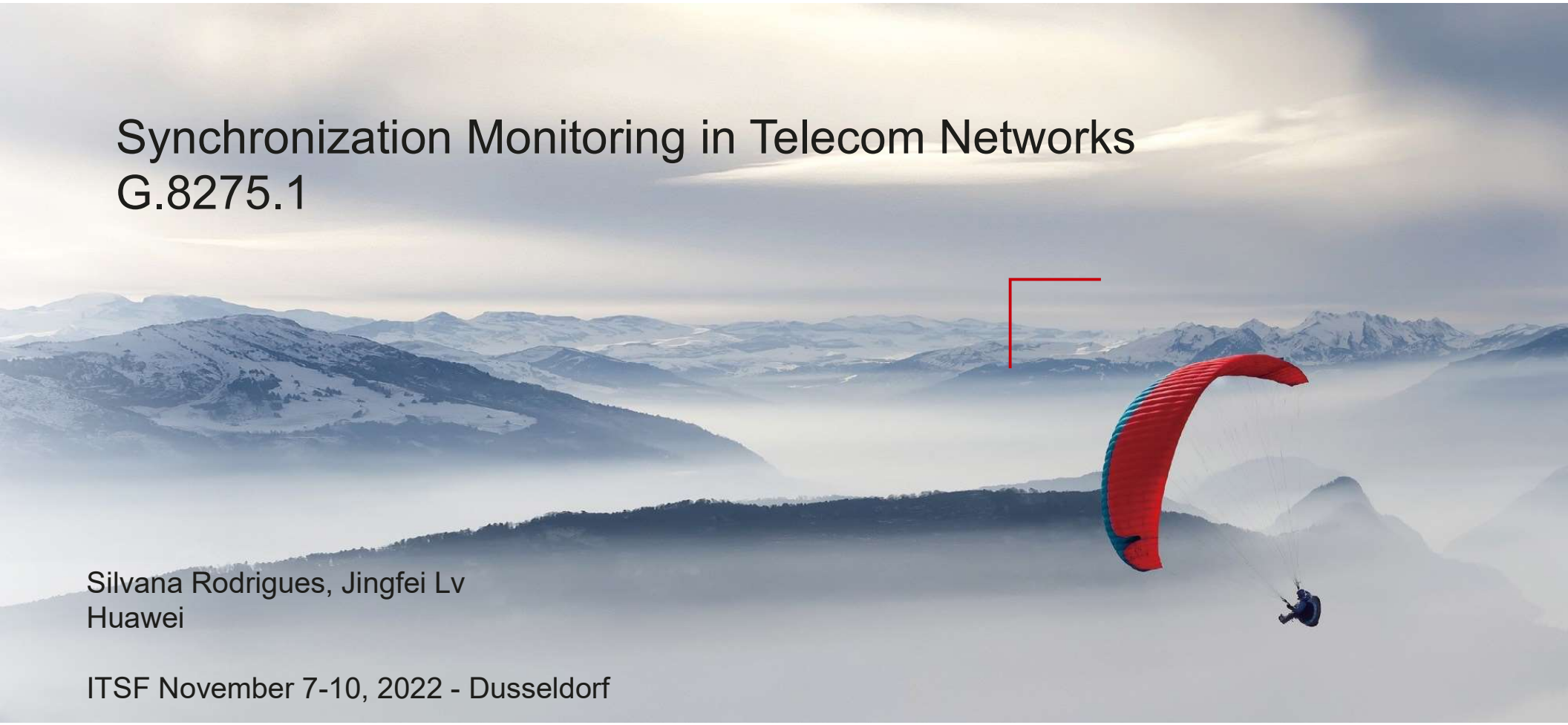
Synchronization Monitoring in Telecom Networks G.8275.1



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Outline

- Need for Synchronization monitoring in Telecom
- G.8275.1 New Features
- Use-cases of synchronization monitoring
- Summary

Note: This presentation uses timeTransmitter for master and timeReceiver for slave. However, G.8275.1 mentioned in this presentation has not been updated with this nomenclature.

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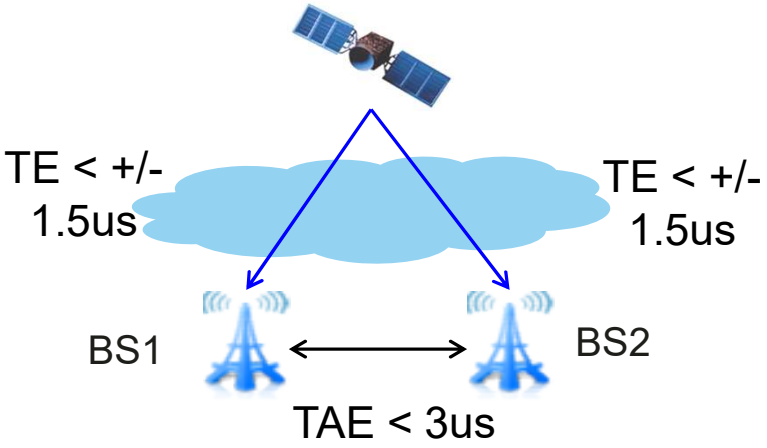
Need for Synchronization monitoring in Telecom

- Synchronization is vital for the operation of telecom networks
  > 3GPP defines time requirements for the base stations

- Monitoring the network for sync failures is important to mitigate network outages

- Some Operators have Service Level Agreement (SLA) to offer synchronization as a service
  >SLAs must be met



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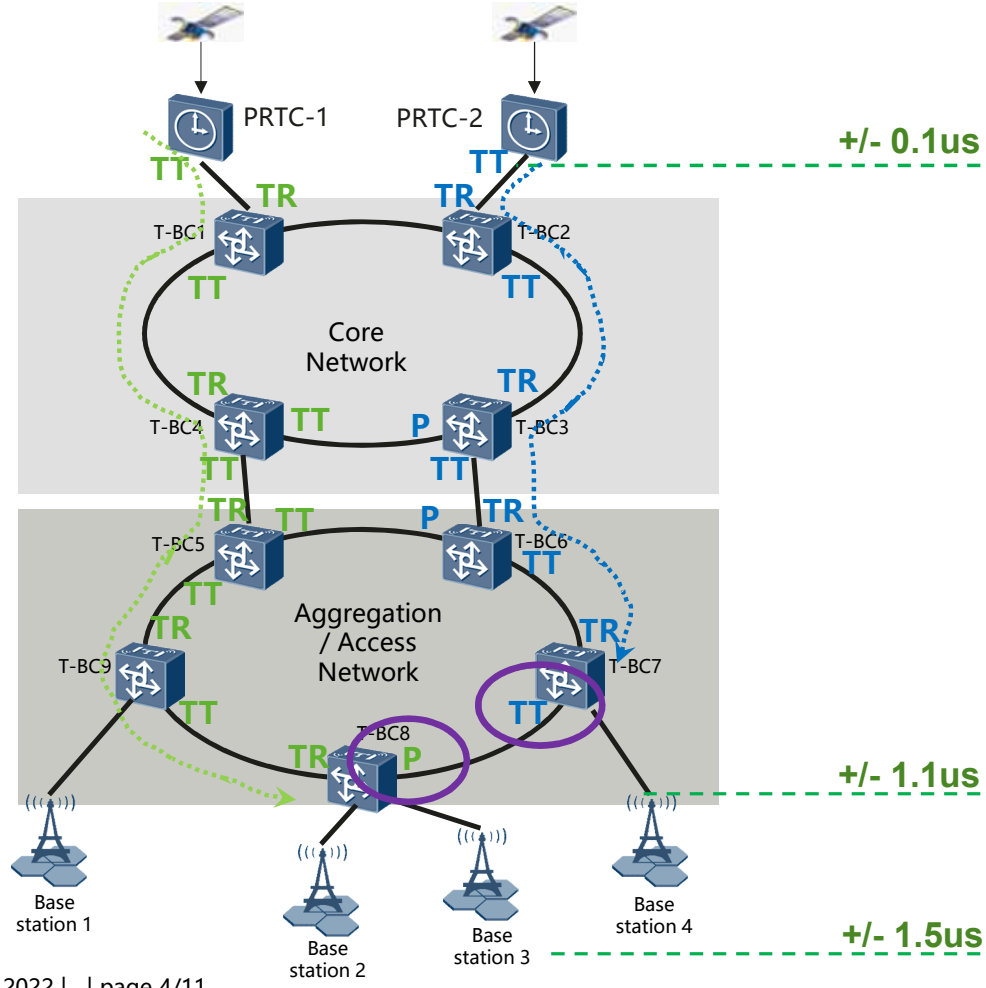
G.8275.1 New Features

- Best TimeTransmitter Clock Algorithm (BTCA) is a mechanism defined in IEEE 1588 for choosing the best clock in the network that other clocks will synchronize to, and it also defines the hierarchy of the clocks.
  - > PTP clock only synchronizes to a PTP port in TIME_TRANSMITTER state
  - > The synchronization is received on the PTP port in TIME_RECEIVER state
- For monitoring purposes, it is desirable for a PTP port, that is not in the TIME_RECEIVER state, to receive synchronization from a peer PTP port that is not always in the TIME_TRANSMITTER state. Two data set members have been defined in G.8275.1
  - > **monitorSender** – setting this data set to TRUE allows a PTP port that is not in TIME_TRANSMITTER state to send Announce, Sync, Follow_Up, and Delay_Resp messages with the alternateMasterFlag set to TRUE
  - > **monitorReceiver** – setting this data set to TRUE allows a PTP port that is not in TIME_RECEIVER state to send Delay_Req messages with the alternateMasterFlag set to TRUE

Use Case 1 – PASSIVE port monitors TIME_TRANSMITTER port



- The port in PASSIVE (P) state of T-BC8 monitors the port in TIME_TRANSMITTER (TT) of T-BC7
- T-BC8 sets monitorReceiver to True for the port in PASSIVE state
  - > T-BC8 sends Delay_Req to T-BC7 with the alternateMasterFlag set to TRUE, and receives sync and Delay_Resp from T-BC7
  - > T-BC8 can get the time error in its passive port
  - > The time error of T-BC8 passive port can be compared with the time error of its slave port
  - > A threshold can be set and an alarm can be generated. Maintenance personnel can check the network and fix issues in advance avoiding network outages

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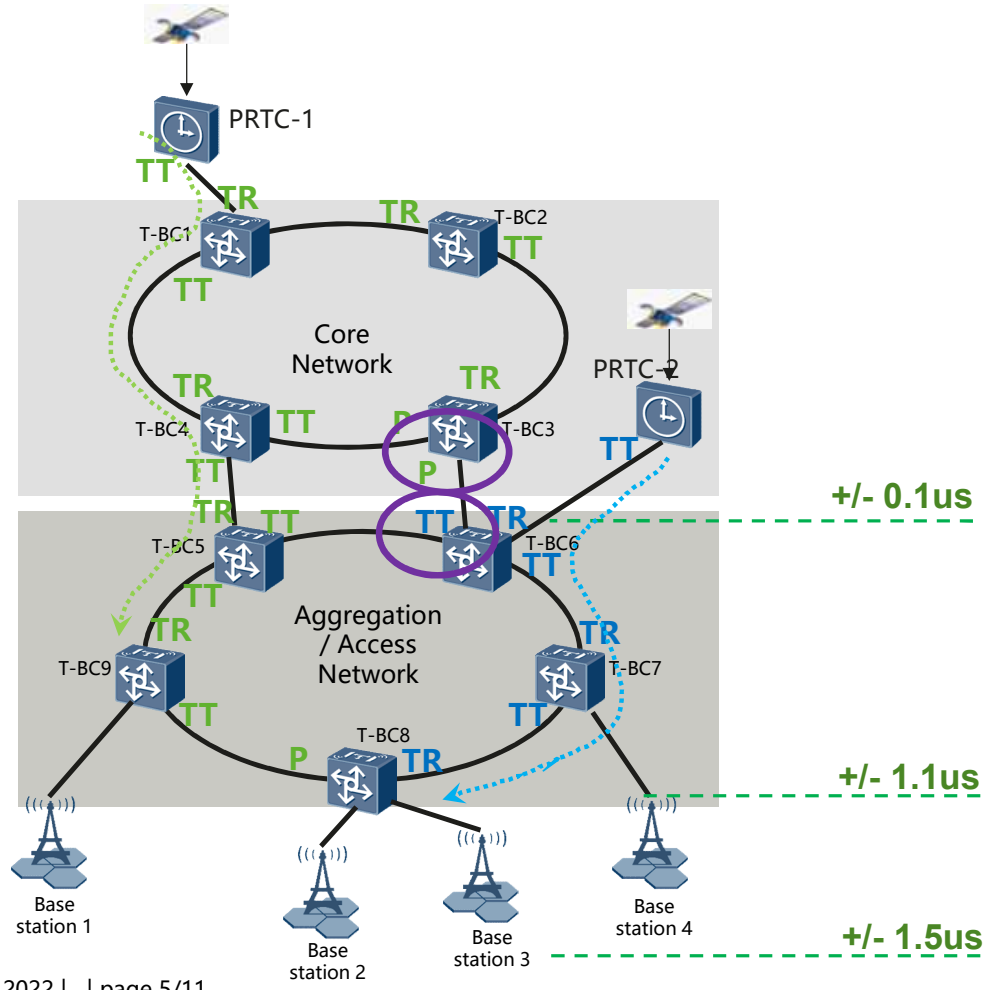
Use Case 2 – TIME_TRANSMITTER port monitors PASSIVE port



- The port in TIME_TRANSMITTER (TT) state of T-BC6 monitors the port in PASSIVE (P) of T-BC3
- T-BC6 sets monitorReceiver to True for the port in TT state and T-BC3 sets monitorSender to True for the port in passive state
  - > T-BC3 sends sync and Delay_Resp to T-BC6 with the alternateMasterFlag set to TRUE and receives Delay_Req from T-BC6
  - > T-BC6 sends Delay_Req to T-BC3 with the alternateMasterFlag set to TRUE, and receives sync and Delay_Resp from T-BC3
  - > T-BC6 can get the time error in its TT port
  - > T-BC 6 can measure the time error of the core PTP network

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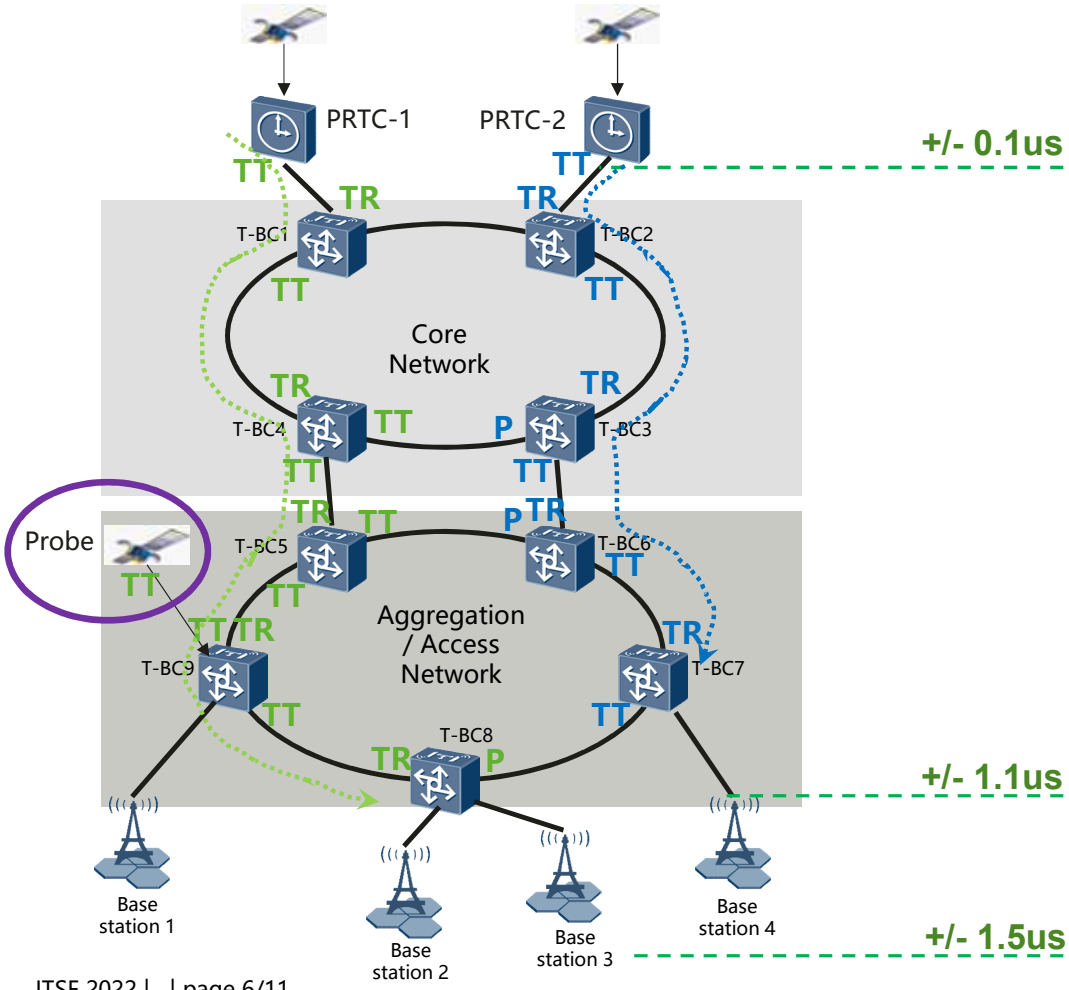
Use Case 3.1 – TIME_TRANSMITTER port monitors TIME_TRANSMITTER port



- T-BC9 has a probe to monitor time error
- The port of T-BC9 attached to the probe is set to TT by using “masterOnly” attribute to prevent the PTP probe to be used for synchronization.
- The port in TIME_TRANSMITTER (TT) state of probe monitors the PTP clock by setting monitorReceiver to True of its port in TT state
  - > The probe receives sync from T-BC9 and sends Delay_Req to T-BC9
  - > T-BC9 receives Delay_Req from the probe, and replies Delay_Resp to the probe
  - > The probe can measure the time error of the PTP network

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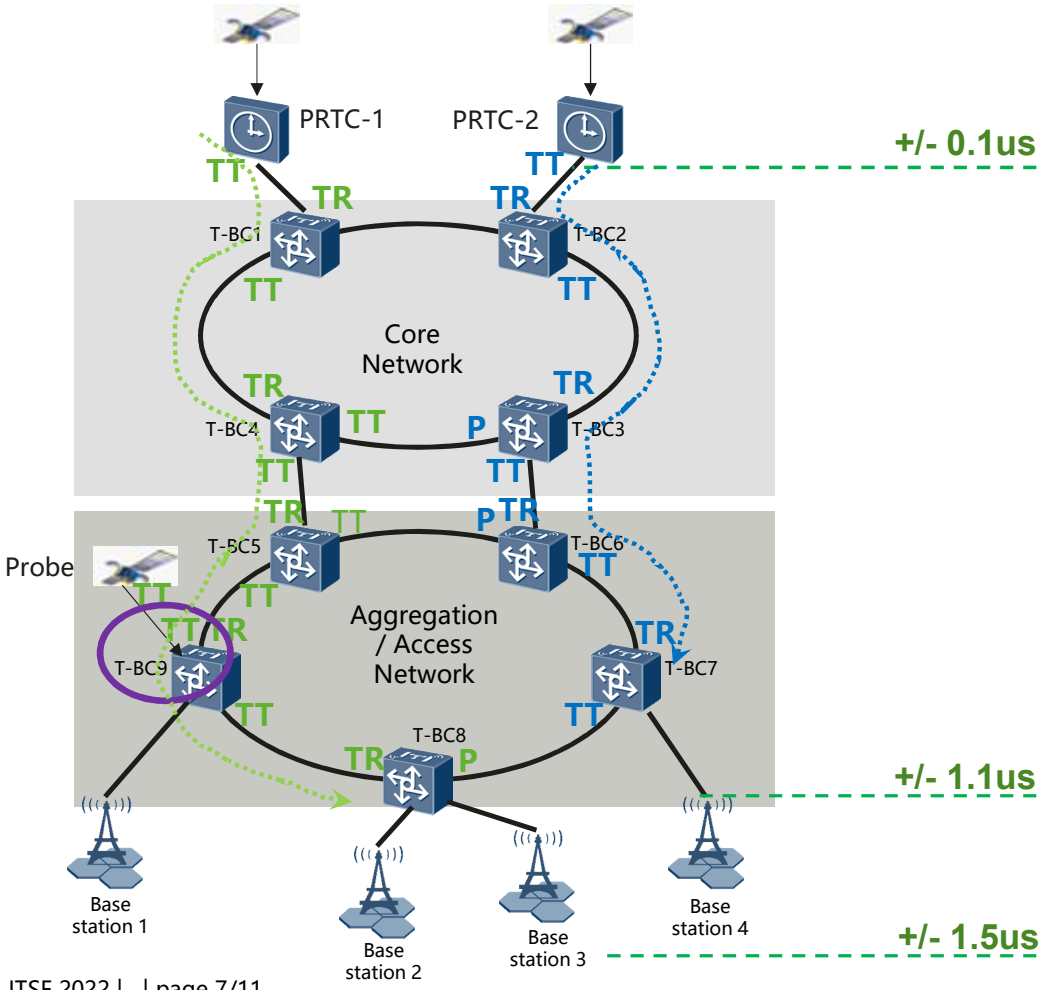
Use Case 3.2 – TIME_TRANSMITTER port monitors TIME_TRANSMITTER port



- T-BC9 has a probe to monitor the time error.
- The port of T-BC9 attached to the probe is set to TT by using “masterOnly” attribute to prevent the PTP probe to be used for synchronization.
- The port in TIME_TRANSMITTER (TT) state of T-BC9 monitors the probe by setting monitorReceiver to True of its port in TT state
  - > T-BC9 receives sync from probe and sends Delay_Req to probe
  - > Probe receives Delay_Req from T-BC9, and replies Delay_Resp to the T-BC9
  - > T-BC9 can measure the time error of the probe

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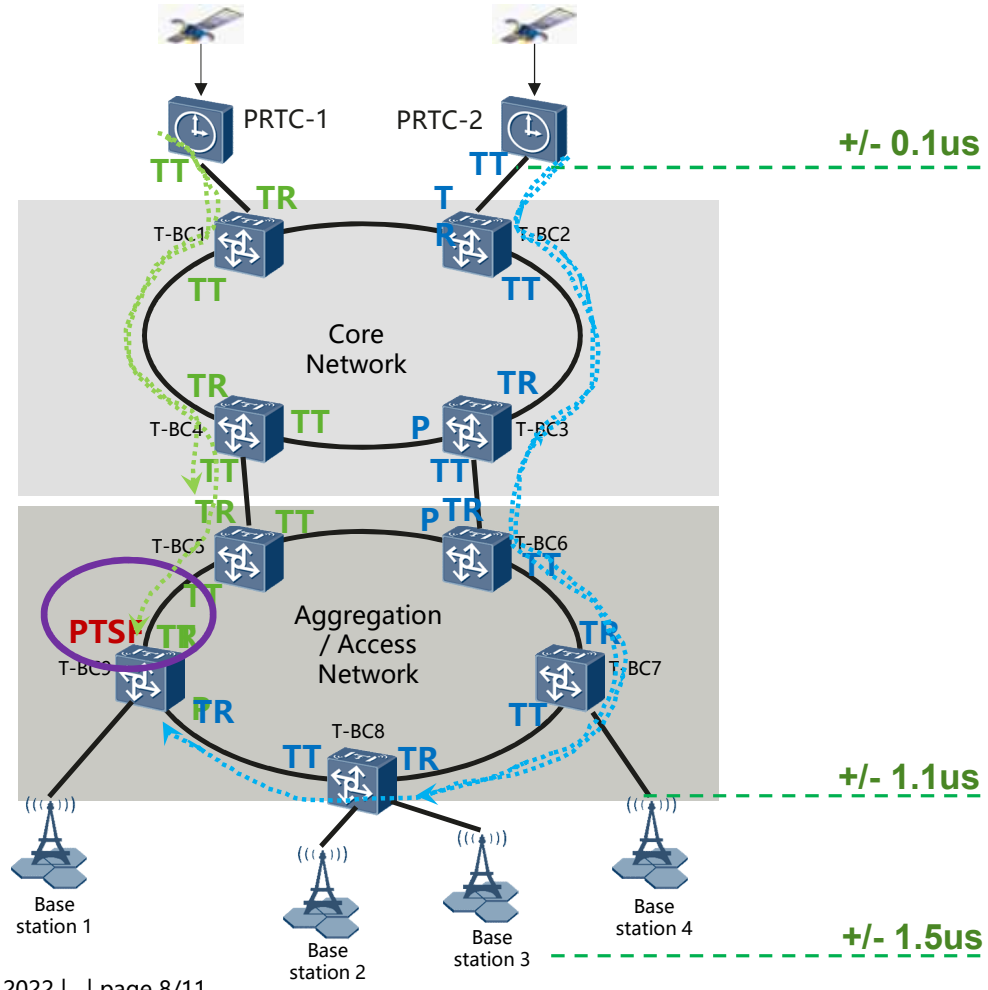
Use Case 4 – Clearing Packet Time Signal Failure



- T-BC9 had a port that was previously in TR state synchronizing with T-BC5. This port had a packet time signal failure witch triggers the BMTA
  - > T-BC9 sets Signal Fail (SF) to TRUE on its port with PTSF and the port state is set to TT
  - > T-BC 9 selects T-BC8 as its time source
- To clear the PTSF condition, T-BC 9 can monitor the port with PTSF by allowing Sync, Delay_Req, Delay_Resp to be exchanged between T-BC5 and T-BC9
- Once the PTSF condition is clear, then this port can be considered again in the BMTA

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Summary

- Synchronization monitoring is important to avoid network outages and undesirable PTP switching.

- Once there is a failure in the PTP port, monitoring can be used to detect that the failure condition has been cleared, and allow that port to participate in the BMTA

- These features are included in the latest version of G.8275.1

Thank you.

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