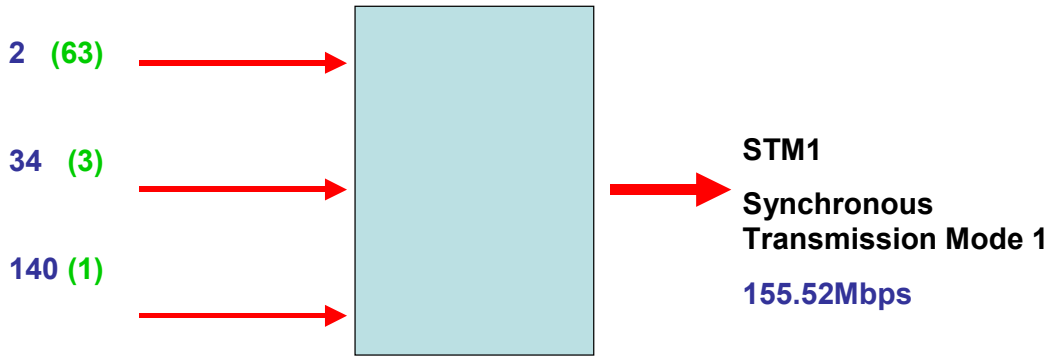
Synchronous Digital Hierarchy (SDH)

- Characteristics
  - Can combine European & American PDH
  - Basically based on Synchronous Optical NETwork – SONET (American)
  - The following PDH (European) can be multiplexed

Multiplexing of PDH Tributaries to STM1



Various Combinations of PDH Tributaries to STM1

- 2.048 Mbps (63 channels) or 34 Mbps (3 channels) or 140 Mbps (1 channel) will form an STM1.
- n_1 of 2.048 Mbps, n_2 of 34 Mbps can be multiplexed where n_1 & n_2 will give rise to a total of less than 155.52 Mbps;
  - if n_2 =2, $n_{1(max)}$ = 21
  - n_2 =1, $n_{1(max)}$ = 42

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Plesiochronous Digital Hierarchy (PDH) - Principles

- Basic bit period shrunk at each point from 2 Mbps upwards (multiplexing) and at each multiplexing point bits are added.

Example:

Speed	Bit Period	Added bits (assume)
2 Mbps	488 ns	
8 Mbps	118 ns	x
34 Mbps	25 ns	x_1
140 Mbps	7 ns	x_2
560 Mbps	1.7 ns	x_3

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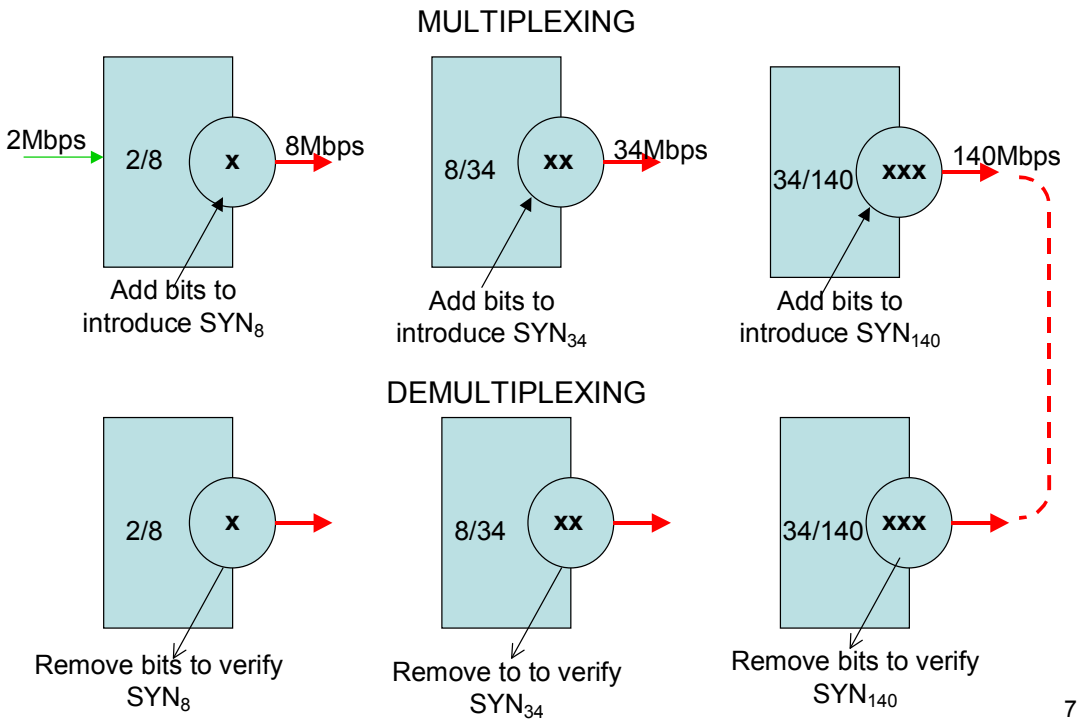
The Principles of PDH



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- At each de-multiplexing point bit period expands, and the inserted bits are removed
- Hence from example, 560 Mbps stream, an 8 Mbps stream cannot be obtained direct. 560 Mbps has to be converted to 140 Mbps , then to 34 Mbps, and then to 8 Mbps; due to the extraction of overhead bits at each de-multiplexing point.
- PDH means Plesiochronous digital Hierarchy. Plesiochronous means Multiple synchornization. That is why the above cannot be achieved.

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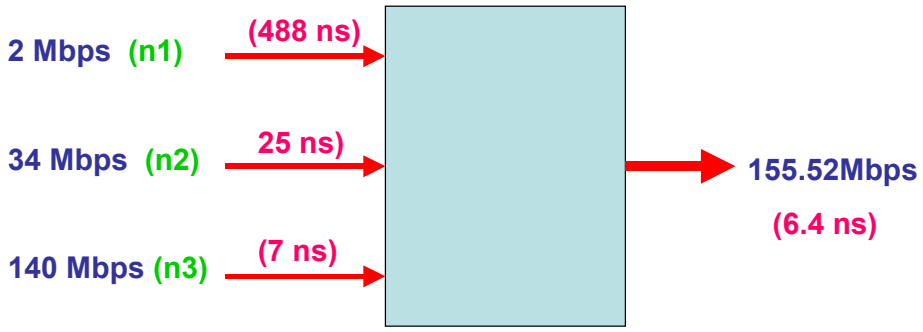
Synchronous Digital Hierarchy (SDH) - Principles



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- Different periods of bits are multiplexed to form a single period of 6.4 ns
- Similarly, from 6.4 ns different periods can be obtained at de-multiplexing points
- All treatment will be done at the entrance from 2 Mbps, 34 Mbps or 140 Mbps into STM1
- No additional bits are introduced within STM1 (after entrance) transforming from 2 Mbps or 34 Mbps or 140 Mbps to STM1

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PDH to SDH at the Entry

- SDH is always of higher frequency than PDH. The treatment to the deviation of the PDH streams has to be accommodated in the SDH stream. Complexity increases when the higher order PDH stream to be placed in the SDH stream. Hence positive, negative & zero justification to be applied, depending upon the PDH stream at the entry to SDH.
- Management of PDH tributary (bit stream) throughout SDH and back again to de-multiplex to PDH
- This management information is called ‘path Overhead’ (POH). Exchange at which this tributary to be terminated, error control etc.
- At the entry to SDH stream, any PDH tributary will be treated for positive, negative & zero justification, depending upon the primary PCMs characteristics. POH and stuffing bits to convert to a single bit period of 6.4 ns. After this no additional bits are introduced to further shrink the period of 6.4 ns.
- Even in higher order SDH, assume STM4, no additional bits introduced. In STM4 the bit period exactly (6.4 ns)/4 = 1.6 ns
- Same concept extends for higher order STM.

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