TDMoIP

TDM-Based Solutions over Packet-Switched Networks

TDMoIP

- **Generates new service revenues for service providers**

- **Investment protection for enterprises**

- **Delivers transparent leased line and private line services over less expensive IP and Ethernet networks**

- **Runs legacy and native enterprise data over a common packet-switched infrastructure**

Transport Any Service over IP

TDM over IP (TDMoIP) is a transport technology developed by RAD that provides a simple conversion strategy to IP-based networks. TDMoIP carries E1, T1, E3 or T3 circuits across the packet-switched network, transparent to all protocols and signaling. TDMoIP enables service providers to migrate to next generation networks and continue to provide all their revenue-generating legacy voice and data services. TDMoIP also benefits data carriers by enabling them to offer lucrative leased line and private line services. This lets them maximize revenues from their packet-switched (e.g., Gigabit Ethernet) infrastructure by selling voice services as well as data. It enables enterprises to run voice and video over the same IP/Ethernet-based network that is currently used to run only LAN traffic, thereby minimizing network maintenance and operating costs.

Smooth Transition to Next Generation Networks

Not only is TDMoIP simpler and less expensive than VoIP, it is also a superior alternative in many other ways – especially in applications where the existing PBX functionality is sufficient. Most importantly, TDMoIP provides higher voice quality with much lower latency than VoIP. Unlike VoIP, TDMoIP can support all applications that run over E1/T1 circuits, not just voice. TDMoIP can provide traditional leased line services over IP, and is transparent to protocols and signaling. Because TDMoIP provides an evolutionary – not revolutionary – approach, investment protection is maximized. Finally, TDMoIP supports installed PBXs with no loss of functionality.

TDMoIP vs. VoIP

TDMoIP (Circuit Extension over IP)	VoIP (IP Telephony)
Simple and evolutionary	Complex and revolutionary
Uses standard, mature and well-known protocols: E1, T1, E3, T3, IP	New, evolving protocols such as H.323, MGCP and SIP
Low cost of ownership	Complexity requires retraining IT
Supports existing PBXs	Forklift upgrade (reinvents telephony)
Significant cost savings	Expensive upgrades and replacements
Little disruption to business	Compatibility issues
Transparent to signaling and protocols	Translates between signaling formats
No loss of PBX functionality	Limited support for existing PBX features
Superior voice quality*	Long call-setup times
Much lower latency*	
Configurable packet size	Packets depend on codec samples
Minimizes delay	Delays as sample is recorded
Minimizes overhead	Overhead on each voice session
Data, voice, and video circuit extension	Primarily voice
DS0 level bundling and cross connect	Voice switching per call

* Based on tests conducted by Mier Communications, as reported in *Business Communications Review*, Sept. 2001

Who Benefits from TDMoIP?

- **Utility companies** reduce expenses and simplify their networks by migrating legacy voice and SCADA applications over their more efficient Ethernet networks

- **Utelcos** generate new revenue by delivering profitable leased and private line services over their scalable Ethernet/fiber infrastructures

- **Incumbent carriers** reduce infrastructure costs by utilizing their IP cores for TDM transport (e.g., connecting SS7 over IP)

- **Metropolitan carriers** with IP or Ethernet access networks generate new revenue by delivering traditional leased line and private line services such as E1/T1 and E3/T3

- **Cable operators** can generate new revenue by offering traditional E1/T1 leased line and private line services over their hybrid fiber coax (HFC) cable networks

- **Enterprises** reduce network expenses with maximum investment protection by running all TDM traffic over Ethernet

How TDMoIP Works

TDMoIP takes TDM data streams and converts them into IP packets (with an IP addressing scheme) for transmission over the network. The original traffic, including clocking, is regenerated at the destination. Transparent connectivity over the IP/Ethernet network maintains all features and functionality of the telephony network. TDMoIP thereby provides seamless migration of a variety of legacy services to packet-switched networks, with full support for legacy equipment such as Class 4 and 5 switches, PBXs and TDM multiplexers.

RAD is working together with other industry leaders on the Internet Engineering Task Force (IETF) to standardize the TDMoIP protocol.

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A Complete System Solution

RAD's TDMoIP family comprises a diverse mix of TDMoIP gateways, from small customer-located equipment (CLE) to higher capacity units for the carrier's central office or point-of-presence (POP). The products facilitate a wide range of applications, including simple end-to-end circuit extension over IP and delivery of a variety of legacy services over packet-switched networks.

RAD has vast experience in enabling legacy services using TDM multiplexers. Adding TDMoIP capabilities to these devices expands the solution range for utilities, local government, city carriers and nationwide trunking services. These products take advantage of the next generation network to deliver voice, fax, modem and data services without compromising traditional PSTN quality.

IPmux-1, IPmux-1E
TDMoIP Gateways

The IPmux-1™ and IPmux-1E™ TDMoIP gateways support digital E1/T1 trunks and analog and ISDN voice channels over Fast Ethernet fiber or copper links. User Ethernet enhanced VLAN support and rate limiting enable enterprises and service providers to avoid congestion and offer different grades of service, while providing traffic isolation for multiple services or applications.

IPmux-8, IPmux-16
TDMoIP Gateways

RAD's IPmux-8™ and the NEBS-compliant IPmux-16™ are higher capacity units, ideal for aggregating circuits at enterprise headquarters or carriers' POP or central office. They provide modular support for extending up to 16 E1/T1 circuits or two E3/T3 circuits over IP/Ethernet networks. The channelized E1/T1 interfaces enable point-to-multipoint applications on a DS0 level.

Megaplex Family
Modular Multiplexers

Megaplex-2200™, Megaplex-2100™ and Megaplex-2104™ TDM multiplexers deliver a wide variety of services over TDM and next generation networks. The versatile, modular platform enhances the TDMoIP system solution with high capacity support for POTS, ISDN, low and high speed data, Ethernet and LAN-to-LAN traffic in daisy-chain and Resilient Fast Ethernet Ring (RFER) topologies.

Easy, Automated Service Provisioning

The RADview Service Center TDMoIP™ is a powerful management tool for end-to-end control, monitoring and provisioning of TDMoIP services. The ability to perform automated service provisioning of TDMoIP services from a central site improves time-to-market, eliminates the need for on-site visits and lowers customer support costs. The Service Center's intuitive graphical user interface, point-and-click functionality and easy-to-follow wizards increase the efficiency and accuracy of the service provisioning process.

The Service Center application monitors the status, configuration and resource availability of the TDMoIP gateways. Its open, CORBA-based architecture integrates with any third-party management platform.

Kilomux Family
Sub-Rate Multiplexers

Kilomux-2100™ and Kilomux-2104™ sub-rate integrating multiplexers are well-suited to narrow bandwidth voice and data applications, including compressed voice (with E1/T1, analog and ISDN interfaces) and low and high speed data.

## Vmux Family
Voice Trunking Gateways

The Vmux™ series of voice trunking gateways are designed for transporting digital voice traffic. They employ various compression codecs for optimal transmission over broadband, narrowband, and even poor performance network links. Dynamic bandwidth allocation supports fax relay without wasting bandwidth.

# E1/T1 and E3/T3 Leased Line Services over IP

The challenge for carriers is to cost-effectively provision broadband next generation services as well as leased line services, which are the carriers' main sources of revenue. And enterprises are seeking effective use of the broadband infrastructure to run all their traffic. The packet-switched network is the natural choice for new data services, but the Gigabit Ethernet/IP backbone does not support legacy equipment and applications. RAD's TDMoIP enables carriers and enterprises to migrate to the packet-switched network and still benefit from all legacy and new services, streamlining operations over one network. TDMoIP technology is a win-win for both carriers and enterprises because it offers the most efficient way to provide TDM services to distributed enterprises and private customers looking for broadband data connectivity, transparent LAN services and access to PSTN services.
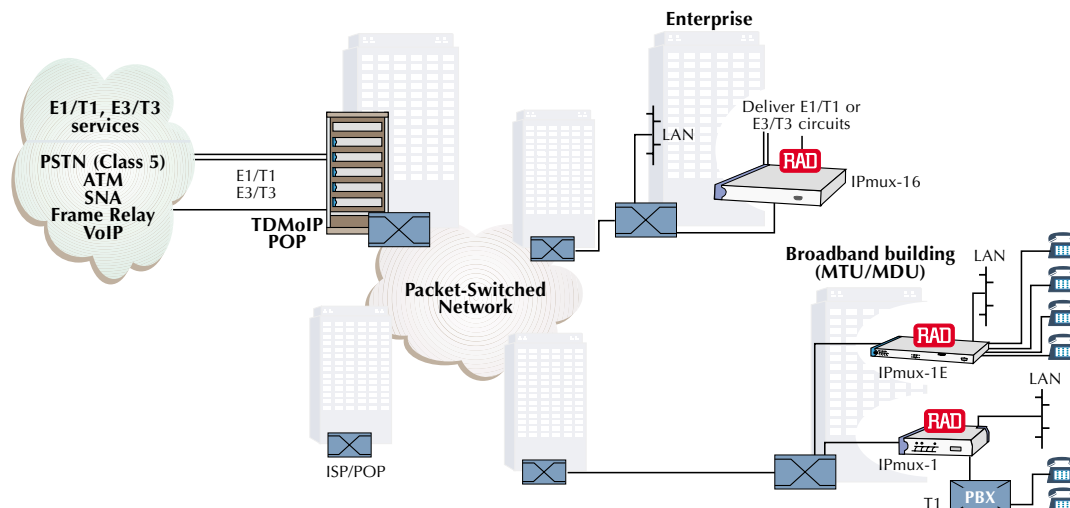
IP Cellular Backhaul

A packet-switched network replaces the leased lines that connect the base stations (BTSs), base station controllers (BSCs) and mobile switching centers (MSCs). 2G and 2.5G cellular networks are based on switching performed at the MSC. TDMoIP is used to provide transparent transport with minimal delay. Supported access media include fiber, coax and fixed wireless.
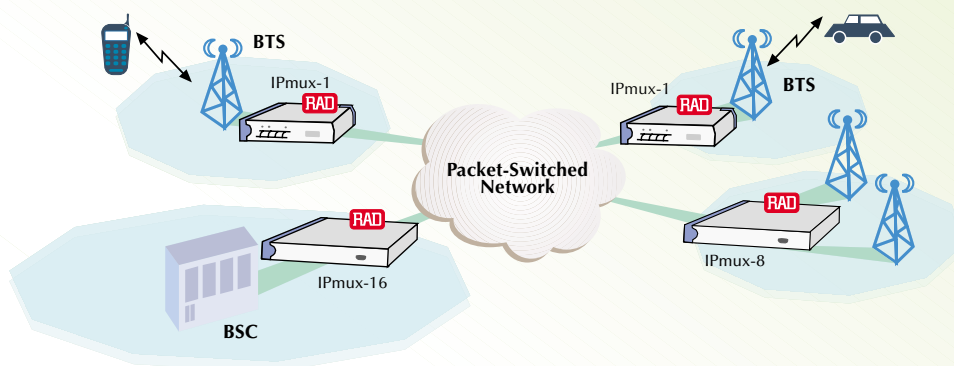
Resilient Fast Ethernet Ring

Megaplex multiplexers support TDMoIP and RAD's new Resilient Fast Ethernet Ring (RFER) technology, which introduces 50 millisecond self-healing capabilities on Fast Ethernet (100 Mbps) fiber or copper rings. Scalable support for multiple rings eliminates the risk of a single point of failure. This is ideal for dispersed applications.

Megaplex empowers RAD's TDMoIP solutions with its vast variety of voice and high and low speed data interfaces, high port density and attractive price-per-port performance, allowing the transmission of all legacy services over Fast Ethernet. Combining TDMoIP and RFER creates a virtual TDM resilient ring with a capacity of 40 E1 or 50 T1 lines. This offers a very attractive alternative to 155 Mbps SDH/SONET rings with better cost performance, improved flexibility and native Ethernet support.
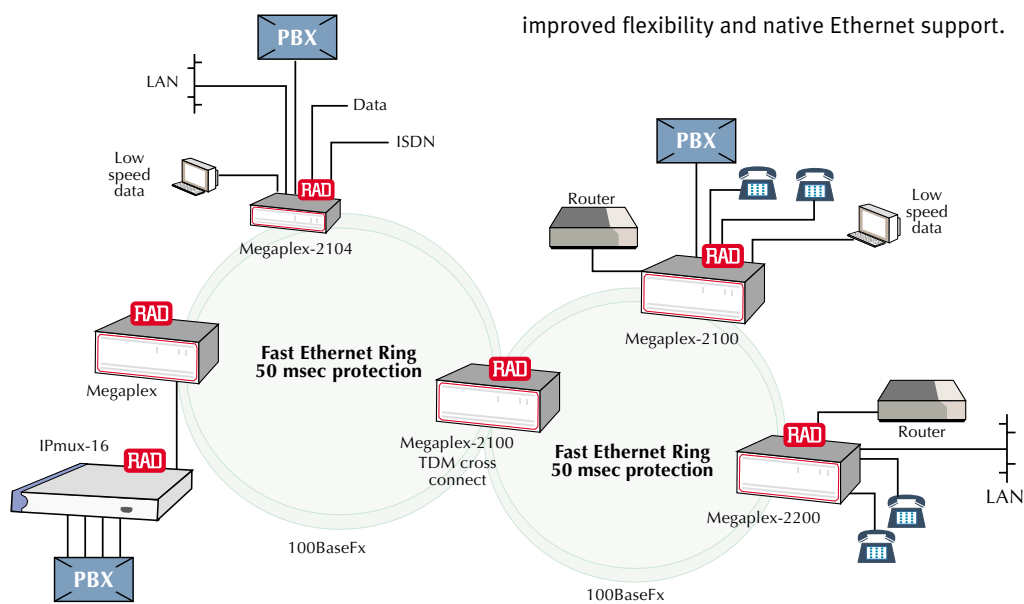
Voice Compression over IP Core Network

A Vmux voice trunking gateway compresses traffic at the voice switch (for example, MSC) and sends it over the packet-switched network. Voice activity detection and silence suppression allow the Vmux-2100 to dynamically allocate bandwidth for voice traffic and fax relay, resulting in very efficient bandwidth usage, while the signaling information is transmitted transparently.
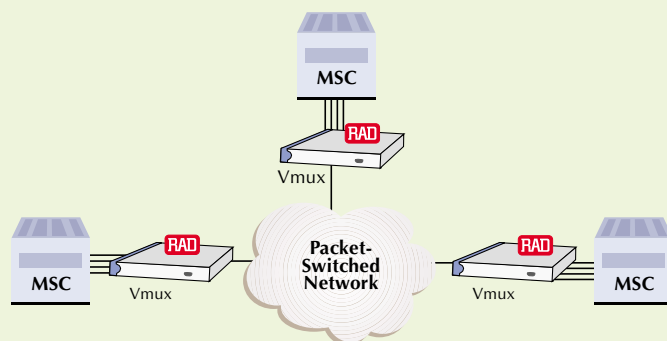
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