



DNX Cross-Connect Platform

Intelligent Bandwidth Management for Evolving Multiservice Access Networks

An Economical Platform for Networks Now

Digital Network Exchange (DNX) Cross-Connects help fixed line and mobile operators overcome myriad challenges in evolving multiservice access networks by optimizing bandwidth management. This premier access platform from Sycamore Networks delivers operational cost savings, enhanced network reliability, and an industry-first integration of circuit/packet processing on a carrier-class cross-connect. DNX combines the power of large, traditional digital cross-connect systems (DCS) with a unique IP forwarding engine and intelligent bandwidth management features – in a right-sized, scalable platform, and at a fraction of the cost.

DNX cross-connects accommodate narrowband, wideband, and broadband services and adapt to diverse network environments, including fixed line and mobile service provider, government, MSO/cable, large enterprise, utility, teleport and satellite network provider, network over-builder, IXC, ILEC, CLEC, ISP, SS7, and international. In each setting, the DNX handles vital functions (e.g., grooming and service delivery, port concentration, backhaul consolidation) while providing the high-availability performance required for revenue-generating services, and remote test access capabilities that ensure customer satisfaction.

As access networks migrate from copper to optical, and from circuit-switched to packet-based technologies, DNX platforms facilitate transition. By connecting copper-based edge facilities to optical core infrastructures, providing port concentration and grooming for protocol-based platforms, and integrating circuit/packet processing within a single platform, the DNX forms a reliable bridge between present and future networks.

Scalable Access Aggregation, Grooming, and Switching

Every day, DNX Cross-Connects reliably aggregate and transport a range of traffic types in the multiservice access networks of operators large and small. DNX-11, the fundamental building block of the DNX series, provides traffic grooming and concentration from DS0 to OC-3/STM-1 levels, with integrated test access and diagnostics and optional integrated circuit/packet processing. The mid-range DNX-88 scales to hundreds of T1/E1 ports to support seamless network expansion and transition from TDM to IP. The highest capacity S-DNX platform expands DNX-88 capacity by a factor of four, to thousands of T1/E1 ports.

Each platform in the DNX product line employs the same flexible mid-plane architecture, and incorporates narrowband (1/0) and wideband switching (DS1/VT1.5/VC-11/VC-12) within a time-slot interchange (TSI) switching fabric. DNX systems perform non-blocking, 3-1-0 cross-connections of up to 2,688 T1 or 2,304 E1, 96 DS3, 128 E3, or 32 OC-3/STM-1 interfaces. All interfaces can be protected through N+1 or 1+1 redundancy, depending on the interface type, with 1+1 redundancy in the common elements. STM-1 and T1/E1 ports support 1+1 Automatic Protection Switching (APS) for line protection.

Features and Benefits

- Compact, Cost-Effective, and Highly Scalable
- Versatility for Fixed Line and Mobile Applications
- End-to-End Intelligent Bandwidth Management
- Industry-First Module Simplifies TDM to IP Migration
- Proven Reliability in Large-Scale Global Deployments



Figure 1: DNX Cross-Connect Platforms

Single-Chassis Circuit/Package Support

DNX-11/88 platforms equipped with Sycamore's innovative Circuit/Package eXchange (CPX) IP interface provide single-chassis support for circuit and packet traffic (up to 1,024 DS0 or 32 T1/E1 virtual WAN connections) and are interoperable with Ethernet/PPP-compliant routers and SS7 signaling elements (STP and SCP). The CPX module set enables a seamless transition from TDM to IP technology in both fixed line and mobile networks, and solves many operational challenges of signaling network migration from SS7 to Sigtran.

Carrier-Class Manageability

As a true carrier-class product, the DNX complies with NEBS Level 3 and offers an array of network management options. Operations personnel can perform configuration, provisioning, and a variety of diagnostic tests from a menu-driven user interface or through ENvision Plus, the comprehensive management platform for DNX networks. Either approach provides an embedded, multi-level security scheme through a craftsperson interface, Telnet/IP, SNMP, or dial-up interfaces. Audit trails, circuit naming, and configuration uploads and downloads are just a few of the available features.

Integrated Test Access and Diagnostics

The test access and diagnostic features embedded in every DNX product add value through quick resolution of network outages, helping operators comply with strict service level agreements. When deployed in conjunction with external TAD/FAD test heads, the DNX can also be integrated with existing network diagnostic facilities. The innovative IP/Ethernet test access features on the CPX module set bring all the circuit-based, carrier-grade diagnostics and test facilities of DNX platforms to packet-switched networks.

Cost-Effective Scalability

DNX scalability enables network operators to rapidly provision service on cross-connects that are right-sized for initial deployment. As the network grows, the extensible DNX platform scales in physical port count and through the use of higher capacity transmission media. This allows for an economical initial build-out and provides exceptional investment protection. An operator can migrate from the DNX-11 to the S-DNX without discarding any component, since all DNX platforms use common modules, chassis, power supplies, and application/interface modules.

DNX-11: Network Building Block

A workhorse serving network operators worldwide, the DNX-11 brings DCS functionality to smaller or remote locations without sacrificing carrier-class reliability, interface flexibility, or growth options. Populated with any mix of module sets across 11 slots, the DNX-11 terminates services from as many as 88 T1/E1, 6 DS3, 7 E3, or 2 OC-3/STM-1 interfaces. The non-blocking switching capacity of 168 T1/128 E1 equivalents occupies only 6 rack units (RU) of vertical space. With a CPX

IP interface, the DNX-11 enables a smooth, cost-effective migration from TDM to IP, by consolidating circuit/package processing in a single platform. And, as the network grows beyond DNX-11 capacities, one hundred percent of the initial capital outlay can be reused in a DNX-88 configuration.

DNX-88: Multiservice Flexibility

The exceptional density and proven reliability of the DNX-88 enables network operators to push core network functions closer to the network edge. The DNX-88 leverages all narrowband and broadband interfaces in the DNX portfolio, including T1/E1, T1/E1 APS, T3/E3, and OC-3/STM-1. A 1.2 Gbps switching fabric provides excellent midrange DCS scalability (from 8 to over 600 T1, 500 E1, 24 fully loaded DS3, 30 E3, or up to 8 fully loaded OC-3/STM-1 interfaces), grooms multiservice traffic with full granularity to DS0 levels, and satisfies most applications in less than one standard bay. Intelligent bandwidth management enables port consolidation on costly service delivery platforms; and backhaul facility concentration that reduces costs and extends the life of core resources.

S-DNX: Scalability for Growth

The S-DNX high-capacity cross-connect provides four times the port capacity of the DNX-88 (up to 2,688 T1 or 2,304 E1 ports). Because the S-DNX non-blocking 4.8 Gbps switch is constructed from standard DNX components, operators with DNX-11/88 networks can retain and reuse all existing chassis, power supplies, controllers, and line cards. DNX-11/88 platforms can be upgraded to S-DNX, or S-DNX systems added to existing DNX-11/88 networks, without disruption. In fixed line and mobile environments, S-DNX empowers seamless expansion options and pay-as-you-grow strategies for DNX networks.

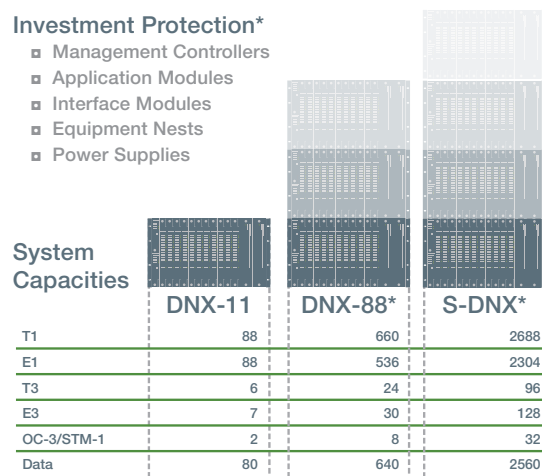


Figure 2: Scalability and Investment Protection

With minimal front-end investment, a network operator can rapidly provision services on right-sized platforms; then scale seamlessly from DNX-11 to S-DNX to accommodate growth.

Versatility to Meet Evolving Application Requirements

DNX Cross-Connects enhance a variety of multiservice applications in fixed line and mobile networks. Here are a few examples.

Service Platform Concentration

Optimizing network traffic enhances the efficiency and useful life of voice and data service delivery platforms, including multiservice switches and voice gateways. By concentrating the traffic associated with these platforms, DNX conserves ports on high-priced network elements and reduces both capital expenditures (CapEx) and operating expenses (OpEx).

In today's central offices and service POPs, the need to add newer services such as IP/MPLS VPN, DSL, and VoIP to existing services such as Frame Relay, ATM, and circuit-switched voice has expanded the number and variety of service delivery platforms – and resulted in partially filled circuits taking up expensive ports on those platforms. For example, an IP VPN or VoIP provider may be wasting T1/E1 or T3/E3 ports on edge routers, backbone routers, and VoIP gateways as a result of sub-optimal bandwidth grooming.

Deployed to 'front-end' service delivery platforms, DNX grooms and concentrates the traffic that feeds them, reducing the number of ports required in the expensive systems by increasing subscriber traffic per port. DNX also provides important OAM&P features that do not exist on service delivery platforms. All of this translates into reduced capital outlays for service delivery equipment, reduced rack space requirements, better overall bandwidth/port utilization, and streamlined operations and maintenance. DNX platforms don't replace service delivery platforms – they make them better and more cost-effective.

Figure 4: Cost-Saving Remote Grooming and Platform Concentration

DNX platforms can be deployed at a variety of locations (e.g., remote end offices, ILEC collocation space, commercial multi-tenant buildings) to enable more efficient backhaul into the central hub office – and dramatically reduce recurring costs.

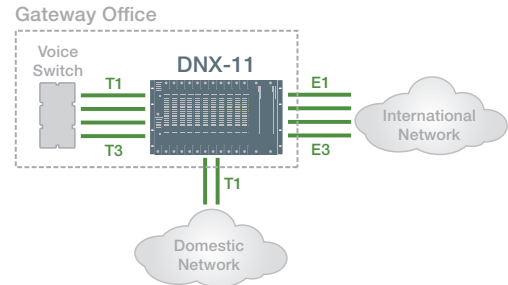
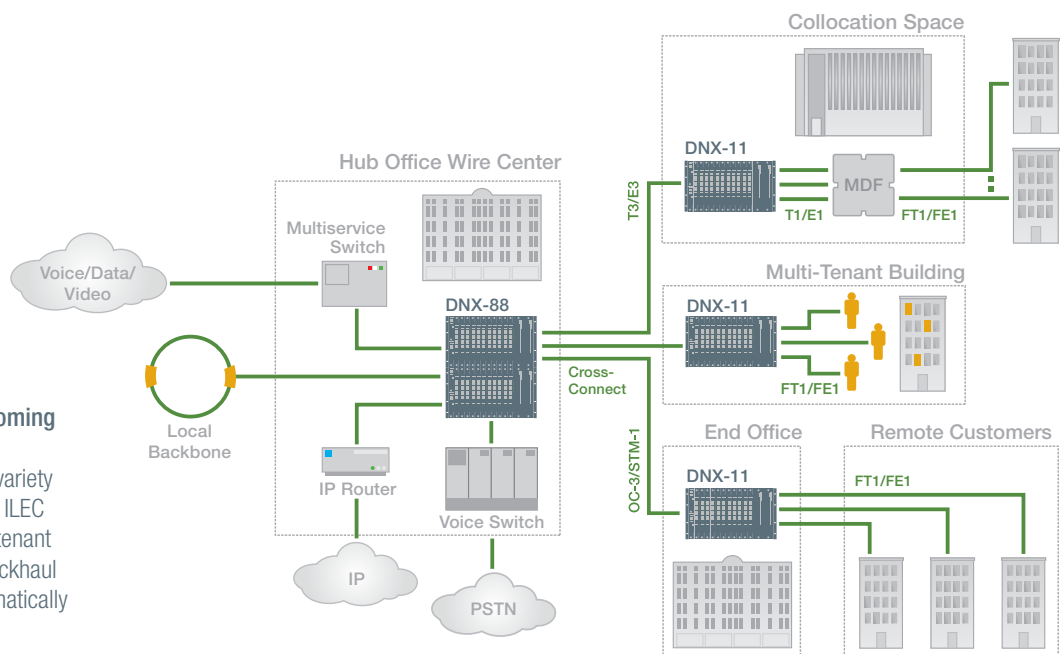


Figure 3: DNX International Gateway Application

Network operators use the service interface flexibility, density, and intelligent bandwidth management of DNX platforms to optimize international gateway locations, enhance global network services, and cost-effectively scale service bandwidth to handle increasing global traffic.

Robust protection and restoration options also make the DNX a true carrier-class solution for grooming, aggregating, and converting multiple traffic types at international gateway locations (Figure 3). At any site, the embedded diagnostics in DNX platforms minimize truck rolls and the need to collocate costly test equipment.

Bandwidth-Efficient Remote Grooming

DNX remote grooming and access concentration (e.g., at the network edge and in unmanned collocation facilities) reduces recurring costs by allowing faster, more flexible service provisioning and more efficient backhaul into the central hub office. Reducing or eliminating the need for narrowband DCS platforms at the central site further conserves space and curtails maintenance costs. DNX enables network operators to realize incremental revenues from new services in outlying areas, where subscriber densities may initially be too low to justify an investment in multiple, geographically dispersed voice/data platforms.

SS7 Optimization and Sigtran Migration

In SS7 signaling networks, DNX platforms reduce the equipment footprint, to conserve space, lower costs, and eliminate complex cabling; and supply remote management and diagnostics not available in most deployment alternatives. Perhaps most importantly, a DNX/CPX solution resolves the serious reliability, scalability, and jurisdiction issues involved in converting from SS7 to IP-based Sigtran. DNX/CPX delivers all the operational efficiencies of IP/Ethernet in a platform with DCS reliability and test access features. This avoids the high cost of an overlay router network, ensures mission-critical reliability, and enables circuit-based network operators to retain authority over the signaling network.

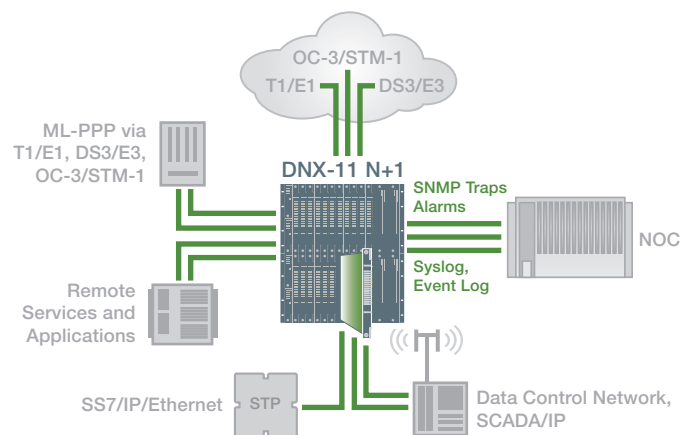


Figure 5: DNX-11/88 with CPX Simplifies Migration

By merging IP/Ethernet traffic with circuit-based services (e.g., SS7/IP, SCADA/IP, EMS/NMS data), the CPX module set supports smooth network migration within a single network element.

Carrier-Class Redundancy and Reliability

The DNX platform has earned respect among network operators as a leading multiservice cross-connect system – a reputation based on thousands of platforms in service today worldwide. Purpose-built with an emphasis on scalability, flexibility, and reliability, Sycamore cross-connects are also standards-based to ensure interoperability with equipment from other manufacturers.

DNX products offer redundancy at all levels of operation. Redundant System Management Controllers provide central control, including internal Stratum 3 timing with holdover and hitless switchover to ensure uninterrupted service. DNX platforms can be configured for AC or DC redundant load-sharing power supplies, with independent inputs from power distribution panels and alarming in the event of a power failure. OC-3/STM-1 ports on the DNX can optionally support 1+1 APS line and module protection. When ENvision Plus NMS is used to manage a DNX network, automatic circuit rerouting can further protect connections throughout the network against line, node, and even site-wide failures.

CPX – INTEGRATED IP TECHNOLOGY FOR DNX PLATFORMS

Today’s complex access networks demand a clear, scalable migration path from TDM to IP. The Circuit/Packet eXchange (CPX) module set provides one, by adding a unique IP forwarding engine to DNX-11/88 platforms. This industry-first integration of circuit/packet functionality on a carrier-class cross-connect allows incremental, non-disruptive infrastructure changes to support a seamless transition in fixed line and mobile networks.

The ability to groom TDM and IP/Ethernet traffic onto shared T3/E3 or OC-3/STM-1 facilities in a single platform with pay-as-you-grow scalability greatly enhances applications flexibility. DNX/CPX can efficiently aggregate thousands of data control network (DCN) circuits and encapsulate them into Ethernet transport for efficient handoff to the IP network, reducing port costs and preserving capacity on expensive router platforms.

In mobile networks, DNX/CPX converges DCN traffic from individual base stations onto a shared IP transport and combines multiple base stations for long-distance backhaul to the MTSO. CPX also solves the operational challenges of signaling network migration, enabling circuit-expert SS7 engineers to maintain control of packet-based Sigtran diagnostics and troubleshooting.

DNX/CPX solutions take much of the work out of network migration – and get the job done cost-efficiently in real-world networks.

Network operators can add redundant circuit protection and augment system alarming and cooling of DNX platforms with the PSX-5300 Protection Switch. The PSX-5300 offers N+1 redundancy on electrical interfaces (T1/E1, DS3, and E3) and simultaneously operates two independent broadband redundancy groups and one narrowband group. This allows DNX-11/88 deployments to include optional redundancy without burdening base system cost, and ensures carrier-class reliability and performance.

Protect Critical Infrastructure Utility Networks

DNX systems, in concert with ENvision Plus, build resiliency into the network at all levels, to minimize downtime and safeguard vital infrastructure against natural or man-made disasters. In utility network environments, for example, automated disaster recovery capabilities help utility network operators meet NERC/FERC reliability requirements.

Carrier-grade, integrated circuit/packet processing accommodates the growing need for IP-based services, while support for voice, low-speed data, SCADA, and other

critical utility functions – and the ability to groom this traffic onto the modernized network – eases the transition from analog to digital, and from copper to optical. The SPS-1000 Signal Processing System, used with the DNX-11/88, provides up to 496 protected (or 992 unprotected) channels (DSOs), with device-level and T1/E1 link-level APS protection for high availability voice conferencing and SCADA/telemetry data bridging.

Enhanced Solutions for Mobile Infrastructure

Mobile network operators are challenged to deploy, scale, and manage an increasing array of voice and data services while curtailing expenses and extracting maximum value from existing infrastructure. Sycamore solutions, from the DNX-1u at cell sites to DNX-11/88 platforms with integrated circuit/packet processing at BSC and MSC/SS7 locations, can help mobile operators accommodate burgeoning traffic growth, streamline provisioning of voice and data services, and move toward next-generation mobile RAN infrastructure. Low upfront costs, small footprints, and a scalable architecture enable cost-effective integration today – with ample room for expansion to meet the growing demand for wireless broadband services.

DNX-1u: Multifunction Access Gateway

The DNX-1u access gateway integrates the functions of multiple network elements into a single unit, with support for TDM traffic grooming to enable cost-effective backhaul strategies, and APS to ensure network availability. Many different service types can share common transmission facilities, with up to eight T1 or E1 short/long haul interfaces, eight ports of 10/100BaseT Ethernet connectivity, Layer 2 switching and channelized Layer 3 routing.

With the DNX-1u installed at remote sites, virtually every device can be managed from the Network Operations Center (NOC) or other centralized location. An IP management channel within the backhaul facilities delivers visibility to previously unmanaged network and non-network elements. Terminal server functionality enables remote control of devices limited to craft port access. DNX-1u can also detect and report failures of collocated equipment (such as air conditioning, access doors, power systems, etc.), and toggle or reset other devices. Differential inputs with user-selectable thresholds offer monitoring and alarming of temperature and voltage; and dual power supplies with independent feeds enhance reliability.

Equipment consolidation and remote management combine to minimize ongoing capital needs, simplify sparing, improve visibility into cell site infrastructure, and reduce recurring operational expenses (e.g., backhaul costs, space and power consumption, truck rolls and site maintenance).

ENVISION PLUS – END-TO-END MANAGEABILITY FOR DNX NETWORKS

The ENvision Plus network management system (NMS) brings unique value to a network of DNX products by enhancing configuration, management, and planning functions critical to efficient and reliable network performance. Intuitive, graphical tools and multi-level topology views simplify the creation and monitoring of connections from end-to-end, and a distributed architecture scales effortlessly to fit any size DNX network. ENvision Plus works with DNX platforms to automate and simplify provisioning, streamline event and alarm management, and provide advanced bandwidth reporting, visual test access and line diagnostics – while integrating seamlessly into an existing OSS.

A topology-based routing algorithm improves network resiliency, with path and site-level protection options that automatically reroute traffic around network faults. Intelligent protection and failover mechanisms, and optional redundancy, ensure network survivability and disaster recovery in critical infrastructure environments. ENvision Plus safeguards service continuity for end users – and revenue continuity for network operators. ENvision Plus also reduces operating expenses by improving staff productivity, eliminating guesswork, and simplifying routine management tasks.

Intelligent Bandwidth Management Keeps Pace with Network Growth

DNX Cross-Connects aggregate, groom, and deliver a variety of services, ranging from traditional leased lines to dynamic IP VPNs, with multi-tiered, end-to-end protection options. DNX provides the power of a high-performance intelligent bandwidth manager in a compact and scalable platform, including a unique IP forwarding engine to ease the transition from TDM to IP. Exceptional performance monitoring and diagnostic capabilities support remote management and automated operations while maintaining carrier-class network availability.

For fixed line and mobile operators engaged in evolving a multiservice access network, the DNX product line offers both a rich feature set and a history of reliable performance in Tier 1 carrier deployments worldwide. The ability to consolidate multiple network nodes into a single intelligent system leads to simpler operations, space savings, cost optimization, and improved economies of scale, now and into the future, as networks and traffic demands continue to grow and evolve.

SPECIFICATIONS¹

ATTRIBUTE		DNX-1u	DNX-11	DNX-88
Cross-Connect Capacity		Non-blocking TDM switch fabric has a capacity of 1024 DS0s (64 Mbps) DS0, Sub-DS0 and DS1 switch resolution provided	Non-blocking 262 Mbps TDM Buss, 168 equivalent DS1s or 6 DS3s or 7 E3s	Non-blocking 1.2 Gbps TDM fabric supports over 600 T1s, 500 E1s, 24 T3s, 30 E3s or 8 OC-3/STM-1s
System Chassis/Enclosure		1 RU 19/23" flush, center, wall mount 420 mm W x 305 mm D x 45 mm H (16.5" x 12" x 1.75") 9 pounds (4.1 kg) fully configured	6 RU 19/23" flush, center mount (9 RU with PSX) 432 mm W x 356 mm D x 267 mm H (17" x 14" x 10.5") 25 pounds (11.3 kg)	6 RU (9 RU with PSX) single chassis, up to a maximum of 8 chassis configuration-dependent, 483 mm/584 mm (19/23") rack mount
Power Supply Options		Redundant or non-redundant ± 21 to ±60 VDC, 1.4 Amps max., 28 Watts	Redundant or non-redundant 90-230 VAC (47-63 Hz) or -48 VDC, 200 Watts	Redundant or non-redundant 90-230 VAC (47-63 Hz) or -48 VDC, 200 Watts per chassis
System/Expansion Manager Options		Integrated	Redundant or non-redundant	Redundant or non-redundant
Application Slot Capacity		2 x 4-port T1/E1	11 front and rear midplane module sets	Up to 88 front and rear midplane module sets
Environment	Temperature	-20°C (-4°F) to 65°C (149°F)	0°C (32°F) to 50°C (122°F)	0°C (32°F) to 50°C (122°F)
	Humidity	0% to 95% (non-condensing)	0% to 90% (non-condensing)	0% to 90% (non-condensing)
System-Level Approvals		CE, CSA, FCC, UL	NEBS Level 3, CE, CSA, FCC, UL	NEBS Level 3, CE, CSA, FCC, UL
Module-Level Approvals		CE, CSA, FCC, UL	NEBS Level 3, CE, CSA, FCC, UL	NEBS Level 3, CE, CSA, FCC, UL

MODULE SET		INTERFACE		DESCRIPTION
Optical	OC-3 or STM-1	Telcordia GR-253 ITU-T G.707 ITU-T G.841	(2 x SC-UPC) ITU-T G.747	Supports single OC-3 or STM-1 duplex connection for terminal applications. The interface module (rear card) has two simplex single-mode 1310 nm SC/UPC receptacles, one for transmit and one for receive. Can terminate or be transparent to 84 OC-3 T1/VC1.5 or 84 STM-1 T1/VC-11 or 63 E1/VC-12.
Management	System Manager Controller II	10/100BaseT BITS	EIA-232	Provides central control for DNX-11 systems and is utilized in expansion nests of DNX-88. Distributes a Stratum 3 clock with holdover and/or locks to external station clock or T1/E1 BITS interface or selected T1/E1 port.
	Expansion Node Manager	10/100BaseT BITS	EIA-232	Provides central control for DNX-88 systems. Distributes a Stratum 3 clock with holdover and/or locks to external station clock or T1/E1 BITS interface or selected T1/E1 port.
Expansion	Expansion Cross Connect	(14 x RJ-45)		Provides central switch fabric for DNX-88 systems. Protection provided on a 1+1 basis capable of hitless commanded switchovers.
	Expansion Link Controller	(2 x RJ-45)		Provides the interface between the expansion nests and the expansion cross connect. Also functions as Octal T1/ E1 to preserve slots. XLC function is 1+1 redundancy, Octal T1/E1 is N+1.
Broadband	E3 ²	ITU-T G.703 ITU-T G.751	ITU-T G.823 (2 x BNC 75ohm)	Supports multiplexing/demultiplexing of 16 E1s into a single E3 data stream. The single E3 port supports E13 framing and HDB3 line coding, plus integral BERT and loopback diagnostics.
	Hybrid DS3 ²	ANSI T1.404 ANSI T1X1.107a AT&T 54016	AT&T 62411 ITU-T G.747 (2 x BNC 75ohm)	Designed for mixed T1 and E1 operation. Supports single DS3 link with M13 or C-bit parity framing and B3ZS line coding, plus integral BERT and loopback diagnostics.
Narrowband	Octal T1/E1 ² Octal T1/E1 APS ²	ANSI T1.403 AT&T 54016 AT&T 62411 ITU-T G.703	ITU-T G.704 ITU-T G.826 (1 x RJ-48M)	Supports 8 T1 or E1 links, in any combination, with D4, ESF or G.70x framing and AMI, B8ZS, or HDB3 line coding, plus integral BERT and loopback diagnostics. T1/ E1 voice encoding and signaling bit conversion included. Optional APS functionality for 1:1 and 1+1 applications in revertive and non-revertive modes.
	Quad T1/E1 ³	ANSI T1.403 ITU-T G.703 ITU-T G.704 ITU-T G.826	TR-54016 TR-62411 (4 x RJ-48C)	Supports 4 T1/E1 links, with D4, ESF, or G.70x framing and AMI, B8ZS, or HDB3 line coding supported. The module can operate in short or long haul formats and includes integral BERT and loopback diagnostics. APS functionality for 1:1 and 1+1 applications in revertive and non-revertive modes. All features soft-selectable.

SPECIFICATIONS (CONT.)

MODULE SET		INTERFACE		DESCRIPTION
Data	Dual High Speed Data ³	EIA-232 EIA-422 EIA-530	ITU-T X.21 ITU-T V.35 (2 x micro DB-26)	Provides 2 soft-selectable ports that can be directed to the cross-connect or function as WAN ports to the routing engine. Ports can operate at all Nx56/64 Kbps data rates, with a maximum speed of 2.048 Mbps.
	Octal High Speed Data	EIA-232 EIA-422 EIA-530 EIA-530-A	ITU-T X.21 ITU-T V.35 (8 x micro DB-26)	Supports 8 synchronous DCE ports operating at 9.6 and Nx56/64 Kbps data rates, with a maximum speed of 2.048 Mbps (except EIA-232), plus integral BERT and loopback (V.54) diagnostics.
	Router/8	100BaseT Ethernet ANSI T1.617 IEEE 802.3	RFC 1213 8-port Ethernet Switch	Supports single LAN/WAN connection via 8-port switch with up to 32 network time slot channelization for industry standard protocols, including TCP/IP, RIP, RIP2, Frame Relay, NAT/PAT, DHCP, Packet Filtering, ML-PPP, OSPF, SLIP, LAPB
	Circuit/Packet eXchange (CPX)	10/100BaseT Ethernet IEEE 802.3	8-port Ethernet Switch	Provides multi-megabit routing capability to the existing DNX product line, supporting up to 32 WAN connections for speeds Nx56/64 Kbps, 8 Multi-Link Point-to-Point Protocol (ML-PPP) Bundles, and 32 PPP connections.
	Octal 10/100 Ethernet Switch/Router ³	ANSI T1.617 IEEE 802.3	IEEE 802.3X (8 x RJ-45)	Supports 8 auto-sensing 10/100BaseT Ethernet interfaces with layer 2 switching and channelized routing for industry standard protocols, including TCP/IP, RIP, RIP2, Frame Relay, NAT/PAT, DHCP, Packet Filtering, ML-PPP
	DS0-DP	TR-77 (1 x 50 Pin Telco)		Supports 8 4-wire digital NRZ data interfaces operating at 56/64 Kbps, plus integral BERT local loopbacks, and responds to inband latching loop.
	Test Access	EIA-232 EIA-422 EIA-530	ISO-2110 ISO-2593 ITU-T V.35 (4 x DB-25)	Supports 4 independent DS0 level (Nx56/64 Kbps) enhanced BERT and local/remote loopback diagnostics.

¹ Specifications are subject to change without notification.

² Optional module set redundancy supported via PSX-5300.

³ DNX-1u only.

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Sycamore Networks, Inc. (NASDAQ: SCMR) is a leading provider of intelligent bandwidth management solutions for fixed line and mobile network operators worldwide. From multiservice access networks to the optical core, Sycamore products enable network operators to lower overall network costs, increase operational efficiencies, and rapidly deploy new revenue-generating services.

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