

## Low Latency, Clock Accurate Transport of TDM & Ethernet over Packet

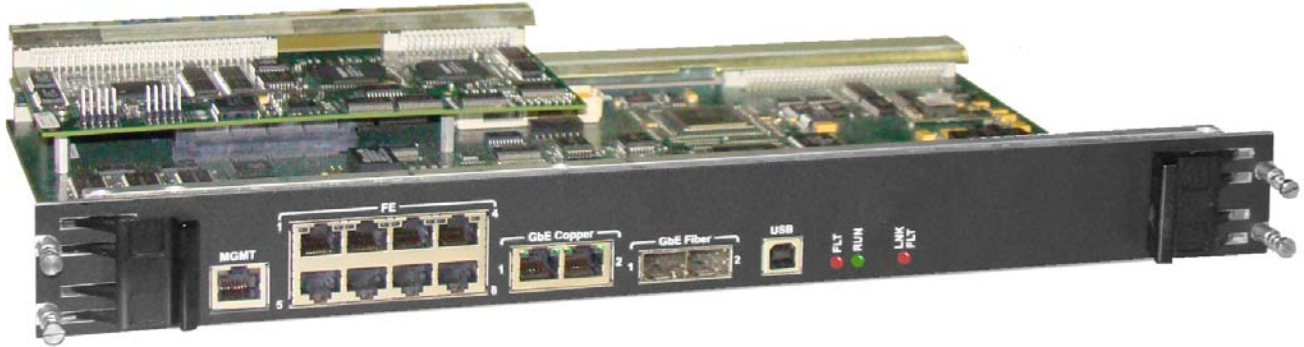


Figure 1: Xedge Packet Circuit Emulation Module

### FEATURE HIGHLIGHTS

- Circuit emulation (T1/E1, DS3/E3, Serial) with clock recovery over Ethernet, MPLS, VLAN, IP
- High speed Ethernet, Metro Ethernet & VLAN services
- Gigabit Ethernet ports for electrical (10,100,1000), or for Gig-E optical Small Form Factor Pluggable (SFP) transceivers
- Built-in IP router with RIP, OSPF
- Adaptive time independent data transport
- Conforms to IEEE 1588 Precision Time Protocol Version 2 as an IEEE 1588 Client over Ethernet.
- Conforms to Ethernet standards including 802.1x port-based access control and 802.1p
- Conforms to SAToP, CESoPSN and TDMoIP
- Secure configuration and management via SNMP or MIB editor over Telnet/craft connection, or via GDC's ProSphere Network Management System.

### Xedge Shelf Options

The dual-width Xedge PCE plugs into two adjacent slots of an Xedge AC- or DC-powered shelf: Xedge 6002 (2 slots), Xedge 6160 (4 slots), Xedge 6280 (7 slots) and the 16-slot Xedge 6640/6645 shelves. [Figure 1](#) shows the dual-width PCE controller module in the Xedge 6002 chassis.

### INTRODUCTION

GDC's Xedge Packet Circuit Emulation (PCE) is designed for networks transitioning to a packet-based infrastructure while maintaining real-time legacy TDM applications and services. For mobile networks, satellite communications, and mission critical, fixed wide area networks, Xedge PCE minimizes OPEX and CAPEX by leveraging capabilities in products that converge Ethernet based services with time critical TDM services across a packet switched wide area network (WAN). The PCE's powerful timing recovery allows delay-sensitive, bit-transparent TDM data to be transported efficiently through a packet core.

### Flexible Interfaces

Standard TDM circuits (e.g., T1/E1, T3, E3 circuits) or serial V.35, Rs232/449, EIA422/530, ECL circuits can be reliably transported over an Ethernet/MPLS packet network via six Fast Ethernet (FE) ports (ports 3 through 8), two Gigabit Ethernet optical ports, or two Gigabit Ethernet auto-rate 10, 100, 1000 electrical ports. The Ethernet ports can be used for ingress or egress traffic. A 10/100 Base physical interface handles management traffic, and one RS232 connection (USB port) is available for the craft interface.

Note that two of the eight Fast Ethernet (FE) ports (ports 1 and 2) are used internally for adaptation of serial data streams into packets.

## Flexible Networking & Connectivity

The Xedge PCE offers six Fast Ethernet 100baseT interfaces. The PCE mates with T1, E1, T3, E3, and Serial I/O line interface modules (LIMs). An additional 100BT physical interface is used for management traffic. There is also one RS232 connection (USB port) available for a craft interface.

## Standards Based Operation

The PCE conforms to IETF, MEF, ITU, and IEEE standards. It is capable of interoperation in multi-vendor networks, providing channelized and clear channel circuit emulation.

- Channelized circuit emulation is supported via Xedge DS1 and E1 interface modules. The PCE provides Circuit Emulation Service over Packet Switch Network (CESoPSN) in compliance with RFC 5086.
- Clear channel circuit emulation is supported on DS1/E1, DS3/E3 as well as serial connections (V.35, 442, X.21, etc.). This clear channel CES complies with RFC 4553 Structure Agnostic TDM over Packet (SAToP).

Xedge PCE also supports adaptive timing with auto-tracking for time independent network operation. It also conforms to the IEEE 1588 Precision Time Protocol Ver. 2 as an IEEE 1588 Client over Ethernet. In general, PCE presents a range of timing options to minimize the impact of jitter and delay for time sensitive circuit emulation services.

Xedge PCE offers a flexible range of network options, including the use of RSVP-TE signaling to set up dynamic bandwidth-aware LSP tunnels for MPLS transport. The PCE supports VLAN QinQ and allows for efficient multiplexing of CES services and Ethernet data transport.

## Reliable & Scalable Packaging

The Xedge PCE plugs into two adjacent front slots of an AC- or DC-powered Xedge 6000 chassis. One or two associated LIMs plug into the midplane connectors at the chassis rear panel. This modular design allows the PCE to perform consistently across the entire Xedge family of enclosures.

At aggregate sites, the PCE and its LIMs can be installed in a higher density 7-slot or 15-slot Xedge chassis that can accommodate multiple controllers and LIMs. Smaller remote sites can employ the 2-slot or 4-slot chassis. This seamless integration enables simplified, scalable and cost-effective network maintenance, sparing and operation.

## Traffic Control

The Xedge PCE offers a variety of traffic control mechanisms, including 802.1x port-based access control to regulate subscriber traffic during congestion events. This mechanism assures that priority traffic (e.g., real-time IP/Ethernet flows) is not perturbed when the destination route encounters bursty traffic congestion.

The PCE also provides tunnel management and traffic queueing as part of its integrated QoS capabilities that include 802.1p support.

## Secure, Versatile Management

Xedge PCE is securely configured and monitored via SNMP or GDC's ProSphere NMS.

The SNMP interface provides password-protected access to the Xedge PCE via a craft or Telnet/SSH connection. Menu-based SNMP utilizes both standard MIBS and GDC's proprietary MIBs that define the management data available from the Xedge PCE and other co-located network elements installed in the Xedge chassis.

ProSphere Network Management System (NMS) is GDC's Java-based management software that allows multiple clients to access a ProSphere Server located on a remote PC or SUN workstation. ProSphere facilitates the configuration and monitoring of users, communications and Xedge devices via an intuitive graphical user interface.

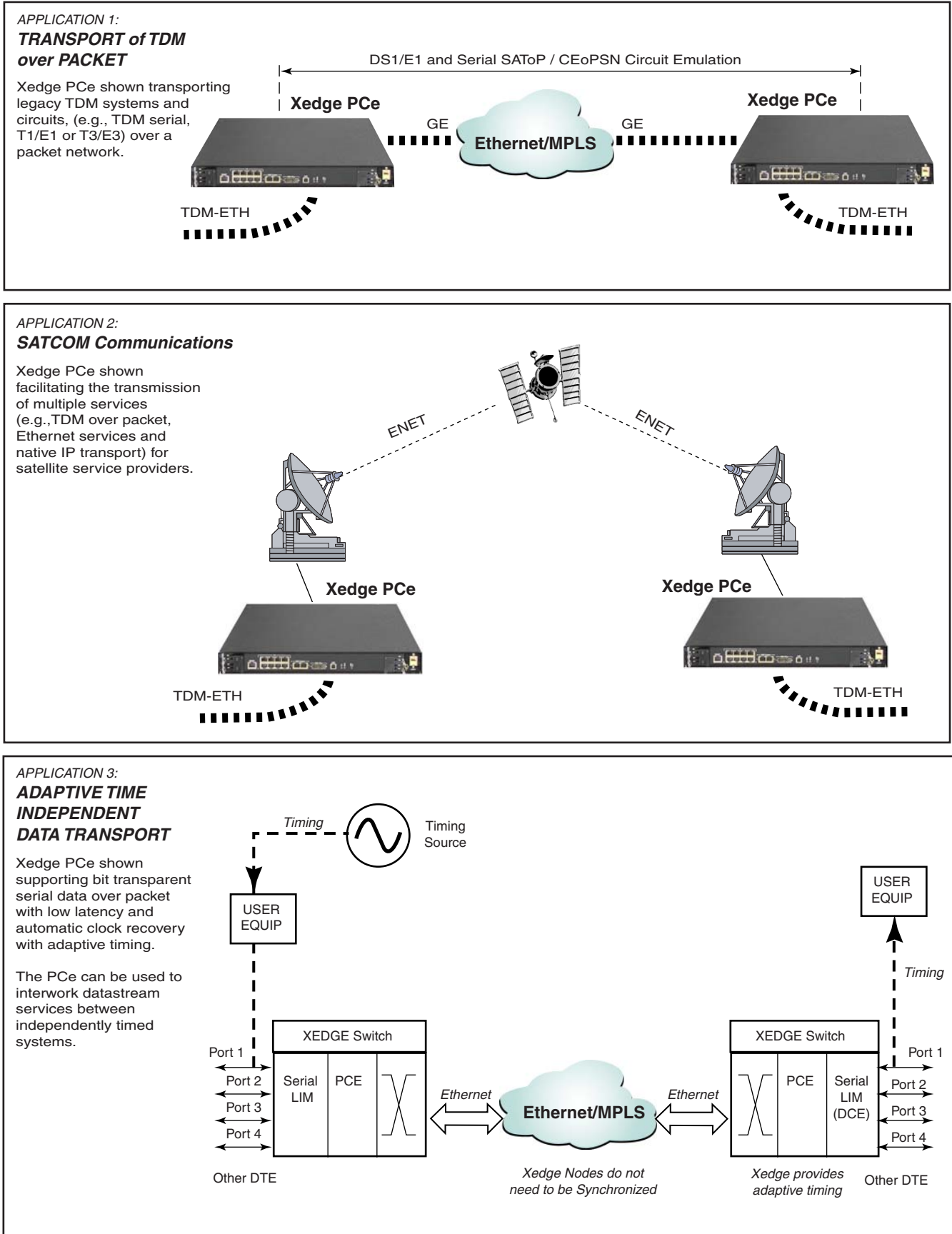
## Diagnostics

All Xedge slot controllers support standard network diagnostics. The system administrator can collect PCE configuration, status and fault information for informed maintenance and troubleshooting.

## Cost-Effective Circuit Emulation

Xedge PCE provides WAN network operators with a variety of cost-saving methods for efficiently transporting TDM and Ethernet data across packet networks. [Figure 2](#) shows three of the many examples of Xedge PCE application benefits.

# Xedge PCE



**Figure 2: Examples of Xedge PCE Applications**

## Physical Specifications

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### *Xedge PCe Slot Controller only*

Dual-Slot model (horizontally Installed)

Width: 40.12 mm (1.58 in.)  
Height: 395.73 mm (15.58 in.)  
Depth: 240.53 mm (9.47 in.)  
Weight: TBD

### *Line Interface Module only*

Width: 19.81 mm (0.79 in.)  
Height: 261.62 mm (10.3 in.)  
Depth: 198.12 mm (7.80 in.)  
Weight: TBD

### *Xedge PCe and LIM in Xedge 6002 Chassis*

Dual-slot Width: 40.38 mm (1.59 in.)  
Height: 482.61 mm (19.0 in.)  
Depth: 482.6 mm (19.0 in.)  
Weight: TBD

## Environmental Specifications

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### *Non-Operating*

Temperature: -40 to 70 degrees C (-40 to 158 degrees F)  
Relative Humidity: Up to 95%  
Altitude: up to 12,191 m (40,000 ft)

### *Operating*

Temperature: 0 to 50 degrees C (32 to 122 degrees F)  
Relative Humidity: Up to 95% non-condensing  
Altitude: -60 to 4,0000 m (-197 to 13,123 ft)

## Electrical Specifications

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Dependent on Xedge Chassis used:

Xedge 6645 Chassis (16 I/O slots, DC Power)  
Xedge 6640 Chassis (16 I/O slots, AC Power)  
Xedge 6280 Chassis (7 I/O slots, AC or DC Power)  
Xedge 6160 Chassis (4 I/O slots, AC or DC Power)  
Xedge 6002 Chassis (2 I/O slots, AC Power)

## Certifications & Acceptances

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USDA RUS Accepted

## Functional Specifications

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### *Physical Interfaces*

Interface Ports:

Two SFP ports for optical 1000 Mbps (GE) ports  
Two electrical 10, 100, 1000 ports.  
Six Fast Ethernet (100 Mbps) ports (Ports 3 through 8)  
Two Fast Ethernet (100 Mbps) ports used internally (Ports 1 and 2)  
One USB port for Craft interface

Line Interface Module Support:

Speeds from 75 bps to 50 Mbps (serial), 34 Mbps (E3), 45 Mbps (T3)  
2 LIM slots per PCe  
4 T1/E1 ports per LIM  
2 DS3/E3 ports on one LIM (limited to 2 high speed ports per PCe)  
4 serial V.35, EIA 422/530, RS 232/449, HSSI, ECL or TTL ports per LIM

### *Timing Options*

Node Timing Options:

Derived from BITS clock or any port of an Xedge chassis

Port Timing Options:

Xedge-supplied clock or  
Adaptive clock recovery (independent in each direction)  
Conforms to IEEE 1588 Precision Time Protocol Ver. 2 as an  
IEEE 1588 Client over Ethernet.

### *Protocols*

VLAN-aware Bridging: 802.1D, 802.1Q, 802.1P  
MPLS: Pseudowires (PWE3)  
SATO: RFC 4553  
CESoPSN: RFC 5086  
SNMP

### *Routing Services*

RIP-1, RIP-2, OSPF (Full mandatory OSPF protocol support)  
IP V4; IP V6 capable, BGP  
Conforms to RFC 1884 IPV4 addressing schemes

### *Diagnostics*

Status LEDs for all ports  
Diagnostic screens for all faults  
Performance Monitoring  
Local and Line Loopbacks

### *Management Interfaces*

Standard SNMP and GDC MIB management;  
GDC's ProSphere Network Management System