Net.Sync is synchronization appliance configurable as PTP grandmaster or slave clock that can monitor and measure timing services. It can also prequalify the PTP network and verify the performance of transmission path used by PTP packets.

Datasheet

Updated on 23/10/15

ALBEDO Net.Sync

Net.Sync is a timing distribution and assurance device. Therefore it plays several roles: *1st.* As a synchronization clock it supports full PTP Grand-Master and Slave functionality. *2nd.* As assurance node it monitors the synchro accuracy executing frequency and phase measurements. *3rd.* As a tester it verifies the transmission path followed by the time stamped packets by means of (a) capacity test, (b) quality procedures, and (c) looping back frames to remote appliances. In other words, Critical Timing SLAs implemented in LTE architectures, Power utilities or Factories can be now monitored in-service. When lost of accuracy occurs -or any event detected- alarms can be sent to the surveillance system to assure that ordinary clocks are delivering the timing services correctly while reporting faults to those host that are tracking the accuracy of master clocks.

1. Operation Modes
- PTP Grandmaster Clock (IEEE 1588v2)
- PTP Slave Clock (IEEE 1588v2)
- GNSS Receiver and PRTC
- Synchronization from input ref. to timing output
- Loop back of Frames and packets
- Performance test (IEEE RFC2544)
- Service Activation Methodology (ITU-T Y.1544)

2. Precision Time Protocol (PTP) Profiles
- Default (IEEE 1588v2)
- Frequency Delivery (ITU-T G.8265.1)
- Power Profile (IEEE C37.238-2011)

3. Timing Inputs (Ref. clocks)

3.1 Global Navigation Satellite System (GNSS)
- Built-in GNSS receiver (GPS and GLONASS support)
- Over SMA-F connector

Antenna
- L1 band receiver
- Polarization RHCP
- Frequency: 1573 to 1610 MHz
- DC power supplied + 3v3
- Gain: 27 dB
- Noise: 1.5 dB
- Up to 25 m without amplification

3.2 Oven Controlled Crystal Oscillator (OCXO)
- Built-in quartz crystal
- Short term stability: 0.5 ppb over 0.1 to 30 seconds
- Typical stability: 0,05 ppb over 1 second

3.3 Synchronous Ethernet (SyncE)
- SyncE (ITU-T G.8261, G.8262, G.8264)
- ESMC and SSM decoding
- Double Port 1000BASE-T and 1000BASE-X
- Over RJ45 and SFP connectors

3.4 Precision Time Protocol (PTP)
- PTP Clock (IEEE 1588v2)
- Double Port 1000BASE-T and 1000BASE-X
- Over RJ45 and SFP connectors

3.5 Pulse Per Second / Time of Day (PPS / ToD)
- 1 x PPS
- 1 x ToD with NMEA format
- Over RJ45 and BNC connectors

3.6 Building Integrated Timing Supply (BITS)
- E1, 2048 kbit/s, 2048 kHz
- T1, 1544 kbit/s, 1544 kHz
- Over RJ45 and BNC connectors

3.7 External Clock
- 10 MHz (over RJ45 and BNC connectors)

4. Timing Outputs
- PTP Clock IEEE 1588v2 (over RJ45 and SFP)
- Synchronous Ethernet (over RJ45 and SFP)
- E1, 2048 kbit/s, 2048 kHz (over RJ45 and BNC)
- T1, 1544 kbit/s, 1544 kHz (over RJ45 and BNC)
- 1 x PPS (over RJ45)

5. Timing Conversion
- Input Reference to output Signal:

in/out	PTP	SyncE	E1/2MHz	T1/1.5MHz	1xPPS
GNSS	✓	✓	✓	✓	✓
PPS / ToD	✓	✓	✓	✓	✓
OCXO	✓	✓	✓	✓	✓
SyncE	✓	✓	✓	✓	✓
PTP	-	✓	✓	✓	✓
BITS	✓	✓	✓	✓	✓
10MHz	✓	✓	✓	✓	✓

6. Timing Accuracy
- Locked to GPS: timestamp ± 100 ns
- Holdover mode from PPS to OCXO or Rubidium:

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Metric	OCXO	Rubidium
Phase < ±1.5 μs	1 hour	24 hour
Phase < ±5.0 μs	4 hour	72 hour
Phase < ±10.0 μs	12 hour	120 hour
Frequency < 16 ppb	1 month	5 year

7. Timing Quality and Assurance

7.1 Operation
- Generation / Decoding of PTP - IEEE 1588-2008
- Operation as Ordinary Clock
- Master / Slave operations, ability to force Slave role
- Transparent operation in pass-through mode

7.2 Protocol state
- Port state, best master clock, master identity
- Grandmaster: identity, BMC priorities, clock class, accuracy, clock variance, time source

7.3 PTP Counts & statistics
- Sync, Delay req, Delay resp, Peer delay req, Peer delay res, Follow up, Peer delay res. follow up, Announce, Signaling, Management
- Sync delay: current, max, min, avg, st-dev, range
- Sync delay variation: current, max, avg
- Sync inter arrival time: min, max, avg, current
- Delay request: current, max, min, avg, st-dev, range
- Round trip delay: current, mean
- Correction field: current, max, avg

7.4 PTP Sync Floor Delay Population
- Floor delay packet metric as specified in ITU-T G.8260
- Floor packet count (FPC): min and current
- Floor packet rate (FPR): min and current
- Floor packet percent (FPP): min and current
- Configurable Pass / Fail threshold

7.5 PTP Wander Analysis
- Time Interval Error (TIE): according to ITU-T G.8260 pktfilteredTIE
- Max. Time Interval Error (MTIE): according ITU-T G.8260 pktfilteredMTIE
- Time Deviation (TDEV): according to ITU-T G.8260 pktfilteredTDEV

7.6 SyncE Analysis
- Line frequency, offset, drift (ITU-T O.174)
- Wander measurements TIE / MTIE / TDEV (ITU-T O.172 clause 10)
- Sinusoidal wander generation (ITU-T O.174 Amendment 1 sections)
- QL in SSM decoding (ITU-T G.781)

7.7 Asymmetric Delay Analysis
- Latency test assisted by GNSS
- One-way delay measurement
- Two-way delay measurement

8. Automatic Transmission Tests

8.1 RFC 2544
- Throughput, Frame-loss, Latency, Back-to-back, Recovery
- Asymmetric RFC based on Ethernet and IP RMP

8.2 Y.1564
- Ethernet service activation
- Eight / four services (color / not) CIR, EIR, max, throughput
- FTD, FDV, FLR, availability objectives

8.3 Port Loopback
- Layer 1-4 loopback with Filtering conditions
- MPLS loop control
- Loop controls for broadcast and ICMP

9. Frame Analysis
- Modes: One-way (port A - A), two-way (port A - B)
- Separate statistics for Port A / B, Tx / Rx, Filter

9.1 Ethernet Statistics
- Counts: Ethernet, VLAN, IEEE 802.1ad, Q-in-Q, Control, Pause, IEEE 1588
- Frames: unicast, multicast, broadcast
- FCS errors, Undersized, Oversized, Fragments, Jabbers
- Frame Size: gruped in segments

9.2 MPLS Statistics
- MPLS stack size: max, min

9.3 IP Statistics
- Packet counts: IPv4 packets, IPv6 packets
- Packet counts: unicast, multicast and broadcast
- UDP packets, ICMP packets
- IPv4 checksum errors, IPv6 checksum errors

9.4 Bandwidth Statistics
- Current, max, min, avrg (Tx / Rx, Port A / B)
- Unicast, multicast and broadcast counts
- IP and UDP statistics

9.5 SLA Statistics
- Delay (FTD): current, min, max, mean
- Delay variation (FDV or jitter): current, min, max, mean
- Reordering: Out-of-order, Duplicated count and ratio
- Loss (FLR): count, ratio
- Availability: SES count, PEU, PEA

9.6 BER
- Count, seconds, ratio and pattern loss secs at layer 1-4

9.7 Network Exploration
- Top talkers: 25 most popular MAC / IPv4 / IPv6 addr
- Top C-VID and S-VID: 25+25 most popular tags
- Automatic setup of 8 filtering blocks

10. Network Interfaces

10.1 1000BASE-X
- 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX, 100BASE-FX, 1000BASE-T, 100BASE-TX, 10BASE-T
- Over optical and electrical SFPs
- On / Off laser control

10.2 1000BASE-T
- 1000BASE-T, 100BASE-TX, 10BASE-T
- Over RJ-45 connectors

10.3 Auto-Negotiation
- Bit rate: 10 Mbit/s, 100 Mbit/s, 1 Gbit/s
- Master and Slave roles in the 1000BASE-T
- Disable auto-negotiation, force line settings

11. Frames and Packets

11.1 Ethernet MAC
- Formats: DIX, IEEE 802.3, IEEE 802.1Q, IEEE 802.1ad
- Jumbo frames up to 10 kB
- Sour / Dest MAC address setting
- Type / Length Setting
- Enable / Disable VLAN and Q-in-Q modes
- VLAN VID / User Priority setting
- S-VLAN VID, DEI, PCP, C-VLAN VID, User Priority
- FCS errors insertion

11.2 Internet Protocol
- Sour / Dest IPv4 address setting
- Dest. MAC address by hand or ARP
- DSCP CoS labels, TTL and transport protocol
- IP checksum errors insertion

Protocols
- ARP, DHCP, DNS, Ping, Trace route

MPLS
- MPLS generation / analysis
- Double label stack support
- TTL exp, label fields

12. Platform

12.1 Ergonomics
- Size 223 x 144 x 65 mm
- Weight: 1.0 kg (with rubber boot, one battery pack)
- 4.3 inch TFT colour screen (480 x 272 pixels)

12.2 Graphical User Interface
- GUI controlled by Touch-screen, Keyboard or Mouse

- Direct configuration and management in graphical mode
- User interface by touch-screen, keyboard and mouse
- Full remote control with VNC
- Configuration up/down through Internet, USB and SNMP
- Local management with CLI
- Full remote control: SNMP, SSH, VNC

12.3 Results

- Local storage in txt and pdf files
- File transfer to SD card and USB port
- File management through web interface and SNMP

12.4 Board

- 2 x USB ports
- 1 x RJ45 port
- 2 x LEDs
- Software upgrade through USB port

12.5 Batteries

- Li Ion Polymer
- Up to 22 hours of operation in E1 (with two packs)
- Up to 10 hours of operation in Ethernet (with two packs)

12.6 Operational Ranges

- IP rating: 54
- Operational range: -10ºC to +50ºC
- Storage range: -20ºC to +70ºC
- Operation humidity: 5% - 95%

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