

## SNMP and CobraNet™

Since the September 1998 presentation of Controlling and Monitoring Audio Systems with Simple Network Management Protocol (SNMP) (Preprint #4760), Cirrus Logic has publicly advocated the use of SNMP for control and monitoring of networked audio devices. SNMP has been implemented in the CS181xxx family of CobraNet™ chips in order to provide a reliable, industry standard means of controlling and monitoring CobraNet™ interfaces. SNMP is well suited to this task for the following reasons.

- Availability of management applications and platforms
- Availability of off the shelf agent implementations
- Availability of development tools
- Dominance in data communications industry
- Demonstrated interoperability
- Demonstrated extensibility
- Manageable implementation
- Carried via ubiquitous Internet Protocol (IP) through many types of communications systems

To promote the use of SNMP Cirrus Logic is able to do the following:

- Provide an SNMP agent with every CobraNet™ interface.
- Make it easy for CobraNet™ products to extend the standard CobraNet™ MIB to allow control and monitoring of product features outside the CobraNet™ interface.
- Conduct public demonstrations of SNMP in conjunction with CobraNet™ marketing efforts.
- Publish references and pointers on SNMP management and agent and MIB design issues to help audio manufacturers get SNMP capability into devices and systems that don't have a CobraNet™ interface.

## Learning about SNMP

Simple Network Management Protocol (SNMP) is a conceptually simple protocol. There are two basic commands: "get a value" and "set a value". A device being monitored or controlled runs software modules known as an SNMP agent. The agent oversees a collection of variables that represent the state of the device being managed. The collection is organized in an extensible tree structure known as the Management Information Base (MIB).

*"Controlling and Monitoring Audio Systems with Simple Network Management Protocol (SNMP)"* by Kevin Gross and Tom Holtzen, Presented at the 105th AES Convention, September 26, 1998, Preprint #4760. An overview of SNMP from an audio perspective.

TCP/IP Illustrated, Volume 1 by W. Richard Stevens (Addison-Wesley) ISBN: 0201633469. Chapter 25 offers a readable technical description of the protocol.

## Designing a MIB

A Management Information Base (MIB) is a collection of management variables which may be read and optionally written through SNMP commands. Variables are represented in the MIB as a tree structure. Different branches of this tree correspond to different functional units of the system being managed. MIBs are generally expressed as a text file using a data structure specification language called ASN.1. The CobraNet™ MIB, available from Cirrus Logic, is a good example of a MIB expressed as a text file.

Understanding SNMP MIBs by David Perkins and Evan McGuinnis (Prentice Hall) ISBN: 0134377087. A technical reference useful for those designing a MIB and indispensable if you are writing an SNMP agent.

"Management Information Base for Network Management of TCP/IP-based internets: MIB-II (RFC 1213)" from the IETF. All SNMP agents include this standard information base. The IETF has standardized a number of other commonly used information bases. If you are building a network printer, for instance, you definitely want to have a look at Printer MIB (RFC 1759).

The Internet Assigned Number Authority (IANA) can provide you with an Enterprise Number. Product specific variables reside under the umbrella of your enterprise number.

MG-Soft offers a MIB browser and compiler which can be used to help write and check syntax of your MIB file(s).

The ASN.1 Homepage can help you understand the Abstract Syntax Notation (ASN) used to define a MIB. ASN.1 is a programming language used to formally describe shared data structures.

## Using an Off-the-Shelf Agent

All major embedded operating systems (Phar Lap, QNX, pSOS, VxWorks and even Windows CE) include or are currently developing an SNMP agent either as part of the core package or as a cost added option.

SNMP Research is a major provider of commercial SNMP agents. Many of the OS vendors listed above have integrated and resell the SNMP Research agent. Epilogue (a subsidiary of ISI [the pSOS people]) is another SNMP agent developer.

DMH Software is a vendor of a highly portable SNMP agent for embedded system and other systems.

## Using a Public Domain SNMP Agent

Agent++ supports SNMPv3

The Carnegie Mellon Network Group offers a full featured SNMP agent in source code.

Linux is an open source operating system which includes an SNMP agent.

## Writing Your own Agent

Unless you have some extraordinary development constraints, you should not be reading this section. In most circumstances, the cost and effort to develop, debug and test an agent far outweighs any money spent to purchase an off the shelf agent. However, resources useful to those wishing to write their own agent would include:

- Understanding SNMP MIBs by David Perkins and Evan McGuinnis (Prentice Hall) ISBN: 0134377087. The appendices of this book give some of the essential details and constants used by SNMP.
- "A Simple Network Management Protocol (RFC 1157)" from the IETF. This is *the* protocol specification for SNMP. The standards documents generated by the IETF (Internet Engineering Task Force) are surprisingly readable. Part of the IETF's standards approval process involves building a correct (interoperable) implementation merely by reading the specification document.
- SNMP Version 3 (SNMPv3) Web Site contains version 3 (and version 2) information including links to relevant IETF protocol standards documents (RFCs).

## Testing an Agent

If you've written your own agent, you'll want to procure a test suite to verify your implementation. The following vendors offer SNMP test suites and tools.

- [InternetWorking Labs](#)
- [SimpleSoft Inc.](#)

## Managing a Windows Application Via SNMP

You need to write an SNMP "extension agent" to manage an application, or hardware peripheral on a workstation. The extension agent supplements the standard SNMP agent with the additional management variables relevant to the application or peripheral under management. Typically writing an extension agent is not a difficult task. The SNMP agent connects to your extension agent through a well defined (though platform dependent) high level Application Programmer's Interface (API). With multiple extension agents running, multiple applications on the same computer can be managed and monitored via SNMP. [Windows NT SNMP](#) by James D. Murray (O'Reilly) ISBN: 1565923383. This is the book to look to if you need to make a Windows application manageable via SNMP.

## Lightweight Managers and APIs

- [CobraNet Object Tools](#) is a COM object library available from Cirrus Logic which greatly eases the development of software containing SNMP and other functions commonly used in the monitoring and control of CobraNet networks. COT is available from the worldwide Cirrus Logic sales network.
- [SNMP++](#) is an object oriented programming interface to SNMP. This is an open source initiative originally shepherded by Hewlett Packard.
- [Dart](#) offers an [SNMP COM](#) object targeted to SNMP operations under Visual Basic.
- [ACE-SNMP](#) from [SNMP Frameworks](#) includes scripting capability and allows SNMP network management to be accomplished through a browser. Most of the heavy duty management platforms include variants of these capabilities.
- [SNMPc](#) from Castle Rock Computing is a comprehensive lightweight manager.
- [TopTools](#) is a comprehensive manager that currently ships *free* with every Hewlett Packard ProCurve Ethernet switch. It's interface is very user-friendly, and it allows monitoring scenarios to be customized relatively quickly.
- [Transcend Network Supervisor](#) is a free network monitoring tool from 3COM similar to TopTools.
- [DeviceView](#) is a free SNMP manager from Intel primarily for managing Intel networking products. Some generic SNMP management capability is included.
- [MG-Soft](#) offers a suite of SNMP development tools and utilities. Some of these can be downloaded on a trial basis.

## Heavy Duty Management Platforms

The heavy duty management platforms are extremely scalable. These platforms are designed for enterprise management and usually carry an enterprise sized price tag. Campus sized installations (such as a theme park) are appropriate applications of these platforms.

- [HP OpenView](#)
- [Tivoli](#)
- [Computer Associates Unicenter TNG](#)
- [Transcend Enterprise Manager](#)

## Internet Resources

There is a large amount of technical information regarding data networking on the web:

- [comp.dcom.net-management newsgroup](#) and associated Archive Base.
- [comp.protocols.snmp newsgroup](#).
- [The Simple Times](#) is a technical SNMP newsletter.
- [SNMP Link](#) is a comprehensive SNMP resource for SNMP developers.
- [The SimpleWeb](#) a collection of SNMP and network management links.
- [SNMP Version 3 \(SNMPv3\)](#) Web Site contains version 3 (and version 2) information including links to relevant IETF protocol standards documents (RFCs).