XAUI error protection concept

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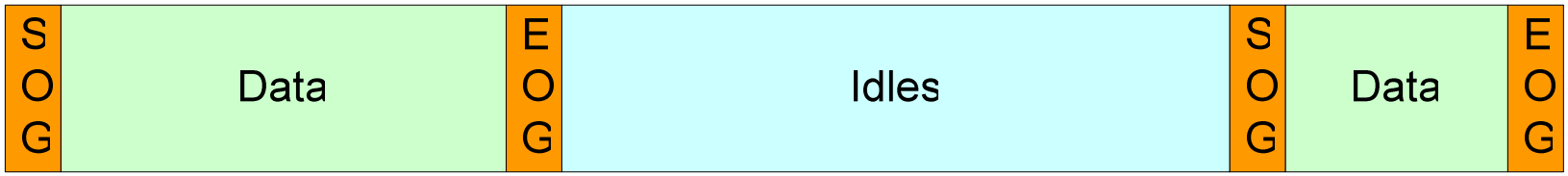
Motivation

- Laser control must be accurate
  - Not interfering to other ONUs
  - Grants lengths are set to complete FEC block
    - Timing error could cause loss of entire FEC block, which may be the entire grant
- XAUI BER is <1E-12
  - A single error in XAUI can expand to corrupted 66 bits after translation
    - Error is multiplied to 2.5E-10

Reliable laser control

- The only decisive method for overcoming errors is using correlators at the receive state machine
  - Positive identification of “laser-on” and “laser-off” markers in the presence of a single or more errors
  - Resiliency to errors at consecutive words
- Concept is based on enhancing the XGMII translation state machine to silence noises between 8/10 delimiters



Any non-idle data between End-of-Grant and Start-of-Grant delimiters is silenced

8/10 delimiters

- Two options to select delimiters:
  - Basing the delimiters on the existing 1G EPON FEC delimiters
  - Defining new 8/10 delimiters
- Using existing delimiters as a basis seems faster and safer

Illustrated delimiters – example

- Laser-on (Start of grant) – first 4 bytes of /S_FEC/
  - /K28.5/D6.4/K28.5/D6.4/
- Laser-off (End of grant) – last 4 bytes of /T_FEC/
  - /I/T/R/
    - Even and odd alignment is not required because the goal is NOT detecting packet boundary, but positive laser-off

D	D	D	D	/T/	/R/	/I/	/I/	/I/	/I/	/T/	/R/
D	D	D	/T/	/R/	/R/	/I/	/I/	/I/	/I/	/T/	/R/
D	D	/T/	/R/	/I/	/I/	/T/	/R/				
D	/T/	/R/	/R/	/I/	/I/	/T/	/R/				

Scheme implications

- XGMII translation is mentioned in clause 47
- A new annex is required (47A) to include the following changes within the XGXS sublayers:
  - Before the XAUI sublayer:
    - Adding a new section to describe 8/10 correlator
    - Adding a data detector to add the SOG/EOG delimiters
  - After the XAUI sublayer:
    - Adding a new section to describe 8/10 correlator
    - Adding a new state machine for silencing non-idle data between EOG and SOG delimiters
    - Erasing the delimiters

Summary

- Concept of reliable laser control in presence of XAUI error was presented
- Delimiters, potentially based on EPON FEC delimiters, are used to indicate laser control
- The XGXS sublayer should be changed to support the adding/removal of delimiters and silence data between delimiters.
- Main advantages: simple, reliable, no corner cases