

## The poacher and the Gamekeeper: Synchronization Delivery and Assurance

Ken Hann, Director ,R&D June 2016

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# Synchronization Delivery V Monitoring

### Monitoring a time service



Did you see his face when you mentioned SLA?

# Synchronization - Delivery Or Assurance?

Given a reference - Suitable equipment can provide:

1. A distribution solution
Poacher:
"Fresh sync" with innovation
2. An Assured solution
Gamekeeper:
Synchronization by the book





to nearby nodes

# Synchronization Delivery and Monitoring Requirements

<b>Telecom Profile</b>	Delivery Requirement	Monitoring
Frequency G.826X	16ppb	FFP>1% (150us in 200s)
Phase G.827X	1.5usec	?
Phase G.82XX	<100nsec	?

Question 1: Should Standards support monitoring PTP phase networks?







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# The Solution(s)

1) Bypass the problem: Grand Master closer to the Slave Use full on path support where possible Use sync probes to monitor performance



#### 2) Compensate for fixed asymmetries



### Operators Survey - Synchronization Assurance ("Gamekeeping")

# Do you rate synchronization service assurance as an important tool for delivering mobile backhaul services?





# Why "In Service" Sync Assurance is needed ?

- Making sure synchronization works is not trivial.
- Network PDV and asymmetry impact Synchronization quality.
- SLA 1-way delay monitoring using OAM / OWAMP or PTP
- Requires equipment to collect data (probes).
- Needs OSS/NMS to check alarms and performance.



How well does Sync work ?





2. APTS Backing up local GM





# Monitoring the real world

#### GNSS jamming - antenna separation distance



#### Large D<sub>GNSS</sub> protects against "double jamming" events



#### GNSS jamming - antenna separation distance



#### "Practically perfect" PTP networks ...

are also vulnerable





#### Large $D_{GNSS}$ but is the network good enough?



## Asisted Partial Timing Support An example of Delivery and monitoring

When GNSS is available it:

- 1. Supports the local time base
- 2. Allows monitoring of PTP slave timestamps
- 3. Calculation of assymetry etc.



#### PTP clocks are not stressed when GNSS is available



#### APTS - Monitoring using GNSS Reference





#### APTS – KPIs and SLA

- PRTC Vs. PTP Slave recovered clock (PTP Input)
  - Total/Constant/Dynamic Time Error (TE) Vs predefined threshold
  - MTIE Vs predefined mask
  - Network asymmetry and PDV
- PRTC Vs. Sync-E
  - MTIE Vs predefined mask
- Results and Alarms are collected by NMS
- Helps in early detection of primary and secondary errors





## APTS – GNSS failed



When GNSS fails:

- 1. PTP maintains the local timebase
- 2. Prior assymetry can be comphensated
- 3. Increased sensitivity to temperature

Question 2: What about reversing roles I.e. PTP primary and GNSS backup?





# **Probing functions**

# Add physical probe devices to the network

- A Sync Probe compares a selected port to a reference (GNSS)
- The port can be a physical input; or T3 monitoring; slave monitoring
- SLA monitoring and Brownfield applications



#### CLK TIE, 1PPS TE & Packet TE

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#### Embedded probe functions in every Ethernet port...

- A Sync Probe function compares a selected port to a reference
- The port can be a PTP clock or monitoring instance
- Delivery and monitoring functions co-exist on the same Ethernet port



#### Packet TE



#### Packet MTIE





# Self Monitoring chain using T3

- G.8275.1 can support long chains of BC (i.e. 20 hops)
- Monitoring can be included based upon returned T3
- Each BC compares own clock with downstream neighbour
- May need PTP monitoring functions in each port (if no valid T3)



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#### Synchronization monitoring is still early days



# Self Monitoring complex topologies (Open for Ideas)

- G.8275.1 can support large and complex structures of BCs
- Each BC port supports: Distribution and Monitoring Input / Output;



## Question 3: Who will define In-ciruit monitoring ?



Assuring quality and Correlating Testing

- Simultaneous probing across Network
- Dedicated "GNSS probes" on edge
- Integrated probes ?



#### CLK TIE ,1PPS TE & Packet TE

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Summary (The "Poacher" and the "Gamekeeper")

## The "Poacher"

- innovates to provide sync
- The "Gamekeeper"
- Enforces the rules for assured sync delivery
- We need to write the rules
- Today Probes monitor Clocks and Network/Service
- Tomorrow Probes integrated into delivery systems



RULE



# **Questions**?

# Thank you!

khann@oscilloquartz.com Ken Hann, Director ,R&D



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