

Juniper Networks Ethernet PICs

Ethernet's flexibility, cost effectiveness, and proven interoperability, along with a continuous stream of enhancements have made it a widely adopted form of connectivity – from data centers and peering at Internet exchange points to the growing trend of metropolitan Ethernet access. The Juniper Networks portfolio of Ethernet interfaces is broad, supporting various port densities of 10/100 Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet on the M-series and T-series platforms.

Juniper Networks has further enhanced its portfolio with the advent of Ethernet Intelligent Queuing (IQ) Physical Interface Cards (PICs). These advanced PICs are based on the Q Performance Processor (QPP), a custom high-performance ASIC designed to deliver granular per-VLAN quality-of-service (QoS) capabilities along with extensive instrumentation and diagnostics on a per-VLAN and per-MAC address basis.

- Granular per-VLAN QoS such as weighted round-robin, strict priority scheduling, RED, WRED, policing, marking, and shaping supports differentiated services and converged applications over a single interface, without compromising performance.
- MAC policing and filtering enables providers to establish peering arrangements without complex routing configurations and also supports additional levels of QoS enforcement.
- VLAN rewrite, tagging, and deleting enables flexible use of VLAN address space to support more customers and services.

- Extensive per-MAC and per-VLAN billing and accounting capabilities are supported by multiple counters for gathering statistics on frames, packets and bytes that are transmitted, received, or dropped, enabling carriers to perform usage based billing for premium QoS and SLA-based services and to provide the visibility needed into network operations to ensure that trends are anticipated to meet increasing demands.

Ethernet IQ PICs have been combined with the JUNOS virtual private LAN service (VPLS) capability to deliver a metro Ethernet service. VPLS enables service providers to deliver true multipoint-to-multipoint Ethernet services over their IP/MPLS networks across both single metropolitan and geographically disparate metro areas. This compelling new capability enables the provider edge (PE) routers to automatically build a full mesh of LSPs and to switch Ethernet frames based on MAC address into the appropriate LSP, thereby leveraging IP/MPLS to provide a new level of scalability and resiliency that was previously unavailable in purely switched metropolitan Ethernet infrastructures.

Juniper Networks PICs enhance network scalability and flexibility in both core and edge networks by supporting predictable performance, standards-based features, granular QoS, and a wide range of port densities and speeds.

Advantages

Features	Benefits
Highly granular per-VLAN QoS <ul style="list-style-type: none"> • Four queues per-VLAN, weighted round robin or strict priority scheduler • RED and weighted RED per queue • Policing (ingress/egress) and filtering per-MAC and per-VLAN • Shaping per-VLAN and per queue 	<ul style="list-style-type: none"> • Customizes services on a per-user basis for maximum revenues • Migrates Ethernet traffic to an IP/MPLS infrastructure • Delivers new levels of security • Enables oversubscription of uplinks to ensure maximum capital efficiency • Policing enables rate limiting to deliver sub-rate Fast Ethernet or Gigabit Ethernet for which service providers can charge accordingly, and later increase to the full rate on demand • Paired with VPLS, delivers a solution for intra- and inter-metro multipoint-to-multipoint Ethernet connectivity – MPLS infrastructure appears as an extension of the LAN to end users
Rich per-MAC and per-VLAN accounting including support for stacked VLANs	<ul style="list-style-type: none"> • Enables service providers to simply monitor and account for peering traffic without complex routing policies • Supports usage-based billing and service level agreement verification • Bill for premium QoS and SLA-based services and recommend upgrades if a customer's SLA has been exceeded • Provide the visibility needed into network operations to ensure that trends are anticipated and capacity is expanded to meet increasing demand • MAC counters can be associated with a VLAN pair (inner and outer VLAN tag)

VLAN rewrite, tagging, and deleting, including support for stacked VLANs	<ul style="list-style-type: none"> • Enables flexible use of VLAN address space to support more customers and services • Resolves conflicts between service provider VLANs and customer VLANs • Supports stacked VLANs – look-up, rewrite, deletion on both the inner and outer VLAN tag and associate the VLAN to a particular customer or service • Stacked VLANs enables increase in address space and compatibility with customer premise devices that use stacked VLAN
Predictable performance and consistent service-enabling features across all M-series and T-series PICs	<ul style="list-style-type: none"> • Supports rich IP service deployment across all interfaces • Increases service reliability • Simplifies configuration • Accelerates deployment time • Reduces operational complexity • Decreases operational costs • Minimizes training time for operational staff
<ul style="list-style-type: none"> • High-density interfaces with the ability to mix and match up to four PICs within a single Flexible PIC Concentrator (FPC) slot • Small form-factor pluggable (SFP) transceiver modules provide support for SX, LX, and LH optical interfaces as well as copper UTP based interfaces on the same PIC • XENPAK pluggable optics modules for use with the 10 Gigabit Ethernet PIC provide for flexible choice of either 300m (depending on bandwidth of multimode fiber) 10GBase-SR, 10km 10GBase-LR, 40km 10GBase-ER, or 80km 10GBase-ZR on a single PIC 	<ul style="list-style-type: none"> • Improves edge concentration and scalability of the core • Increases configuration flexibility by enabling service providers to mix different speeds, technologies, and IP services • Enables service providers to add uplink interfaces without wholly consuming an FPC slot • Reduces operational costs by maximizing POP space • Dramatically increases density to provide industry leading Gigabit Ethernet density in a router platform • SFP optical transceivers deliver greater flexibility in interface support and efficiencies in sparing

Broad range of connectivity	<ul style="list-style-type: none"> • Enables service providers to offer a wide range of IP services in diverse environments • Enhances service definition richness by increasing configuration flexibility • Ensures scalability for both subscriber and uplink interfaces
IEEE standards-based Ethernet features, such as 802.1Q and VRRP	<ul style="list-style-type: none"> • Increases interoperability • Enhances reliability
Layer 2 to Layer 3 mapping	<ul style="list-style-type: none"> • Allows for end-to-end class of service • Preserves VLAN information over IP • Enables multitiered Web-hosting services
IEEE 802.3ad link aggregation	<ul style="list-style-type: none"> • Increases performance by multiplying available bandwidth • Increases network reliability • Provides link redundancy • Increases scalability using existing Ethernet technology to provide additional bandwidth
Circuit Cross-connect and Layer 2 VPNs on unlike ingress and egress interfaces	<ul style="list-style-type: none"> • Provides interconnection for IP traffic between Ethernet VLAN interfaces and other interfaces

Descriptions

Fast Ethernet	<p>The 4-port, 12-port and 48-port Fast Ethernet PICs are ideal for peering, and intra-POP connectivity, data center connectivity, and Web hosting server aggregation. By eliminating the need for incremental switches, you can simplify network configuration tasks and lower costs. By deploying these cost-efficient PICs in today's architectures, you are setting the stage for a smooth migration to higher bandwidths in the future.</p> <ul style="list-style-type: none"> • 4-port 100Base-TX <ul style="list-style-type: none"> – Available on all M-series, T320, and T640 platforms – 1,024 802.1Q VLANs per port – 100Base-T support – Autosensing full or half duplex • 8-port 100Base-FX <ul style="list-style-type: none"> – Available on M7i, M10i, M20, M40e and M320 platforms – 8 100Base-FX MTRJ multimode fiber ports – 16 802.1Q VLANs per port – Autosensing full or half duplex • 12-port 100Base-TX <ul style="list-style-type: none"> – Available on M7i, M10i, M20, M40e, M320 and T320 platforms – With all ports enabled, the PIC can be over subscribed; up to 800 Mbps available per all 12 ports – 16 802.1Q VLANs per port – 100Base-T support – Autosensing full or half duplex • 48-port 100Base-TX <ul style="list-style-type: none"> – Available on M40e and M320 platforms – With all ports enabled, the PIC can be over subscribed; up to 800 Mbps available per each group of 12 ports – 16 802.1Q VLANs per port – 100Base-T support – Autosensing full or half duplex
---------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Gigabit Ethernet	<p>Gigabit Ethernet PICs provide 1 Gbps per link, supporting a number of different applications.</p> <ul style="list-style-type: none"> • Customer facing access links – for metropolitan Ethernet applications, leveraging LX optics that span distances up to 43.5 miles/70 km and LH optics for distances up to 4.35 miles/7.0 km. • Intra-POP connectivity – as the backbone scales, intra-POP connections between core routers and edge aggregation routers must also scale. Gigabit Ethernet PICs enable the aggregation of large numbers of edge circuits onto high-speed Internet backbone circuits. • Peering connectivity at interexchange points – interconnects between service providers at NAPS must also scale. Gigabit Ethernet PICs connect M-series and T-series platforms to NAPS that are migrating to Gigabit Ethernet as a shared medium. • Connectivity for web hosting and data center servers – Juniper Networks platforms support Web- and content hosting applications where traffic demands require Gigabit Ethernet up-links from server farms. Combined with the high performance of M-series and T-series platforms, these PICs enable service providers to connect to an Internet backbone circuit for faster Web response times. <p>The Gigabit Ethernet PICs come in the following configurations:</p> <ul style="list-style-type: none"> • 1-Gbps, 1-port Ethernet IQ PIC <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on all M-series and T320 platforms • 1-Gbps, 2-port Ethernet IQ PIC <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on M40e, M320, T320, and T640 platforms • 1-Gbps, 1-port <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on M7i, M10i, M20, M40e, M320, and T320 platforms • 1-Gbps, 2-port <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on M40e, M320, T320, and T640 platforms • 1-Gbps, 4-port <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on M40e, M320, T320, and T640 platforms • 1-Gbps, 10-port <ul style="list-style-type: none"> – Utilizes Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) – Available on M320, T320 and T640 platforms
10 Gigabit Ethernet	<p>For the highest speed connectivity, Juniper offers the 10-Gigabit Ethernet PICs. An effective means to provide high speed intra-POP connectivity or metropolitan Ethernet uplinks into the core.</p> <ul style="list-style-type: none"> • 10-Gbps XENPAK, 1-port <ul style="list-style-type: none"> – SR optics (984 ft/300m, depending on MMF bandwidth) – LR optics (6.2-mile/10km) – ER optics (24.8 mile/40km) – ZR optics (49.6-mile/80km) – Available on M320, T320 and T640 platforms

Port Density and Flexibility

Platform	Fast Ethernet				1-Gbps Gigabit Ethernet				10-Gbps Gigabit Ethernet
	4-port	8-port	12-port	48-port	1-port	2-port	4-port	10-port	1-port
M7i									
Per chassis	16	32	48	–	4	–	–	–	–
Per rack	240	480	720	–	60	–	–	–	–
M10i									
Per chassis	32	64	96	–	8	–	–	–	–
Per rack	480	960	1,440	–	120	–	–	–	–
M20									
Per chassis	64	128	192	–	16	–	–	–	–
Per rack	320	640	960	–	80	–	–	–	–
M40e									
Per chassis	128	256	384	384	32	16	32	–	–
Per rack	256	512	768	768	64	32	64	–	–
M320									
Per chassis	128	256	384	1,152	32	64	128	160	16
Per rack	256	512	768	2,304	64	128	256	320	32
T320									
Per chassis	64	–	192	–	16	32	64	160	16
Per rack	192	–	576	–	48	96	192	480	48
T640									
Per chassis	–	–	–	–	–	64	128	320	32
Per rack	–	–	–	–	–	128	256	640	64

– = Not applicable

Key Features

A few of the key features supported by Ethernet PICs include support for integrated 802.1Q VLAN, link aggregation, Circuit Cross-connect, VRRP, Layer 2 to Layer 3 mapping, and port monitoring. Additionally, Ethernet PICs support filtering, sampling, load balancing, rate limiting, class of service, and other key features necessary for deploying secure, dependable, high-performance IP services.

Virtual Private LAN Service (VPLS)

VPLS is multipoint-to-multipoint (MP2MP) Ethernet service that uses IP and a tunnel mechanism (typically MPLS) to provide connectivity across an IP cloud between multiple enterprise sites as if these sites were attached to the same Ethernet LAN. This compelling new capability enables the PE routers to automatically build a full mesh of LSPs and to actually switch frames based on Ethernet MAC address into the appropriate LSP. This results in an Ethernet service where the provider network looks like a large broadcast domain to the enterprise customer and the customer has a simple Ethernet handoff from the provider. It allows the provider to deliver this LAN interconnect service between sites within a metro or across geographically disparate metros.

Granular QoS

Quality of service is the ability to prioritize traffic during periods of congestion. Gigabit Ethernet IQ PICs enable QoS on a per VLAN basis, which means that if each customer is assigned a VLAN then that customer can have four different levels of traffic priority. There are a

number of tools supported by Gigabit Ethernet IQ PICs that support congestion management, including per-VLAN and per-queue shaping, per-VLAN and per MAC policing (including hard policing [drop] and soft policing [marking]), and RED and weighted RED with multiple drop profiles per queue.

802.1Q VLAN Support

Ethernet PICs support 802.1Q VLANs. In a hosting environment, VLANs enable service providers to partition traffic from different servers into separate subnets without having to use separate physical circuits between the switch and the router. The router partitions the traffic according to the VLAN tags within the packets, supporting multiple VLANs per port.

802.3ad Link Aggregation

Link aggregation is the ability to bundle together a set of ports configured with the same speed in full-duplex mode into a virtual link, thereby supporting simultaneous parallel physical links between Juniper Networks platforms. Service providers can configure up to 16 groups per router, and each group supports up to 8 ports. If a link goes down, the traffic is redistributed among the remaining links, thereby improving network reliability.

Layer 2 VPN VLAN Support

Juniper Networks supports the transport of Ethernet frames across an MPLS network via a number of different Layer 2 VPN solutions – Layer 2 draft Martini circuits, Layer 2 draft Kompella VPNs and Circuit Cross-connect (CCC). Any of these technologies can be used to map VLANs on an Ethernet interface to MPLS label-switched paths (LSPs), thereby leveraging the IP infrastructure by combining Layer 2 switching capabilities with IP traffic engineering and tunneling capabilities. On any given port, service providers can terminate, switch, or tunnel the VLAN. CCC also enables the stitching together of traffic engineering domains together. Service providers can interconnect LSPs across different domains without IP routing, thereby enabling them to remain private.

Ethernet Circuit Cross-connect

Additionally, for one- and two-port Gigabit Ethernet interfaces, when an Ethernet CCC connection is established between two Gigabit Ethernet ports, all packets from the ingress port are forwarded to the egress port without any portions of the packet being modified. This simple Layer 2 pass through connection can be rate limited or policed.

VRRP Support

Ethernet PICs support VRRP at the physical interface level and independently over each 802.1Q VLAN. Hence, a physical port can act as a backup for another physical port, or service providers can configure VLANs on two physical ports to act as backups for each other.

Layer 2 to Layer 3 Mapping

Layer 2 information (VLAN tags or 802.1p CoS) is mapped to Layer 3 to transport over the routed WAN. For example 802.1p tags map into DiffServ of MPLS experimental bits, so that CoS can be carried end to end with Ethernet ingress and egress circuits.

Port Monitoring

Ethernet PICs support the collection of port statistics using the EtherStats portion of the RMON MIB. These statistics are available both through the CLI and through SNMP. Additionally, the CLI provides full- and half-duplex auto-negotiation information.

Specifications

Specifications	Description
Interfaces	Fast Ethernet 4-port <ul style="list-style-type: none"> Connector: Two-pair, category 5 unshielded twisted pair connectivity through an RJ-45 connector Pinout: MDI non-crossover
	Fast Ethernet 8-port <ul style="list-style-type: none"> FX optical interface <ul style="list-style-type: none"> Connector: MT-RJ connector Length: 1.24-mile / 2-km reach on 62.5/125 micrometer MMF Wavelength: 1,270 to 1,380 nm Average launch power: -20 to -14 dBm Receiver saturation: -14 dBm Receiver sensitivity: -34 dBm
	Fast Ethernet 12-port <ul style="list-style-type: none"> Connector: Single VHDCI connector that services all twelve 10/100-Mbps ports Cable: VHDCI to RJ-21 cable used to connect to an RJ-45 patch panel <ul style="list-style-type: none"> Length: 9.84 ft / 3 m Compliance: Category 5 Pinout: MDI or MDI-X
	Fast Ethernet 48-port <ul style="list-style-type: none"> Connector: Four VHDCI connectors; each connector services twelve 10/100-Mbps ports Cable: VHDCI to RJ-21 cable used to connect to an RJ-45 patch panel <ul style="list-style-type: none"> Length: 9.84 ft / 3 m Compliance: Category 5 Pinout: MDI or MDI-X
	1-Gbps Gigabit Ethernet: 1-port, 2-port, 4-port, and 10-port SFP versions; 1-Gbps Gigabit Ethernet IQ PICs, 1-port and 2-port SFP versions <ul style="list-style-type: none"> Utilize Small Form-factor Pluggable (SFP) optics (SX, LX, LH, and Copper types) SX optical interface (IEEE 802.3 compliant) <ul style="list-style-type: none"> Connector: LC duplex connector Length <ul style="list-style-type: none"> 200-m reach on 62.5/125 micrometer MMF 500-m reach on 50/125 micrometer MMF Wavelength: 830 to 860 nm Average launch power: -9.5 to -4 dBm Receiver saturation: -3 dBm Receiver sensitivity: -18 dBm LX optical interface (IEEE 802.3 compliant) <ul style="list-style-type: none"> Connector: LC duplex connector Length <ul style="list-style-type: none"> 6.2-mile/10-km reach on 9/125 micrometer SMF 1,804.5-ft / 550-m reach on 62.5/125 and 50/125 micrometer MMF Wavelength: 1,270 to 1,355 nm Average launch power: -9.5 to -3 dBm Receiver saturation: -3 dBm Receiver sensitivity: -20.5 dBm LH optical interface (IEEE 802.3 compliant) <ul style="list-style-type: none"> Connector: LC duplex connector Length: 49.5-mile / 70-km reach on 9/125 micrometer SMF Wavelength: 1,480 to 1,580 nm Average Launch Power: -3 to +3 dBm Receiver Saturation: -3 dBm Receiver Sensitivity: -23 dBm (BER 1012) for SMF Copper unshielded twisted-pair (UTP) interface (IEEE 802.3 compliant) <ul style="list-style-type: none"> Connector: Four-pair, Category 5 unshielded twisted-pair (UTP) connectivity through an RJ-45 connector Pinout: MDI crossover Length: 328-ft/100-m Receiver sensitivity: -10.3 dBm

Specifications	Description																																											
Interfaces	10-Gbps Gigabit Ethernet XENPAK, 1-port <ul style="list-style-type: none"> XENPAK pluggable optics (SR, LR, ER, ZR types) SR optical interface (IEEE 802.3ae compliant) <ul style="list-style-type: none"> Connector: SC duplex Length: 108-ft/33-m on 62.5/125 micrometer MMF 984-ft/300-m on 50 micrometer MMF (Depends on bandwidth of MMF) Wavelength: 840 to 865 nm Average launch power: -4.5 through -1 dBm Receiver saturation: -1.0 dBm Receiver sensitivity: -7.5 dBm LR optical interface (IEEE 802.3ae compliant) <ul style="list-style-type: none"> Connector: SC duplex Length: 6.2-mile / 10-km reach on 9/125 micrometer SMF Wavelength: 1,260 to 1,355 nm Average launch power: -4 through 0.5 dBm Receiver saturation: 0.5 dBm Receiver sensitivity: -10.3 dBm ER optical interface (IEEE 802.3ae compliant) <ul style="list-style-type: none"> Connector: SC duplex Length: 25-mile / 40-km reach on 9/125 micrometer SMF Wavelength: 1,530 to 1,565 nm Average launch power: -4.7 through 4 dBm Receiver saturation: 1 dBm Receiver sensitivity: -11.3 dBm ZR optical interface (IEEE 802.3ae compliant) <ul style="list-style-type: none"> Connector: SC duplex Length: 50-mile / 80-km reach on 9/125 micrometer SMF Wavelength: 1,530 to 1,565 nm Average launch power: 0 through 4 dBm Receiver saturation: -7 dBm Receiver sensitivity: -24 dBm 																																											
	LEDs <table border="1"> <thead> <tr> <th colspan="2">Fast Ethernet 4-port, 8-port, 12-port, and 48-port PIC Status LED</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>PIC is on</td> </tr> <tr> <td>Off</td> <td>PIC is off</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Fast Ethernet 4-port and 8-port Port LEDs</th> </tr> </thead> <tbody> <tr> <td colspan="2">One pair of LEDs per port</td> </tr> <tr> <td>Link</td> <td></td> </tr> <tr> <td>Green</td> <td>Port is online</td> </tr> <tr> <td>Off</td> <td>Port is down</td> </tr> <tr> <td>RX</td> <td></td> </tr> <tr> <td>Blinking green</td> <td>Port is receiving data</td> </tr> <tr> <td>Off</td> <td>Port might be on, but it is not receiving data</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Fast Ethernet 12-port Port LEDs</th> </tr> </thead> <tbody> <tr> <td colspan="2">One pair of LEDs per port</td> </tr> <tr> <td>Green</td> <td>100-Mbps link established</td> </tr> <tr> <td>Flashing green</td> <td>100-Mbps activity</td> </tr> <tr> <td>Yellow</td> <td>10-Mbps link established</td> </tr> <tr> <td>Flashing yellow</td> <td>10-Mbps activity</td> </tr> <tr> <td>Off</td> <td>No link present</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Gigabit Ethernet Status LED</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>PIC is operating normally and one or more links are active</td> </tr> <tr> <td>Red</td> <td>All links are down</td> </tr> <tr> <td>Off</td> <td>PIC is not enabled</td> </tr> </tbody> </table>	Fast Ethernet 4-port, 8-port, 12-port, and 48-port PIC Status LED		Green	PIC is on	Off	PIC is off	Fast Ethernet 4-port and 8-port Port LEDs		One pair of LEDs per port		Link		Green	Port is online	Off	Port is down	RX		Blinking green	Port is receiving data	Off	Port might be on, but it is not receiving data	Fast Ethernet 12-port Port LEDs		One pair of LEDs per port		Green	100-Mbps link established	Flashing green	100-Mbps activity	Yellow	10-Mbps link established	Flashing yellow	10-Mbps activity	Off	No link present	Gigabit Ethernet Status LED		Green	PIC is operating normally and one or more links are active	Red	All links are down	Off
Fast Ethernet 4-port, 8-port, 12-port, and 48-port PIC Status LED																																												
Green	PIC is on																																											
Off	PIC is off																																											
Fast Ethernet 4-port and 8-port Port LEDs																																												
One pair of LEDs per port																																												
Link																																												
Green	Port is online																																											
Off	Port is down																																											
RX																																												
Blinking green	Port is receiving data																																											
Off	Port might be on, but it is not receiving data																																											
Fast Ethernet 12-port Port LEDs																																												
One pair of LEDs per port																																												
Green	100-Mbps link established																																											
Flashing green	100-Mbps activity																																											
Yellow	10-Mbps link established																																											
Flashing yellow	10-Mbps activity																																											
Off	No link present																																											
Gigabit Ethernet Status LED																																												
Green	PIC is operating normally and one or more links are active																																											
Red	All links are down																																											
Off	PIC is not enabled																																											

Specifications	Description	
LEDs	1 Gigabit Ethernet Port LEDs and 10 Gigabit Ethernet Port LEDs One pair of LEDs per port	
	Link Green	Port is online
	Off	Port is down
	RX Blinking green	Port is receiving data
	Off	Port might be on, but it is not receiving data
Agency Approvals	Safety	<ul style="list-style-type: none"> CAN/CSA-C22.2 No. 60950-00/UL 60950—Third Edition, Safety of Information Technology Equipment EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification, Requirements and User's Guide EN 60825-2 Safety of Laser Products—Part 2: Safety of Optical Fibre Communication Systems EN 60950, Safety of Information Technology Equipment
	EMC	<ul style="list-style-type: none"> AS/NZS 3548 Class A (Australia / New Zealand) BSMI Class A (Taiwan) EN 55022 Class A Emissions (Europe) FCC Part 15 Class A (USA) VCCI Class A (Japan)
	Immunity	<ul style="list-style-type: none"> EN 61000-3-2 Power Line Harmonics 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
	NEBS	Designed to meet these standards <ul style="list-style-type: none"> GR-63-CORE: NEBS, Physical Protection GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment SR-3580 NEBS Criteria Levels (Level 3 Compliance)
	ETSI	<ul style="list-style-type: none"> ETS-300386-2 Telecommunication Network Equipment Electromagnetic Compatibility Requirements

Specifications

Specifications	Platform	Model Number
Fast Ethernet PICs		
4-port TX interface with RJ-45 connector	M7i, M10i	PE-4FE-TX
	M20	P-4FE-TX
	M40e, M320, T320, T640	PB-4FE-TX
8-port FX interface	M7i, M10i	PE-8FE-FX
	M20	P-8FE-FX
	M40e, M320	PB-8FE-FX
12-port, TX interface; requires RJ-45 patch panel (available in MDI or MDI-X pinout)	M7i, M10i	PE-12FE-TX
	M20	P-12FE-TX
	M40e, M320, T320	PB-12FE-TX
48-port, TX interface; requires RJ-45 patch panel (available in MDI or MDI-X pinout)	M40e, M320	PB-48FE-TX
1-Gbps Gigabit Ethernet PICs		
1-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M7i, M10i	PE-1GE-SFP
	M20	P-1GE-SFP
	M40e, M320, T320	PB-1GE-SFP
2-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M40e, M320, T320, T640	PB-2GE-SFP
4-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M40e, M320, T320, T640	PB-4GE-SFP
10-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M320, T320, T640	PC-10GE-SFP
1-Gbps Gigabit Ethernet IQ PICs		
1-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M7i, M10i	PE-1GE-SFP-QPP
	M20	P-1GE-SFP-QPP
	M40e, M320, T320	PB-1GE-SFP-QPP
2-port SFP (requires pluggable SFP optics modules: SFP-1GE-SX, SFP-1GE-LX, SFP-1GE-LH, or SFP-1GE-T)	M40e, M320, T320, T640	PB-2GE-SFP-QPP
10-Gbps Gigabit Ethernet PICs		
1-port, XENPAK 10 Gbps	M320, T320, T640	PC-1XGE-XENPAK
Pluggable Optic Modules		
Small Form-Factor Pluggable 1000Base-SX Gigabit Ethernet Optic Module		SFP-1GE-SX
Small Form-Factor Pluggable 1000Base-LX Gigabit Ethernet Optic Module		SFP-1GE-LX
Small Form-Factor Pluggable 1000Base-LH Gigabit Ethernet Optic Module		SFP-1GE-LH
Small Form-Factor Pluggable 1000Base-T Gigabit Ethernet Optic Module (Copper)		SFP-1GE-T
XENPAK Pluggable 10GBase-SR Optic Module		XENPAK-1XGE-SR
XENPAK Pluggable 10GBase-LR Optic Module		XENPAK-1XGE-LR
XENPAK Pluggable 10GBase-ER Optic Module		XENPAK-1XGE-ER
XENPAK Pluggable 10GBase-ZR Optic Module		XENPAK-1XGE-ZR



CORPORATE HEADQUARTERS
AND SALES HEADQUARTERS
FOR NORTH AND SOUTH AMERICA
Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, CA 94089 USA
Phone: 888-JUNIPER (888-586-4737)
or 408-745-2000
Fax: 408-745-2100
www.juniper.net

EAST COAST OFFICE
Juniper Networks, Inc.
10 Technology Park Drive
Westford, MA 01886-3146 USA
Phone: 978-589-5800
Fax: 978-589-0800

ASIA PACIFIC REGIONAL
SALES HEADQUARTERS
Juniper Networks (Hong Kong) Ltd.
Suite 2507-11, Asia Pacific Finance Tower
Citibank Plaza, 3 Garden Road
Central, Hong Kong
Phone: 852-2332-3636
Fax: 852-2574-7803

EUROPE, MIDDLE EAST, AFRICA
REGIONAL SALES HEADQUARTERS
Juniper Networks (UK) Limited
Juniper House
Guildford Road
Leatherhead
Surrey, KT22 9JH, U. K.
Phone: 44(0)-1372-385500
Fax: 44(0)-1372-385501

Copyright 2006, Juniper Networks, Inc. All rights reserved. Juniper Networks and the Juniper Networks logo are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered trademarks, or registered service marks in this document are the property of Juniper Networks or their respective owners. All specifications are subject to change without notice. Juniper Networks assumes no responsibility for any inaccuracies in this document or for any obligation to update information in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.