1830 PSS 1/10/25/100G Universal Ethernet Card

18CE300

The 18CE300 Universal Ethernet Card for the Nokia 1830 Photonic Service Switch (PSS) uses state-of-the-art carrier-grade Layer 2 (L2) switches and Nokia's Service Router Operating System (SR OS) software to provide packet-optimized transport over wavelength division multiplexing (WDM) networks. The Universal Ethernet Card is complementary to the 1830 PSS-8/16II and 1830 PSS-24x Carrier Ethernet Switch Cards, as well as 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.

The 18CE300 card is a key component of Nokia's Integrated Packet Transport (IPT) solution for the 1830 PSS. 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.

The Universal Ethernet Card is a highly flexible card that can be deployed in multiple configurations. It can be utilized as a standalone Ethernet Muxponder with both 100GbE UNI and NNI. Beyond standalone applications, the card has a high capacity L2 fabric interface across adjacent slots which allows two cards to be used as a single L2 switch. Furthermore, the card supports L2 switching among interfaces terminated on Layer 1 (L1) cards (e.g. 20P200, S13X100, S13X400) in the same shelf.

Together these features extend both the flexibility and scalability for L2 switching in the 1830 PSS, with any-to-any L2 among interfaces regardless of the card on which the interface is terminated. This allows a pair of L1 and a pair of L2 cards to be configured together as a L2 switch and a mix of Ethernet and OTN interfaces with interface rates from 0.1 to 100 Gb/s. Additionally, 18CE300 has the capability to connect through its front plate 100G ports to high-capacity L1 cards (e.g. S4X400, S6AD600H), enabling the creation of high bandwidth L2 rings.

Key benefits of integrated packet transport

Efficiency

- Lower total cost of ownership (TCO) due to fault, configuration, account, performance, security (FCAPS)/fulfillment, assurance, billing (FAB) commonality based on Nokia SR OS
- Efficient service aggregation among clients and across sites through packet layer statistical multiplexing
- Right-sized and bandwidth-efficient packet transport delivering on providers' quality of experience (QoE) requirements

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 operations, 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 E-NNI with Ethernet (IEEE 802.3) and Ethernet over OTN (ITU-T G.709) interfaces on local ports or ports of associated layer 1 cards
- Differentiated granular services enabled by feature-rich Carrier Ethernet
- Multiple networking choices with configuration, interconnection, and protection options for increased network flexibility and availability

Applications

- Unconstrained use cases for business retail/ wholesale services, fixed broadband and mobile backhaul, carrier cloud services, and network infrastructure applications with multiple demarcation options
- Cost-optimized metro, regional, and global Carrier Ethernet portfolio enabled by scalable WDM
- Stand-alone muxponder or client card for uplink with packetswitch capability
- 5G applications for midhaul and backhaul including support of 25GE clients
- Extended operational temperature for outside plant applications in metro and access

Technical specifications

Shelf compatibility

- Compatible with 1830 PSS-4II, PSS-8, PSS-16II and PSS-32 shelves

Layer 2 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 configuration, clear MAC per service, MAC learning limit and disabling, MAC aging configuration or disabling, utilization watermark alarming
- Hardware-based MAC learning
- 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 and MPLS-TP modes
  - Flexible EVC definition with MEF CE-VLAN bundling – multiple VLANs and/or VLAN ranges in one EVC (VLAN Range SAP)
  - Layer 2 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)
  - IPv4 SA/DA (including mask)
  - IPv4 protocol
  - TCP/UDP source and destination port
- tr-TCM metering/policing/marking (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
  - L1/L2 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), Loss Measurement (LM), Synthetic Loss Measurement (SLM), both on demand and proactive/MEF 35.1 — 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 to 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 LM, 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 Optical Transponders (OTs)
- 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)

Protection

- In provider bridge mode:
  - ITU-T G.8032 (v5) Ethernet ring protection (ERP) on all rates of UNI and NNI ports
  - 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 ERP Ring state reporting and notifications
- 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 and per service frame distribution
  - Partial link loss (PLL)/total link loss (TTL) thresholds
  - Multi-chassis link aggregation group (MC-LAG) for LAG across shelves
  - MEF 10.4 Per-service Frame Distribution (Clause 8.2) support for LAG

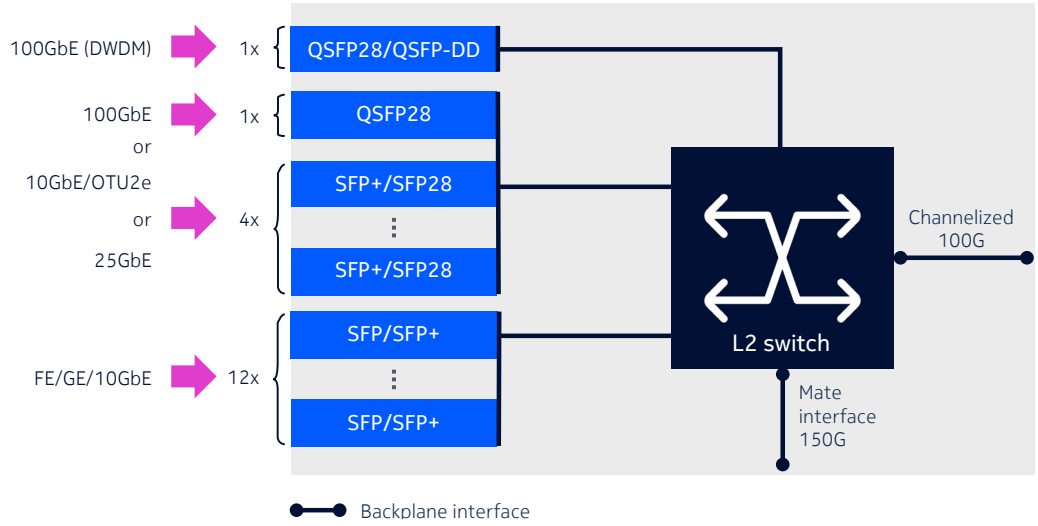
Synchronization

- ITU-T G.8261 Synchronous Ethernet
- ITU-T G.8262.1 enhanced Ethernet Equipment Clock (eEEC)
- ITU-T G.781 Timing reference selection
- ITU-T G.8264 Ethernet Synchronization Message Channel (ESMC)
- IEEE 1588 Precision Time Protocol (PTP) – OC and BC for time/phase distribution
- ITU-T G.8271/G.8271.1 Time/phase synchronization
- ITU-T G.8275.1 PTP telecom profile for phase/time synchronization with full timing support (FTS)
- ITU-T G.8273.2 T-BC/T-TSC timing performance
- Shelf-level timing scheme with synchronization inputs and outputs to and from interfaces on some I/O cards in the shelf

Management of Smart SFPs

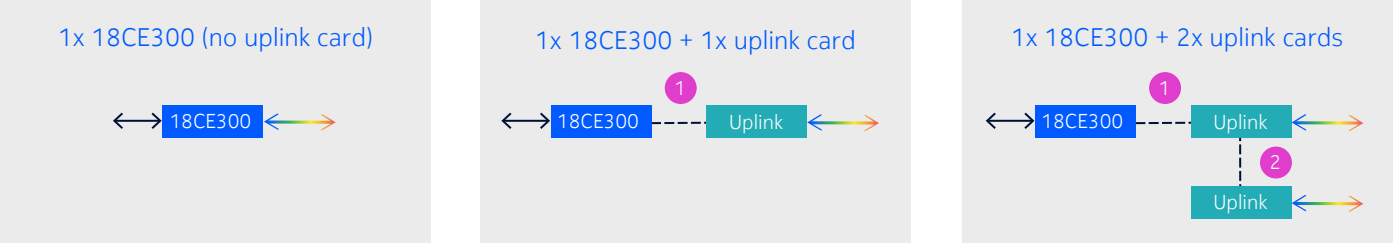
- Smart SFPs for circuit emulation services
  - Transparent SDH/SONET over Packet (TSoP)
  - Transparent PDH (E1, DS1) over Packet (TPoP)
  - Channelized SDH over Packet (CSoP)

Figure 1. 18CE300 architecture functional block diagram



Unit	Part #	Description
18CE300	3KC71211AA	1/10/25/100G Universal Eth Card

Figure 2. 18CE300 simplex configuration options



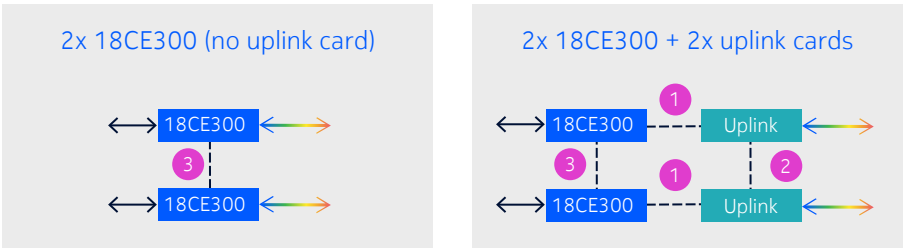
Backplane links

1. Packet-to-uplink: Connects packet card to uplink card
2. Uplink-to-uplink: Connects pair of uplink cards

Application notes

- 18CE300 card can be utilized as stand-alone muxponder for pure packet transport appplications
- Mating with uplink cards enables the 18CE300 card to be used as a client card for aggregation to OTN/WDM coherent lines for high-density and high-capacity applications

Figure 3. 18CE300 duplex configuration options



Backplane links

1. Packet-to-uplink: Connects packet card to uplink card
2. Uplink-to-uplink: Connects pair of uplink cards
3. Packet-to-packet: Connects pair of packet cards

Application notes

- Duplex configurations provide protection against 18CE300 hardware failure
- In duplex configurations 18CE300 cards form a single L2 switch that can be extended to L1 card interfaces
- Mating with uplink cards enables the 18CE300 card to be used as a client card for aggregation to OTN/WDM coherent lines for high-density and high-capacity applications

Table 1. Capacities and interfaces

Features	18CE300
Size	
Full-height slots	1
Capabilities	
Packet Switching Capacity (Gb/s)	300
FDB (MAC table) size	204800
Configurable VLAN Range	0-4094
Interfaces	
100BASE-T (IEEE 802.3)	✓
1000BASE-T (IEEE 802.3)	✓
1000BASE-X (IEEE 802.3)	✓
10GBASE-R (IEEE 802.3)	✓
25GBASE-R (IEEE 802.3)	✓
100GBASE-R (IEEE 802.3)	✓
OTU2e (ITU-T G.709)	✓
STM-1/4 Channelized SDH over Packet (CSoP)	✓
STM-1/4, OC-3/12 Transparent SDH/SONET over Packet (TSoP)	✓
E1, DS1 (Transparent PDH over Packet CES (TPoP)	✓
150Gb/s L2 fabric interface to L2 card in adjacent slot	✓
100Gb/s interface to L1 cards in adjacent slots	✓
Forward Error Correction (FEC) options	
Standard Reed-Solomon forward error correction (RSFEC)	✓
No FEC	✓
Sockets for pluggable transceivers	
SFP/SFP+/SFP28	✓
QSFP28/QSFP-DD	✓
Operating environment	
-40 to +65°C	✓

Table 2. Pluggable transceivers

18CE300 Universal Ethernet Card		
Pluggable transceivers	Wavelength (nm)	Reach (km)
100GBASE-SR4	850	0.1
100GBASE-LR4		10
100GBASE-LR4/OTL4.4		10
100GBASE-ER4f		20-40
100GBASE-ZR4		80
100GBASE-CWDM4		2
100GBASE-FR1	1310	2
100GBASE-LR1		10

18CE300 Universal Ethernet Card		
100GBASE-4WDM-20-U		20
100GBASE-4WDM-20-D		20
100G DWDM Coherent		120
25GBASE-SR	850	0.1
25GBASE-LR	1310	10
10GBASE-SR	850	0.3
10GBASE-LR	1310	10
10GBASE-LR/OTM-0.2	1310	10
10GBASE-ER/OTM-0.2	1550	40
10GBASE-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-R/OTM-0.2 DWDM tunable negative chirp, 99 channels	1529-1568	70
10GBASE-BX10-U/D	1270/1330	10
10GBASE-BX40-U/D	1270/1330	40
1000BASE-SX	850	0.5
1000BASE-LX	1310	10
1000BASE-ZX	1550	70
100/1000BASE-T	-	0.1
1000BASE-ZX CWDM	1471-1611	80
1000BASE-BX20-U/D	1310/1490	20
1000BASE-BX40-U/D	1310/1490	40
TSoP STM-1/OC-3 S-1.1	1310	15
TSoP STM-1/OC-3 L-1.1	1310	40
TSoP STM-4/OC-12 S-4.1	1310	15
TSoP STM-4/OC-12 L-4.1	1310	40
TSoP STM-16/OC-48 SR-16.1	1310	2
TPoP E1 120Ω (CES)	-	-
TPoP T1 100Ω (CES)	-	-
CSoP (channelized STM-1/OC-3 CES)	1310	15

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.

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