TimeProvider 4100
Gateway Clock
TimeProvider 4100 – Gateway Clock

MULITPLE INPUTS
- GNSS
- 1PPS 10 MHz
- 1PPS ToD
- PTP
- E1/T1
- Core PTP
- GM Network Redundancy
- Extended Holdover (Rb)

DISTRIBUTES TIMING FLOWS
- NTP
- 1PPS ToD
- 1PPS 10 MHz
- E1/T1
Under the Hood
Flexible – E1/T1, 1GbE, Electrical, Optical

4x E1/T1

8x ETH
2x RJ-45
6X SFP
Product – Physical Outline

- GNSS
- Power A DC
- 4 E1/T1 Ports RJ48c 120 Ohm
- 8 ETH ports (6 SFP + 2 RJ45)
- Craft Port RS232
- Power B DC
- 16 x E1/T1/2.048Mhz/1.544Mhz Out
- Internal Expansion RJ48c
- 2 x 1pps/10Mhz In/Out
- 2 x E1/T1/2.048Mhz/1.544Mhz In/Out (programmable)
- 2 x E1/T1/2.048Mhz/1.544Mhz Out with SSU function
- 2 x 1pps/TsD In/out
- 1 x Packet Ethernet In + Management (with SyncE) - 1 x RJ45 or 1x SFP cage. Either in-band Mgmt. or Out-of-band.
- 6 x packet Ethernet Out (with SyncE) - 1 x RJ45 and 5 x SFP cage
## Hardware Description

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecom Rack</td>
<td>1U, 300mm depth maximum</td>
</tr>
<tr>
<td>Power</td>
<td>DC – dual input</td>
</tr>
<tr>
<td>Oscillator choice</td>
<td>Standard oscillator on main PCB, Mini-OCXO Factory options – OCXO and Rubidium</td>
</tr>
<tr>
<td>GNSS Support</td>
<td>GPS, Glonass and Galileo QZSS, SBAS Beidou with specific antenna kit</td>
</tr>
<tr>
<td>SyncE</td>
<td>SyncE input – each PTP client port SyncE output - any other port maximum 2 SyncE inputs</td>
</tr>
</tbody>
</table>
New Architecture – Futureproof “Plumbing”

Leading with new technology adoption
Fanless Device
Benefits for product evolution

No Rotation
No Moving Parts
Passive heat sinks
Multiple Constellations
Base Units – Many standard features

- PTP
- PRTC
- APTS

- GPS
- Glonass
- Galileo
- Beidou

- Frequency Phase Profiles

- 4 BITS
- 8 ETH
- 2 1pps/ToD
- 2 1pps/10 Mhz

- 64 clients
- 128pps

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# Software Capabilities – PTP, NTP

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>PRTC</td>
<td>Meets ITU 100ns specification</td>
</tr>
<tr>
<td>PTP</td>
<td></td>
</tr>
<tr>
<td>PTP GM - Frequency</td>
<td>Ethernet Default, Default (IPv4 only), Telecom-2008, ITU-G.8265.1</td>
</tr>
<tr>
<td>PTP GM - Phase</td>
<td>ITU-G.8275.1, ITU-G.8275.2</td>
</tr>
<tr>
<td>PTP Input (client) - Frequency</td>
<td>Telecom 2008, ITU-G.8265.1</td>
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<tr>
<td>PTP Input (client) - Phase</td>
<td>ITU-G.8275.1, ITU-G.8275.2</td>
</tr>
<tr>
<td>PTP Input (client)</td>
<td>BMCA and alternate BMCA support</td>
</tr>
<tr>
<td>PTP Profiles - Serving mix of clients</td>
<td>Multiple PTP profiles support for box</td>
</tr>
<tr>
<td>NTP Reflector</td>
<td></td>
</tr>
<tr>
<td>NTPr Support</td>
<td>V4 and V6 NTP reflector - FPGA implementation, more secured, 20,000 tps</td>
</tr>
</tbody>
</table>
Scalability

- 512 PTP clients at 128 pps Unicast
- 515 Total VLANs
  - 512 VLANs GM IPv4 & IPv6
  - 1 VLAN per client (2)
  - 1 VLAN for Management
- 20,000 NTP tps
# Upgrade Options

<table>
<thead>
<tr>
<th>Hardware Option</th>
<th>Upgrade</th>
</tr>
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<tbody>
<tr>
<td>Oscillator – base mini OCXO</td>
<td>OCXO or Rubidium</td>
</tr>
<tr>
<td>Expansion Module</td>
<td>16 ports – E1/T1</td>
</tr>
</tbody>
</table>

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<tr>
<th>Software Option</th>
<th>Upgrade</th>
</tr>
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<tbody>
<tr>
<td>NTPr</td>
<td>NTP reflector license</td>
</tr>
<tr>
<td>PTP Client Scalability – base 64</td>
<td>128, 256, 512 upgrade licenses</td>
</tr>
<tr>
<td>TimePictra Management</td>
<td>Node license</td>
</tr>
</tbody>
</table>
System Expansion – Subtending

- Slave TP4100 & Master TP4100: subtend using TOD I/O
- Doubles port count: 12 x Packet Sync, and 40 x E1/T1 Sync

Master TP4100 - with GNSS - Rb Oscillator
Subtending TP4100 - no GNSS - Standard Oscillator

GNSS Antenna
TOD connection
Reliability, Robustness

Maintain performance levels for a period of time until technicians can re-establish or fix the disruption

Oscillator Choice

Geographical Redundancy

APTS

Bridging Time
Management & Security

TP10 - Full FCAPS

- SNMP
- Internal Log
- Separate Management Port
- SSH
- In band Management
- Firewall

webGUI
Monitoring
Status Dashboard
Monitoring Overview

<table>
<thead>
<tr>
<th>PTP Calculated in TP4100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Error - TE</td>
</tr>
<tr>
<td>Daily path offset average value</td>
</tr>
<tr>
<td>cTE</td>
</tr>
<tr>
<td>Max</td>
</tr>
<tr>
<td>TE threshold alarm</td>
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<table>
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<tr>
<th>1pps</th>
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<tbody>
<tr>
<td>1PPS Input to 4100</td>
</tr>
<tr>
<td>Monitoring - TE</td>
</tr>
<tr>
<td>Daily path offset average value</td>
</tr>
<tr>
<td>cTE</td>
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<tr>
<td>Max</td>
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<td>TE threshold alarm</td>
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Performance Monitoring Summary page

User can start up to 4 parallel Measurements in parallel from the following phase channels.
Monitoring Web-Pages : PTP1/PTP2 Configuration page

Any Single Reference from 7 possible inputs

Measured Parameters: TE, cTE with User Threshold, Max |TE|, FPP1/FPP2 Forward and Reverse Threshold
Real Time Graphing of PTP channels

On time results will be saved including floor measurements.

Results trending on Graph.

Results in 1 sec resolution can be exported to TimeMonitor or 3rd party tools.
TP4100 Strengths Summary

**Flexibility**
- Legacy & New – Frequency, Phase, E1/T1, 1588
- Numerous Ports - 4+16 E1/T1 ports and 8 Ethernet ports
- Expansion – internal module 16xE1/T1

**Scalability**
- 512 1588 PTP Clients at 128 pps, NTP 20,000 tps

**Resiliency**
- Back Up to GNSS – PTP Input, APTS
- Oscillator Options – Mini OCXO, OCXO, Rubidium
- Dual Power

**Evolutative**
- Modern Platform – latest electronics, FPGA, Galileo
- Existing & Future Standards, Trends – 1588 Phase profiles, PRTC compliant

**Feature Rich Base Unit**
- Hardware & Software rich feature set

**Management**
- Sync Portfolio – full FCAPS
- Monitoring – PTP, 1pps, presentation GUI
- SDN model evolution – TimePictra platform
## TP4100 v2 – Summary of main features

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Description</th>
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<tbody>
<tr>
<td>10G ports</td>
<td>4 x SFP+ and additional 4 x SFP</td>
</tr>
<tr>
<td>Redundancy</td>
<td>1:1 software based</td>
</tr>
<tr>
<td>Higher capacity</td>
<td>1,000 or greater</td>
</tr>
<tr>
<td>PRTC-B Demo</td>
<td>PoC of L1/L2 receiver with &lt; 40ns performance</td>
</tr>
<tr>
<td>Dual Active-Active PTP client</td>
<td>Hitless switching for East-West architecture</td>
</tr>
<tr>
<td>Enhanced monitoring</td>
<td>MTIE/TDEV for SyncE and E1/T1</td>
</tr>
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