TECH NOTE :: IEEE1588:2008 PTP*v2*-Switches and Grandmaster Clocks

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Intro

The Precision Time Protocol (PTP or also PTPv2) is with IEEE1588:2008 an internationally standardized network-based time synchronization communication protocol that can be used to synchronize clocks of different device types, providing time accuracy in the sub-microsecond range. **PTPv2** is based on Ethernet. Compared to NTP, PTPv2 is embedded in the physical layer and thus a true hardware-based time stamping for precise time synchronization of all participants in an Ethernet network. This TECH NOTE shows available and tested PTP components together with HBM equipment and can be used as reference source giving you some recommendations.

HBM devices supporting PTP

The following HBM DAQ devices support PTP
- QuantumX / SomatXR MX modules (UDP over IPv4 / IPv6 and IEEE 802.3 (Ethernet) with either P2P or E2E)
- SomatXR CX23 (only supports UDP over IPv6 and only E2E)
- GENESIS Highspeed (UDP over IPv4 and E2E)

Ethernet PTP Switches

The following basic characteristics are necessary in selecting a PTPv2 switch:
- Support of IEEE1588:2008 (PTPv2)
- Transparent Clock (TC)
- Hardware time stamping
- Delay mechanism: End-To-End (E2E) or Peer-To-Peer (P2P)
- Network transport mechanism : UDP IPv4, UDP IPv6 (required for SomatXR CX23-R) or IEEE 802.3 (Ethernet)

Manufacturer	HBM	Siemens	Hirschmann	Rockwell	
Name	**EX23-R**	**Scalance XR324-12M**	**RSP20, MACH1000**	**Stratix 5400**	
Character	Ruggedized 10-30 V DC supply, IP65/IP67, shock proof	Rack-size, 24 V DC,	DIN-rail or rack 48-320 VDC or 88-265 VAC	DIN-rail 24..60 V DC, 10 A 100..240V AC, 2 A	
No. of ports	10 Gigabit M12 8 Pin x-coded (5 with PoE)	up to 16 ports (el. or optical)	Up to 11 ports, 3 x SFP slot 8 x RJ45 100 Mbit	up to 20 ports (el. or optical)	
Delay Mechanism	E2E/P2P	E2E/P2P	E2E/P2P	E2E	
Network Transport Mechanism	UDP IPv4, UDP IPv6	UDP IPv4	UDP IPv4	UDP IPv4	
Hardware time stamping	yes	yes	yes	yes	
Transparent Clock	yes	yes	yes	yes	
Further Info	All HBM PTP devices	All HBM PTP devices (without CX23)	All HBM PTP devices (without CX23)	All HBM PTP devices (without CX23)	

Other switches, available in the market but not tested:
- MOXA: PT-7728-PTP Rack Type Switch (E2E/P2P,hardware time stamping and transparent clock)
- MOXA: EDS-405A-PTP Series (E2E/P2P,hardware time stamping and transparent clock)
- LANTECH: IPES-3416 DSFP DIN-rail(E2E/P2P, hardware time stamping and transparent clock)

Ethernet PTP Grandmaster Clocks

Integrating a grandmaster clock in the network is <u>not</u> a must as PTP offers a "best clock" mechanism. But in some applications absolute clock information makes sense or is necessary.

- Meinberg: LANTIME M600 - IEEE 1588-2008 Grandmaster Clock (GPS based)
    - o System design: rack mounted solution, 110 – 230 V AC supply, 6 ports in total (RJ45)
- Omicron: OTMC 100 (integrated GPS)
    - o System design: small, for outdoor installations (IP67, 24 V DC supply, -40°C … +70°C / -40°F ... +158°F)

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