

University of Diyala

Telecom Switching Systems

Lecture 6

4th Stage

Communication department / Engineering collage

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The plesiochronous digital hierarchy (PDH)

(PDH) was designed to transport the huge amounts of data over digital equipment like microwave radio or fiber optic systems.

The term *plesiochronous* is derived from Greek *plēsios*, meaning near, and *chronos*, time, and refers to the fact that PDH networks run in a state where different parts of the network are nearly, but not quite perfectly, *synchronized*.

Plesiochronous telecommunication system is one where different parts of the system are almost, but not quite, perfectly synchronised.

PDH MULTIPLEX SYSTEM

- **In USA**

- 24 voice channels (64 k) gives a DS-1 (1544 kbps)

- 4 DS-1 gives a DS-2 (6312 kbps)

- 7 DS-2 gives a DS-3 (44736 kbps)

- **Europe and other countries**

- 30 -32 voice channels (64 kbps) plus two channels for framing and signaling gives an E-1 (2048kbps)

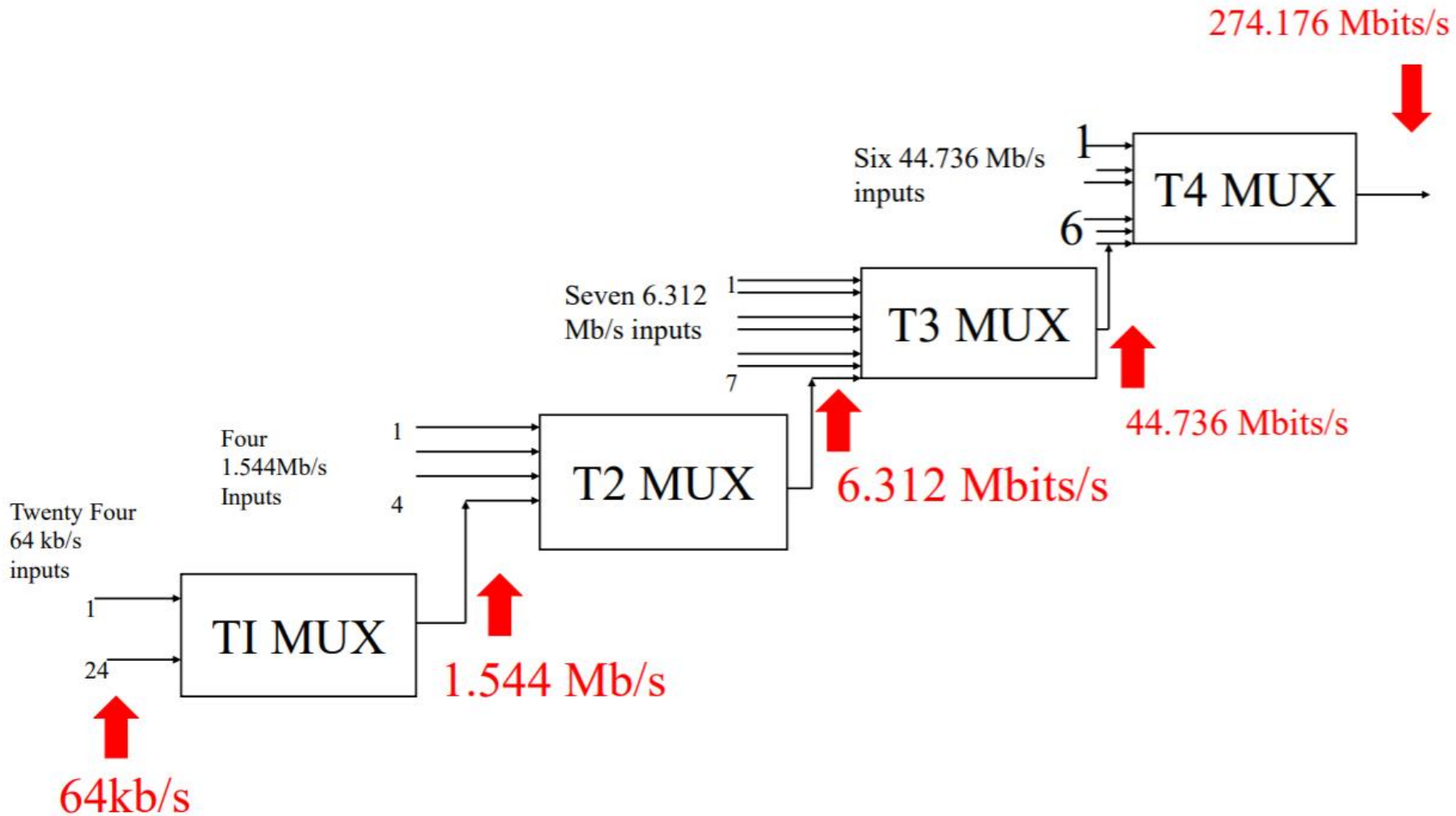
- 4 x E-1 gives an E-2 (8448 kbps)

- 4 x E-2 gives an E-3 (34368 kbps)

- 4 x E-3 gives a E-4 (139264 kbps)

PDH MULTIPLEX SYSTEM - NORTH AMERICA

1. The 24 channel PCM system (T1) is the primary order of Digital Multiplex System.
2. If it is necessary to transmit more than 24 channels, the system is build-up as in the “Plesiochronous Digital Hierarchy” as shown



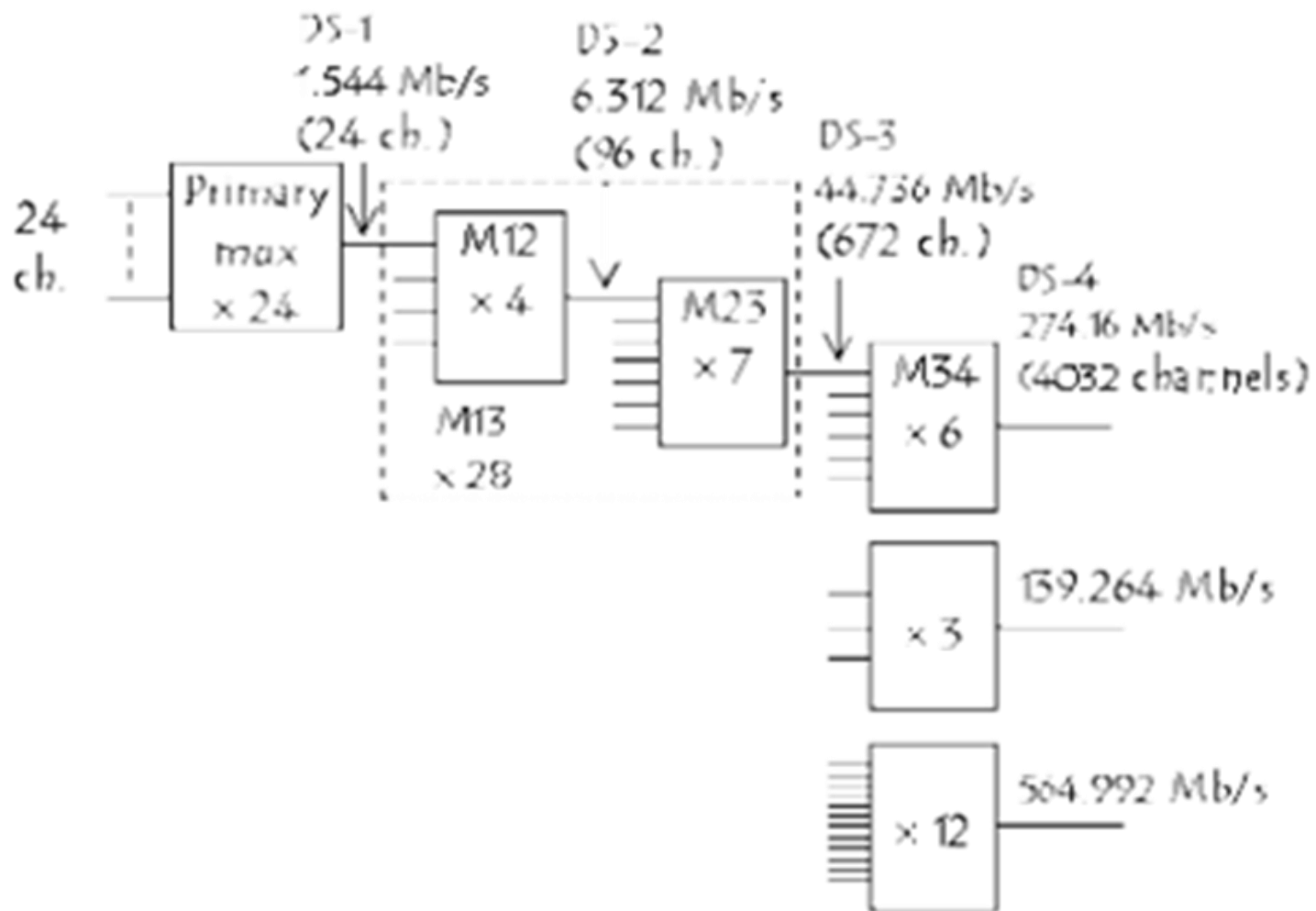


Figure 4.12 North America plesiochronous digital hierarchy

PDH MULTIPLEX SYSTEM - NORTH AMERICA

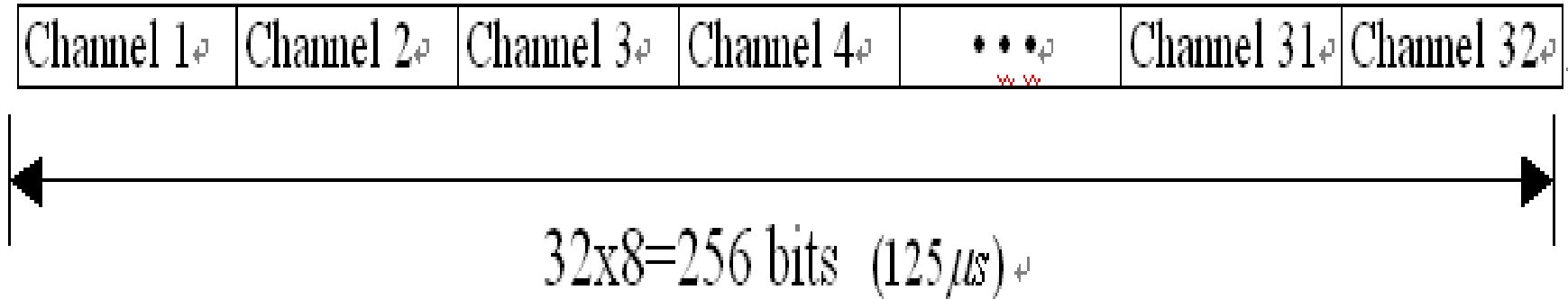
1. Second order multiplexing (T2): Four primary systems (24-channle each) are combined, multiplexed, to form an output having 96 channels.
2. Third order Multiplexing (T3): Seven 96 channel systems are multiplexed to give an output of 672-channels.
3. Fourth order Multiplexing (T4): Six 672 – channels systems are multiplexed to give an output of 4032 channels -

◎ PDH (Plesiochronous Digital Hierarchy)

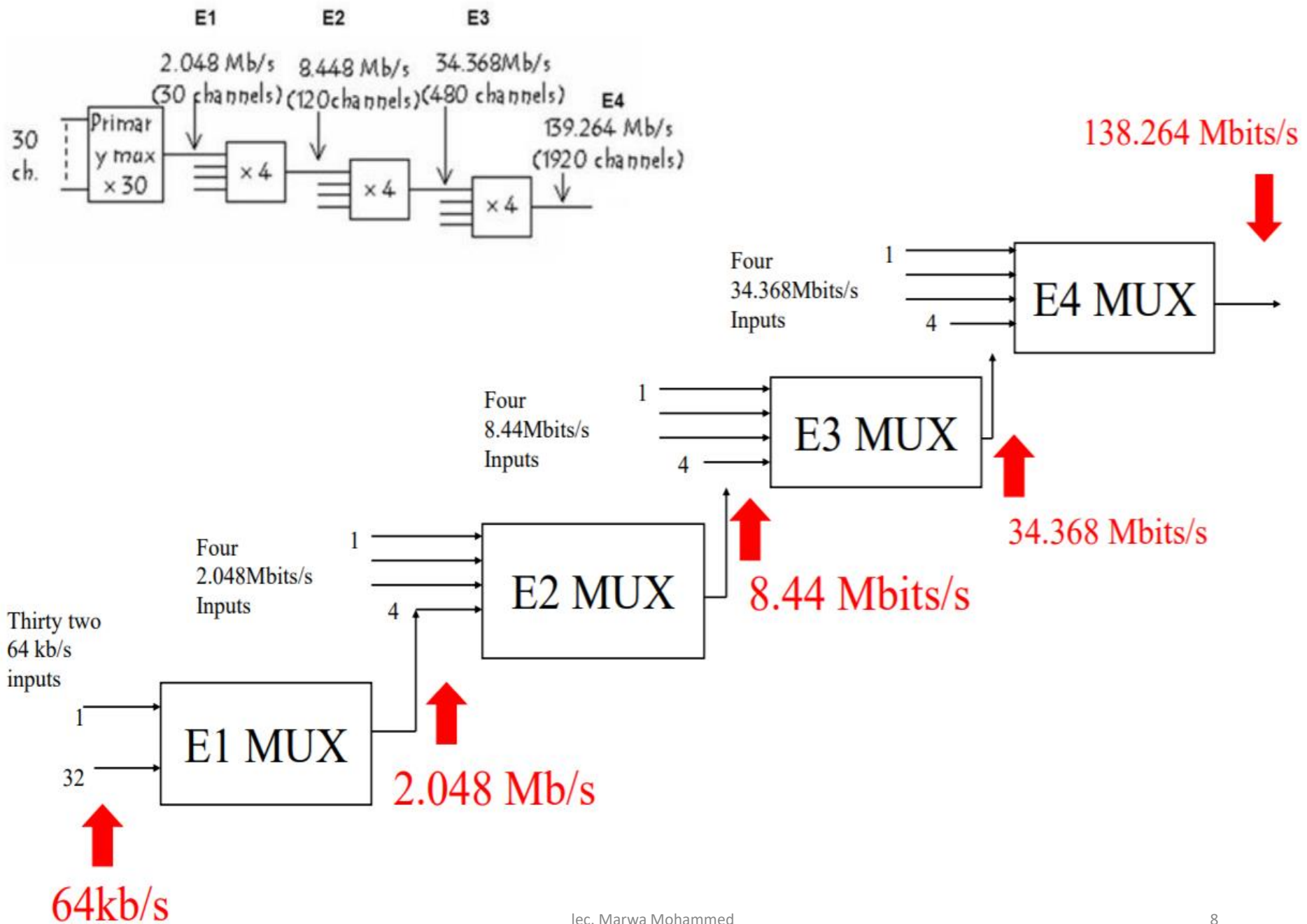
- European Standards: E1, E2, E3, ...

E1:

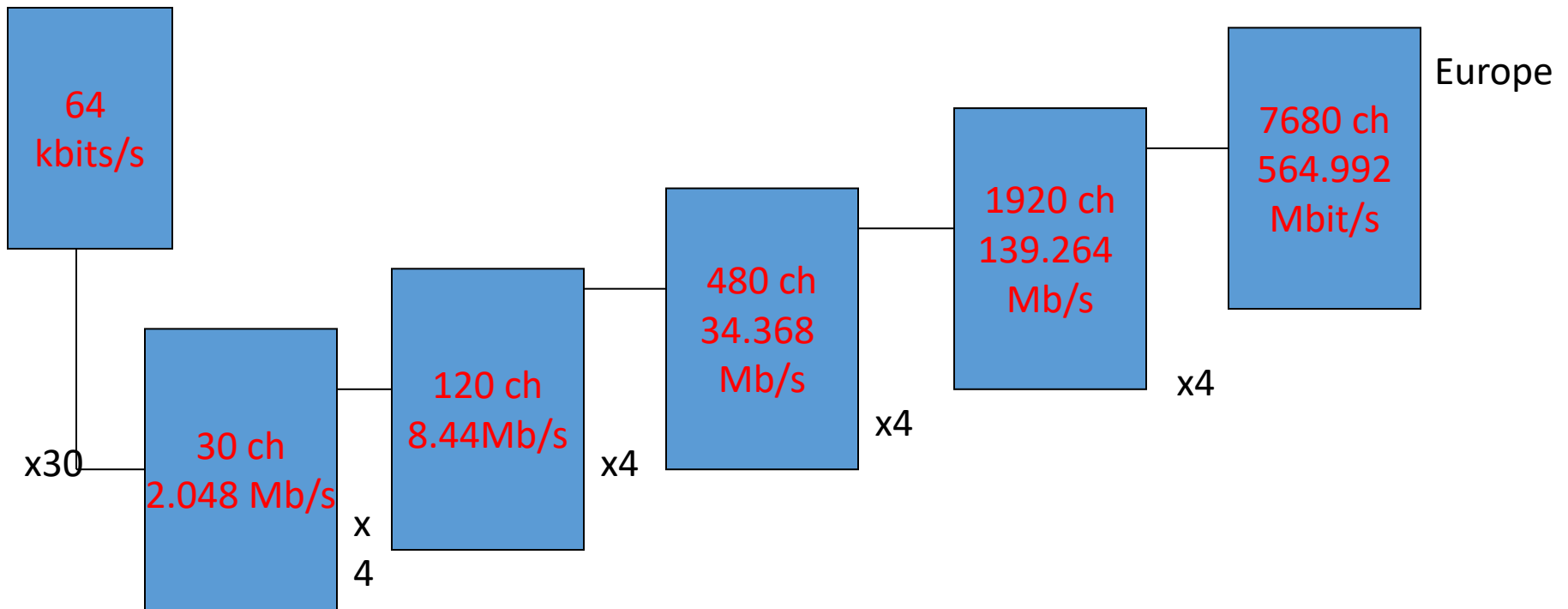
	E1	E2	E3
Rate	2.048Mbps	8.448Mbps	139.264Mbps



$$\text{Rate} = \frac{256 \text{ bits}}{125 \mu\text{s}} = 2.048 \text{ Mbps}$$



PDH Europe



DIGITAL MUX LEVELS IN North America, Europe, Japan

Digital MUX Level	No.of 64Kb/s Channels	North America Mbits/s	Europe Mbits/s	Japan Mbits/s
0	1	0.064	0.064	0.064
1	24	1.544		1.544
	30 -32		2.048	
	48	3.152		3.152
2	96	6.312		6.312
	120		8.448	
3	480		34.368	32.064
	672	44.376		
	1344	91.053		
	1440			97.728
4	1920		139.264	
	4032	274.176		
	5760			397.200

- The 6.312-Mb/s output of a second order (**DS2**) Multiplexer is created by multiplexing four first order (**DS1**) multiplexing outputs.
- This is done by interleaving the bit stream of the four primary systems.
- Each individual bit stream is called the “**tributary**”.

