



Jagged Little (Sync) Pill

Enabling installed based networks for accurate phase delivery and assurance

Nir Laufer , Senior Director PLM , Oscilloquartz

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This presentation will not be about Alanis Morissette iconic Album...

Sync challenges

Network operators

- Require to deliver accurate phase for LTE-TDD/LTE-A/5G
- Existing networks/NE don't support PTP /GNSS
- Cost of upgrading/replacing existing networks is high and will take time

Equipment vendor

- Have a large portfolio including legacy products which don't support PTP/GNSS
- Find it hard to follow the GNSS rapid technology enhancements (GPS->GNSS-> Multi band GNSS)
- Sync is a "problem" just need to be "solved"



Jagged Little (Sync) Pill

Imagine we could have a Jagged Little Sync Pill...

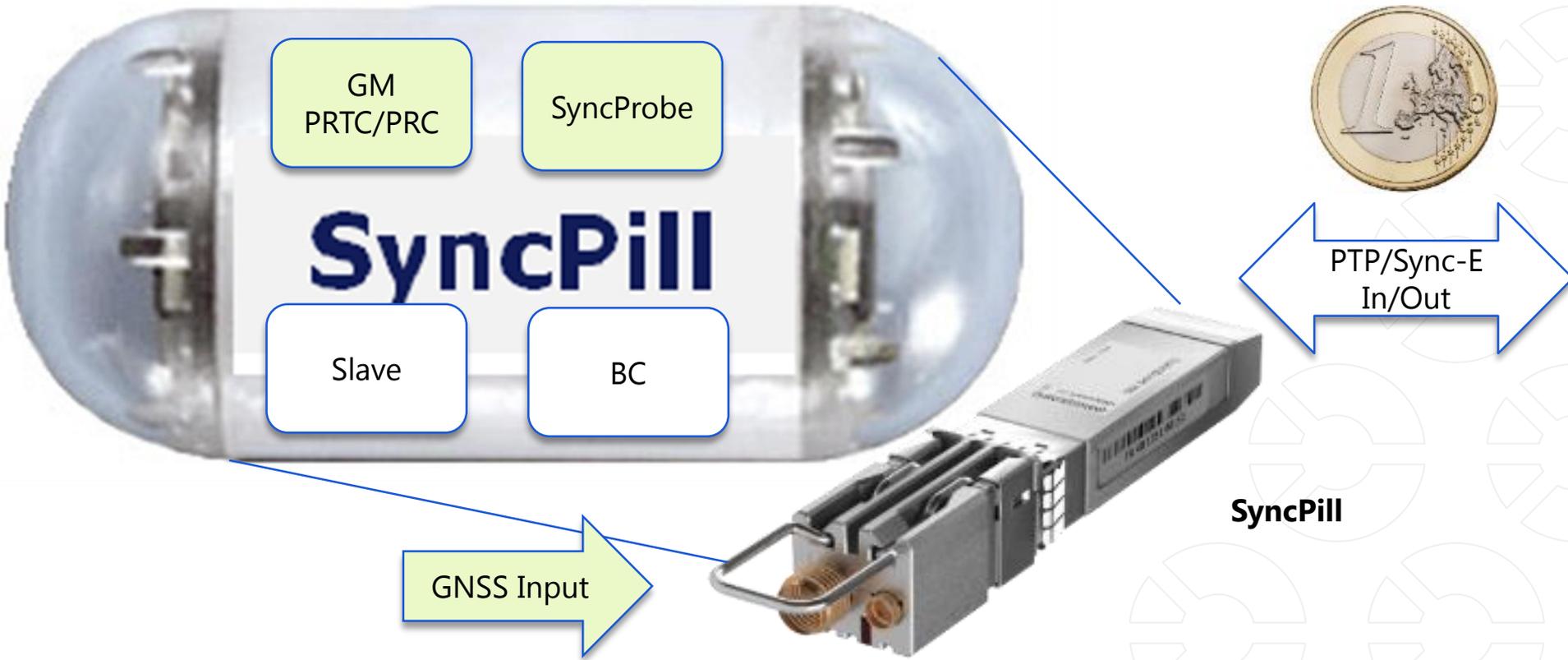


A pill a network element can swallow wherever an accurate frequency & phase is needed ...



A pill a network element can swallow wherever a sync probing & assurance is needed...

SyncPill Example ...



The Game of the Day : Find the SyncPill...

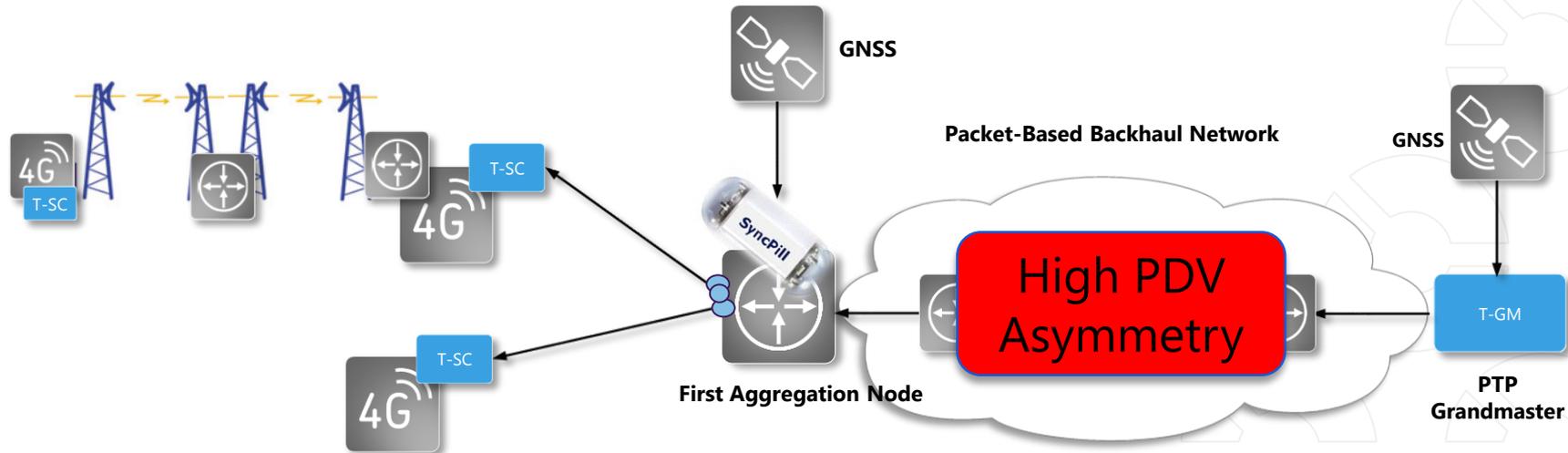


Grandmaster Clock & PRTC enabler

LTE-TDD/ LTE-A base station and small cells requires stringent phase synchronization

Delivering accurate phase from the core is challenging due to PDV and asymmetry

We can bypass the problem by locating our "SyncPill" GM/PRTC closer to the end application , e.g. in first aggregation node

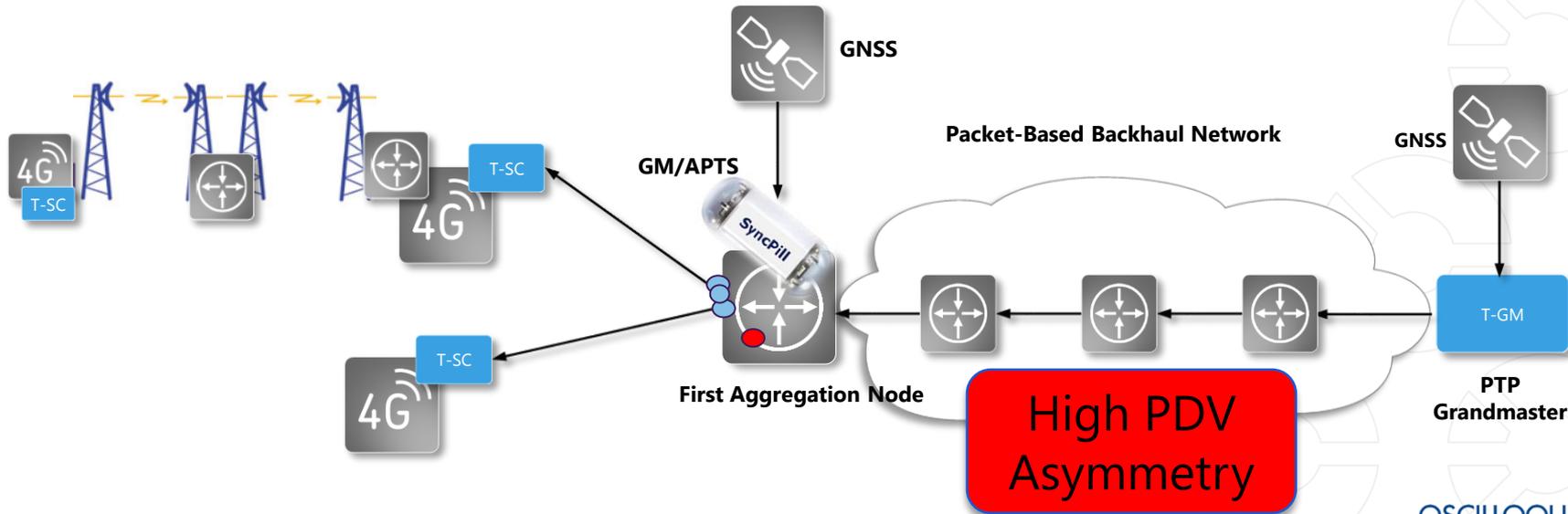


How can we use core GM for backup?

We can use a PTP input from core GM as backup to SyncPill GM

Asymmetry between the SyncPill GM and the core GM can be calibrated using GNSS

How can the frequency stability (MTIE/TDEV) of the clock recovered from the PTP backup be improved?

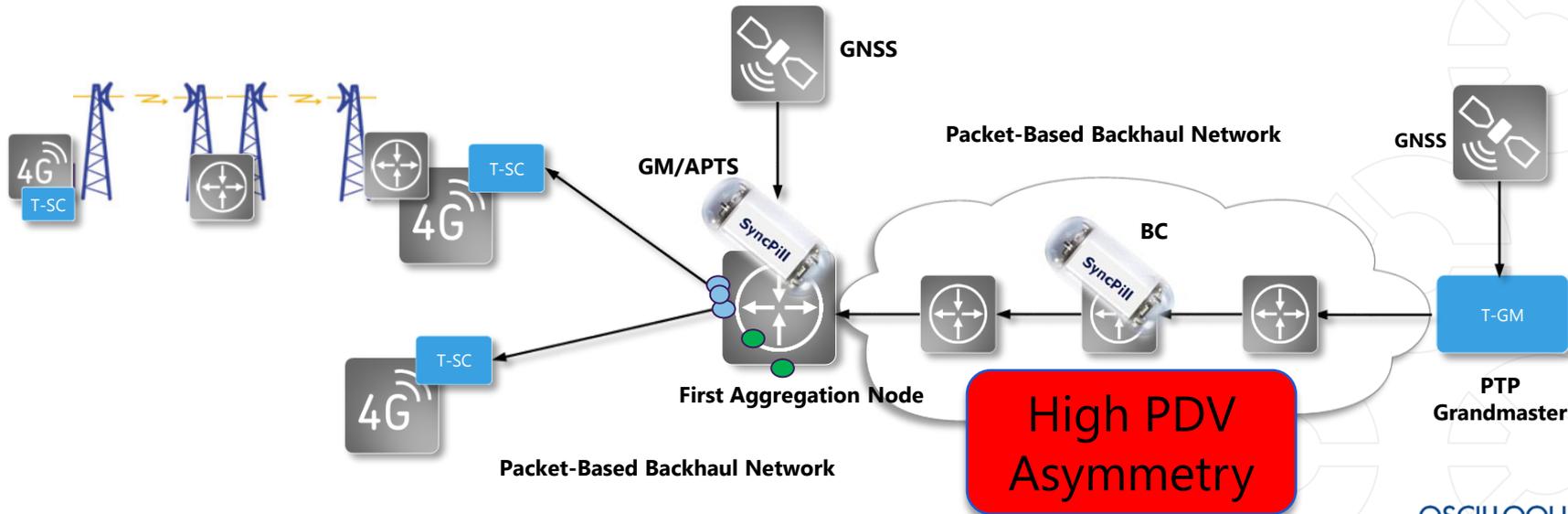


How can we use core GM for backup?

PDV typically accumulates exponentially as a function of number PTP unaware hops, adding BC's between GM and slave can reduce the PDV significantly (increasing the probability of lucky packets)

We can use our SyncPill as BC enablers to existing network elements – no GNSS is needed!

The BC will not eliminate the static asymmetry - which can be compensated by the SyncPill GM, but it will improve the frequency stability



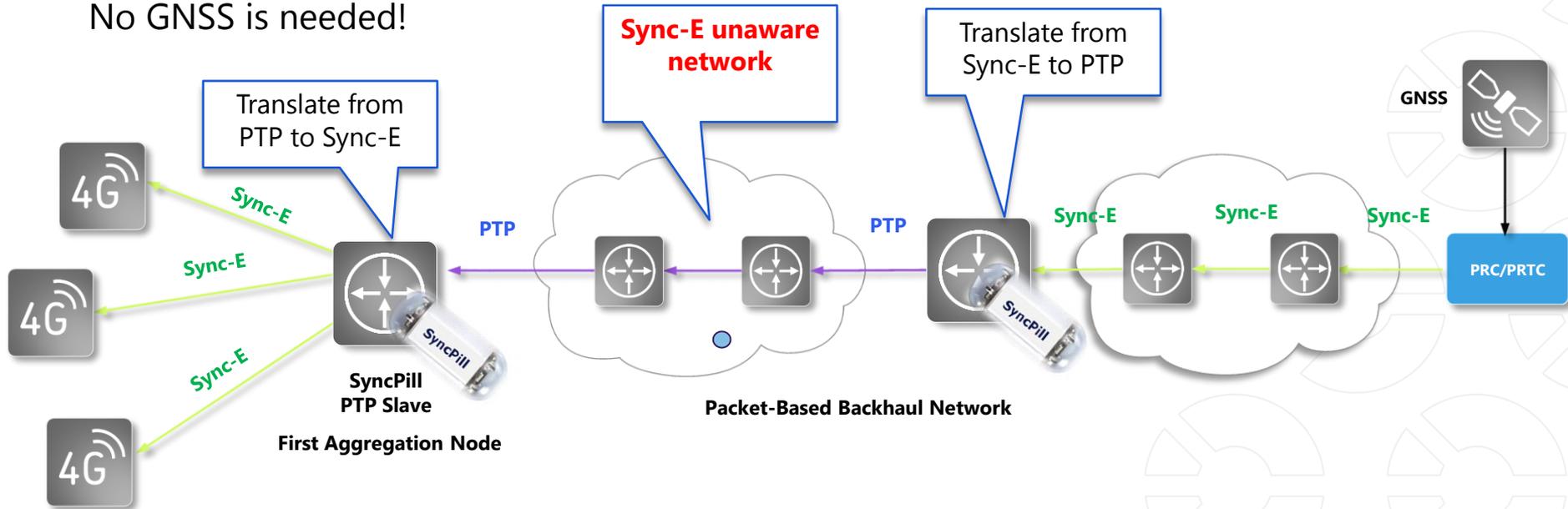
Sync-E “Pseudo Wire” using PTP

How can we bridge across Sync-E unaware networks?

SyncPill can function as GM and Slave

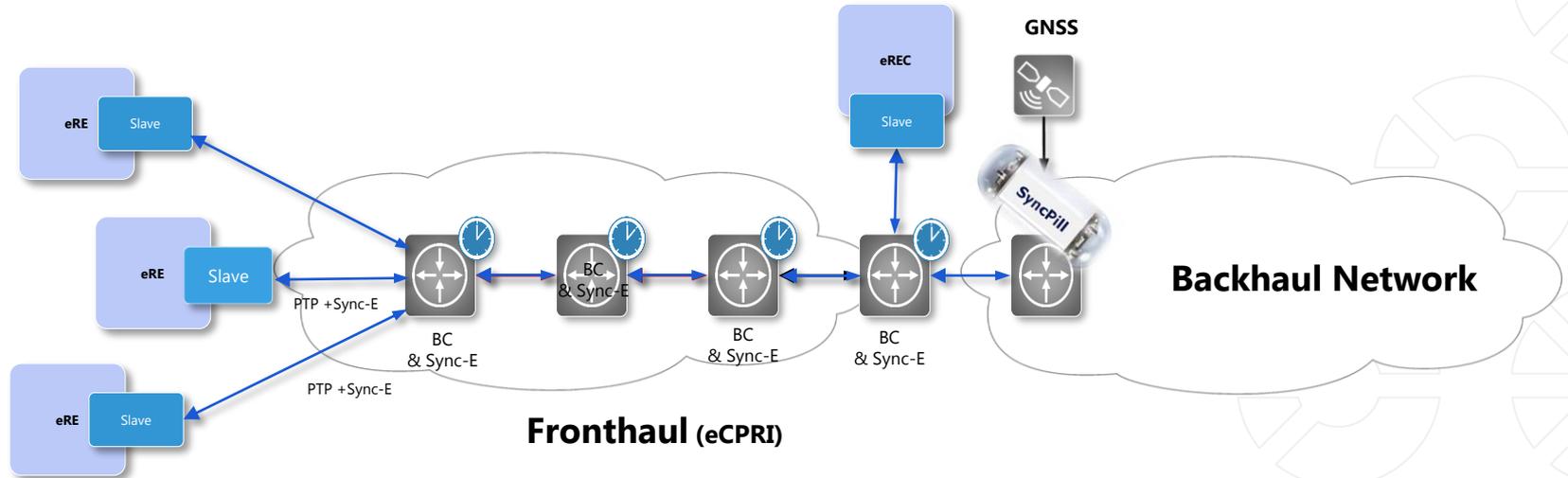
Translate between Sync-E to PTP (freq) and vice versa

No GNSS is needed!



Path to 5G

Use of PTP and Sync-E over the eCPRI fronthaul network to deliver sync to the eRE and eREC



Sync Probing and Assurance

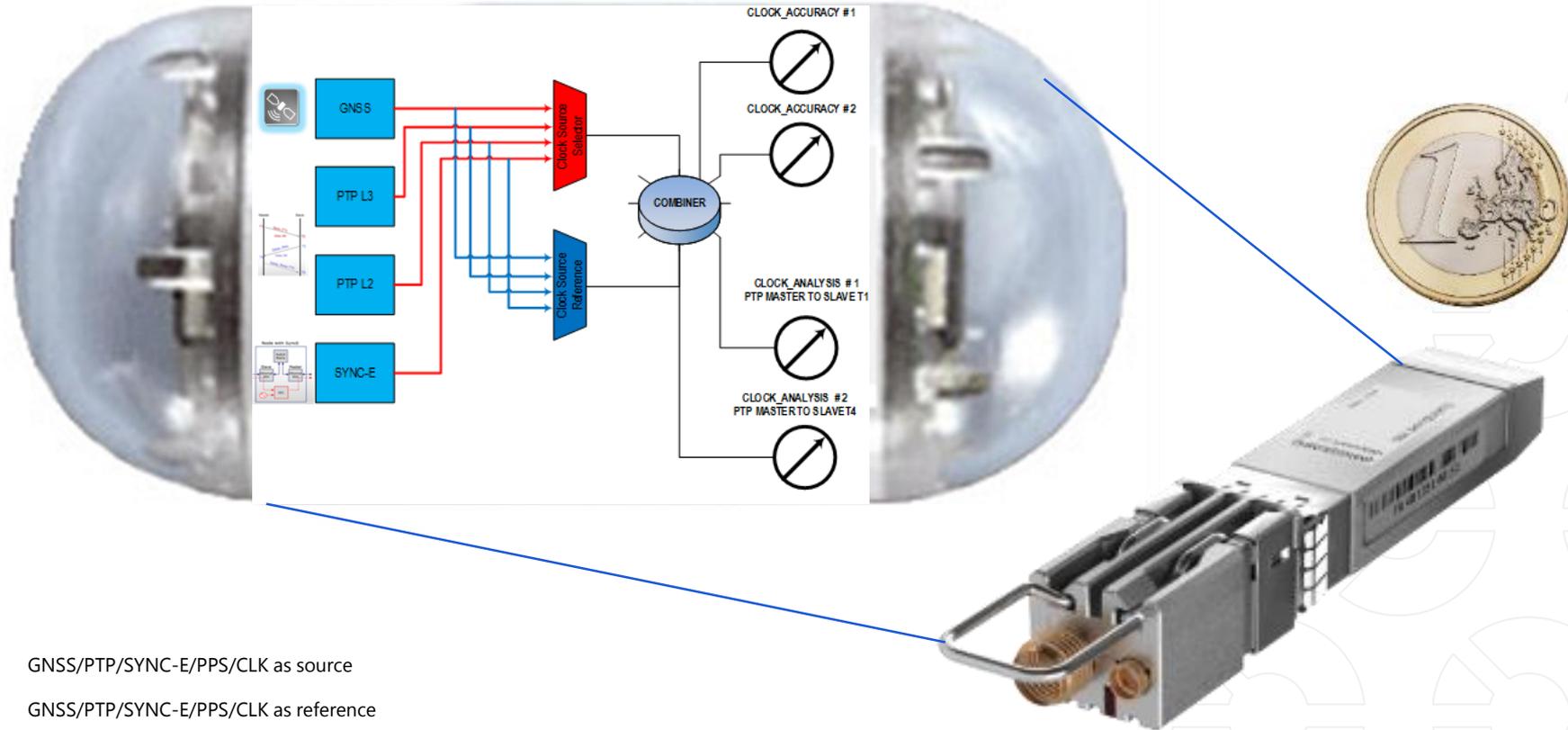


What would be the minimal HW needed in the SyncPill which allow in service Sync monitoring and assurance ?

- Reference (e.g. from GNSS)
- Signal under test (SUT)
- Time Error (TE)/Time Interval error (TIE) counters
- Networking capabilities which allow to send the collected data for analysis in the "cloud"
- All the rest can done in the "cloud"



SyncProbe in SyncPill ...

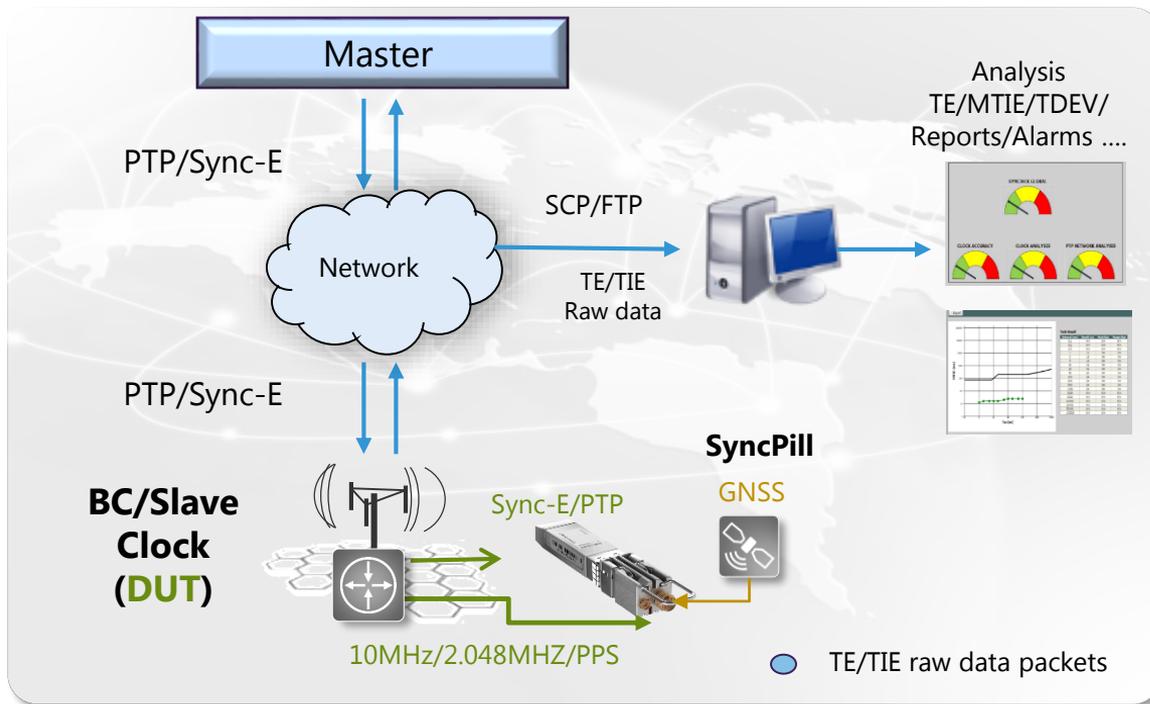


GNSS/PTP/SYNC-E/PPS/CLK as source

GNSS/PTP/SYNC-E/PPS/CLK as reference

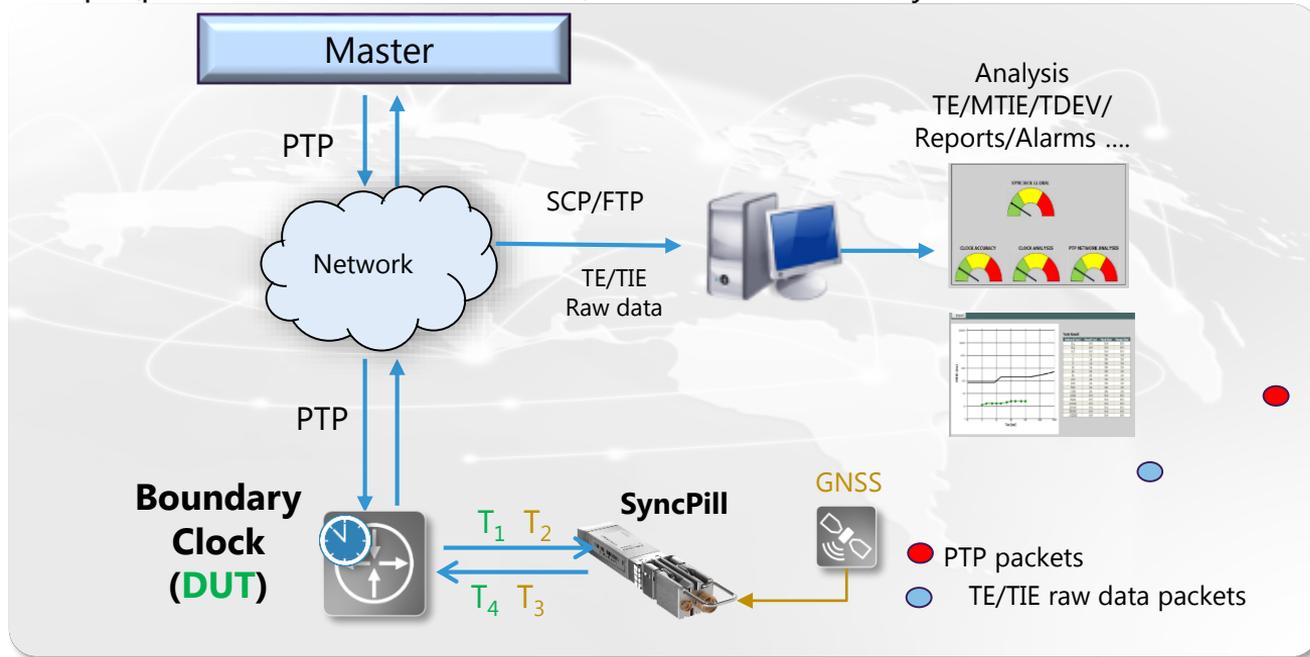
Probing Third Party BC/Slave

- ▶ SyncPill is used for Sync Assurance of third Party Physical Clock
- ▶ Slave/BC 1PPS/10MHz/2.048MHz/Sync-E/PTP can be monitored Vs. SyncPill using GNSS as reference
- ▶ Collected TE/TIE data is sent from SyncPill to a server of analysis and reporting



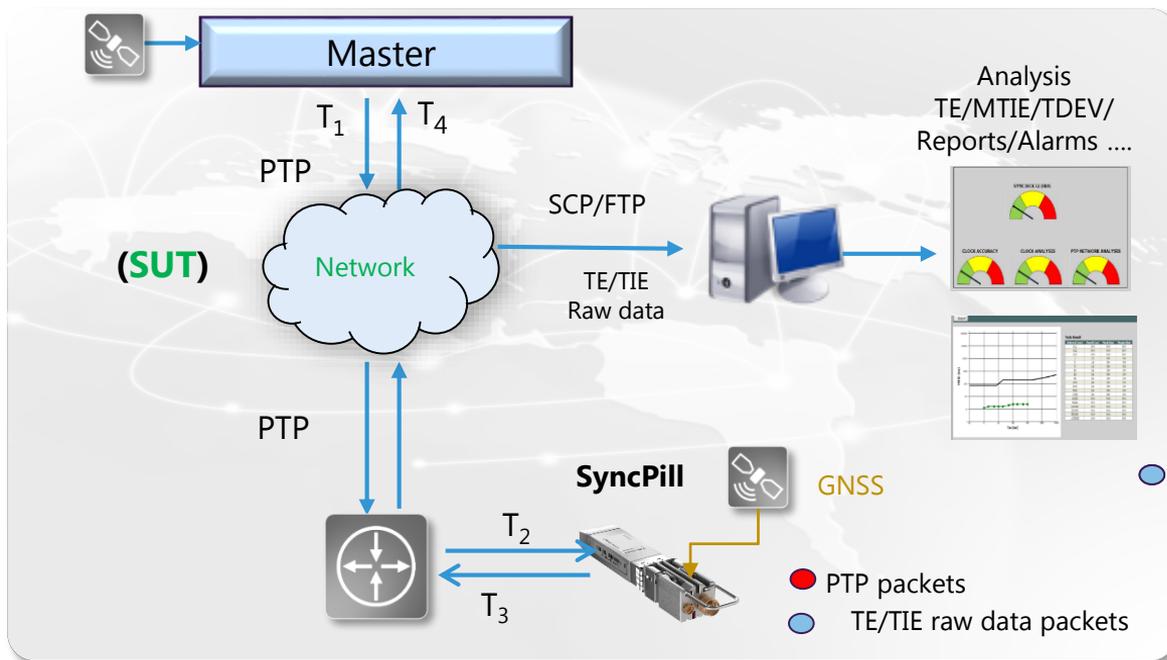
Probing an Third Party Master Port

- ▶ The SyncPill is used for Sync Assurance of third Party BC or GM master port (DUT)
- ▶ The SyncPill functions as Slave clock/Active probe and performs measurements at the same time (active PTP probe)
- ▶ Collected timestamps (packet TE/TIE , T_2-T_1 , T_4-T_3) data is sent from SyncPill to server



Active Probing of the Network

- ▶ SyncPill function as active probe and uses the internal Telecom slave packets exchanged over the network (IP unicast – G.8265.1/G.8275.2)
- ▶ The SyncPill can probe the network and recover the clock simultaneously
- ▶ Timestamps (T_2-T_1 and T_4-T_3) data is sent from SyncPill to server



Come and Pick Your SyncPill ...



Many sicknesses – one cure. Remember to take your Sync Pill !





Thank you

nlaufer@advaoptical.com



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