

1830 PSS-24x Carrier Ethernet Switch Cards

6SE300, 30SE300

The Carrier Ethernet Switch Cards for the Nokia 1830 Photonic Service Switch 24x (PSS- 24x) use state-of-the-art carrier-grade Layer 2 (L2) switches and Nokia’s Service Router Operating System (SR OS) to provide packet-optimized transport over an OTN transport layer as a further degree of optimization on top of OTN multiplexing/aggregation. In other words, they extend the service provisioning flexibility beyond the scope of a pure OTN/ WDM networks. These Carrier Ethernet Switch Cards are complementary to the PSS-8/16II Carrier Ethernet Switch Cards and Carrier Ethernet Muxponders, delivering the full set of Carrier Ethernet services in point-to-point and multipoint configurations with L2 switching and networking over optical transport networks (OTN), while providing higher interface rates and higher L2 switching capacities.

These cards are key components of Nokia’s Integrated Packet Transport (IPT) solution for the 1830 PSS family of products. IPT, built on scalable, packet-optimized WDM transport, enables the transformation to a converged metro aggregation network that cost effectively delivers multiple services in a range of applications including retail and wholesale business services, cloud services, and mobile and broadband backhaul. IPT uses SR OS to enable a fully managed, end-to-end packet solution with a field-proven common service, operations, and management model across the Nokia Optical and Ethernet/IP/Multiprotocol Label Switching (MPLS) portfolio.

Similar to the PSS-8/16II Carrier Ethernet cards, these PSS-24x cards have a high capacity L2 fabric interface across adjacent slots which allows the two cards to be used together as a single L2 switch.



6SE300



30SE300

However, these Carrier Ethernet Switch Cards over OTN are different in the sense that they connect to the OTN fabric of the shelf rather than directly to an Uplink via the backplane as on PSS-8/16II. They support switching among any client Ethernet interface and any “WAN” interfaces or ODUk terminated on the OTN fabric interface.

Together these features extend the reliability, flexibility and scalability for L2 switching in the 1830 PSS product families, with any-to-any L2 switching among interfaces regardless of the card on which the interface is terminated. Also, a pair of L2 cards can be configured together as a L2 switch with capacity of 1.4 Tb/s per packet switch (pair of cards) and up to 5.6 Tb/s per System. It gives flexibility in the mix of Ethernet and OTN interfaces with interface rates from 0.1 to 100 Gb/s.

Key benefits of integrated packet transport

Efficiency

- Lower total cost of ownership (TCO) due to fault, configuration, account, performance, security (FCAPS)/fulfilment, assurance, billing (FAB) commonality based on the Nokia SROS.
- Cost-optimized metro, regional, and global Carrier Ethernet portfolio enabled by scalable WDM
- Right-sized and bandwidth-efficient packet transport delivering on providers' quality of experience (QoE) requirements
- Supports ODUk/flex on WAN ports to efficiently use OTN resources.

Reliability

- Broad feature set delivered by a proven, robust, and reliable packet OS, deployed in more than 500 networks worldwide
- Equipment, interface, and network redundancy options for high-availability packet transport services
- Advanced carrier-grade packet networking: multiple classes of service (CoS), Ethernet operation, administration, and maintenance (OAM), and performance monitoring, as well as carrier-grade link and network protection protocols

Versatility

- Flexible L2 port role configuration as UNI (client), network-to-network interface (NNI) or ENNI with Ethernet (IEEE 802.3) and Ethernet over OTN (ITU-T G.709) interfaces on local ports

- Differentiated granular services enabled by feature-rich Carrier Ethernet
- Unconstrained use cases for business retail/wholesale services, fixed broadband and mobile backhaul, carrier cloud services, and network infrastructure applications such as P-Router bypass and PE-Router interconnection optimization
- Transport slicing using flexible mix of hard and soft isolation
- Efficient service aggregation among clients and across sites through packet layer statistical multiplexing
- Multiple networking choices with configuration, interconnection, and protection options for increased network flexibility and availability

Technical specifications

Compatibility/Interoperability

- For use in the 1830 PSS-24x shelf
- Fully interoperable with the available IPT cards, allowing consistent e2e service provisioning and monitoring from the metro access/aggregation to the backbone network

L2 packet switching

- IEEE 802.1Q/802.1ad Provider Bridge (PB)
 - MEF service support: E-Line, E-LAN, E-Tree, Access E-Line, Transit E-Line; Private (port-based) and virtual (VLAN-based) services
 - L2 switching with VLAN push/pop/rewrite
 - Forwarding data base (FDB) management features include: retrieve FDB, static MAC address table configuration, clear MAC address entry per service, MAC address learning limit and disabling, MAC address aging configuration or disabling, utilization watermark alarming, MAC move monitoring for loop detection and automatic blocking
 - IGMPv2/3 snooping, proxy, fast leave

- MPLS-TP (IETF, ITU-T G.8113.2) Connection-oriented packet transport
 - MEF E-Line services, bidirectional
 - Label Edge Router/Label Switched Router (LER/ LSR) switching with label push/pop/swap
 - Single segment and multi segment pseudowires (SS-PW and MS-PW)
 - Next Hop Ethernet addressing (RFC 7213)
 - GAL/G-Ach (RFC 5586 and RFC 6423)
 - MPLS-TP Identifiers (RFC 6370)
- MPLS-TP (IETF, ITU-T G.8113.2) Virtual Private LAN Service (VPLS)
 - MEF E-LAN and E-Tree; Private (port-based) and virtual (VLAN-based) services
 - Hierarchical VPLS (H-VPLS)
 - Static MAC address withdraw
- Service management in provider bridge, MPLS-TP and VPLS-TP modes
 - Flexible EVC definition with MEF CE-VLAN bundling – multiple VLANs and/or VLAN ranges in one EVC (VLAN Range SAP)
 - L2 Control Protocol (L2CP) tunnelling/filtering/peering option for MEF 6.1.1/45.1 compliance (including EPL Option 2)
 - Port mirroring (ingress and egress)
 - Service mirroring
 - L2 access control list (ACL)
 - Ethernet and OTN port loopbacks in both directions with MAC swap
 - EVC/SAP loopback in both directions with MAC swap
 - IEEE 802.1AB Link Layer Discovery Protocol (LLDP), transmit and/or receive at 3 levels, independently configurable per port
 - Jumbo frames with configurable maximum transmission unit (MTU) 1514-9612 bytes
 - ITU-T Y.1564 service activation testing (SAT) embedded test head

DiffServ QoS

- Forwarding class (FC) classification per service access point (SAP) at UNI based on:
 - VLAN priority code point (PCP)/p-bits
 - MAC source address (SA) and destination address (DA)
 - Ethertype/TPID
 - IPv4 traffic class (TC)/differentiated services code point (DSCP)
- tr-TCM metering/policing/marketing (MEF 10.4 ingress bandwidth profile [BWP] per SAP Ingress CoS
 - Provisionable committed information rate (CIR), excess information Rate (EIR), committed burst size (CBS), excess burst size (EBS), color mode (CM)
 - Color-blind and color-aware (E-NNI) mode
 - frame/packet-based accounting option for metering/policing/shaping
- SAP ingress QoS profile management
- Queuing (8 queues per port)
- Tail drop and weighted random early detection (WRED) congestion management
- Egress PCP (re)marking
- Strict priority queuing (SPQ) and weighted round robin (WRR) scheduling
- Egress shaping per port/queue (egress BWP)

OAM and Performance Monitoring (PM)

- In both provider bridge and MPLS-TP modes:
 - IEEE 802.3ah Ethernet in the first mile (EFM) link OAM
 - IEEE 802.1ag/ITU-T Y.1731 Connectivity Fault Management (CFM), Continuity Check (CC), Loopback (LB), Link Trace (LT), Remote Defect Indication (RDI)/MEF 30.1 Service OAM (SOAM) Fault Management (FM)
 - ITU-T Y.1731 FM - alarm indication signal (AIS)

- ITU-T Y.1731 PM - 2-way Delay Measurement (DM), Synthetic Loss Measurement (SLM), both on demand and proactive/MEF 35 — SOAM PM-1 solution
- Link pass through (LPT) for point-to-point services or link loss forwarding (LLF)
- ITU-T G.7710 General Transport PM with 15-minute/24-hour binning and thresholding (TCAs, TR-only and TR/RTR methods)
- Port PM counters according RFC 2819, RFC 2863, RFC 3635, RFC 3273 MIBs
- SAP (service) counters
- SAP ingress meter/FC counters (color-aware)
- Egress queue counters
- ITU-T Y.1731/MEF 35.1 service level agreement (SLA) monitoring counters for SLM and DM
- ITU-T G.8021-compliant FM processing
- User-controllable per-slot software upgrade
- OTN FM and PM consistent with other 1830 PSS-x OTN cards
- In MPLS-TP mode:
 - Label Switched Path (LSP) OAM: pro-active bidirectional forwarding detection – continuity check/continuity verification (BFD-CC), (RFC 6428, RFC 5880) down to 3.33ms
 - LSP ping/trace on-demand (RFC 6426)
 - Virtual circuit connectivity verification (VCCV) ping/trace on-demand (RFC 6426)
 - Static PW status signaling (RFC 6478)
- Ethernet ring protection (ERP) instances configurable per port or per service or per group of services
- Standard operator administrator commands and timers (WtR, Guard, WtB, hold-off)
- Sub-50ms protection switching
- ERP interconnection with dual node interconnection (DNI) using sub-rings, with or without Ring – Automatic Protection Switching (R-APS) virtual channel
- ERP over LAG for scalability and reliability
- Enhanced state reporting and notifications
- MEF 10.4 Per-service Frame Distribution (Clause 8.2) support for LAG
- In MPLS-TP mode:
 - LSP 1:1 bidirectional linear protection (RFC 6378 and ITU-T G.8131), with operator commands and timers
 - PW redundancy (RFC 6718, RFC 6870, RFC 7771)
 - Equipment protection using MC-LAG on client interfaces and PW redundancy on network interfaces
- In both provider bridge and MPLS-TP modes:
 - IEEE 802.1AX link aggregation (LAG) with or without Link Aggregation Control Protocol (LACP)
 - LAG sub-groups for active/stand-by configuration
 - Partial link loss (PLL)/total link loss (TTL) thresholds
 - Multi-chassis link aggregation group (MC-LAG) for LAG across shelves

Protection

- In provider bridge mode:
 - ITU-T G.8032 (v5) Ethernet ring protection (ERP) on all rates of UNI and NNI ports

Figure 1. 6SE300 100GBe Carrier Ethernet Switch Card – Architecture and interfaces

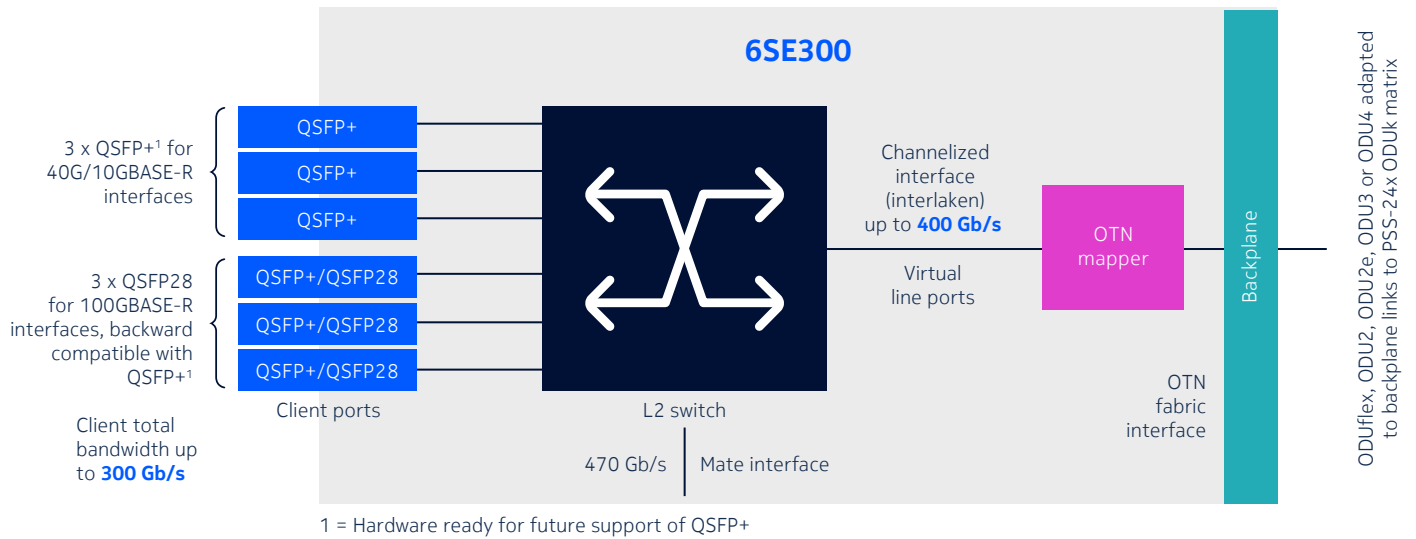


Figure 2. 30SE300 10Gbe Carrier Ethernet Switch Card – Architecture and interfaces

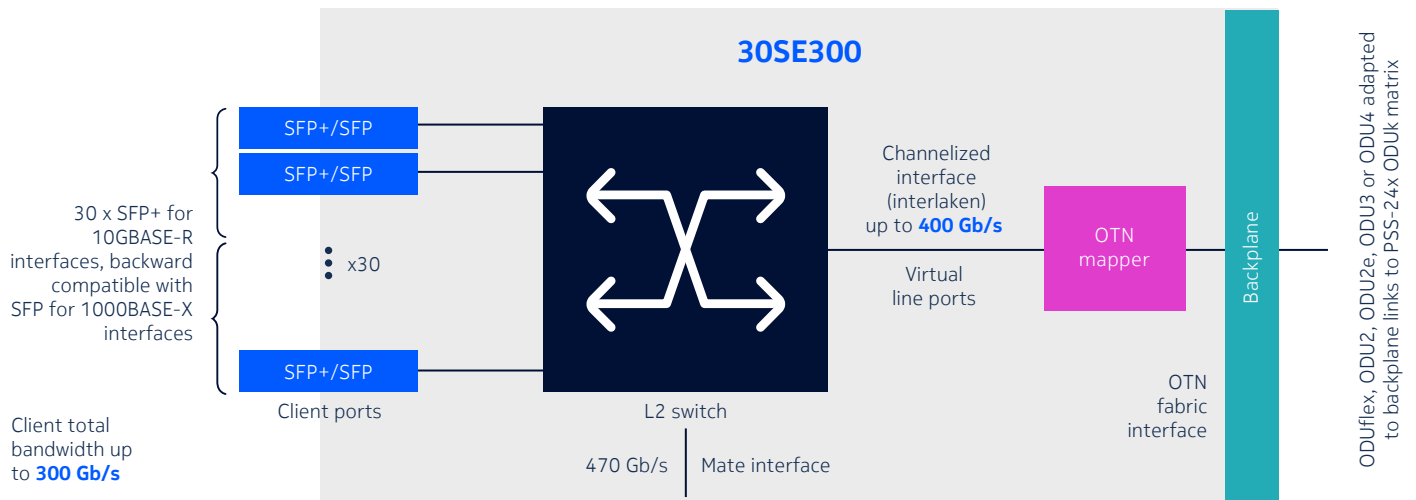


Table 1. Capacities and interfaces

| Features | Carrier Ethernet Switch Cards | |
|--|-------------------------------|---------|
| | 6SE300 | 30SE300 |
| Size | | |
| Full-height slots | 1 | 1 |
| Capacities | | |
| Packet Switching Capacity (Gb/s) | 700 | 700 |
| FDB (MAC table) size | 200K | 200K |
| Configurable VLAN range | 0-4094 | 0-4094 |
| Interfaces | | |
| 100/1000BASE-T (IEEE 802.3) | - | ✓ |
| 1000BASE-X (IEEE 802.3) | - | ✓ |
| 10GBASE-R (IEEE. 802.3) | - | ✓ |
| 100GBASE-R (IEEE 802.3) | ✓ | - |
| 470 Gb/s L2 fabric interface to L2 card in adjacent slot | ✓ | ✓ |
| 400 Gb/s backplane interface to OTN fabric | ✓ | ✓ |
| ODUk Containers (WAN ports) | | |
| Total number of ODUk/flex channels (WAN ports) | 120 | 120 |
| Sockets for pluggable transceivers | | |
| SFP/SFP+ | - | 30 |
| QSFP+ ¹ | 3 | - |
| QSFP28/QSFP+ ¹ | 3 | - |
| Operating environment | | |
| -5 to +55°C | ✓ | ✓ |

¹ Hardware ready for future support of QSFP+



Table 2. Pluggable transceivers

| Pluggable transceivers | Wavelength (nm) | Reach (km) | Carrier Ethernet Switch Cards | |
|-------------------------|-----------------|------------|-------------------------------|---------|
| | | | 6SE300 | 30SE300 |
| QSFP28 | | | | |
| 100GBASE-SR4 | | 0.1 | ✓ | – |
| 100GBASE-LR4 | | 10 | ✓ | – |
| 100GBASE-LR4/OTL4.4 | | 10 | ✓ | – |
| 100GBASE-ER4f | | 40 | ✓ | – |
| 100GBASE-CWDM4 | | 2 | ✓ | – |
| 100GBASE-FR1 | 1310 | 2 | ✓ | – |
| 100GBASE-LR1 | | 10 | ✓ | – |
| SFP+ | | | | |
| 10GBASE-SR | 850 | 0.3 | – | ✓ |
| 10GBASE-LR | 1310 | 10 | – | ✓ |
| 10GBASE-LR/OTM-0.2 | 1310 | 10 | – | ✓ |
| 10GBASE-ER/OTM-0.2 | 1550 | 40 | – | ✓ |
| 10BASE-ZR/OTM-0.2 | 1550 | 80 | – | ✓ |
| 10GBASE-ER/OTM-0.2 CWDM | 1471-1611 | 40 | – | ✓ |
| 10GBASE-ZR/OTM-0.2 CWDM | 1471-1611 | 70 | – | ✓ |
| 10GBASE-BX10-U/D | 1270/1330 | 10 | – | ✓ |
| 10BASE-BX40-U/D | 1270/1330 | 40 | – | ✓ |
| SFP | | | | |
| 1000BASE-SX | 850 | 0.5 | – | ✓ |
| 1000BASE-LX | 1310 | 10 | – | ✓ |
| 1000BASE-ZX | 1550 | 70 | – | ✓ |
| 100/1000BASE-T | – | 0.1 | – | ✓ |
| 1000BASE-BX20-U/D | 1310/1490 | 20 | – | ✓ |
| 1000BASE-BX40-U/D | 1310/1490 | 40 | – | ✓ |

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