**Annex 1 to the tender documentation**

Public procurement: “CESNET - Precision time distribution elements”

**Technical parameters and requirements**

For all relevant points in this Annex, please indicate whether the offer meets them (yes/no). If additional information beyond the yes/no answer is required, this shall be included in the text of the relevant requirement.

For requirements, the supplier may also refer to a specific place in the offer where the parameter can be verified (e.g. attached product datasheet, etc.).

CESNET as the Czech NREN operates own optical network and provides accurate time and frequency to its partners and customers. Our primary time sources are atomic clocks traceable to the national approximation of the UTC time scale. We intend to deploy new infrastructure for time and frequency distribution based on the White Rabbit technology distribution elements, that will be deployed in geographically distributed locations (CZ, AT (Vienna)).

Subject of this public contract is the delivery of 20 pieces of White Rabbit (WR) devices – switches satisfying following parameters.

1. **Requirements for WR switches (precise time distribution elements)**
* 20pc of identical devices

Number of offered devices [pc]:

* Interoperability with Open Hardware White Rabbit switches

Offered devices meet: YES/NO:

* Accuracy of time transfer better than 1 ns once devices are locked

Offered devices meet: YES/NO:

* Basic support for default PTP protocol according to IEEE 1588-2019

Offered devices meet: YES/NO, number of ports:

* Support for unrestricted PTP protocol according to IEEE 1588-2019 on at least two delivered devices (in case of required license, it shall be transferable to any of supplied devices)

Offered devices meet: YES/NO, number of ports:

* Low jitter functionality, i.e. device use precise phase comparator and stable ovenized oscillator

Offered devices meet: YES/NO

* 10 MHz and 1 PPS inputs for external reference with standardized connectors e.g. SMA

Offered devices meet: YES/NO, specify type of connectors:

* 10 MHz and 1 PPS outputs with standardized connectors e.g. SMA

Offered devices meet: YES/NO, specify type of connectors:

* At least 10 available SFP interfaces compatible with valid SFP standards – the supplier shall provide the list of these SFP standards

Offered devices meet: YES/NO, number of ports and specify SFP standards:

* All SFP interfaces are configurable in either master or slave WhiteRabbit mode

Offered devices meet: YES/NO:

* All SFP interfaces must be compatible with DWDM SFP modules working in both C and L bands (participant will specify standards that the SFP transceivers must meet or provide list of compatible SFP transceivers),

Offered devices meet: YES/NO, specify SFP standards or list of compatible transceivers:

* At least 4 SFP ports must allow simultaneous use of Class 3 power consumption type transceivers without limiting of available/usable SFP ports

Offered devices meet: YES/NO, number of ports

* Support for monitoring of operational parameters at all SFP ports (e.g. temperature, TX/RX power, link state)

Offered devices meet: YES/NO

* Fully documented method of user calibration of every SFP port and optical path available to customer (availability under NDA is acceptable)

Offered devices meet: YES/NO

* Possibility of configuring multiple time sources, including redundant master WR and 1PPS+10MHz with automatic fail-over algorithm. Two master WR signals are the intended use at most sites. Requested is resilience against occasional optical line flapping - the device has to synchronize without the operator intervention when optical connection is again stable.

Offered devices meet: YES/NO

* Standard 19" rack mountable design capable of continuous operation in a hot and cold aisle system and maximum height is 2U (rack units)

Offered devices meet: YES/NO

* Redundant hot-swap power supply, AC 230V or 48 V DC option, all units will be delivered with two AC power supplies

Offered devices meet: YES/NO

* At least dedicated 1x Ethernet (RJ-45) port for remote device management over IP network

Offered devices meet: YES/NO

* Local console for device setup via USB or RJ-45 port

Offered devices meet: YES/NO

* Remote device configuration (at least Web/HTTPS and CLI/SSHv2) and monitoring (SNMPv3, and another advanced protocol, e.g. REST API, RESTCONF, or NETCONF)

Offered devices meet: YES/NO, type of advanced protocol

* External authentication and authorization using RADIUS/TACACS+

Offered devices meet: YES/NO

* Remote logging to syslog server

Offered devices meet: YES/NO

* Internal firewall/ACL at least to limit access to management protocols in IP address/prefix basis

Offered devices meet: YES/NO

* In case any of required parameters are subject of a license, all necessary licenses shall be included in the offer and licenses must not be time limited (perpetual).

Offered meets requirement: YES/NO

1. **Warranty and related services**

The parameters of the warranty and related services required by the contracting authority are set out in the contracting authority's terms and conditions - in the binding draft of the Purchase Contract (Annex 2 of the tender documentation).

1. **Testing of the samples - devices (before conclusion of the contract)**

The selected supplier will be obliged, before conclusion of the contract, to provide at least two samples of WR devices to run tests by the contracting authority. Applicants can nominate a representative to participate in these tests. Testing will take a maximum of 15 working days from submitting of the samples.

Within the tests, the contracting authority will mainly verify the following functionalities/parameters. However, the contracting authority also reserves the possibility to verify any other parameter required in the tender documentation (in this annex).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Tested parameter | Test result* OK
* Limited functionality
* Not functional
 | Comment |
| 1 | power supply hot swapping |  |  |
| 2 | remote configuration and monitoring of operational status |  |  |
| 3 | connection of multiple sources of input timing signal (multiple WR signals and RF signal 10MHz and 1 PPS) |  |  |
| 4 | connection of outputs (WR and RF signal 10MHz and 1 PPS) |  |  |
| 5 | hot swapping of input timing signal as a reaction to discontinued external reference or optical link break |  |  |
| 6 | resilience against occasional optical line flapping - the device has to synchronize without the operator intervention when optical connection is again stable |  |  |
| 7 | DWDM long-range SFP module compatibility (particularly DWDM channels 6-9) |  |  |
| 8 | verification of suggested calibration method |  |  |