1	Ok	2d 19h 3m 31s	1/5	2015-02-27 05:06:00	SNMP OK - "ES-Container"
	CName2	Ok	2d 19h 3m 25s	1/5	2015-02-27 05:06:12	SNMP OK - "Distributed_Setup_Production"
	CName3	Ok	2d 19h 3m 19s	1/5	2015-02-27 05:06:14	SNMP OK - "GatewayServer_Production"
	CName4	Ok	2d 19h 3m 13s	1/5	2015-02-27 05:06:06	SNMP OK - "DFS-Container"
	SP1IOPS	Ok	2d 18h 46m 24s	1/5	2015-02-27 05:08:03	SNMP OK - 236
	SP1Latency	Ok	2d 18h 46m 18s	1/5	2015-02-27 05:03:34	SNMP OK - 483
	SP1Name	Ok	2d 18h 46m 12s	1/5	2015-02-27 05:08:15	SNMP OK - "ES-SP"
	SP1TotalCapacity	Ok	2d 18h 46m 6s	1/5	2015-02-27 05:03:39	SNMP OK - 10721445431498
	SP1UsedCapacity	Ok	2d 18h 46m 0s	1/5	2015-02-27 05:03:41	SNMP OK - 2081991917568

NOTE: The wizard steps 4, 5, and 6 for configuring table attributes are similar to what we presented in the previous section, "Configuring Cluster Scalar Attributes." Please revisit these steps for assistance in completing the final steps. Change the configurations to suit your preferences.

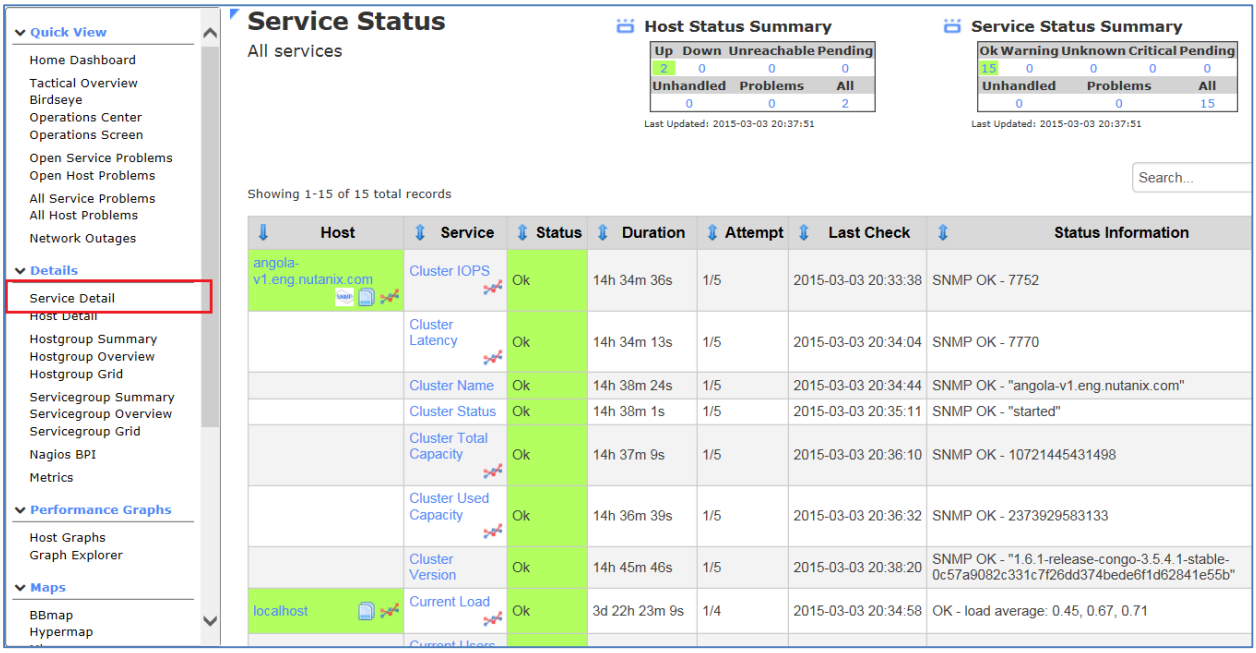
5 Monitor a Nutanix Cluster: Snapshots

This section includes snapshots of a Nutanix cluster being monitored by Nagios as per the configuration described in this document.

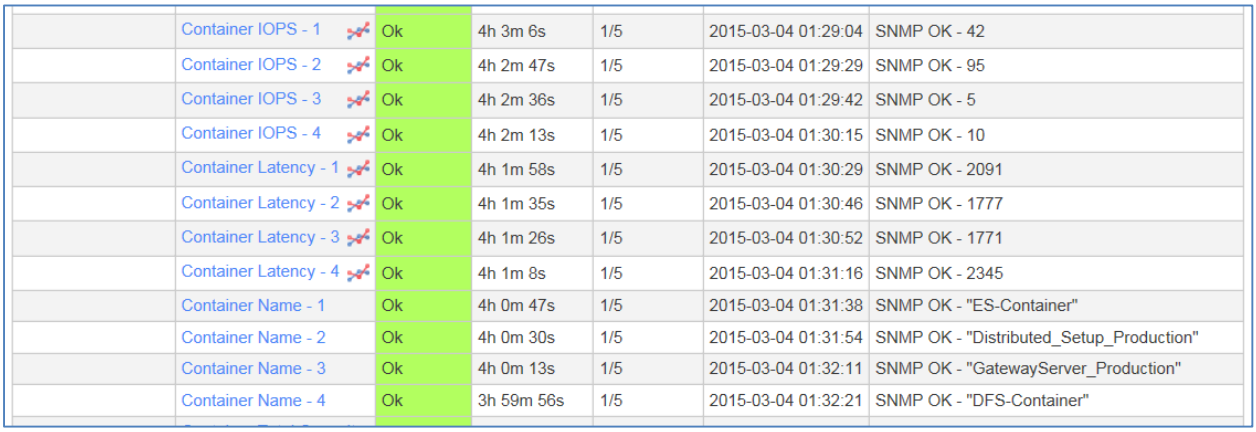
Go to **Home**; click **Host Details** to view the following overall status:



Go to **Home**; click **Service Details** to view the following cluster attributes and status:

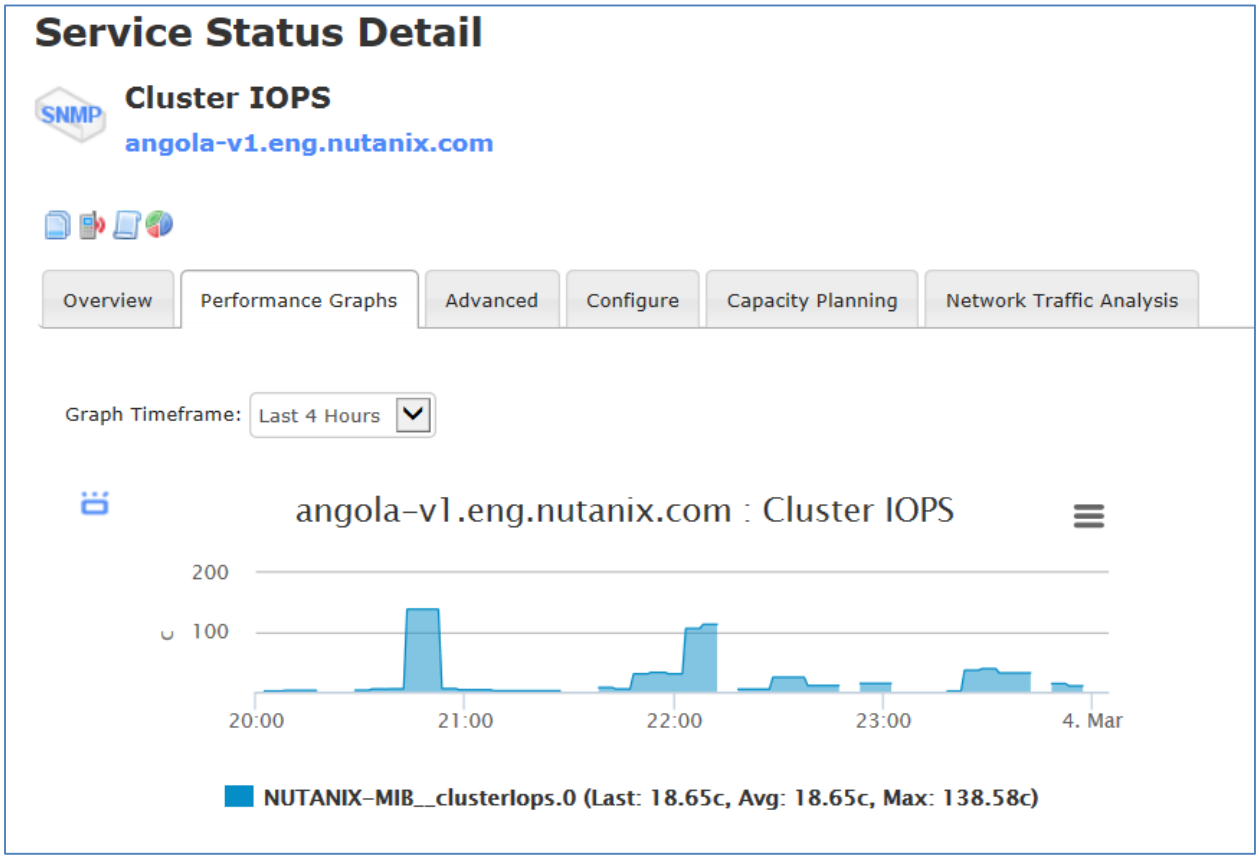


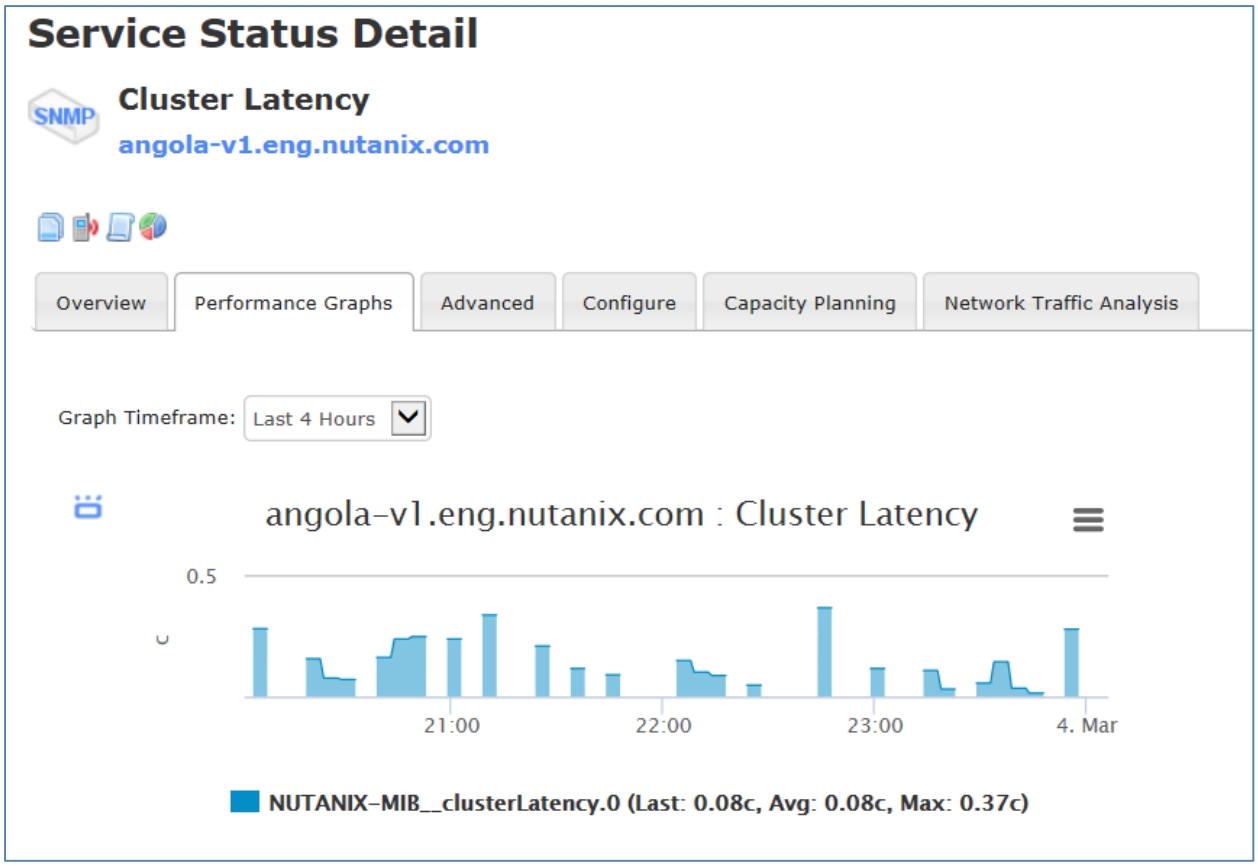
Below is the container table:

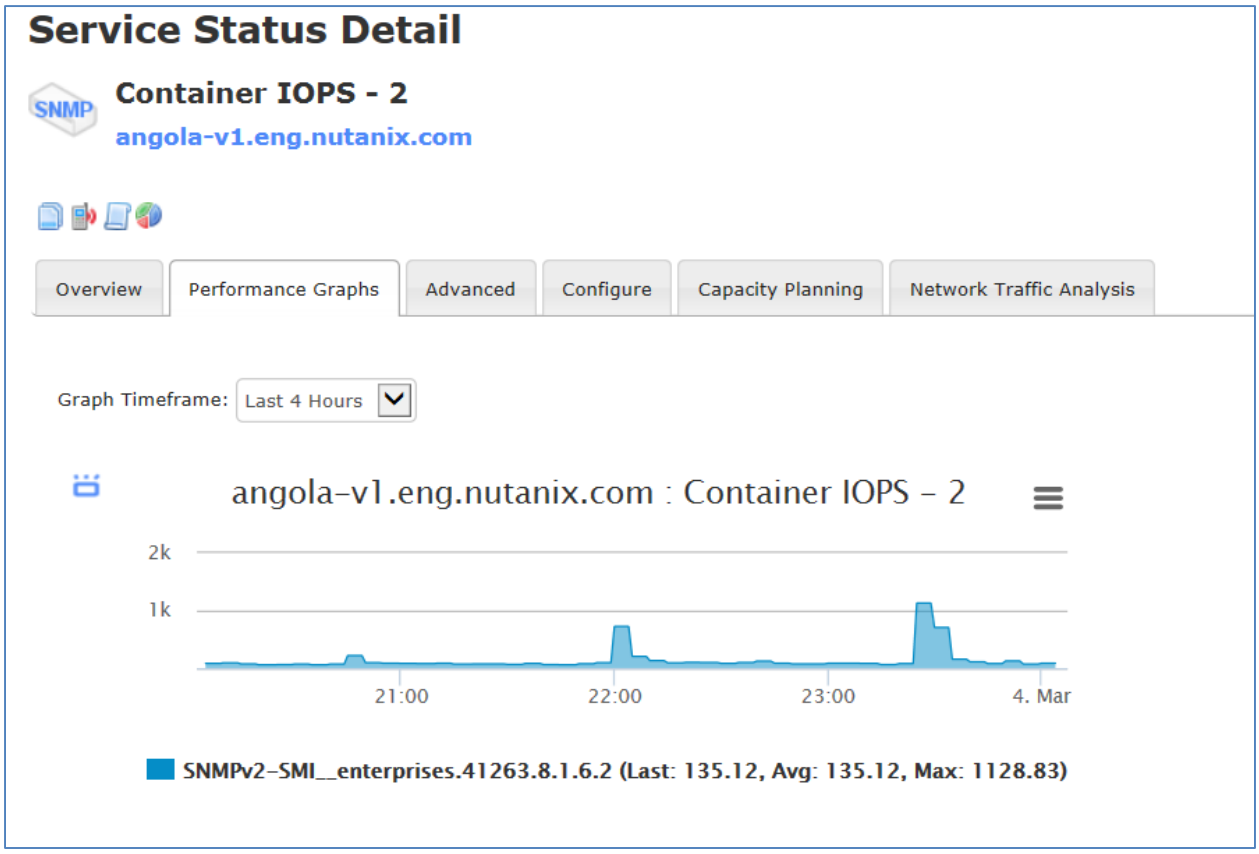


	Container IOPS - 1	Ok	4h 3m 6s	1/5	2015-03-04 01:29:04	SNMP OK - 42
	Container IOPS - 2	Ok	4h 2m 47s	1/5	2015-03-04 01:29:29	SNMP OK - 95
	Container IOPS - 3	Ok	4h 2m 36s	1/5	2015-03-04 01:29:42	SNMP OK - 5
	Container IOPS - 4	Ok	4h 2m 13s	1/5	2015-03-04 01:30:15	SNMP OK - 10
	Container Latency - 1	Ok	4h 1m 58s	1/5	2015-03-04 01:30:29	SNMP OK - 2091
	Container Latency - 2	Ok	4h 1m 35s	1/5	2015-03-04 01:30:46	SNMP OK - 1777
	Container Latency - 3	Ok	4h 1m 26s	1/5	2015-03-04 01:30:52	SNMP OK - 1771
	Container Latency - 4	Ok	4h 1m 8s	1/5	2015-03-04 01:31:16	SNMP OK - 2345
	Container Name - 1	Ok	4h 0m 47s	1/5	2015-03-04 01:31:38	SNMP OK - "ES-Container"
	Container Name - 2	Ok	4h 0m 30s	1/5	2015-03-04 01:31:54	SNMP OK - "Distributed_Setup_Production"
	Container Name - 3	Ok	4h 0m 13s	1/5	2015-03-04 01:32:11	SNMP OK - "GatewayServer_Production"
	Container Name - 4	Ok	3h 59m 56s	1/5	2015-03-04 01:32:21	SNMP OK - "DFS-Container"

The three performance graphs below display snapshots of cluster IOPS, cluster latency, and container IOPS, respectively.




Service Status Detail
SNMP
Cluster Latency
angola-v1.eng.nutanix.com
Overview
Performance Graphs
Advanced
Configure
Capacity Planning
Network Traffic Analysis
Graph Timeframe:
Last 4 Hours
angola-v1.eng.nutanix.com : Cluster Latency
0.5
21:00
22:00
23:00
4. Mar
NUTANIX-MIB__clusterLatency.0 (Last: 0.08c, Avg: 0.08c, Max: 0.37c)


Service Status Detail
SNMP
Container IOPS - 2
angola-v1.eng.nutanix.com
Overview
Performance Graphs
Advanced
Configure
Capacity Planning
Network Traffic Analysis
Graph Timeframe:
Last 4 Hours
angola-v1.eng.nutanix.com : Container IOPS - 2
2k
1k
21:00
22:00
23:00
4. Mar
SNMPv2-SMI__enterprises.41263.8.1.6.2 (Last: 135.12, Avg: 135.12, Max: 1128.83)

6 SNMP Traps

This document does not cover trap configuration from a Nutanix cluster into Nagios XI.

7 Conclusion

This user guide provides a head start in using Nagios to monitor Nutanix clusters. The user may contact Nutanix support for further feedback and clarifications.

7.1 About Nutanix

Nutanix is the leader in hyper-converged infrastructure, natively converging compute and storage into a single, 100% software-driven solution to drive unprecedented simplicity at lower costs in the datacenter. Customers run any application, at any scale, with predictable performance and economics. Learn more at www.nutanix.com or follow up on Twitter @nutanix.

8 Appendix

8.1 Appendix A: References

We referenced the following Nagios XI material in this document:

- User Guide for Nagios XI.
- Administrator Guide for Nagios XI.
- More information about Nagios XI and its capabilities can be found online at http://www.nagios.com/products/nagiosxi
- "How to Integrate SNMP Traps With Nagios XI"

  http://assets.nagios.com/downloads/nagiosxi/docs/Integrating_SNMP_Traps_With_Nagios_XI.pdf

- Nagios software user guides Nagios are available at http://www.nagios.com/

8.2 Appendix B: The Nutanix MIB

Below is the Nutanix MIB from the latest NOS 4.1.1 release.

```
NUTANIX-MIB DEFINITIONS ::= BEGIN
 IMPORTS
   DisplayString
     FROM RFC1213-MIB
   enterprises, MODULE-IDENTITY, OBJECT-TYPE, Integer32, Counter64
     FROM SNMPv2-SMI
   TimeStamp
     FROM SNMPv2-TC;
 nutanix MODULE-IDENTITY
   LAST-UPDATED       "201302191930Z"
   ORGANIZATION       "Nutanix Inc."
   CONTACT-INFO       "support@nutanix.com"
   DESCRIPTION        "Nutanix Cluster Managment Information Base"
   REVISION           "201302191930Z"
   DESCRIPTION        "SNMP MIB for Nutanix Cluster software."
   ::= { enterprises 41263 }
--
-- Cluster wide scalars starting from sub oid 501. This leaves room to add
-- more table types in sequential oid order in future.
--
 clusterName OBJECT-TYPE
   SYNTAX             DisplayString (SIZE (0..255))
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Name of the cluster."
   ::= { nutanix 501 }
 clusterVersion OBJECT-TYPE
   SYNTAX             DisplayString (SIZE (0..255))
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Current cluster version. This is the nutanix-core
                       package version expected on all the Controller VMs."
   ::= { nutanix 502 }
 clusterStatus OBJECT-TYPE
   SYNTAX             DisplayString (SIZE (0..255))
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Current Status of the cluster. This will usually be one of started or stopped"
   ::= { nutanix 503 }
 clusterTotalStorageCapacity OBJECT-TYPE
   SYNTAX             Counter64
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Total storage capacity of the cluster in bytes."
   ::= { nutanix 504 }
 clusterUsedStorageCapacity OBJECT-TYPE
   SYNTAX             Counter64
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Number of bytes of storage used on the cluster."
   ::= { nutanix 505 }
 clusterIops OBJECT-TYPE
   SYNTAX             Counter64
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Cluster wide average IO operations per second."
   ::= { nutanix 506 }

 clusterLatency OBJECT-TYPE
   SYNTAX             Counter64
   ACCESS             read-only
   STATUS             mandatory
   DESCRIPTION        "Cluster wide average latency."
   ::= { nutanix 507 }
--  clusterThroughput OBJECT-TYPE
```

```
--    SYNTAX            Counter64
--    ACCESS            read-only
--    STATUS            mandatory
--    DESCRIPTION       "Cluster wide throughput."
--    ::= { nutanix 508 }
--
-- Nutanix SNMP table definitions.
--
-- Software version table
--
 softwareVersionTable OBJECT-TYPE
   SYNTAX            SEQUENCE OF svtEntry
   MAX-ACCESS        not-accessible
   STATUS            current
   DESCRIPTION       "Table of software versions for packages on allController VMs."
   ::= { nutanix 1 }
 svtEntry OBJECT-TYPE
   SYNTAX            svtEntry
   ACCESS            not-accessible
   STATUS            mandatory
   DESCRIPTION       "Software version table entry containing software versions on the Controller VMs."
   INDEX             { svtIndex }
   ::= { softwareVersionTable 1 }
 svtEntry ::= SEQUENCE {
   svtIndex              INTEGER,
   svtControllerVMId     Counter64,
   svtNutanixBootstrap   DisplayString,
   svtNutanixInfrastructure  DisplayString,
   svtNutanixCore        DisplayString,
   svtNutanixToolchain   DisplayString,
   svtNutanixServiceability  DisplayString,
   svtLinuxKernel        DisplayString
 }
 svtIndex OBJECT-TYPE
   SYNTAX            INTEGER
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "Index for software version table entries."
   ::= { svtEntry 1 }
 svtControllerVMId OBJECT-TYPE
   SYNTAX            Counter64
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "Nutanix Controller VM Id."
   ::= { svtEntry 2 }

 svtNutanixBootstrap OBJECT-TYPE
   SYNTAX            DisplayString (SIZE (0..255))
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "The nutanix-bootstrap software package version."
   ::= { svtEntry 3 }
 svtNutanixInfrastructure OBJECT-TYPE
   SYNTAX            DisplayString (SIZE (0..255))
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "The nutanix-infrastructure software package version."
   ::= { svtEntry 4 }

 svtNutanixCore OBJECT-TYPE
   SYNTAX            DisplayString (SIZE (0..255))
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "The nutanix-core software package version."
   ::= { svtEntry 5 }
 svtNutanixToolchain OBJECT-TYPE
   SYNTAX            DisplayString (SIZE (0..255))
   ACCESS            read-only
   STATUS            mandatory
   DESCRIPTION       "The nutanix-toolchain software package version."
   ::= { svtEntry 6 }
```

```
  svtNutanixServiceability OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "The nutanix-serviceability software package version."
    ::= { svtEntry 7 }
  svtLinuxKernel OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "The linux kernel version currently installed."
    ::= { svtEntry 8 }
--
-- Service status table
--
  serviceStatusTable OBJECT-TYPE
    SYNTAX              SEQUENCE OF sstEntry
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION         "Table of status of each service with one row per Controller VM."
    ::= { nutanix 2 }
  sstEntry OBJECT-TYPE
    SYNTAX              sstEntry
    ACCESS              not-accessible
    STATUS              mandatory
    DESCRIPTION         "Table entry containing status of services on one node."
    INDEX               { sstIndex }
    ::= { serviceStatusTable 1 }

  sstEntry ::= SEQUENCE {
    sstIndex                INTEGER,
    sstControllerVMId       Counter64,
    sstControllerVMStatus   DisplayString,
    sstZeusStatus           DisplayString,
    sstScavengerStatus      DisplayString,
    sstMedusaStatus         DisplayString,
    sstPithosStatus         DisplayString,
    sstStargateStatus       DisplayString,
    sstChronosStatus        DisplayString,
    sstCuratorStatus        DisplayString,
    sstPrismStatus          DisplayString,
    sstAlertManagerStatus   DisplayString,
    sstStatsAggregatorStatus  DisplayString,
    sstSysStatCollectorStatus  DisplayString
  }
  sstIndex OBJECT-TYPE
    SYNTAX              INTEGER
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "A unique index for each row in the service status table."
    ::= { sstEntry 1 }
  sstControllerVMId OBJECT-TYPE
    SYNTAX              Counter64
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Nutanix Controller VM Id."
    ::= { sstEntry 2 }
  sstControllerVMStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of the node."
    ::= { sstEntry 3 }
  sstZeusStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Zeus on the node. A comma separated list of pids of the zeus service."
    ::= { sstEntry 4 }
  sstScavengerStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
```

```
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Scavenger on the node. A comma separated list of pids of the scavenger service."
    ::= { sstEntry 5 }

  sstMedusaStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Medusa on the node. A comma separated list of pids of the medusa service."
    ::= { sstEntry 6 }
  sstPithosStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Pithos on the node. A comma separated list of pids of the pithos service."
    ::= { sstEntry 7 }

  sstStargateStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Stargate on the node. A comma separated list of pids of the stargate service."
    ::= { sstEntry 8 }
  sstChronosStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Chronos on the node. A comma separated list of pids of the chronos service."
    ::= { sstEntry 9 }
  sstCuratorStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Curator on the node. A comma separated list of pids of the curator service."
    ::= { sstEntry 10 }
  sstPrismStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Prism on the node. A comma separated list of pids of the prism service."
    ::= { sstEntry 11 }
  sstAlertManagerStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Alert Manager on the node. A comma separated list of pids of the alert manager service."
    ::= { sstEntry 12 }
  sstStatsAggregatorStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of Stats Aggregator on the node. A comma  separated list of pids of the stats aggregator
                        service."
    ::= { sstEntry 13 }
  sstSysStatCollectorStatus OBJECT-TYPE
    SYNTAX              DisplayString (SIZE (0..255))
    ACCESS              read-only
    STATUS              mandatory
    DESCRIPTION         "Status of SysStatCollector on the node. A comma separated list of pids of the sys stat collector
                        service."
    ::= { sstEntry 14 }
--
-- Disk Status Table
--
  diskStatusTable OBJECT-TYPE
    SYNTAX              SEQUENCE OF dstEntry
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION         "Table provides disk status on all CVMs."
    ::= { nutanix 3 }
```

```
 dstEntry OBJECT-TYPE
  SYNTAX            dstEntry
  ACCESS            not-accessible
  STATUS            mandatory
  DESCRIPTION       "Table entry containing status of a disk on a CVM."
  INDEX             { dstIndex}
  ::= { diskStatusTable 1 }
 dstEntry ::= SEQUENCE {
  dstIndex           INTEGER,
  dstDiskId          Counter64,
  dstControllerVMId  Counter64,
  dstSerial          DisplayString,
  dstNumRawBytes     Counter64,
  dstNumTotalBytes   Counter64,
  dstNumFreeBytes    Counter64,
  dstNumTotalInodes  Counter64,
  dstNumFreeInodes   Counter64,
  dstTemperature     INTEGER
 }
 dstIndex OBJECT-TYPE
  SYNTAX            INTEGER
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "A unique index for each row in the disk status   table."
  ::= { dstEntry 1 }
 dstDiskId OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "A unique disk id for each disk."
  ::= { dstEntry 2 }
 dstControllerVMId OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Nutanix Controller VM Id."
  ::= { dstEntry 3 }
 dstSerial OBJECT-TYPE
  SYNTAX            DisplayString (SIZE (0..255))
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Disk Serial Number"
  ::= { dstEntry 4 }
 dstNumRawBytes OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Maximum number of raw bytes available on the device."
  ::= { dstEntry 5 }
 dstNumTotalBytes OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Total number of bytes usable on the device through  its file system."
  ::= { dstEntry 6 }

 dstNumFreeBytes OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Total number of bytes availabe to the non-root users on the device through its file system."
  ::= { dstEntry 7 }
 dstNumTotalInodes OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
  STATUS            mandatory
  DESCRIPTION       "Maximum number of inodes usable on the device through its file system."
  ::= { dstEntry 8 }
 dstNumFreeInodes OBJECT-TYPE
  SYNTAX            Counter64
  ACCESS            read-only
```

```
    STATUS          mandatory
    DESCRIPTION     "Total number of inodes availabe to the non-root users on the device through its file system."
    ::= { dstEntry 9 }

  dstTemperature OBJECT-TYPE
    SYNTAX          INTEGER
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Temperature of FIO disk in centigrade."
    ::= { dstEntry 10 }
--
-- Controller VM resource table.
--
  controllerVMResourceTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF crtEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION     "Table of resources per Controller VM."
    ::= { nutanix 4 }
  crtEntry OBJECT-TYPE
    SYNTAX          crtEntry
    ACCESS          not-accessible
    STATUS          mandatory
    DESCRIPTION     "Table entry containing resource information of one Controller VM."
    INDEX           { crtIndex }
    ::= { controllerVMResourceTable 1 }
  crtEntry ::= SEQUENCE {
    crtIndex        INTEGER,
    crtControllerVMId  Counter64,
    crtMemory       Counter64,
    crtNumCpus      INTEGER
  }
  crtIndex OBJECT-TYPE
    SYNTAX          INTEGER
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "A unique index for each row in the CVM memory table."
    ::= { crtEntry 1 }
  crtControllerVMId OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Nutanix Controller VM Id."
    ::= { crtEntry 2 }
  crtMemory OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Total memory available on a CVM."
    ::= { crtEntry 3 }
  crtNumCpus OBJECT-TYPE
    SYNTAX          INTEGER
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Total number of CPUs allocated to a CVM."
    ::= { crtEntry 4 }
  --
  -- Storage pool information table.
  --
  storagePoolInformationTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF spitEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION     "Storage pool information in a table form."
    ::= { nutanix 7 }
  spitEntry OBJECT-TYPE
    SYNTAX          spitEntry
    ACCESS          not-accessible
    STATUS          mandatory
    DESCRIPTION     "Storage pool information table entry."
    INDEX           { spitIndex }
```

```
    ::= { storagePoolInformationTable 1 }
  spitEntry ::= SEQUENCE {
    spitIndex          INTEGER,
    spitStoragePoolId    Counter64,
    spitStoragePoolName  DisplayString,
    spitTotalCapacity    Counter64,
    spitUsedCapacity     Counter64,
    spitIOPerSecond      INTEGER,
    spitAvgLatencyUsecs  Counter64
  }
  spitIndex OBJECT-TYPE
    SYNTAX             INTEGER
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Unique index for storage pool information table entries."
    ::= { spitEntry 1 }

  spitStoragePoolId OBJECT-TYPE
    SYNTAX             Counter64
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Storage pool id."
    ::= { spitEntry 2 }
  spitStoragePoolName OBJECT-TYPE
    SYNTAX             DisplayString (SIZE (0..255))
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Name of the storage pool."
    ::= { spitEntry 3 }
  spitTotalCapacity OBJECT-TYPE
    SYNTAX             Counter64
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Total capacity of the storage pool in bytes."
    ::= { spitEntry 4 }
  spitUsedCapacity OBJECT-TYPE
    SYNTAX             Counter64
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Number of bytes used in the storage pool."
    ::= { spitEntry 5 }
  spitIOPerSecond OBJECT-TYPE
    SYNTAX             INTEGER
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Number of IO operations served per second from this storage pool."
    ::= { spitEntry 6 }
  spitAvgLatencyUsecs OBJECT-TYPE
    SYNTAX             Counter64
    ACCESS             read-only
    STATUS             mandatory
    DESCRIPTION        "Average IO latency for this storage pool in microseconds."
    ::= { spitEntry 7 }
--
-- Container information table
--
  containerInformationTable OBJECT-TYPE
    SYNTAX             SEQUENCE OF citEntry
    MAX-ACCESS         not-accessible
    STATUS             current
    DESCRIPTION        "Container information in a table form."
    ::= { nutanix 8 }
  citEntry OBJECT-TYPE
    SYNTAX             citEntry
    ACCESS             not-accessible
    STATUS             mandatory
    DESCRIPTION        "Container information table entry."
    INDEX              { citIndex }
    ::= { containerInformationTable 1 }
  citEntry ::= SEQUENCE {
    citIndex           INTEGER,
```

```
    citContainerId      Counter64,
    citContainerName    DisplayString,
    citTotalCapacity    Counter64,
    citUsedCapacity     Counter64,
    citIOPerSecond      INTEGER,
    citAvgLatencyUsecs  Counter64
  }
  citIndex OBJECT-TYPE
    SYNTAX          INTEGER
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Unique index for container information table entries."
    ::= { citEntry 1 }
  citContainerId OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Container id."
    ::= { citEntry 2 }
  citContainerName OBJECT-TYPE
    SYNTAX          DisplayString (SIZE (0..255))
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Name of the container."
    ::= { citEntry 3 }
  citTotalCapacity OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Total capacity of the container in bytes."
    ::= { citEntry 4 }
  citUsedCapacity OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Number of bytes used in the container."
    ::= { citEntry 5 }
  citIOPerSecond OBJECT-TYPE
    SYNTAX          INTEGER
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Number of IO operations served per second from this container."
    ::= { citEntry 6 }
  citAvgLatencyUsecs OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Average IO latency for this container in microseconds."
    ::= { citEntry 7 }
--
-- Abstract alert object.
-- All alert data to be sent in a trap is grouped within this object. This
-- allows alert objects to appear grouped together in certain graphical MIB
-- viewers.
--
  ntxAlert OBJECT IDENTIFIER ::= {nutanix 999}
  ntxAlertCreationTime   OBJECT-TYPE
    SYNTAX          Counter64
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Alert creation Timestamp in seconds from epoch."
    ::= {ntxAlert 1}
  ntxAlertDisplayMsg    OBJECT-TYPE
    SYNTAX          DisplayString (SIZE (0..1024))
    ACCESS          read-only
    STATUS          mandatory
    DESCRIPTION     "Display message for the sent alert."
    ::= {ntxAlert 2}

  ntxTrap NOTIFICATION-TYPE
    OBJECTS         { ntxAlertCreationTime, ntxAlertDisplayMsg}
```

```
    STATUS              current
    DESCRIPTION         "Nutanix enterprise trap"
    ::= { nutanix 991 }
END
```

8.3 Appendix C: Nutanix EULA

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