



Stream-based FEC proposal



Supporters

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Basic principles

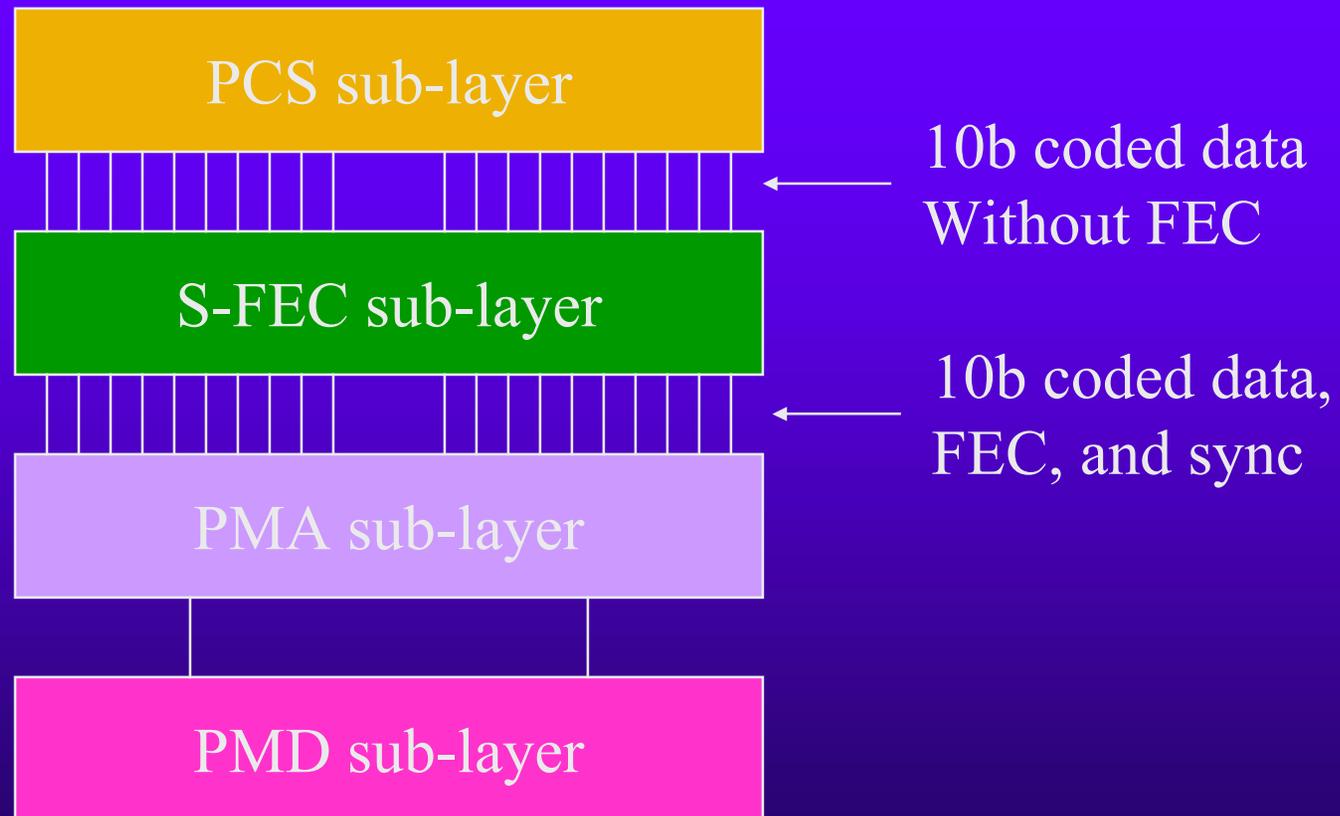
- ◆ FEC is a coding function
 - It shouldn't need to think about frames
 - It shouldn't get involved in protocol
 - It should have a fixed overhead
- ◆ Backward compatibility is an illusion
 - There are no EPON PHYs out there now
 - In a mixed environment, what is the power budget? How do I know what I have?



Stream-based FEC

- ◆ The FEC process accepts a block of data
 - It doesn't care about the actual content
 - The data is just 'bits' to the FEC
- ◆ The FEC computes parity information
- ◆ The parity info, plus a FEC synchronization symbol, is inserted into the bit stream
- ◆ The receiving side reconstructs the original bit stream, and upper layers are unaware

Stream-FEC proposal





S-FEC encoding algorithm

- ◆ PCS data is accepted in 191 symbol blocks
 - This data fits into 1912 bit payload of FEC
- ◆ Basic FEC code used is RS(255,239,16)
- ◆ 16 bytes of parity are encoded into 16-10b symbols using standard encoder
- ◆ 1 special FEC sync symbol is added
- ◆ Total efficiency is $191/208 = 91.8\%$ fixed.

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Data

Parity



S-FEC decoding algorithm

- ◆ Synchronization keys on sync symbol
 - Error tolerance afforded by implementing hysteresis over several frames (see G.975)
- ◆ Data+Parity block is then run through RS decoder
- ◆ Resulting corrected data is handed up to PCS layer as if nothing happened



Notable differences from F-FEC

- ◆ FEC sublayer is unaware of frame boundaries and special codes
- ◆ FEC sublayer does not have to implement shortened last codeword (SLCW)
 - FEC carries over from one frame to another
 - Simpler and more efficient
 - Upstream could use SLCW at end of burst, or could require every burst to be an integral number of blocks
- ◆ PCS special codes are protected by strong FEC, not by lengthy symbol sequences
 - Higher and more deterministic efficiency



Rate adjustment

- ◆ There are two options – either will work
- ◆ PMA/PMD rate increase
 - Has precedent in G.975 work
 - Maintains apparent line rate
- ◆ MAC rate decrease
 - Has precedent in 10 GbE work
 - Maintains same PMD and PMA layers



Summary

- ◆ Stream-based FEC is simple and effective
 - It is completely transparent to all signaling
 - It has a higher and constant efficiency
 - It is simpler to implement
 - It provides complete and equal protection to every bit of the Ethernet frame