The Nokia 1850 Transport Service Switch 5R (TSS-5R) is a fully redundant aggregation switch with compact access for packet transport networks (PTNs). Ideally suited for mobile backhaul and business Ethernet applications, it can be deployed at base station sites — or act as a compact hub for traffic aggregation by collecting Ethernet and leased-line traffic and feeding it into higher capacity metro PTN or optical platforms. Equipment redundancy and multiple traffic protection options make this a robust platform for the transport and delivery of high-availability services.

This full-featured switch offers a flexible, high-density mix of packet interfaces along with more than 80 Gb/s switching fabric or 28 Gb/s switching fabric. The interfaces include Fast Ethernet (FE), FX, Gigabit Ethernet (GigE and 10 GigE) and circuit emulation (E1, DS1 and STM-1). The switch also implements MPLS Transport Profile (MPLS-TP), Metro Ethernet Forum (MEF), IEEE 1588v2, and Synchronous Ethernet (SyncE) standards and supports PDH/SDH legacy services using Pseudowire Emulation Edge to Edge (PWE3). Control, switching, power, fan and interface card redundancy help ensure that there is no single point of failure.

For TDM traffic, the Nokia 1850 TSS-5R provides resiliency and reliability with redundant equipment and multiple network path and link protection mechanisms, which are supported by hardware-based data plane operations, administration and maintenance (OA&M). In addition, its full suite of synchronization options meets the challenge of delivering timing to 2G, 3G or 4G base stations.

As part of a Carrier Ethernet service offering, this highly versatile, resilient, yet cost-effective platform provides extensive management, quality of service (QoS), virtual LAN (VLAN) and security features — as well as networking with a low cost per bit.

The Nokia 1850 TSS-5R is an integral part of the Nokia 1850 TSS portfolio for packet optical transport networks and is fully managed by the Nokia 1350 Optical Management System (OMS).
Features

• High-density 3 RU chassis with high switching fabric (>80 Gb/s)
• Ethernet: FE, FX, GigE, 10 GigE interfaces
• E1, DS1, STM-1 circuit emulation using Structure-Agnostic TDM over Packet (SAToP) and PWE3
• Redundant (1+1) control, switching, synchronization, power and fan
• 1:N equipment protection for electrical interfaces (E1, DS1)
• Fast, scalable, hardware-based OA&M for transport-grade applications
• Multiple synchronization options
• E-Line, E-LAN, E-Tree and E-Access services with MEF compliance

Benefits

• Achieves economies of scale using a single access platform for mobile backhaul, transport and Carrier Ethernet services
• Maintains high-margin revenue streams from priority traffic with advanced traffic management and QoS features
• Accelerates network transformation from TDM to packet architectures
• Reduces capital expenditures (CAPEX) by eliminating the need for overlay networks and multiple equipment types
• Reduces operating expense (OPEX) by simplifying operations, training and network management requirements, using an operational model in line with transport networking best practices

Technical specifications

System hardware

• Optional switching fabric: 28 Gb/s or >80 Gb/s
• 1+1 core card (control, switching, synchronization, protection)
• 1+1 power supply and fan protection
• 6 slots for I/O cards and 4 slots for access cards
• 1:N equipment protection for E1/DS1

Interface cards

• 10 GigE card: 2 x 10 GigE (XFP)
• GigE card: 4 x GigE (SFP)
• FE card: 8 x FX (SFP) plus 16 x FE
• FE/GigE card: 8 x GigE (SFP) plus 8 x FE or 4 x GigE/FX (SFP)
• STM-1 card: 2 x cSTM-1 (SFP)
• E1/DS1 card: 32 x E1 (120Ω/75 Ω)/DS1 (100 Ω)
• E1 card: 16 x E1 (75 Ω)
• STM-1/E1 card: 2 x cSTM-1 (SFP) plus 32 x E1 (120Ω/75 Ω)

Ethernet

• Ethernet protocol: IEEE 802.3
• MEF Ethernet services: E-Line, E-LAN, E-Tree, E-Access
• Ethernet media access control (MAC)
• IEEE 802.3 Clause 43 link aggregation
• Access control list (ACL)
• VLAN push, pop, swap at User Network Interface (UNI)
• Jumbo-frame management
• Ethernet flow control
• Port mirroring: ingress/egress
• Egress shaping: port, queue
• Ingress two-rate three-color metering/policing compliant with RFC 2698/MEF 10.1
• Eight QoS classes
• Layer 2 control protocol filtering/tunneling
• IGMP snooping
• Open Shortest Path First (OSPF) management (MD5)
• Deep VLAN inspection

**Ethernet traffic classification**

• Port
• LAG
• Ethernet VLAN
• MAC address (source, destination)
• Ethernet priority bits
• EtherType
• IPv4 address (source, destination)
• IPv4/IPv6 differentiated services code point (DSCP)
• IPv4 type of service (ToS)

**Ethernet forwarding criteria**

• Port
• Link aggregation group (LAG)
• Port plus MAC
• Port plus VLAN
• Port plus MAC plus VLAN
• P-bits
• Unicast traffic
• Multicast traffic
• Broadcast traffic

**MPLS-TP**

• Data plane: MPLS-TP
• E1/DS1/STM-1 pseudowires: SAToP
• E-Line, E-LAN, E-Tree and E-Access
• Ethernet MAC address auto-learning and aging
• Ethernet MAC address static configuration
• MPLS-TP profile management (per LSP/tunnel)
• Classifier (Port, .Q, .1ad, E-Type, DSCP and MPLS EXP)
• MPLS over VLAN encapsulation with EXP to PCP configuration
• Eight QoS classes
• H-VPLS
• Tunnel redundancy with MAC blackhole L2 forwarding prevention
• Linear 1:1 LSP/tunnel protection
• Dual-homing LSP/tunnel protection
• MPLS-TP support for Maintenance association End Point (MEP) and Maintenance domain Intermediate Point (MIP)
• MPLS-TP Ring Protection Switching (incl. dual ring interconnection)
• Line protection configurable reversions mode

**TDM circuit emulation services (CES)**

• TDM E1/DS1 CES (SAToP)
• Channelized STM-1 CES (SAToP)
• 1+1 MSP protection for STM-1 card
• E1/logical E1/STM-1/VC12 port loopback
Synchronization
• PDH E1/DS1 clock, STM-1
• SyncE with Synchronization Status Message (SSM)
• IEEE 1588v2 (PTP) Ordinary Clock (M/S), E2E Transparent Clock (1 step), Boundary Clock
• 1pps+ToD input/output port
• 2 MHz/E1 station clock
• 1588v2 UDP/IP encapsulation

OA&M
Ethernet OA&M
• IEEE 802.3ah Ethernet in the First Mile (EFM)
• ITU-T Y.1731/IEEE 802.1ag/MEF Ethernet Service OA&M (CC, LB, LT)
• ITU-T Y.1731 Proactive (AIS, RDI, CSF, Synthetic Loss Management [LM]) one- and two-way Ethernet Frame Delay Measurement (ETH-DM)
• ITU-T Y.1731 On demand (one-way and two-way ETH-DM)
• Ethernet OA&M MIP
• IEEE 802.3ah Dying Gasp

MPLS-TP OA&M
• ITU-T G.8113.1 MPLS-TP section proactive (CCM, RDI)
• ITU-T G.8113.1 MPLS-TP Tunnel proactive (CCM, APS, AIS, RDI, Synthetic LM, two-way DM)
• ITU-T G.8113.1 MPLS-TP Tunnel OA&M On Demand (loopback on MEP, one-way and two-way DM)

Fault propagation
• Link Pass Through (LPT)
• Link Loss Carry Forward (LLCF)

Security
• Transport layer security (TLS) RFC 5246
• Anti-DoS attack
• Unknown unicast/multicast and broadcast filtering
• Number of MAC addresses per virtual forwarding interface (VFI)
• Bound MAC table size, per service, with watermark
• Configurable MAC aging, MAC flushing
• Storm control
• Internet Control Message Protocol (ICMP) security
• Unused services disabling
• RADIUS authentication
• Management port segregation
• Secure Shell (SSH)/Secure Socket Layer (SSL), user access log (UAL), SSH File Transfer Protocol (SFTP)
• Simple Network Management Protocol (SNMP) v3
• MAC ACL extended criteria (IPv4, IPv6)
• Intrusion alarm

Performance management (PM)
• PM counters for Ethernet, MPLS-TP, CES, PDH and SDH
• Threshold Crossing Alerts (TCAs)

Management
• Nokia 1350 OMS
• Zero-installation craft (ZIC) terminal
• SNMP
• SSH v2/SSL for secure connection
• Ethernet in-band management
• DCN auto-setup
Physical specifications

Dimensions and weight
- Height: 132 mm (5.2 in)
- Width: 436 mm (17.2 in)
- Depth: 221 mm (8.7 in)
- Weight (chassis): 5.98 kg (13.18 lb)
- Desk mount and rack mount kits (19 in, 23 in, and ETSI)

Power
- -48 V/-60 V DC (redundant)
- Cooling: forced air (redundant fans)

Environmental

GigE application
- ETSI
  - Operating temperature: -5°C to 45°C (23°F to 113°F)
  - Humidity: 5% to 95%
- Telcordia GR-63-CORE
  - Operating temperature: 5°C to 40°C (41°F to 104°F), short term -5°C to 55°C (23°F to 131°F)
  - Humidity: 5% to 85%, short term 5% to 90%

10 GigE application
- ETSI
  - Operating temperature: -5°C to 45°C (23°F to 113°F)
  - Humidity: 5% to 95%

Regulatory and standards compliance
- NEBS Level 3 Zone 4, GR-63-CORE
- ES 201468
- IEC 60825-1, 60825-2
- EN 60950-1
- EN 55022 Class A: radiated and conducted emissions
- Electrostatic discharge/electromagnetic compatibility (ESD/EMC): ETS 300 386 “Telecommunications Center”
- ETSI 300-019 Storage, Class 1.2; Transportation, Class 2.3; Operational, Class 3.2
- ITU-T K.21
- MEF 9, 14 compliant
- CE 2.0 certification