
# Net.Time Ω flexible time server

*Just in Time*

Net.Time Omega

**Net.Time Ω represents the state-of-the-art in timing as it has been designed to deploy the most precise and secure timing for industrial applications such as Data Centers, Air Traffic Control or the Power Grid.** This clock is tolerant to power, network and sync failures and can be equipped with different output modules to satisfy the needs and facilitate the integration of any type of signals making it ideal in heterogeneous applications.

Accurate and reliable synchronisation is an essential resource to keep the stability and safety in 5G as well as in other relevant sectors of the industry including the Power Grid, Finance, Broadcast, IoT, Automation and the Air / Rail / Road Traffic Control. Timing is so crucial that small perturbations may induce a power blackout, phone call breaks, chaos in airports or cause millions in losses in the stock market. GNSS clocks may satisfy all of these timing needs; however, stand-alone solutions are not reliable as per documented reports demonstrate that interferences degrade GPS performance, while cyber-attacks, jamming and spoofing are real threats. Net.Time Ω contains the latest achievements for timing distribution providing any type of signals with the format, level of accuracy and robustness required by each particular application.

## Flexible, accurate & secure time

Synchronisation quality is more relevant than ever. Signals must be delivered 24/7 minimising all kind of interruptions, wander and phase errors, this is why Net.Time is network fault tolerant by means of supporting PRP protocol, it is time redundant, as it can use up to 10 different input signals, and a configurable double Power Supply.

## Profile & Protocol Translator

Net.Time Ω can be placed at one end of the transmission network and be synchronized with signals such as PTP or NTP after being filtered for possible deficiencies such as asymmetric delays, time errors, even wander to better discipline the internal oscillator. Once locked, Net.Time Ω delivers the right signals to each client in the appropriate format providing the highest level of accuracy.

Net.Time Ω is a great clock for demanding applications thanks to its stable pace and the flexibility to accept a wide variety of references. It is also remarkable the availability of a large number of modules intended to satisfy almost any need for synchronism. It is very unique its ability to translate any timing protocol to become an ideal solution for heterogeneous environments where technologies from different eras must coexist.

ALBEDO

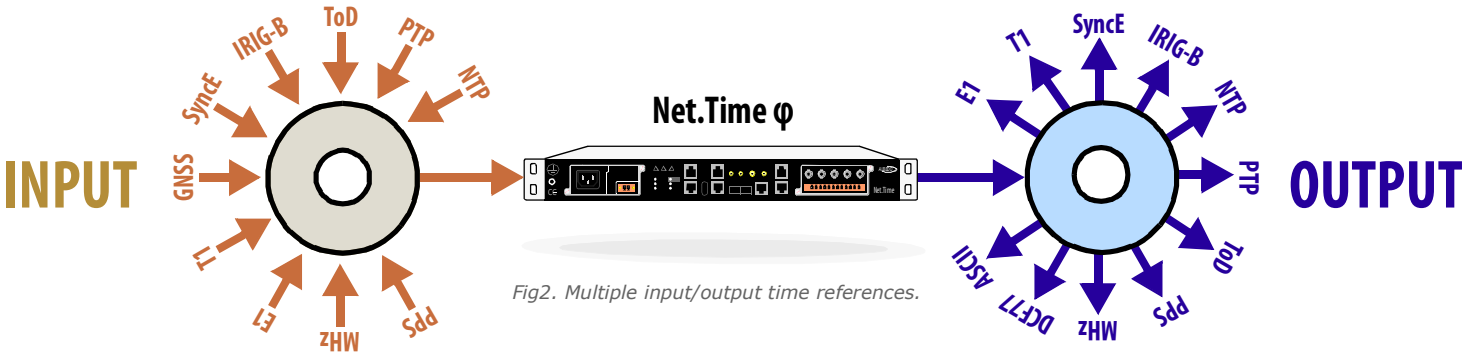



*Fig2. Multiple input/output time references.*

# Applications

At ALBEDO we have more than 25 years of experience as a manufacturer of testers devoted to the verification of synchronisation networks. Our clients are clock Manufacturers, Telecom, Power Utilities, Banks, Railways and Air Traffic Control companies that have always relied on our sophisticated equipment to install and verify the quality of their synchronisation devices and networks. It does not matter if time signals are based on circuits or packets, our xGenius or Zeus testers are always ready to measure the timing quality and identify the sources of degradation. That was the starting point of Net.Time Ω design using the latest available technology and bearing in mind a few, but fundamental, objectives:

1. Simplify the **migration** to PTP architectures starting from legacy signals like NTP, IRIG-B or TDM based.
2. Facilitate the **integration** of different timing architectures offering seamless translations and a wide variety of inputs / outputs that can be used as primary or backup references.

With all the accumulated experience in synchronism, we present Net.Time Ω that has an endless number of outstanding features that position it among the most accurate, reliable and competitive in the market *to keep your network in sync*.

## Aerospace

Time is a key resource in Navigation Systems to ensure the proper functioning. Inherited signals such as IRIG-B, NTP and TDM are still in use but progressively are being replaced by PTP time-stamping systems to provide a unique, accurate and consistent synchronisation based on Net.Time Ω equipped with atomic oscillators disciplined by GNSS and distributed throughout the territory, air traffic control centres and airports.

## Rail, Road traffic control

Railways need timing to manage signalling, information panels, station clocks, railway substations and power supply. The energy demand is in movement and modern trains are also power generators on the move sending it back to the grid. To ensure optimal operation accurate synchronisation is essential being a must at converter stations.

Road transport services require continuous location tracking of the fleet while for autonomous driving require precise timing for control and determine the exact positioning on the road. Interestingly IoT is addressing this niche defining objects like trucks with embedded sensors with PTP timing.

**TCXO, OCXO, Rb, Rb HQ**

## Power Utilities

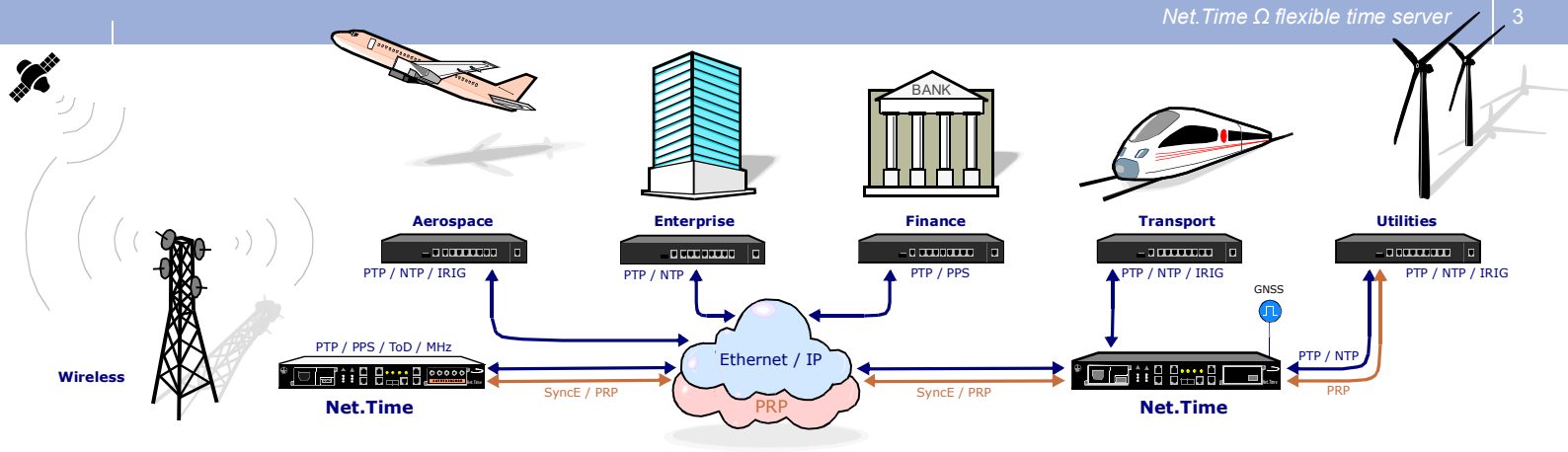
Net.Time Ω provides timing to legacy and newly deployed devices through redundant paths to achieve fail-safe operation while supports all relevant timing distribution and redundant transmission requested by the power grid. ALBEDO' clocks are compliant with IEC 61850 to simplify the transition to the currently standard adopted by the industry which is considered a key enabler of the Smart Grid. The unit supports PTP and NTP over PRP and multiple reference options are possible: GNSS, PTP, NTP, ToD, IRIG-B, PPS, etc. to satisfy all timing needs in each substation. The unit implements Power and Telecom profiles for those grids using both, typically Telecom in the WAN and Power in the substation making on this way easier the integration of the installed plant for perfect control, protection and data acquisition. Net.Time Ω is network fault tolerant by means of PRP, it can operate up to 70ºC and can be assembled with double power supply for redundancy.

## Finance

Banks, Stock exchanges and other Financial institutions are legally committed to register operations with a consistent and accurate time-stamps provided by Net.Time Ω that in this context is disciplined with GPS or PTP to satisfy the mandate of national regulators for highly precision and traceable timing to confirm when any financial operation occurs, including money transfers, currency exchange, credit card payments, stock market operations all must be logged in a chronological manner. According to the European Securities and Markets Authority (ESMA) accurate timing and traceability is imperative to confirm when transactions occur (Directive MiFID 2, since 01/01/18).

## Wireless

This application requires accurate phase and time alignment at the backhaul of the wireless in order to increase the density of clients. Accurate timing is also necessary for reusing the frequencies, to control hand-over, logging the events particularly in those critical wireless applications that control infrastructures.
Net.Time Ω in wireless can be deployed at the edges as Grandmaster to provide a high level of accuracy and protection and also as a client clock.




# About Net.Time Ω

Net.Time Ω uses the latest electronics components for efficient power consumption and uses a built in GNSS receiver to provide a good accuracy to its clients. Alternatively another reference signal can discipline the internal oscillator that can be OCXO or Rubidium in case of more demanding accuracy in mission critical applications particularly in hold-over mode.

## Universal Timing Protocol / Profile Translator

Net.Time Ω is highly stable in any configuration: locked, hold-over even in free running mode thanks to its excellent oscillators and the advanced FPGA assistance that maintains control rooms and operation centres in a good synchronisation state. Net.Time Ω can be configured as Master or Slave clock depending on the application, whilst the Boundary clock configuration promotes GNSS as redundant source of timing and selects PTP as the time protocol reference over the IP network.

### PTP domain

There is no question about the advantages of the PTP protocol because, among other things, it improves precision, flexibility and interoperation. However, nothing happens overnight, and its adoption in Airports, Substations, Base stations and Central Offices will be a gradual process where Net.Time Ω can play an important role facilitating the transition integrating all the devices deployed through the great versatility of interfaces, protocols and profiles. All in the same unit, therefore Net.Time Ω doesn't need protocol translators, profile converters, or RedBox to ensure the coexistence of legacy devices, using IRIG or T1 / E1, and new ones that already have PTP interfaces.

### NTP Time Server

Net.Time Ω can be configured as an NTP server for those enterprises willing to improve the quality of their internal processes where they should stop relying on external sources excessively fluctuating signals, or the poor quality of internal servers that always under risk of introducing errors in the synchronism signal. NTP and PTP can coexist so administrators do not need to choose which one to enable or the installation of a device for each protocol.

## Native PRP clock (DAN-P)

### PRP assurance

Net.Time Ω is a native Parallel Redundancy Protocol DAN-P clock, hence it does not need a RedBox to support PRP, reducing costs and simplifying the system. PTP over PRP in mission critical application offers better accuracy, minimizing wiring and maintenance. Theoretically, any PTP clock could be attached to a PRP-protected network adapting a Redundancy Box (RedBox). However, this is not an optimal solution because it involves deploying a new device adding complexity and price.

❑

### KEY FEATURES

- Modular & Configurable
- Up to 4 Ports 1Gb/s (opt/ele)
- 1,000,000 NTP tracactions/s
- PTP Power, Telecom, Utility
- Up to PTP 1024 unicast clients
- Simultaneous PTP + NTP
- PRP for PTP and NTP
- PTP, NTP, ToD, PPS, T1/E1, SyncE, IRIG-B, MHz, DCF77
- Carrier-class: 2 x Vac / Vdc
- +70ºC fan-less operation
- Rb / OCXO / TCXO oscillator
- RADIUS and TACACS
- Optional Display

### BENEFITS

- Universal Protocol translator
- Universal Profile translator
- Network Fault Tolerant
- Power Fault Tolerant
- Time Fault Tolerant

### APPLICATIONS

- Industrial Grandmaster
- Utility WAN / Substations
- Master / Boundary / Slave
- Data Centers
- Air Traffic Control

| Features | |
|---|---|
| PTP roles | • Grandmaster, Slave, Boundary<br>• Up to 256 unicast clients at 128 packets/sec per port, (1024 clients in total) |
| PTP profiles | • Default profiles (IEEE 1588-2008 Annex J)<br>• PTS / APTS profile (ITU-T G.8275.2)<br>• Utility Profile (IEC 61850-9-3)<br>• Power Profile (IEC C37.238) |
| NTP function | • Port A: NTP server (up to 1 000 000 transactions per second)<br>• MD5 authenticated NTP transactions<br>• NTPv3 (RFC 1305) and NTPv4 (RFC 5905) server and client<br>• SNTPv3 (RFC 1769) server |
| GNSS | • GPS, GLONASS, BeiDou, Galileo, Navic support / Single and Multiple constellation<br>• Single-band and Multi-band support<br>• Jamming and Spoofing detection and mitigation |
| Platform time protocols | • Frequency: 1.0 MHz, 1.544 MHz, 2.048 MHz, 5.0 MHz, 10.0 MHz, 1.544 Mb/s (T1), 2.048 Mb/s (E1), SyncE<br>• Phase: User programmable PPS<br>• Time: PTP, NTP, ToD (ITU-T G.8271, China Mobile, NMEA), IRIG-B (B00X, B12X, B13X, B14X, B15X, B22X), DFC77 |
| Clock Performance | • Rubidium better than ±1.0 e-12<br>• OCXO better than ±1.0 e-12<br>Hold-over<br>• Rubidium: 100 ns @ 10h, 500 ns @ 24h, 1µs @ 48 hours<br>• OCXO: 500 ns @ 2h, 1µs @ 4 h, 10µs @ 24 hours |
| PRP resilience | • PRP extension for IEEE 1588 / IEC 61588<br>• Link Redundancy Entity (LRE) / IEC 62439-3 |
| Ports | • Timing: 4 x SFP, 4 x RJ-45, 1 x SMA: unbalanced 50 Ω, 3 x SMB: unbalanced 50 Ω, 3 x RJ-48: balanced (RS-422) 100 Ω<br>• Control: 2 x RJ45 (Console and Management), USB (Storage) |

| Platform | |
|---|---|
| Operation | • ETSI 1U rack mountable: Dimensions 44 mm x 228 mm x 435 mm (equivalent to 1U in 19" rack), weight: 1.9 kg / 4.2 lb<br>• Fan-less operation, Temperature / Humidity range: -40 ~ +70°C temp. / 0 ~ 95% RH (non condensing)<br>• Redundant power supply (AC, DC, AC+AC, AC+DC, DC+DC) |
| Front/Back Panel | • Display and keyboard. LEDs: Platform (PSU1, PSU2, System), Application (alarm, GNSS, locked), Port (link, activity)<br>• Network and Time interfaces. Management Interfaces. USB software and firmware upgrade |
| Management | • Graphical User Interface for configuration and monitoring based on web server<br>• RADIUS and TACACS+ Access Control<br>• RFC 3164 Syslog event reporting (device role) |

| Modules | |
|---|---|
| RIC 50 | • ST (R1..5): IRIG-B00X, PPS, 1.544 / 2.048 / 5.0 / 10.0 MHz \| BNC (R1..5): IRIG-B00X, PPS, 1.544 / 2.048 / 5.0 / 10.0 MHz<br>• BNC (T1..4): IRIG-B00X, PPS, 1.544 / 2.048 / 5.0 / 10.0 MHz \|BNC (S): IRIG-B1XX, DCF77 |
| RIC 52 | • RJ48(R1..4): IRIG-B00X, ToD (NMEA, G.8271), ASCII (NMEA, Meinberg)<br>• BNC (T1..4): IRIG-B00X, PPS, 1.544 / 2.048 / 5.0 / 10.0 MHz \| BNC (S): IRIG-B1XX), DCF77 |
| RIC 54 | • BNC (R1..4): IRIG-B00X, PPS, 1.544 / 2.048 / 5.0 / 10.0 MHz \| BNC (S): IRIG-B1XX, DCF77 \| TTL (T1..3): IRIG-B00X, PPS<br>• RS232 (V1..2): ASCII \| RS485 (U): IRIG-B00X, ASCII, PPS \| OC (W): PPS, Alarm \| RLY (X): Alarm |
| RIC 56 | • BNC / SMA (R1..5): 10 MHz Sine Wave<br>• BNC / SMA (T1..4): IRIG-B00X, PPS, 1.544 / 2.048 / 5 / 10 MHz square wave, BNC / SMA (T5): IRIG-B or DCF77 |
| RIC 82 | • ST (R1..5): IRIG-B00X, PPS \| BNC (R1..5): IRIG-B00X, PPS \| TTL (T1..3): IRIG-B00X, PPS \| RS232 (V1..2): ASCII (NMEA, Meinberg)<br>• RS485 (U): IRIG-B00X, ASCII (NMEA, Meinberg), PPS \| OC (W): PPS, Alarm (Electronic –MOSFET driver– relay) \| RLY (X): Alarm |
| RIC 84 | • ST (R1..5): IRIG-B00X, PPS \| BNC (R1..5): IRIG-B00X, PPS \| TTL(T1..3): IRIG-B00X, PPS \| OC (U): PPS, Alarm<br>• RS232(V1..2): ASCII \| OC (W): PPS, Alarm (Electro-mechanic relay) \| RLY (X): Alarm (Electro-mechanic relay) |
| RIC 152 | • RJ45 (J, K): PTP, NTP SyncE \| SFP (J, K): PTP, NTP SyncE \| RJ48 (R1..4): IRIG-B00X, ToD / EH90, ASCII (NMEA, Meinberg)<br>• BNC (T1..4): IRIG-B00X, PPS,1.0/ 1.544 / 2.048 / 5.0 / 10.0 MHz \| ST (T1..4): IRIG-B00X, PPS, 1.0/ 1.544 / 2.048 / 5.0 / 10.0 MHz<br>• BNC (S): IRIG-B1XX, DCF77 \| OC (T): PPS, Alarm (Electronic –MOSFET driver– relay) \| RLY (U): Alarm (Electro-mechanic relay) |