# FRAME LOSS CONSIDERATIONS FOR FRONTHAUL

**Balázs Varga (A);** balazs.a.varga@ericsson.com
**János Farkas;** janos.farkas@ericsson.com

2016-05-26, IEEE P802.1CM session

# RECAP

- http://www.ieee802.org/1/files/public/docs2016/cm-varga-CPRI-packetloss-considerations-0116-v02.pdf
  - Frame Loss Ratio (FLR) and Bit Error Ratio (BER) are meaningful only when the service is available → Availability should be distinguished from FLR and BER
  - No frame is lost due to congestion in a well-designed TSN network
  - Bit errors may cause frame loss (more on next slide)
  - Network failures may cause frame loss (more on slide 4)
- http://www.ieee802.org/1/files/public/docs2016/cm-CPRI-discussion-on-requirements-0416.pdf
  - IQ data: FLR < $10^{-9}$
- http://www.ieee802.org/1/files/public/docs2016/cm-CPRI-discussion-on-requirements-0516.pdf
  - IQ data: FLR < $10^{-7}$

# BIT ERRORS AND FRAME LOSS

- An Ethernet frame is dropped if its FCS fails
- Loss of an Ethernet frame causes bursty bit errors and increased error rate for an IQ data flow (compared to bit error of an optical link)
  - Smaller Ethernet frame size decreases the burst of bit errors
- There is a relationship between BER, FLR, and frame size

**Per hop values**

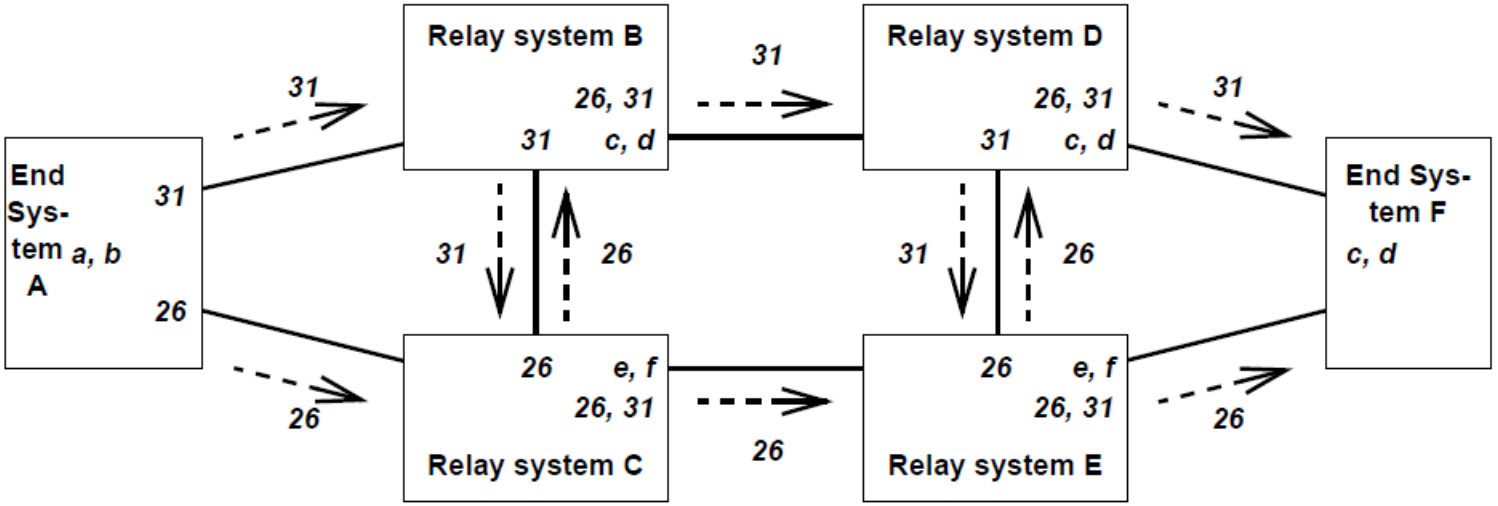
| $BER_{Link}$ | Frame size | $FLR_{Link}$ |
|---|---|---|
| $10^{-12}$ | 200 bytes | $1.6 \times 10^{-9}$ |
| $10^{-12}$ | 1000 bytes | $8 \times 10^{-9}$ |

# NETWORK FAILURES

- Link or node failures may cause frame loss.
  - Note that FLR and service availability are distinguished
- Restoration is often used to resolve a failure if the network topology is redundant
  - A control protocol can restore the forwarding paths
  - Restoration time depends on many aspects, network topology, the given failure, etc.
  - Restoration time may vary from a couple of ms to 100s of ms
- Protection switching can be used to resolve a failure
  - There are techniques to provide 50ms failover time
- 802.1CB Frame Replication and Elimination for Reliability is designed to minimize loss, more details on next slide

# 802.1CB FRAME REPLICATION AND ELIMINATION FOR RELIABILITY

- It is 1+N redundancy for increased reliability (reduced FLR)
- Sequence numbering and replicating every packet, in the source end system and/or in relay systems in the network, and eliminating those replicates in the destination end system and/or in other relay systems



# DISCUSSION

- 802.1CB can be used
  - to meet stringent loss requirements
    - Price: bandwidth
    - Is it feasible to use 802.1CB for IQ data flows?
  - to deal with outage (restoration time) during network convergence after a failure
    - Price: bandwidth
    - Is it required by CPRI related flows (e.g., to avoide CPRI reset)?

- Shall we introduce a new Profile (Profile C) that includes 802.1CB?

ERICSSON