

EoVDSL



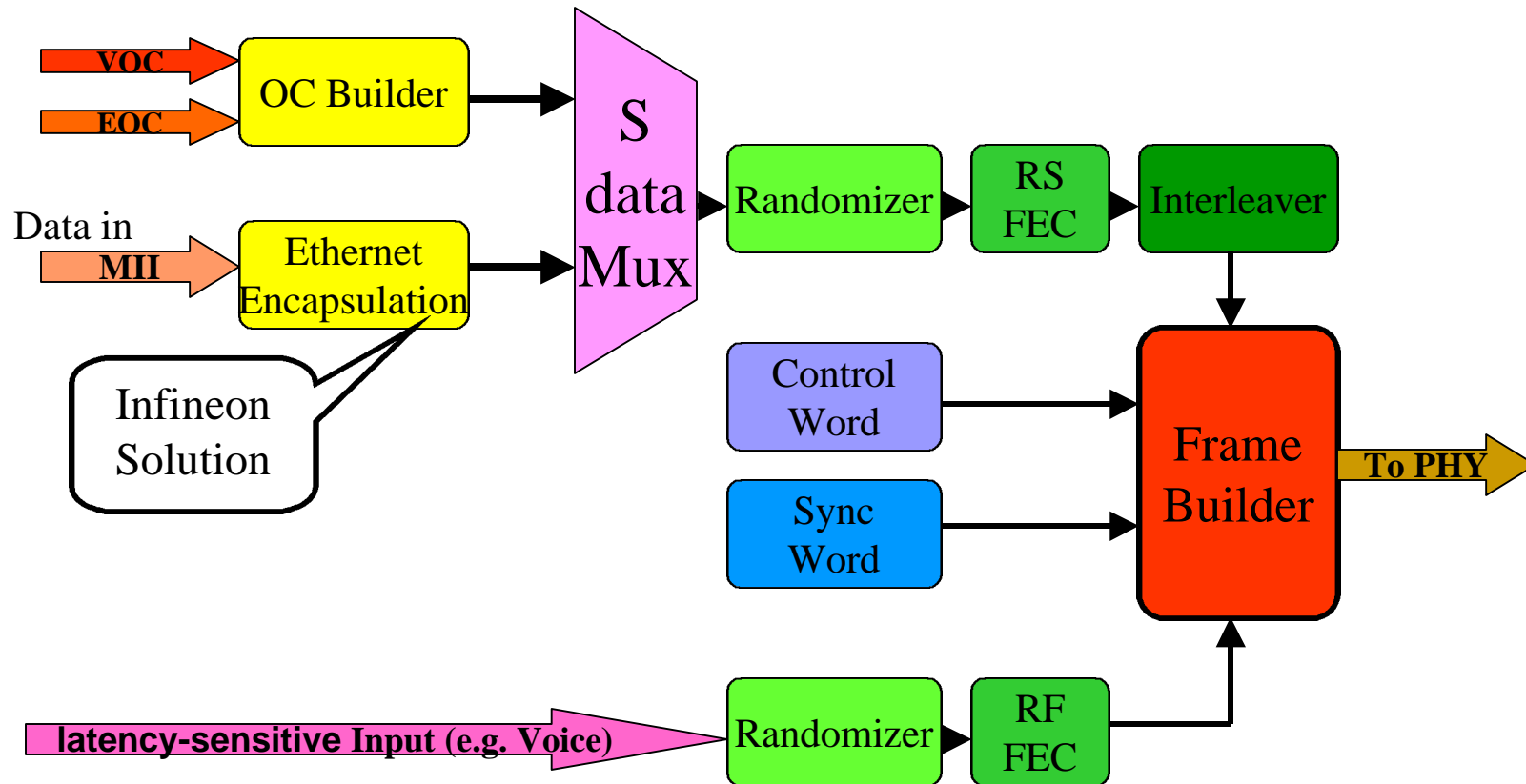
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Agenda

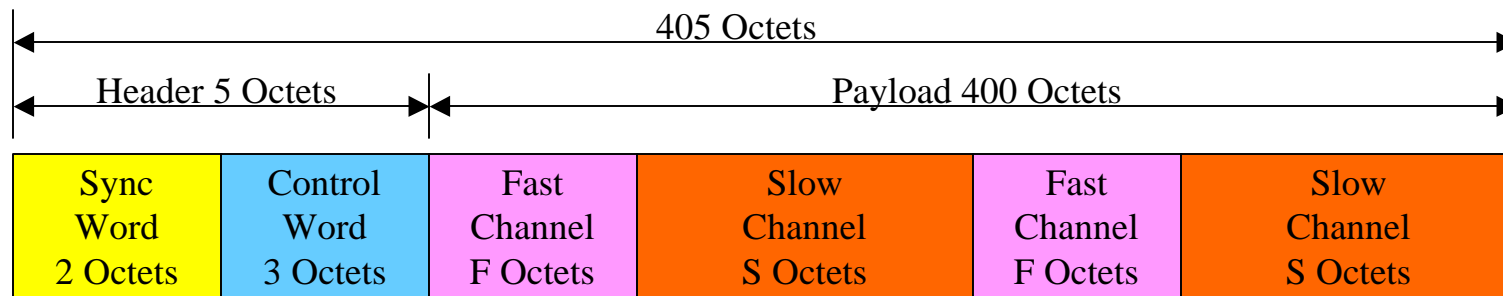
- ★ SCM VDSL TC layer
- ★ SCM VDSL frame format
- ★ Fast and Slow Channels
- ★ Operations channel
- ★ Randomizer
- ★ FEC – Forward Error Correction
- ★ Interleaver
- ★ Ethernet Encapsulation

SCM VDSL – Single Carrier Mode Very High Bit rate DSL

VDSL TC Layer

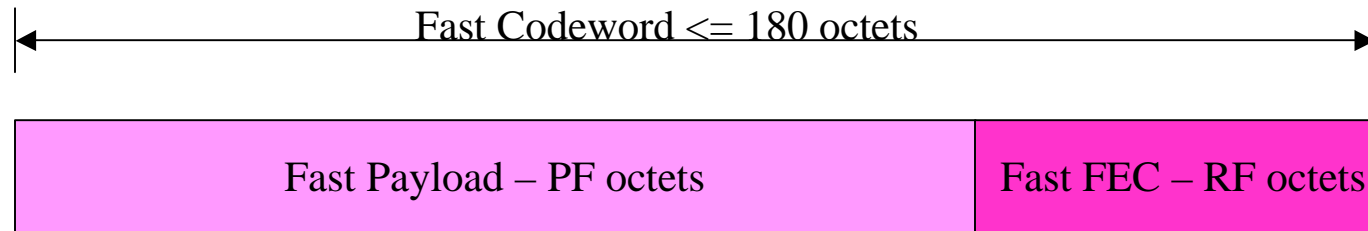


VDSL Frame Format



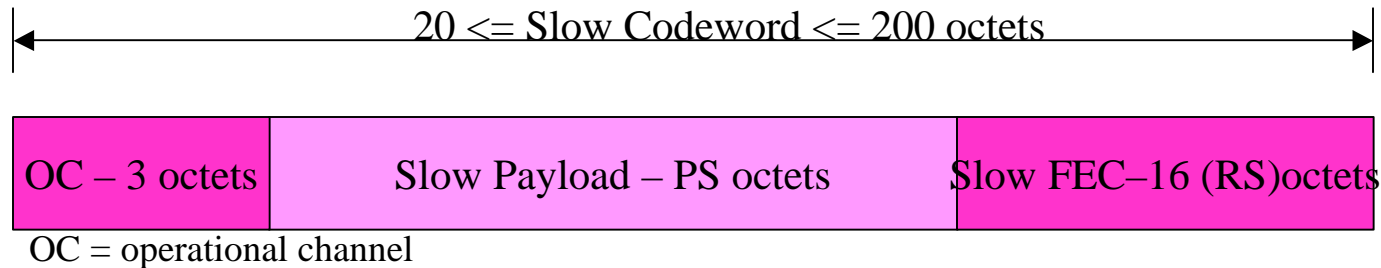
- ★ Payload is divided into two equal parts to support latency-sensitivity services (e.g. voice)
 - $F+S = 200$ octets
 - Frame length supports frequency reference of 8KHz
- ★ If transport class 1 (single latency) is applied $F=0, S=200$

Fast Channel



- * Defined for voice and latency-sensitivity applications
- * Not protected by Interleaver
- * Optional channel (is not mandatory)
 - Optional during implementation
 - Optional during operation
- * FEC size
 - 0 octets – No FEC
 - 2,4,16 octets – Defines FEC protection

Slow Channel

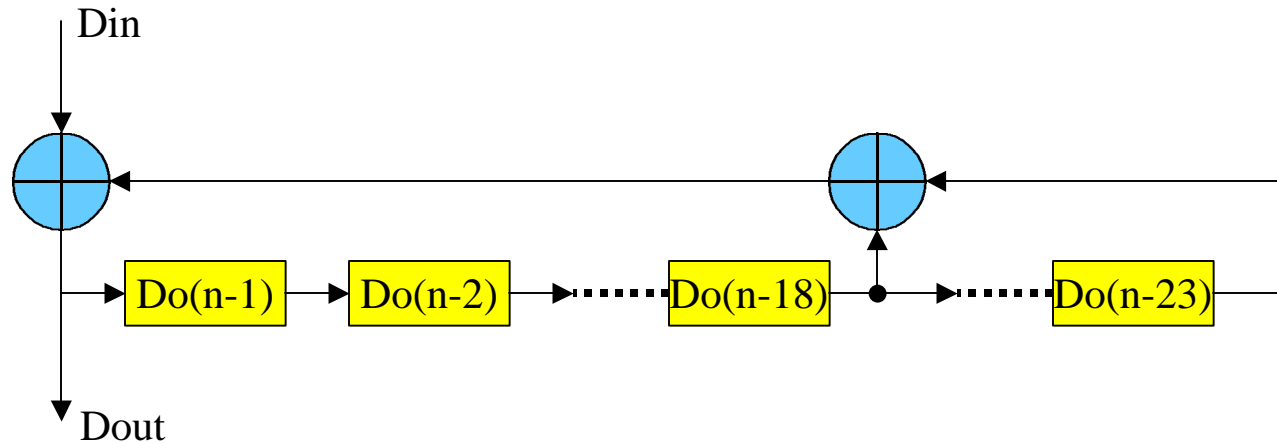


- ★ Defined for data transmission
- ★ Mandatory during operation
- ★ Protected by Interleaver
- ★ Carries both payload and in-band control channel

Operational Channel

- ★ Contain 3 octets per frame. One Op-code octet and two data octets
- ★ Used as transport media for VOC (VDSL Overhead Control) and EOC (Embedded Operation Channel)
- ★ VOC used for control of the modem layers (VDSL chipset)
- ★ EOC used for management application

Randomizer



- ★ Convert any bit stream of data to an equal number of ones and zeros
- ★ Keep the line (copper) unbiased (no DC)
- ★ Important to the blind equalization algorithm
- ★ Important to the timing recovery

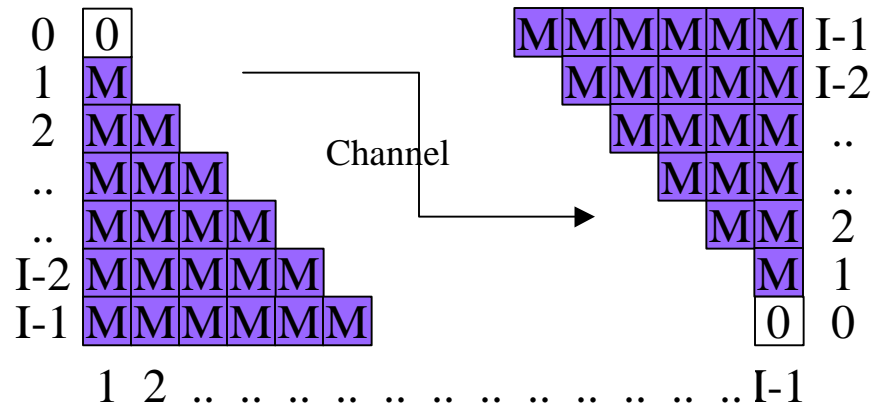
Forward Error Correction

- ★ Using Reed-Solomon FEC mechanism.
- ★ Block length of 255 octets
 - Fast – PF octets data, 2 or 4 or 16 octets parity (RF) and leading zeros
 - Slow - OC+PS octets data, 16 octets parity (RS) and leading zeros
- ★ Correct up to (Parity octets / 2) corrupted octets, any number of bits corrupted in a byte
- ★ Improve BER from 1 in 10^3 to 1 in 10^7
- ★ Has a weakness with burst noise

Interleaver-1

- ★ Used to protect against burst noise.
 - Maximum burst noise protection 500 microseconds
 - Maximum Delay 11.8Msec
 - Minimum Interleaver size is 0 (no added delay)
- ★ Guarantee that number of corrupted octets per frame will be less or equal than FEC's capability to correct (Parity octets/2)
- ★ Implementing the Ramsey III method
 - Minimum latency
 - Minimum storage memory

Interleaver-2



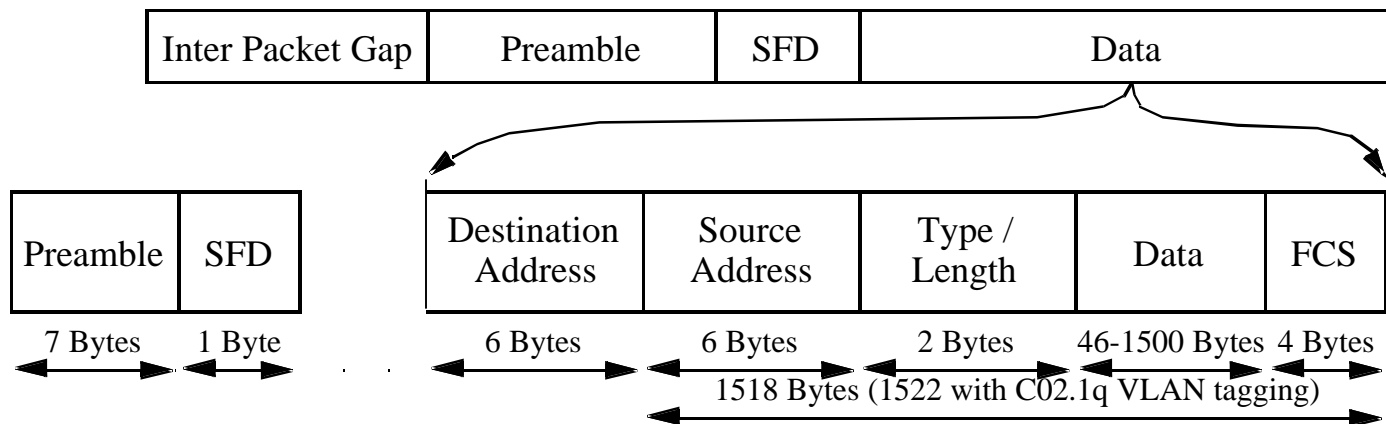
| Line rate, Mbps | | 1.62 | 3.24 | 6.48 | 12.96 | 25.92 | 51.84 |
|--------------------------------|-------------|------|------|------|-------|-------|-------|
| Value of N/l | | 8 | | | | | |
| 250 usec of Erasure correction | M, octets | 2 | 4 | 8 | 16 | 32 | 64 |
| | Delay, msec | 5.9 | | | | | |
| 500 usec of Erasure correction | M, octets | 4 | 8 | 16 | 32 | 64 | 128 |
| | Delay, msec | 11.8 | | | | | |

Ethernet Encapsulation

- ★ The Ethernet frame must be transferred transparently, as is, without manipulating the content
- ★ The encapsulation method is a store & forward mechanism
- ★ EoVDSL is a PHY. Prioritization is performed by higher layer devices and packets are transferred in the order received
- ★ The encapsulation method is not data dependant (no bit stuffing)

Ethernet Encapsulation-2

- ★ The Ethernet packet is preceded by an IPG of 9.6usec/0.96usec for 10/100Mbps links
- ★ The preamble (0x55) is not used by MAC
- ★ The SFD (0x5D) is required by the MAC layer



Ethernet Encapsulation-3

- ★ The Ethernet frame (without preamble, SFD and EFD) is encapsulated by a new preamble. Idle bytes are filled with flags
- ★ The preamble includes a length field. This is not the Ethernet length field's content

