Secure and Resilient LAN Extension over Copper Loops

**Highlights**
- Reliable routing or Ethernet extension
- Supports scalable high performance LAN via 10/100BASE-T Ethernet
- Transports data at rates up to 11.3 Mbps using G.shdsl.bis
- Operates as 2-wire (single loop) or 4-wire (two loop)
- In 4-wire mode, supports auto-fallback to single loop operation, and auto-restoral when recovered.
- Increased revenues and service offerings
- Extended reach without the need for repeaters
- Scalable Telco-tough NEBS Level III-compliant packaging for the Central Office or remote sites
- Expedited Forwarding PHB for IP DiffServ applications

**Connectivity via IP Routing**

*Figure 1 demonstrates the SpectraComm IP-DSL as a static router, forwarding IP data between a local and remote location via G.shdsl. The SCIP also connects to craft ports of up to eight co-located devices. Dial-in users can 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, SCIP-DSL extends carrier or enterprise local area networks. Deployed in pairs, SCIP cards are connected to their separate LANs via the Ethernet interface and are connected to each other ‘back-to-back’ via 2-wire or 4-wire copper loops. GDC’s Ethernet extension (LAN-X) is used as the link layer WAN protocol.*

**Robust Recovery**

In the event of a loop failure, SCIP-DSL in 4-wire mode performs auto-fallback to single loop operation, and two-loop restoral when the failed loop recovers. SCIP-DSL can also auto-adapt the data rate based on line length and current conditions. Auto-fallback, Auto-restoral and Auto Rate Adaptation are individually enabled/disabled.

**Switched Ethernet Applications**

When additional NEBS-compliant Ethernet connectivity is required, SCIP can integrate with SpectraComm Ethernet Switch (SC-ES) cards which provide scalable IP.

---

**Introduction**

As IP equipment is introduced into networks, SCIP-DSL provides two access modes for LAN-attached IP devices and legacy (craft) devices. Either mode can be conducted over the G.shdsl network, or over a dial-up PSTN.

- In router mode, the SCIP provides management access by extending the internal network to remote locations where separate IP networks are required.
- In LAN-X mode, the SCIP can be deployed as an Ethernet extension device for those remote locations where a single ‘flat’ IP network is required.

---

**Figure 1: SCIP-DSL in Router Mode**

![Diagram of SCIP-DSL in Router Mode](image)
SCIP ROUTER APPLICATIONS

Figure 1 shows the primary application of the SCIP-DSL in static router mode, providing NEBS-compliant IP connectivity to the carrier or enterprise internal network and between managed sites.

SCIP-DSL can be located anywhere in the network; for example, SCIP-DSL 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-DSL routers deployed in all remote offices, virtually all remote devices can be connected back to the NOC 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 or enterprise network.

SCIP LAN-X APPLICATIONS

Figure 2 shows SCIP-DSL in LAN-X mode of operation where a NOC extends its Ethernet network via one or more pairs of SCIPs connected ‘back-to-back’ over 2-wire copper G.shdsl loops. This configuration provides NEBS-compliance and extends carrier or enterprise networks; any remote device can be accessed from the NOC via SCIP. The Ethernet can be extended within a building (i.e., between floors) or, more typically, across a WAN connection.

SCIP-DSL can be located anywhere in the carrier or enterprise network; for example, in the Central Office environment as part of the inside plant, or located in a remote office or CEV-Hut environment as part of the outside plant.

SCIP-DSL in LAN-X mode emulates a “flat” IP network, in that inband management is conducted in one direction from a specified SCIP port at the NOC to the remote site(s).
**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.
- Transports data at rates of 192 Kbps to 5.6 Mbps (2-wire) or 384 Kbps to 11.3 Mbps (4-wire) using the standard G.shdsl interface.
- Provides Telnet ‘cut-thru’ to terminal server ports.
- 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 or FTP.
- Supports an external V.34 modem at the craft interface.
- 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 queuing of IP traffic marked for expedited forwarding.
- Provides Auto Rate Adaptation which negotiates the optimal data rate for SCIP-DSL devices on either end of the link, based on length and condition of the circuit.

**NEBS-Compliant - Telco Tough**

The SCIP-DSL is NEBS Level III compliant and can be deployed in the 16-slot SC 5000 high density shelf or the 2-slot SC 2000 low density shelf. Non-NEBS standalone applications can use a single SCIP-DSL card in Spectra-Comm AC or DC standalone enclosures.

**Flexible and Scalable Connectivity**

Any SpectraComm device, from SC 202 to SC 800 T3, can be co-located in the shelf with SCIP-DSL cards, providing a unified, flexible, managed shelf environment that is scalable to carrier or enterprise network requirements. Typical shelf configurations can include SCIP-DSL cards with SpectraComm Ethernet Switch cards (SC-ES 9-Port or SC-ES 18-Port), along with GDC modems, CSU/DSUs, LTUs multiplexers and transport devices.

**SCIP-DSL and SCES Applications**

In applications with SC-ES cards, several 10/100B-T Ethernet devices can be connected on the same network segment at maximum speed and improved LAN performance. In a SC 5000 shelf at a remote site, the SC-ES 9-port or SC-ES 18-port device connects to one of SCIP-DSL’s two ethernet ports, for a maximum of 36 ports attached to each SCIP-DSL card. A SCIP and SCES application can extend carrier or enterprise management networks to reach remote devices attached to a scalable Ethernet LAN.

---

### Your Connectivity Requirements vs. SCIP-DSL Solutions

| Local legacy devices and two local LANs | The terminal server connects to up to eight legacy device craft port; the Ethernet interface connects to two hosts, hubs or switches, reaching devices attached to associated LANs. |
| Remote legacy devices via G.shdsl | The G.s interface connects to SCIP-DSL at the remote site, reaching up to eight 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 9-Port switch or SC-ES 18-port switch) |
| Secure and authenticated access for remote users | Password-protected access to SCIP via an external modem. Integrates with optional TACACS+ Authentication via LAN or an external GDC modem, and a customer-supplied TACACS+ server. Supports SNMP traps for all interfaces from illegal MAC addresses link up/down, and several other alarms. Integrates with optional SSH via SSH Server for CLI, SSH “cut-thru” terminal server, and SSH Client for dial-in connections. |
**SCIP-DSL MANAGEMENT INTERFACES**

SC-IP-DSL configuration is managed through SMART CLI, an interactive command line interface, or through graphical user interface (GUI) web screens. Through these interfaces, authorized users can monitor or configure any SCIP-DSL 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 SCIP-DSL 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, FTP and TFTP services deters hacking through these protocols.
- Enable/Disable management traffic, by interface for provider and customer access schemes.
- Enable/disable Auto-fallback and Auto-Restoral
- Supports DSL or DDS network access via synchronous DTE interface to an external DSU (UAS611 DSU or SC521A/S DSU, respectively).
- Supports TACACS+ authentication protocol (optional) which centralizes security at a network access server.
- Supports SNMP traps for a variety of events.
- Supports SSH protocol (optional) which uses encryption and RSA keys for added security.

**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-DSL upgrades via TFTP or FTP downloads of software versions and configuration data.
- Command entry from a Telnet or terminal connection, or using a standard browser.

**Centralized and Versatile Options**

Figure 3 illustrates SCIP-DSL centralized management in the Carrier’s network. From the central site, SCIP-DSL can be accessed via a craft connection from a VT100-compatible terminal, via a Telnet connection, or via a web interface. The maximum number of concurrent management sessions is determined by your workstation capabilities.
**SCIP-DSL Physical Specifications**

**Single-slot Blade Dimensions**
- 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**

- **Operating Ambient Temperature:**
  0 to 50 degrees C (32 to 122 degrees F)
- **Non-Operating Ambient Temperature:**
  -40 to 70 degrees C (-40 to 158 degrees F)
- Relative Humidity: 5% - 90% non-condensing
- Altitude: -60 to 4,000 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

**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 HTTP, SNMP, TFTP and FTP
- HTTP, Telnet, FTP and TFTP timeouts
- MACL (Media Access Control List) Security
- TACACS+ Authentication Protocol (optional)
- SSH Protocol (optional)

**Compliance & Compatibility**

- Designed for NEBS Level III compliance
- EMI: FCC Part 15 Class A Approved
- Telco: FCC Part 68 Approved
- ISO 9001: 2000 Certified
- Safety: UL Approved

**Management Options**

- Command line interface via VT100-compatible terminal.
- Command line interface via Telnet interface.
- Command line interface via web (HTTP) interface;
- Embedded webserver agent using PC browser (Supports HTML).
- SNMP support for standard statistics: RFC 1213;
- MIB for Network Management of TCP/IP-based Internets MIB2;
- RFC 1398; Ethernet MIB
- IP DiffServ Expedited Forwarding PHB (RFC 2598).
- SCIP-DSL Diagnostics, Alarms and SNMP Traps
- Inject CRCs/Pulse Template
- Line Loopback
- Remote Loopback
- Local Self Test
- End-to-End Self Test
- Loss of Signal (LOS) alarm
- Cyclic Redundancy Check (CRC) error alarm
- Loss of Sync Word (LOSWD) defect
- Loss of Sync Word (LOSWF) failure
- Signal to Noise Ratio (SNR) alarm
- Attenuation alarm
- Cold Start trap
- LinkUp/Down traps for ethernet0, serial0, serial1
- Up/Down traps for etserswitch ports 1 and port 2
- Contact Sense trap for Start/Stop
- Contact Sense trap for Active/Clear
- MACL Violation trap
- Authentication Failure trap