**Priedas Nr. 5 – Kritinės paskirties tinklo mazgų techninių charakteristikų reikalavimai / Annex No. 5 Technical parameters for parts provided in technical specification**

| Eil. Nr. / No. | Technical parameters for parts provided in technical specification | | Siūlomų prekių techniniai parametrai ir kiti duomenys / Specifications and other details for suggested parts | Pasiūlymo dokumentai patvirtinantys siūlomos prekės techninius parametrus / Documents which confirms technical specifications of suggested part | |
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| | | | | Dokumento pavadinimas / Document name | Pasiūlymo lapo numeris arba nuoroda į gamintojo tinklalapį / Offer sheet number or reference to manufacturer's page |
| | Indicator | Requirement | | *Nurodo Tiekėjas: / Provided by supplier:* | |
| **1.** | **Kritinės paskirties tinklo Maršrutizatoriai, atliekantys LSR funkciją (toliau - Įrenginys) / Critical network routers, responsible for LSR function (further - Device)** | | | | |
| **1.1** | **LSR Maršrutizatorius A tipo / A type LSR router** | | | | |
| 1.1.1 | Device manufacturer, name and model (manufacturer's number (code)) | It is necessary to list the components of all the proposed equipment, their quantities, models, manufacturer and product codes. *Note: The proposal must be accompanied by a detailed list of the elements / modules used for each node, including licenses planned to be used (Bill of Material - BOM).* | NPT1200,MCIPS560,DHGE_10,DHXE_4Sec | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 1.1.2 | Number of 10 Gbps SFP+ interfaces | At least 8 pcs. with possibility to increase up to 16 pcs. *Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 102-103 LSR_A node have availaible slots to host additional 10G services with option to insert Neptune reference annual Page 202-203 by this expand for 4+4 10G DHXE_4Sec Please refer Neptune reference manual Page 206-208 |
| 1.1.3 | Number of 100/1000 Mb/s SFP interfaces | At least 16 interfaces. *Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 1.1.4 | Of these, the number of encrypted interfaces | At least 4 x 10G and 4 x 1G interfaces. *Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 2 + 2). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **1.2** | **LSR Maršrutizatorius B tipo / B type LSR router** | | | | |
| 1.2.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS560,DHGE_10,DHXE_4Sec | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 1.2.2 | Number of 10 Gbps SFP+ interfaces | At least 4 pcs. with possibility to increase up to 8 pcs. *Note: Interfaces must be distributed across different cards and provide high availability (ex. 2 + 2).* | | * Neptune reference manual | Please refer Neptune reference manual Page 102-103 DHXE_4Sec Please refer Neptune reference manual Page 206-208 |

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| 1.2.3 | Number of 100/1000 Mb/s SFP interfaces | At least 8 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 1.2.4 | Of these, the number of encrypted interfaces | At least 4 x 10G and 4 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 2 + 2). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **1.3** | | **Bendri reikalavimai LSR Maršrutizatorius A ir B tipo / General Requirements for LSR Router Types A and B** | | | |
| 1.3.1 | Compatibility | LSR routers must be fully compatible with each other and with any router that performs LER function. | NPT1200,MCIPS560 | * Neptune reference manual | Please refer Neptune reference manual Page 83-109<br>Please refer Neptune reference manual Page 102-103 |
| 1.3.2 | High availability | Proposed device must be of modular design, ensuring high availability with redundant management, switching, power, fan and interface cards. In case of equipment failure, data transfer must be uninterrupted and traverse via backup path.<br><br>*Note: It is allowed to propose equipment with single FAN card if there is internal (in-card) redundancy for fans.* | | * Neptune reference manual | Please refer Neptune reference manual Page 83-109 |
| 1.3.3 | Device power feed | It must be possible to install 230V AC or 48V DC power supplies.<br><br>*Note: permited to use external AC / DC and / or DC / AC converters.* | | * Neptune reference manual | Please refer Neptune reference manual Page 88-90 |
| 1.3.4 | Number of power supplies installed in device | No less than 2.<br><br>*Note: Types of power supplies are selected at the time of design.* | | * Neptune reference manual | Please refer Neptune reference manual Page 88-90 |
| 1.3.5 | Types of installed SFP and SFP+ modules | The combinations of SFP and SFP + type modules installed in the device will depend on the designed device for the respective object. SFP ports must support Base-X and Base-T type modules without restricting one or the other usage (i.e. the interface must allow the use of any type of SFP / SFP + module specified in Annex 1 according to the interface numbers required in this specification). | | * Neptune reference manual | Please refer Neptune reference manual Page 102-103<br>DHXE_4Sec Please refer Neptune reference annual Page 206-208<br>Please refer Neptune reference manual Page 193-194 |

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| 1.3.6 | Interface set | It is allowed to use combinations of interface cards that terminate different types of interfaces (eg 10G and 1G interfaces terminated and/or encrypted on the same card), but the reservation of all required interfaces and their independent operation must be ensured simultaneously. | | * Neptune reference manual | Please refer Neptune reference mannual Page 102-103 DHXE_4Sec Please refer Neptune reference mannual Page 206-208 Please refer Neptune reference mannual Page 193-194 |
| 1.3.7 | Number of console or out-of-band ports | No less than 1. | | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 1.3.8 | Supported interfaces | Device must support transport of following traffic: - Ethernet; - TDM. | | * Neptune reference manual | Please refer Neptune referencem Manual Page 83-109 |
| 1.3.9 | Time synchronization | There must be accurate time synchronization to ensure  migration of TDM services to the packet network. | | * Neptune reference manual | Please refer Neptune reference manual Page 87-88 |
| 1.3.10 | Device synchronization | Device must be synchronized with an external time source or line. | | * Neptune reference manual | Please refer Neptune reference manual Page 87-88 |
| 1.3.11 | External synchronization input/output | At least 1. | | * Neptune reference manual | Please refer Neptune reference manual Page 87-88 |
| 1.3.12 | Time and synchronization | Device must support the following time and synchronization protocols and mechanisms: - Sync-E; - IEEE 1588v2 (Master Clock, Boundary Clock, Slave Clock); - NTP; - Integrated Stratum3 level clock. | | * Neptune reference manual * Neptune system specifications | Please refer Neptune reference manual Page 87-88 Please refer Neptune system specifications Page 87-88 |
| 1.3.13 | Support for Internet Protocol (IP) versions | Device must support implementation of IP (VPN) services using IPv4 and IPv6 protocol versions. | | * Neptune system specifications | Please refer Neptune system specifications Page 122-128 |
| 1.3.14 | IPv4 routing protocols | Device must support the following routing protocols with ability to use different Virtual Routing and Forwarding VRFs: - Static routes; - BGPv4; - OSPFv2 and OSPFv3; - IS-IS. | | * Neptune system specifications | Please refer Neptune system specifications Page 122-128 |
| 1.3.15 | Conditional Routing | Conditional Routing depending on L3/L4 packet Information. | | * Neptune reference manual * Neptune Secrity General description | Please see Neptune reference manual paragraph 20.12 (Page 309) ACL Please see Neptune Secrity General description paragraph 2.4.2 (Pages 53,54) Please see Neptune reference manual Page 403-404 |
| 1.3.16 | Connection failure detection | Bidirectional Forwarding Detection (BFD) or equivalent functionality capable of detecting connection failured in no less than 50 ms. | | * Neptune reference manual | Please refer Neptune reference manual Page 451-452 |
| 1.3.17 | Total maximum throughput of the device | No less than 400 Gbps. | | * Neptune system specifications | Please refer Neptune system specificationspage 122 |

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| 1.3.18 | Maximum number of IPv4 routes in Forwarding Information Base (FIBs) | At least 100K. | | | |
| 1.3.19 | Number of MAC addresses in device Content Addressable Memory (CAM) table | At least 100K. | | | |
| 1.3.20 | Maximum number of IPv4 routes in Routing Information Base (RIB) table | At least 250K. | | | |
| 1.3.21 | Maximum number of LDPs that can be configured on a device | At least 250. | | * Neptune system specifications | Please refer Neptune system specifications Page 122-128 |
| 1.3.22 | Maximum number of L2VPNs that can be configured on the device | At least 4K. | | | |
| 1.3.23 | Maximum number of L3VPNs that can be configured on the device | At least 500. | | | |
| 1.3.24 | Maximum number of VRFs that can be configured on a device | At least 500. | | | |
| 1.3.25 | Maximum number of VLANs that can be configured on a device in a single VRF | At least 4K. | | | |
| 1.3.26 | Multicast protocols | Device must support the following or equivalent protocols:<br>- IGMPv1 / v2 / v3;<br>- MLDv1 / v2;<br>- PIM SM. | | * Neptune system specifications | 1. Please refer Neptune system specifications Page 286<br>2. Please refer Neptune system specifications Page 290<br>3. Please refer Neptune system specifications Page 291-292 |
| 1.3.27 | Multicast debugging tools | Device must support tools that facilitate multicast switching and routing problems. | | *Technical solution design | Please refer Technical solution design document Page 21-22 (Paragraph 3.2) |
| 1.3.28 | MPLS functionality and services | Device must support the following or equivalent protocols:<br>- LDP;<br>- T-LDP;<br>- MP-BGP;<br>- one of Traffic engiineering mechanizms: MPLS-TE, SR, MPLS-TP;<br>- L3VPN (MP-BGP VPNv4);<br>- IPv6 VPN Provider Edge (6VPE);<br>- L2VPN (VPLS, EoMPLS);<br>- VPWS;<br>- IP Loop Free Alternate Fast Reroute (FRR);<br>- IS-IS and OSPF FRR.<br><br>*Note: Suppliers are allowed to use an additional device to implement the L3 MPLS functionality without integrating this functionality into the router node (see Additional Requirements in Section 1.3.29).* | | * Neptune system specifications<br>* Neptune Reference Manual | 1. LDP - Please refer Neptune system specifications Pages 289-290<br>2. T-LDP - Please refer Neptune system specifications Pages 128<br>3. MP-BGP - Please refer Neptune system specifications Pages 285<br>4. MPLS-TP,SR- Please refer Neptune Reference Manual Pages 308-321(Paragraph 17 & 18)<br>Page 299-304 MPLS-TP & IP-MPLS Interworking<br>4. L3VPN/IPv6VPN- Please refer Neptune Reference Manual Pages 291-298<br>5.L2VPN - Please refer Neptune Reference Manual Page 459-460,20 - VPWS<br>6. FRR - Please refer Neptune Reference Manual Page 313 (TI-LFA)<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR)<br>Please refer Neptune system specifications Pages 289<br>7. IS-IS & OSPF FRR- This implementation can be used with both OSPFv2 and IS-IS protocols<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR) |

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| 1.3.29 | MPLS functionality and services (additional requirements) | Additional requirements applies to separate equipment for the complience of L3 MPLS functionality:<br>- L3 MPLS functionality and services can be moved to a separate device, while L2 MPLS and TDM services shall be implemented on equipment based on MPLS-TP, Segment Routing or other equivalent technology;<br>- end-to-end control of equipment and services and network homogeneity must be ensured;<br>- all requirements for LSR routers apply;<br>- L3 MPLS services of LER nodes may be terminated in a separate device of LSR;<br>- Additional 10G ports must be provided for the connection of a separate device, which are not considered in the requirements for the number of router interfaces.<br><br>*Note: The supplier must clearly indicate which L3 MPLS functionalities are transferred to a separate device and provide a description of the architecture of the proposed technical solution including interconnection schemes.* | | * Neptune system specifications<br>* Neptune Reference Manual | N/A as integrated functionality used on the same Ribbon device |
| 1.3.30 | Logical gateway backup functionality | VRRPv2 / v3 or equivalent with the ability to implement on separate virtual networks (VPNs). | | * Neptune reference Manual | VRRP - Please refer Neptune Reference Manual Page 281-282<br>Please refer Neptune Reference Manual Page 460 |
| 1.3.31 | Logical port aggregation functionality | Static LAGs and dynamic LACPs or equivalent protocols for Ethernet ports. | | * Neptune reference Manual | LAG - Please refer Neptune Reference Manual Page 386-388<br>Please refer Neptune Reference Manual Page 394-395 |
| 1.3.32 | Operation of logical port aggregation | Ports can be on the same platform, interface card or distributed through different node components. | | * Neptune reference Manual | LAG - Please refer Neptune Reference Manual Page 386-388<br>Please refer Neptune Reference Manual Page 394-395 |
| 1.3.33 | Distribution of logical port aggregation | Distributed across different devices port aggregation functionality MLAG must be supporter. | | * Neptune reference Manual | MC-LAG - Please refer Neptune Reference Manual Page 387-392 |
| 1.3.34 | Flexible Quality of Service Architecture | - Classifying inbound traffic;<br>- Developing rules for managing classified traffic;<br>- Creating quality-of-service objects that associate one or more classes with management rules;<br>- Assigning quality of service objects to physical and virtual ports (subinterface) and valid for inbound and outbound traffic;<br>- Prioritizing outgoing traffic;<br>- Outgoing traffic queue congestion control. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |

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| 1.3.35 | Quality of Service features | - Hierarchical QoS (HQoS) (at least 2 levels);<br>- Calssification of incoming traffic by: port, L3 TOS or DSCP values, MPLS EXP value (for Ethernet WAN ports), source/destination IP address. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 1.3.36 | Rules for managing classified traffic | - Maximum throughput;<br>- Rewriting TOS or DSCP values of packets;<br>- Overwriting EXP values of MPLS frames;<br>- Overwriting of TOS or DSCP values of packets depending on whether traffic exceeds set maximum bandwidth;<br>- packet rejection, depending on whether traffic exceeds set maximum bandwidth. | | * Neptune reference Manual<br>* Neptune system specifications | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442<br>Please refer Neptune system specifications page 123-124<br>Please refer Neptune system specifications page 281 |
| 1.3.37 | Bandwidth limitation for incoming / outgoing traffic: | It must be possible to limit the incoming or outgoing traffic on physical port, virtual port (subinterface), source / destination IP address, or by other measures or setting the desired bandwidth limit. | | * Neptune reference Manual | BW is controlled on service level , regardless whether it is physical or logical port, via policer (aggregate or regular or h-policer or combination thereof) . In addition , user can also define shaping . Policers are applied at the ingress , shaping can be defined both for ingress and egress.<br>QOE (Policing)- Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22) |
| 1.3.38 | Queue of outgoing traffic unconditional priority | Ensures queuing priority for outgoing traffic. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 1.3.39 | Outbound traffic queue servicing by weights | Provides Weighted Round-Robin Outbound Queue Servicing or equivalent. | | | |
| 1.3.40 | Priority queuing on each physical port | At least 8 queues per port. | | | |
| 1.3.41 | Access Lists (ACL) | Access Lists must be configured according to:<br>- MAC addresses;<br>- IP addresses;<br>- TCP/UDP ports;<br>- ICMP type and code. | | * Neptune reference Manual<br>* Neptune system specifications<br>* Neptune Security General Description | ACL - Please refer Neptune Reference Manual Page 340,403-404<br>Please refer Neptune system specifications Page 118<br>Please refer Neptune Security General Description Page 36-40<br>Please refer Neptune Security General Description Page 53-54 |
| 1.3.42 | Connections encryption | Proposed device must be able to implement/enable interconnection (MACsec) or discrete MPLS services encryption using AES-128 or higher algorithm without the need to modify or extend equipment components/modules.<br>Encryption functionality is included in a separate Offer line.<br><br>*Note: When implementing an encryption mechanism for individual services in a network, LSR nodes can be interpreted as transit if no encryption is performed on them. In this case, secure control plane protocols must be used in the network to ensure not only the security of the services, but also the security of the communication.* | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 76-83<br>Please refer Neptune Reference Manual Page 206-208<br>Please refer Neptune Reference Manual Page 404-406 |
| 1.3.43 | User authentication methods | Following authentication methods must be ensured:<br>- RADIUS;<br>- Local user base. | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |

| 1.3.44 | User Authentication | Local authentication is attempted if other authentication methods fail when a local authentication is added to the authentication queue. | | * Neptune Security General Description<br>* Neptune reference Manual | Please refer Neptune Security General Description Page 42-53<br>Please refer Neptune Reference Manual Page 405-406 |
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| 1.3.45 | Remote Authentication | It must be possible to configure at least 3 remote authentication servers (RADIUS). | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |
| 1.3.46 | User Authorization | User authentication using any of the user authentication methods by assigning appropriate profiles must be ensured. User profiles can be configured locally or downloaded using remote authentication. Profiles must consist of a set of commands that user is allowed or denied. | | * Neptune Security General Description | Please refer Neptune Security General Description Page 42-53 |
| 1.3.47 | Device management | Device must be controlled by the following methods or protocols:<br>- Command Line Interface (CLI);<br>- SNMPv2 / v3;<br>- SSHv2;<br>- NETCONF or equivalent protocols or other methods compatible with the proposed Network Management System (NMS) and ensuring device configuration management. | | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page432-434<br>SNMPv2/v3 - Please refer Neptune Reference Manual Page 356<br>SSH2 - Please refer Neptune Reference Manual Page 403,407<br>NETCONF - Please refer Neptune Reference Manual Page 424-427,457 |
| 1.3.48 | Secure file transfer | Device must be capable of transferring operating system and configuration through a SCP or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 408 |
| 1.3.49 | Information exchange protocol | LLDP (Link Layer Discovery) or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 357 |
| 1.3.50 | Transmission of logs | Device is running Syslog protocol. | | * Neptune System Specifications | Please refer Neptune System specifications page 112 |
| 1.3.51 | Operations, Administration and Maintenance (OAM) | Device runs 802.3ah and 802.1ag or equivalent OAM protocols. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 343-344 (Paragraph 21 OAM Page 243-357) |
| 1.3.52 | Traffic monitoring features | One of the following or equivalent traffic monitoring functions must be provided:<br>- NetFlow;<br>- IPFIX;<br>- sFlow.<br><br>*Note: Traffic monitoring functionality shall be provided on a separate offer line.* | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 353-355 (Paragraph 21 OAM Page 243-357) |
| 1.3.53 | Autonomous operation | All functionality and network reservation and quality assurance mechanisms must be able to be activated and operated without the use of external control software or network management system. | | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page 432-434<br>LCT - Please refer Neptune Reference Manual Page 431<br>EMS- Please refer Neptune Reference Manual Page 428-430<br>NMS - Please refer Neptune Reference Manual Page 417-423<br>Note : Configuration can be done via CLI where LCT,EMS,NMS are providing comftobale and easy remote managment in addtion to this NETCONF/Yang is availiable |

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| 1.3.54 | Unit height in rack | No more than 7U.<br><br>*Note: requirements applied to the height of active equipment including additional equipment reffered to clause 1.3.29.* | | * Neptune reference Manual | Please refer Neptune reference manual Page 83 |
| 1.3.55 | Mounting accessories | Device is ready (with necessary accessories) for installation in a 19-inch equipment cabinet. | | * Neptune reference Manual | Please refer Neptune reference manual Page 84 |
| 1.3.56 | Electric power supply set | Device power supplies are complete with appropriate cables selected for the project. | | BOM | Power cable include in BOM |
| 1.3.57 | Console connection cable | No less than 4 devices shall be equipped with a console or out-of-band connection cable. | | BOM | Console cables included in BOM |
| 1.3.58 | Equipment documentation | Equipment documentation in English is available on the manufacturer's website. | | | https://ribboncommunications.com/ |
| 1.3.59 | Licenses | Device must be accompanied by all necessary licenses required to activate all required services and functionality. | | BOM | All requested licenses included in BOM |
| 1.3.60 | Warranty | Offered equipment  and all supplied hardware and software components  must be under warranty service either by equipment manufacturer or by an authorized service representative.<br>Warranty service must include free repair and replacement of defective components.<br>For additional warranty repair and maintenance requirements, see Section 4.12 of the Technical Specification. | | Ribbon - ECI's Standard Warranty Terms Litrail<br>Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail | Please refer Ribbon - ECI's Standard Warranty Terms Litrail<br>Please refer  Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail |
| 2. | | Kritinės paskirties tinklo Maršrutizatoriai, atliekantys LER funkciją (toliau - Įrenginys) / Critical network routers, responsible for LER function (further - Device) | | | |
| 2.1 | | LER Maršrutizatorius A tipo / A type LER router | | | |
| 2.1.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHGE_10,DHXE_4Sec,MSE1_32 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.1.2 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.1.3 | Number of E1 (2 Mb/s G.703)  120Ω interfaces | At least 96 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 64 + 64,  32 + 32 + 32 or similar).* | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |

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| 2.1.4 | Of these, the number of encrypted interfaces | At least 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.2** | | **LER Maršrutizatorius B tipo / B type LER Router** | | | |
| 2.2.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MS1_4 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.2.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.2.3 | Number of STM-1 (155 Mb/s) SFP interfaces | At least 8 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 181-182 |
| 2.2.4 | Of these, the number of encrypted interfaces | At least 2 x 10G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.3** | | **LER Maršrutizatorius C tipo / C type LER Router** | | | |
| 2.3.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MS1_4,MSE1_32,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.3.2 | Number of 10 Gbps SFP+ interfaces | At least 4 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 2 + 2).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208<br>All port can use encryption or non encryption functionalities |
| 2.3.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |

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| 2.3.4 | Number of STM-1/4 (155/622 Mb/s) SFP interfaces | At least 2 vnt. interfaces capable of operating in STM-1 or STM-4 mode.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 181-182 |
| 2.3.5 | Number of E1 (2 Mb/s G.703) 120Ω interfaces | At least 64 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 32 + 32).* | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |
| 2.3.6 | Of these, the number of encrypted interfaces | At least 2 x 10G and 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.4** | | | **LER Maršrutizatorius D tipo / D type LER Router** | | |
| 2.4.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MS1_4,MSE1_32,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.4.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.4.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.4.4 | Number of STM-1/4 (155/622 Mb/s) SFP interfaces | At least 1 vnt. interfaces capable of operating in STM-1 or STM-4 mode. | | * Neptune reference manual | Please refer Neptune reference manual Page 181-182 |
| 2.4.5 | Number of E1 (2 Mb/s G.703) 120Ω interfaces | At least 16 interfaces. | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |
| 2.4.6 | Of these, the number of encrypted interfaces | At least 2 x 10G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.5** | | | **LER Maršrutizatorius E tipo / E type LER Router** | | |
| 2.5.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MSE1_32,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |

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| 2.5.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.5.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.5.4 | Number of E1 (2 Mb/s G.703) 120Ω interfaces | At least 16 interfaces. | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |
| 2.5.5 | Of these, the number of encrypted interfaces | At least 2 x 10G and 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.6** | | **LER Maršrutizatorius F tipo / F type LER Router** | | | |
| 2.6.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MSE1_32,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.6.2 | Number of 10 Gbps SFP+ interfaces | At least 4 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 2 + 2).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.6.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.6.4 | Number of E1 (2 Mb/s G.703) 120Ω interfaces | At least 16 interfaces. | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |
| 2.6.5 | Of these, the number of encrypted interfaces | At least 4 x 10G and 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 2 + 2).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.7** | | **LER Maršrutizatorius G tipo / G type LER Router** | | | |
| 2.7.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,MSE1_32,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |

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| 2.7.2 | Number of 1 Gb/s SFP interfaces | At least 16.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.7.3 | Number of E1 (2 Mb/s G.703) 120Ω interfaces | At least 16 interfaces. | | * Neptune reference manual | Please refer Neptune reference manual Page 175-176 |
| 2.7.4 | Of these, the number of encrypted interfaces | At least 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.8** | | LER Maršrutizatorius H tipo / H type LER Router | | | |
| 2.8.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS320,DHGE_10,DHXE_4Sec, EXT-2RU,EM_10E,SM_V24E | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.8.2 | Number of 1 Gb/s SFP interfaces | At least 16.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.8.3 | Number of RS-232 serial interfaces | At least 8 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 249-255,20 |
| 2.8.4 | Of these, the number of encrypted interfaces | At least 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.9** | | LER Maršrutizatorius I tipo / I type LER Router | | | |
| 2.9.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS320,DHGE_10,DHXE_4Sec, EXT-2RU,EM_10E,SM_V24E | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.9.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |

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| 2.9.3 | Number of 1 Gb/s SFP interfaces | At least 16.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.9.4 | Number of RS-232 serial interfaces | At least 8 interfaces.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 249-255,20 |
| 2.9.5 | Of these, the number of encrypted interfaces | At least 2 x 10G and 4 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.10** | | **LER Maršrutizatorius K tipo / K type LER Router** | | | |
| 2.10.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS320,DHGE_10,DHXE_4Sec, EXT-2RU,EM_10E,SM_EM_24W_6E | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.10.2 | Number of 1 Gb/s SFP interfaces | At least 16.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.10.3 | Number of E&M analog voice interfaces | No less than 4. | | * Neptune reference manual | Please refer Neptune reference manual Page 249-255,20 |
| 2.10.4 | Of these, the number of encrypted interfaces | At least 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.10** | | **LER Maršrutizatorius L tipo / L type LER Router** | | | |
| 2.10.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS320,DHGE_10,DHXE_4Sec, EXT-2RU,EM_10E,SM_EM_24W_6E | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.10.2 | Number of 1 Gb/s SFP interfaces | At least 16.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 8 + 8).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.10.3 | Number of E&M analog voice interfaces | No less than 24. | | * Neptune reference manual | Please refer Neptune reference manual Page 249-255,20 |

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| 2.10.4 | Of these, the number of encrypted interfaces | At least 2 x 1G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.11** | | **LER Maršrutizatorius M tipo / M type LER Router** | | | |
| 2.11.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1200,MCIPS320,DHGE_10,DHXE_4Sec, EXT-2RU,EM_10E,SM_EM_24W_6E | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.11.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.11.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |
| 2.11.4 | Number of E&M analog voice interfaces | No less than 4. | | * Neptune reference manual | Please refer Neptune reference manual Page 249-255,20 |
| 2.11.5 | Of these, the number of encrypted interfaces | At least 2 x 10G interfaces.<br><br>*Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1). When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.11** | | **LER Maršrutizatorius N tipo / N type LER Router** | | | |
| 2.11.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1250,MCIPS300F,DHXE_4Sec,DHGE10 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.11.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| 2.11.3 | Number of 1 Gb/s SFP interfaces | At least 8.<br><br>*Note: Interfaces must be distributed across different cards and provide high availability (ex. 4 + 4).* | | * Neptune reference manual | Please refer Neptune reference manual Page 193-194 |

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| 2.11.4 | Of these, the number of encrypted interfaces | At least 2 x 10G and  4 x 1G interfaces.  *Note: Encrypted interfaces must be distributed across different cards and provide high availability (ex. 1 + 1).  When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.12** | | **Maršrutizatorius RR tipo / RR type LER Router** | | | |
| 2.12.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1050,MCIPS300 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.12.2 | Number of 1 Gb/s SFP interfaces | At least 8. | | * Neptune reference manual | Please refer Neptune reference manual Page 122-125 |
| 2.11.3 | Requirements exceptions | The following clauses requirements do not applicable to RR type routers: 2.13.2, 2.13.5 - 2.13.11, 2.13.13 - 2.13.19. | | | |
| **2.13** | | **Bendri reikalavimai LER Maršrutizatorius A - N ir RR tipo / General Requirements for LSR Router A - N and RR Types** | | | |
| 2.13.1 | Compatibility | LER routers must be fully compatible with each other and with LSR routers. | | * Neptune reference manual | Please refer Neptune Reference Manual Page 68-82  Please refer Neptune Reference Manual Page 110-129  Please refer Neptune Reference Manual Page 83-109 |
| 2.13.2 | High availability | Proposed device must be of modular design, ensuring high availability with redundant  management, switching, power, fan and interface cards. In case of equipment failure, data transfer must be uninterrupted and traverse via backup path. | | * Neptune reference manual | Please refer Neptune Reference Manual Page 68-82  Please refer Neptune Reference Manual Page 110-129  Please refer Neptune Reference Manual Page 83-109 |
| 2.13.3 | Device power feed | It must be possible to install 230V AC or 48V DC power supplies.  *Note: permited to use external AC / DC and / or DC / AC converters.* | | * Neptune reference manual | Please refer Neptune Reference Manual Page 73-75  Please refer Neptune Reference Manual Page 115-117  Please refer Neptune Reference Manual Page 88-90 |
| 2.13.4 | Number of power supplies installed in device | No less than 2.  *Note: Types of power supplies are selected at the time of design.* | | * Neptune reference manual | Please refer Neptune Reference Manual Page 69  Please refer Neptune Reference Manual Page 111  Please refer Neptune Reference Manual Page 84 |
| 2.13.5 | Types of installed SFP and SFP+ modules | The combinations of SFP and SFP + type modules installed in the device will depend on the designed device for the respective object. SFP ports must support Base-X and Base-T type modules without restricting one or the other usage (i.e. the interface must allow the use of any type of SFP / SFP + module specified in Annex 1 according to the interface numbers required in this specification). | | * Neptune reference manual | Please refer Neptune reference manual Page 101-106  Please refer Neptune reference annual Page 206-208  Please refer Neptune reference manual Page 193-194 |
| 2.13.6 | TDM Emulation (CESoETH) | There must be two ways to emulate TDM services according to MEF-8: - structured (CESoPSN); - unstructured (SAToP). | | * Neptune reference manual | Please refer Neptune reference manual Page 170-173 |

| 2.13.7 | Serial Interface Requirements | Supported interfaces:<br>- RS-232 (V.24/V.28);<br>Configurable interface speeds b/s:<br>- synchronous 4800, 9600,<br>19200.<br>Multiple transmission functionality:<br>- setting of master or slave modes.<br><br>*Note: Suppliers are allowed to use an additional device to implement serial and voice interfaces without integrating this functionality into the router node (see Additional Requirements in clause 2.13.9).* | | * Neptune reference manual | Please refer Neptune reference manual Page 252-253 |
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| 2.13.8 | Voice interface requirements | Analog Interfaces 600Ω:<br>- Configurable 2/4-wire (E&M Type II and Type V);<br>- Programmable incoming and outgoing signal strength levels change (step 1 dBr).<br><br>*Note: Suppliers are allowed to use an additional device to implement serial and voice interfaces without integrating this functionality into the router node (see Additional Requirements in clause 2.13.9).* | | * Neptune reference manual | Please refer Neptune reference manual Page 252 |
| 2.13.9 | Serial and voice interfaces additional requirements | Additional requirements applies to separate equipment for the complience of serial and voice interfaces:<br>- serial and voice interfaces can be moved to a separate device, while interconnection implemented based on IP\MPLS, MPLS-TP, Segment Routing or other equivalent technology proposed for LER routers;<br>- end-to-end control of equipment and services and network homogeneity must be ensured;<br>- all requirements for LER router interface quantities and high reliability apply, as well as the requirements of clauses 2.13.1 - 2.13.12, 2.13.59 - 2.13.69 apply;<br>- additional 1G ports must be provided for the connection of a separate device, which are not considered in the requirements for the number of router interfaces.<br><br>*Note: The supplier must clearly indicate which interfaces are transferred to a separate device and provide a description of the architecture of the proposed technical solution, setup of each type of node (including used cards) and interconnection schemes.* | | * Neptune system specifications<br>* Neptune Reference Manual | N/A as integrated functionality used on the same Ribbon device |

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| 2.13.10 | Interface set | It is allowed to use combinations of interface cards that terminate different types of interfaces (eg 10G and 1G terminated and/or encrypted on the same card or different types of TDM interfaces), but the reservation of all required interfaces and their independent operation must be ensured simultaneously. | * Neptune reference manual | Please refer Neptune reference manual Page 101-106<br>Please refer Neptune reference annual Page 206-208<br>Please refer Neptune reference manual Page 193-194<br>Please refer Neptune reference manual Page 175-176<br>Please refer Neptune reference manual Page 181-182<br>Please refer Neptune reference manual Page 252-253<br>Please refer Neptune reference manual Page 252 |
| 2.13.11 | Serial interfaces patching | If other than **DB-25 (F)** type of interfaces are used for serial ports then the device must be provided with appropriate cables and panels, also must be assured installation in the rack and connection of the terminal equipment. | BOM | Pannels included in BOM |
| 2.13.12 | E1 and Voice interfaces patching | If other than **RJ-45** type of interfaces are used for E1 and Voice ports then the device must be privided with appropriate cables and panels, also must be assured installation in the rack and connection of the terminal equipment. | BOM | Pannels included in BOM |
| 2.13.13 | Number of console or out-of-band ports | No less than 1. | BOM | Console cables included in BOM |
| 2.13.14 | Number of input ports for emergency messages | No less than 2.<br><br>*Note: Suppliers are permitted to use separate equipment to implement this clause without integrating this functionality into the router node (see Additional Requirements in clause 2.13.15).* | BOM<br>Alarms Connection | NPT1200 + Alarms connection cable at Auxilari port on MCP1200 Card<br>NPT1250 + Alarms connection cable at Alarms port on ECB<br>NPT1050 + Alarms Connection cable at Alarms port on FCU_150<br>Please refer alarms connection document |
| 2.13.15 | Number of input ports for emergency messages (additional requirements) | Additional requirements applies to separate equipment for the complience of clause 2.13.14:<br>- installation on DIN rail;<br>- WEB GUI HTTPS management (without additional software usage);<br>- SNMPv2 support;<br>- centralized monitoring and displaying emergency messages in the Critical Application network management system;<br>- an additional LAN port must be provided for the connection of a separate device, which is not taken into account in the requirements for the number of router interfaces. | * Neptune system specifications<br>* Neptune Reference Manual | N/A as integrated functionality used on the same Ribbon device |
| 2.13.16 | Channelization of STM interfaces | Channelization of STM-1/4 interfaces to E1 must be ensured and possibility of terminating separated E1 channel from STM traffic must be ensured. | * Neptune reference manual | Please refer Neptune reference manual Page 181-182 |
| 2.13.17 | Supported interfaces | Device must support following interfaces:<br>- Ethernet;<br>- TDM. | * Netpune Reference Manual<br>* Neptune System Specifications | All mentioned elements/cards above support both TDM & Ethernet interfaces<br>Please refer answer on point 2.13.1 devices description and support |
| 2.13.18 | Time synchronization | There must be accurate time synchronization to ensure migration of TDM services to the packet network. | | |

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| 2.13.19 | Device synchronization | Device must be synchronized with an external time source or line. | | | NPT1200 - Please refer Neptune reference manual Page 87-88 |
| 2.13.20 | External synchronization input/output | At least 1. | | * Neptune reference manual<br>* Neptune System Specifications | NPT1200 - Please refer Neptune System specifications Page 108<br>NPT1250 - Please refer Neptune reference manual Page 71-72 |
| 2.13.21 | Time and synchronization | Device must support the following time and synchronization protocols and mechanisms:<br>- Sync-E;<br>- IEEE 1588v2 (Master Clock, Boundary Clock, Slave Clock);<br>- NTP;<br>- Integrated Stratum3 level clock. | | | NPT1250 - Please refer Neptune System specifications Page 147<br>NPT1050 - Please refer Neptune reference manual Page 114-115<br>NPT1050 - Please refer Neptune System specifications Page 78 |
| 2.13.22 | Time and synchronization recovery | Device must support the following time and synchronization recovery protocols and mechanisms:<br>- Adaptive Clock Recovery (ACR);<br>- Differential Clock Recovery (DCR). | | * Neptune reference manual | Please refer Neptune reference manual Page 170-173 |
| 2.13.23 | Support for Internet Protocol (IP) versions | Device must support implementation of IP (VPN) services using IPv4 and IPv6 protocol versions. | | * Neptune reference manual | L3VPN/IPv6VPN- Please refer Neptune Reference Manual Pages 291-298 |
| 2.13.24 | IPv4 routing protocols | Device must support the following routing protocols with ability to use different Virtual Routing and Forwarding VRFs:<br>- Static routes;<br>- BGPv4;<br>- OSPFv2 and OSPFv3;<br>- IS-IS. | | * Neptune System Specifications | MCIPS320 - Please refer Neptune System specifications Page 115-122<br>MCIPS300F - Please refer Neptune System specifications Page 153-159<br>MCIPS300 - Please refer Neptune System specifications Page 88-94 |
| 2.13.25 | Conditional Routing | Conditional Routing depending on L3/L4 packet Information. | | * Neptune reference manual<br>* Neptune Secrity General description | Please see Neptune reference manual paragraph 20.12 (Page 309) ACL<br>Please see Neptune Secrity General description paragraph 2.4.2 (Pages 53,54)<br>Please see Neptune reference manual Page 403-404 |
| 2.13.26 | Connection failure detection | Bidirectional Forwarding Detection (BFD) or equivalent functionality capable of detecting connection failed in no less than 50 ms. | | * Neptune reference manual | Please refer Neptune reference manual Page 451-452 |
| 2.13.27 | Total maximum throughput of the device | No less than 60 Gbps. | | | |
| 2.13.28 | Maximum number of IPv4 routes in Forwarding Information Base (FIBs) | At least 100K. | | | |
| 2.13.29 | Number of MAC addresses in device Content Addressable Memory (CAM) table | At least 50K. | | | |
| 2.13.30 | Maximum number of IPv4 routes in Routing Information Base (RIB) table | At least 250K. | | | MCIPS320 - Please refer Neptune System specifications Page 115-122 |
| 2.13.31 | Maximum number of LDPs that can be configured on a device | At least 250. | | * Neptune System Specifications | MCIPS300F - Please refer Neptune System specifications Page 153-159<br>MCIPS300 - Please refer Neptune System specifications Page 88-94 |

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| 2.13.32 | Maximum number of L2VPNs that can be configured on the device | At least 64. | | |
| 2.13.33 | Maximum number of L3VPNs that can be configured on the device | At least 250. | | |
| 2.13.34 | Maximum number of VRFs that can be configured on a device | At least 250. | | |
| 2.13.35 | Maximum number of VLANs that can be configured on a device in a single VRF | At least 1K. | | |
| 2.13.36 | Multicast protocols | Device must support the following or equivalent protocols:<br>- IGMPv1 / v2 / v3;<br>- MLDv1 / v2;<br>- PIM SM. | * Neptune system specifications | 1. Please refer Neptune system specifications Page 286<br>2. Please refer Neptune system specifications Page 290<br>3. Please refer Neptune system specifications Page 291-292 |
| 2.13.37 | Multicast debugging tools | Device must support tools that facilitate multicast switching and routing problems. | *Technical solution design | Please refer Technical solution design document Page 21-22 (Paragraph 3.2) |
| 2.13.38 | MPLS functionality and services | Device must support the following or equivalent protocols:<br>- LDP;<br>- T-LDP;<br>- MP-BGP;<br>- one of Traffic engiineering mechanizms: MPLS-TE, SR, MPLS-TP;<br>- L3VPN (MP-BGP VPNv4);<br>- IPv6 VPN Provider Edge (6VPE);<br>- L2VPN (VPLS, EoMPLS);<br>- VPWS;<br>- IP Loop Free Alternate Fast Reroute (FRR);<br>- IS-IS and OSPF FRR.<br><br>*Note: Suppliers are allowed to use an additional device to implement the L3 MPLS functionality without integrating this functionality into the router node (see Additional Requirements in Section 1.3.29).* | * Neptune system specifications<br>* Neptune Reference Manual | 1. LDP - Please refer Neptune system specifications Pages 289-290<br>2. T-LDP - Please refer Neptune system specifications Pages 128<br>3. MP-BGP - Please refer Neptune system specifications Pages 285<br>4. MPLS-TP,SR- Please refer Neptune Reference Manual Pages 308-321(Paragraph 17 & 18)<br>Page 299-304 MPLS-TP & IP-MPLS Interworking<br>4. L3VPN/IPv6VPN- Please refer Neptune Reference Manual Pages 291-298<br>5.L2VPN - Please refer Neptune Reference Manual Page 459-460<br>6. FRR - Please refer Neptune Reference Manual Page 313 (TI-LFA)<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR)<br>Please refer Neptune system specifications Pages 289<br>7. IS-IS & OSPF FRR- This implementation can be used with both OSPFv2 and IS-IS protocols<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR) |
| 2.13.39 | Logical gateway backup functionality | VRRPv2 / v3 or equivalent with the ability to implement on separate virtual networks (VPNs). | * Neptune reference Manual | VRRP - Please refer Neptune Reference Manual Page 281-282<br>Please refer Neptune Reference Manual Page 460 |
| 2.13.40 | Logical port aggregation functionality | Static LAGs and dynamic LACPs or equivalent protocols for Ethernet ports. | * Neptune reference Manual | LAG - Please refer Neptune Reference Manual Page 386-388<br>Please refer Neptune Reference Manual Page 394-395 |
| 2.13.41 | Operation of logical port aggregation | Ports can be on the same platform, interface card or distributed through different node components. | * Neptune reference Manual | LAG - Please refer Neptune Reference Manual Page 386-388<br>Please refer Neptune Reference Manual Page 394-395 |
| 2.13.42 | Distribution of logical port aggregation | Distributed across different devices port aggregation functionality MLAG must be supporter. | * Neptune reference Manual | MC-LAG - Please refer Neptune Reference Manual Page 387-392 |

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| 2.13.43 | Flexible Quality of Service Architecture | - Classifying inbound traffic;<br>- Developing rules for managing classified traffic;<br>- Creating quality-of-service objects that associate one or more classes with management rules;<br>- Assigning quality of service objects to physical and virtual ports (subinterface) and valid for inbound and outbound traffic;<br>- Prioritizing outgoing traffic;<br>- Outgoing traffic queue congestion control. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.44 | Quality of Service features | - Hierarchical QoS (HQoS) (at least 2 levels);<br>- Calssification of incoming traffic by: port, L3 TOS or DSCP values, MPLS EXP value (for Ethernet WAN ports), source/destination IP address. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.45 | Rules for managing classified traffic | - Maximum throughput;<br>- Rewriting TOS/DSCP values of packets;<br>- Overwriting EXP values of MPLS frames;<br>- Overwriting of TOS/DSCP values of packets depending on whether traffic exceeds set maximum bandwidth;<br>- packet rejection, depending on whether traffic exceeds set maximum bandwidth. | | * Neptune reference Manual<br>* Neptune system specifications | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442<br>Please refer Neptune system specifications page 123-124<br>Please refer Neptune system specifications page 281 |
| 2.13.46 | Bandwidth limitation for incoming / outgoing traffic: | It must be possible to limit the incoming or outgoing traffic on physical port, virtual port (subinterface), source / destination IP address, or by other measures or setting the desired bandwidth limit. | | * Neptune reference Manual | BW is controlled on service level , regardless whether it is physical or logical port, via policer (aggregate or regular or h-policer or combination thereof) . In addition , user can also define shaping . Policers are applied at the ingress , shaping can be defined both for ingress and egress.<br>QOE (Policing)- Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22) |
| 2.13.47 | Queue of outgoing traffic unconditional priority | Ensures queuing priority for outgoing traffic. | | | |
| 2.13.48 | Outbound traffic queue servicing by weights | Provides Weighted Round-Robin Outbound Queue Servicing or equivalent. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.49 | Priority queuing on each physical port | At least 8 queues per port. | | | |
| 2.13.50 | Access Lists (ACL) | Access Lists must be configured according to:<br>- MAC addresses;<br>- IP addresses;<br>- TCP/UDP ports;<br>- ICMP type and code. | | * Neptune reference Manual<br>* Neptune system specifications<br>* Neptune Security General Description | ACL - Please refer Neptune Reference Manual Page 340,403-404<br>Please refer Neptune system specifications Page 118<br>Please refer Neptune Security General Description Page 36-40<br>Please refer Neptune Security General Description Page 53-54 |

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| 2.13.51 | Connections encryption | Proposed device must be able to implement/enable interconnection (MACsec) or discrete MPLS services encryption using AES-128 or higher algorithm without the need to modify or extend equipment components/modules.<br>Encryption functionality is included in a separate Offer line.<br><br>*Note: When implementing an encryption mechanism for individual services in a network, LSR nodes can be interpreted as transit if no encryption is performed on them. In this case, secure control plane protocols must be used in the network to ensure not only the security of the services, but also the security of the communication.* | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 76-83<br>Please refer Neptune Reference Manual Page 206-208<br>Please refer Neptune Reference Manual Page 404-406 |
| 2.13.52 | User authentication methods | Following authentication methods must be ensured:<br>- RADIUS;<br>- Local user base. | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.53 | User Authentication | Local authentication is attempted if other authentication methods fail when a local authentication is added to the authentication queue. | | * Neptune Security General Description<br>* Neptune reference Manual | Please refer Neptune Security General Description Page 42-53<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.54 | Remote Authentication | It must be possible to configure at least 3 remote authentication servers (RADIUS). | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.55 | User Authorization | User authentication using any of the user authentication methods by assigning appropriate profiles must be ensured. User profiles can be configured locally or downloaded using remote authentication. Profiles must consist of a set of commands that user is allowed or denied. | | * Neptune Security General Description | Please refer Neptune Security General Description Page 42-53 |
| 2.13.56 | Device management | Device must be controlled by the following methods or protocols:<br>- Command Line Interface (CLI);<br>- SNMPv2 / v3;<br>- SSHv2;<br>- NETCONF or equivalent protocols or other methods compatible with the proposed Network Management System (NMS) and ensuring device configuration management. | | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page432-434<br>SNMPv2/v3 - Please refer Neptune Reference Manual Page 356<br>SSH2 - Please refer Neptune Reference Manual Page 403,407<br>NETCONF - Please refer Neptune Reference Manual Page 424-427,457 |
| 2.13.57 | Secure file transfer | Device must be capable of transferring operating system and configuration through a secure SCP or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 408 |
| 2.13.58 | Information exchange protocol | LLDP (Link Layer Discovery) or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 357 |
| 2.13.59 | Transmission of logs | Device is running Syslog protocol. | | * Neptune System Specifications | Please refer Neptune System specifications page 112<br>Please refer Neptune System specifications page 82<br>Please refer Neptune System specifications page 151 |

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| 2.13.60 | Operations, Administration and Maintenance (OAM) | Device runs 802.3ah and 802.1ag or equivalent OAM protocols. | * Neptune reference Manual | Please refer Neptune Reference Manual Page 343-344 (Paragraph 21 OAM Page 243-357) |
| 2.13.61 | Traffic monitoring features | One of the following or equivalent traffic monitoring functions must be provided:<br>- NetFlow;<br>- IPFIX;<br>- sFlow.<br><br>Note: Traffic monitoring functionality shall be provided on a separate offer line. | * Neptune reference Manual | Please refer Neptune Reference Manual Page 353-355 (Paragraph 21 OAM Page 243-357) |
| 2.13.62 | Autonomous operation | All functionality and network reservation and quality assurance mechanisms must be able to be activated and operated without the use of external control software or network management system. | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page 432-434<br>LCT - Please refer Neptune Reference Manual Page 431<br>EMS- Please refer Neptune Reference Manual Page 428-430<br>NMS - Please refer Neptune Reference Manual Page 417-423<br>Note : Configuration can be done via CLI where LCT,EMS,NMS are providing comftobale and easy remote managment in addtion to this NETCONF/Yang |
| 2.13.63 | Unit height in rack | No more than 8U.<br><br>Note: requirements applied to the height of active equipment including additional equipment reffered to clause 2.13.9, passive panels installed in accordance with the requirements of clauses 2.13.11, 2.13.12 may be interpreted as additional and installed in adjacent cabinets or in other free units in the same cabinet (if there are any). | * Neptune reference Manual | Please refer Neptune reference manual Page 83<br>Please refer Neptune reference manual Page 68<br>Please refer Neptune reference manual Page 111 |
| 2.13.64 | Mounting accessories | Device is ready (with necessary accessories) for installation in a 19-inch equipment cabinet. | * Neptune reference Manual | Please refer Neptune reference manual Page 84 |
| 2.13.65 | Electric power supply set | Device power supplies are complete with appropriate cables selected for the project. | BOM | Power cable include in BOM |
| 2.13.66 | Console connection cable | No less than 12 devices shall be equipped with a console or out-of-band connection cable. | BOM | Console cables included in BOM |
| 2.13.67 | Equipment documentation | Equipment documentation in English is available on the manufacturer's website. | | https://ribboncommunications.com/ |
| 2.13.68 | Licenses | Device must be accompanied by all necessary licenses required to activate all required services and functionality. | BOM | All requested licenses included in BOM |
| 2.13.69 | Warranty | Offered equipment and all supplied hardware and software components must be under warranty service either by equipment manufacturer or by an authorized service representative.<br>Warranty service must include free repair and replacement of defective components.<br>For additional warranty repair and maintenance requirements, see Section 4.12 of the Technical Specification. | Ribbon - ECI's Standard Warranty Terms Litrail<br>Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail | Please refer Ribbon - ECI's Standard Warranty Terms Litrail<br>Please refer Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail |
| **2.12** | | LER Maršrutizatorius O tipo / O type LER Router | | |

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| 2.12.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | NPT1022 | BOM Critical Infrastructure | Please refer BOM Critical Infrastructure Litral |
| 2.12.2 | Number of 10 Gbps SFP+ interfaces | At least 2 pcs. | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208<br>Please refer Neptune reference manual Page 137-138 |
| 2.12.3 | Number of 1 Gb/s SFP interfaces | At least 8. | | * Neptune reference manual | Please refer Neptune reference manual Page 137-138 |
| 2.12.4 | Of these, the number of encrypted interfaces | At least 2 x 10G interfaces.<br><br>*Note: When offering encryption mechanism for services, licenses must be provided according to the distribution of the required amounts of encrypted interfaces on the boards.* | | * Neptune reference manual | Please refer Neptune reference manual Page 206-208 |
| **2.13** | | **Bendri reikalavimai LER Maršrutizatorius O tipo / General Requirements for LSR Router O type** | | | |
| 2.13.1 | Compatibility | LER routers must be fully compatible with each other and with LSR routers. | | * Neptune reference manual | Please refer Neptune reference manual Page 130-140 |
| 2.13.2 | Device power feed | It must be possible to use 230V AC or 48V DC power supplies.<br><br>*Note: permited to use external AC / DC and / or DC / AC converters.* | | * Neptune reference manual | Please refer Neptune reference manual Page 136 |
| 2.13.3 | Types of installed SFP and SFP+ modules | The combinations of SFP and SFP + type modules installed in the device will depend on the designed device for the respective object. SFP ports must support Base-X and Base-T type modules without restricting one or the other usage (i.e. the interface must allow the use of any type of SFP / SFP + module specified in Annex 1 according to the interface numbers required in this specification). | | * Neptune reference manual | Please refer Neptune reference manual Page 137-138<br>Please refer Neptune reference manual Page 206-208 |
| 2.13.4 | Konsolės arba out-of-band prievadų skaičius | No less than 1. | | BOM | Console cables included in BOM |
| 2.13.5 | Time synchronization | There must be accurate time synchronization to ensure  migration of TDM services to the packet network. | | | |
| 2.13.6 | Time and synchronization | Device must support the following time and synchronization protocols and mechanisms:<br>- Sync-E;<br>- IEEE 1588v2;<br>- NTP. | | * Neptune reference manual | Please refer Neptune reference manual Page 135 |
| 2.13.7 | Support for Internet Protocol (IP) versions | Device must support implementation of IP (VPN) services using IPv4 and IPv6 protocol versions. | | * Neptune System Specificationsl | Please refer Neptune System Specifications Page 62-68 |
| 2.13.8 | IPv4 routing protocols | Device must support the following routing protocols with ability to use different Virtual Routing and Forwarding VRFs:<br>- Static routes;<br>- OSPFv2 and OSPFv3;<br>- IS-IS. | | * Neptune System Specificationsl | Please refer Neptune System Specifications Page 62-68 |

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| 2.13.9 | Conditional Routing | Conditional Routing depending on L3/L4 packet Information. | | * Neptune reference manual<br>* Neptune Secrity General description | Please see Neptune reference manual paragraph 20.12 (Page 309) ACL<br>Please see Neptune Secrity General description paragraph 2.4.2 (Pages 53,54)<br>Please see Neptune reference manual Page 403-404 |
| 2.13.10 | Connection failure detection | Bidirectional Forwarding Detection (BFD) or equivalent functionality capable of detecting connection failured in no less than 50 ms. | | * Neptune reference manual | Please refer Neptune reference manual Page 451-452 |
| 2.13.11 | Total maximum throughput of the device | No less than 30 Gbps. | | * Neptune reference manual | Please refer Neptune System Specifications Page 62-68 |
| 2.13.12 | Maximum number of IPv4 routes in Forwarding Information Base (FIBs) | At least 10K. | | | |
| 2.13.13 | Number of MAC addresses in device Content Addressable Memory (CAM) table | At least 10K. | | | |
| 2.13.14 | Maximum number of L2VPNs that can be configured on the device | At least 10. | | | |
| 2.13.15 | Maximum number of L3VPNs that can be configured on the device | At least 20. | | | |
| 2.13.16 | Maximum number of VRFs that can be configured on a device | At least 10. | | | |
| 2.13.17 | Maximum number of VLANs that can be configured on a device | At least 250. | | | |
| 2.13.18 | Multicast protocols | Device must support the following or equivalent protocols:<br>- IGMPv1 / v2 / v3;<br>- MLDv1 / v2;<br>- PIM SM. | | * Neptune system specifications | 1. Please refer Neptune system specifications Page 286<br>2. Please refer Neptune system specifications Page 290<br>3. Please refer Neptune system specifications Page 291-292 |
| 2.13.19 | MPLS functionality and services | Device must support the following or equivalent protocols:<br>- LDP;<br>- T-LDP;<br>- one of Traffic engiineering mechanizms: MPLS-TE, SR, MPLS-TP;<br>- L3VPN;<br>- L2VPN (VPLS, EoMPLS);<br>- VPWS;<br>- IP Loop Free Alternate Fast Reroute (FRR);<br>- IS-IS and OSPF FRR. | | * Neptune system specifications<br>* Neptune Reference Manual | 1. LDP - Please refer Neptune system specifications Pages 289-290<br>2. T-LDP - Please refer Neptune system specifications Pages 128<br>3. MP-BGP - Please refer Neptune system specifications Pages 285<br>4. MPLS-TP,SR- Please refer Neptune Reference Manual Pages 308-321(Paragraph 17 & 18)<br>Page 299-304 MPLS-TP & IP-MPLS Interworking<br>4. L3VPN/IPv6VPN- Please refer Neptune Reference Manual Pages 291-298<br>5.L2VPN - Please refer Neptune Reference Manual Page 459-460,20 - VPWS<br>6. FRR - Please refer Neptune Reference Manual Page 313 (TI-LFA)<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR)<br>Please refer Neptune system specifications Pages 289<br>7. IS-IS & OSPF FRR- This implementation can be used with both OSPFv2 and IS-IS protocols<br>Please refer Neptune Reference Manual Page 370-373 (LDP-FRR) |

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| 2.13.20 | Logical gateway backup functionality | VRRPv2 / v3 or equivalent with the ability to implement on separate virtual networks (VPNs). | | * Neptune reference Manual | VRRP - Please refer Neptune Reference Manual Page 281-282<br>Please refer Neptune Reference Manual Page 460 |
| 2.13.21 | Logical port aggregation functionality | Static LAGs and dynamic LACPs or equivalent protocols for Ethernet ports. | | * Neptune reference Manual | LAG - Please refer Neptune Reference Manual Page 386-388<br>Please refer Neptune Reference Manual Page 394-395 |
| 2.13.22 | Distribution of logical port aggregation | Distributed across different devices port aggregation functionality MLAG must be supporter. | | * Neptune reference Manual | MC-LAG - Please refer Neptune Reference Manual Page 387-392 |
| 2.13.23 | Flexible Quality of Service Architecture | - Classifying inbound traffic;<br>- Developing rules for managing classified traffic;<br>- Creating quality-of-service objects that associate one or more classes with management rules;<br>- Assigning quality of service objects to physical and virtual ports (subinterface) and valid for inbound and outbound traffic;<br>- Prioritizing outgoing traffic;<br>- Outgoing traffic queue congestion control. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.24 | Bandwidth limitation for incoming / outgoing traffic: | It must be possible to limit the incoming or outgoing traffic on physical port, virtual port (subinterface), source / destination IP address, or by other measures or settings the desired bandwidth limit. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.25 | Outbound traffic queue servicing by weights | Provides Weighted Round-Robin Outbound Queue Servicing or equivalent. | | * Neptune reference Manual | QOE - Please refer Neptune Reference Manual Page 354-365 ( Paragraph 22)<br>Please refer Neptune Reference Manual Page 442 |
| 2.13.26 | Priority queuing on each physical port | At least 8 queues per port. | | | |
| 2.16.27 | Access Lists (ACL) | Access Lists must be configured according to:<br>- MAC addresses;<br>- IP addresses;<br>- TCP/UDP ports. | | * Neptune reference Manual<br>* Neptune system specifications<br>* Neptune Security General Description | ACL - Please refer Neptune Reference Manual Page 340,403-404<br>Please refer Neptune system specifications Page 118<br>Please refer Neptune Security General Description Page 36-40<br>Please refer Neptune Security General Description Page 53-54 |

| | | | | * Neptune reference Manual | Please refer Neptune Security General Description Page 76-83<br>Please refer Neptune Reference Manual Page 206-208<br>Please refer Neptune Reference Manual Page 404-406 |
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| 2.13.28 | Connections encryption | Proposed device must be able to implement/enable interconnection (MACsec) or discrete MPLS services encryption using AES-128 or higher algorithm without the need to modify or extend equipment components/modules.<br>Encryption functionality is included in a separate Offer line.<br><br>*Note: When implementing an encryption mechanism for individual services in a network, LSR nodes can be interpreted as transit if no encryption is performed on them. In this case, secure control plane protocols must be used in the network to ensure not only the security of the services, but also the security of the communication.* | | * Neptune reference Manual<br>* Neptune Security General Description | |
| 2.13.29 | User authentication methods | Following authentication methods must be ensured:<br>- RADIUS;<br>- Local user base. | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.30 | User Authentication | Local authentication is attempted if other authentication methods fail when a local authentication is added to the authentication queue. | | * Neptune Security General Description<br>* Neptune reference Manual | Please refer Neptune Security General Description Page 42-53<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.31 | Remote Authentication | It must be possible to configure at least 3 remote authentication servers (RADIUS). | | * Neptune reference Manual<br>* Neptune Security General Description | Please refer Neptune Security General Description Page 51-53<br>Please refer Neptune Reference Manual Page 403<br>Please refer Neptune Reference Manual Page 405-406 |
| 2.13.32 | Device management | Device must be controlled by the following protocols or methods:<br>- Command Line Interface (CLI);<br>- SNMPv2 / v3;<br>- SSHv2;<br>- NETCONF or equivalent protocols or other methods compatible with the proposed Network Management System (NMS) and ensured device configuration management. | | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page432-434<br>SNMPv2/v3 - Please refer Neptune Reference Manual Page 356<br>SSH2 - Please refer Neptune Reference Manual Page 403,407<br>NETCONF - Please refer Neptune Reference Manual Page 424-427,457 |
| 2.13.33 | Secure file transfer | Device must be capable of transferring operating system and configuration through a secure SCP or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 408 |
| 2.13.34 | Information exchange protocol | LLDP (Link Layer Discovery) or equivalent protocol. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 357 |
| 2.13.35 | Transmission of logs | Device is running Syslog protocol. | | * Neptune System Specifications | Please refer Neptune System specifications page 60 |
| 2.13.36 | Operations, Administration and Maintenance (OAM) | Device runs 802.3ah and 802.1ag or equivalent OAM protocols. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 343-344 (Paragraph 21 OAM Page 243-357) |

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| 2.13.37 | Traffic monitoring features | One of the following or equivalent traffic monitoring functions must be provided:<br>- NetFlow;<br>- IPFIX;<br>- sFlow.<br><br>*Note: Traffic monitoring functionality shall be provided in separate line of offer.* | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 353-355 (Paragraph 21 OAM Page 243-357) |
| 2.13.38 | Autonomous operation | All functionality and network reservation and quality assurance mechanisms must be able to be activated and operated without the use of external control software or network management system. | | * Neptune reference Manual | CLI - Please refer Neptune Reference Manual Page 432-434<br>LCT - Please refer Neptune Reference Manual Page 431<br>EMS- Please refer Neptune Reference Manual Page 428-430<br>NMS - Please refer Neptune Reference Manual Page 417-423<br>Note : Configuration can be done via CLI where LCT,EMS,NMS are providing comftobale and easy remote managment in addtion to this NETCONF/Yang is availiable |
| 2.13.39 | Unit height in rack | No more than 2U. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 130 |
| 2.13.40 | Mounting accessories | Device is ready (with necessary accessories) for installation in a 19-inch equipment cabinet. | | * Neptune reference Manual | Please refer Neptune Reference Manual Page 131 |
| 2.13.41 | Electric power supply set | Device power supplies are complete with appropriate cables selected for the project. | | BOM | Power cable include in BOM |
| 2.13.42 | Equipment documentation | Equipment documentation in English is available on the manufacturer's website. | | | https://ribboncommunications.com/ |
| 2.13.43 | Licenses | Device must be accompanied by all necessary licenses required to activate all required services and functionality. | | BOM | All requested licenses included in BOM |
| 2.13.44 | Warranty | Offered equipment and all supplied hardware and software components must be under warranty service either by equipment manufacturer or by an authorized service representative.<br>Warranty service must include free repair and replacement of defective components.<br>For additional warranty repair and maintenance requirements, see Section 4.12 of the Technical Specification. | | Ribbon - ECI's Standard Warranty Terms Litrail<br>Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail | Please refer Ribbon - ECI's Standard Warranty Terms Litrail<br>Please refer Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail |
| **3.** | | | **Tikslaus laiko šaltinis / Precise Timing Source** | | |
| 3.1 | Device manufacturer, name and model (manufacturer's number (code)) | Manufacturer, name and model of device, models of bundled interface cards (manufacturer's number / code). | TP4100 | BOM | Please refer BOM Critical Infrastructure Litral |
| 3.2 | High availability | Proposed device must be of modular design, ensuring high availability with redundant management and interface cards.<br><br>*Note: A cluster of multiple devices may be used to implement this requirement.* | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 1 |

| 3.3 | Network synchronization | The newly installed time synchronization equipment must provide the physical interfaces required for the time synchronization of the newly installed network equipment and TDM services (required interface types are determined by the Supplier). | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 1 |
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| 3.4 | Supported applications | The following time synchronization applications must be supported:<br>- Enhanced primary time clock (ePRTC);<br>- Primary time clock (PRTC);<br>- 1588v2 PTP grandmaster/boundary/slave clock ;<br>- GNSS receiver and PRC/PRTC;<br>- NTP server. | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 1 |
| 3.5 | Additional interfaces | In order to ensure compatibility with the Customer's existing equipment, additional interfaces must be provided for synchronization:<br>- no less than 2 x E1 (120 Ω);<br>- no less than 2 x Ethernet (SyncE, 1588v2, NTP). | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 1 |
| 3.6 | Number of power supplies installed in device | No less than 2 of 48V DC power supplies. | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 1 |
| 3.7 | User authentication methods | Following authentication methods must be ensured:<br>- RADIUS;<br>- Local user base. | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 3 |
| 3.8 | Device management | Device must be controlled by the following protocols<br>- SNMPv2 / v3;<br>- SSHv2;<br>- HTTPS. | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 9 |
| 3.9 | Unit height in rack | No more than 2U. | | Time Provided 4100 Release 2.2 | Please refer Time Provided 4100 Release 2.2 Page 8 |
| 3.10 | Equipment documentation | Equipment documentation in English is available on the manufacturer's website. | | https://www.microsemi.com/product-directory/carrier-grade-ntp-ptp-ieee-1588-grand-masters/4422-timeprovider-4100#overview | https://ww1.microchip.com/downloads/en/DeviceDoc/00003802.pdf |
| 3.11 | Licenses | Device must be accompanied by all necessary licenses required to activate all required functionality. | | BOM | Licenses included in BOM critical Infrastructure |

| 3.12 | Warranty | Offered equipment and all supplied hardware and software components must be under warranty service either by equipment manufacturer or by an authorized service representative.<br>Warranty service must include free repair and replacement of defective components.<br>For additional warranty repair and maintenance requirements, see Section 4.12 of the Technical Specification. | | Ribbon - ECI's Standard Warranty Terms Litrail<br>Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail | Please refer Ribbon - ECI's Standard Warranty Terms Litrail<br>Please refer  Ribbon - ECI's Maintenance Services Description Packges & SLA Litrail |