

10-PORT 10GBE OVERSUBSCRIBED ETHERNET PIC FOR T SERIES CORE ROUTERS

Product Overview

High-density 10GbE interfaces are increasingly a requirement in the core, metro, and data center markets. 10GbE interfaces within a data center application provide substantial value to content providers when coupled with increases in port density and decreases in port costs. Since line-rate usage of 10GbE throughputs is not always needed by content providers and Internet service provider customers, there is the opportunity to share bandwidth among ports by means of classification and intelligent prioritization of traffic, thus increasing port densities and reducing costs.

The 10-port 10GbE PIC provides 50 Gbps of capacity across five line-rate ports, ten oversubscribed ports, or a combination of line-rate and oversubscribed ports. It provides the ideal solution for service providers and data centers that must cost-effectively deploy a large number of high bandwidth, 10-Gigabit Ethernet ports.

Product Description

The 10-port 10GbE PIC is a Type 4 PIC for Juniper Networks® T Series Core Routers. This PIC provides an aggregate throughput of 50 Gbps, with line-rate Ethernet throughput on five ports or oversubscribed forwarding at a gross ratio of 2:1 on all 10 ports. The ingress traffic into the PIC can go up to 100 Gbps, with the traffic in excess of 50 Gbps dropped intelligently by pre-classification mechanisms based upon header information on IP, MPLS, or VLAN-tagged packets.

Since the T1600 Core Router supports 100 Gbps per slot forwarding; it can support up to 16 10-port 10GbE PICs using the T1600-FPC4-ES, for a total of 160 10GbE ports per chassis. A single T640 system can support up to eight 10-port 10GbE PICs using the T640-FPC4-ES, for a total of 80 10GbE ports per chassis. Using the T1600 footprint, per-rack 10GbE densities up to 320 ports can be realized. The Type 4 Flexible PIC Concentrators (FPCs) can also be mixed with other FPC types in T640 and T1600 routers, creating a wide range of flexible interface options to match your high capacity, high-performance platform needs.

Per-port configuration options include LAN-PHY or WAN-PHY, and transmission distance is selectable based upon small form-factor pluggable transceiver (SFP+). SFP+ optics enable a variable set of range and feature configurations among all 10 ports. The combination of exceptional interface density, performance, and versatility ensure not only that you get the most out of your current investment in T Series Core Routers, but that your investment continues to be protected as your data center or point of presence (POP) grows.

Architecture and Key Components

The aggregate bandwidth for the 10-port 10GbE PIC is 50 Gbps. 10 Gbps of bandwidth is shared between each pair of adjacent ports, e.g., ports 0 and 1, ports 2 and 3, ports 4 and 5, ports 6 and 7, and ports 8 and 9. The ingress ports can be considered to be mapped into groups as shown below, with each group having 10 Gbps of throughput.

- Port Group 1: Port 0 and Port 1
- Port Group 2: Port 2 and Port 3
- Port Group 3: Port 4 and Port 5
- Port Group 4: Port 6 and Port 7
- Port Group 5: Port 8 and Port 9

The PIC can operate in one of three modes: line-rate mode, oversubscribed mode, or a combination of the two. In line rate mode, one port from within each of the five groups can support full 10GbE line-rate performance. In the oversubscribed mode, each of the port pairs in a group can share 10 Gbps of throughput. The total traffic arriving into the two ports within a group can add up to 20 Gbps. However, only 10 Gbps of traffic will pass through. Four queues are available per physical port on the PIC, and the pre-classification and intelligent drops of packets are done on the PIC itself before making it to the lookup engine. The classification of packets can be performed using a variety of methods such as 802.1p, DiffServ code point (DSCP), MPLS EXP, and inet prec. In oversubscribed mode, it is possible to mix line-rate ports with oversubscribed ports in different port groups, supporting customer facing applications and uplink applications on the same interface.

Features and Benefits

The 10-port 10GbE PIC offers several unique features and benefits for both large scale data centers and POPs. The massive 10 Gbps port density, resulting from the combination of number of ports per T Series systems and number of chassis per rack, make this PIC a space saving solution for device and network consolidation, intra- and inter-site connectivity, and core uplinks.

Investment Protection

The modular architecture of the 10-port 10GbE Type 4 PIC provides significant investment protection for T Series routers and Flexible PIC Concentrators. FPCs purchased for the T640 (T640-FPC4-ES) and the T1600 (T1600-FPC4-ES) can be repurposed over time with new Type 4 interfaces for new applications, based on the FPC-PIC concept, without forklift upgrades to the platform. In addition, the 10-port 10GbE Type 4 PIC supports multiple modes of use from 10 oversubscribed ports to 5 line-rate ports, thus allowing specific connections to evolve over time from low usage to line-rate capacity. SFP+ pluggable optics also ensure investment protection. As new modules are developed to provide additional connectivity options or enhanced cabling distances, service providers and data center operators can simply insert the new optical module into the PIC without replacing the entire unit.

Management

The 10-port 10GbE PIC provides support for optical diagnostics and monitoring through the use of SFP+ pluggable optics.

Framing

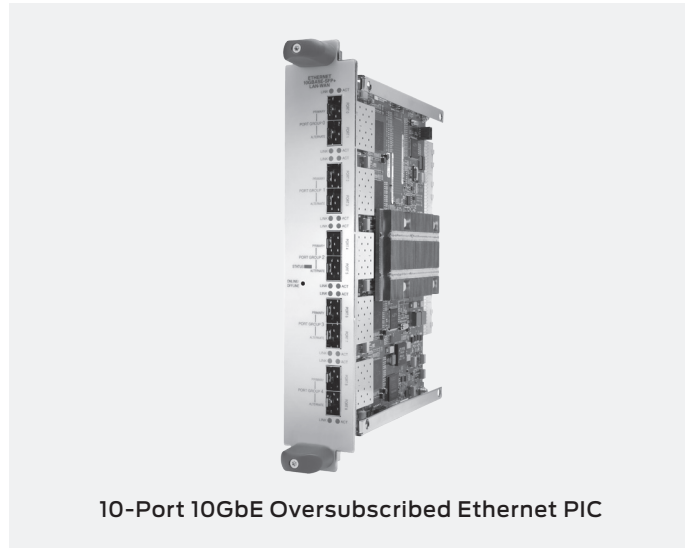
This PIC supports both LAN-PHY and WAN-PHY framing per port, which extends the applications to transport across SONET networks.

High-Density Configurations

Each 10-port 10-Gigabit Ethernet PIC supports up to 50 Gbps data transmission and, as the following table demonstrates, Juniper can support up to 2,560 10GbE ports in a single system (Juniper Networks TX Matrix Plus).

Juniper Networks Platform: 10-Gigabit Ethernet Port Density

Platform	Ports per Chassis	Ports per Rack
T640	80	160
T1600/T4000	160	320
TX Matrix	320	N/A
TX Matrix Plus	2,560	N/A



10-Port 10GbE Oversubscribed Ethernet PIC

Specifications

Product Specifications

Ports

- Ten oversubscribed (five line rate) 10 GbE ports

Framing

- Ethernet circuit cross-connect (CCC), Ethernet translational cross-connect (TCC), Ethernet virtual private LAN service (VPLS), VLAN CCC, Extended VLAN TCC, VLAN VPLS through command line interface (CLI)

Data rate

- 50 Gbps, full line rate down to minimum 64 bytes with no reordering of packets

Optics

- SFP+

Status LEDs

- One tricolor LED:
 - Off - PIC is offline and safe to remove from the router
 - Green - PIC is operating normally
 - Yellow - PIC is initializing
 - Red - PIC has an error or failure
- Two LEDs (Link and Act) per port:
 - Link LED:
 - › Off—port not enabled
 - › Green—port online with no alarms or failures
 - › Red—port detecting failure with alarms
 - Act LED:
 - › Green flashing—port sending or receiving packets
 - › OFF or solid green (non-flashing)—no packet activity detected on the port

Supported platforms

- T640, T1600 and T4000

Software Specifications

The following software features are supported:

- Quality of Service Support
 - QoS support available per port, in either line-rate mode or oversubscribed mode
 - Intelligent handling of oversubscribed traffic via BA Classification & Strict Priority
 - Flexible mapping of port-assigned queues and scheduler resources at both ingress and egress
 - CIR/PIR
 - Weighted Round Robin (WRR)
- Protocol Support
 - L2 Protocols:
 - › Ethernet CCC, Ethernet TCC, Ethernet VPLS
 - › VLAN CCC
 - › Extended VLAN TCC
 - › VLAN VPLS
 - › Flexible-Ethernet-Service
 - L3 Protocols:
 - › IPv4
 - › IPv6
 - › MPLS
 - 802.3ad Link Aggregation:
 - › Aggregated Ethernet, Link Aggregation Control Protocol (LACP)
 - › Multiple VPN types (Flexible-Ethernet-Service) over aggregated Ethernet
 - MAC Learning, Accounting, and Filtering:
 - › VLAN pass counters
 - › VLAN drop counters
 - › VLAN, SA counters
 - VLANs and stacked VLAN support per port
 - Flex-VLAN tagging support
 - Interrupt-driven link down detection
 - Ethernet WAN Interface Sublayer (WIS) SNMP Object
 - Graceful Routing Engine switchover (GRES) fully operable in all PIC/chassis configurations
 - Configurable WAN-PHY mode options include:
 - › Loopback
 - › MPLS
 - › Path-Trace
 - › Trigger

Compliance

Communications

- 802.3ae (10-Gigabit Ethernet: Receiver Bandwidth Measurement)

Safety Approvals

- CAN/CSA-C22.2 No. 60950-1-03 - UL 60950-1 Safety of Information Technology Equipment
- EN 60950-1 Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide

EMC

- AS/NZS CISPR22 Class A (Australia/New Zealand)
- EN55022 Class A (Europe)
- FCC Part 15 Class A (USA)
- VCCI Class A (Japan)

EMI

- AS/NZS 3548 Class A (Australia)
- EN55022 Class A (Europe)
- FCC Class A (USA)
- VCCI Class A (Japan)
- BSMI Class A (Taiwan)

Immunity

- EN-61000-3-2 Power Line Harmonics
- EN-61000-3-3 Voltage Fluctuations and Flicker
- EN-61000-4-2 ESD
- EN-61000-4-3 Radiated Immunity
- EN-61000-4-4 EFT
- EN-61000-4-5 Surge
- EN-61000-4-6 Low Frequency Common Immunity
- EN-61000-4-11 Voltage Dips and Sags

ETSI

- ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services.

Ordering Information

Model Number	Description	Platforms
10-Port 10GbE Type 4 PIC		
PD-5-10XGE-SFPP	10-port 10GbE PIC	T640, T1600, T4000
Model Number	Description	
SFPP-10GE-SR	SFP+ 10GbE pluggable transceiver, MMF, 850nm for 300m transmission	
SFPP-10GE-LR	SFP+ 10GbE pluggable transceiver, SMF, 1310nm for 10KM transmission	

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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