Reliable E1 Connectivity for Remote Network Management

Highlights

- Low-cost, reliable routing or Ethernet extension

- Supports scalable high performance LAN via 10/100BASE-T Ethernet

- Compatible with existing UAS 600, 700 and 7000 Series devices.

- Compliant, PTT-tough packaging for central or remote sites

Introduction

As PTTs introduce IP equipment to their networks, GDC's SpectraComm IP-E1 device (SCIP-E1) offers two independent modes of operation that provide access solutions for LAN-attached IP devices and legacy (Craft Port) devices. SCIP connectivity can be conducted over the E1/FE1 networks, as well as over a dial-up PSTN.

- In router mode, SCIP-E1 provides management access by extending the PTT's internal network to remote locations where separate IP networks are required.

- In LAN-X mode, SCIP-E1 can be deployed as an Ethernet extension device for those remote locations where a single 'flat' IP network is required.

Connectivity via IP Routing

Figure 1 demonstrates the SpectraComm IP-E1 using static routing to forward IP data between serial WAN ports and an Ethernet (LAN) switch. The SCIP-E1 also connects to the craft ports of up to eight co-located devices. Dial-in users may be authorized for read or read-write access to remote devices over the private switched telephone network.
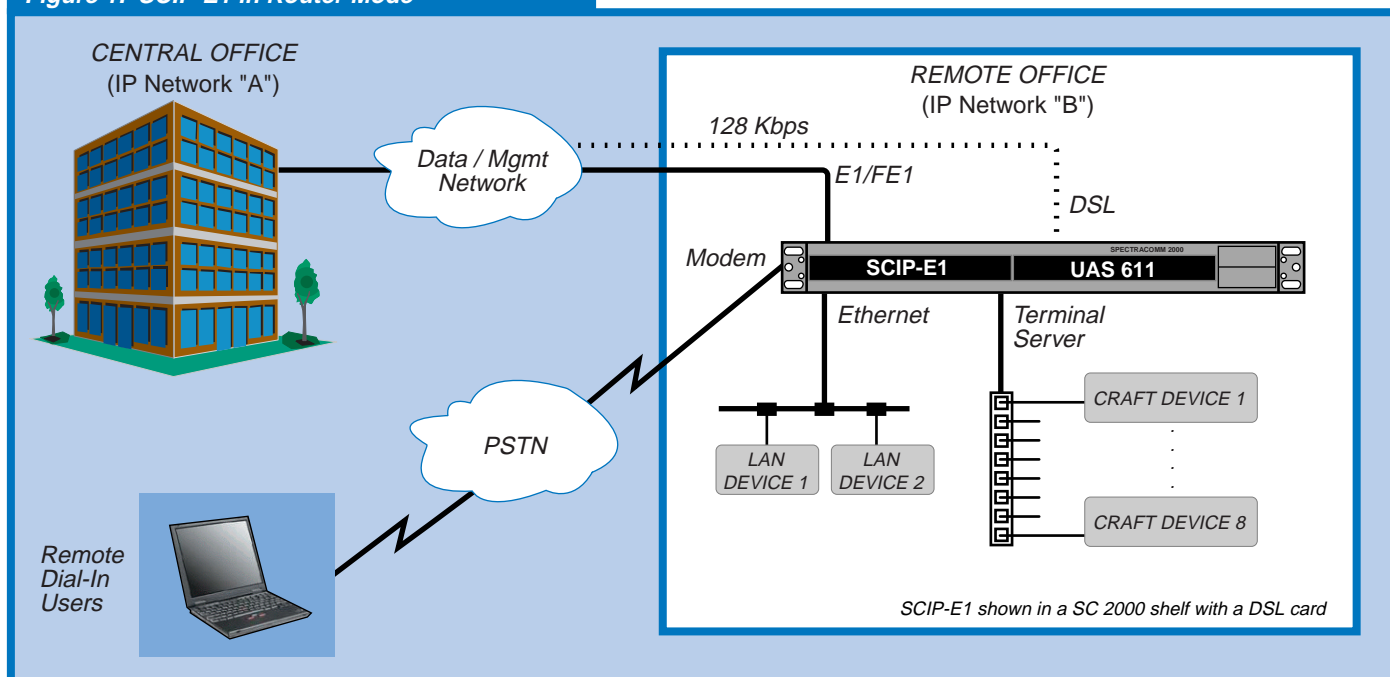
Connectivity via LAN-Extension

Figure 2: When placed in LAN-extension mode, the SCIP-E1 extends the Carrier's Ethernet network. Deployed in pairs, SCIP-E1 cards are connected to their separate LANs via the Ethernet interface and are connected to each other 'back-to-back' via the E1 or WAN. GDC's LAN-extension (LAN-X) is used as the link layer WAN protocol.

Switched Ethernet Applications

When additional Ethernet connectivity is required, SCIP-E1 will integrate with SpectraComm Ethernet Switch (SC-ES) cards, offering scalable IP connectivity in 9 or 18 port increments.

Figure 1: SCIP-E1 in Router Mode

CENTRAL OFFICE
(IP Network "A")

REMOTE OFFICE
(IP Network "B")

128 Kbps

Data / Mgmt Network

E1/FE1

DSL

Modem

SPECTRACOMM 2000

SCIP-E1   UAS 611

Ethernet

Terminal Server

CRAFT DEVICE 1

CRAFT DEVICE 8

LAN DEVICE 1   LAN DEVICE 2

PSTN

Remote Dial-In Users

SCIP-E1 shown in a SC 2000 shelf with a DSL card

SCIP-E1 ROUTER APPLICATIONS

Figure 1 shows an application of the SCIP-E1 in static router mode, which provides "Telco-tough" IP connectivity to the PTT's internal network and between managed sites.

SCIP-E1 can be located anywhere within the PTT's network; for example SCIP can be located within the Central Office's environment as part of the inside plant, or located in a remote office or CEV-Hut environment as part of the outside plant.

With SCIP-E1 routers deployed in all remote offices, virtually all remote devices can be connected back to the Central Office through their ethernet LAN ports or their craft ports. In addition, the SCIP's exclusive use of static routes provides reduced IP traffic in the Carrier's network.

SCIP-E1 LAN-X APPLICATIONS

Figure 2 shows SCIP-E1 in LAN-X mode of operation where a Central Office can extend its Ethernet network via one or more pairs of SCIPs connected 'back-to-back' over the E1 line. This configuration reliably extends the PTT's network; any remote device can be accessed from the Central Office via the SCIP. The Ethernet can be extended within a building (i.e., between floors) or, more typically, across a WAN connection.

SCIP-E1 can be located anywhere within the PTT's network; for example SCIP can be located within the Central Office's environment as part of the inside plant, or located in a remote office or CEV-Hut environment as part of the outside plant.

SCIP-E1 in LAN-X mode is ideal for flat IP networks and realizes savings by eliminating routers in the network topology.

Figure 2: SCIP-E1 in LAN-X Mode
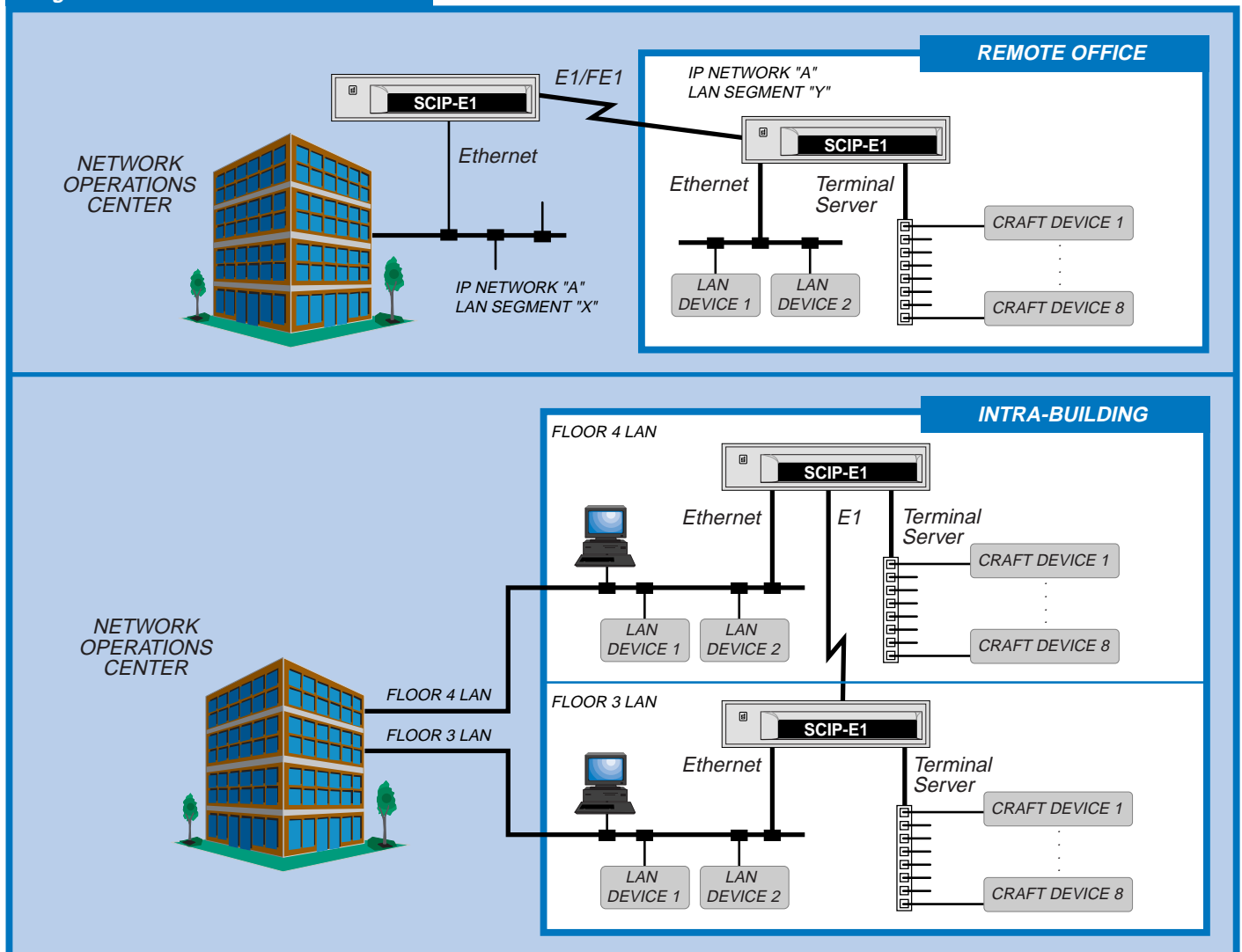
ADDITIONAL FEATURES

- Employs GDC's 'Smart CLI', an interactive command line interface, and the intuitive web (HTTP) interface.
- Remote access to eight craft devices and two LAN switching devices.
- Provides Telnet 'cut-thru' to terminal server ports.
- Access to E1/FE1 network via an integral E1 CSU/DSU with long-haul and short-haul capability.
- Frame Relay or PPP for link layer encapsulation of IP traffic
- Efficient configuration of multiple SCIPs via ASCII batch file upload/download
- High performance 'run from ram' architecture includes Running, Primary and Standby versions of software.
- Software can be upgraded via TFTP.
- Supports an internal or external V.34 modem.
- Supports DSL or DDS network access via synchronous DTE interface to an external DSU (UAS611 DSU or SC521A/S DSU, respectively).
- Secure SCIP configuration via dial-up connectivity.
- Supports Spanning Tree Protocol (STP) which eliminates loops and provides fault tolerance
- Supports MACL (Media Access Control List) Security which identifies invalid users by their MAC address.
- Supports Ethernet broadcast limiting, Ethernet jumbo packets, and priority queueing of IP traffic marked for expedited forwarding.

PTT Safe - Telco Tough

Designed for reliable and secure deployment anywhere in the PTT network, the SCIP-E1 installs easily in the high density 16-slot SC 5000 shelf or the 2-slot SC 2000 shelf. Non-NEBS standalone applications can use a single SCIP-E1 card in SpectraComm AC or DC standalone enclosures.

Flexible and Scalable Connectivity

Any UAS system device can be co-located in the shelf with SCIP-E1 cards, providing a unified, flexible, managed shelf environment that is scalable to the PTT's network requirements. Typical shelf configurations can include SCIP-E1 with SpectraComm Ethernet Switch cards (SC-ES 9-Port or SC-ES 18-Port), the SpectraComm Manager Card, the UAS 600, 700 and 7000 Series devices, as well as GDC modems and line termination units (LTUs), and multiplexers.

SpectraComm Ethernet Switch Cards

The SC-ES cards can connect several 10/100B-T Ethernet devices on the same network segment at maximum speed and improved LAN performance. In a shelf at a remote site, the SC-ES 9-port or SC-ES 18-port card connects to one of SCIP's two ethernet ports. This configuration extends the Carrier's management network to reach remote devices attached to a scalable ethernet LAN.

Connectivity Requirements:	SC-IP Solutions Extend the Reach
Local legacy devices and two local LANs	The terminal server connects to up to eight legacy device craft ports; the Ethernet interface connects to two hosts, hubs or switches, reaching devices attached to associated LANs.
Remote legacy devices via E1/FE1	The E1/FE1 interface connects to SCIP at the remote site, reaching up to eight remote legacy devices.
Remote legacy devices via DSL networks	Synchronous DTE interface to a UAS611 NTU (at 128 kpbs) connects to SCIP at a remote site, reaching up to 8 remote legacy devices.
LAN-attached devices at remote sites on the same IP network (i.e., a flat IP network)	SCIP LAN-extension reaches any LAN or craft-attached device at remote sites.
LAN-attached devices at remote sites on separate IP networks	SCIP static routing reaches LAN or craft devices at remote sites; static routes required.
Local or remote switched Ethernet devices	SCIP and SC-ES cards provides switched connectivity to remote sites: SC-ES 900 (9 ports) or SC-ES 1800 (18 ports).
Secure and authenticated access for remote users	Password-protected access to SCIP via its integral or external modem. Password-protected access to SCIP via its asynchronous AUX interface to an external modem. Integrates with optional TACACS+ Authentication via the integral or external modem and a customer-supplied TACACS+ server. Supports SNMP traps for all interfaces from illegal MAC addresses or from link up/down.

SCIP-E1 MANAGEMENT INTERFACES

SCIP-E1 configuration is managed through SMART CLI, an interactive command line interface, or through graphical user interface (GUI) web screens. Through these interfaces, an authorized user can monitor or configure any SC-IP in the network from a terminal or Telnet connection or through any popular web browser.

Secure Access and Protection

Management access at CLI and web interfaces is protected by several SC-IP security features:
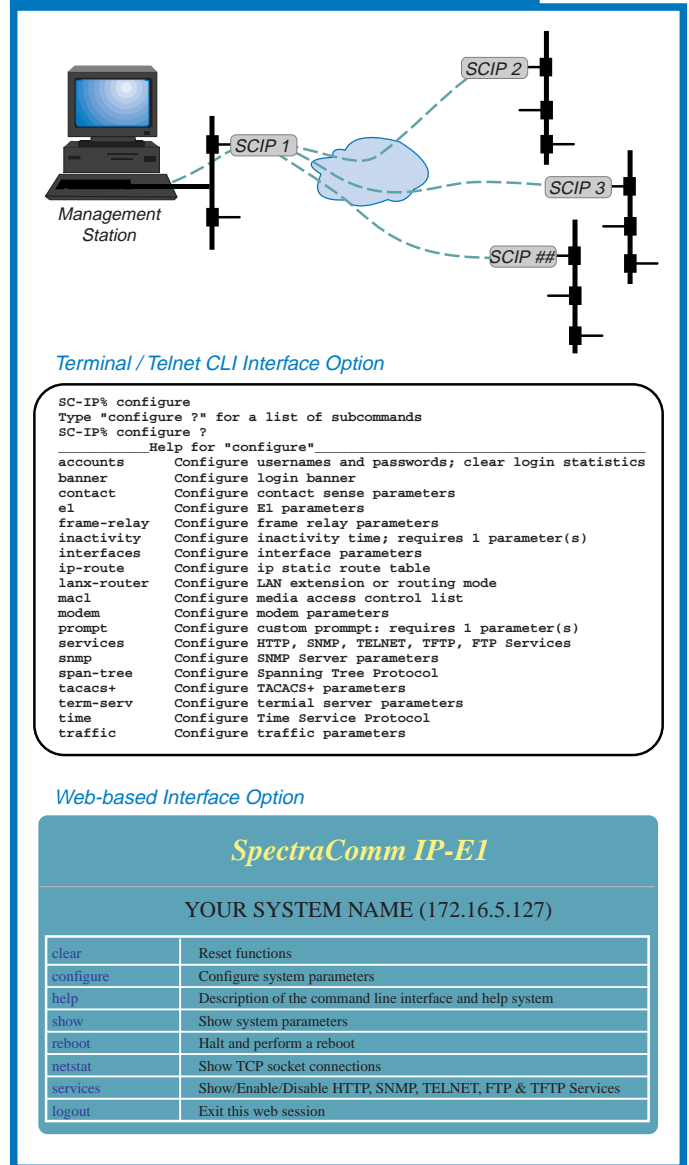
- User- and Supervisor-level password protection authorizes every access attempt.
- Inactivity logoff prevents hacks through 'left on' equipment
- Enable/Disable of SNMP, HTTP, Telnet, FTP and TFTP services deters hacking through these protocols.
- Enable/Disable management traffic by interface, for provider and customer management access schemes.
- Supports TACACS+ authentication protocol (optional) which centralizes security at a network access server.
- Supports SNMP traps for a variety of events.

SMART CLI Features

General DataComm's SMART CLI has a look and feel that will be familiar to most field personnel, with the benefit of several enhancements over most standard CLIs, such as:

- Recognition and auto-expansion of abbreviated commands and sub-commands.
- Auto-prompts for required command arguments.
- General help at the command prompt.
- Context-sensitive help at the command string.
- Command line recall for easy re-entry or review of previous commands.
- Advanced utility for generating downloadable ASCII configuration files as batch scripts.
- SCIP upgrades via TFTP or FTP downloads of software versions and configuration data.
- Command entry from a Telnet or terminal connection.
- Command entry at the web-based CLI webscreen.

Figure 3: SCIP Management Interface Options

Terminal / Telnet CLI Interface Option

```
SC-IP% configure
Type "configure ?" for a list of subcommands
SC-IP% configure ?
_____Help for "configure"_____
accounts      Configure usernames and passwords; clear login statistics
banner        Configure login banner
contact       Configure contact sense parameters
e1            Configure E1 parameters
frame-relay   Configure frame relay parameters
inactivity    Configure inactivity time; requires 1 parameter(s)
interfaces    Configure interface parameters
ip-route      Configure ip static route table
lanx-router   Configure LAN extension or routing mode
macl          Configure media access control list
modem         Configure modem parameters
prompt        Configure custom prommpt: requires 1 parameter(s)
services      Configure HTTP, SNMP, TELNET, TFTP, FTP Services
snmp          Configure SNMP Server parameters
span-tree     Configure Spanning Tree Protocol
tacacs+       Configure TACACS+ parameters
term-serv     Configure termial server parameters
time          Configure Time Service Protocol
traffic       Configure traffic parameters
```

Web-based Interface Option

SpectraComm IP-E1

YOUR SYSTEM NAME (172.16.5.127)

clear	Reset functions
configure	Configure system parameters
help	Description of the command line interface and help system
show	Show system parameters
reboot	Halt and perform a reboot
netstat	Show TCP socket connections
services	Show/Enable/Disable HTTP, SNMP, TELNET, FTP & TFTP Services
logout	Exit this web session

Centralized and Versatile Options

Figure 3 illustrates centralized management of a system of SCIP-E1s in the Carrier's network. From this central site, the user can access the SCIP-E1 via the preferred CLI interface: Terminal/Telnet CLI, or web-based CLI via a web browser. The number of concurrent management sessions is determined by your workstation resources.

General DataComm
Best Connections in the Business

SpectraComm IP-E1

SCIP-E1 Physical Specifications

Single-slot Blade
Width: 178 mm (7.0 in.)
Height: 21 mm (0.81 in.)
Depth: 241 mm (9.5 in.)
Weight: 0.28 kg (10 oz.; Shipping weight: 0.74 kg (1 lb 10 oz)

Environmental Specifications

Non-Operating Temperature
-40 to 70 degrees C (-40 to 158 degrees F)
Non-Operating Relative Humidity: 5% to 95%
Non-operating Altitude: Up to 12,191 m (40,000 ft)

Operating Temperature:
0 to 50 degrees C (32 to 122 degrees F)
Operating Relative Humidity: 5% - 90% non-condensing
Operating Altitude: -60 to 4,0000 m (-197 to 13,123 ft)

Electrical Specifications

Power (AC or DC), voltage, frequency, and fusing determined by your SpectraComm shelf or enclosure.

Power Dissipation: 6 Watts maximum, each

Compliance & Compatibility

Safety:
TUV *(Pending)*
CE Mark *(Pending)*
UL, CUL *(Pending)*

SC-IP Card:
CTR-12; CTR-13*(Pending)*
EN 55022 Class A approval *(Pending)*
EN 60950 *(Pending)*

Quality Assurance
ISO 9001: 2000 Certified

Security and Authentication

Username and Password verification

Multi-level permissions: User (Read-only), Supervisor (Read-Write), or Administrator (Read-Write and special functions)

Individual disable/enable of HTTP, SNMP, Telnet, TFTP and FTP

HTTP, Telnet, TFTP and FTP timeouts

MACL (Media Access Control List) Security

TACACS+ Authentication Protocol (optional)

Management Interfaces

Command line interface via Telnet, VT-100 compatible terminal, and web (HTTP) interface

Embedded web-server agent uses PC browser (HTML supported)

SNMP support for standard statistics: RFC 1213;
MIB for Network Management of TCP/IP-based Internets MIB2;
RFC 1398; Ethernet MIB

Operational Specifications

Modes of Operation
Router Mode: Static routing between any two SC-IP interfaces. (IP version 4)

LAN-X Mode: Ethernet extension via SC-IP to SC-IP over WAN (E1) interface. (Proprietary WAN protocol)

Physical Interfaces
Front Panel Craft Port: V.24/V.28, TIA/EIA-232

Front Panel Ethernet Ports (2):
RFC 1213; MIB for Network Management of TCP/IP-based
Internets; RFC 1398; Ethernet MIB; ANSI/IEEE 802.3; ANSI/IEEE 802.1d; Full duplex Ethernet

WAN Ports (2)

Terminal Server Ports:
V.24/V.28, TIA/EIA-232 for connection to up to eight devices.

AUX Port:
V.24 / V.28, TIA/EIA-232 for asynchronous operation up to 115.2 kbps *(Future)*

V.24 / V.28, TIA/EIA-232 for synchronous operation up to 128 kbps

E1 Interface:
2048 Kbps per G.703 and G.704
Frame Relay DTE interface (UNI-U)
PPP interface (RFC 1661)

Integral Modem port: PPP or UART mode

CSU/DSU Operation
E1 Data Rate: N x 56/64 Kbps, where N = 1 - 32 DS0s

Data Encoding: HDB3

Framing: E1 Framed G.704 (with or without CRC4)

LMI: Q.933 Annex A, T1.67 Annex D, Consortium LMI

Integral Modem Operation
ITU-T V.34

V.42 LAPM and MNP 2-4 error correction

V.42 bis and MNP 5 data compression

Alarms and SNMP Traps
Line Code Violations (LCV) Alarm
Loss of Frame Alignment (LFA) Alarm
Loss of Signal (LOS) Alarm
Alarm Indication Signal (AIS)
Cyclic Redundancy Check (CRC) Error Alarm
Remote Alarm Indicator (RAI) Alarm
Far-End Block Error (FEBE) Alarm
Frame Alignment Signaling (FAS) Alarm

Cold Start trap
LinkUp/Down traps for ethernet0, serial0, serial1
LinkUp/Down trap for modem0 (if so equipped)
Up/Down traps for etherswitch ports 1 and port 2
Contact Sense trap for Start/Stop
Contact Sense trap for Active/Clear
MACL Violation trap
Authentication Failure trap