

Voice Compression For GDC's TMS/OCM Product Family

Application Brief

The TMS/OCM family is a set of wide area network bandwidth management systems that provide transport for today's multimedia applications over a broad range of communication services. Highly scalable both in terms of size and applications supported, TMS products allow corporations to integrate voice, data, video and LAN traffic over digital leased line, ATM* or satellite networks.

Product Overview

TMS 3000

The TMS 3000 — the core of the Transport Management System product family — is a high capacity inter-networking platform designed to efficiently manage all types of communications. Connections between Local Area Networks (LANs), traditional data applications, videoconferencing, and voice communications are consolidated to provide a streamlined, highly integrated network. Applications formerly supported over separate LAN, data and voice networks are now effectively integrated for simpler, more cost-effective operation.

Support for such varied requirements as frame relay access, SNA traffic which requires predictable response times, videoconferencing and voice traffic is integral to the TMS 3000.

OCM 2000

GDC's Office Communications Manager (OCM) 2000 is a powerful, cost-effective networking platform that extends the backbone TMS 3000 network's capabilities to remote branch office locations. Supporting voice, fax, data, video, image and LAN applications, the OCM 2000 can easily be tailored to any organization's network requirements.

OCM 1000

The OCM 1000 is a hybrid access networking device for point-to-point, point-to-multipoint, and point-to-network applications with a growth

path to the power of the TMS 3000. The OCM 1000 offers connectivity to a variety of digital carrier services, allowing users to select the one providing the best performance/cost ratio in each location.

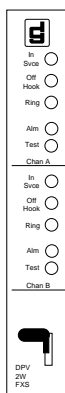
The OCM 1000 offers investment protection — it can be upgraded to participate in a large TMS backbone network simply by swapping a common logic module. There is no need to discard network equipment and the initial investment as requirements grow.

Voice Capabilities

The TMS family enables network planners to implement a broad range of analog and digital voice scenarios. Its voice modules support voice compression techniques that compress the voice channel input while offering excellent voice quality. The result is more efficient use of the bandwidth and tremendous savings in transmission costs.

Dual Private Voice Module (DPV)

GDC's DPV module is a two channel analog voice compression module that occupies one slot in an Office Communications Manager (OCM) and delivers two channels of analog telephony. The DPV supports full rate bypass of Group III Fax signals. It provides compression of 8 or 9.6 Kbps using Conjugate Structure – Algebraic Code Excited Linear Predictive (CS-ACELP — ITU-T G.729A).



Voice Transcoder Platform (VTP)

The VTP module resides in a single slot in the OCM and provides the means for up to four network circuits (64 K PCM voice) to be compressed to 8 or 9.6 Kbps using CS-ACELP, and then transported as channels in a subaggregate, in bit format. Termination of the voice circuit occurs on a GDC DPV or another VTP, digital to analog or digital to digital.

Voice Compression

Standard voice traffic is passed through the network at 64 Kbps. The CS-ACELP voice compression algorithm reduces the bandwidth required for voice traffic to 8 Kbps while maintaining the quality of a 32 Kbps ADPCM call. This compression leads to extensive reductions in the amount of bandwidth required to transmit information across the backbone, as well as savings in infrastructure costs.

Echo Cancellation

The voice compression algorithm contains an integrated 16 millisecond, configurable G.165 compliant echo canceller and a non-linear echo suppressor. The echo canceller prevents echoes that may be present on analog loops from being transmitted to the other end of the network. The echo canceller is adequate to eliminate near end echoes for telephone terminations within the allowable 9,000 foot loop length.

Fax Bypass

Full rate Group III fax bypass allows the transparent bypass of fax signals at the full Group III rate of 9.6 Kbps.

* Connection to ATM networks is through a T1/E1 connection and circuit emulation

OCM 1000 Applications

Digital PBX to Digital or Analog PBX

As shown in Figures 1 and 2, the VTP can be used to carry voice in both private and public networks. Signals from the Digital PBX (DPBX) are received with the appropriate network Line Interface Module (LIM) and passed across the backplane to the VTP. The VTP compresses the voice circuits and converts them to proprietary bit format. The signals are then sent across the network via a LIM. At the other end, the voice circuits are terminated by either another VTP/LIM, for use by a DPBX, or by GDC DPV cards, for use by an Analog PBX (APBX) or station end.

With these applications, users require less bandwidth to transport voice circuits across the backbone network. Data circuits can be multiplexed into the same T1 that carries the compressed

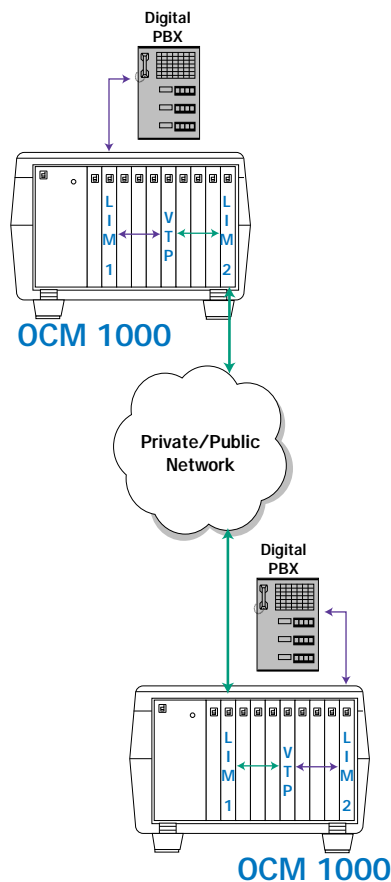


Figure 1 — Remote PBX (Digital)

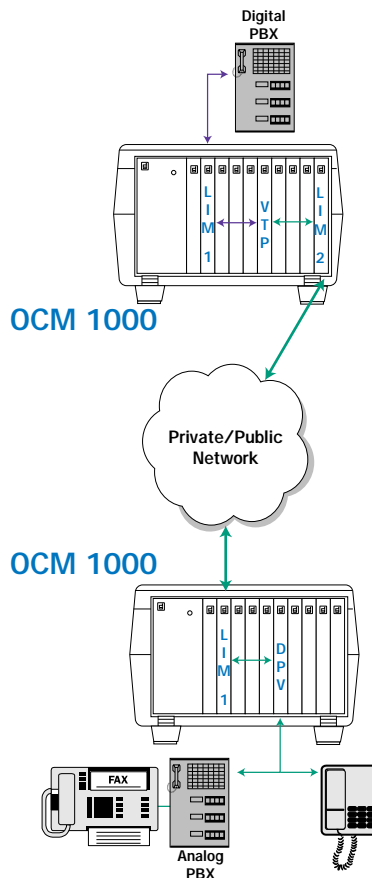


Figure 2 — Remote Station (Analog) voice, enabling more efficient use of the available bandwidth.

Single LIM in FT1 Application

The application shown in Figure 3 demonstrates the use of a fractional T1 service to bring in network voice on a T1 connection, compress it, and then send it out on the same T1 to a remote destination. Data circuits can also be

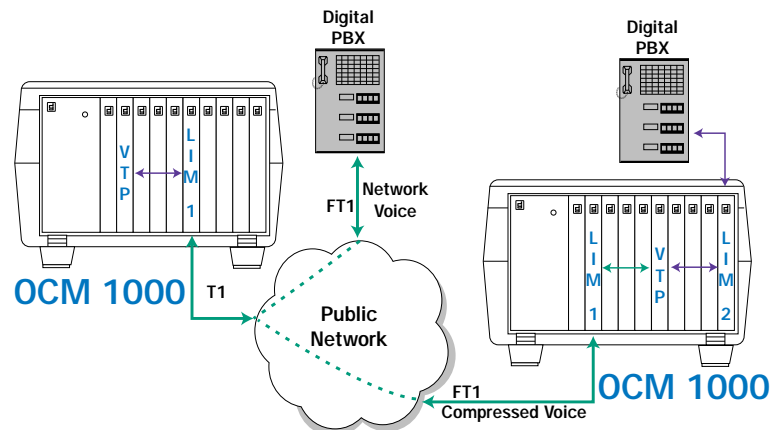


Figure 3 — Single LIM Carrying Network and Compressed Voice

multiplexed onto the T1 at the local OCM, using the extra bandwidth gained by compression. The compressed voice and data will be framed into an $N \times 64$ Kbps subaggregate for transport over a fractional T1 service.

TMS 3000/OCM 2000 Applications

Voice service needs of larger networks are easily met with a TMS 3000 node at the central site and OCM 2000 nodes at remote locations. Connection can be over either private facilities or the public network.

Analog Remotes to Central Site with Analog PBX

In this application, signals from remote offices originate on a DPV module installed in the OCM 2000 (Figure 4). These signals are passed across the backplane to the appropriate LIM and are sent across the network to a Combined Digital Aggregate (CDA) module in the central site's TMS 3000. The CDA then passes the voice signal to a collocated OCM 2000 equipped with a LIM and a DPV module, where the signal is converted from digital to analog, and on to the Analog PBX.

In this configuration, the OCM 2000 sends analog (2/4 wire) voice signals in $N \times 64$ K portions to a T1 or E1 connection on the TMS 3000. The CS-ACELP algorithm compresses the voice signal to 8 or 9.6 Kbps. Group III FAX Bypass is supported in this application.

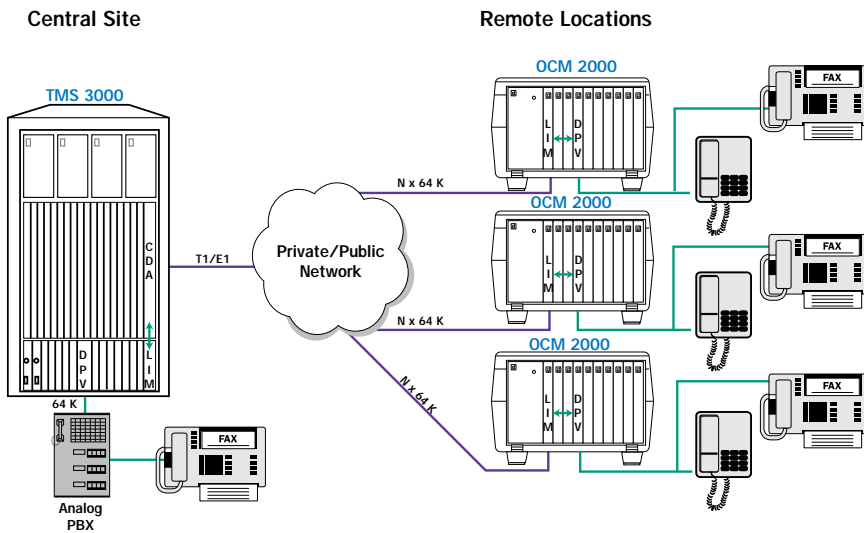


Figure 4 — Central Site with Analog PBX

In the case of line failures, the voice and data circuits can be rerouted using Intelligent Automatic Rerouting. The circuits can have different priority levels to allow critical data and voice circuits to remain active during a failure.

Key Benefits:

- Voice and data signals can be combined over narrowband connections
- Supports a wide variety of analog equipment — PBX, telephone, fax machines, etc.

Analog Remotes to Central Site with Digital PBX

As shown in Figure 5, the remote OCM 2000 units send analog signals from the user's equipment via the DPV to the appropriate LIM and across the digital network to the TMS 3000's CDA module. The CDA passes the digital signal to a collocated OCM 2000 equipped with a LIM and a VTP module. The VTP converts the compressed voice to 64K PCM and passes along the signalling to the digital PBX*.

The remote OCM 2000s support 2/4 wire E&M, 2W FXS and 2W FXO. Voice compression of 8.0 or 9.6 Kbps is possible through the CS-ACELP algorithm. Group III FAX Bypass is also supported.

Key Benefits:

- Allows voice compression from dissimilar equipment — digital to analog
- Permits many small offices to communicate with each other and with several other larger sites

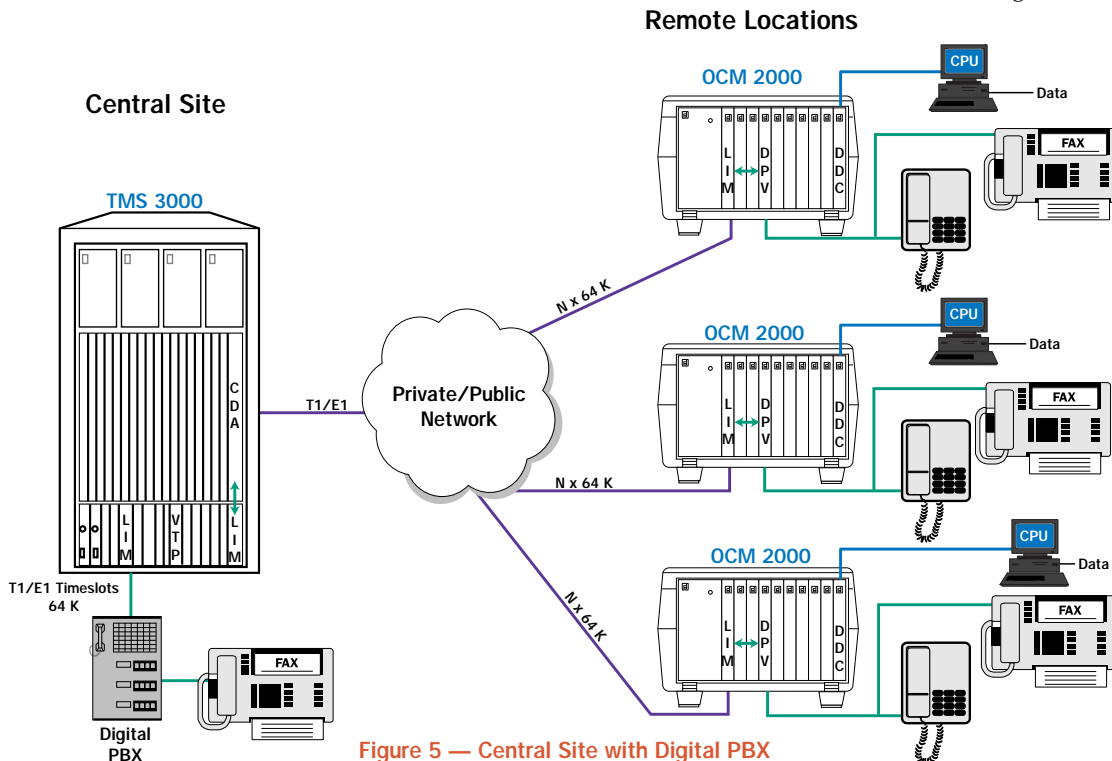


Figure 5 — Central Site with Digital PBX

* At present, this requires TMS-4000 to support VTP in a TMS/OCM 2000 network. Check with your GDC representative for availability.

Voice Compression on GDC's TMS/OCM Product Family

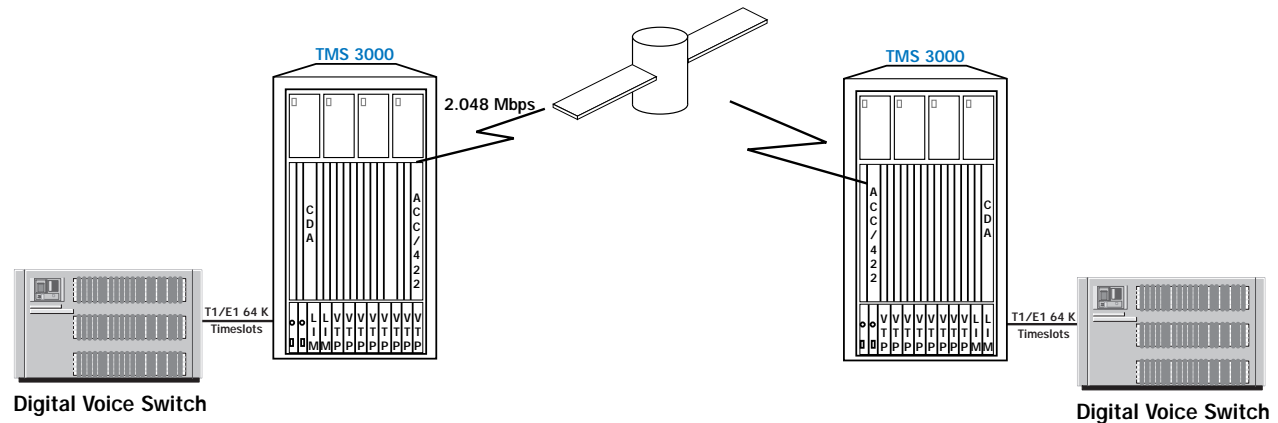


Figure 6 — VTP Bulk Compression and Satellite-Based Carriers

Bulk Voice Compression

The application depicted in Figure 6 uses the OCM clear channel feature. Multiple VTPs provide bulk compression on each E1 voice link using CS-ACELP. The 30 DS0s in each shelf are compressed to 8.0 Kbps, requiring only 5 DS0s of bandwidth, 320 K. Figure 6 does not show the other five OCMs that are connected via a V.35 LIM to the clear channel and are groomed into a single E1

Six E1s worth of voice traffic can be transported over the 2.048 Mbps satellite link. Provisioning voice services using TMS/OCM offers a low cost solution to service providers. In addition, this configuration is ideal for satellite-based carriers with limited bandwidth (Figure 6).

Key Benefits:

- TMS 3000 can be used to compress hundreds of voice channels over sub-E1/T1 links
- Ideal for provisioning voice services over high-cost international circuits
- Provides fast payback on equipment

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