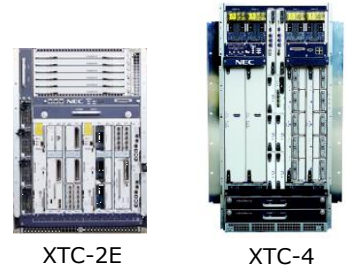# NEC DTN-X Family
- XTC-2E and XTC-4

XTC-2E   XTC-4

Offering service providers operational simplicity, multi-terabit network scalability and superior PIC-enabled network efficiency

DTN-X Family Overview

The DTN-X is a family of next-generation multi-terabit transport network platforms, combining the benefits of photonic integrated circuit (PIC) technology, integrated switching and the flexibility of digital and packet for subsea, long-haul and metro networks.

- XTC-4: 22 RU, 4 universal slots, 2T (4.8T future) capacity
- XTC-2E: 15 RU, 24 interface slots, 6 optical line system slots, 1.2T (2.4T future) capacity

The NEC DTN-X Family provides network service intelligence and is positioned to meet the needs of service providers seeking to offer new and innovative services in a simple, scalable, and efficient manner.

■Simple

The DTN-X Family is simple to install, operate, troubleshoot and scale. Services can be quickly and easily provisioned and transported over a common WDM layer. The key enablers of network simplicity are:

➢**Bandwidth Virtualization**: Any Service, Anywhere, On-Demand: The ability to convert the network into a pool of resources available to any service, anywhere, offering simplicity of planning, bandwidth efficiency and ultra-fast service provisioning.

➢**Automatic Control Plane**: A generalized multi-protocol label switching (GMPLS) based automated control plane enables automated topology discovery, service provisioning and ≤50ms protection.

➢**Multi-layer SDN**: Xceed Software Suite is a portfolio of software solutions that make bandwidth more dynamic and flexible. Xceed combines an open, multi-layer SDN control platform with modular, commercially deployable applications that enable new revenue sources while improving network efficiency. Designed for multi-layer networks and unified SDN control across metro, long-haul and subsea networks, Xceed complements Digital Network Administrator (DNA) network management software and enhances the robust portfolio of software solutions.

■Efficient

The PIC-based WDM line module consolidates more than 600 key optical functions using the 500G PIC and provides a foundation that enables space and power efficiencies.

➢**Efficiency of space**: The DTN-X Family provides dense input/output (I/O) bandwidth per rack and a dense non-blocking switch fabric on them.

500G PIC

Tx   Rx

- 500G "**WDM on a chip**"
- Low Power, High Density
- Ultra-Reliable Optical Engine

Discrete Optics

INDUSTRY's ONLY **500G LARGE SCALE PHOTONIC INTEGRATED CIRCUIT**
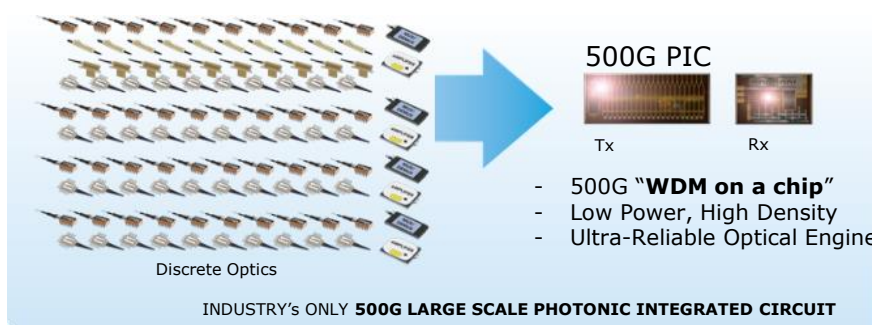
Figure 1: Photonic Integrated Circuit (PIC) Technology

➢ **Efficiency of power**: The PIC-based DTN-X Family realizes power savings for a green footprint.

■ Scalable

NEC continues to prove monolithic large-scale PIC technology with network deployments around the world. PICs are designed to improve network reliability and reduce power and space by integrating hundreds of optical functions onto a single chip. In fact, PICs on the XTC Series have operated for more than 1 billion hours in live deployments.

NEC expects PIC capacities to scale along a curve similar to Moore's law and believes PICs are the only viable technology to scale network bandwidth in a cost-effective manner as the industry moves to higher data rates. The DTN-X Family uses PICs and a clean sheet design to offer terabit-scale performance. For example, the XTC-4 scales up to 1.2T per slot delivering a total of 4.8T of non-blocking packet optical transport network (P-OTN) switching per bay The non-blocking switching capacity is always available on the XTC Series without any sacrifice in switching or WDM bandwidth, whether it operates as a pure switch, as an integrated switch with WDM optics, or in pure WDM configuration.

■ An Architecture without Compromise

The DTN-X Family leverages the latest generation of PIC technology to deliver high performance. The universal interface slots in the XTC Series accept client and line-side modules. Client interfaces include synchronous digital hierarchy / synchronous optical networking (SONET/SDH), ITU G.709 Optical Transport Network (OTN), Ethernet, storage area network (SAN) and transparent clear-channel services, from 1G to 100G.

Terminal, junction or optical cross connect (OXC) configuration for the XTC Series: Flexible universal interface slots and integrated switching allow each digital site to be deployed in any configuration from a terminal node to multi-degree junction node with any add/drop ratio. The XTC Series can therefore be configured as a terminal node (mix of client and line modules), a junction/digital reconfigurable optical add/drop multiplexer (ROADM) (all line modules) or a multi-terabit OXC (all client modules).

Investment protection: The XTC Series supports a common set of line and client modules that are compatible between the different platforms. This simplifies inventory management while protecting investments in networking equipment.

Line system interoperability: The XTC-2E and XTC-4 interoperate seamlessly over the FlexILS™ line system to support both fixed and flexible grid for increased reach and bandwidth.

■ FlexCoherent™

FlexCoherent™ technology on the DTN-X Family enables service providers to easily select from one of many modulation formats to realize a more efficient reach/bandwidth trade-off with per channel granularity.

■ Instant Bandwidth™

Instant Bandwidth™ technology on the DTN-X Family enables service providers to adopt a cash-flow efficient business model, deploying additional bandwidth rapidly with a few mouse clicks when demand arises, without the need to order, install and deploy additional equipment.

■ FastSMP™

FastSMP™ shared mesh protection technology on the XTC Series combines mesh restoration bandwidth efficiencies with <50ms recovery. Using shared protection bandwidth reduces network bandwidth needed for protection since it is more efficient with network resources than 1+1 protection.

FastSMP™ shared mesh protection uses pre-planned and pre-signaled protection circuits. GMPLS is used as the control protocol. The pre-signaled protection circuit reserves resources only in the control plane, and does not commit any resource in the data plane.

Figure 2: FlexILS™ Photonic Chassis (MTC-9)

■Packet Services

NEC's packet services technology on the XTC Series provide advanced packet features and quality of service (QoS). It directly maps Ethernet and multi-protocol label switching (MPLS) services with QoS from the edge of the network to core transport services using OTN, creating a highly efficient packet-optical network**.**

■GMPLS

Service providers can simplify optical network operations with the extensive automation capabilities incorporated into the NEC IQ Network Operating System (IQ NOS) on the DTN-X Family. IQ NOS includes a GMPLS control plane that dynamically automates network topology discovery and enables end-to-end routing and provisioning. IQ NOS also enables plug-and-play capabilities for rapid system and network turn-up and bandwidth expansions. IQ NOS improves network manageability with embedded digital maintenance, digital performance monitoring and trouble-shooting capabilities for rapid fault isolation.

■Carrier-Class Network Management

The DTN-X Family is managed by the Intelligent Management Suite (IMS), a collection of robust carrier-class applications and toolsets, including:

➢**The Graphical Node Manager (GNM):** Full-featured graphical element manager

➢**The Digital Node Administrator(DNA):** GUI-based element and network management system

➢**The Network Planning System (NPS):** Offline engineering, planning and optimization tool

➢**The XML Integration SDK and SNMP Fault Integration Server:** Facilitates customer OSS integration

An optimal combination of scale and long term network value is critical to the success of the transport network. The NEC DTN-X Family combines customer proven technologies such as large scale PICs to offer scalability, simplicity and efficiency. As the network infrastructure transforms to the new model of Layer C and Layer T, the NEC DTN-X Family offers a foundation for what the network will be.
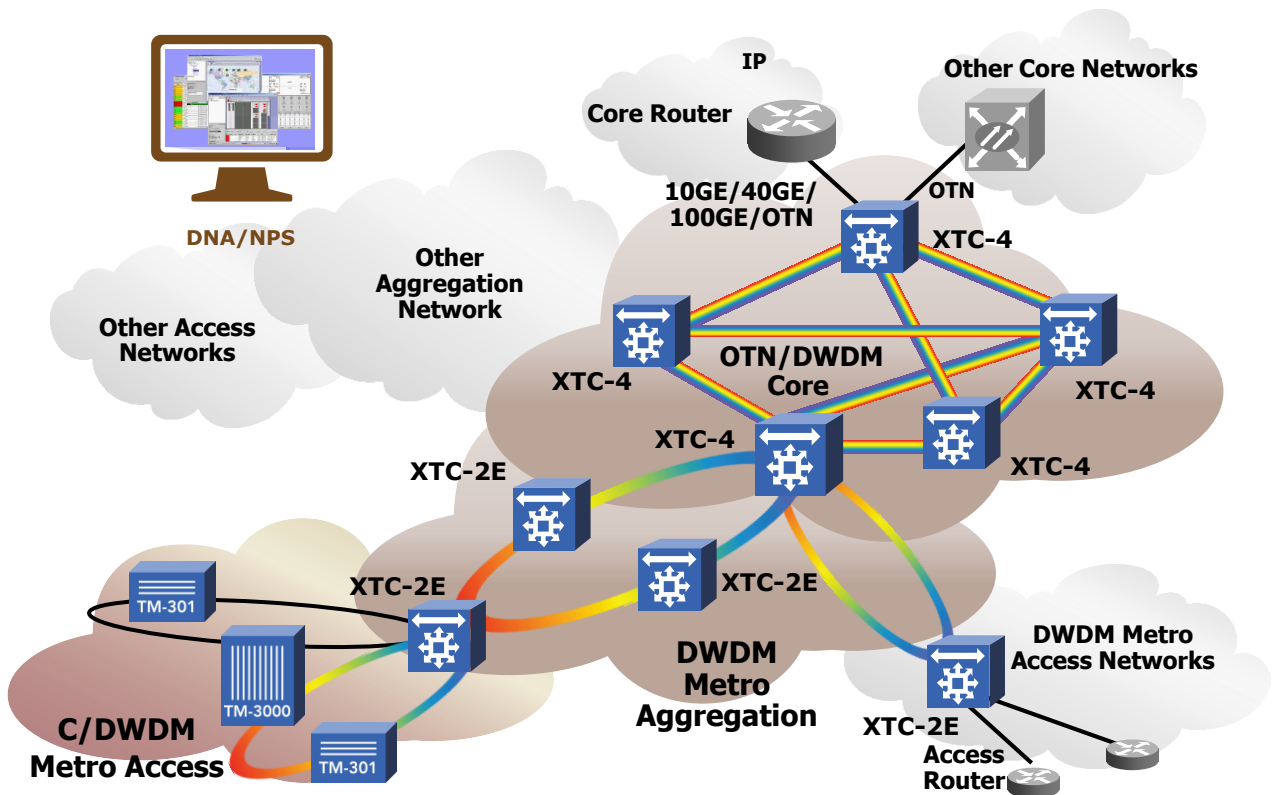

Figure 3: End-to-End Network Architecture

Technical Specifications

DTN-X	Main Chassis	XTC-2E	XTC-4
	Sibling Chassis	MTC-9, FPC, OTC, DMC, MPC-6, FMP-F250	
Cross Connect	Electrical XC	1.2Tbps non-blocking architecture ODU0/1/2/3/4/flex cross-connect	2Tbps non-blocking architecture ODU0/1/2/3/4/flex cross-connect 4+1 Redundancy
	Optical XC	Up to 9 degrees	Up to 9 degrees (w/ MTC-9)
Line Interface	500Gbps (5 x 100G, 10 x 50G)	-	DC-PM-QPSK, ~19ch, ~4,000km SC-PM-QPSK , ~19ch, ~4,000km
	250Gbps (5 x 50G)	-	DC-PM-(e)BPSK , ~19ch, ~8,000km
	100Gbps (1 x 100G)	DC-PM-QPSK, ~96ch, ~4,000km	
Client Interface	SONET/SDH	OC-192/STM-64, OC-48/STM-16	
	OTN	OTU1e/2/2e	OTU4 (CFP/Coherent CFP), OTU1e/2/2e
	Ethernet	100GbE (CFP/Coherent CFP), 10GbE (LAN/WAN), GbE	
Protection/Restoration Scheme		Digital SNCP, GMPLS Dynamic Restoration, Fast Shared Mesh Protection, Optical SNCP	
Packet Features (PXM)		IEEE 802.1Q (CV-LAN)/802.1ad (CV &. SV-LAN), MPLS-TP/PW, MEF CE 2.0 EPL/EVPL, policing/shaping, SP/WFQ scheduling, 200Gbps packet switching	
Main Chassis	Card Slot	24 interface slots, 6 optical slots	40 interface slots (4 universal slots)
	Input Voltage	-40V DC to -72V DC (-48V DC typical)	
	Power Consumption	Typical 2,200W (at 25º C)	Typical 3,200W (at 25º C)
	EMC	Emissions: CISPR 22/EN55022 Class A, FCC-A, VCCI-A Immunity: CISPR 24/EN55024	
	Safety	IEC/EN/UL 60950, CAN/CSA C22.2 No. 60950, AS/NZS 60950, UL Class II	
	Operating Temperature	Normal operation (including system power up): 5º C to 40º C Short term operation: -5º C to 50º C	
	Humidity	90% non-condensing	
	Dimension (W x D x H mm)	482.60 x 470.66 x 531.88 /15RU, 19"/23", 600mm ETSI rack fit	444.50 x 469.90 x 973.38 /22RU, 19"/23", 600mm ETSI rack fit
	Weight	Approx. 113.4kg (fully loaded)	Approx. 176.2kg (fully loaded)
Management Suites		DNA (Digital Network Administrator): XTC Series network management GNM (Graphical Node Manager): Java app for element management NPS (Network Planning System): Optical &. service planning and design	

⚠ **Safety Precautions** ★ Before installing, connection or using this product, be sure to carefully read and observe the cautionary and prohibited matters provided in the instruction manual.