General DataComm

TURBO DATA DIGITAL COMPRESSION

HOW TO DRAMATICALLY INCREASE THE CAPACITY
OF TMS 3000 AND OCM NETWORKS

OVERVIEW Today's corporate backbone networks have an ever increasing need for more bandwidth. Classic SNA, host-centric terminal applications and low speed data circuits have been rapidly overshadowed by the need to support high speed digital connections between LAN routers and bridges. Corporate E1/T1 backbone bandwidth managers and multiplexers are being stressed in an attempt to support many fractional T1/E1 channels. Indeed, GDC's TMS 3000™ can multiplex up to 512 channels into a single E1/T1 aggregate. But supporting a large number of 256 Kbps or 512 Kbps channels not only consumes expensive WAN bandwidth, it also consumes precious bandwidth capabilities within the bandwidth manager itself.

In this integrated Turbo application, two channels are connected to Turbo cards within OCMs and two channels are presented as network channels groomed to standalone Turbo Data Units. The OCM and standalone Turbo Units support the compression of the branch office router traffic.

GDC digital data compression products can more than double the bandwidth capabilities of the TMS 3000, the OCM 2000 and the OCM 1000.

COMPRESSION THROUGH AUTOMATIC TOKENIZATION
Digital data compression has been employed in networks for many years. Only recently, however, has the technology matured to the point where it can be integrated within corporate backbone equipment. Several data compression methods can be used. Each method has different characteristics for compression ratio, protocol support and overall delay. GDC's compression technology uses automatic tokenization, a powerful heuristic compression method. Phrases occurring frequently in the data stream are

represented more compactly by encodings known as tokens. In addition, GDC's compression technology automatically modifies its compression technique to achieve the best compression ratio and throughput for any given conditions.

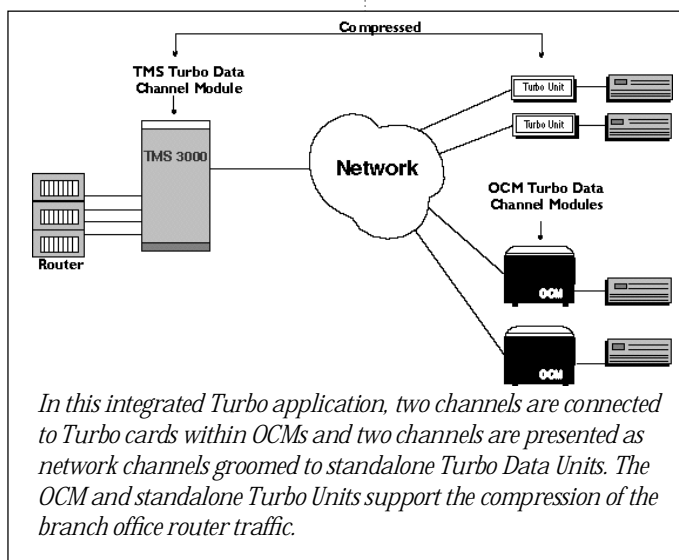This technique results in a compression ratio which is typically 4:1 or better. In other words, only 128 Kbps of bandwidth is required to transport 512 Kbps of user data; only 64 Kbps of bandwidth is required to transport 256 Kbps of user data, and only 16 Kbps of bandwidth is required to transport 64 Kbps of user data.

THE GDC TURBO DATA FAMILY
GDC's family of digital compression products includes integral data compression within both the TMS and OCM as well as standalone data compression units. All GDC's data compression products are 100% end-to-end compatible with one another.

TMS TURBO DATA CHANNEL, 512 KBPS (TDC-5)
This data compression module for the TMS 3000 supports up to 512 Kbps of synchronous user data or up to 230.4 Kbps of asynchronous user data. It has a configurable channel rate (compressed data) from 2400 bps to 128 Kbps. It is configured in a standard channel expansion shelf. Its selectable DTE interfaces include: V.35, V.11/RS-422, V.24/EIA/TIA-232-E.

TMS TURBO DATA CHANNEL, 256 KBPS (TDC-2)
This data compression module for the TM 3000 supports up to 256 Kbps of synchronous user data, or up to 230.4 Kbps of asynchronous user data. It has a

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configurable channel rate (compressed data) from 2400 bps to 64 Kbps. It is configured in a standard channel expansion shelf. Its selectable DTE interfaces include: V.35, V.11/RS-422, V.24/EIA/TIA-232-E.

OCM TURBO DATA CHANNEL, 512 KBPS

This data compression module for the OCM-1000 and OCM-2000 supports up to 512 Kbps of synchronous user data or up to 230.4 Kbps of asynchronous user data. It has a configurable channel rate (compressed data) from 2400 bps to 128 Kbps. It is configured in a standard OCM. Its selectable DTE interfaces include: V.35, V.11/RS-422, V.24/EIA/TIA-232-E.

OCM TURBO DATA CHANNEL, 256 KBPS

This data compression module for the OCM 1000 and OCM 2000 supports up to 256 Kbps of synchronous user data or up to 230.4 Kbps of asynchronous user data. It has a configurable channel rate (compressed data) from 2400 bps to 64 Kbps. It is configured in a standard OCM. Its selectable DTE interfaces include: V.35, V.11/RS-422, V.24/EIA/TIA-232-E.

TURBO DATA UNIT, 512 KBPS

This standalone data compression unit supports up to 512 Kbps of synchronous user data or up to 230.4 Kbps of asynchronous user data. It has a configurable channel rate (compressed data) from 2400 bps to 128 Kbps. Selectable DTE interfaces: V.35, V.11/RS-422, V.24/EIA/TIA-232-E.

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COMMON PRODUCT BENEFITS

All GDC data compression products provide:

- 4:1 typical compression ratio. Higher ratios

Before Data Compression
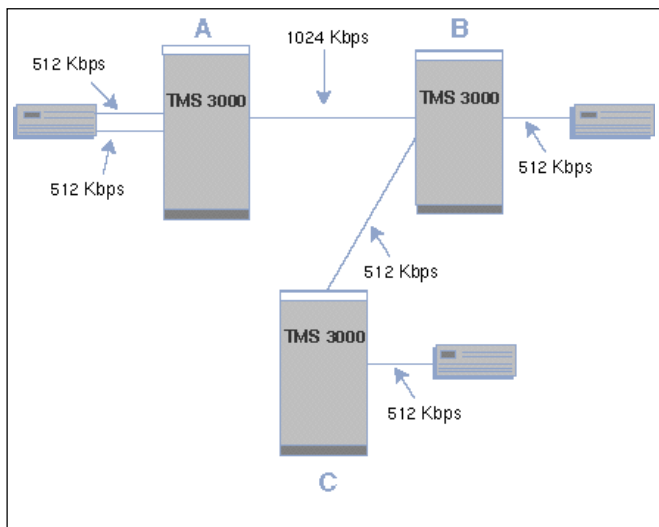
Before data compression, three external routers are interconnected via standard circuits. The router at node A is connected to the routers at nodes B and C via 512 Kbps circuits. A total of 1024 Kbps of bandwidth is used between nodes A and B and 512 Kbps between nodes B and C.

With Turbo Data Channel Cards
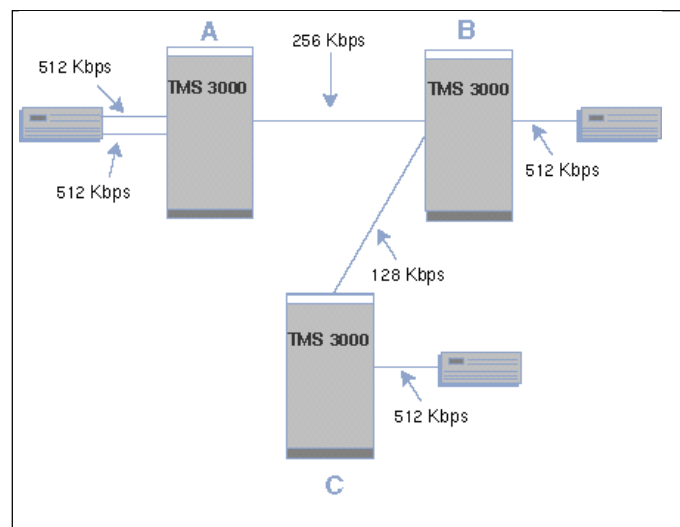
After Turbo Data Channel Cards have been applied, the circuit speeds to each router remain at 512 Kbps, but only 256 Kbps of bandwidth is required between nodes A and B, and only 128 Kbps between nodes B and C. An additional 1152 Kbps of bandwidth is now available for other applications, such as compressed voice, data and frame relay services.

possible, depending on protocol and data content

- Support for synchronous protocols including TCP/IP between routers, HDLC/SDLC, X.25 and asynchronous data
- On-board selectable CCITT V.35, V.24 (EIA/TIA-232-E) and V.11 (RS-422) interfaces
- Management data logging and statistics. The Turbo products gather statistics on compressor performance, error control, overhead and input/output activities and checks. Network managers can gather statistics and information on network performance, compression ratio and circuit integrity
- Flexible flow control and variable clocking
- Reliable, unattended operation. After installation, the Turbo products function without user intervention.

FLOW CONTROL The Turbo Data Channel modules and Turbo Data Units both provide extensive flow control to connected terminal equipment. In synchronous applications where control lead or XON/XOFF flow control may be inappropriate, the Turbo products can be configured so that the clock delivered to the terminal equipment is varied to allow the most efficient use of composite channel capacity. Since the actual compression ratio will vary based on protocol, it is possible to configure the Turbo products for maximum possible compression and allow them to vary the clock as required in order to achieve maximum compression as the terminal protocol and payload allow.

INCREASED CAPACITY GDC's data compression capabilities not only offer significant bandwidth savings across the Wide Area Network, they also more than double the capacity of existing TMS 3000 circuit multiplexed networks. Nodal equipment that previously supported 2 Mbps of data channel capacity may now support 4 Mbps or more. Because the capacity increase comes from compression, there are no increases in monthly line charges, yet network throughput is more than doubled. The cost-effective compression features offer rapid payback in WAN bandwidth savings. They are also flexible and can be used to increase nodal capacity, thus avoiding the need to purchase additional nodal equipment. GDC's compression products, ranging from integral Turbo Data Channel modules to standalone Turbo Data Units, offer complete end-to-end compression solutions in virtually any network topology.

Rate Conversion
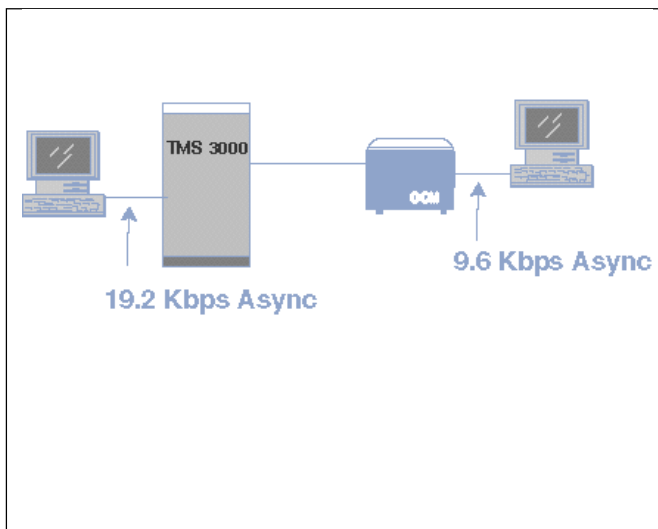
The Turbo products also provide rate conversion. A Turbo product at one end of a circuit may be configured for a different terminal rate than the other end. The Turbo products will flow control or vary the clocking to achieve maximum compression and rate conversion.

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SPECIFICATIONS

Compression Ratio: Up to 6 to 1 (typically 4 to 1 for X.25), protocol dependent

DTE Data Formats and Rates

Synchronous: TMS: TDC-2–2400 bps to 256 Kbps send and receive continuous (384 Kbps max.)
OCM: TDC 256K–2400 bps to 256 Kbps send and receive continuous (384 Kbps max.)
TMS: TDC-5–2400 bps to 512 Kbps send and receive continuous (768 Kbps max.)
OCM: TDC 512K–2400 bps to 512 Kbps send and receive continuous (768 Kbps max.)

Asynchronous: From 110 bps to 230.4 Kbps (max. determined by cable and DTE characteristics)

TDM Channel Rates: Synchronous, from 2400 bps to 64 Kbps (TDC-2) and to 128 Kbps (TDC-5)

Interface Ports On-board switch-selectable

DTE: Compatible with EIA/TIA-232-E; ITU-T V.24; ITU-T V.28; ITU-T V.35; EIA RS-422 (ITU-T V.11); MIL-STD-188-114 , Balanced; EIA RS-423 (ITU-T V.10)

Management
Port: Physical stereo jack (3.5MM); Electrical 3 wire: Tip, ring, sleeve; 1200 baud ASCII

Protocols: Most standard protocols with automatic recognition up to 5,000 bytes/block.

HDLC, SDLC, APPN, TCP/IP, ASYNC, X.25, and Xerox PTP; other synchronous protocols.

Flow Control: Xon/Xoff; RTS/CTS; Variable clocking (clock throttling)

LED Indicators
TMS: Data In, Data Out, Ready, In Service, Clear to Send, Channel Alarm
OCM: In Service, Data In, Data Out, Clear to Send, Alarm, Test

Diagnostic Tests: Local loopback, compressor bypass, remote loopback

Statistics: Compression ratio, I/O, Communications link parameters, SD writes, RD reads, Link error log including data checks, overruns and frame discards

Configuration: Download to/from either end; terminal via rear panel; on-board switch settings

Power Consumption:
TMS TDC-2 and OCM TDC 256K: 5.2 watts (max.)
TMS TDC-5 and OCM TDC 512K : 6.2 watts (max.)

Operating Temperature: 0° to 45° C (32° to 113° F)

Humidity: Up to 95% non-condensing

Interference Protection: Verified to comply with FCC Part 15, Subpart J (Class A Requirements); EN 55022 Class B

All specifications subject to change without notice.

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