Analysis Report

ALU 1850 TSS/ Huawei Optix OSN /UT NetRing TN
Agenda

- ALU 1850 TSS Series
- Huawei Optix OSN Series
- UT TN Series
- Analysis
- Opportunity and Challenge for Centec
ALU 1850 TSS Series

- A family of Packet-Optical Transport switches that support any mix of traffic, from all-circuit to all-packet.
- TSS-320/160 – Metro and regional core
- TSS-100 – Metro edge and core
- TSS-40 – Metro access
- TSS-5 - Aggregation at the network edge and customer premises
- TSS-3 - Ethernet service demarcation
TSS-320 - Overview

- 624*532*304.8 (H*W*D mm ~14U)
- 16 slots, 20 Gb/s per slot; 32 half slots, 10 Gb/s per half slot
- Two 320 Gb/s protected switching fabrics
- Data cards: 1GE(SFP),10GE(XFP),PoS,ATM
- SONET/SDH cards: OC-192/STM-64(XFP),OC-48/STM-16(SFP),OC-3-12/STM-1-4(SFP),(OTU)-2
- VLH/ULH cards:10 Gb/s booster +10 dBm,10 Gb/s pre-amp +10 dBm
- CWDM cards
- (OADM) DWDM cards (packs)
- T-MPLS
TSS320结构介绍

- 风扇
- 系统控制板主备保护
- 电源板主备保护，SDH同步接口
- 扩展板
- 32个10G通用槽位，插业务板
- 320G矩阵板主备保护
TSS-320 – Architecture (2)

1*10GE 板卡
10*1GE 板卡
1*STM64 板卡
4*STM16 板卡
8*STM1/4 板卡
10*ANY 板卡
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 Metro Ethernet Forum (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
- Access Control List (ACL)
- Virtual LAN (VLAN) push, pop, swap: Service delimiting
- Ethernet virtual bridging: 802.1Q
- Ethernet provider bridging: 802.1ad
- Q in Q
- Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP)
- Link aggregation
- Jumbo-frame management
- Y.1731/802.1ag OAM: Continuity check (CC), link trace (LT), loopback (LB)
- Y.1731/802.3ag Eth ASI, Eth RDI
- Y.1731 Eth OAM DM two-way
- 802.3ah OAM: Ethernet in the first mile (EFM)
- 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 9, 14 and 21 certified: EPL, EVPL and E-LAN

Ethernet traffic classification
- Port
- Ethernet VLAN
- Ethernet priority bits
- IPv4 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
**ATM functionality**
- Pseudowire emulation edge to edge (PWE3): ATM-PWE3 gateway
- OC-3/STM-1 ATM unchannelized
- ATM virtual path identifier/ virtual channel identifier (VPI/ VCI) N:1 mapping with PWE3 static configuration
- ATM QoS, OAM F4, F5: PWE OAM
- Cell concatenation
- UNI2UNI

**T-MPLS functionality**
- Data plane: T-MPLS, MPLS
- T-MPLS OAM: CV, automatic protection switching (APS), Forward Defect Indication (FDI)
- RDI: G.8114 T-MPLS OAM DM two-way
- Tunnel Linear Protection 1:1
- Ethernet line (E-line), E-LAN and Ethernet Tree (E-Tree)

**SONET/SDH functionality**
- Cross connection
- Termination
- Ethernet mapping over SONET/ SDH
  - Generic framing procedure ((GFP), G.7041)
- Virtual concatenation
- Link capacity adjustment scheme (LCAS)
- Performance monitoring
- HO and LO capabilities

**DWDM functionality**
- Node configurations
  - Terminal
  - In-line amplifier (ILA)
  - OADM
- Network configurations
  - Point-to-point
  - Linear
  - Ring
- **178*450*280 (H*W*D mm ~4U)**
- **Up to a maximum of 40 Gb/s switching capacity**
- **Supports flexible slots into which can be inserted up to two trunk cards and/or up to four line cards.**
- **Trunk cards:** single STM-16 trunk (2-ports), single STM-64 trunk (2-ports)
- **Ethernet line cards:** 16 x 10/100-TX Ethernet (RJ-45), 14 x 10/100-FX Ethernet (SFP), GigE: 4 x 1000 Ethernet (SFP)
- **SDH line cards (up to two):** 4 x STM-1 or 2 x STM-4
- **Metro Ethernet, T-MPLS**
Ring Aggregation
- Protocol stack: Ethernet/T-MPLS/GFP
- Protection: sub 50 ms ring
- Ring aggregation capabilities:
  - bidirectional ring with spatial reuse
  - ring load balancing – dynamically adjust bandwidth allocated for overbooked and best-effort services
  - per-flow fairness
- Other: Internet group management protocol (IGMP) snooping

MPLS Compliance
- IETF RFC 3031
- IETF RFC 3032
- IETF RFC 3036
- IETF RFC 3209
- IETF draft-ietf-pwe3-ethernetencap
- IETF draft-ietf-pwe3-controlprotocol

Metro Ethernet
- Packet classification: port, VLAN (IEEE 802.1Q), MPLS exp, DiffServ/ToS
- Policing:
  - MEF model (CIR, CBS, EIR, EBS)
  - any combination of CIR and EIR
  - per UNI/service/service-CoS
  - color awareness and marking
- Three CoS levels: H, M, L
- Packet forwarding: port, C-VLAN, S-VLAN, MPLS, MAC DA
- VLAN: Q-in-Q support, editing (add, swap, strip)
- Performance monitoring: ingress, egress packets
- Services: MEF E-line and E-LAN, ITU EPL
- Service interoperability: IETF VPWS
TSS-40 – Feature List (2)

- **Topologies, Protection and Synchronization**
  - Topologies: ring, hierarchical rings, ring closure
  - Ring protection: T-MPLS for data traffic, SNCP for TDM sub 50 ms
  - Dual-node interconnect (DNI)
  - Tributary protection: dual homing (at different nodes), link aggregation (at one node, across boards)
  - STP/RSTP/PVST/MSTP
  - Synchronization modes: SDH/SONET trunk – recovered from any ring interface; recovered from any TDM tributary interface; internal – Stratum 3

- **OAM**
  - Ethernet: RMON
  - TDM: G.802

- **Craft Terminal**
  - Method: web-based
  - Functionality:
    - commissioning
    - alarm and fault displays
    - maintenance operations

- **Access:** 100Base-T

- **1350 Optical Management System**
  - Protocol to 1850 TSS-40 PRS: SNMP V2c
  - Database: Oracle 9i
  - Functionality:
    - feature-rich GUI
    - point-and-click service provisioning including SLA
    - service and transmission PM statistics in graphical and tabular displays
    - alarm and fault management
    - full node remote configuration
  - MIB support:
    - RFC 1907 (SNMP V2 MIB)
    - RFC 1213 (MIB II)
    - RFC 2665 (Ethernet MIB)
    - RFC 2558 (SONET/SDH MIB)
    - RFC 2737 (Entity MIB)
    - RFC 2863 (Interface MIB)
    - RFC 2668 (MAU MIB)
    - RFC 1493 (Bridge MIB)
    - Private MIBs
- 125*441*280.6 (H*W*D mm ~3U)
- 5 Gb/s chassis
- **Ethernet:** 20 x 100BASE-TX (10/100) plus 4 x GigE (100/1000 optical or 1000 electrical) with SyncE; Half-slot module for 3 x 100BASE-FX
- **SONET/SDH and EoS:** 8-port T1/E1; 28-port T1 or 21-port E1; 6 x FE: half-slot module for EoS, 4 x 100BASE-T plus 2 x 100BASE-FX
- **CES:** 8-port T1/E1; 16-port T1/E1; 1-port OC-3/STM-1, channelized to T1/E1
- **PWE3/SyncE/1588v2**
## TSS5主要板卡

<table>
<thead>
<tr>
<th>板卡类型</th>
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<th>描述</th>
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<tbody>
<tr>
<td>接口板</td>
<td>VLIU1板</td>
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<td>VLIUC3板</td>
<td>2xFE(SFP), 4xFE(RJ45)扩展槽位</td>
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<td>SDR控制板</td>
<td>扩展槽位</td>
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<td>PTP板卡</td>
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<td>4xGE/FE(SFP), 20xFE</td>
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<td><strong>VLIUC4板</strong></td>
<td><strong>16xGE/FE(SFP), 20xFE</strong> 增强型</td>
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<td>VLIUC8板</td>
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<td><strong>VLIUC9板</strong></td>
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<td><strong>VLIUC6板</strong></td>
<td><strong>2xGE/FE(SFP), 1xSTM-1(SFP)</strong></td>
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### VLIU接口槽位

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<thead>
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<tbody>
<tr>
<td>M2 业务槽位</td>
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<td>M1 业务槽位</td>
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### 电源

- 风扇
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<tr>
<th>Supported circuit pack configurations</th>
<th>Compatible VLIU Interface Units</th>
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主要板卡
- VLNC42B板接口：4xGE/FE(SFP)+20xFE
- VLNC62板接口：2xGE/FE(SFP)+8xE1 CES 支持TOD
- VLNC64板接口：2xGE/FE(SFP)+1xSTM-1(SFP) CES
**Synchronization**
- Loop and differential timing
- IEEE 1588v2 for clock distribution
- ITU-T Synchronous Ethernet support
- Synchronization – SDH/SONET with SSM, Synchronous Ethernet with SSM, IEEE 1588v2 master, slave, and transport clock
- 1588v2 ToD and 1PPS capabilities
- 1588v2 transparent clock

**Ethernet functionality**
- IEEE 802.3 Ethernet interfaces 10/100/1000 Mb/s
- Media Access Control (MAC) bridging, IEEE 802.1D, including Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP)
- 16,000 MAC table
- Virtual local area network (VLAN) bridging, IEEE 802.1Q
- Provider bridging IEEE 802.1ad, Ethernet line (E-line), Ethernet LAN (E-LAN)
- Link aggregation
- Layer 2 control protocol tunneling aggregation
- Ethernet OAM IEEE 802.3ah link OAM
- Connectivity Fault Management (CFM) IEEE 802.1ag: loopbacks, connectivity check, link trace
- Ethernet OAM Y.1731 (RDI, AIS, LM, 2-way and 1-way DM) VLAN loopbacks
- Ethernet Ring Protection G.8032
- Jumbo frames: 9 kb
- Full duplex, flow control, MDIX
- Port mirror: in and/or out
- Layer 2 and Layer 3 Access Control Lists (ACLs) for filtering and rate limiting
- Multiple classification options: port, VID, P-bits, MAC DA/SA, differentiated services code points (DSCP)
- Eight Quality of Service (QoS) classes
- Ingress policing
- Class-based queuing
- Strict priority, weighted round robin (WRR) scheduling and tail-drop
- Egress shaping per port
- Multilink Point-to-Point Protocol (MLPPP)-Ethernet interworking with static routing
- Port-based statistics
PWE3 functionality
- T1/E1 pseudowires: RFC 4553, structure-agnostic TDM over packet (SAToP)
- Bidirectional forwarding detection (BFD) for 1:1 tunnel protection
- T-MPLS 1:1 APS protected tunnels
- E-Line services
- 500 bidirectional tunnels
- 250 bidirectional pseudowires
- T-MPLS OAM CV, APS, FDI, RDI
- CAC
- Ethernet 802.1ag CC, LB, LT in T-MPLS mode
- Ethernet 802.3ah link OAM
- T-MPLS 8 QoS
- Related RFCs: 4553, 4446, 4197, 3985, 3916

SONET/SDH functionality
- Unidirectional path-switched ring (UPSR): VT1.5/STS1/STS-3c, Subnetwork Connection Protection (SNCP, VC-12/3/4), 1+1 APS
- EoS: frame-mapped generic framing procedure (GFP-F), virtual concatenation (VCAT) including low-order VCAT, link capacity adjustment scheme (LCAS), client signal fail (CSF)
- Line timing, SSM with auto-reconfiguration and DS1/E1 building integrated timing supply (BITS) output; free-run
- Equipment protection option
- Standard SONET/SDH performance monitoring, loopbacks
- DS1 in-band loopback
- Bi-directional SFP, ZX, and electrical FE SFP optics support
- SONET cross-connect loopback towards the backhaul network
- DS3 FEAC loopback and alarms
- Transmux

Management
- Secure FTP download
- Alcatel-Lucent 1350 Optical Management System (OMS) and 1340 Integrated Network Controller (INC)
- Transaction Language 1 (TL1)
- Command-line interface (CLI)
- Simple Network Management Protocol (SNMP) v2, v3
- SONET/SDH data communication channel (DCC)
- IP tunneling for remote software download
- Web browser interface (ZIC)
Series of multi-service transmission and switching system with powerful packet and TDM transport capability.

- **OSN 9500**: inherits DXC's powerful service grooming ability and MADM's complicated networking ability
- **OSN 7500**: 10G MSTP.
- **OSN 3500**: 10G/2.5G, both packet and TDM transport
- **OSN 3500 II**: 10G/2.5G MSTP
- **OSN 2500**: 2.5G/622M MSTP
- **OSN 2000**: Integrated transport of SDH, PDH and Ethernet
- **OSN 1500A**: 2.5G/622M MSTP
- **OSN 1500B**: 2.5G/622M, both packet and TDM transport
OSN 7500 - Overview

- 756*496*295 (H*W*D mm ~17U)
- High-order cross-connect capacity: 360G VC-4;
- Low-order capacity: 20G/40G/80G VC-12 or equivalent VC-3
- 22 service board positions and 8 interface board positions.
- Service interfaces: STM-1 (O/E), STM-4/16/64, E1/T1/E3/T3/E4, FE, GE, ATM, IMA, SAN and Video
- Build-in WDM technology: Provides two-channel optical add/drop multiplexing board; Provides arbitrary bit rate wavelength conversion board
- Built-in Microwave technology: Provides 2-port Intermediate Frequency board; Support 30 Microwave directions in one subrack
- G-MPLS based fast end-to-end services
- **EOW**: 实现板间通信功能，并对外提供辅助接口（公务、广播、外部时钟等接口）。

- **AUX**: 实现电源集中备份功能，并对外提供辅助接口（F1、告警、外部时钟等接口）。

- **SCC**: 系统控制与通信/开销处理单元

- **PIU**: 电源输入单元

- **XCS**: 交叉矩阵/同步定时单元，包括GXCS（SDH/PDH）和EXCS（Ethernet）
接口区与处理区对应关系

<table>
<thead>
<tr>
<th>处理板槽位号</th>
<th>对应转接板槽位号</th>
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<tbody>
<tr>
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<td>SLOT2</td>
<td>SLOT 19、SLOT 20</td>
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<td>SLOT18</td>
<td>SLOT 37、SLOT 38</td>
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</table>
### Ethernet
- Ethernet II、IEEE 802.3
- VCTRUNK: Up to 48
- EPL, EVPL, EPLAN, EVPLAN
- MPLS
- IEEE 802.1p/q
- QinQ
- RSTP
- IGMP
- LPT (Link Stat Pass Through)
- JUMBO frame
- ITU-T G.7042
- CAR: based on port or port+VLAN
- Flow control
- Ethernet Monitoring
- Test frame

### RPR:
- MPLS frame
- JUMBO frame: 9600 Byte
- EVPL, EVPLAN
- 802.1q/p, up to 4K VLAN
- MAC: 64K
- MPLS label: 2K
- STP, RSTP
- IGMP Snooping
- RPR Protection: Steering, Wrapping, Wrapping+Steering
- RPR Protection switch: <50ms

### Encapsulation
- ITU-T G.7041, ITU-T X.86
- LCAS: ITU-T 7042
- CAR
- Flow control
- Max nodes: 255
- Service Priority: A0, A1, B_EIR, B_CIR, C

### ATM

### SAN

### Protection
- 支路板的TPS保护;
- 以太网板EFS0的TPS保护;
- ATM业务处理板的1+1备份;
- 波长转换单元的保护;
- 交叉、时钟功能单元的1+1备份;
- 系统控制与通信单元1+1备份;
- 电源输入单元1+1备份;
- 单板+3.3V电源1:N保护;
- 智能风扇;
- 异常情况下的单板保护方式。
OSN 3500 - Overview

- 730*496*295 (H*W*D mm ~17U)
- High-order cross-connect capacity: 200G VC-4;
- Low-order capacity: 20G/40G VC-12 or equivalent VC-3
- 80G Packet Switching
- 15 service board positions and 16 interface board positions.
- Service interfaces: STM-1 (O/E), STM-4/16/64, E1/T1/E3/T3/E4, FE, GE, ATM, IMA, SAN and Video
- Built-in Microwave technology: Provides 2-port Intermediate Frequency board; Support 20 Microwave directions in one subrack
- G-MPLS based fast end-to-end services
OSN 3500 – Architecture (1)

SDH接口单元（STM-1/4/16/64）

西向

系统控制与通信及开销处理单元

PDH接口单元（E1/T1/E3/T3/E4）

以太网接口单元（10/100/1000M）

辅助接口单元

东向

SDH交叉矩阵和同步定时单元（高阶/低阶：40G/5G和80G/5G）
- **EOW**: 实现板间通信功能，并对外提供辅助接口（公务、广播、外部时钟等接口）。
- **AUX**: 实现电源集中备份功能，并对外提供辅助接口（F1、告警、外部时钟等接口）。
- **SCC**: 系统控制与通信/开销处理单元
- **PIU**: 电源输入单元
- **XCS**: 交叉矩阵/同步定时单元
### 接口区与处理区对应关系

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![接口区与处理区对应关系图](image)
OSN 3500 – Feature List (System)

- **SyncE, 1588v2**
- **E-Line, E-LAN, and E-AGGR**
- **ETH-OAM, MPLS-OAM, and H-QoS**
- **Spanning tree and IGMP Snooping**
- **1+1/1:1 MPLS tunnel protection and LAG protection**
- **PWs/Tunnels**
  - Max. number of QinQs supported by equipment (NNI side): 1024
  - Number of MPLS tunnels: 4096
  - Max. number of PWs supported by equipment: 16384
  - Number of tunnel OAMs: 2048
  - Number of APS protection groups: 1024
- **ETH-OAM**
  - Number of MDs: 64
  - Number of MAs: 1024
  - Number of MPs: 2048
- **L2 VPN**
  - VUNI ingress flow Classifications: 8K
  - Number of VUNIs: 8K
  - Number of VNNIs: 17552
  - Number of VUNI groups: 1024
  - Number of E-LINE services: 4K
  - Number of E-LAN services: 1K
  - Number of E-AGGR services: 4
- **Number of multicasts: 4K**
- **Number of multicast members: 24K**
- **Number of port flow classifications: 1600**
- **QoS**
  - Number of CARs for flow classification: 8K
  - Max. number of ACLs: 8K
  - Number of port WRED policies: 7
  - Number of service WRED policies: 127
  - Number of WFQ templates: 256
  - Number of VUNI egress policies: 256
  - Number of VUNI ingress policies: 256
  - Number of port policies: 100
  - Number of PW policies: 256
  - Number of QinQ policies: 256
  - Number of DiffServ domains: 8
OSN 1500(B) - Overview

- 221*444*262 (H*W*D mm ~5U)
- **Low-order capacity**: supports 20G VC-4/VC-3/VC-12
- **8G Packet Switching**
- 9 service board positions and 4 interface board positions.
- **Service interfaces**: STM-1 (O/E), STM-4/16, E1/T1/E3/T3/E4, FE, GE, ATM, SAN and Video
- **Built-in Microwave technology**: Provides 2-port Intermediate Frequency board; Support 4 Microwave directions in one subrack
- **Build-in WDM technology**: Provides two-channel optical add/drop multiplexing board; Provides arbitrary bit rate wavelength conversion board;
- **G-MPLS based fast end-to-end services**
OSN 1500(B) – Architecture (1)

SDH交叉矩阵和同步定时单元
（128×128 VC-4）

西向

系统控制与通信及开销处理单元

PDH接口单元
（E1/T1,E3/DS3,140Mbit/s/155Mbps）

以太网接口单元
（10/100/1000Mbps）

辅助接口单元

东向

SDH接口单元
（STM-1/4/16）

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线路、交叉、主控复合单元 (SLOT4/5) :
- CXL16 - STM-16 光接口、20G 高阶/5G 低阶交叉、主控复合板
- CXL4 - STM-4 光接口、20G 高阶/5G 低阶交叉、主控复合板
- CXL1 - STM-1 光接口、20G 高阶/5G 低阶交叉、主控复合板

AUX：提供系统辅助接口，板间通信和电源，环境监测功能、1:N 二次电源备份保护

PIU：电源输入单元
OSN 1500(B) – Feature List (System)

- SyncE, 1588v2
- MPLS-OAM and QoS
- 1+1/1:1 MPLS tunnel protection and LAG protection
- 1+1/1:1 LSP protection with the switching time less than 50 ms
- The MPLS (MPLS-TP) control plane supports static configuration
- MPLS-based DiffServ
- 802.1ag
- E-Line, E-LAN, E-AGGR(MP2P)
UT NetRing TN Series

- Series of Packet Optical Transport (PTN) products.
- **TN725**: aggregation solution at access and metro layer.
- **TN705**: high capacity network edge as well as aggregation applications.
- **TN703**: edge applications.
- 320*440*410(H*W*D mm ~7U)
- 108G Full-Duplex redundant Switching Fabric
- 14 pluggable slots (6 with 10G support)
- Support E1/T1/STM-1(ATM/CES) /FE/GE client interface.
- Support GE/10GbE/2.5G/10G POS uplink interface
- **Available Interfaces:** 12 * FE/GE, 8 * STM1 (ATM/CES), 1 * STM16 POS, 1 * STM64 POS, 1 * 10 GE
- MPLS-TP
**MPLS-TP FEATURES**

- Maximum 4K Label Switching Path (LSP) tunnel per TN725 chassis;
- EXP-Inferred-PSC LSPs (E-LSP);
- Label-only-Inferred-PSC LSPs (L-LSP);
- Per platform Label space support;
- Bi-directional MPLS-TP trail and Unidirectional MPLS-TP trail;
- Diff-Serv support:
  - 2 service levels for TDM Emulation;
  - 4 service levels for statistical multiplexing traffic;
- 8 service levels supported in the Network;
- MPLS OAM including protection switching;
- LSP Ping;
- LSP TraceRoute;
- EMS/SNMS manual control the setup and release of PW and LSP.

**PROTECTION SCHEMES**

- Hardware redundancy: 1+1 power supply, 1+1 main control (OAM),
- 1+1 clock processing unit, 1+1 switch fabric,
- 2:1 E1 Card Failure Protection (CFP)
- Network Protection: 1+1 Linear MSP (ITU-T G.841 Annex B) for STM-1 (ATM or SDH); 1:1 Linear MSP for STM-1 (ATM or SDH); 1+1 Linear protection for LSP; 1:1 Linear Protection for LSP

**TIMING/SYNCHRONIZATION**

- POS interface: line timing and SSM (S1 byte) transmission;
- GE/10GE interface: line timing and SSM (control frame) transmission;
- Free run: $\pm 4.6$ppm (ITU G.813)
- Holdover: $\pm 0.05$ppm (better than ITU G.813: $\pm 0.37$ppm) within 24 hours.
- Provide sync signal for 3G Base Station: External timing output; Traceable
- STM-1 ATM interface as line timing source.
TN725 – Feature List (2)

- NETWORK MANAGEMENT
  - Qx, CLI

- STANDARDS & RECOMMENDATIONS
  - IETF RFC3031, RFC3916, RFC 3985, RFC 4197, RFC 4553, RFC 4842, RFC 4717,
  - RFC 4816, RFC 4448
  - ITU-T G.8110, G.8110.1, Y.1711, Y.1720
- 133*440*410 (H*W*D mm ~3U)
- 88G Full-Duplex redundant Switching Fabric
- 2 System boards, 2 client slots and 4 uplink slots
- Support E1/T1/STM-1 (ATM/CES)/FE/GE client interface.
- Support GE/10GbE/2.5G/10G POS uplink interface
- **Available Interfaces:** 12 * FE/GE, 4 * STM1 (ATM/CES), Combo 8* FE/GE + 4 * STM1 + 16 E1/T1, 1 * STM16 POS, 1 * STM64 POS, 1 * 10 GE
- MPLS-TP
MPLS-TP FEATURES
- Maximum 8K Label Switching Path(LSP) tunnel per TN705 chassis;
- EXP-Inferred-PSC LSPs(E-LSP);
- Label-only-Inferred-PSC LSPs(L-LSP);
- Per platform Label space support;
- Bi-directional MPLS-TP trail and Uni-directional MPLS-TP trail;
- Diff-Serv support:
  - 2 service levels for TDM Emulation;
  - 4 service levels for statistical multiplexing traffic;
- 8 service levels supported in the Network;
- MPLS OAM including protection switching;
- LSP Ping;
- LSP TraceRoute;
- EMS/SNMS manual control the setup and release of PW and LSP

PROTECTION SCHEMES
- Hardware redundancy: 1+1 power supply, 1+1 main control (OAM),
- 1+1 clock processing unit, 1+1 switch fabric;
- 1:1 E1 Card Failure Protection (CFP)
- Network Protection: 1+1 Linear MSP (ITU-T G.841 Annex B) for STM-1 (ATM or SDH); 1:1 Linear MSP for STM-1 (ATM or SDH); 1+1 Linear protection for LSP; 1:1 Linear Protection for LSP.

TIMING/SYNCHRONIZATION
- POS interface: line timing and SSM(S1 byte) transmission;
- GE/10GE interface: line timing and SSM(control frame) transmission;
- Free run: ±4.6ppm (ITU G.813)
- Holdover: ±0.05ppm (better than ITU G.813: ±0.37ppm) within 24 hours.
- Provide sync signal for 3G Base Station: External timing output;
- Traceable
- STM-1 ATM interface as line timing source
NETWORK MANAGEMENT
- Qx, CLI

STANDARDS & RECOMMENDATIONS
- IETF RFC3031, RFC3916, RFC 3985, RFC 4197, RFC 4553, RFC 4842, RFC 4717,
- RFC 4816, RFC 4448 ITU-T G.8110, G.8110.1, Y.1711, Y.1720
TN703

- 44.5*440*245 (H*W*D mm ~1U)
- 44G Full-Duplex redundant Switching Fabric
- Support E1/T1/STM-1 (ATM/CES) /FE/GE client interfaces.
- Integrated 16 x T1/E1, 6 x GE and 2 x ATM/CES/POS interfaces
- Maximum 22 x GE/ FE ports per chassis
- MPLS-TP, 1588v2
TN703 – Feature List (1)

- **MPLS-TP FEATURES**
  - Maximum 1K Label Switching Path (LSP) tunnel and 2K Pseudo Wire (PW) per TN703 chassis;
  - EXP-Inferred-PSC LSPs (E-LSP);
  - Label-only-Inferred-PSC LSPs (L-LSP);
  - Per platform Label space support;
  - Bi-directional MPLS-TP trail and Uni-directional MPLS-TP trail;
  - Diff-Serv support;
  - 2 service levels for TDM Emulation;
  - 4 service levels for statistical multiplexing traffic;
  - 8 service levels supported in the Network;
  - MPLS OAM including protection switching;
  - LSP Ping;
  - LSP TraceRoute;
  - EMS/SNMS manual control the setup and release of PW and LSP.

- **PROTECTION SCHEMES**
  - Hardware redundancy: 1+1 input power supply
  - Network Protection: 1+1 Linear MSP (ITU-T G.841 Annex B) for STM-1 (ATM or SDH); 1:1 Linear MSP for STM-1 (ATM or SDH); 1+1 Linear protection for LSP; 1:1 Linear Protection for LSP.

- **TIMING/SYNCHRONIZATION**
  - POS interface: line timing and SSM (S1 byte) transmission;
  - FE/GE/10GE interface: line timing and SSM (control frame) transmission;
  - Free run: ±4.6ppm (ITU G.813)
  - Holdover: ±0.05ppm (better than ITU G.813: ±0.37ppm) within 24 hours.
  - Provide sync signal for 3G Base Station: External timing output; Traceable
  - STM-1 ATM interface as line timing source.
  - Provide 1pps+tod time input and output
  - Any FE/GE/10GE interface support IEEE 1588V2
TN703 – Feature List (2)

- NETWORK MANAGEMENT
  - Qx, CLI

- STANDARDS & RECOMMENDATIONS
  - IETF RFC3031, RFC3916, RFC 3985, RFC 4197, RFC 4553, RFC 4842, RFC 4717,
  - RFC 4816, RFC 4448
  - ITU-T G.8110, G.8110.1, Y.1711, Y.1720
  - IEEE 1588v2, 802.1ag, 802.3ah
Analysis

- ALU 1850 TSS Series – Dual Cross-Connect Switching Platforms (Both TDM based and Packet based)
- Huawei Optix OSN Series – Mostly MSTP (TDM), 3500 and 1500B with dual cross-connect switching platforms.
- TSS-320 and OSN7500/1500 with built-in WDM technology.
- OSN7500/3500/1500 with Built-in Microwave technology.
Opportunity and Challenge for Centec

**Opportunity (chip level)**
- Truly and powerful packet based switching chips with advanced carrier grade features
- Support MPLS-TP except for OAM with BFD.

**Challenge (System level)**
- Few experience in TDM.
- Limited resource for challenging time.