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ioPLEX™ IP Access Gateway

High-performance Pseudowire Technology

APPLICATIONS

- High-port-density IP gateway for point-to-point pseudowire circuit emulation
- Replaces legacy TDM multiplexers, enabling migration to packet-switched core networks
- Low-latency telemetry and command distribution for mission operations center and range applications
- Video/audio multiplexing & distribution
- Encrypted high-speed serial data multiplexing and distribution

KEY FEATURES

- High reliability and availability: 1 to 1 redundancy, hot-swap for all modules, no single point of failure
- Dual GigE interfaces (optical or copper) for packet network uplink, with **IPv4** and **IPv6** support
- I/O module options include E1/T1, multi-protocol serial (EIA-530, EIA/TIA-449, EIA/TIA-232, V.35, X.21), NTSC analog and SDI video, DS3, and SONET/SDH.
- **Assured Delivery**™ for critical data via diverse path routing, packet reordering, and intelligent reconstruction at endpoints
- Supports isochronous I/O with automatic rate tracking
- High-quality, low-latency, robust video compression using JPEG2000



Route anything over IP. *ioPLEX powers transparent delivery of critical data circuits and services over packet-switched networks via industry-standard pseudowire emulation end-to-end (PWE3) encapsulation.*

ioPLEX OVERVIEW The ioPLEX is an affordable, high-performance IP access gateway that offers support for more data types, higher aggregate throughput and better operational reliability than other circuit emulation devices on the market today. Featuring **Assured Delivery**™, in which diverse-path routing, packet reordering, intelligent reconstruction and other technologies are employed to guarantee data delivery, ioPLEX is ideal for applications in which data loss during network transit is simply unacceptable. Designed to move up to 2 Gbps of data across the network and generally introducing less than a millisecond of added latency into multiplexed streams, ioPLEX is also appropriate for very high rate and/or high-priority data circuits.

In the most common configuration, two or more ioPLEXes are deployed as edge devices on either side of a modern packet-switched network, such as an IP or MPLS WAN. Using **pseudowire** protocols (as defined by the IETF PWE3 WG) the ioPLEX encapsulates the native services for delivery over a meshed packet switched network (PSN).

Built into a compact 2U chassis, ioPLEX offers carrier-class performance, features and availability at an enterprise price point. The unit is engineered to avoid single points of failure, with 1 to 1 redundancy for CPU boards, network adapters, and power supplies. All I/O modules and system components are hot-swappable, including CPUs.

I/O MODULES AND NETWORK INTERFACES

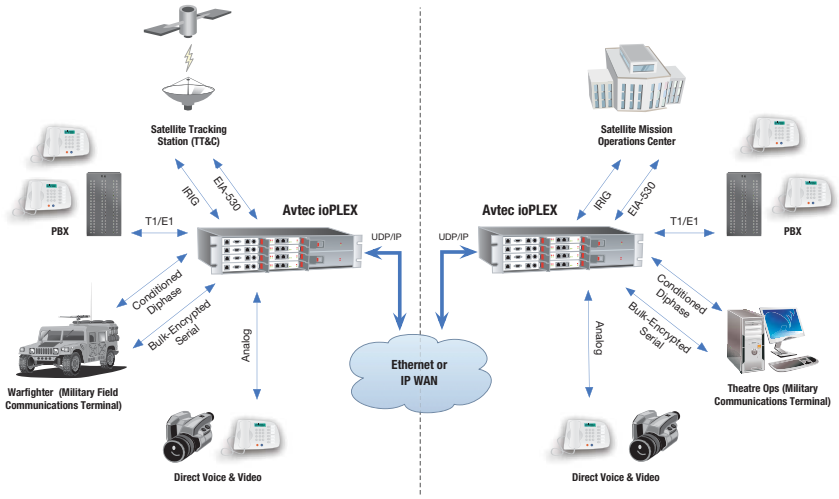
ioPLEX I/O modules, once initialized and configured by the CPU, perform data processing tasks autonomously. During operation, traffic from access circuits are packetized, encapsulated using the pseudowire protocol, and transmitted with the applicable PSN header. Packetized streams received via the WAN are routed to the appropriate I/O module, any encapsulations are removed, and using the appropriate timing information the data is transmitted onto the access circuit.

ioPLEX can be configured with up to six front I/O modules and up to four rear I/O modules. Available modules include 4-port Serial (RS-449, EIA-530, TTL, RS-232, X.21, and V.35) with multi-coding and data rates up to 20 Mbps, 2-port Video NTSC and SDI using JPEG2000 coding, 12-port DS1/E1 LIM with Processor Module, 2-port DS3/STS-1e module, and 2-port High Speed Serial and SONET/SDH module.

The single port Gigabit Ethernet module interfaces to the PSN through SFP optics or an auto sense 10/100/1000 Base-T electrical interface using IPv4 (and IPv6 capable) UDP/IP, switched Ethernet VLAN, or MPLS packets.

PEACE OF MIND WITH ASSURED DELIVERY™

Leveraging Avtec's expertise in satellite data communications, ioPLEX Assured Delivery™ is a set of technologies that allow ioPLEX-based pseudowire connections to perform with unprecedented reliability across even the most challenged packet networks. When Assured Delivery™ is enabled, ioPLEX employs diverse-path routing to forward the same information across the WAN redundantly via separate channels. At the termination point, each channel is processed by the receiving ioPLEX and Avtec-developed algorithms then intelligently reconstruct the source data stream.



Common ioPLEX pseudowire applications. ioPLEX powers transparent circuit and service emulation over packet access networks. By extending legacy data and voice services in native format over Ethernet, IP, and MPLS networks, ioPLEX delivers greater operational efficiency and a smooth migration strategy to a single converged network.

HIGH RELIABILITY, HIGH AVAILABILITY ioPLEX features a highly decentralized, fault-tolerant hardware architecture. Within the unit, configuration/control and data paths are isolated, redundant and distinct. CPU, network interface, and I/O modules are connected in a point-to-point "**Dual-star**" topology across the backplane. Since the onboard CPUs do not participate in data processing operations, the failure of one or both will not impact overall operation of the unit. Each I/O module communicates with the CPU via an independent control link across the control plane. Similarly, each I/O module has independent, dedicated links to both network interface modules across the data plane, which is totally independent of the control plane. Thus, the failure of a single module will not disrupt the data flow of any other module in the system.

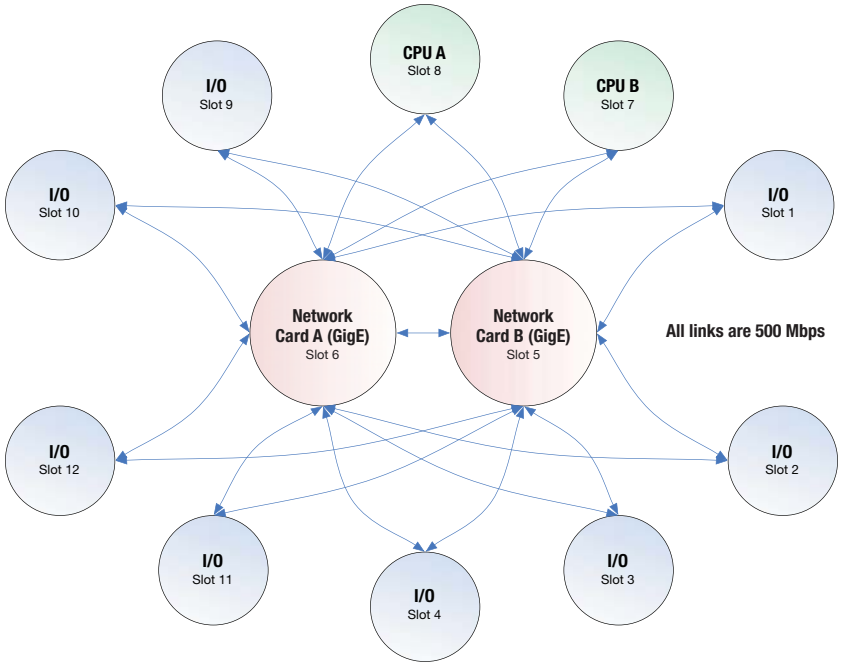
ioPLEX PERFORMANCE Data processing and data transfer operations within the ioPLEX are highly optimized, ensuring that the unit's pseudowire circuit emulation is as transparent as possible. Because processing is performed in dedicated I/O module hardware, and because each I/O module has a dedicated

connection to both network interfaces across the ioPLEX high-speed (10 Gbps) backplane, introduced latency is minimal. For example, a 128 byte packet wil traverse the backplane in less than 2 micro-seconds.

ONBOARD DIAGNOSTIC TOOLS ioPLEX includes powerful diagnostic tools for performance tuning and network status testing. Built-in test capabilities include a Bit Error Rate Tester (BERT), network throughput tester with performance monitor, internal I/O loopback and automated self-diagnostics.

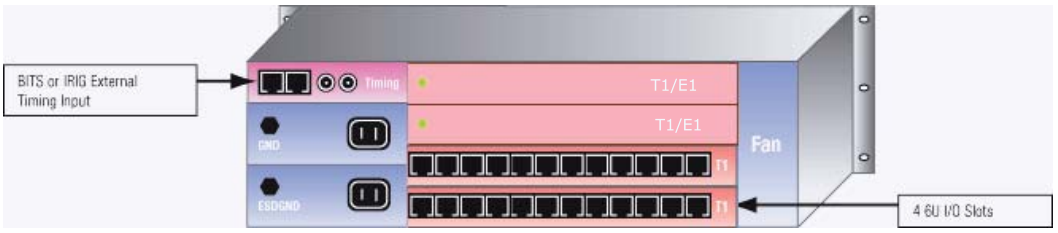
LOCAL AND REMOTE SYSTEM MANAGEMENT

ioPLEX can be controlled using a web-based user interface or command-line interface via secure shell or the console port. To facilitate integration with a Network Operations Center, ioPLEX provides a Simple Network Management Protocol (SNMPv3) interface. ioPLEX monitors system status and generates events and/or SNMP traps when a fault is detected.



ioPLEX "Dual-star" data plane topology. In this configuration, each CPU is connected to both network interfaces, and each network interface, in turn, has an independent connection across the data plane to all data I/O modules. CPUs and I/O modules operate in parallel, and they can simultaneously communicate with the network.





ioPLEX Component Layout

ioPLEX offers carrier-class performance, features and availability at an enterprise price point. The unit is engineered to avoid single points of failure, with 1 to 1 redundancy for CPU boards, network adapters, and power supplies. All components are hot-swappable, including CPUs.

Depending on redundancy level, up to six 3U front user I/O modules are supported by the ioPLEX. Four rear 6U I/O modules are also supported. Front access modules: 1-port Gigabit Ethernet, 4-port Serial, 2-port Video, 2-port SONET/SDH and High Speed Serial, and 2-port Channelized DS3/STS-1e. Rear access modules: Channelized DS1/E1 Processor and 12-port DS1/E1 Line interface Module.

SYSTEM SPECIFICATIONS

Common Equipment

Chassis and Power Suplies
- Low-profile 2U height, 19-inch rack-mount, 11.3in deep enclosure
- Up to two CPUs and two network modules
- Four to six 3U front access I/O modules (depending on CPU and network redundancy)
- Four rear access 6U I/O modules
- Dual Star control and data planes
- Redundant power supplies 110/220 VAC or -48 VDC input power with independent power entry
- Hot-swap fan tray with blowers providing side-to-side cooling; fan speed monitored by CPU

CPU Modules
- 400 MHz PowerPC 440 processor w/128 MB RAM
- 10/100 Mbps Ethernet and serial interface
- Onboard 256 MB CompactFlash
- Linux OS for configuration and control
- Stratum 3 internal reference
- Primary and secondary reference fail-over, Holdover and Freerun

Timing Distribution Module
- Dual external reference timing inputs (BITS, RS-422 or IRIG) mini-BNC & RJ45

Management Interfaces
- 10/100 Mbps Ethernet interface RJ-45 connector
- Web-based browser user interface
- Command Line Interface (CLI) using Secure Shell (SSH) or console serial interface
- SNMPv3 Alarm and Fault Management
- Multi-level username/password access control with LDAP-based authentication

Diagnostics
- BERT test using fixed patterns and port loop
- Network throughput test with real-time performance monitor
- User defined port loop capabilities
- Complete battery of automated self-diagnostic tests, run at start-up and/or manually

Network Interface Modules

Gigabit Ethernet Module
- 10/100/1000Base-T RJ-45 electrical with auto-sense detect or 1000Base-SX/LX SFP optical
- IEEE 802.3x-compliant flow control; Automatic link speed, duplex, and flow control negotiation
- Packet Switched Network support for routed UDP/IP, Switched Ethernet VLAN, and MPLS using IETF Pseudowire Protocols
- Quality of Service (QoS) 4 levels; Class of Service (CoS) DiffServ for UDP/IP, VLAN for Ethernet, and EXP for MPLS
- Diverse Path Routing
- Support for IPv4 and IPv6 capable.

Optical and High Speed Serial Module
- OC3/STM-1 SFP optics, SM, MM, SC connector
- RS-422, TTL, or Differential ECL capable
- Packet Switched Network support for ATM
- Quality of Service (QoS)
- PVC; Symmetric/Asymmetric
- APS protection switching

I/O Interface Modules

Quad Serial I/O Module
- Four full duplex serial ports with high density smart serial connectors
- Synchronous or isochronous serial data at rates from 75 bps to 20 Mbps per port with automatic rate tracking
- Port types: EIA-530, EIA-530A, EIA/TIA-449, EIA/TIA-232, V.35, X.21
- Transmit timing modes: Auto-rate, adaptive, loop, and local timing
- Receive timing modes: Line, recovered, and local timing
- Transport of handshaking control signals

Video I/O Module
- Two broadcast quality video ports, mini-BNC
- Support for NTSC and SDI video formats
- Hardware-based JPEG2000 compression and decompression
- Configurable compression mode and output data rates
- End-to-end latency of less than 50 msec

E1/T1 I/O Module
- Processor module supports up to 2 each LIMs
- 12-port Line Interface Module (LIM), RJ48
- Channelized n x DS0
- Unstructured interface

DS3/STS-1e I/O Module
- Two port Channelized DS3 or STS-1e interface, mini-BNC connector
- Channelized n x DS1
- Channelized n x DS0
- Unstructured interface

Optical and High Speed Serial Module
- OC3/STM-1 SFP optics, SM, MM, SC connector
- RS-422, TTL, or Differential ECL capable
- Synchronous or isochronous serial data at rates up to 32 Mbps with automatic rate tracking
- Differential ECL rates up to 150 Mbps
- APS protection switching

Gigabit Ethernet I/O Module
- 10/100/1000Base-T RJ-45 electrical with auto-sense detect or 1000Base-SX/LX SFP optical
- IEEE 802.3x-compliant flow control; Automatic link speed, duplex: and flow control negotiation
- Bridging

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