



Carrier Ethernet Switches | 20G Transport Switch and EoS Mapper | TPWX3192

Altera's TPWX3192 combines Carrier Ethernet Switching and SONET/SDH transport in one device. It supports all combinations of Ethernet and MPLS packet transport switching protocols and can map the packets in and out of groups of SONET/SDH higher or lower order containers for transport over SONET/SDH interfaces.

TPWX3192 is based on SoftSilicon® technology which guarantees that the evolution of features and protocols can be supported and also makes it possible to adapt to specific interface requirements.

Family Key Features

- Integrated Packet Processor, Traffic Manager and Packet over SONET/SDH mapper
- 20 Gbps packet switch solution
- Switching between physical Ethernet ports and channelized SONET/SDH interfaces
- Up to 8 built-in triple-speed Ethernet SGMII MAC interfaces
- Up to 16 built-in 10/100 Ethernet SMII MAC interfaces
- Optional 10 GE XGMII Ethernet interface
- Four 2.5G SONET/SDH interfaces, channelized as up to 64 Virtually Concatenated Groups (VCG) of VT1.5/STS-1/STS-3c channels (SONET) or VC-12/-3/-4 channels (SDH) under LCAS control
- True deterministic packet switching performance
 - the switch capacity is independent on the amount and combinations of look-ups
- Supports E(VP)-LINE / -LAN / -TREE services based on Ethernet and MPLS pseudowire technologies
- Hardware based ETH and MPLS OAM support for sub 50 ms protection switching
- Advanced traffic management with per flow policing
- Supports deep packet buffers through storage in external memory
- Handles all look-ups without additional TCAM
- High-level driver software designed for quick and easy integration

Packet Switching in SONET/SDH Networks

More and more services become packet based which makes packet switching technology a natural choice also for transport networks, especially of course for E-LAN and E-TREE types of services. However, there is an enormous installed base of SONET/SDH nodes and SONET/SDH is still the preferred network technology in many networks.

TPWX3192 combines the packet switching and SONET/SDH worlds in one device.

Packet switching solutions for transport networks is based on layer 2 Ethernet and MPLS switching protocols complemented with traffic management and OAM support in order to resemble the traditional carrier class attributes of SONET/SDH networks as close as possible.

Support of all these requirements requires a solution that can not only meet stringent carrier class requirements, but also is flexible enough to allow changes in standards and new technologies to be easily accommodated.

TPWX3192 provides just that. It fully supports all of the above technologies and protocols while also providing a carrier class, integrated packet processor and traffic management solution, plus a 10G packet over SONET/SDH mapper.

Designed according to MEF, ITU-T, IEEE and IETF specifications, TPWX3192 provides key features that enable the deployment of true Carrier Class packet networks, such as redundancy, protection, OAM support, fault & service management and advanced Quality of Service (QoS) features.

And along with that comes support of mapping of the Ethernet and MPLS packet flows to Virtually Concatenated Groups (VCGs) of SONET/SDH higher order or lower order containers under control of the LCAS protocol.

Deterministic Performance

TPWX3192 provides guaranteed, deterministic packet processing performance. Every packet is guaranteed to be processed within the same, fixed number of clock cycles no matter the number and combinations of Ethernet, MPLS and pseudo-wire look-ups to be performed.

Three speed grade variants are available:

- 26 Gbps, 32.0 Mpps,
- 22 Gbps, 27.0 Mpps,
- 20 Gbps, 24.5 Mpps

Carrier Class Features

The design includes hardware based ETH and MPLS OAM and protection features. TPWX3192 implements hardware based sub 50 ms protection switching for hundreds of VLAN flows or MPLS tunnels.

In the SONET/SDH domain 1+1 protection is supported.

VCAT and LCAS support provides an elegant way of achieving protection of packet services by automatically up/down adjusting the size of the SONET/SDH pipe according to the failure status of the individual members of the VCG.

In a packet network with switching between high and low capacity pipes one will inevitably have burst of packets. In order to assure that packets are not lost it is important to have large enough external packet memory that can buffer these bursts as supported by TPWX3192.

TPWX3192 | 20G Transport Switch and EoS Mapper

Specifications

Switch Capacity

- 20-26 Gbps bandwidth, 24.5-32 Mpps
- Switching between 92 logical ports (64 VCGs and up to 28 Ethernet and CPU ports)

L2/VLAN and L2/VSI switching

- 8K Virtual Switch Instances (VSI)
- L2 switching using VLAN or VSI
- Up to 576K (packet flows, CoS)
- Up to 128K L2 addresses
- Link aggregation with 8K groups
- Wire speed L2 multicast handling

MPLS Packet Switching

- Three MPLS push/pops per packet
- 8K MPLS lookup entries provided
- Wire speed MPLS multicast handling

OAM support

- ETH OAM based on Y.1731, 802.1ag
- MPLS OAM based G.8114/Y.1711
- 3.3 msec OAM packets interval
- HW based CCM/CV check for up to 1K remote MEPs
- HW based Loss and Delay perform
- HW based protection switching

Policing and Traffic Management

- Up to 64K policing buckets, single or dual leaky bucket
- Ingress or egress policing
- Output queue system with 8 queues per logical port
- WRED support with 4 levels
- Strict priority weighted round robin and guaranteed bandwidth scheduling
- Leaky bucket output shaping per output queue and per logical port

Traffic Statistics

- Ingress octet and packet counts for up to two VLAN-, MPLS- and/or PBT tunnel lookups
- Egress octet or packet counts for each Tx update entry
- Police octet or packet counts per color per bucket entry

SONET/SDH capacity

- 4x STS-48/STM-16 interfaces
- Support for 10G capacity of STS-3c/VC-4, STS-1/VC-3 and 2.5G capacity of VT1.5/VC-11

Encapsulation support

- GFP-F (ITU G.7041)

Concatenation support

- Support for 64 concurrent VCGs
- Contiguous concatenation support

LCAS support

- Compliant with G.7042/Y.1355
- Hitless increase/decrease of capacity
- LCAS to non-LCAS interworking

Functional description

The block diagram below shows the most important internal functional blocks of TPWX3192 along with the necessary ancillary components. Packets are received from left (ingress) and are processed from left to right through the TPWX3192 and are finally transmitted from the port module to the right (egress).

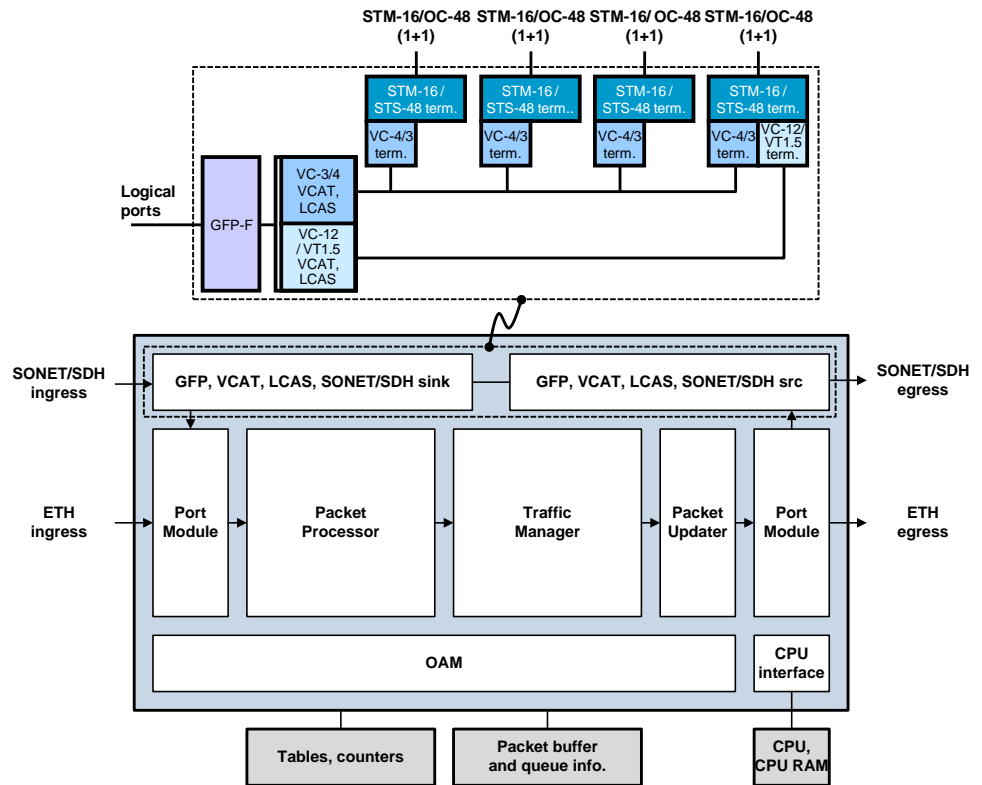
The Port module is responsible for combining the incoming packet flows from the different ports to one flow, which then is forwarded to the packet processor. From the packet processor's perspective all so-called logical ports, whether physical Ethernet ports, VCG channels or the CPU ports, look the same and get the same treatment. The port module supports up to 92 logical ports.

The SONET/SDH blocks at the top are responsible for mapping packets in and out of SONET/SDH VCGs.

TPWX3192 contains a packet processor for handling the headers of the packets and a traffic manager for storage and scheduling of packets.

The packet processor looks at the header of the packets and uses this information to determine how to forward, police and en-queue the packets.

The traffic manager stores incoming packets in external packet buffer memory and determines in which order to send packets to the different output ports. Replication of packets in connection with multicasting is also done by the traffic manager.



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