



Intel® Simple Network Management Protocol (SNMP) Subagent

User Guide

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Introduction

The Intel® SNMP Subagent on managed servers allows you to communicate using Simple Network Management Protocol (SNMP) with the baseboard SNMP Subagent on the managed server. With the Intel® SNMP subagent, you can use SNMP TRAPs, SETs, and GETs to manage supported hardware components.

This document discusses the SNMP Subagent for the baseboard. For information on other SNMP Subagents that may be available for your server board, check the Utilities/SNMP_SA folder on the Intel® System Management Software CD or DVD or go to Intel support site.

Getting the Latest Information

Intel® System Management Software components are frequently enhanced and updated to support new features and platforms. In addition to enhancements, your server board may also have other SNMP Subagents available on the Intel® System Management Software CD or DVD, or the Intel support website. See *Intel® System Management Software Release Notes* or <http://support.intel.com> for the latest information.

Platform Compatibility and System Requirements

Before installing the Intel® SNMP subagent on server systems, each system must meet the requirements described in the following sections.

Supported Intel® Server Platforms

This version of the Intel® SNMP Subagent utility supports the Intel® Server Boards listed below. (Intel® Server Systems based on the Intel® Server Boards listed below are also supported unless otherwise noted in the product documentation for the Intel® Server System.)

Multi-Core Intel® Xeon® Processor 3000 Sequence-based Servers:

- Intel® Server Board S3420GP
- Intel® Server Board S3200SH
- Intel® Server Board X38ML

Multi-Core Intel® Xeon® Processor 5000 Sequence-based Servers:

- Intel® Server Board S5520UR
- Intel® Server Board S5500BC
- Intel® Server Board S5520HC
- Intel® Server Board S5500HCV
- Intel® Server Board S5500WB
- Intel® Workstation Board S5520SC
- Intel® Server Board S5000PAL
- Intel® Server Board S5000PSL
- Intel® Server Board S5000VCL
- Intel® Server Board S5000VXN
- Intel® Server Board S5000VSA
- Intel® Server Board S5000XAL
- Intel® Server Board S5000XSL
- Intel® Server Board S5400SF
- Intel® Server Board S5400RA

Multi-Core Intel® Xeon® Processor MP 7000 Sequence-based Servers:

- Intel® Server Board S7000FC4UR
- Intel® Server Platform SR4850HW4/M
- Intel® Server Platform SR6850HW4/M

Intel® Xeon® Processor-based Servers:

- Intel® Server Board SE7520JR2
- Intel® Server Board SE7520BD2
- Intel® Server Board SE7320SP2[†]
- Intel® Server Board SE7320VP2[†]
- Intel® Server Board SE7520AF2[†]
- Intel® Server Board SE7525GP2[†]

[†] This product has been discontinued. Contact your Intel Sales representative for information about product support for discontinued products.

Supported Server Operating Systems

The Intel® SNMP Subagent is supported on the following operating systems:

- Windows Server® 2003 Standard or Enterprise Edition*, with SP1 or later x86 & EM64T
- Windows Server® 2003* R2 x86 & EM64T
- Red Hat* Enterprise Linux* 4.0, U4
- Red Hat* Enterprise Linux* 5.0 32-bit & 64-bit
- SuSE* Linux Server 9 Enterprise Server SP4 – 32-bit
- SuSE* Linux Server 9 Enterprise Server SP4 – 64-bit
- SuSE* Linux Server 10 Enterprise Server SP2 – 32-bit
- SuSE* Linux Server 10 Enterprise Server SP2 – 64-bit

Refer to the *Intel® SNMP SubAgent Release Notes* or the *Tested Hardware and Operating System List* for your Intel server platform for the latest information on supported operating systems, Intel 64 architecture support, and supported service packs.

System Requirements

On Microsoft Windows*

1. Verify that the following components are installed before running installing the Intel components:
 - a. Intel® SNMP Subagent requires the SNMP component (Master Agent).
2. Insert System Management Software Version CD containing the Utilities.
3. Select and install the Intel® SNMP SubAgent from Utilities section in the auto run screen.

On Linux*

1. Verify that the following components are installed before running the installation scripts:
 - a. Intel® SNMP Subagent requires the SNMP Master Agent.
2. Open a command shell window.
3. Run the installation script listed in the following table that corresponds to your OS and software component you wish to install.

Note: *The Intel® SNMP Subagent installation script will uninstall the default net-SNMP RPM and install the Intel® Server Management Software net-SNMP 5.4.1 RPM from the installation CD. Intel suggests using the Intel® SNMP Subagent installation script to install this component because it will also create all the required soft links.*

Utility	Operating System	Installation Script
Intel® SNMP Subagent	SuSE* or Red Hat* Linux	<cd>/software/Utilities/linux/SNMP_SA/Baseboard_Subagent/linux/snmpsubagentinstall.sh
IPMI Driver	SuSE* or Red Hat* Linux	<cd>/software/Utilities/linux/IPMIDriver/IPMIDriver_Install.sh

Baseboard Management Controllers (BMC)

The Intel® SNMP Subagent is only supported on Intel® Server platforms with one of the following baseboard management controllers:

- Intel® Sahalee BMC on the baseboard or on the Intel® Management Module
- The National Semiconductor* PC87431x family of “mini” BMCs
- Intel® ESB2 BMC
- Intel® Integrated BMC (iBMC)

SNMP Master Agent

You must install the SNMP Master Agent on the managed server.

- For supported Linux* operating systems, use the net-snmp package.
- For supported Windows* operating systems, use the SNMP Service included in the Windows* operating system.

Overview

Intel® SNMP Subagents are SNMP extension agents that provide interfaces and databases for retrieving server hardware information and for monitoring server health status on the network using the SNMP protocol.

The Management Information Base (MIB) file that accompanies each SNMP subagent contains the definitions of the management information the SNMP subagent can access, with each definition distinguished by a unique object identifier (OID). Each SNMP subagent has its own MIB file and OID. The SNMP subagents support SNMP-based access (GETs, SETs and TRAPs) to the instrumented components on the managed server, collecting and returning information as requested by a management system. The subagents plug into the SNMP Master Agent infrastructure supported by the operating system and respond to queries and sets filtered to the subagents by the master agent, based on the OID specifying the data defined in the MIB to be retrieved or set.

Table 1. Intel® SNMP Subagents

Description	MIB File	Base OID
Baseboard (baseboard sensors, processors, memory) subagent	basebrd5_v1.mib (SNMP Version 1), basebrd5_v2.mib (SNMP Version 2)	iso(1) org(3) dod(6) internet(1) private(4) enterprises(1) Intel(343) products(2) server-management(10) software(3) baseboardGroup5(5)

For systems running the Windows* operating system, the SNMP subagent is implemented as a dynamic link library (DLL) and is configured in the Registration Database. When the SNMP master agent (Snmp.exe) is started, it queries the registry, then loads and initializes the DLL for the registered SNMP subagent. The SNMP master agent invokes DLL entry points to request MIB queries and sets, and obtains events generated by the subagent.

For Linux* systems, the SNMP subagent is implemented as an rpm package. It is installed, configured and started as a service. The SNMP master agent (net-snmp) communicates with the subagent through AgentX protocol.

General Architecture

The Intel® SNMP subagent makes sensor, memory, and processor information on a managed server available to SNMP-based management applications. The SNMP master agent, distributed with the operating system, must be installed and configured before installing the baseboard SNMP subagent.

All SNMP traffic coming over the network to the managed server is received by the SNMP Master Agent. When the Intel® SNMP Subagent initializes, it tells the SNMP Master Agent which OID values the subagent is responsible for. These OID values correspond to the data provided in the MIB. The SNMP-based Management Console will use the MIB to determine the OID values for particular attributes, and whether or not the attribute may be modified through an SNMP SET. Both requests to retrieve data (SNMP GET) and requests to modify data (SNMP SET) identify the attribute of interest by OID. The SNMP Master Agent will route SNMP requests to the appropriate SNMP subagent based on the supported OIDs. The SNMP request contains information about the originator of the request. The SNMP subagent will process the request and send back the information to the SNMP Master Agent, which will then send it back across the network to the SNMP-based Management Console.

Baseboard SNMP Subagent

The baseboard SNMP subagent is described in detail in the section titled [“Baseboard SNMP Subagent Details”](#) beginning on page 10.

Installation and Configuration

Pre-Installation

The SNMP Master Agent must be installed and configured on the managed server prior to installing the Intel® SNMP Subagents. The Community name string and trap destinations must be configured correctly. Once the Intel® SNMP Subagent is installed, the MIB file must be copied to any SNMP Management Applications requiring the supported OID and attribute information.

NOTE

The Intel® SNMP Subagent is intended for use with third-party SNMP-based management clients. For information on installing and configuring third-party SNMP-based management clients, refer to the documentation included with the client software you intend to install.

Linux* Operating System

Master Agent

The Intel® SNMP Subagent works with the net-snmp Master Agent.

Configuration File

Since the Intel® SNMP Subagent is designed to use AgentX protocol to communicate with the NET-SNMP Master Agent on Linux*, the snmp configuration file needs to be modified before you can use the Intel® SNMP Subagent. The Intel® System Management Software CD has the necessary conf files for both Red Hat* and SuSE Linux*.

On Red Hat Linux*, for example, the /etc/snmp/snmpd.conf file for snmpd must be modified. The Linux* installation scripts will overwrite the existing files then restart the Master Agent in order for any configuration file changes to take effect. A typical conf file looks like the following:

```
# This line allows SNMP remote access to the subagent
rwcommunity    <communityname>

# This line turns on agentx master agent support
master agentx

# This line enables V2 trap sending
trap2sink     localhost    <communityname>
```

The changes are similar for SuSE Linux*. You can view the SuSE Linux* conf file on the Intel® System Management Software CD.

MIB File Location

After the Intel® SNMP Subagent is installed on the server, the MIB files (basebrd5_v1.mib and basebrd5_v2.mib) will be located in /usr/share/snmp/mibs and /usr/local/snmpsa/mibs on Red Hat Linux* and similar locations on SuSE Linux*. Use basebrd5_v1.mib with SNMP Version 1 software, or basebrd5_v2.mib with SNMP Version 2 software. In order to use net-snmp utilities such as SNMPGET on a Linux* console to retrieve data from the SNMP subagent on a server, copy the MIB files to the Linux* console, and run the command "export MIBS=ALL" from a terminal window to make the MIB information available to the utilities. Note that third party SNMP-based management clients may have specific requirements for MIB file location. Consult your client software documentation for any such configuration requirements.

Windows® Operating System

Master Agent

For Microsoft® Windows® operating system based systems, the SNMP service (available on the operating system installation CD) must be installed. It is not included in the default operating system installation, but can be added after the initial operating system installation completes.

Under the properties settings for the SNMP service, the Traps tab enables the user to select the destinations for traps from the server. The Security tab under the SNMP service properties settings enables you to configure the valid community names and the access rights for those community names. The rights need to be at least READ WRITE in order to SET an attribute using the SNMP subagent.

MIB File Location

The MIB files (basebrd5_v1.mib and basebrd5_v2.mib) are located in the same location the SNMP subagent is installed. Use basebrd5_v1.mib with SNMP Version 1 software, or basebrd5_v2.mib with SNMP Version 2 software. The MIB files are not required by the Intel® SNMP Subagent for execution, but are required for management applications that issue SNMP GET and SET commands based on the MIB.

Stand-alone Installation

On Microsoft Windows*

1. Select appropriate installer based on your processor type (Intel SNMP Subagent-x86.exe or Intel SNMP Subagent-x86_64.exe)
2. Run the installer and follow the instructions
3. Edit the config file as described in the previous section

On Linux*

1. Verify that the following components are installed before running the installation scripts:
 - a. Intel® SNMP Subagent requires the SNMP Master Agent.

2. Open a command shell window.
3. Run the installation script listed in the following table that corresponds to your OS and software component you wish to install.

Intel® SNMP Subagent	SuSE* or Red Hat* Linux	<code><cd>/software/Utilities/linux/SNMP_SA/Baseboard_Subagent/linux/snmpsubagentinstall.sh</code>
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Intel® SNMP Subagent Details

Figure 1 illustrates how the Intel® SNMP Subagent interfaces with the SNMP Master Agent and the BMC on the platform.

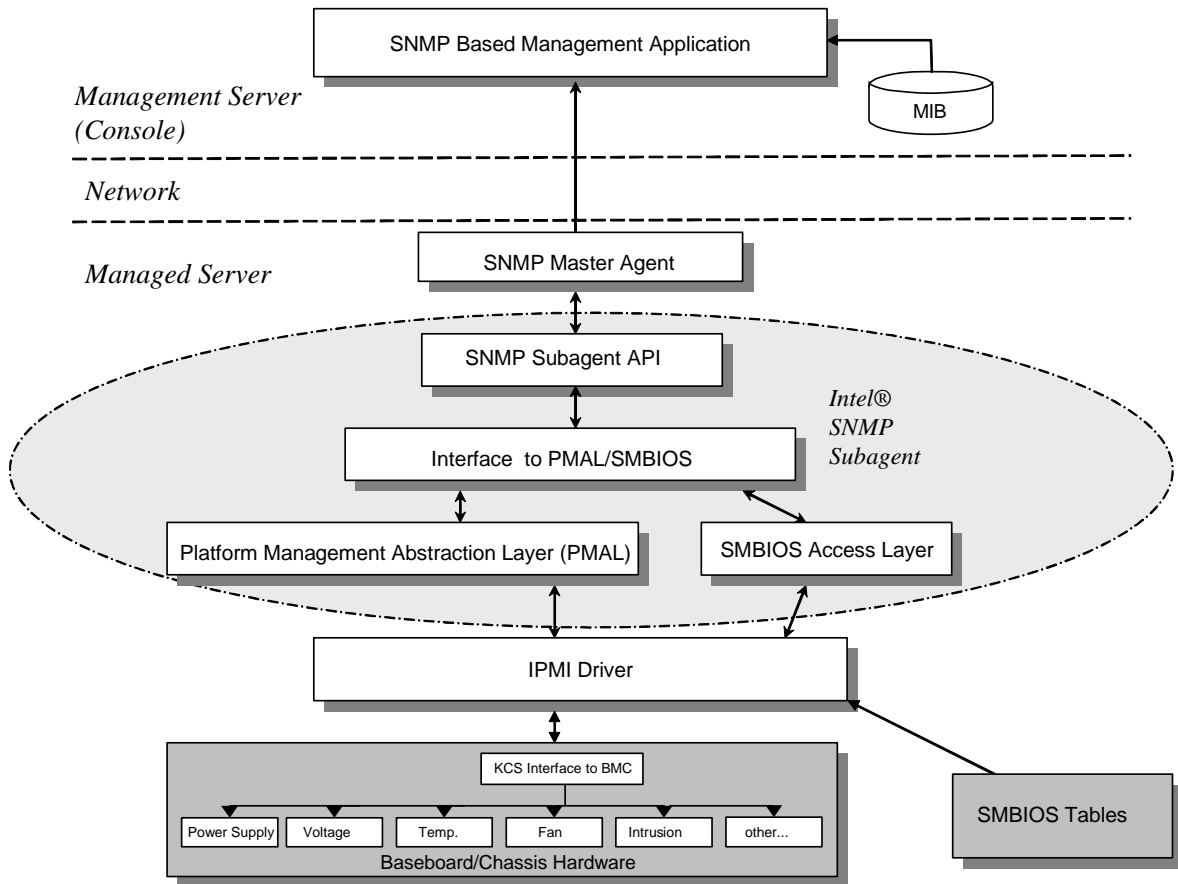


Figure 1. Intel® SNMP Subagent Architecture

There are two sources of information for the Intel® SNMP Subagent on the server. The Intel® SNMP Subagent communicates with the Baseboard Management Controller (BMC) using an Intelligent Platform Management Interface (IPMI) driver. Through the IPMI driver, the Intel® SNMP Subagent has access to information on components such as power supplies, voltages, temperature sensors, cooling devices, chassis intrusion sensors, and the System Event Log (SEL). The Intel® SNMP Subagent also has access to information on processors and memory stored in the System Management BIOS (SMBIOS) tables.

In addition to responding to SNMP GET and SNMP SET requests, the Intel® SNMP Subagent generates TRAPs. While one component of the Intel® SNMP Subagent waits for SNMP requests from the SNMP Master Agent, another component of the Intel® SNMP Subagent monitors the System Event Log (SEL). Entries are placed in the SEL when significant events occur on the server, such as when a temperature sensor's reading exceeds a threshold, or when a power supply is removed. When a new SEL entry is detected, the Intel® SNMP Subagent analyzes the SEL entry and sends SNMP TRAPs to the SNMP Master Agent. The SNMP Master Agent duplicates and transmits the SNMP TRAP to all nodes that are configured to receive traps from the managed server. You must configure trap recipients as part of installing and configuring the SNMP Master Agent.

The Intel® SNMP Subagent uses a Platform Management Abstraction Layer (PMAL) and the IPMI driver to access the information from the BMC, such as information about power supplies, voltages, temperature sensors, cooling devices, chassis intrusion sensors, and the SEL. The information regarding processors and memory are stored in the SMBIOS tables and are accessed through either the IPMI driver or through direct memory mapping.

Features of the Intel® SNMP Subagent

Through basic SNMP GETs, SETs, and TRAPs, the Intel® SNMP Subagent provides the following functionality for managing servers:

- Accessing sensor data
- Viewing and modifying threshold settings
- Reading the SMBIOS tables
- Providing overall system health status

Accessing Sensor Data

The Intel® SNMP Subagent accesses management information through IPMI commands that the BMC on the managed server responds to. The information available varies by platform. For example, some servers don't support chassis intrusion detection, and some don't support server monitoring of redundant fans, although individual fans are monitored. The Intel® SNMP Subagent's Management Information Base (MIB) is designed to support the following list of components:

- Voltage
- Temperature
- System Fan (includes redundancy)
- Memory
- Processor
- Power Supply (includes redundancy)
- PCI Hot Plug Events
- Chassis

Events are generated by the SNMP agent based on SEL events and provide as much information as possible concerning the event to the event reader. The events use the NOTIFICATION-TYPE construct specified in SNMPv2C.

The SNMP agent is designed to accommodate the full range of possible events, although specific server platforms may not support all of the events. Some server platforms do not support certain features in firmware. Also, some server platforms lack some sensors or the right sensor types to support a feature.

Viewing and Modifying Threshold Settings

Some sensors monitored by the BMC have thresholds, which define normal, non-critical, and critical operating parameters. Many of the sensor thresholds can be changed. The MIB for the Intel® SNMP Subagent defines the possible thresholds and indicates which are capable of being changed via the SNMP SET command. The Intel® SNMP Subagent configuration file, `snmpsa.conf`, also includes a setting that globally enables or disables the Intel® SNMP Subagent SET command. Changes to thresholds for the following sensors are supported by the Intel® SNMP Subagent:

- Voltage
- Temperature
- System Fan

Any runtime changes to sensor thresholds are reset to the values in the Sensor Data Records (SDR) file when the server reboots.

Displaying System Health Status

The Intel® SNMP Subagent provides system health status (“Ok”, “Non-critical”, or “Critical”) based on the health status of the following hardware subsystems:

Sensor	Sensor Health Status	System Health Status
Voltage	Ok	Ok
Temperature	Non-Critical	Non-Critical
	Critical	Critical
Fan	Ok	Ok
	All Errors	Critical
Power Supply	Ok/Redundancy regained	Ok
	Error/Redundancy lost	Critical
Power Unit	OK/Power On/Power Off	OK
	Fault	Critical
Memory Array	Ok	Ok
	Single-bit Error	Non-Critical
	Multiple-bit Error	Critical
Memory Device	Chassis Ok	Ok
	General Chassis Intrusion	Critical

Changes to the overall health are triggered by SEL events, which alert the Intel® SNMP Subagent that an event has occurred that might impact the current overall health status of the server.

Intel® SNMP Subagent Configuration Files

Linux* Operating System Configuration Files

- snmpd.conf – for the master agent
- snmpsa.conf – for the subagent

After installing the subagent, both configuration files are located at /usr/local/snmpsa/conf on the system (Red Hat Linux*). The snmpd.conf file is a sample configuration file that includes lines necessary to configure the master agent to properly recognize the subagent. Use these sample configuration files as an example for editing your system's configuration files.

Windows® Operating System Configuration Files

- snmpsa.conf for the subagent

After installation, the configuration file is located at \Program Files\Intel\ServerManager\SNMP_SA\baseboard. Note that in the Windows® operating system, the Master Agent configuration is handled through the Properties of the SNMP Service. See your operating system documentation for details.

Change to SetsEnable Setting

In addition to ensuring that the SNMP community is readable and writable, the following change must be made to the snmpsa.conf file, located as noted in the “[Linux Configuration Files](#)” and “[Windows® Operating System Configuration Files](#)” sections above:

```
SetsEnabled = 1
```

After editing the snmpsa.conf file, the master agent and subagent must be restarted on both Windows® and Linux* operating systems. See the section “[Restarting SNMP Agents](#)” on page 14 for more details.

Linux* SNMP Command-Line Options

You should use the ‘start’ option the first time the subagent is loaded or right after the server boots. The Intel® SNMP subagent requires that the IPMI driver be started.

- Start the subagent:

```
/etc/init.d/snmpsa start
```
- Stop the subagent:

```
/etc/init.d/snmpsa stop
```
- Stop and restart the subagent:

```
/etc/init.d/snmpsa restart
```

- Starts the subagent without loading the IPMI driver:
`/etc/init.d/snmpsa saonly`
- Returns the running status of the subagent:
`/etc/init.d/snmpsa status`

Restarting SNMP Agents

If the Intel® SNMP Subagent or Master locks up, you must restart both agents. Use the following steps from the command line to restart the agents, depending on your operating system. For information on setting services or daemons to start at system boot, see your operating system documentation.

Linux* Operating System

1. Stop the subagent by entering the following command:
`/etc/init.d/snmpsa stop`
2. Restart the master agent by entering the following command:
`/etc/init.d/snmpd restart`
3. Start the subagent by entering the following command:
`/etc/init.d/snmpsa start`

Windows® Operating System

In Windows® Operating System, choose **Start > Control Panel > Administrative Tools > Services**, then stop and restart the SNMP Service.

Uninstalling the Intel® SNMP Subagent

An uninstall script will be installed with each component in the default installation directory for each component.

Microsoft® Windows*

To uninstall the Intel® SNMP SubAgent under Microsoft Windows*, use the Add/Remove Software applet in the Control Panel.

Linux*

To uninstall the software under Linux, run the uninstall script listed in the following table.

Utility	Operating System	Uninstallation Script or Procedure
Intel® SNMP Subagent	SuSE or Red Hat Linux	snmpsubagent_uninstall.sh
IPMI RPMs installed by Intel® SNMP Subagent	SuSE* or Red Hat* Linux	CAUTION: These components are also used by other components. Do not uninstall these components if you have Intel® Server Management Software installed. IPMIDriver_Uninstall.sh