CLA-2000/Internet™

Comsat Link Accelerator

IP Router • **Satellite** • **Wireless Point-To-Point** • **TCP/IP Protocol**

The CLA-2000/Internet™ is an IP router, optimized to carry IP traffic over noisy satellite or wireless point-to-point WAN links, operating at 2.4 kb/s to 3 Mb/s data rates.

The CLA-2000/Internet provides efficient bandwidth utilization, improves link quality and increases application throughput over noisy WAN links. The CLA-2000/Internet is ideally suited for use over wideband satellite (fixed or mobile) or terrestrial wireless links.

Fiber-like quality with improved bandwidth utilization is achieved through the use of an adaptive Reed-Solomon based forward error correction (FEC) and interleaving mechanisms. The bursty bit errors on such links are corrected by the CLA-2000/Internet to provide Packet Error Ratios of 10^{-10} and better. This results in a significant performance improvement for TCP/IP based applications such as Web access and file transfers. This is because packet losses normally slow down TCP transmission rates, significantly reducing application data throughput over satellite and wireless links.

The adaptive coding mechanism of the CLA-2000/Internet eliminates the need to over-design the links to function under adverse link conditions. It can dynamically modify its Reed-Solomon coding rates depending on the quality of the link. For example, on "clear" days, it uses less overhead for FEC coding, thereby providing up to 7% additional bandwidth for higher throughput. Further, through loss-less data compression, the CLA-2000/Internet improves the effective link rate, typically by a factor of 2, providing savings towards additional satellite or wireless bandwidth that may otherwise be required.
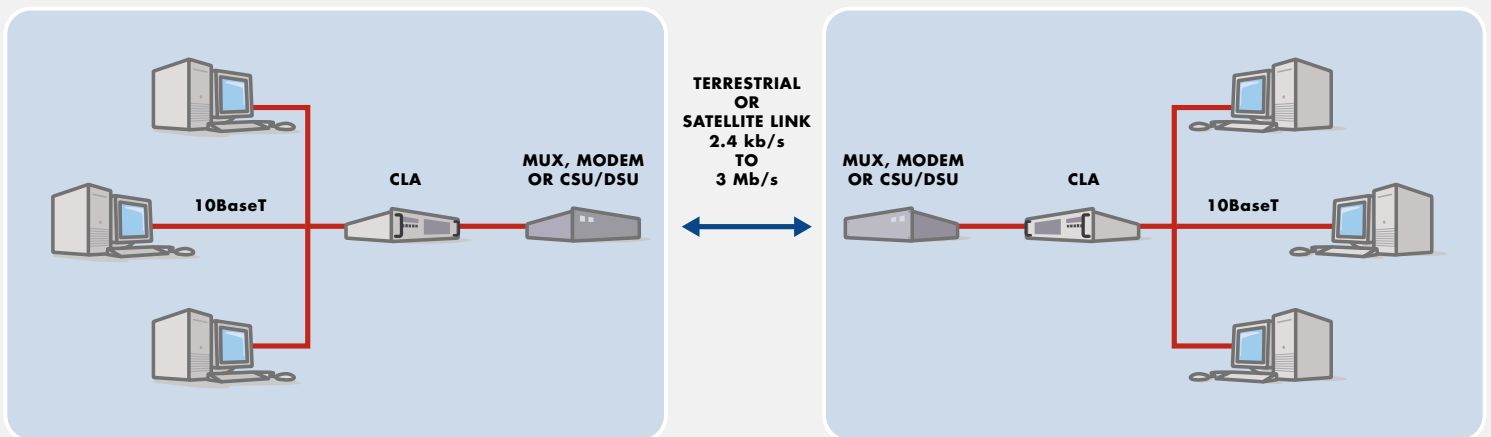

CLA-2000/INTERNET™ BENEFITS

Improved application throughput and quality, especially over high error rate links.

Application throughput and quality remain high over a wide variety of link types — terrestrial, mobile, radio and satellite.

Improved link availability even under severe link conditions.

Reduced WAN link cost through data compression and adaptive FEC.

Reduced WAN link capital investment with use of smaller antennas and reduced transmission power.

TERRESTRIAL OR SATELLITE LINK 2.4 kb/s TO 3 Mb/s

10BaseT   CLA   MUX, MODEM OR CSU/DSU   MUX, MODEM OR CSU/DSU   CLA   10BaseT

EXAMPLE CLA APPLICATION

The CLA-2000/Internet is easily installed into existing customer networks between the user's LAN and the WAN transmission device (modem, multiplexer, CSU/DSU). It provides an Ethernet (10BaseT) interface to the LAN. The WAN equipment connection is supported for RS-449, RS-530, V.35 interfaces.

The CLA-2000/Internet also functions as an IP router for the link. No changes are needed to end user equipment or protocols.

In addition to improving aggregate link performance, an optional TCP spoofing feature can provide throughput up to 2 Mb/s for a single session over a satellite link.

FEATURES

- Reed-Solomon coding and byte interleaving. Automatically adapts coding rate to measured link quality. Packet Error Ratio of 10^{-10} or better; coding overhead of 0 to 7%.
- Byte interleaving to combat burst errors. Convolutional interleaving scheme reduces interleaver delay.
- Packet buffering to perform rate adaptation.
- Random Early Discard (RED) queue management algorithm.
- Adaptive, loss-less data compression. Uses multi-packet compression history, resulting in superior compression ratio. WAN link rate must be 1.5 Mb/s or lower.
- WAN link -2.4 kb/s to 3 Mb/s. symmetric or asymmetric data rates. Terrestrial, single-hop or double-hop satellite link. Supports RS-449, RS-530, V.35 external clocking.
- WAN link raw bit error rate range: 0 – 10^{-3}.
- IP access ports — Ethernet (10BaseT).

- Novel synchronization scheme to achieve rapid bit, byte and frame synchronization between CLA-2000/Internet units over the WAN link.
- Compatible with related IP suite of protocols — RIP, ICMP, SNMP, ARP, UDP, TCP
- Plug-and-play ease of use. Preset to accommodate most common configurations.
- Customer-configurable parameters.
- Flash memory for software upgrades.
- Management via console port, Ethernet/IP or SNMP.
- Redundancy option (1:1) available.
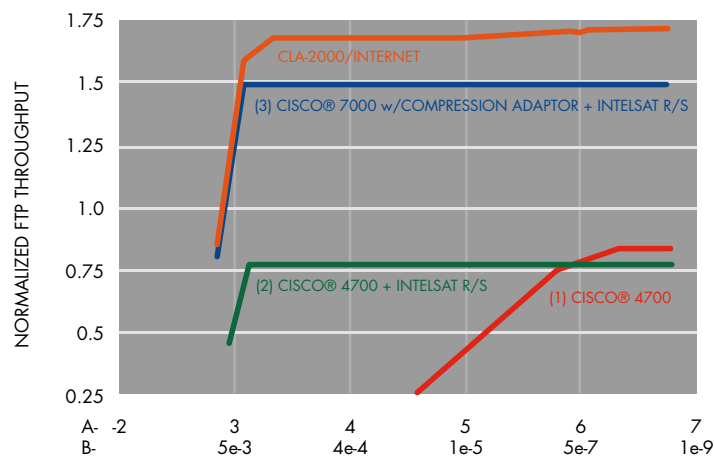
SATELLITE MODEM = VITERBI RATE 3/4 QPSK
SATELLITE DATA RATE = 1.544 Mb/s
COMPRESSION = 50%
R/S= REED SOLOMON OUTER CODEC

A- Eb/No (dB) of TRANMISSION BITS
B- BER AFTER VITERBI DECODING

CLA-2000/Internet Performance

The graph at left shows comparative network throughput when using the CLA-2000/Internet as a function of satellite or wireless link quality. For comparison, performance curves are also shown after the CLA-2000/Internet is replaced with other popular routers. Curve (1) shows throughput when using the Cisco® 4700 router over a satellite modem with Viterbi rate 3/4 coding; Curve (2) shows throughput achieved using the Cisco 4700 over a satellite modem with Viterbi rate 3/4 coding plus an INTELSAT standard Reed-Solomon outer coding; Curve (3) shows throughput when employing a relatively expensive solution of using the Cisco 7000 router (with compression adaptor) over a satellite modem that uses rate 3/4 Viterbi coding plus an INTELSAT standard Reed-Solomon outer coding (a relatively expensive solution).

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