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OAM Asymmetric latency

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Next Generation Fronthaul Interface
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Asymmetric latency			
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Introduction

- Time synchronization in all networks either wired or wireless is important. It is, however, particularly vital for wireless networks.
- Wireless time synchronization is used for many different purposes:
  - to calculate the distance to mobile terminals,
  - to support geographical localization services,
  - to control the transmission power,
  - to avoid interferences with other cells and base stations,
  - to manage handovers,
  - to get accurate access to the time-slots,
  - to compensate the propagation delay,
  - to reuse frequencies efficiently,
  - to calculate the billing.
- In his presentation (Synchronization_and_NGFI, April 5th 2017 Webex), Richard Tse highlighted the issue of timing inaccuracy due to asymmetric link delay.

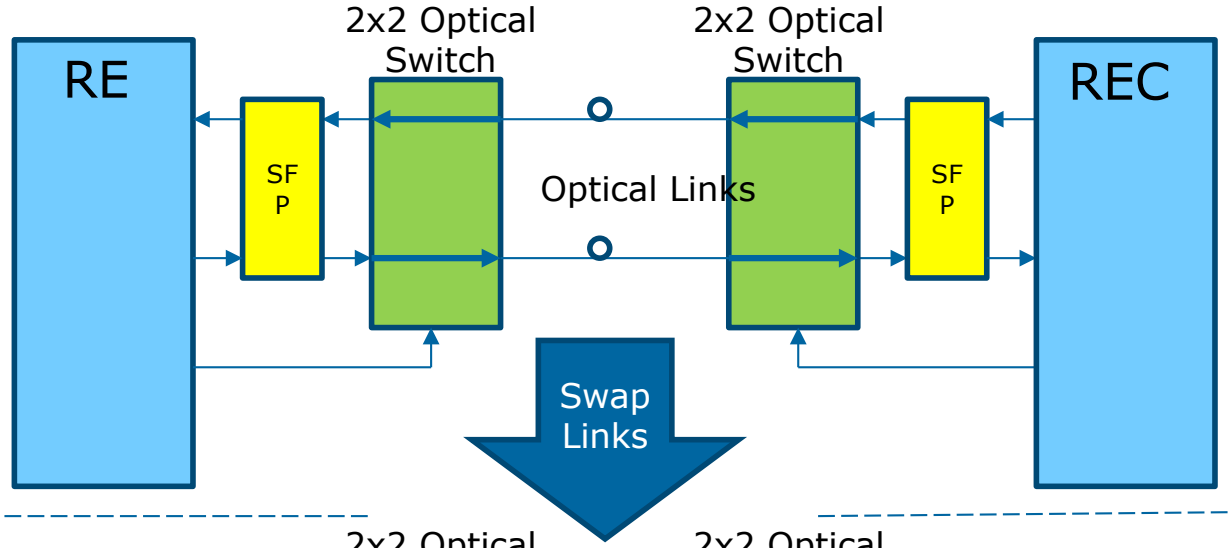
The problem

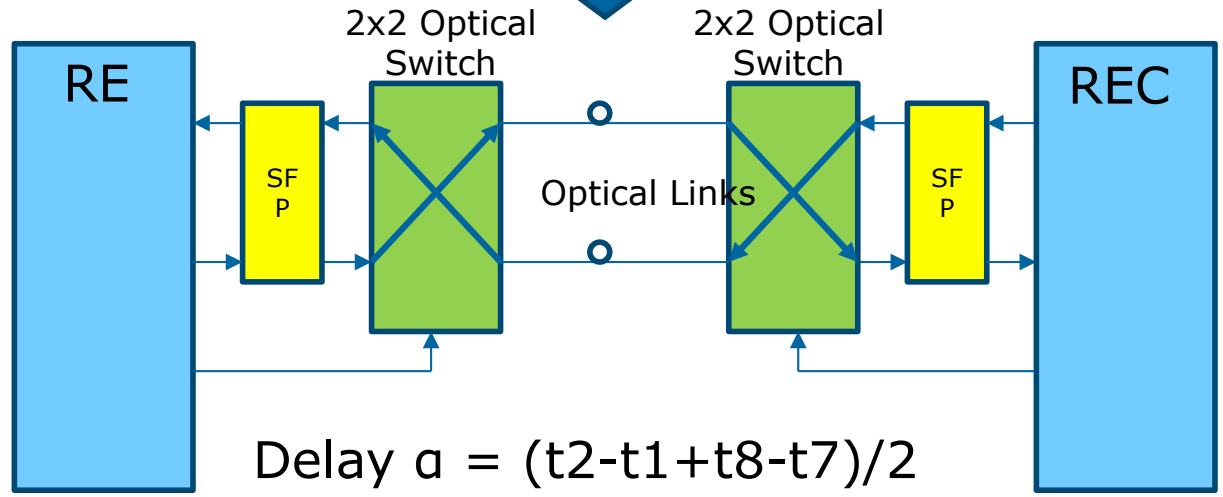
- For accurate timing synchronization, PTP relays on the assumption that latency is symmetric, so any asymmetry introduces an error.
  - TC alleviates the problem for nodes asymmetry, but link (fiber) asymmetry still remains.
  - Note that 10 meters in fiber length difference are equivalent to 50ns.
- Some solutions are being considered each with its caveat:
  - Use GNNS in both sides
    - But it is hard to get GPS signal in some places, e.g. subway
  - Use bidirectional fibers
    - But transport networks typically use unidirectional fibers
  - Manual methods
    - But it is hard work to measure compensation value at every endpoints
    - After a protection switch, the compensation should be measured again
    - When network changes (e.g. repair fiber line break), compensation should be manually measured again.

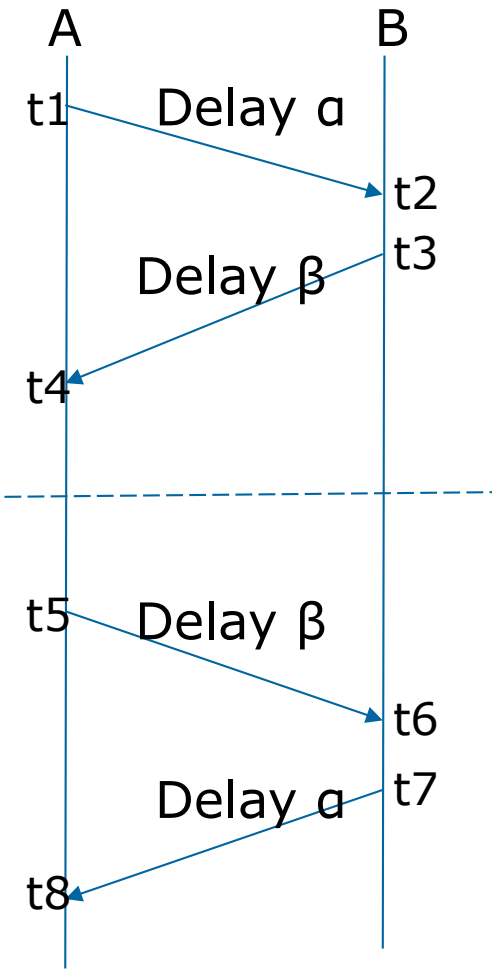
Possible solution – line swapping

- Line swapping is suitable for unidirectional links and bidirectional links using different wavelengths.
- The process:
  - Measure delay in each direction
  - IEEE1588 "Like" protocol
  - Calculation of one way delay
  - Add delay to compensate the asymmetry
  - Run process automatically each time the link recovers from a failure
- This scheme has been already described (not in great detail) in G.8271 Appendix IV.
- During the last ITU-T SG15/Q11 interim meeting there was support for beginning work on the asymmetry issue, and they plan to address it at joint session with Q13/15 during the next SG15 plenary meeting.

The swapping scheme







Delay α = (t2-t1+t8-t7)/2

Delay β = (t4-t3+t6-t5)/2

Work to be done

- Liaise with SG15/Q13 and SG15/Q11 to express our interest in this issue and request to be updated on progress.
- Verify that NGFI supports asymmetric latency evaluation for bidirectional and unidirectional links.
- Assuming swapping is agreed as a solution:
  - Define swapping process requirements for NGFI:
    - When is swapping applicable ?
    - When is swapping activated ?
    - Who controls the swap ?

Motion #__

- Liaise with SG15 Q13 and Q11 to express our interest in following their progress on Asymmetry latency measurement.

- Mover: Leon Bruckman
- Seconder:

- Yes: ___ No: ___ Abstain: ___ (technical motion needs >= 2/3)