Nokia 1850 Transport Service Switch 320H
Release 7.1.10 (ETSI only)

The Nokia 1850 Transport Service Switch 320 (TSS-320H) platform provides converged, connection-oriented support for Carrier Ethernet MEF2.0 services and packet services, as well as native and emulated support for TDM and SDH services. It is suited for edge and metro regional sites.

This packet optical transport (POT) platform supports any mix of traffic, from all-circuit to all-packet, with an up to 1.2Tb/s switching capacity fabric and 100 Gigabit Ethernet optical interfaces.

As part of a large 1850 TSS portfolio for POT networks, the TSS-320H supports a combination of transport technologies — including Carrier Ethernet, Multi-Protocol Label Switching-Transport Profile (MPLS-TP), wavelength division multiplexing (WDM) and TDM.

Its unique universal matrix can seamlessly switch packets or circuits in their native format, cost-effectively transforming them from TDM to packets. It is perfectly suited for evolving traditional multiservice provisioning platforms (MSPPs) to packet transport networks (PTNs), as well as for cost-effective greenfield PTN installations.

Businesses can begin with circuit-based transport and, over time, gradually ramp up packet transport by simply changing line cards. This approach enables deployment of advanced services, such as LTE and MEF CE 2.0, eliminating the scalability issues encountered when traditional multiservice provisioning platforms are confronted with the high growth of packet-based traffic.

The 1850 TSS-320H provides high resiliency and reliability with redundant equipment, multiple protection mechanisms, and synchronization options.

The whole 1850 TSS portfolio is fully managed by the Nokia 1350 Optical Management System, a powerful cross-layer network management system and a unified control plane, simplifying operations and reducing the total cost of ownership (TCO).
Features

• Up to 1.2Tb/s switching capacity, with unique, universal-switch architecture
  - Packet or circuit switching in their native format
  - SDH switching, including high order/low order (HO/LO) virtual circuit (VC) switching
  - Any traffic mix, from all-circuit to all-packet
• MEF Carrier Ethernet 2.0 standards-based, connection-oriented packet transport through MPLS-TP
  - Transport-oriented operations, administration and maintenance (OA&M) for Ethernet and MPLS-TP
  - Highly scalable linear and ring full-packet protection, allowing multiple failure sub-50ms resiliency
• 1850 TSS single-NE, multi-shelf arrangements with drop shelves, offering optimized fan out for E1 circuits, as well as compact coarse or dense wavelength division multiplexing (C/DWDM) options, leveraging the Nokia 1662 Synchronous Multiplexer Compact, the Nokia 1646 Synchronous Multiplexer (SDH/PDH) and the Nokia 1830 Versatile WDM Module (VWM) (photonic)
• Multiple synchronization options for transport networks:
  - SDH G.813 synchronization, including synch status message (SSM)
  - Synchronous Ethernet (SyncE) with SSM
  - Full interworking between TDM and data synchronization, including SSM messages for supporting timing redundancy
  - EEE 1588v2 for Time of Day (ToD)
• Secure management
  - User authentication
  - Encryption of management protocols
  - Security logs

Benefits

• Switches any combination of packets and circuits in their native formats using a single platform
• Fully scales packet transport, smoothly progressing from all-circuit to all-packet, allowing service providers to transform networks to packet transport
• Efficiently aggregates and grooms metro and long-haul transport
• Reduces TCO and simplifies operations through cross-layer network management and unified control plane
• Supports a broad range of applications, such as business Ethernet, video on demand, mobility backhaul services and LTE advanced, paving the way to 5G

Technical specifications

• Two protected switching fabrics, each offering two options
  - 1.28Tb/s packet-based switching capacity or 320Gb/s HO SDH TDM switching capacity
  - 800Gb/s packet-based switching capacity or 160Gb/s HO SDH TDM switching capacity
• 16 full slots (or 32 half slots) for I/O cards with the following traffic capability:
  - 8 full slots with 100Gb/s
  - 8 full slots with 60Gb/s
  - All half slots with 10Gb/s
• Two protected controllers
• Two protected power supplies
• One fan tray with fully redundant fans
• Up to two subracks in a standard ETSI rack

Interfaces

• Bidirectional Small Form Factor Pluggables (SFPs): Single working fiber (SWF)
• 10G Bidirectional Small Form Factor Pluggables XFP
• CFP2-100GBASE-ER4, LR4, SR10
• Data cards
  – 1 x 100 Gigabit Ethernet packet module, 100G CFP2
  – 10 x 10 Gigabit Ethernet packet module, 10 Gb/s Form Factor Pluggable, XFP
  – 20 x 1 Gigabit Ethernet packet module, SFP
  – 2 x 10 Gigabit Ethernet packet module, 10 Gb/s Form Factor Pluggable, XFP
  – Multiservice packet over SDH (PoS) packet module, portless
  – Circuit Emulation Services (CES) gateway card 2.5Gb/s capacity, portless
• SONET/SDH cards
  – Bidirectional SFPs: SWF
  – 1 x STM-64: XFP
  – 8 x STM1/4, 4 x STM16 combo: SFP

**Service Level Agreement (SLA) management**
• Traffic profiles
  – Bandwidth guaranteed
  – Regulated: Minimum bandwidth guaranteed plus burst
  – Best effort
• Hitless traffic-profile modification
• Metering
  – Single rate token bucket: RFC 2697
  – Dual rate token bucket: RFC 2698
  – IETF and MEF Metering, Policing and Marking
  – Color-blind and color-aware, based on Ethernet priority bits

**Ethernet functionality**
• Ethernet protocol: 802.3
• Ethernet Media Access Control (MAC) auto-learning and aging
• Ethernet-MAC static configuration
• MAC black hole forwarding prevention
• Access control list (ACL)
• Virtual LAN (VLAN) push, pop, swap: Service delimiting
• Deep VLAN classification
• Ethernet provider bridging: 802.1ad
• 802.1Q tunneling (Q in Q)
• Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP)
• Link aggregation
• Jumbo-frame management
• Y.1731/802.1ag Eth OA&M: Continuity check (CC), link trace (LT), loopback (LB), AIS proactive/on-demand two-way delay measurement (DM), proactive one-way DM proactive dual-ended synthetic loss measurement (LM)
• 802.3ah OA&M: Ethernet in the first mile (EFM)
• Port mirroring
• Virtual port to port
• Eight Quality of Service (QoS) classes
• Two levels Hierarchical QoS (H-QoS):
  – Per-class, per-transport service
  – Ethernet flow, Red/Green/Yellow (RGY) counters
• L2 control protocol filtering/tunneling
• MEF CE 2.0 certified

**Ethernet traffic classification**
• Port
• Ethernet VLAN
• Double VLAN TAG
• Ethernet priority bits
• IPv4/IPv6 differentiated services code points (DSCP)
• EtherType
• MPLS Exp bits
Ethernet forwarding criteria
• Port
• Port plus MAC
• Port plus VLAN
• Port plus MAC plus VLAN
• Port plus MAC plus VLAN plus Prio bits
• Unicast traffic
• Multicast traffic
• Broadcast traffic

Synchronization
• SyncE
• SSM support for timing redundancy
• Packet layer (IEEE 1588v2) synchronization configurable as:
  – Master Ordinary Clock, Slave Ordinary Clock, Boundary Clock, Transparent Clock
  – Best Master Clock Algorithm”(BMCA)
  – Support for 1588v2 encapsulation over Ethernet (L2) or over UDP/IPv4 (L3)
  – 1PPS output for distribution, 1588v2 slave ports and 1PPS input selectable as synch reference
• Full interworking between TDM and data synchronization

PWE3/TDM CES
• TDM encapsulation methods supported:
  – SATAP encapsulation method as per RFC 4553
  – CESoETH encapsulation method as per MEF-8
• RTP header supported as per RFC 3550
• E1 TDM client (2048kb/s) for CES functionality in framed structure, as per ITU-T Rec. G.704
  – 1008xE1 per CES gateway card (2.5Gb/s processing capacity)
  – Equipment protection 1+1
• TDM CES timing modes: TDM loop line, ELIne (SyncE and differential packet timing), external, free-running
• ITU-T G.705 PDH alarms and performance monitoring (PM) counters for E1 physical ports

MPLS-TP functionality
• Common to tunnel/section/pseudowire (PW) level MPLS-TP OA&M (as per IETF draft-bhhmpls-tp-oam-y1731 and ITU-T G.8113.1):
  – Continuity check CCM
  – Automatic remote defect indicator (RDI)
  – Proactive/on-demand two-way DM
  – Proactive dual-ended synth LM
  – On-demand loopback message/loopback reply (LBM/LBR)
• Additional tunnel/PW-specific MPLS-TP OA&M: alarm indication signal (AIS)
• Additional tunnel/section MPLS-TP OA&M: protection switching (APS)
• MEF 2.0 services supported (EVP-LINE, EVP-LAN, E-TREE, E-ACCESS)
• Static L3VPN as mobile backhauling (MBH) packet transport network solution

SONET/SDH functionality
• Cross connection
• Termination
• Ethernet mapping over SDH
  – Generic framing procedure (GFP), G.7041
  – Fiber channel over SDH: GFP-T
• Virtual concatenation
• Link capacity adjustment scheme (LCAS)
• Performance monitoring
• HO and LO capabilities
• PDH drop shelf 1662 SMC
  – Single TID with hosting 1850 TSS
  – Up to 6 x 63 x E1 ports (378)
  – 1+3 equipment protection switching (EPS) redundancy
  – 75/120 ohm option
  – STM-4 uplinks 1+1 protected
• PDH drop shelf with 1646 Synchronous Multiplexer (SM)
  – Single TID with hosting 1850 TSS
  – 2.5Gb/s LO switching capability
  – Up to 6 x 42 x E1 ports (252)
  – 1+1 EPS redundancy
  – 75/120 ohm option
  – Up to 4 1646 SM drop shelves in daisy chain
  – STM-16 uplinks MSP 1+1 protected

DWDM functionality
• Network configurations
  – Point-to-point
  – Linear
  – Ring
• 1830 VWM CWDM drop shelf (up to six extensions in daisy chain)
  – Single TID, multishelf node
  – Completely passive uncooled drop shelf
  – Line terminal and OADM configuration
  – 1/2/4 channels OADM
  – 8 channels MUX-DEMUX

Protection
• Ethernet network protection
  – RSTP: 802.1w
  – MSTP: 802.1s
  – Link aggregation
• MPLS-TP network protection
  – ITU G.8131 bidirectional linear protection 1:1
  – Linear protection enhanced switching triggers (SD)
  – Draft-helvoort-mpls-tp-ring-protectionswitching-01 MPLS-TP RING protection
  – Dual homing (DH)
• SDH network protection
  – Single- and dual-ended APS 1 + 1
  – Subnetwork Connection Protocol (SNCP)
  – Multiplex Section-Protection Ring (MSPRING) 2F bidirectional line switching ring
• Equipment protection
  – Power protection
  – Controller protection
  – Universal switch protection

Fault propagation
• Link pass through (LPT)
• Link loss carry forward (LLCF)
• Fault propagation tools: GFP CSF/SSF, Ethernet CSF

Management
• 1350 Optical Management System (OMS)
• Zero-installation craft (ZIC) terminal, TL1 shell, command-line interface (CLI)
• Security:
  – Remote Access Dial-In User Server (RADIUS) user authentication support
  – Secure Shell (SSH2), Secure Socket Layer (SSL) for: Hypertext Transfer Protocol Secure (HTTPS), Secure Shell File Transfer Protocol (SFTP), TL1, CLI
– Simple Network Management Protocol (SNMP) v3 Message Digest 5 (MD5), Secure Hash Algorithm (SHA)
– Security log
– Port-based network access control as per IEEE 802.1x

Physical specifications – 1850 TSS-320H subrack

Dimensions
• Height: 748mm (29.4in)
• Width: 537.5mm (21.2in)
• Depth: 316mm (12.4in)
• Designed to be installed in a standard ETSI rack
  – Height: 2.20m (86.6in)
  – Width: 600mm (23.6in)
  – Depth: 300mm (11.8in)

Power and cooling
• Power supply: DC feed (-48V DC nominal)
• Power supply: -65V
• Power consumption: Up to 5500W
• Cooling: Forced air

Environment
• Operating temperature: -5°C to +45°C (23°F to 113°F)
• Relative humidity: 0% to 90%, non-condensed

Regulatory compliance
• MEF CE2.0 certification
• Operating conditions: ETS 300 019, Class 3.2
• Storage conditions: ETS 300 019, Class 1.2
• Transportation conditions: ETS 300 019, Class 2.2
• Electrostatic discharge (ESD)/electromagnetic compatibility (EMC): ETS 300 386 “Telecommunications Center”