

MIX-Enabled T1/E1 Port Adapter for the Cisco 7200 VXR Series Routers



Introduction

The Cisco 7200 series router is a modular, multifunction wide-area network (WAN) aggregation router for use in large enterprise and service-provider environments. Currently more than 100 modular interface port adapters are available for the Cisco 7200 router platform, providing a wide range of solutions for voice/video/data integration, virtual private networks (VPNs), and multiprotocol data routing. Using the Cisco multiservice interchange (MIX)-enabled enhanced digital voice adapter (PA-VXC-2TE1+), the MIX-enabled Cisco 7200 VXR router enables customers to consolidate voice, fax, and data traffic on a single network platform. The high-performance, modular architecture of the Cisco 7200 VXR series router protects customers' investments in network technology and integrates the functions of several devices into a single, manageable solution.

With the introduction of the MIX-enabled T1/E1 port adapter, voice and data integration options for customers using the Cisco 7200 VXR platform continue to grow. The MIX-enabled T1/E1 port adapter provides the ability to integrate voice and data on the same T1/E1 interface without the need for an external time-division multiplexing (TDM) device. With the "drop and insert" capability, DS0-level grooming is supported, thus providing cost-effective WAN access. Ports can be configured for voice, data, or both, depending on the application requirements. Three different density options are available for the MIX-enabled T1/E1 adapter supporting two, four, or eight ports. These port adapters come with built-in channel service units/data service units (CSU/DSUs), and they support software-selectable T1 or E1 interfaces. A total of 30 ISDN PRIs can be supported on a Cisco 7206 VXR series router with T1 links, and 24 ISDN PRIs can be supported with E1 links.

When the Cisco 7200 VXR MIX architecture is combined with the MIX-enabled T1/E1 port adapter and the enhanced digital voice adapter, connectivity is possible to both the legacy campus private branch exchange (PBX) and the Public Switched Telephone Network (PSTN). The configuration can provide the same call-control capabilities for PBX-to-PSTN calls as those that will be provided for packet voice calls on enterprise and service-provider networks. These multiservice capabilities give customers a manageable migration path to robust, cost-effective, multiservice networks.



Multiservice Networks

Rather than deploying separate voice and data networks, enterprises and service providers can merge these into a common multiservice infrastructure. Deploying a multiservice network with data, voice, and video provides tremendous cost savings by eliminating redundant network infrastructure, reducing voice toll charges, and reducing network-management overhead. A white paper, *Multiservice IP Telephony Business Case* at http://www.cisco.com/warp/public/cc/so/neso/vvda/iptl/msipt_bc.pdf, reports the results of a study conducted by Renaissance Worldwide Inc. that investigated the cost savings to enterprise organizations by implementing a combined data and voice infrastructure. The study shows a minimum of a 169-percent return on investment (ROI) generated over a three-year life cycle for a 100-user business location, and a 136-percent ROI for a 1000-user campus location.

Product Overview

The MIX-enabled T1/E1 port adapter enhances the multiservice solutions enabled by the enhanced digital voice adapters available on the Cisco 7200 VXR series of routers. By using the TDM capabilities of the Cisco 7200 VXR, the MIX-enabled T1/E1 port adapter can maximize the use of digital signal processor (DSP) resources on the enhanced digital voice adapters. The MIX-enabled T1/E1 port adapter enables the use of the DSP resource pool on the enhanced digital voice adapters. This concept of sharing the DSP resources across the TDM bus on the Cisco 7200 VXR platform is called DSP farming.

DSP farming enables unprecedented high-density multiservice network solutions in headquarters and larger regional offices. Now, enterprise offices needing to aggregate smaller-office voice and data can deploy multiservice networking using a single-box solution. Service providers offering data and telephony managed services can connect a single platform to their central offices or points of presence (POPs) for an integrated voice gateway/wide-area network (WAN) solution.

The MIX-enabled T1/E1 port adapter provides an ideal migration path to multiservice networking. Customers who need to keep existing circuit-switched network interfaces while they migrate to packet-based multiservice solutions can do so in a seamless and structured manner. There is no need go through complete replacement of older, legacy PBX or key communication system equipment when migrating. The MIX-enabled T1/E1 port adapter seamlessly interoperates with other multiservice platforms available from Cisco, allowing the easy creation of a complete end-to-end packet voice solution.

With support for voice over IP (VoIP), voice over Frame Relay (VoFR), voice over ATM (VoATM), multiple signaling types, and voice compression from 64 down to 5.3 Kbps, the MIX-enabled T1/E1 port adapter delivers the functionality and flexibility required for large-scale, multiservice network deployments across LAN and WAN environments. For data applications that require T1 CSU and DSU functionality, the two-, four-, and eight-port multichannel T1 port adapters provide the right combination of integration and cost. For E1 applications, the multichannel E1/G.703 interface allows direct connectivity to 120-ohm G.703/4 circuits. Twenty ISDN Primary Rate Interfaces (PRIs) can be supported on a Cisco 7206 VXR series router.

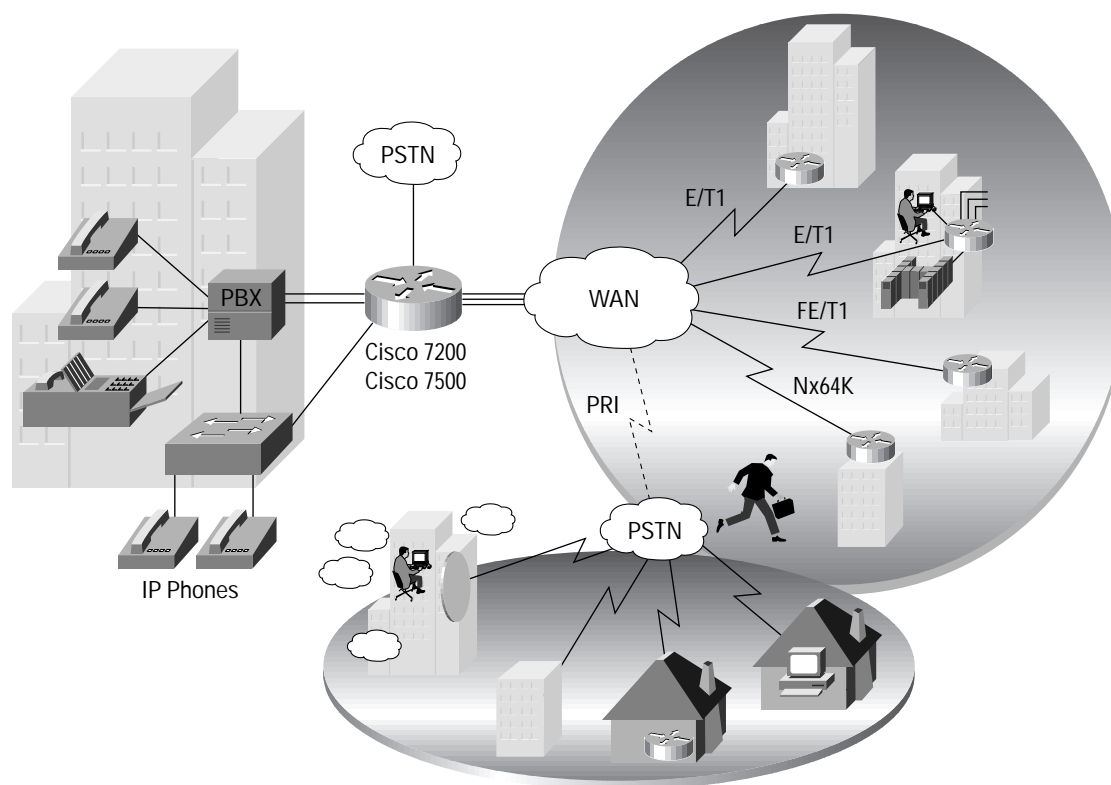
Application Example

Multisite enterprises generally have many voice calls placed between their locations. The enterprise can reduce costs by providing private voice services between sites, avoiding tariffs or voice tolls. Traditionally, the voice network was built separately from the data network because the technologies were quite different and separate groups managed voice and data. The MIX-enabled Cisco 7200 VXR routers with the enhanced digital voice port adapter and MIX-enabled T1/E1 port adapter are key tools in integrating both the voice and data worlds and creating next-generation multiservice networks.

The performance, rich quality-of-service (QoS) features and robust, multichannel WAN capabilities of the Cisco 7200 VXR platform have made it the logical choice in central-site deployments where there is a need to aggregate data and voice traffic from a large number of remote sites.



Figure 1



Features

The MIX-enabled T1/E1 port adapter offers the following features:

- Universal ports—Two, four, or eight interface ports per port adapter are configurable as either T1 (with integrated CSU/DSU) or E1 (with an integrated G.703/G.704 120-ohm interface). Additionally, a port may be configured on a per-DS0 basis for packet voice termination, TDM pass-through (crossconnect), or data.
- High-density DSP technology—This solution offers full support for low-bit-rate voice compression (down to 5.3 kbps) on all T1/E1 port channels.
- MIX support—Voice channels can be TDM-switched between ports on the MIX-enabled T1/E1 port adapter. This allows DSP resources to be shared between port adapters in the same chassis.
- DS0 drop and insert— This solution offers flexible TDM crossconnect capability between ports, with full signaling support.
- VoIP and VoFR termination—Full VoIP and VoFR gateway functionality for mixed environments is available.
- Full-featured DSP firmware—Support exists for eight standard-compression algorithms plus echo cancellation, full dual tone multifrequency (DTMF)/MF tone detection and generation, and dial pulse generation.
- Silence suppression—To conserve network bandwidth, voice activity detection prevents sending data when no voice is present. Comfort-noise generation prevents uncomfortable dead silence on the receiving end.
- Multiple clocking options—Ports can be clocked internally from the network, or the network clock from one port can be sent to the other port on the card or to other cards across the MIX bus in the Cisco 7200 VXR chassis.
- Flexible signaling support—Channel-associated signaling (CAS) and common channel signaling (CCS) support is available for both E1 and T1 applications.
- This solution offers support for 128 High-Level Data Link Control (HDLC) channels.

- This solution supports all features available with multichannel T1/E1 port adapters.
- The MIX-enabled T1/E1 port adapter offers transparent CCS support for tunneling legacy PBX signaling.
- This solution provides a connection trunk for CAS.

Signaling Supported

When the MIX-enabled T1/E1 is used in conjunction with enhanced digital voice adapters (PA-VXC-2TE1+, PA-VXB-2TE1+), the following signaling support is provided:

- T1 CAS (foreign exchange station/foreign exchange office/ear and mouth [FXS/FXO/E&M])
- E1—R2
- ISDN PRI (user and network side)
- Q.SIG (for PBX interconnection)
- FG-D

T1 Features Supported

- DS1 100-ohm interfaces with RJ-48c connectors
- D4 Super Frame (SF) and Extended Superframe (ESF) framing
- Alternate mark inversion (AMI) or binary 8-zero substitution (B8ZS) line encoding
- Full facility data link (FDL) support and FDL performance monitoring per ANSI T1.403 or AT&T TR 54016
- Selectable DSX-1 cable length in increments from 0 to 655 feet
- Selectable DS1 CSU line build-out: 0, -7.5, -15, and -22.5 dB
- Selectable DS1 CSU receiver gain: 26 or 36 dB
- DS1 line protection per UL1459/1950, FCC part 68
- Full support for DSX-1 Management Information Base (MIB), RFC 1406, including alarm detection and reporting
- DSX-1 MIB remote access supported
- DS0 drop and insert

E1 Features Supported

- E1 120-ohm (G.703) with RJ-48c connectors
- Software-configurable E1 national bits
- HDB3, AMI encoding
- CRC4 and non-CRC4 framing
- Full support for E1 MIB, RFC 1406, including alarm detection and reporting
- DS0 drop and insert

Full Bit-Error, Rate-Testing Capabilities on Each E1/T1

- Programmable pseudo-random pattern up to 24 bits long, including 211-1, 215-1, 220-1, 220-1 QRSS, 233-1, all zeros, all ones, alternating ones and zeros
- 32-bit-error count registers

Supported Loopbacks

- Line loopback: The T1/E1 stream is looped back at the Line Interface Unit (LIU) toward the network.
- Payload loopback: The T1/E1 data stream is looped back at the framer toward the network.
- Diagnostic local loopback: The T1/E1 data stream is looped back at the framer toward the system.
- Remote loopback: The T1 stream is looped back at the LIU toward the network upon request from the far end via FDL command.

Network Management Support

- Simple Network Management Protocol (SNMP) protocol compliant
- Manageable via a MIB browser
- CiscoView interface for configuration
- Cisco Voice Manager (CVM) Version 2.0 supported
- Netsys supported

Country Support

- Approved in most countries
- Software-configurable ring-cadence and call-progress tones

Ordering Information

Part Number	Description
PA-MCX-2TE1	Two-port MIX multichannel T1/E1 port adapter
PA-MCX-2TE1=	Two-port MIX multichannel T1/E1 port adapter
PA-MCX-4TE1	Four-port MIX multichannel T1/E1 port adapter
PA-MCX-4TE1=	Four-port MIX multichannel T1/E1 port adapter
PA-MCX-8TE1	Eight-port MIX multichannel T1/E1 port adapter
PA-MCX-8TE1=	Eight-port MIX multichannel T1/E1 port adapter

Cisco IOS Software Support

The MIX-enabled T1/E1 port adapter is supported in all Cisco IOS[®] feature sets starting with Release 12.1(5)T.



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