NP Config MIB Reference Manual

Optional Feature

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About This Manual

This manual is about NP Config MIB, the Simple Network Management Protocol (SNMP) management information base (MIB) for the NuPoint Messenger server. In SNMP terms, a MIB is a specification that defines management information about a networked device. The MIB allows an SNMP-based management station to monitor the device across a TCP/IP network (or SLIP/PPP phone line). The MIB also allows the management station to receive unsolicited event indications from the device.

Who Should Read This Manual?

This manual is for developers who create client applications for network management of NuPoint Messenger servers. This manual is also for management station operators who must retrieve or modify NuPoint Messenger server management information. This manual assumes readers are familiar with SNMP and client-server computing. It also assumes readers are familiar with NuPoint Messenger server configuration and operating characteristics.

What's In This Manual?

Chapters contained in this manual are:

Chapter 1 — Learning About NP Config MIB: An orientation to NP Config MIB and how it is used.

Chapter 2 — Installing NP Config MIB: Instructions for installing NP Config MIB files at the management station.

Chapter 3 — Using NP Config MIB: Instructions for using NP Config MIB from the perspective of a network management station operator.

Chapter 4 — NP Config MIB Reference: Detailed reference on vendor-specific NuPoint Messenger server management information.

Appendix A — Reference Sources: A list of related Internet specifications and SNMP background information.

Appendix B — More About Standard MIB Support: Additional information on NuPoint Messenger server support of standard MIB modules.

Appendix C — Binary-Decimal Encoding: Description of the encoding scheme used to determine values of several objects in VM-MIB.

Glossary — Definitions of key terms used in this manual.

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What Related Documents Are Available?

For detailed reference on NuPoint Messenger server configuration and operating characteristics, refer to the following:

- *Installation and Service Manual*
- *Reference and Configuration Manual*
- *Error Log Messages Manual*

For information on Mitel Networks NuPoint Messenger manuals related to NP Config MIB, refer to the following:

- *NP Config Administrator's Guide*
- *NP Config SNMP Administrator's Guide*

1 Introduction

This chapter describes what NP Config MIB is and how it relates to other elements of SNMP-based network management. It also describes NP Config MIB structure and syntax.

What is NP Config MIB?

NP Config MIB is the management information base for the NuPoint Messenger server. In terms of Simple Network Management Protocol (SNMP), a MIB is a specification that defines management information for a networked device. NP Config MIB defines vendor-specific management information for a NuPoint Messenger server.

NP Config MIB allows an SNMP-based network management station to monitor and control a NuPoint Messenger server across a TCP/IP network or SLIP/PPP phone line (SNMP messages are exchanged via a datagram mechanism; TCP/IP and SLIP/PPP protocol groups support datagrams).

Terms and Concepts

The following terms and concepts are used throughout this manual. You should understand this information before attempting to install or use NP Config MIB.

SNMP Standards

SNMP is a set of standards for multivendor network management. The standards specify a means by which management information on networked devices is retrieved or modified. Management information includes configuration, operating, and status parameters. SNMP defines three key network management elements: the SNMP manager, the SNMP agent, and the management information base (MIB).

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SNMP Manager

The SNMP manager is a software program running on the management station (Figure 1-1). The management station typically is a PC equipped with a network management platform, such as HP OpenView®. The platform consists of a GUI and underlying software support for the manager.

Figure 1-1 SNMP-Based Management Elements

A management station may have different managers installed, each performing a separate task. Generally speaking, there is a separate manager for each type of managed device (router, voice processing system, and so forth).

SNMP Agent

The SNMP agent is a software program running on a networked device. The agent responds to manager requests to inspect or change management information on the device. The agent also can send managers unsolicited event messages that contain management information. The manager can indicate which events it wants to monitor.

Typically, management information is not centrally stored on a device (for example, in a database). The agent collects the information, as needed, from applications running on the device.

SNMP MIBS

A MIB is a specification that defines management information. The MIB identifies each type of management information and provides a formal data description of each. The data descriptions are in a format based on Abstract Syntax Notation One (ASN.1). The data descriptions allow managers and the agent to exchange data in a format understood by each. The exchange is done through SNMP messages.

A device may have one or more MIBs associated with it. Typically, the separate MIBs are called MIB modules. Each MIB module defines management information of a separate type. A MIB module that defines management information that is vendor-specific (proprietary) is called a private MIB module. A MIB module that defines management information that is not vendor-specific is called a standard MIB module.

MIB support is specified by the device vendor; that is, the vendor makes clear which management information is located on a device, and which MIB modules define that information.

MIB modules are contained in ASCII files that are loaded at the management station. The vendor provides private MIB modules. Standard MIB modules typically are downloaded from the Internet. After the MIB files are loaded, the data descriptions contained in the files are available to any manager running on that station.

Note: The MIB files need not be loaded at the device, because MIB support is integrated with agent software.

Collectively, the MIB modules for all devices can be viewed as a global MIB (Figure 1-2). The global MIB represents all information that can be managed on the Internet. However, at any time, a given management station has just a subset of the global MIB loaded (the subset that applies to devices the station manages).

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Management information for the NuPoint Messenger server is defined in two private and two standard MIB modules. The two private MIB modules are called VM-MIB and SS7-MIB. VM-MIB defines general status and configuration information. SS7-MIB defines information related to Signaling System 7. VM-MIB and SS7-MIB are bundled into NP Config MIB.

The standard MIB modules are MIB-2 and DS1-MIB. MIB-2 defines information related to TCP/IP connectivity. DS1-MIB defines information related to digital trunk connectivity.

Figure 1-2 Global MIB and MIB Modules

In MIB terms, each type of management information is called an object. Each instance of an information type is called a MIB variable. For example, for the NuPoint Messenger server, disk serial number is an information type. The serial number for a specific disk is a variable. Another way to view this is that a variable has two pieces of information, and object name and a value. For example:

- object name: disk serial number
- value: TX218204

MIB Structure

The hierarchy of the global MIB is like an inverted tree. It has a root at the top, and groups of objects extending from the root like branches on a tree (Figure 1-3). The intermediate objects on each branch represent group names (each identifies the portion of the branch that follows). The terminal objects represent types of management information. Terminal objects are sometimes called leaves on the tree or atomic objects (atomic, because they cannot be subdivided further into other objects).

Figure 1-3 Global MIB Hierarchy

Note: In most SNMP documents, both the intermediate and terminal objects are simply called objects. This is somewhat confusing, because only the terminal (atomic) objects represent types of management information. Intermediate objects simply name groups or subgroups of management information located at a lower level.

Within the global MIB, you can locate MIB modules using object names as signposts. Each MIB module is located down a separate branch from the root. For purposes of simple display, branch locations are often given as pathways. For example, following is one way to show the pathway leading to NuPoint Messenger private MIB modules. In this display, the sideways carats (>) represent paths between objects.

```
root>iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
   >Centigram(1096)>series6cs(1)
```

Each object is labeled with its formal name and numeric identifier. The name is established through standards set by the Internet Engineering Task Force (IETF). The numeric identifier is based on a numbering scheme devised by the IETF.

Beneath the series6cs vertex, the pathway forks into two branches. The two branches make up the two private MIB modules supported by the NuPoint Messenger server: VM-MIB and SS7-MIB. Figure 1-4 shows the tree structure of each of those branches. The figure stops at the level just above atomic objects (not shown).

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In Figure 1-4, each indentation represents a lower object level. For example, ctrap, vmsystem, and vmhost are subgroups immediately below the vm-mib group (itself a subgroup of series6cs). Similarly, ss7info, isup, and vmmtp are subgroups below the ss7-mib group.

```
vm-mib(1)                          ss7-mib(2)
   ctrap(1)                        ss7info(1)
         trapCommon(1)                   isup(2)
         trapFilter(2)                   vmmtp(3)
   vmsystem(2)
         vmsysgeneral(1)
         vmsysdisk(2)
         vmsyscssi(3)
         vmsysnet(4)
         vmsysextra(5)
   vmhost(3)
         localhost(1)
         localhost(2)
         localhost(3)
         localhost(4)
```

Figure 1-4 VM-MIB and SS7-MIB Branches of OID Tree

Each object in the global MIB has a unique object identifier (OID). The OID identifies the position of the object in global MIB hierarchy. The position is determined by stringing together all numeric identifiers that lead to the object from the root.

For example, the OIDs for the two NP Config MIB modules are:

- VM-MIB OID: 1.3.6.1.4.1.1096.1.1
- SS7-MIB OID: 1.3.6.1.4.1.1096.1.2

In MIB modules, objects are either scalar or columnar (Figure 1-5). Scalar objects are objects for which only one instance is possible (they have only one value). Columnar objects are objects which may have multiple instances (many values are possible). In a MIB module, columnar objects are part of two-dimensional arrays called tables.

Figure 1-5 Scalar and Columnar Objects

For example, vmsysDiskTable is a table in the VM-MIB module (Figure 1-6). Each row in the vmsysDiskTable provides information about a different disk in the system. There are fifteen types of disk information in this table, corresponding to the fifteen columns. The first column is a number that identifies the disk (and row). The twelfth column is disk serial number (vmsysDiskSerialNum).

Figure 1-6 Model of vmsysDiskTable

MIB syntax

Every object within the MIB has an ASN.1 data description. The data description for an object includes its formal name, its allowable forms and value ranges, and its relationship to other objects in the global MIB. For example, here is the data description for vmsysDiskSerialNum:

```
vmsysDiskSerialNum  OBJECT-TYPE
   SYNTAX       DisplayString
   ACCESS        read-only
```

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```
STATUS        mandatory
DESCRIPTION
      The serial number of the disk drive.
::= ( vmsysDiskEntry 12)
```

The data description indicates the following:

- The object has a value that is a string (and no range is given).
- The object is read-only, meaning that the management station can inspect but not change this object.
- The status of the object is mandatory, meaning this object is currently supported in the SNMP agent (if status is obsolete, the object is no longer supported).
- The object is the twelfth columnar entry in a table. (Other lines in the VM-MIB module give the absolute pathway of the table back to the global MIB root.)

Note: NP Config MIB is written to the SNMPv1 standard. ASN.1 syntax in NP Config MIB corresponds to syntax supported by SNMPv1.

2 Installing NP Config MIB

NP Config MIB is bundled with NP Config SNMP and NP Config. This chapter describes how to install NP Config MIB at the network management station.

Before You Begin

NP Config MIB is provided on a 3.5-inch diskette. The diskette contains seven ASCII files that provide ASN.1 data definitions for all objects in NuPoint Messenger server private MIB modules: VM-MIB and SS7-MIB. Six of the ASCII files form the VM-MIB module (Table 2-1). The other file is the SS7-module.

Table 2-1 NP Config MIB Files

File	Description
system.mib	VM-MIB module; vmsystem subgroup
host1.mib	VM-MIB module; vmhost1 subgroup
host2.mib	VM-MIB module; vmhost2 subgroup
host3.mib	VM-MIB module; vmhost3 subgroup
host4.mib	VM-MIB module; vmhost4 subgroup
trap.mib	VM-MIB module; ctrap subgroup
ss7.mib	SS7-MIB module

Before attempting to load the files at the management station, do the following:

- Create a backup copy of the diskette.
- Check management station documents for the correct loading procedure. In particular, note the directory where the MIB files should be installed.

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Loading NP Config MIB Files

You load NP Config MIB files at the management station(s) to which the server is under management. You load the files in the appropriate MIB directory on the management station. For the location of that directory, refer to documents supplied with the management station.

The standard MIB modules are available on the Internet or may already be installed on the management station. For information on how to obtain standard MIB modules, see Appendix A, “References.”

3 Using NP Config MIB

This chapter introduces NuPoint Messenger server MIB variables and the content of NuPoint Messenger server MIB modules. It also gives tips on developing network management strategy.

MIB Variables

NuPoint Messenger server management information is available as MIB variables. The name of each variable and syntax of its value are defined in MIB modules supported by the server. The modules are either standard (defined in Internet RFCs) or private (defined for NuPoint Messenger). The NuPoint Messenger server supports the following four MIB modules:

- VM-MIB (private)
- SS7-MIB (private)
- MIB-2 (standard)
- DS1-MIB (standard)

Note: The series 6 server supports only a subset of the two standard MIB modules. For details, see Appendix B, “More About Standard MIB Support.”

Each of the four MIB modules must be installed on workstations that manage the NuPoint Messenger server. Most management stations have a specific directory set aside for this. Of course, the directory may contain MIB modules for other devices as well as the NuPoint Messenger server (other devices managed by that station).

In operation, the management station typically also maintains a database called the MIB database. MIB modules, whole or in part, are loaded from the MIB directory into the database as needed. The process of adding MIB modules to the MIB database is sometimes called compiling MIBs.

SNMP-based network management involves processing the values of MIB variables. The processing is initiated at management stations (except for traps, which are initiated at the NuPoint Messenger server). The mechanisms underlying the processing are the five SNMP messages: get request, get-next request, set request, get response, and trap.

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Standard MIB Modules

The MIB-2 and DS1-MIB modules are defined in RFC 1213 and RFC 1406, respectively. Like other standard MIB modules, MIB-2 and DS1-MIB have full-standards status as defined by the IETF (they have passed through a review process of an IETF working group).

MIB-2 Module

MIB-2 defines management information related to device connections. The information defined in MIB-2 can be grouped into eleven functional areas (Table 3-1).

All devices managed via SNMP must support at least a subset of MIB-2. In particular, the devices must support collection of statistics about TCP/IP connectivity.

Table 3-1 Groups in MIB-2 Module

Group	Description
system	Defines how the system is managed.
interfaces	Defines how to manage network interfaces.
at	Defines how to translate network to subnetwork address.
ip	Defines how to manage the IP protocol.
icmp	Defines how to manage the ICMP protocol.
tcp	Defines how to manage the TCP protocol.
udp	Defines how to manage the UDP protocol.
egp	Defines how to manage the EGP protocol.
cmot	A placeholder for definitions used with CMOT.
transmission	A placeholder for definitions, which are contained in other MIB modules, for managing transmission media.
snmp	Defines means to manage the SNMP protocol.

Note: The NuPoint Messenger server does not support the egp group. For details, see Appendix B, “More About Standard MIB Support.”

Figure 3-1 MIB Modules Supported by NuPoint Messenger

Most SNMP-based management stations come with MIB-2 installed. If MIB-2 is not installed, you must download it from the Internet and compile it into the MIB database. With respect to global MIB hierarchy, MIB-2 should be located within the mgmt(2) group (Figure 3-1).

DS1-MIB Module

DS1-MIB is an independent subgroup of MIB-2 (it is not supplied with MIB-2). DS1-MIB is one of several module extensions for managing transmission media connected to a network device.

DS1-MIB defines management information about digital trunk connections. Among the information it defines are the means of frame format, signaling, and line coding.

The DS1-MIB is necessary if the NuPoint Messenger server under management is connected to a T-1 or E-1 digital trunk. If the DS1-MIB is not already installed on the management station, you must download if from the Internet and compile it into the MIB database. DS1-MIB should be located within the transmission(10) group.

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The information defined by DS1-MIB can be grouped into three functional areas (Table 3-2).

Table 3-2 Groups in DS1-MIB Module

Group	Description
Near End	Defines statistics collected from the near end DS-1 interface.
Far End	Defines statistics collected from the far end DS-1 interface.
Fractional	Defines statistics about fractional use of the DS-1 interface.

Note: Of the three groups, the NuPoint Messenger server supports only portions of the Near End group (the Far End and Fractional groups are not supported). For details, see Appendix B, “More About Standard MIB Support.”

Private MIB Modules

NuPoint Messenger server private MIB modules are bundled with NP Config MIB. The VM-MIB module defines general status and configuration information. The SS7-MIB module defines information about SS7 integration. VM-MIB and SS7-MIB are described in detail in Chapter 4, “NP Config MIB Reference.”

Each management station allows you to view the content of its MIB database through a MIB browser. Typically, this is called browsing the MIB database, or browsing manageable objects. Through the browser, you can see the structure of each compiled MIB module and the objects contained in each.

Planning Management Strategy

NuPoint Messenger server network management strategy has three key dependencies: the capability of the management station, the number and type of NuPoint Messenger servers to be managed, and the goals of the management team. These dependencies make it difficult to be specific about planning management strategy. However, it is possible to give some general tips.

Management Station Capability

The first step in planning management strategy is to thoroughly understand the capability of the management station(s). That ensures no time is wasted in management plans that cannot be implemented.

Management stations vary in the amount of support provided for SNMP operations. Most allow simple MIB queries and provide a trap-handling mechanism. Most also provide a means to display alarms triggered by traps. However, the support for these features varies. For example, full-service management platforms such as HP OpenView provide controls to set alarm thresholds and execute automated polling of MIB variables. Other management platforms do not.

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Device Characteristics

The next step in planning management strategy is to thoroughly understand the device(s) to be managed. Where are they located? How are they configured? How are they expected to be used? What event indications are expected?

With regard to events, determine the severity of events expected and the priority for reporting those events. Are the events critical, major, minor, or informational? Should they initiate alarms at the management station(s)?

Many NuPoint Messenger server characteristics can be viewed as manageable resources. This allows you to set alarm thresholds. For example, the management station can monitor disk storage capacity. A threshold can be set on that MIB variable to trigger an alarm when the disk has approached, for example, 65% capacity.

In short, decide which MIB variables to monitor and at what frequency and against what thresholds.

Management Goals

After the management team understands the capacity of the management stations(s) and device(s) to be managed, it can set some goals. The goals can be stated in terms of metrics. For example, the team can attempt to keep the frequency of disk capacity alarms under a minimum amount per hours of NuPoint Messenger server usage.

The teams goals can balance the level of NuPoint Messenger server management with user needs and resources of the management organization.

4 NP Config MIB Reference

This chapter provides reference information on the NuPoint Messenger server private MIB modules, VM-MIB and SS7-MIB. It gives the OID tree structure of each module and puts the structure into context with the global MIB. It also lists and describes the objects in each module.

Note: This chapter does not give the ASN.1 syntax of each object type. For ASN.1 syntax, refer to ASCII files that correspond to each MIB module.

VM-MIB Module

The VM-MIB module defines basic management information for NuPoint Messenger servers. It specifies the NuPoint Messenger server modules (hosts) under management, the hardware and software characteristics of those hosts, and the content of event information coming from the hosts (via traps).

The VM-MIB module consists of three groups, which are themselves divided into subgroups. The three groups are:

- ctrap: Defines information on traps.

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- vmsystem: Defines information on basic system configuration.
- vmhost: Defines information specific to each host.

ctrap group

The ctrap group defines the content of event information and filters event indications sent to the management station. The ctrap group has two subgroups:

- trapCommon: Defines information on how events are reported.
- trapFilter: Defines information on what events are reported and from which host.

Figure 4-1 shows the OID tree structure of the ctrap group. It also shows objects on the global tree that precede the ctrap object.

```
root>iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
      >Centigram(1096)>series6cs>(1)>vm-mib(1)>

         ctrap(1)
            trapCommon(1)
                  errCode(1)
                  errSeverity(2)
                  errBriefDes(3)
                  errDetailDes(4)
                  errLocation(5)
                  errTimeStamp(6)
                  errParamList(7)
            trapFilter(2)
                  moduleIDFilter(1)
                  severityFilter(2)
                  messagetypeFilter(3)
                  subsystemFilter(4)
```

Figure 4-1 ctrap OID Subtree

trapCommon group

The trapCommon group defines the content of event information at the NuPoint Messenger server. The management station can retrieve this information after an event is indicated by a trap. The trapCommon group contains seven scalar object types, which are all read-only (Table 4-1).

Table 4-1 trapCommon Group

Object	Description
errCode	String (5 bytes) that identifies the event type.
errSeverity	Integer that indicates severity of the event; critical (3), major (5), minor (7), warning (9), informational (11).
errBriefDes	String (0-119 bytes) that is a brief description of the cause and effect of the event.
errDetailDes	String (0-119 bytes) that is a detailed description of the cause and effect of the event.
errLocation	String (0-63 bytes) that indicates where the event occurred.
errTimeStamp	String (0-31 bytes) that indicates when the event occurred.
errParamList	String (4 bytes) that indicates additional event parameters.

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trapFilter Group

The trapFilter group lets the management station configure trap filters. The filters specify which NuPoint Messenger server events are reported to the management station via traps. Trap filtering is based on where the events originate and event severity. The trapFilter group contains five scalar object types, which are all read-write (Table 4-2).

Table 4-2 trapFilter Group

Object	Description
moduleIDFilter	Integer that indicates which modules should send traps.
severityFilter	Integer that indicates which severity traps should be sent.
messagetypeFilter	Integer that specifies which event types should send traps.
subsystemFilter	String (0-31 bytes) that indicates which subsystem should send traps.

vmsystem Group

The vmsystem group identifies the NuPoint Messenger server and gives basic information on hardware and software configuration. For example, it provides the site name and code, number of modules and disks configured, and the number of optional (extra-cost) features installed. The vmsystem group consists of five subgroups:

- vmsysgeneral: Defines information on basic system configuration.
- vmsysdisk: Defines information on status of all system disks.
- vmsysscsi: Defines information specific to SCSI disks.
- vmsysnet: Defines information on network connections.
- vmsysextra: Defines information on optional features.

Figure 4-2 shows the OID tree structure of the vmsystem group. It also shows objects on the global tree that precede the vmsystem object.

```
root>iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
      >Centigram(1096)>series6cs>(1)>vm-mib(1)>

vmsystem(2)
      vmsysgeneral(1)
            vmsysSiteName(1)
            vmsysSiteCode(2)
            vmsysModel(3)
            vmsysRelease(4)
            vmsysRevision(5)
            vmsysRevDate(6)
            vmsysHostCount(7)
            vmsysScsiCount(8)
            vmsysDiskCount(9)
            vmsysQNXPartitionUsage(10)
            vmsysNetCount(11)
            vmsysHostAvail(12)
            vmsysNetAvail(13)
            vmsysExtraCostCount(14)
            vmsysSs7IsupAvail(15)
            vmsysT1E1CardAvail(16)
      vmsysdisk(2)
            vmsysDiskTable (1)
                  vmsysDiskEntry(1)
                        vmsysDiskIndex(1)
```

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```
                        vmsysDiskType(2)
                        vmsysDiskId(3)
                        vmsysDiskRedundantId(4)
                        vmsysDiskCapacity(5)
                        vmsysDiskServiceStat(6)
                        vmsysDiskVMSyncStat(7)
                        vmsysDiskConfigType(8)
                        vmsysDiskQNXSyncStat(9)
                        vmsysDiskSpeechHour(10)
                        vmsysDiskAccounts(11)
                        vmsysDiskSerialNum(12)
                        vmsysDiskVendor(13)
                        vmsysDiskModel(14)
                        vmsysDiskRevision(15)
      vmsysscsi(3)
            vmsysScsi1(1)
            vmsysScsi2(2)
            vmsysScsi3(3)
            vmsysScsi4(4)
      vmsysnet(4)
            vmsysNetTable(1)
                  vmsysNetEntry(1)
                        vmsysNetIndex(1)
                        vmsysNetType(2)
                        vmsysNetHostComb(3)
      vmsysextra(5)
            vmsysExtraCostTable(1)
                  vmsysExtraCostEntry(1)
                        vmsysExtraCostIndex(1)
                        vmsysExtraCostFeature(2)
```

Figure 4-2 vmsystem OID Subtree

vmsysgeneral Group

The vmsysgeneral group identifies a NuPoint Messenger server and indicates its basic hardware and software configuration. It contains sixteen scalar object types, which are read-only (Table 4-3).

Table 4-3 vmsysgeneral Group

Object	Description
vmsysSiteName	String (0-60 bytes) that indicates the system site name.
vmsysSiteCode	String (0-10 bytes) that indicates the system site code.
vmsysModel	Integer that indicates the server model; other models (1), models 120R and 120S (2), model 640 (3), model 70 (4).
vmsysRelease	String (0-255 bytes) that indicates the system software release.
vmsysRevision	String (0-255 bytes) that indicates the system software revision.
vmsysRevDate	String (0-31 bytes) that indicates the system software revision date.
vmsysHostCount	Integer that indicates the number of hosts in the system.
vmsysScsiCount	Integer that indicates the number of SCSI buses in the system.
vmsysDiskCount	Integer that indicates the number of disks in the disk subsystem.
vmsysQNXPartitionUsage	String (0-40 bytes) that indicates the system disk usage in the QNX partition.
vmsysNetCount	Integer that indicates the number of network cards in the system.
vmsysHostAvail	Integer that indicates the available hosts in the system. Any combination of four hosts might be available, as described in Appendix C.

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vmsysNetAvail	Integer that indicates the available networks in the system. Any combination of nine networks might be possible, as described in Appendix C.
vmsysExtraCostCount	Integer that indicates the number of extra-cost features in the system.
vmsysSs7IsupAvail	Integer that indicates whether or not the SS7 card is configured for ISUP; is not present or is configured for BT/NUP (0), is configured for ISUP (1).
vmsysT1E1CardAvail	Integer that indicates whether or not the T1/E1 driver is present.

vmsysdisk Group

The vmsysdisk group gives status information on all disks in the system. It contains a table with fifteen columnar object types, which are read-only (Table 4-4)

Table 4-4 vmsysdisk Group (vmsysDiskTable)

Object	Description
vmsysDiskIndex	Integer (1-8) that indicates the table row number (disk ID).
vmsysDiskType	Integer that indicates the disk drive type; single (1), primary (2), redundant (3).
vmsysDiskID	String (0-10 bytes) that indicates the scsi_bus:scsi_id pair to identify a disk drive.
vmsysDiskRedundantID	Integer (0-10) that indicates the disk ID of the redundant disk of this disk.
vmsysDiskCapacity	Integer that indicates the disk drive capacity.
vmsysDiskServiceStat	Integer that indicates the service status of the disk; disk_in_service (1), disk_out_of_service (2).
vmsysDiskVMsyncStat	Integer that indicates the synchronization status of the disk; vm_in_sync (1), vm_out_of_sync (2), not_applicable (3).
vmsysDiskConfigType	Integer that indicates the disk drive configuration type; system (1), non-system (2).
vmsysDiskQNXSyncStat	Integer that indicates the QNX synchronization status of the system disk; qnx_in_sync (1), qnx_out_of_sync (2), not_applicable (3).
vmsysDiskSpeechHour	Integer that indicates the speech hour in the disk.
vmsysDiskAccounts	Integer that indicates the accounts in the disk.
vmsysDiskSerialNum	String that indicates the serial number of the disk drive.
vmsysDiskVendor	String that indicates the vendor who produced the disk drive.
vmsysDiskModel	String that indicates the disk drive model.
vmsysDiskRevision	String (0-20 bytes) that indicates the disk drive revision.

vmsysscsi Group

The vmsysscsi group indicates the number of SCSI disks available on each SCSI bus. It contains four scalar object types, which are read-only (Table 4-5). For each of these object types, any combination of eight disks might be available, as described in Appendix C.

Table 4-5 vmsysscsi Group

Object	Description
vmsysScsi1	Integer that indicates the number of disks available on SCSI 1.
vmsysScsi2	Integer that indicates the number of disks available on SCSI 2.

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vmsysScsi3	Integer that indicates the number of disks available on SCSI 3.
vmsysScsi4	Integer that indicates the number of disks available on SCSI 4.

vmsysnet Group

The vmsysnet group indicates the Ethernet and NP Net connections on the system. It contains a table with three columnar object types, which are read only (Table 4-6).

Table 4-6 vmsysnet Group (vmsysNetTable)

Object	Description
vmsysNetIndex	Integer that indicates the table row number (logical network ID).
vmsysNetType	String that indicates the network type.
vmsysNetHostComb	Integer that indicates which hosts are connected to this network. Any combination of four hosts might be connected, as described in Appendix C.

vmsysextra Group

The vmsysextra group indicates the optional features installed on the system. It contains a table with two columnar object types, which are read-only (Table 4-7).

Table 4-7 vmsysextra Group (vmsysExtraTable)

Object	Description
vmsysExtraCostIndex	Integer that indicates the table row number.
vmsysExtraCostFeature	String (0-50 bytes) that indicates the optional feature installed.

vmhost Group

The vmhost group gives detailed information on hardware and software configuration of each host. The vmhost group has four subgroups:

- localhost1
- localhost2
- localhost3
- localhost4

Each has identical content.

Figure 4-3 shows the OID tree structure of localhost1 of the vmhost group. It also shows objects on the global tree that precede the vmhost object.

localhost1 Group

The localhost1 group gives detailed information on the server module designated host1. The localhost1 group consists of three subgroups:

- hostGeneral: Defines information about general status and configuration.

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- hostCard: Defines information specific to line cards in the host.
- hostLinePort: Defines information specific to ports on each line card.

localhost2, localhost3, and localhost4 Groups

The structure and content of the localhost2, localhost3, and localhost4 groups are identical to that of localhost1.

```
root>iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
      >Centigram(1096)>series6cs>(1)>ss7-mib(2)>

vmhost(3)
      localhost1(1)
            hostGeneral(1)
                  hostNodeID(1)
                  hostCpuType(2)
                  hostCpuSpeed(3)
                  hostQNXReleaseVersion(4)
                  hostMachineType(5)
                  hostUpTime(6)
                  hostCurrentTime(7)
                  hostMemoryUsage(8)
                  hostLogPartitionUsage(9)
                  hostFloppyType(10)
            hostCard(2)
                  hostCardTable(1)
                        hostCardEntry(1)
                              hostCardPhysicalSlot(1)
                              hostCardLogicalSlot(2)
                              hostCardType(3)
            hostLineTable(2)
                  hostLineEntry(1)
                              hostLineSlot(1
                              hostLineCardType(2))
                              hostLineStatus(3)
                              hostLineAddress(4)
                              hostLinePortNumber(5)
            hostEtherTable(3)
                  hostEtherEntry(1)
                              hostEtherSlot(1)
                              hostEtherCardType(2)
                              hostEtherPhysicalID(3)
                              hostEtherIOPort(4)
                              hostEtherIRQ(5)
            hostMesaTable(4)
                  hostMesaEntry(1)
                              hostMesaSlot(1)
                              hostMesaPhyNodeID(2)
                              hostMesaIOPort(3)
                              hostMesaIRQ(4)
      hostLinePort(3)
            hostLinePortTable(1)
                  hostLinePortEntry(1)
                              hostLinePortIndex(1)
                              hostLinePortModule(2)
                              hostLinePortSlot(3)
                              hostLinePortPort(4)
                              hostLinePortGroup(5)
                              hostLinePortStatus(6)
                              hostLinePortTrunkType(7)
      localhost2(2)...
(Content of localhost2(2), localhost3(3), and localhost4(4) identical to
localhost1(1))
```

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Figure 4-3 vmhost OID Subtree

hostGeneral Group

The hostGeneral group gives general configuration and status information on the host. It contains ten scalar object types, which are read-only (Table 4-8).

Table 4-8 hostGeneral Group

Object	Description
hostNodeID	Integer that indicates the table row number (host ID).
hostCpuType	Integer that indicates the CPU type on the host; i8086 (1), i80186 (2), i80286 (3), i80386 (4), i80486 (5), pentium (6).
hostCpuSpeed	Integer that indicates the CPU speed on the host.
hostQNXReleaseVersion	String (0-20 bytes) that indicates the QNX release and version number.
hostMachineType	String (0-20 bytes) that indicates the machine type of the host.
hostUpTime	TimeTicks that indicate the time (in hundredths of a second) since the host was last booted.
hostCurrentTime	String (0-40) bytes that indicate the current date and time on the host.
hostMemoryUsage	String (0-40) bytes that indicates the memory usage on the host.
hostLogPartitionUsage	String (0-40 bytes) that indicates the disk usage of log partition on the host.
hostFloppyType	Integer that indicates the floppy drive capacity, in kbytes; floppy-unknown (1), floppy-360k (2), floppy-1440k (3).

hostCard Group

The hostCard group gives detailed information on all cards installed in the host. It contains four tables: hostCardTable, hostLineTable, hostEtherTable, and hostMesaTable. The hostCardTable identifies all cards in the host. The other three tables give information specific to line cards, Ethernet cards, and NP Net cards (Table 4-9). Note that all object types are columnar and read-only.

Table 4-9 hostCard Group (Four Tables)

Object	Description
hostCardTable	(Identifies all cards in the host.)
hostCardPhysicalSlot	Integer that indicates the physical slot number.
hostCardLogicalSlot	Integer that indicates the logical slot number.
hostCardType	Integer that indicates the card type; other (1), lc8 (2), dsp24 (3), dsp30 (4), t1 (5), e1 (6) fax2 (7), fax4 (8), fax8 (9), ss7 (10), voicerec (11), empty (13), cti (14), cpu (15), ether (16), q-net (17), serial (18), power (19).
hostLineTable	(Gives specifics about line cards.)
hostLineSlot	Integer that indicates the physical slot number.
hostLineCardType	Integer that indicates the type of line card; other (1), lc8 (2), dsp24 (3), dsp30 (4), t1 (5), e1 (6) fax2 (7), fax4 (8), fax8 (9), ss7 (10), voicerec (11), dsp8 (12), empty (13).
hostLineStatus	Integer that indicates the desired line card status; empty (1), not configured (2), in_service (3).
hostLineAddress	Integer (0-FFFFFFFFh) that indicates the I/O address of a line card.

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hostLinePortNumber	Integer that indicates the number of ports available on the line card.
hostEtherTable	(Gives specifics about Ethernet cards.)
hostEtherSlot	Integer that indicates the logical network ID of the Ethernet card.
hostEtherCardType	String (0-40 bytes) that indicates the Ethernet card type.
hostEtherPhysicalID	String (0-40 bytes) that indicates the physical ID of the Ethernet card.
hostEtherIOPort	String (0-40 bytes) that indicates the I/O port of the Ethernet card.
hostEtherIRQ	Integer that indicates the hardware interrupt of the Ethernet card.
hostMesaTable	(Gives specifics about NP Net cards.)
hostMesaSlot	Integer that indicates the logical network ID of the Mesa-Net card.
hostMesaPhyNodeID	Integer that indicates the physical node ID of the Mesa-Net card.
hostMesaIOPort	String (0-40 bytes) that gives the I/O port of the NP Net card.
hostMesaIRQ	Integer that indicates the hardware interrupt of the NP Net card.

hostLinePort Group

The hostLinePort group gives information about the ports on each line card. It contains a table with seven columnar object types, which are read-only (Table 4-10).

Table 4-10 hostLinePort Group (hostLinePortTable)

Object	Description
hostLinePortIndex	Integer (0-511) that indicates the logical port number.
hostLinePortModule	Integer (1-4) that indicates the host (module) number containing this port.
hostLinePortSlot	Integer (0-15) that indicates the slot number of the line card containing this port.
hostLinePortPort	Integer (0-59) that indicates the line port number.
hostLinePortGroup	Integer that indicates the line group index number, from the line group table.
hostLinePortStatus	Integer that indicates the status of the line port; not_assigned (1), out_of_service (2), in_service (3).
hostLinePortTrunkType	Integer that indicates the operational state of the line port; other (1), analog_EnM (2), analog_loop_start (3), analog_did (4), analog_ground_start (5), digital_EnM (6), digital_loop_start (7), digital_did (8), digital_ground_start (9), digital_common_channel (10), not_configured (11).

SS7-MIB Module

The SS7-MIB module defines basic information for an SS7 integration on a NuPoint Messenger server. It specifies object types that represent basic integration parameters, ISDN User Part (ISUP) parameters, and Message Transfer Part (MTP) parameters. The SS7-MIB module consists of three groups:

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- ss7info: Defines information on basic SS7 configuration.
- isup: Defines information on SS7 ISUP configuration.
- vmmtp: Defines information on SS7 MTP configuration.

ss7info Group

The ss7info group identifies the SS7 integration and gives basic information on hardware and software configuration. For example, it provides the integration number and name, the location of the SS7 card (board), and the settings for source and destination point codes.

Figure 4-4 shows the OID tree structure of the ss7info group. It also shows objects on the global tree that precede the ss7info object.

```
ss7info(1)
      ss7InfoIntgTable(1)
            ss7InfoIntgEntry(1)
                  ss7InfoIntgNum(1)
                  ss7InfoIntgModule(2)
                  ss7InfoIntgCount(3)
                  ss7InfoIntgIName(4)
                  ss7InfoIntgDPC(5)
                  ss7InfoIntgSPC(6)
                  ss7InfoIntgSSF(7)
                  ss7InfoIntgSLC(8)
      ss7InfoBoardTable(2)
            ss7InfoBoardEntry(1)
                  ss7InfoBoardNum(1)
                  ss7InfoBoardIntgNum(2)
                  ss7InfoBoardCirCount(3)
                  ss7InfoBoardCICBase(4)
                  ss7InfoBoardModule(5)
                  ss7InfoBoardSlot(6)
                  ss7InfoBoardLinkNum(7)
```

Figure 4-4 ss7info OID Subtree

The ss7info group contains two tables: infoIntgTable and infoBoardTable. The infoIntgTable contains information about general SS7 configuration parameters. The infoBoardTable contains information about the SS7 card (Table 4-11). Note that all object types are columnar and read-only.

Table 4-11 ss7info Group (Two Tables)

Object	Description
ss7InfoIntgTable	(Gives general SS7 parameters.)
ss7infoIntgNum	Integer that indicates the SS7 integration number.
ss7InfoIntgModule	Integer that indicates the host (module) that contains the integration.
ss7InfoIntgCount	Integer (0-140) that indicates the number of lines allocated to the integration
ss7InfoIntgName	String (0-255) that indicates the integration name.
ss7InfoIntgDPC	String that indicates the SS7 destination point code.
ss7InfoIntgSPC	String that indicates the SS7 source point code.
ss7InfoIntgSSF	Integer that indicates the SS7 subservice field.
ss7InfoIntgSLC	Integer that indicates the SS7 signaling link code.
ss7InfoBoardTable	(Gives specifics about the SS7 card.)
ss7InfoBoardNum	Integer that indicates the number of the table row.

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ss7InfoBoardIntgNum	Integer that indicates the SS7 integration number associated with the card.
ss7InfoBoardCirCount	Integer that indicates the number of circuits on the board.
ss7InfoBoardCICBase	Integer that indicates the Circuit Identification Code (CIC) offset for the card.
ss7InfoBoardModule	Integer that indicates the host (module) that contains the board.
ss7InfoBoardSlot	Integer that indicates the MVIP slot the card occupies.
ss7InfoBoardLinkNum	Integer that indicates the number of SS7 links on the card.

isup Group

The isup group provides information about the SS7 ISUP configuration. ISUP is the call control part of the SS7 protocol that sets up, coordinates, and tears down calls on an SS7-controlled network.

Figure 4-5 isup OID Subtree shows the OID tree structure of the isup group. It also shows objects on the global tree that precede the isup object.

```
iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
      >Centigram(1096)>series6cs>(1)>ss7-mib(2)>

isup(2)
      isupCirMaintTable(1)
            isupCirMaintEntry(1)
                  isupCirModule(1)
                  isupCirSlot(2)
                  isupCirPort(3)
                  isupCirMode(4)
                  isupCirBlock(5)
                  isupCirBlockAck(6)
                  isupCirUnblock(7)
                  isupCirUnblkAck(8)
                  isupCirReset(9)
                  isupCirGrpBlk(10)
                  isupCirGrpBlkAck(11)
                  isupCirGrpUnblk(12)
                  isupCirGrpUnblkAck(13)
                  isupCirGrpReset(14)
                  isupCirGrpResetAck(15)
                  isupCirQueryMsg(16)
                  isupCirQueryRsp(17)
      isupSigMsgTable(2)
            isupSigMsgEntry(1)
                  isupSigSPC(1)
                  isupSigMode(2)
                  isupSigInitAdr(3)
                  isupSigAdrCmplt(4)
                  isupSigAnswer(5)
                  isupSigRel(6)
                  isupSigRelCmplt(7)
                  isupSigCon(8)
                  isupSigSusp(9)
                  isupSigResm(10)
                  isupSigCallModReq(11)
                  isupSigCallModRej(12)
                  isupSigCallModCom(13)
                  isupSigProgress(14)
```

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```
isupSigUneqCirId(15)
isupSigUsrToUsr(16)
isupSigSubsAdr(17)
isupSigFac(18)
isupSigFacAck(19)
isupSigFacRej(20)
isupSigOverId(21)
isupSigInfoReq(22)
isupSigInfo(23)
isupSigForw(24)
isupSigConChkReq(25)
isupSigConti(26)
isupSigPassAlong(27)
isupSigCirReserve(28)
isupSigCirResAck(29)
```

Figure 4-5 isup OID Subtree

The isup group contains two tables: isupCirMainTable and isupSigMsgTable. The isupCirMainTable contains information about the ISUP circuits. The isupSigMsgTable contains information about signaling on the ISUP circuits (Table 4-12). Note that all object types are columnar and read-only

Table 4-12 isup Group (two tables)

Object	Description
isupCirMaintTable	(Gives information about ISUP circuits.)
isupCirModule	Integer that indicates the host (module) the circuit belongs to (first in triplets).
isupCirSlot	Integer that indicates the slot number the circuit belongs to (second in triplets).
isupCirPort	Integer that indicates the port number the circuit belongs to (third in triplets).
isupCirMode	Integer that indicates the ISUP circuit maintenance messages transmission mode; transmitted (1), received (2).
isupCirBlock	Integer that indicates the total number of blocking messages (BLO) transmitted or received.
isupCirBlockAck	Integer that indicates the total number of blocking acknowledge messages (BLA) transmitted or received.
isupCirUnblock	Integer that indicates the total number of unblocking messages transmitted (UBL) transmitted or received.
isupCirUnblkAck	Integer that indicates the total number of unblocking acknowledge messages (UBA) transmitted or received.
isupCirReset	Integer that indicates the total number of Reset Circuit messages (RSC) transmitted or received.
isupCirGrpBlk	Integer that reflects the total number of Circuit Group Blocking (CGB) messages transmitted or received.
isupCirGrpBlkAck	Integer that indicates the total number of Circuit Group Blocking Acknowledge (GBA/CGBA) messages transmitted or received.
isupCirGrpUnblk	Integer that indicates the total number of Circuit Group Unblocking (CGU) messages transmitted or received.
isupCirGrpUnblkAck	Integer that indicates the total number of Circuit Group Unblocking Acknowledge (CGUA/GUA) messages transmitted or received.
isupCirGrpReset	Integer that indicates the total number of Circuit Group Reset (CRS) messages transmitted or received.

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isupCirGrpResetAck	Integer that indicates the total number of Circuit Group Reset Acknowledge (GRA) messages transmitted or received.
isupCirQueryMsg	Integer that indicates the total number of Circuit Group Query (CQM/GQM) messages transmitted or received.
isupCirQueryRsp	Integer that indicates the total number of Circuit Query Response (CQR) messages transmitted or received.
isupSigMsgTable	(Gives information about ISUP signaling.)
isupSigSPC	String that indicates the SS7 integration source point code in ISUP signaling messages.
isupSigMode	Integer that indicates the ISUP signaling messages transmission mode; transmitted (1), received (2).
isupSigInitAdr	Integer that indicates the total number of Initial Address Messages (IAM) transmitted or received.
isupSigAdrCmplt	Integer that indicates the total number of Address Complete Message (ACM) transmitted or received.
isupSigAnswer	Integer that indicates the total number of Answer (ANM/ANS) messages transmitted or received.
isupSigRel	Integer that indicates the total number of Release (REL) messages transmitted or received.
isupSigRelCmplt	Integer that reflects the total number of Release Complete (RLC) messages transmitted or received.
isupSigCon	Integer that indicates the total number of Connect (CON) messages transmitted or received.
isupSigSusp	Integer that indicates the total number of Suspend (SUS) messages transmitted or received.
isupSigResm	Integer that indicates the total number of Reset Circuit messages (RSC) transmitted or received.
isupSigCallModReq	Integer that indicates the total number of Call Modification Request (CMR) messages transmitted or received.
isupSigCallModRej	Integer that indicates the total number of Call Modification Reject (CRJ) messages transmitted or received.
isupSigCallModCom	Integer that indicates the total number of Call Modification Complete (CMC) messages transmitted or received.
isupSigProgress	Integer that indicates the total number of Call Progress (CPG/PRG) messages transmitted or received.

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isupSigUneqCirId	Integer that indicates the total number of Unequipped Circuit Identification code (USIS/UCI) messages transmitted or received.
isupSigUsrToUsr	Integer that indicates the total number of User-to-User Information (USR/USU) messages transmitted or received.
isupSigSubsAdr	Integer that indicates the total number of Subsequent Address Messages (SAM) transmitted or received.
isupSigFac	Integer that indicates the total number of Facility Request (FAR) messages transmitted or received.
isupSigFacAck	Integer that indicates the total number of Facility Accepted (FAA) messages transmitted or received.
isupSigFacRej	Integer that reflects the total number of Facility Reject (FRJ) messages transmitted or received.
isupSigOverId	Integer that reflects the total number of Overload Messages (OLM) transmitted or received.
isupSigInfoReq	Integer that indicates the total number of Information Request (INR) messages transmitted or received.
isupSigInfo	Integer that indicates the total number of Information (INF) messages transmitted or received.
isupSigForw	Integer that indicates the total number of Forward Transfer (FOT) messages transmitted or received.
isupSigConChkReq	Integer that indicates the total number of Continuity Check Request (CCR) messages transmitted or received.
isupSigConti	Integer that indicates the total number of Continuity (COT) messages transmitted or received.
isupSigPassAlong	Integer that indicates the total number of Pass-Along Messages (PAM) transmitted or received.
isupSigCirReserve	Integer that indicates the total number of Circuit Reservation Messages (CRM) transmitted or received.
isupSigCirResAck	Integer that indicates the total number of Circuit Reservation Acknowledgment (CRA) messages transmitted or received.

vmmtp Group

The vmmtp group provides information about the SS7 MTP configuration. MTP controls the

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physical and data link layers of SS7 transmissions. It routes signaling messages between signaling points and controls the flow of data packets to their correct locations.

Figure 4-6 shows the OID tree structure of the vmmtp group. It also shows objects on the global tree that precede the vmmtp object.

```
root>iso(1)>org(3)>dod(6)>internet(1)>private(4)>enterprises(1)
      >Centigram(1096)>series6cs>(1)>ss7-mib(2)>

vmmtp(3)
      mtpStatusTable(1)
            mtpStatusEntry(1)
                  mtpStatModule(1)
                  mtpStatSlot(2)
                  mtpStatLink(3)
                  mtpStatIntg(4)
                  mtpStatSPC(5)
                  mtpStatus(6)
```

Figure 4-6 vmmtp OID Subtree

The vmmtp group contains one table: mtpStatusTable. It contains six columnar object types, which are all read-only (Table 4-13)

Table 4-13 vmmtp Group (mtpStatusTable)

Object	Description
mtpStatModule	Integer that indicates the host (module) that contains the SS7 link.
mtpStatSlot	Integer that indicates the slot in which the SS7 link resides.
mtpStatLink	Integer that indicates the number of signaling links configured for the SS7 card.
mtpStatIntg	Integer that indicates the SS7 integration number associated with the link.
mtpStatSPC	Integer that indicates the source point code (SPC) associated with the link.
mtpStatus	Integer that indicates the MTP link status; in_service (1), out_of_service (2), aligning (3), align_not_ready (4), aligned_ready (5), processor_outage (6), not_available (7), not_configured (8).

Appendix A - References

This appendix lists reference information that can be useful in understanding and applying NP Config MIB.

Background Information

Many texts provide background information on SNMP-based network management. Following is a small cross-section:

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- S. Feit. *SNMP: A Guide to Network Management*, McGraw-Hill, New York, NY, 1995. ISBN 0-07-020359-8.
- M. Rose, K. McCloghrie. *How to Manage Your Network Using SNMP: The Network Management Practicum*, Prentice Hall, Englewood Cliffs, NJ, 1995. ISBN 0-13-141517-4.
- W. Stallings. *SNMP, SNMPv2 and RMON: Practical Network Management (Second Edition)*, Addison-Wesley, Reading, Massachusetts, 1996. ISBN 0-201-63479-1.
- A. Leinwand, K. Fang Conroy. *Network Management: A Practical Perspective*, Addison-Wesley, Reading, MA, 1996. ISBN 0-201-60999-1.
- D.Perkins, E. McGinnis. *Understanding SNMP MIBs*, Prentice Hall, Upper Saddle River, NJ, 1997. ISBN 0-13-437708-7.

Requests for Comments

SNMP standards are documented in Internet Engineering Task Force (IETF) Requests for Comments (RFCs). The following RFCs relate to NP Config MIB architecture and contents.

- RFC 1213. K. McCloghrie, M. Rose, "Management Information Base for Network Management of TCP/IP-based Internets: MIB-II," 1991.
- RFC 1406. F. Baker, J. Watt. "Definitions of Managed Objects for the DS1 and E1 Interface Types, DS1/E1-MIB," 1993.
- RFC 1157. J. Case, M. Fedor, M. Schoffstall, J. Davin."A Simple Network Management Protocol (SNMP)," 1990.
- RFC 1212. M. Rose, K. McCloghrie, "Concise MIB Definitions," 1991.

Note: RFCs are available on the World Wide Web. For information on locating and obtaining RFCs, check the IETF Web page:

http://www.ietf.org

Appendix B - More About Standard MIB Support

This appendix provides additional information on NuPoint Messenger server support of MIB-2 and DS1-MIB modules.

MIB-2 Support

MIB-2 defines a core set of management information related to a TCP/IP network connection. Some or all of MIB-2 is supported by all SNMP-capable devices. The MIB-2 specification is documented in RFC-1213.

The NuPoint Messenger server supports all of MIB-2, with the following exceptions:

- Object ifSpeed of the interface table is not supported
- Object ifSpecific of the interface table is not supported.
- Object ipRoutingDiscards of the ip table is not supported.

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- Object ipAdEntReasmMaxSize of the ipAddrTable is not supported.
- EGP Group is not supported.

Note: Objects that are not supported show “0” when they are viewed through a management station MIB browser.

DS1-MIB Support

The DS1-MIB defines management information related to DS1 digital trunk interfaces, including T1 and E1. The DS1-MIB specification is documented in RFC-1406.

The DS1-MIB has three groups: DS1 Near End Group, DS1 Far End Group, and DS1 Fractional Group. The NuPoint Messenger server supports only portions of the DS1 Near End Group (no parts of the DS1 Far End Group and DS1 Fractional Group are supported).

The DS1 Near End Group has four tables: DS1 Configuration Table, DS1 Current Table, DS1 Interval Table, and DS1 Total Table. The NuPoint Messenger server supports only portions of the DS1 Configuration Table and DS1 Total Table (no parts of the DS1 Current Table and DS1 Interval Table are supported).

The NuPoint Messenger server supports the DS1 Configuration Table and DS1 Total Table with the following exceptions:

- Object dsx1Fdl of the dsx1ConfigTable is not supported.
- Values dsx1E1-MF and dsx1E1-CRC are not supported in the object dsx1LineType of dsx1ConfigTable.
- Only value dsx1SendNoCode is supported in the object dsx1SendCode of the dsx1ConfigTable.
- Only value dsx1NoLoop is supported in the object dsx1LoopbackConfig of dsx1ConfigTable.
- Value bitOriented is not supported in the object dsx1SignalMode of the dsx1ConfigTable.
- Value throughTiming is not supported in the dsx1TransmitClockSource of dsx1ConfigTable.
- Objects dsx1TotalSESs, dsx1TotalSEFSs, dsx1TotalBESs, dsx1TotalDMs, and dsx1TotalLCVs of dsx1TotalTable are not supported.

Note: Objects that are not supported show “0” when they are viewed through a management station MIB browser.

Appendix C - Binary-Decimal Encoding Scheme

This appendix describes the encoding scheme used to determine values of several objects in VM-MIB.

What Is the Encoding Scheme?

The values of several objects in VM-MIB are determined with a binary-decimal encoding scheme. The encoding scheme allows sets of numbers to be represented by a single decimal integer. For

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example, consider the case of the vmsysHostAvail object in the vmsysgeneral group.

vmsysHostAvail indicates available hosts in a system. For a Series 640 system, this could be any one of four hosts: host 1, host 2, host 3 or host 4. It also could be any combination of the four hosts: hosts 2 and 1, hosts 3 and 1, hosts 3, 2, and 1, and so forth.

Host Set	Binary Value	Decimal Value
Host 1 available.	0001	1
Host 2 available.	0010	2
Hosts 2 & 1 available.	0011	3
Host 3 available.	0100	4
Hosts 3 & 1 available.	0101	5
Hosts 3 & 2 available.	0110	5
Hosts 3, 2, & 1 available.	0111	7
Host 4 available.	1000	8
Host 4 & 1 available.	1001	9
Hosts 4 & 2 available.	1010	10
Hosts 4 & 3 available.	1100	11
Hosts 4, 2, & 1 available.	1011	12
Hosts 4, 3, & 1 available.	1101	13
Hosts 4, 3, & 2 available.	1110	14
Hosts 4, 3, 2, & 1 available.	1111	15

Using the binary-decimal encoding scheme, you can quickly determine the decimal integer that represents each host set. You first encode the host set as a binary integer. You then convert the binary integer to decimal.

To encode host sets, construct a simple matrix (Figure C-1). In the first row, put the number that indicates each host (in ascending order, from right to left). In the second row, indicate if the host is available (put a “1” under each host that is available; a “0” under each host that is not available).

Figure C-1 Example 4 x 2 Matrix

For example, assume hosts 1, 2, and 3 are available. That results in the following pattern of “1s” and “0s” in the second row of the matrix: 0111.

The pattern of “1s” and “0s” in the matrix can be viewed as a binary integer. You can convert that integer to decimal to find the decimal integer that represents the host set. For example, when hosts 1, 2, and 3 are available, the set is encoded as a decimal 7 (Figure C-2).

Figure C-2 Example 4 x 2 Matrix Yields 7

Objects With Many Values

This binary-decimal encoding scheme is used for all objects in VM-MIB that, like vmsysHostAvail, have values that may be sets of numbers. For some of these objects, hundreds of such sets may be possible. The encoding scheme provides a systematic way to quickly determine the decimal integer value for each set, even with hundreds of possible values.

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For a more complex example, consider the vmsysNetAvail object of the vmsysgeneral group. vmsysNetAvail indicates the number of networks available to the system at a given time.

A Series 640 system can support up to nine networks. Because any of the nine can be available at one time, that results in 255 possible network sets.

Following are the first seven network sets:

Network Set	Binary Value	Decimal Value
Network with logical id as 1.	00000001	1
Network with logical id as 2.	00000010	2
Network with logical id as 2 & 1.	00000011	3
Network with logical id as 3.	00000100	4
Network with logical ids as 3 & 1.	00000101	5
Network with logical ids as 3 & 2.	00000110	6
Network with logical ids as 3, 2, & 1.	00000111	7

Note: Only first seven values shown of 255 possible values.

As in the previous example, you can determine any possible value of this object by constructing a simple matrix (Figure C-3). In this case, the matrix has nine columns and two rows (a 9 x 2 matrix). The first row contains numbers that indicate network (logical) ids. The second row indicates whether or not each network is available (as in the previous example, a “1” under each number indicates available; a “0” under each number indicates not available).

In this example, networks 7,6, 4, and 2 are available. Converting this binary number to decimal, the resulting integer is decimal 106 (Figure C-4).

In a similar manner, you can determine each of the other 254 possible values of vmsysNetAvail.

Figure C-3 Example 9 x 2 Matrix

Figure C-4 Example 9 x 2 Matrix Yields 106

Besides vmsysHostAvail and vmsysNetAvail, the binary-decimal encoding scheme is used for five other VM-MIB objects: vmsysScsi1, vmsysScsi2, vmsysScsi3, vmsysScsi4, and vmsysNetHostComb.

For the vmsysScsi*n* objects, any combination of eight disks might be available (connected) on a SCSI bus. That results in a 8x2 matrix to encode disk sets (Figure C-5). Up to 127 combinations of disks are possible.

Figure C-5 Example 8 x 2 Matrix

Following are some possible sets and their binary and decimal values:

Disk Set	Binary Value	Decimal Value
Disk 1 available.	0000001	1
Disk 2 available.	0000010	2
Disks 2 &1 available.	0000011	3
Disk 3 available.	0000100	4

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Disk 3 & 1 available.	0000101	5
Disks 3 & 2 available.	0000110	6
Disks 3, 2, & 1 available.	00000111	7

Note: Only first seven values shown of 127 possible values.

For the vmsysNetHostComb object, any combination of four hosts might be available. The process of encoding values for this object is identical to that for vmsysHostAvail, described in the first example of this appendix.

Glossary

Abstract Syntax Notation One (ASN.1) A formal language used to define syntax. In the case of SNMP, ASN.1 defines syntax of objects.

ACCESS An element of OBJECT-TYPE that defines the way in which a variable of that object type can be accessed.

agent In SNMP terms, software running on a network device that responds to a manager's request to inspect or change management information.

alarm A graphic or audible signal that an event was indicated.

atomic object A leaf on the OID MIB tree (a MIB object type that cannot be resolved into another object type). Each atomic object represents a type of management information.

client-server computing Computing that is divided between activities requested by an end user or program (client) and resource responses (server) to the activities requests.

datagram A packet that carries information across a network without need for a connection between source and target devices.

E-1 The CEPT digital telephony format devised by the CCITT that carries data at the rate of 2.048 Mbps (DS-1 level). E-1 can be compared to, but is not the same as, the North American T-1.

error In NuPoint Messenger server terms, an event that is reported in the error log. Some events are routine and others cause degradation or loss of system performance.

event In SNMP terms, a routine or abnormal condition reported to the management station. From the perspective of the NuPoint Messenger server, events are called errors.

filter In SNMP terms, a mechanism that supresses traps for particular devices.

Get SNMP message that requests to retrieve a MIB variable via the agent.

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Get Next SNMP message that requests to retrieve the next MIB variable from a sequence of like variables (contained in a MIB table).

Get Response SNMP message that replies to a manager request with the requested information.

global MIB The union of MIB modules for all Internet devices. The global MIB represents all management information that can be accessed through the Internet.

host See module.

HP OpenView HP's network management platform. Software that includes a GUI and underlying support for network managers.

IETF Standards setting body for the Internet. Standards are published in Requests for Comments (RFCs).

IP address A network-level address assigned to each system in a TCP/IP network. It is 4-bytes long; for example, 192.215.15.46.

management information base (MIB) See MIB.

manager Software that runs on a management station and makes requests to a managed device via the SNMP agent for the device. The manager also can receive unsolicited event messages from the agent.

map A graphical and hierarchial presentation of a network and its systems on a management station.

MIB A specification that defines management information. The MIB allows software running on an SNMP-based management station to monitor or control devices across a TCP/IP network.

MIB database A database for MIB modules on a management station.

MIB module All or part of the MIB for a particular device. The union of all MIB modules for all devices is called the global MIB.

MIB-2 Standard MIB module that defines management information for TCP/IP connectivity. Also called RFC-1213.

module An individual processor (CPU) and attached components on a NuPoint Messenger server. The server can have between one and four modules. Also called a host.

NP Config MIB MIB modules for the NuPoint Messenger server.

NP Config SNMP SNMP agent for the NuPoint Messenger server.

NuPoint Messenger server Voice mail/fax processing system.

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NuPoint Voice Basic software that provides voice processing capability to the NuPoint Messenger server.

object A type or class of management information on an SNMP-capable device. Also called an object type.

object identifier (OID) See OID.

object type See object.

OBJECT-TYPE ASN.1 construct that gives the name of an object.

OID Unique identifier of an object within a MIB. A sequence of numbers separated by periods. The sequence defines the location of an object in the tree-structured MIB of which it is a part.

Point-to-Point Protocol (PPP) See PPP

PPP Protocol that allows transfer of IP packets across a phone line. Similar to but not the same as SLIP.

private MIB module MIB module that contains definitions of enterprise-specific management information.

RFC-1213 IETF document that specifies the MIB-2 standard.

RFC-1406 IETF document that specifies the DS1-MIB standard.

Serial Line Internet Protocol. See SLIP

Set SNMP command that requests to change a MIB variable via the agent.

severity Measure of the seriousness of a NuPoint Messenger server event. The following levels are defined (listed in decreasing order of seriousness): critical, major, minor, warning, informational, normal.

Simple Network Management Protocol (SNMP) A set of standards for multivendor network management. SNMP specifies a means by which management information is defined.

Signaling System 7 See SS7

SLIP Protocol that allows transfer of IP packets across a phone line. Similar to but not the same as PPP.

SNMPv1 SNMP version 1. First and most widely-used version of SNMP standards. Adopted in 1989. Superseded by SNMPv2.

SS7 A common-channel signaling protocol that communicates, on a dedicated circuit or channel, call setup, teardown, routing, origination, destination, and other control or status information

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pertinent to a call.

standard MIB module MIB module that contains definitions of management information that has become an Internet standard. For example, MIB-2 or DS-1 MIB.

subagent In NP Config SNMP terms, a process or processes responsible for a particular kind of NuPoint Messenger server management information. The subagent communicates with a network manager through the NP Config SNMP main agent.

SYNTAX An ASN.1 construct that gives the syntax for an object type.

T-1 The North American telephony format that is similar to but not the same as E-1.

TCP/IP Set of protocols for multivendor networking. Used extensively for the Internet. Includes UDP and IP protocols for connectionless delivery of datagrams.

threshold Low or high limit for a value of a type of management information. If the value exceeds this limit, an alarm is triggered at the management station.

Transmission Control Protocol/Internet Protocol See TCP/IP

trap SNMP message that transfers event indication from agent to management station.

trap handling The processing of traps.

UDP/IP Set of protocols for connectionless delivery of datagrams.

User Datagram Protocol/Internet Protocol See UDP/IP

variable Specific instance of a type of management information. A variable has associated with it an object name and value.

voice processing Generic term for any equipment that can handle voice messages from callers.

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