



A New Hardware Agnostic & Software Open-source Approach to Time Synchronisation for Edge-computing

The Global Leader in Resilient PNT
Providing the world's most critical applications real-time, accurate, reliable positioning, navigation, and timing data.

Safety, Security and Reliability



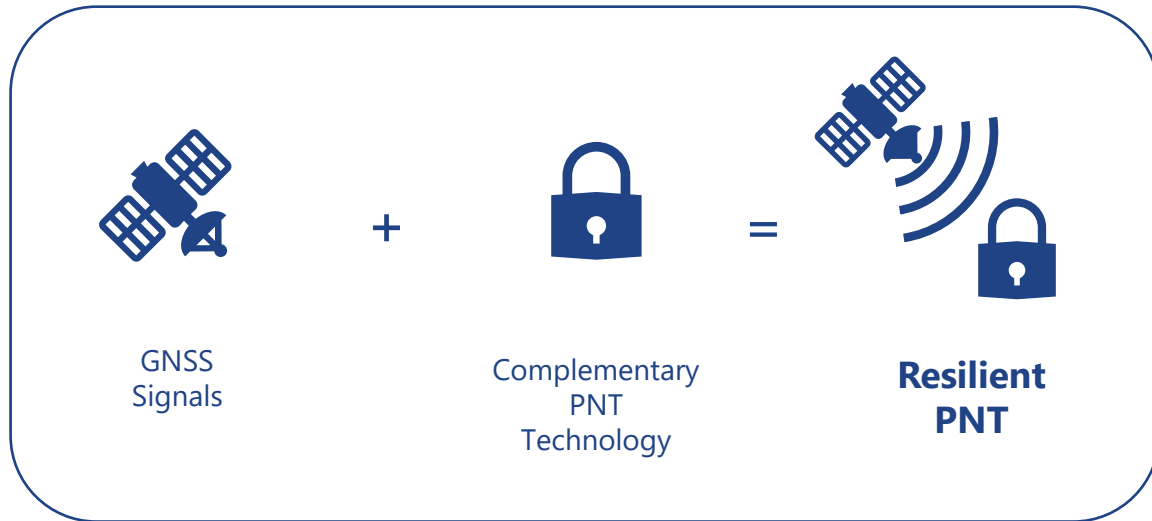
Key Speakers

- Emmanuel Sicsik-Paré
- Jean-Arnold Chenilleau

OROLIA, WORLD LEADER IN RESILIENT PNT

Resilient PNT

At the Core of Mission Critical Applications



In today's world, GNSS signals are not always available or accurate. Orolia makes these signals virtually fail-safe for critical applications in defense and commercial industries worldwide.

With robust, accurate GNSS-based systems and proven technologies, Orolia is the world leader in Resilient Positioning, Navigation and Timing (PNT) solutions.

Time and Location You Can Trust™



A NEW APPROACH TO TIME SYNCHRONIZATION
FOR EDGE COMPUTING

A RECIPE FOR DATACENTERS

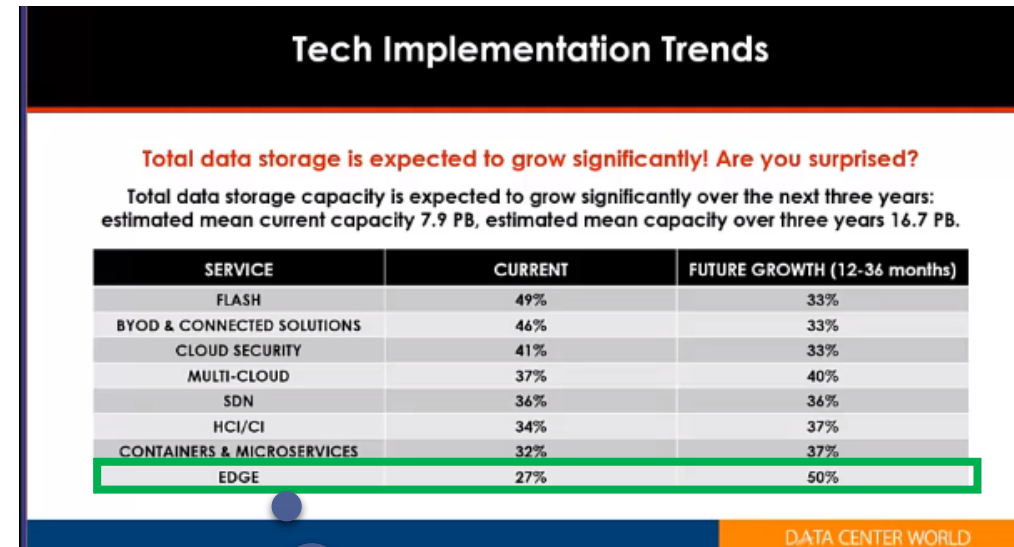
- Time & Sync not easy to deploy in DC
- GM contain networking functionality, accuracy and industry specifications (PTP profiles, package format)
- Divide the three components and drive on the trends
- Timing card responsible only for the accuracy part and very scalable

Benefits of deploying Time & Sync in DC

- **Nanosecond-level clock sync** enables a new spectrum of timing and delay critical applications in DCs
- **Compute burden** will go down
- **Network traffic** will go down
- 3-fold improvement on the **distributed Database Throughput**
- It can also be **applicable in Enterprises**

With the ART card

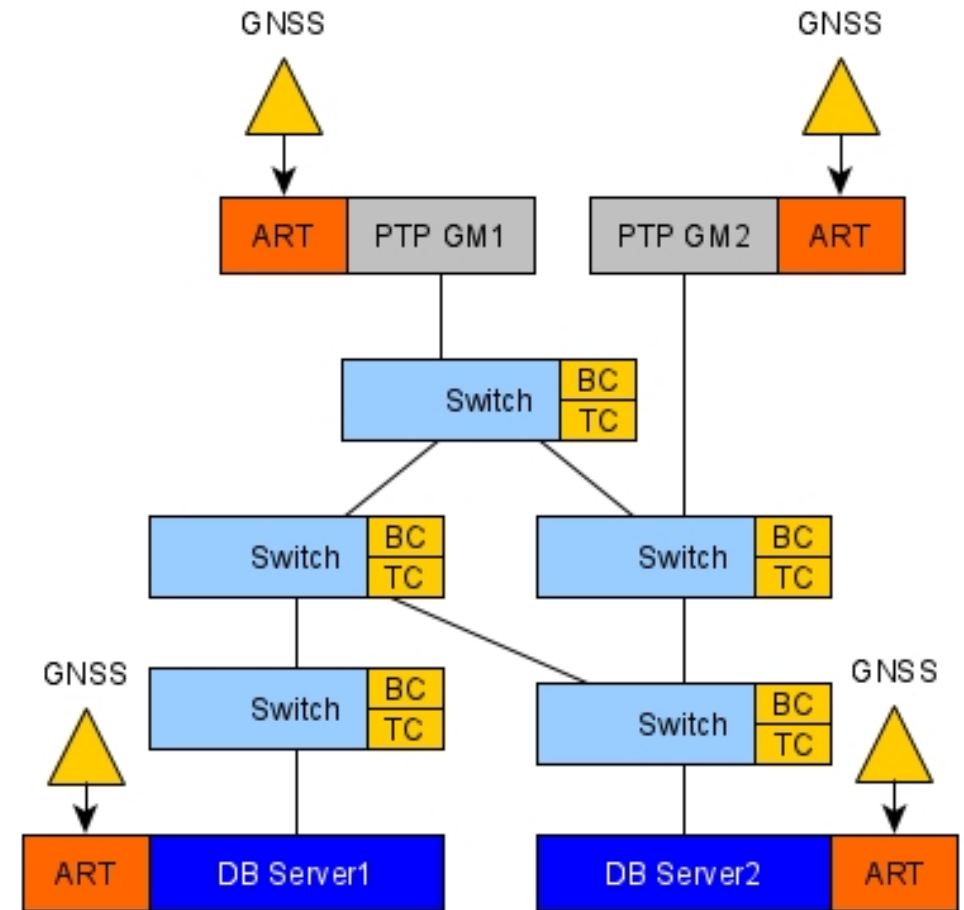
- The **addition in H/W is very low** and **everything scales up** very easily
- Refreshment cycles are getting shorter
- **(Cyber)Security** is handled directly by the customer /no source code with it
- **Time synchronisation** can be achieved in more and more locations with higher performance expectations



Early indications show Edge data centers will support **IoT, autonomous vehicles** and move content **closer to users**, with **5G networks** supporting much higher data transport requirements.

CHANGING THE DESIGN OF TIME ORIENTED NETWORKS

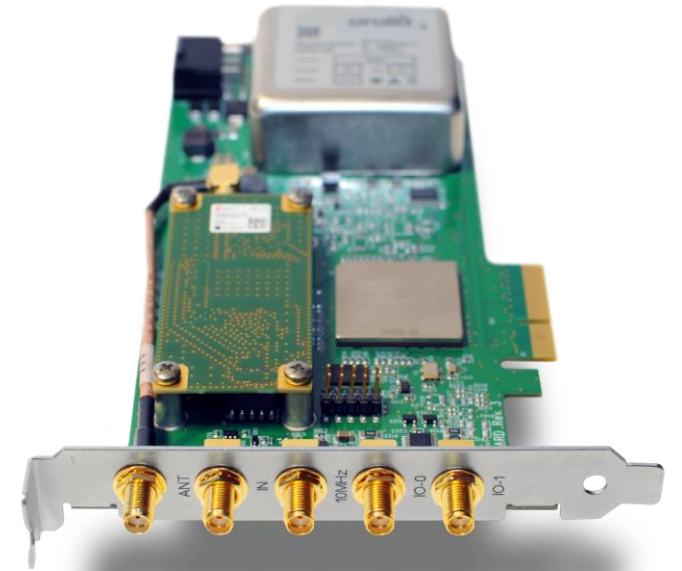
- Atomic time is usually provided by PTP Grand Masters using GNSS as UTC reference
- PTP GM implements an atomic clock to backup GNSS in case of failures (RFI and other security issues)
- Time is cascaded to DB Server through standard network using PTP
- Complexity and resiliency of network architecture can introduce dissymmetrical path delays and therefore PTP accuracy issue
- ART Card can bring Atomic Time Reference directly to DB Servers.



AN OPEN SOURCE – FUTURE PROOF PROJECT

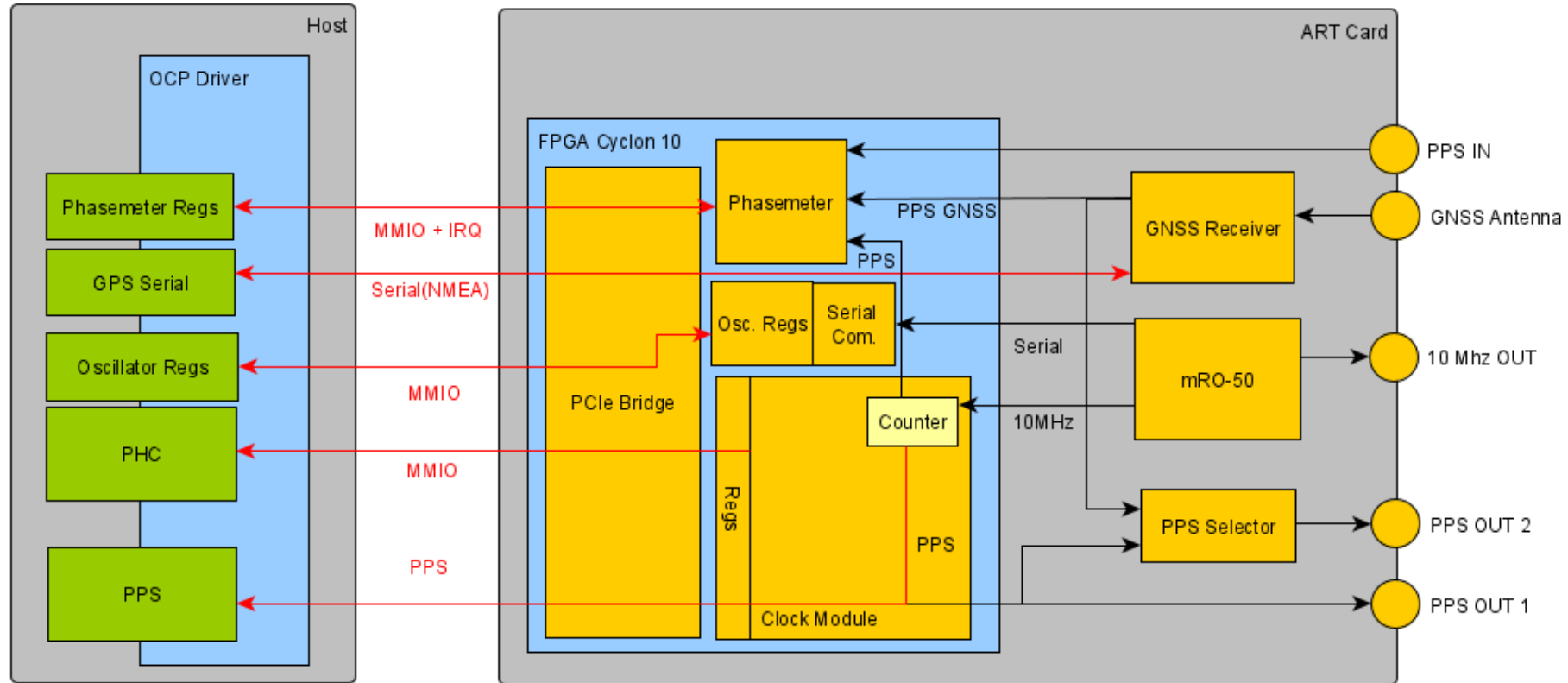
- Game changer, bringing the accuracy of a rubidium clock to any computer/server
- Full integration of the initial customer in the design and testing process
- Secure by design : no hidden firmware or code running
- Hardware evolves quickly, software even quicker

- mRO-50 oscillator
- PCIe x4 format
- Multi-frequency, multi-constellation Timing GNSS receiver from ublox
- A software suite to monitor the board and discipline the oscillator
- 1PPS and 10MHz In & Out



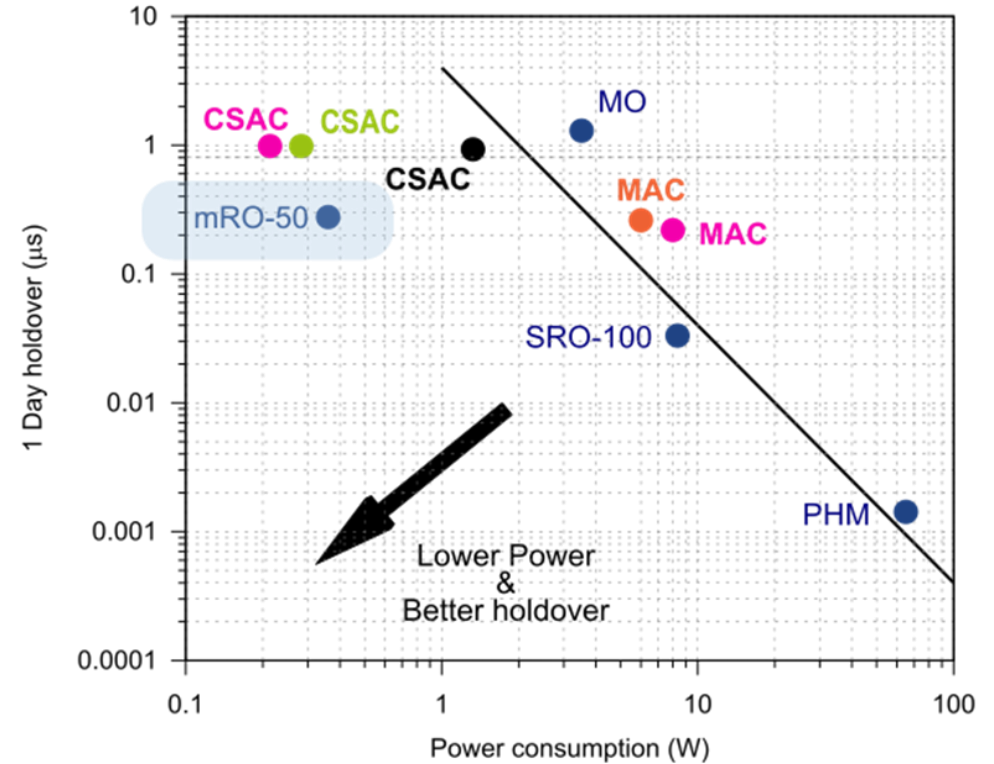
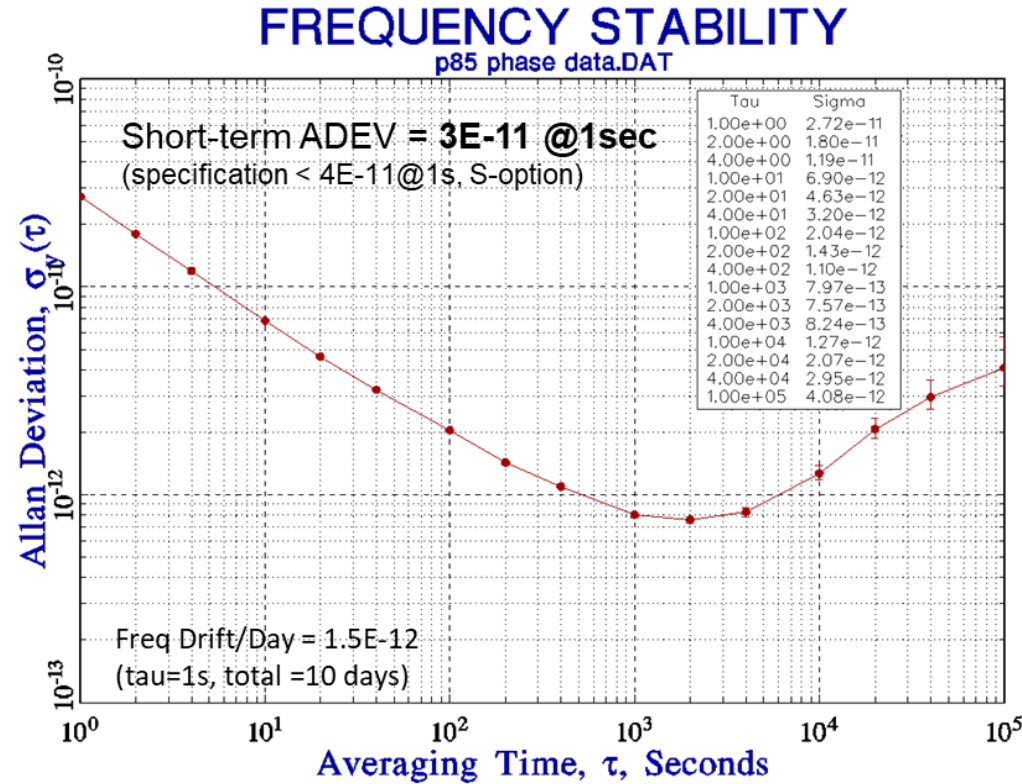
Join the project !

DESIGN ELEMENTS



- « Hardware-free » architecture : main functionalities are software (driver, monitoring, disciplining)
- Only Phasemeter and serial bridge are in FPGA => futureproofness
- Goal is to minimize obsolescence of the hardware part

mRO-50 : FREQUENCY STABILITY AND HOLDOVER PERFORMANCE



mRO-50 was selected as best fit
Key tradeoff : form factor, power consumption vs holdover capability

PERFORMANCE

- Holdover performance : time offset close to 400ns after 24h
- Disciplining on GNSS Source : +/- 10ns

