We always know what time it is

Sweden trusts Netnod to distribute national time.

1997

Netnod start an NTP service using Rubidium clocks

2014

Netnod start building national time distribution system on assignment from PTS

2020

Network Time Security (NTS) standard becomes RFC 8915

Why a national time distribution system

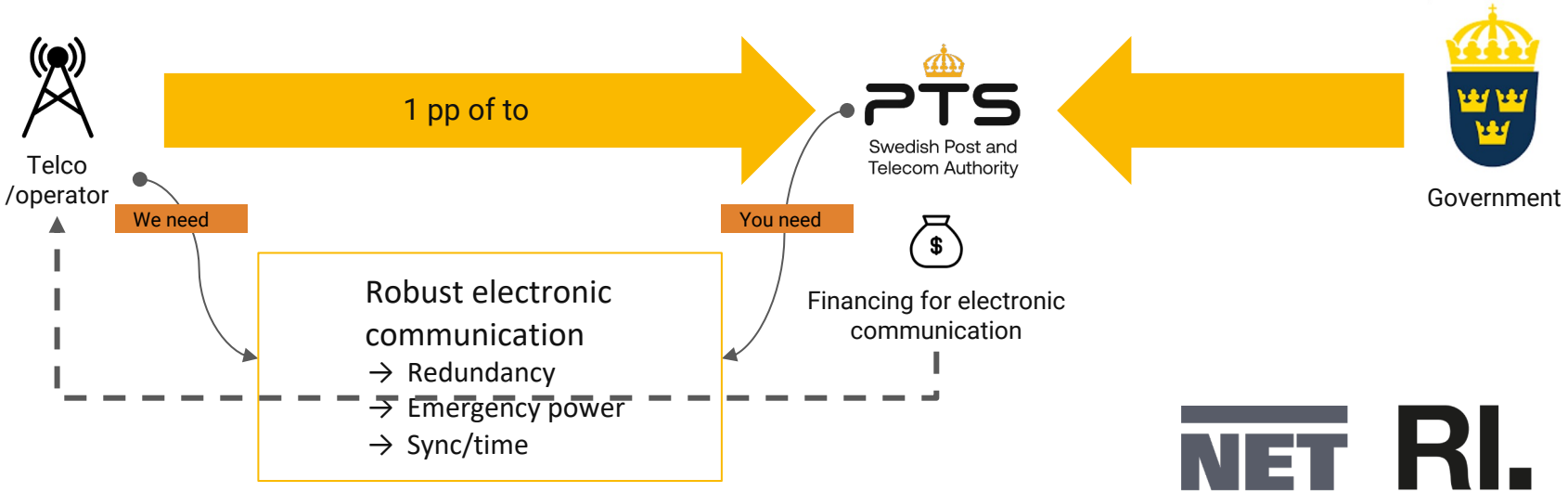
- Citizens and critical community services are dependent on the availability of electronic communications
- Electronic communications have a dependency on correct time and frequency
- Time and frequency distributed by GNSS can be easily spoofed or interrupted

Given these factors we identified a public need which is not delivered by the market

A national time distribution system

- A system without GNSS dependency which, from a national perspective, can guarantee robust and secure time
- The system must be robust and available throughout the country
- The services delivered from the system must be affordable for operators of networks so that the price is not a barrier for use of the services
- The government must have visibility and direct input regarding the infrastructure, which means it must be located in, and operated from, Sweden

Robust finansiering



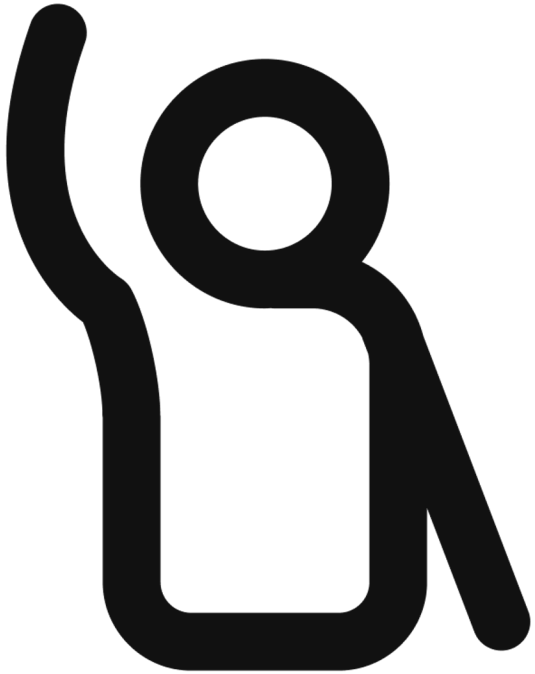
Funding of extraordinary initiatives

- The SGEI regulation (Service of General Economic Interest) is an EU decision which can be an alternative to procurement
- Utilizing SGEI gives PTS and Netnod the opportunity to work in a more long term context
- ISPs in Sweden need redundant and robust time infrastructure as a complement to GNSS to be able to provide electronic communication. This is why PTS stepped in and initiated this initiative.
- State sponsored through what is termed “Robust funding”, which PTS can use to secure critical infrastructure such as time and other infrastructure initiatives.
- For example:
  - Extra cost for establishment of robust fibre as compared to what market is prepared to pay
  - Subsidy for for batteries and generators

How did Netnod and PTS make it happen?

Success factors:

- Transparent cooperation between Netnod and PTS
- Dynamic requirements: in order to succeed a very close cooperation is needed between the parties
- A long term approach to ensure stability in maintenance and development of the service
- Dedicated resources working with the services so that stability and predictability is ensured
- The services delivered from the system must be affordable for network operators so that the price is not a barrier for use and implementation



National distribution of Swedish time

- Sweden has one of the most advanced and secure national time distribution infrastructures in the world
- An excellent example of public/private cooperation
- Main players: Netnod, PTS and RISE
- Benefit: Organisations can ensure they are getting accurate and secure time for free from time servers that ensure low latency and full redundancy.
- Sectors such as telco, energy and finance can use commercial time service with an SLA guaranteeing the highest level of accuracy on market.

Swedish distributed time service

- Operated by Netnod, monitored by RISE and financed by PTS
- 6 time nodes placed in secure bunkers throughout Sweden (Stratum-1 time servers)
- Time traceable to UTC
- Free and commercial service with SLA

NTP service

Connect for free to one of the most advanced and secure NTP services available which also includes…

NTS service

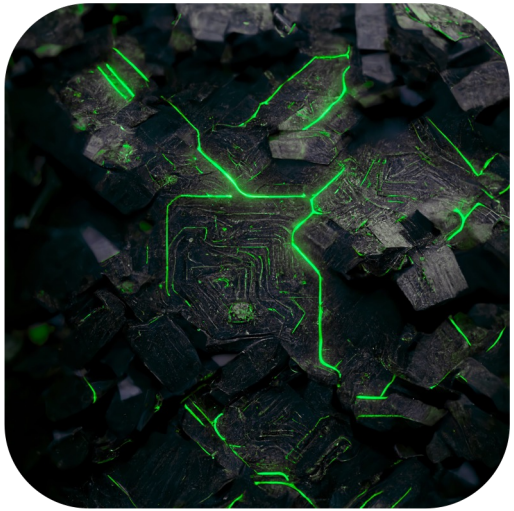
Connect for free to ensure you are receiving secure and accurate time from a trusted source

Netnod PTP

Ensure your network the highest level of accuracy with the most robust, reliable and accurate source of time available without running your own atomic clock.

Netnod Time Direct

Get the most accurate and reliable time available over an IX port with a fully-managed, secure time service that guarantees 30µs accuracy from UTC.

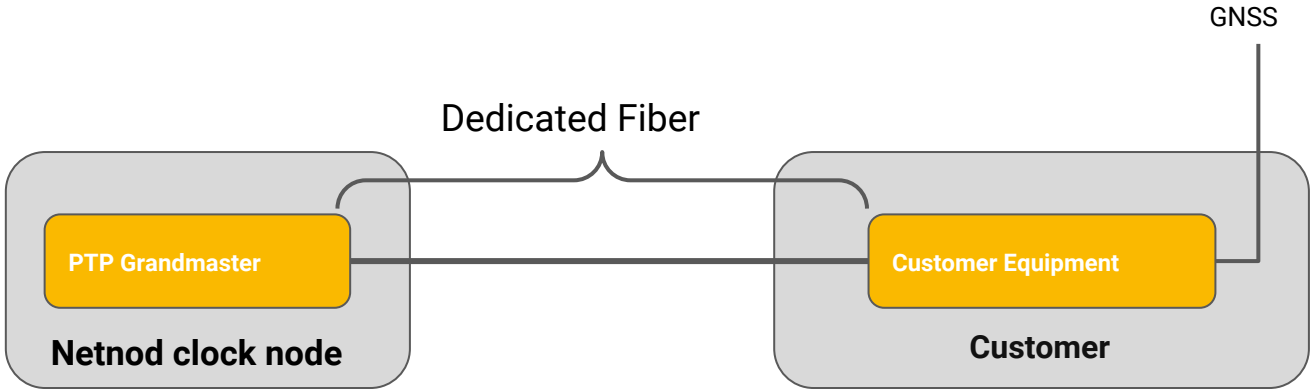


Netnod Time Remote

Get accurate and reliable time securely delivered wherever you are located in Sweden with a guaranteed accuracy of 1ms from UTC.

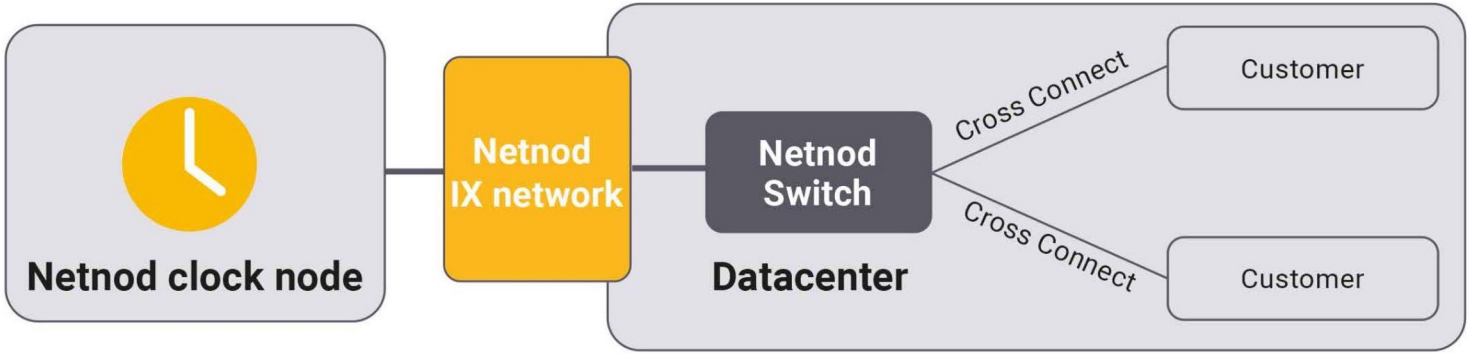
Netnod Time PTP - time-as-a-service

- When extremely high accuracy is required, PTP is the level of choice
- Delivered over a dedicated fibre for predictability and to guarantee ultra high accuracy
- Connected to Netnod´s 6 clock nodes hosted in bunkers at 5 locations in Sweden
- Redundant options available



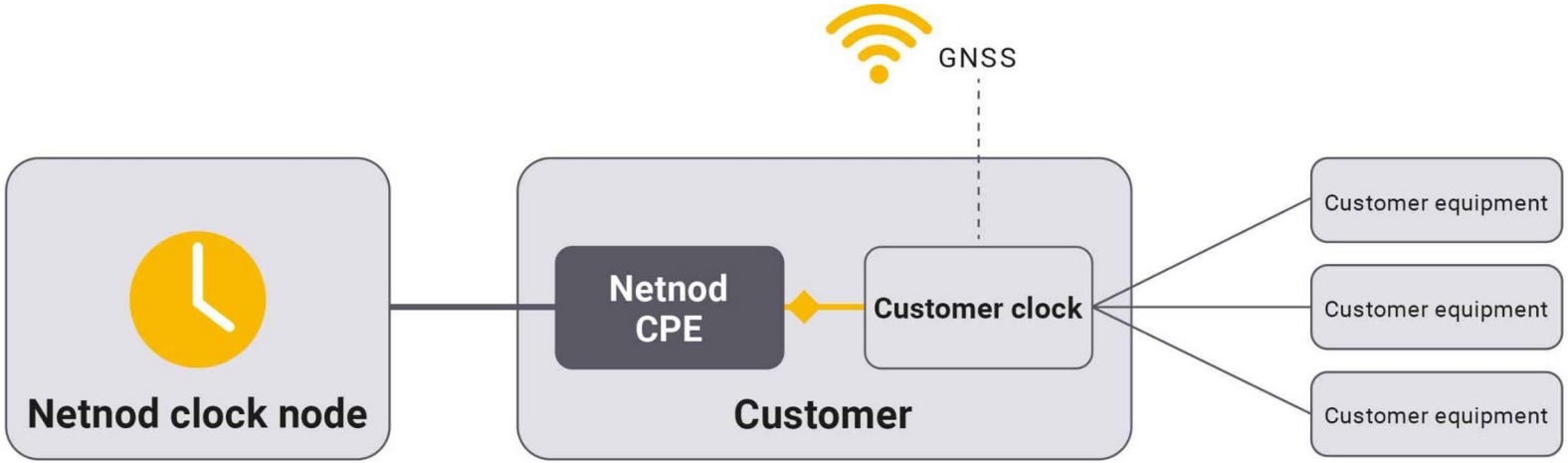
Netnod Time Direct - time-as-a-service

- A fully managed time service with SLA that guarantees 30µs accuracy from UTC
- Delivered over dedicated port or as a separate VLAN on existing IX port
- Redundant options available
- Immediate provisioning and easy integration with current setup



Netnod Time Remote - time-as-a-service

- A fully managed time service with SLA that guarantees 1ms accuracy from UTC
- For remote locations where precis and robust time is crucial
- Customer placed hardware to ensure local robust time
- Delivered over a secure, robust and quality assured VPN connection

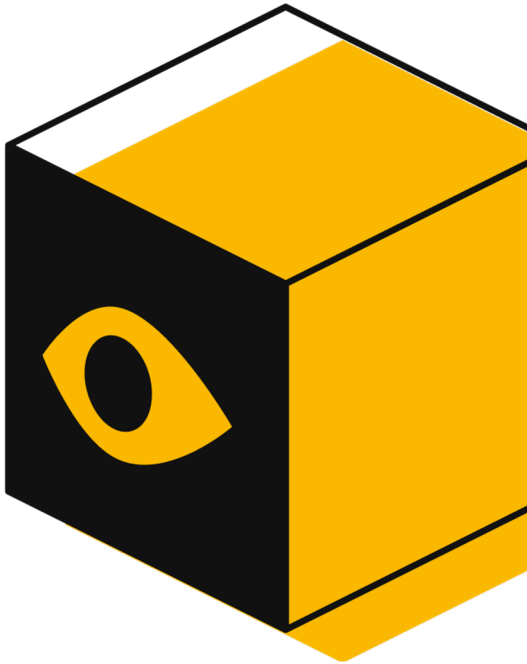


Netnod’s clock nodes - accurate and secure time

- Dual nodes with all critical equipment duplicated for redundancy (2x caesium clocks)
- Dedicated battery backup for all time components
- NTP/NTS servers use a custom-built FPGA-based hardware implementation

Conclusions

- Even if we at Netnod started our first baby steps with NTP back in 1997, establishing Time and Frequency takes time!
- Establishing a national distribution network for T & F demands both heavy investments and sharp brains.
- Private public partnership and cooperation is a huge success factor.
- The customer doesn’t always know what they need.
- Listen to different needs in different sectors and you will find your solution.

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