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Xedge PCX

Pseudowire Transport of Multiple Services over Packet (MPLS/ATM)

When LAN applications extend across the WAN, particularly in bandwidth-constrained environments, it is critical to also extend the service delivery guarantees. The Xedge PCx allows network planners to meet the demand for inexpensive access to information resources, as well as targeting agreed or implied service levels over a multiservice switching and routing wide area network.

Convergence Challenges

Planners need an efficient method for supporting multiservice traffic across the wide area without sacrificing service quality or incurring prohibitive costs for maintaining parallel legacy networks. Planners also need to converge legacy services (e.g., TDM, ATM, Frame Relay) with packet services such as VLAN and IP.

Ethernet & IP Flow Service Guarantees

Customers understand that managing flow service guarantees comes at the cost of increased complexity, in that management of CoS (LAN) and QoS (WAN) implies disparate equipment and management solutions. Without integrating end-to-end service guarantees, attempts towards "any-over any" transport can cause increased operations expense and loss of the attractive plug-n-play ease of use associated with best effort IP packet technologies.

Ethernet VLAN Plus Legacy Services

Xedge Packet Cell Switch (PCx) is the heart of GDC's MultiService Packet xChange architecture that allows service providers and private network operators to converge services such as TDM, ATM, Frame Relay, Ethernet, and IP across a packet network without costly changes in infrastructure. GDC's implementation of Pseudowire Emulation (PW3) in the PCx transparently provides service connections to end users, and operates seamlessly across a packet network. *Figure 1* shows cost-efficient means of transporting services across MPLS, IP, or Ethernet networks. Xedge PCx Pseudowire capability complies with IETF Pseudowire Emulation Edge to Edge (PWE-3) sub working group.

Xedge MultiService Solutions

Xedge PCx provides the end-user with an Ethernet user network interface (UNI) as defined by the Metro Ethernet Forum (MEF). Resulting data flows are mapped to routes based on policies applied to frame or packet header data.

PCx builds layer-2 tunnels across cell or packet switched networks and to other MPLS enabled networks. At each end of a tunnel, the service can terminate on Xedge equipment or other MEF compatible devices.

Services Management

GDC's ProSphere Service Provisioning Manager (SPM), provides an integrated, user-friendly script/GUI interface for implementing, differentiating and managing all supported services and protocols. ProSphere SPM is a flexible, cost-efficient and easy to use policy management tool that streamlines the design, provisioning, and maintenance of multiservice WAN applications.

ProSphere SPM helps operators make selections from GDC's full complement of packet and legacy data services, and creates a clear relationship between capital expenditures, bandwidth costs, and the service level assigned to individual data flows (IP and Ethernet).

Advanced Traffic Management

While bandwidth costs vary based on provider preference for dark fiber, copper, or leased facilities, PCx provides a variety of transport technologies and management tools for maintaining QoS, while tolerant of bandwidth constraints.

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Xedge Packet Cell Switch (PCx)

The Xedge Packet Cell Switch (PCx) is part of the Xedge MultiService Packet xChange system that combines reliable and flexible transport services with the capability of performing as a neutral technology switch. These future-proof characteristics allow diverse packet transport solutions.

Xedge PCx is ideally matched with edge applications. Using MPLS tunneling methods, it can deliver a wide variety of service interfaces including Ethernet private line (E-Line) and Ethernet private LAN (E-LAN).

When deployed in the compact Xedge 6002 chassis, the PCx represents a low-cost small footprint in limited space remote sites. When deployed in the higher density Xedge chassis with line interface modules (LIMs) and other service controllers (such as the VSM digital voice module), the PCx complements the overall application, providing access concentration and edge/core switching.

Xedge PCx along ProSphere SPM give the operator a means of interworking different technologies to implement new cost effective transport solutions or provide for migration to packet-based transport services.

The PCx enables flow-based guarantees delivering delay-sensitive IP voice and video or other high priority data, yet ensures that delay-tolerant data applications (e.g., Internet-intranet traffic, file transfers, email) receive adequate bandwidth.

MPLS, ATM and Ethernet Benefits

MPLS allows the creation of well-characterized tunnels over different transport technologies, a benefit that has given a strong boost to its presence in the market. With its control plane comprising an evolving set of routing and signaling protocols, MPLS is classified as today's generalized approach to delivering layer 2 or layer 3 services.

GDC's implementation of MPLS is a unified approach to managing the construction of accurately characterized tunnels, independent of the underlying transport type. Once constructed, a single tunnel can be given granularity using Pseudowires, thereby delivering a rich set of services that can be signaled end-to-end either by proxy or by end-user equipment. Services include: Ethernet, IP, Frame Relay, ATM, and TDM *(Figure 1)*.

GDC's ATM traffic management algorithms meet published standards and have been deployed in very large private enterprise networks for many years. The PCx, with its powerful network processor, includes the implementation of these algorithms to manage layer-2 and layer-3 flows over packet or ATM connections.

GDC's expertise in the design and deployment of bandwidth efficient networks for packet telephony and video applications is fully represented in the architecture of the PCx. With ProSphere SPM support, the simplified user-interface represents the system level integration of these disparate hardware, software, and transport technologies.

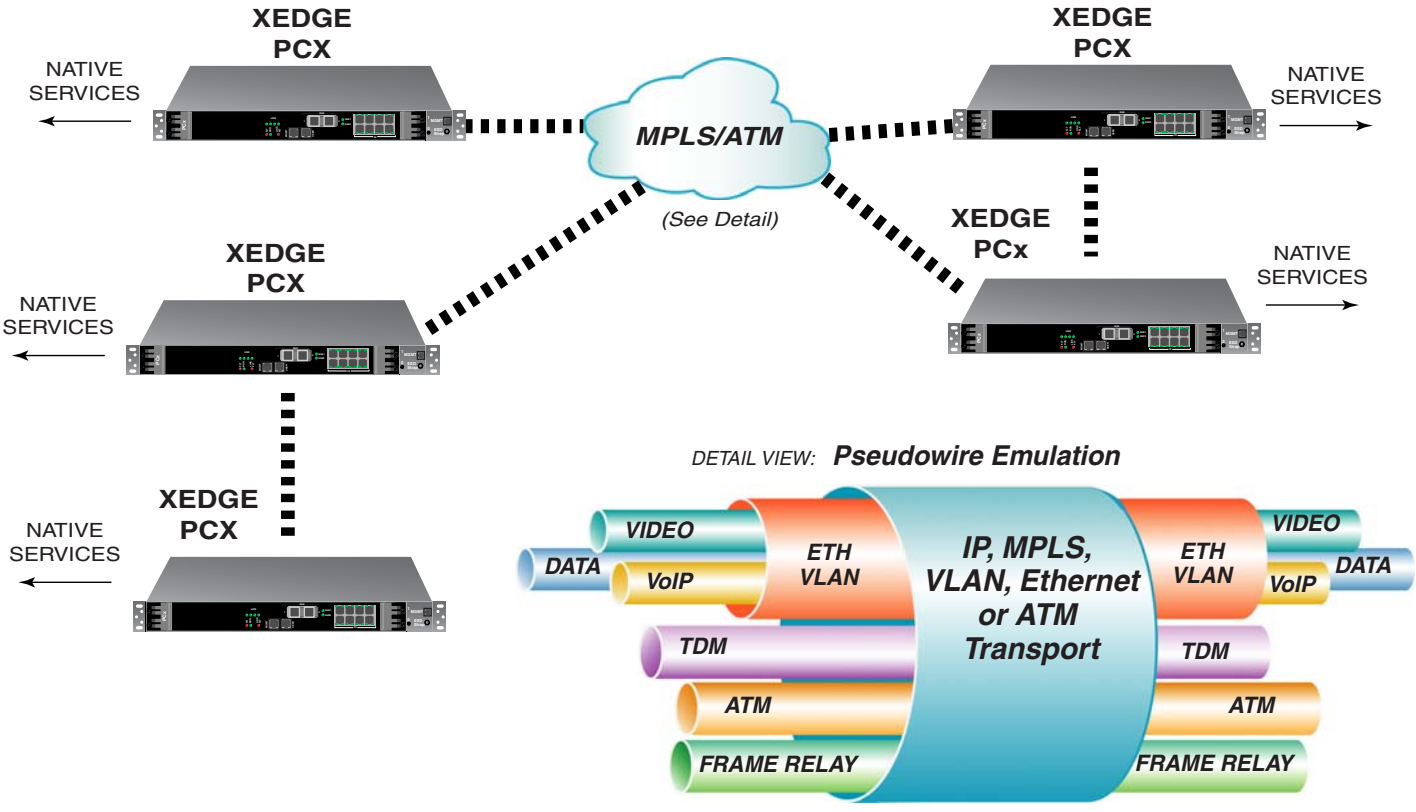

Figure 1: Xedge PCx Maximizes the Benefits of MPLS, ATM and Ethernet

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Xedge PCX

Combining MPLS with Traffic Management

MPLS technology without superior traffic management is little more than traffic engineering. GDC's unique MPLS traffic management inspects both tunnels and the traffic within tunnels, applying advanced algorithms to assure that priority traffic (real-time flows such as video packets) is not perturbed should the path encounter congestion from bursty traffic or link or node failures.

Each PCx can act on priorities: classifying flows by examining the packet header, providing active queue management, and associating these flows with constrained explicit routes (Pseudowires over MPLS tunnels) set up with policies derived and planned through ProSphere SPM.

For example, when using ATM transport, the PNNI routing and signaling protocol determines an explicit route, then populates each intermediate node's forwarding table. From this point, all that is required is simple label swapping (VPI/VCI). Should a link fail, a pre-calculated alternate PNNI path with the same QoS is automatically activated.

Figure 2 shows Xedge PCx deployed in a variety of low- and high-density Xedge chassis, transporting data end-to-end over any technology via ProSphere SPM policies.

When Ethernet or MPLS is included in the solution the process is almost identical. Both cell and packet technologies are integrated in GDC's hybrid-switching PCx, allowing customers to either migrate their TDM/ATM networks to MPLS, or to install new MPLS switching solutions only.

With MPLS, the end-to-end performance is guaranteed by policy based, scheduling and active queue management parameters, applied to packet flows entering each tunnel or to the aggregates of flows or tunnels at each intermediate node.

The MPLS control plane allows the PCx to extend these tunnels over a third party MPLS network. For example, a PCx connected to other label switch routers, coming under one routing policy, may allow the calculation of a route to the distant end-point.

An extension to these applications occurs when the Xedge network has a PCx installed and is enabled to provide a router overlay network implementing hop-by-hop routing. The resulting improved bandwidth efficiency is then traded for less predictable end-to-end QoS.

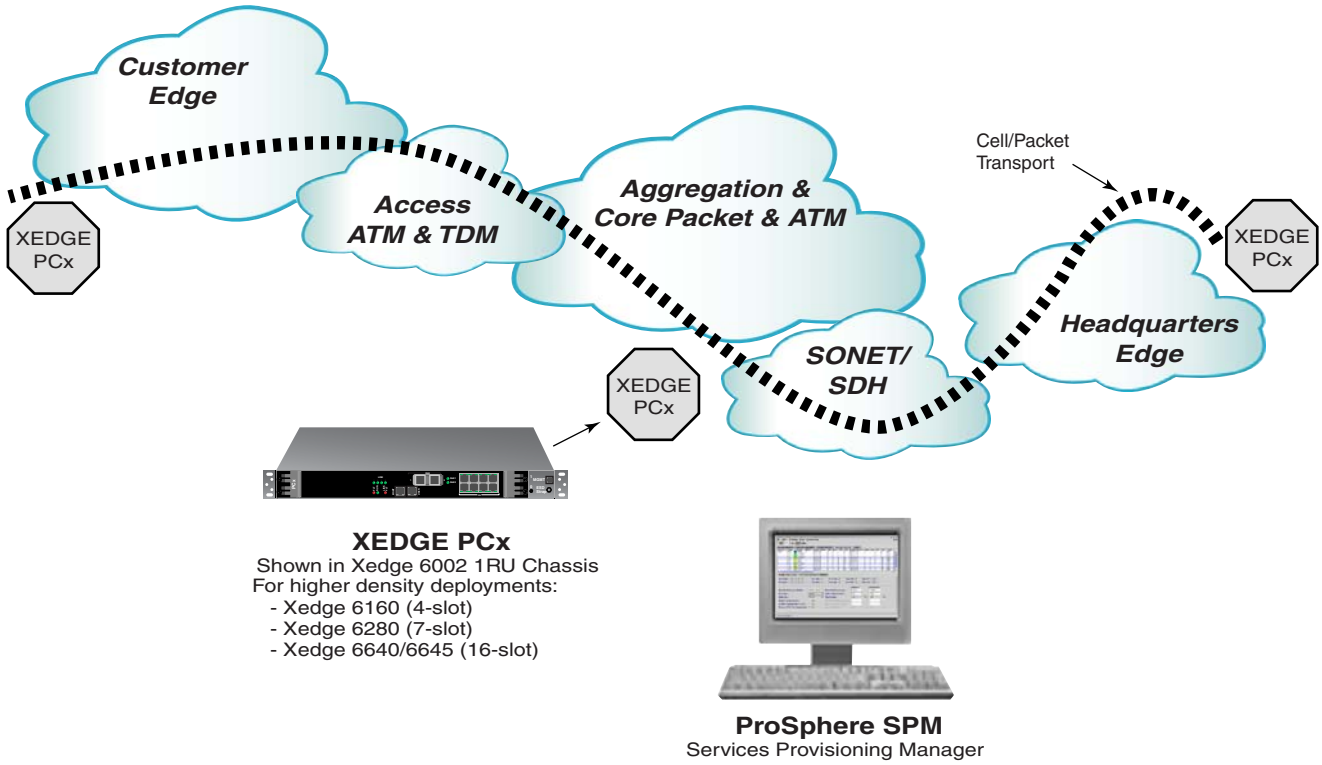

Figure 2: "Any-over-Any" Transport, and Unified Management with MPLS

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