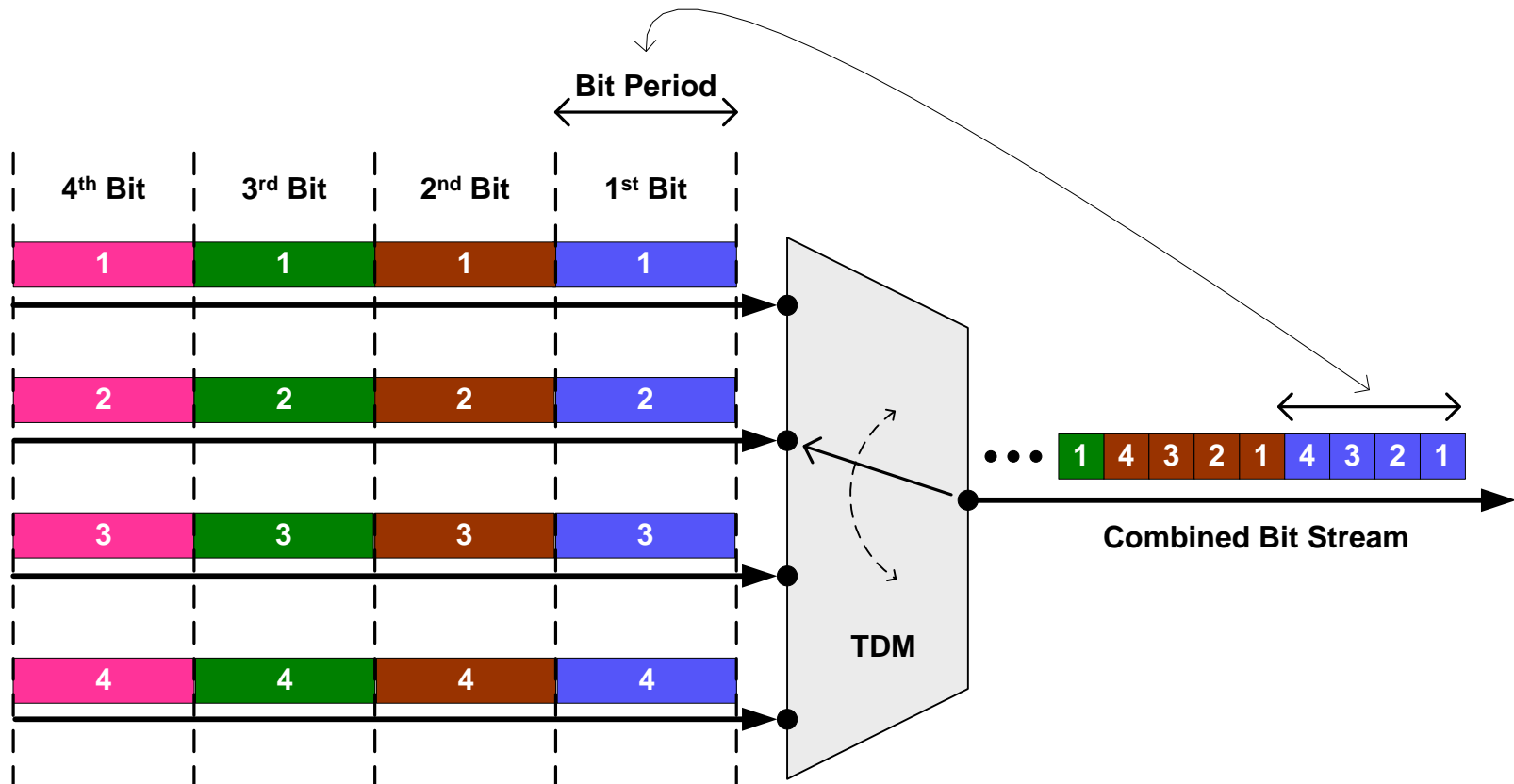


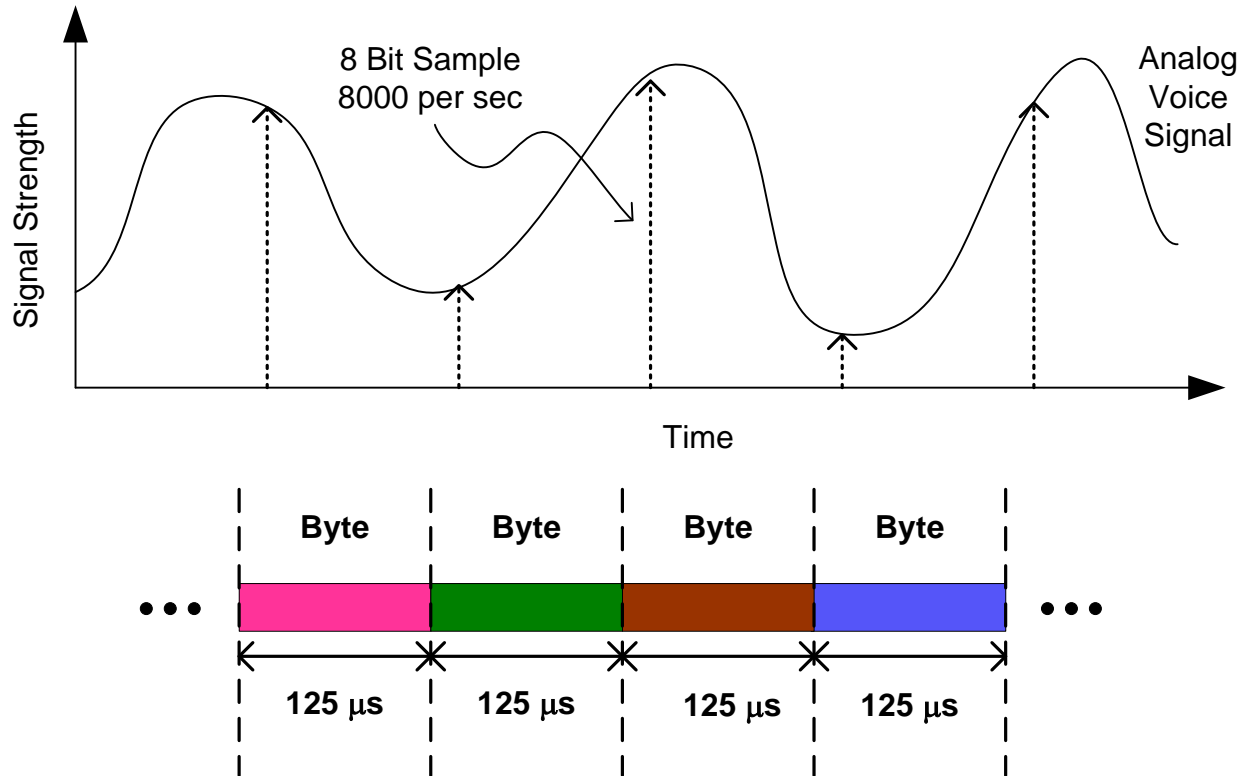
Time Division Multiplexing Bit versus Byte versus Frame Interleaving

Time Division Multiplexing – Bit Interleaving



- Bit interleaving is simple. There is no buffering and bit timing is preserved.

Analog Voice Signal Encoding with Pulse Code Modulation (PCM)

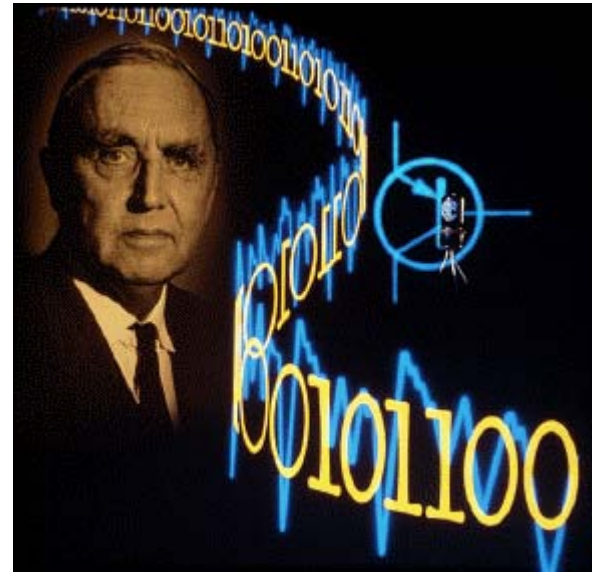


- The DSO digitized voice signal has bytes every 125 microseconds.

History of PCM



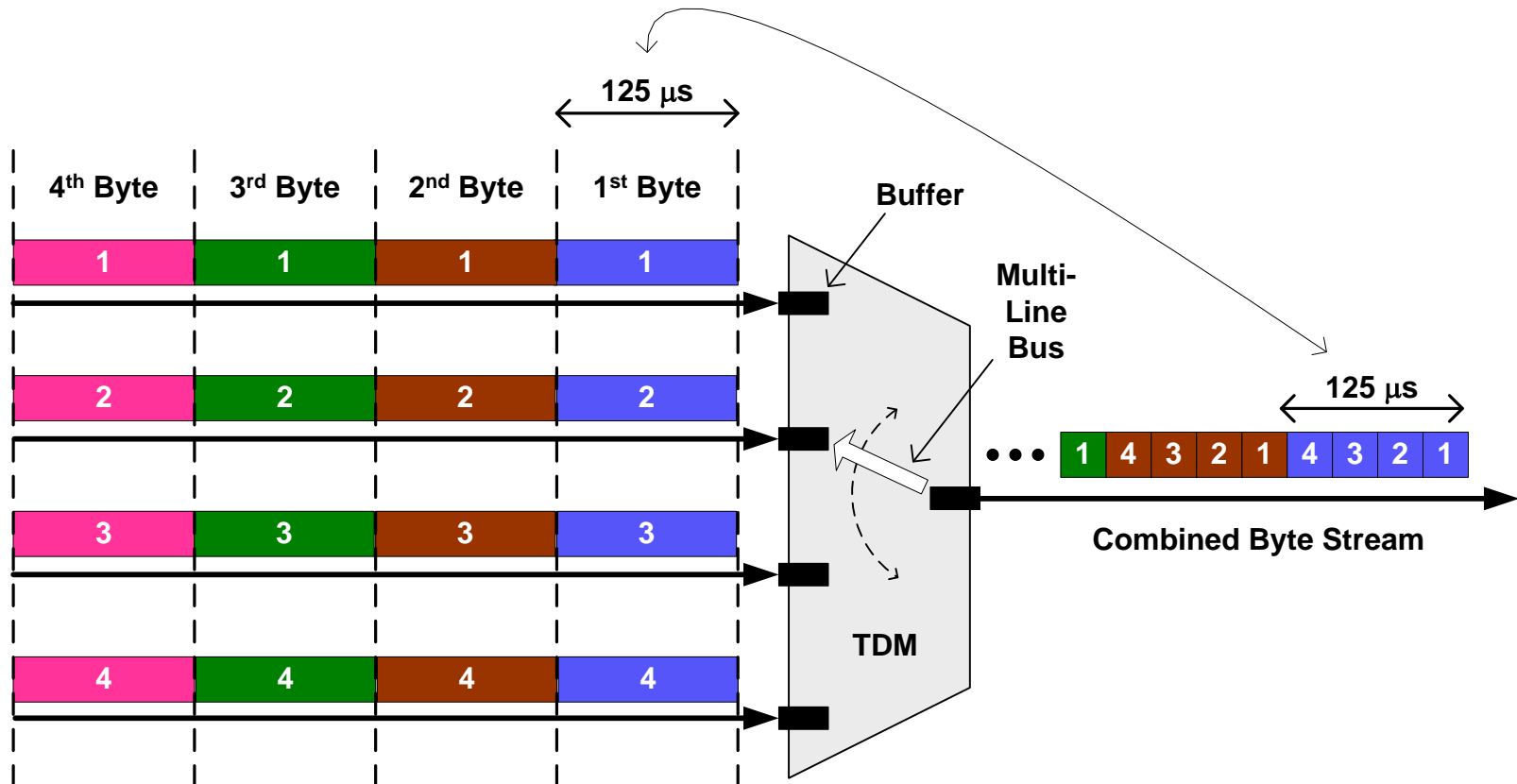
www.edhird.com



www.goforich.co.uk

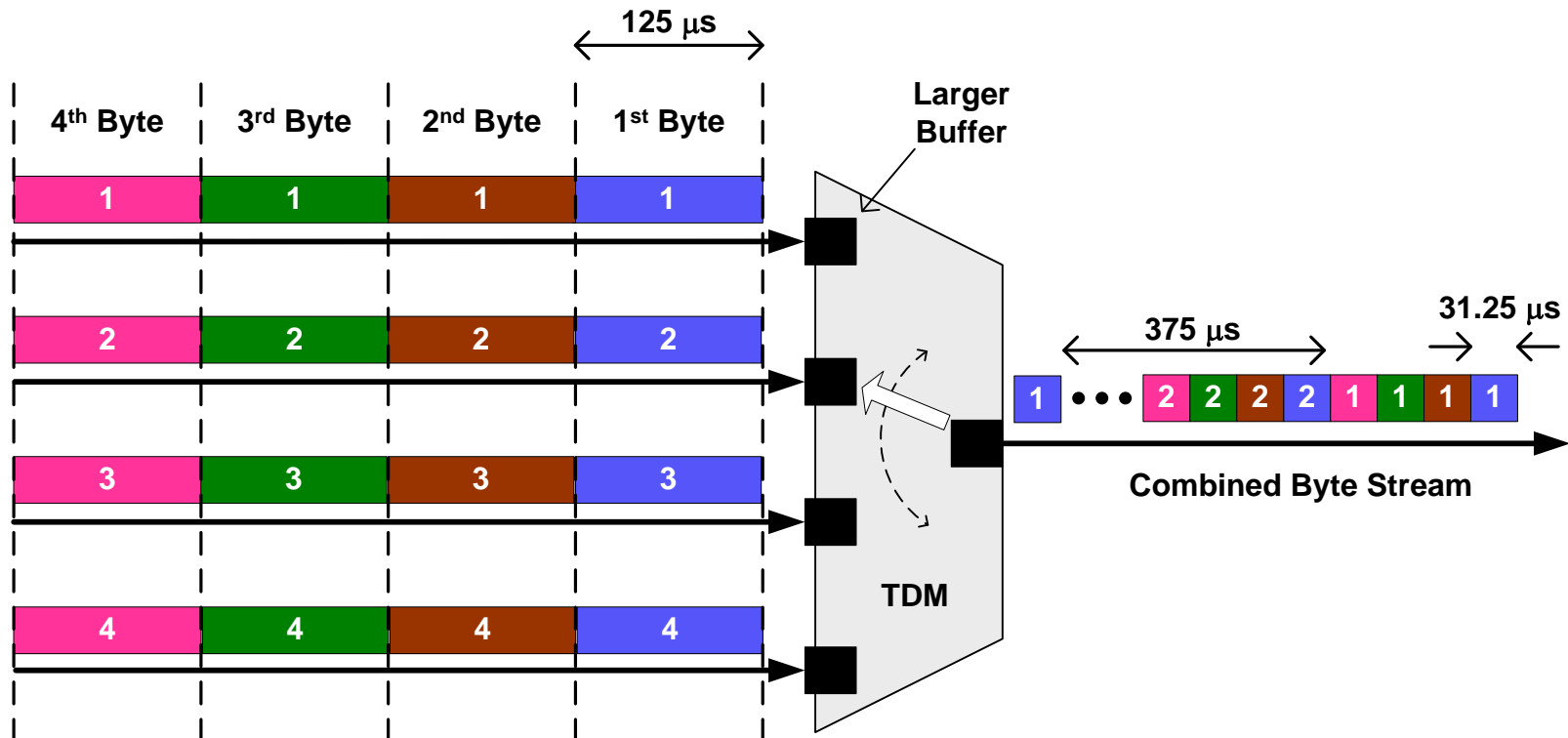
- Alexander Graham Bell demonstrated a telephone in 1876
- Alec Reeves conceived pulse code modulation in 1937

Time Division Multiplexing – Byte Interleaving



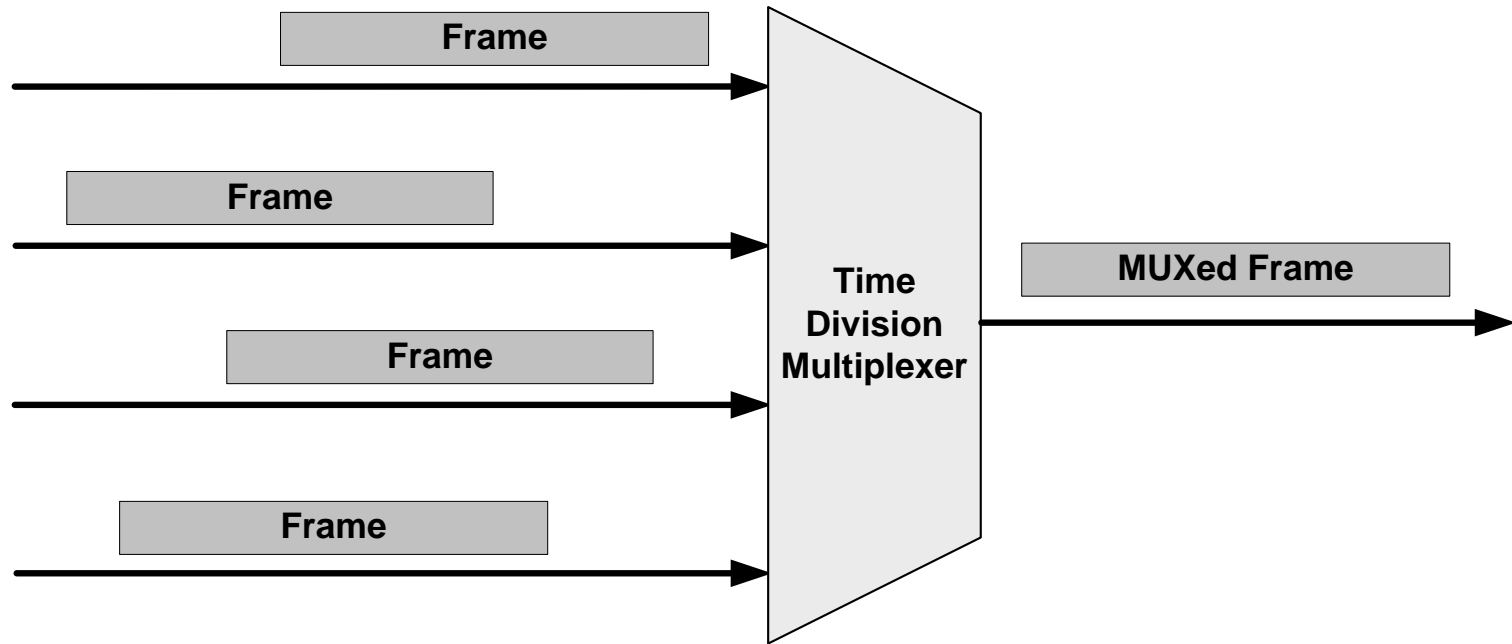
- Byte interleaving takes advantage of technology developed for computers and preserves byte timing

Time Division Multiplexing – Frame Interleaving



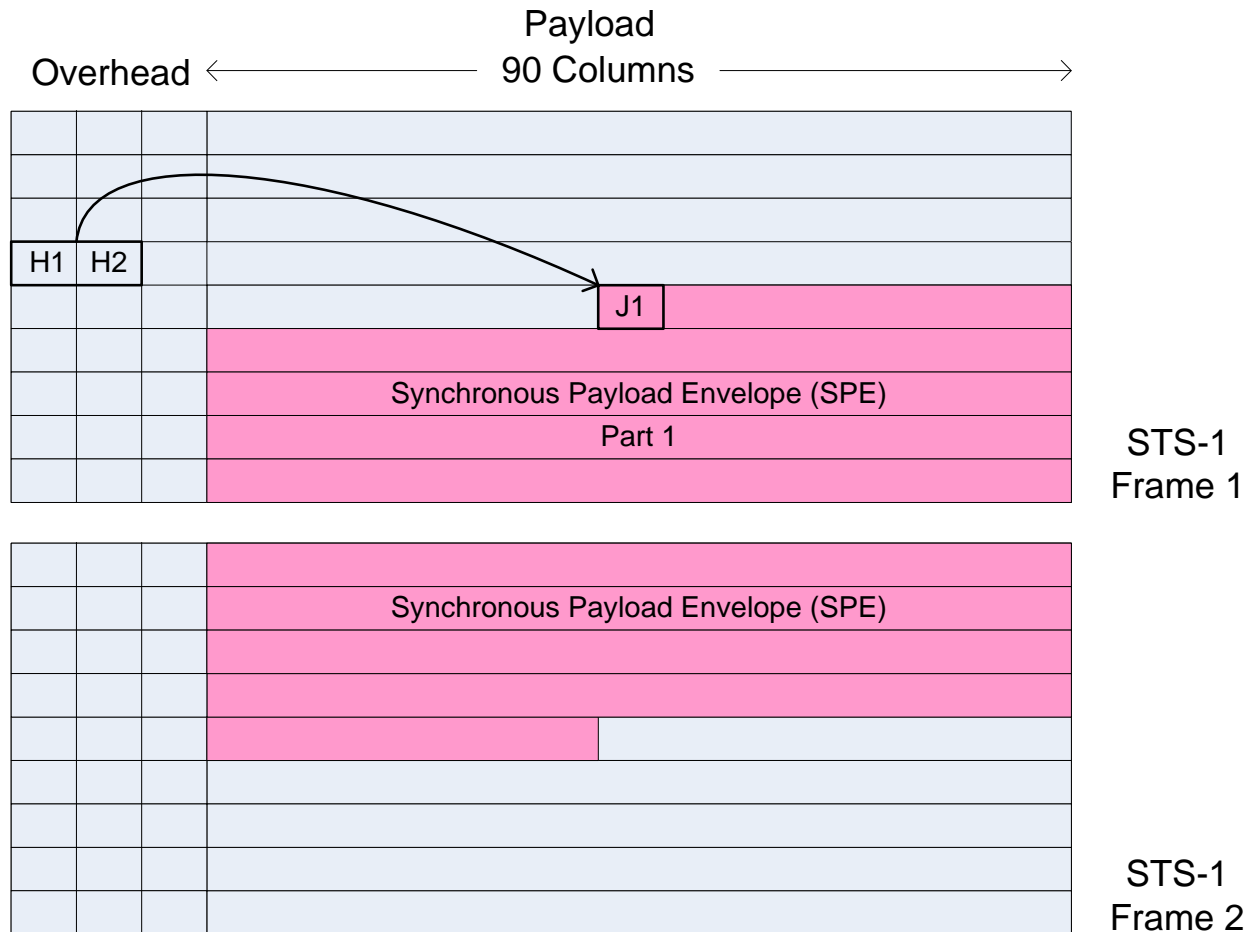
- Frame interleaving requires larger buffers and does not preserve byte timing

Staggered Frame Arrival



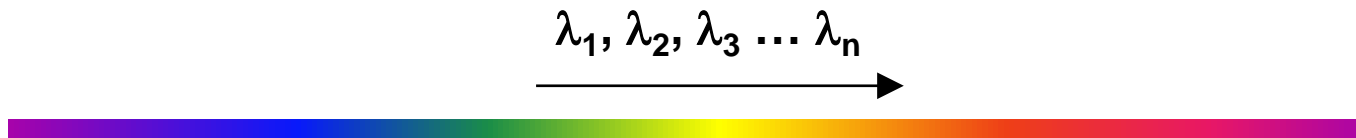
- Frames do not arrive at the same time.
- SONET byte interleaves and does not wait for lagging frames.

SONET Synchronous Payload Envelope



- The synchronous payload envelope is allowed to extend over two SONET frames

WDM Network Links



- Optical Fibers in WDM Networks carry multiple signals each with a distinct wavelength.

WDM Network Equipment



Wavelength
Multiplexer/
Demultiplexer

- Combines optical signals with different wavelengths into one combined optical signal



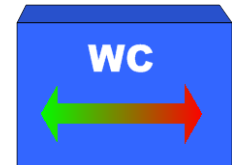
Reconfigurable
Add/Drop Multiplexer

- Same as OADM but we can change the wavelengths to be added or dropped.



Optical Add/Drop
Multiplexer

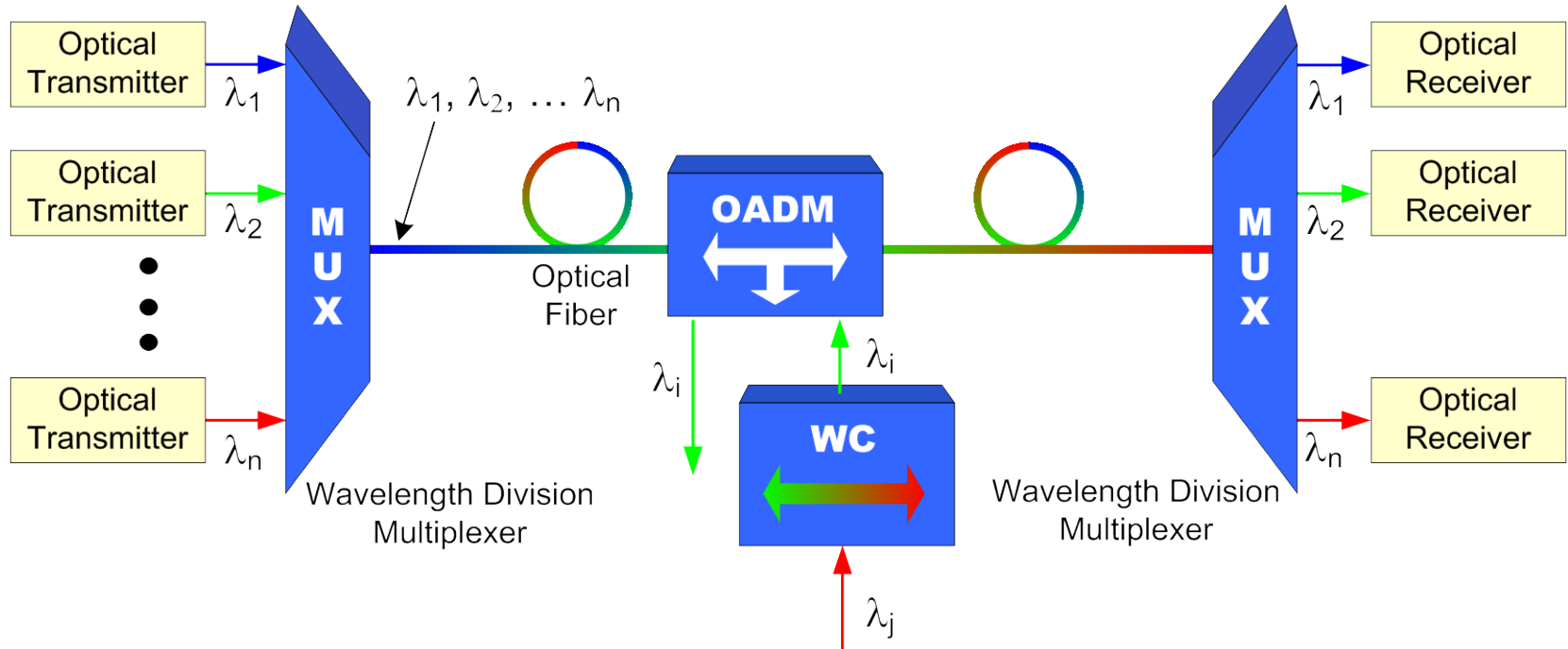
- Adds or drops wavelengths from a WDM link



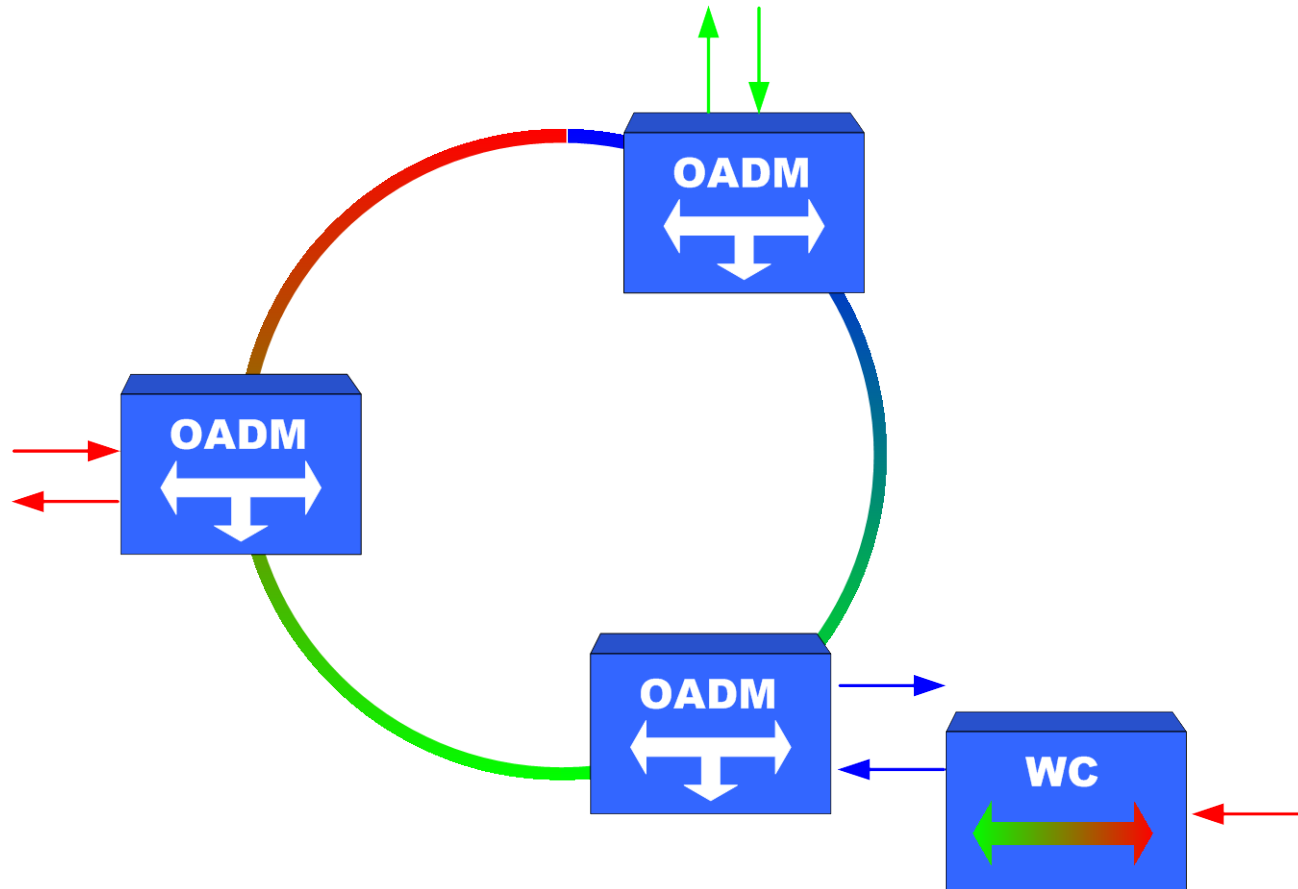
Wavelength Converter

- Changes the wavelength of a signal

A Linear WDM Network



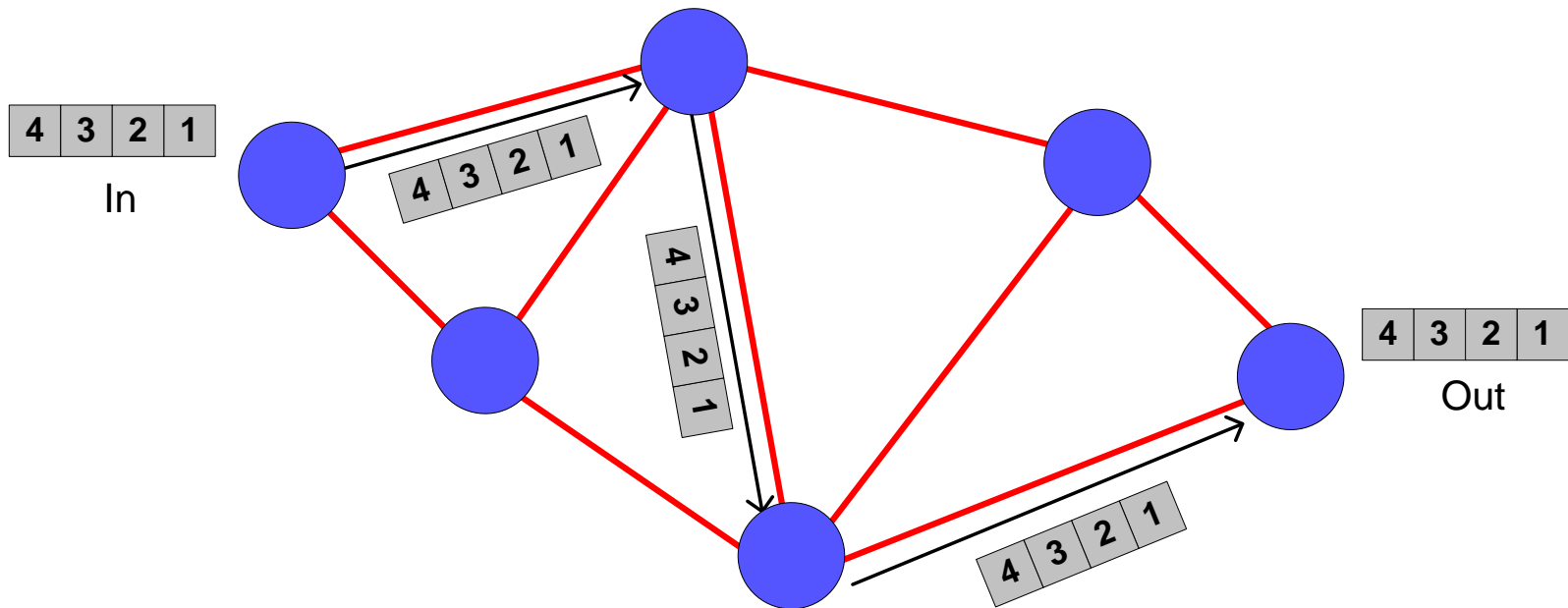
A WDM Ring



Data Communication Networks

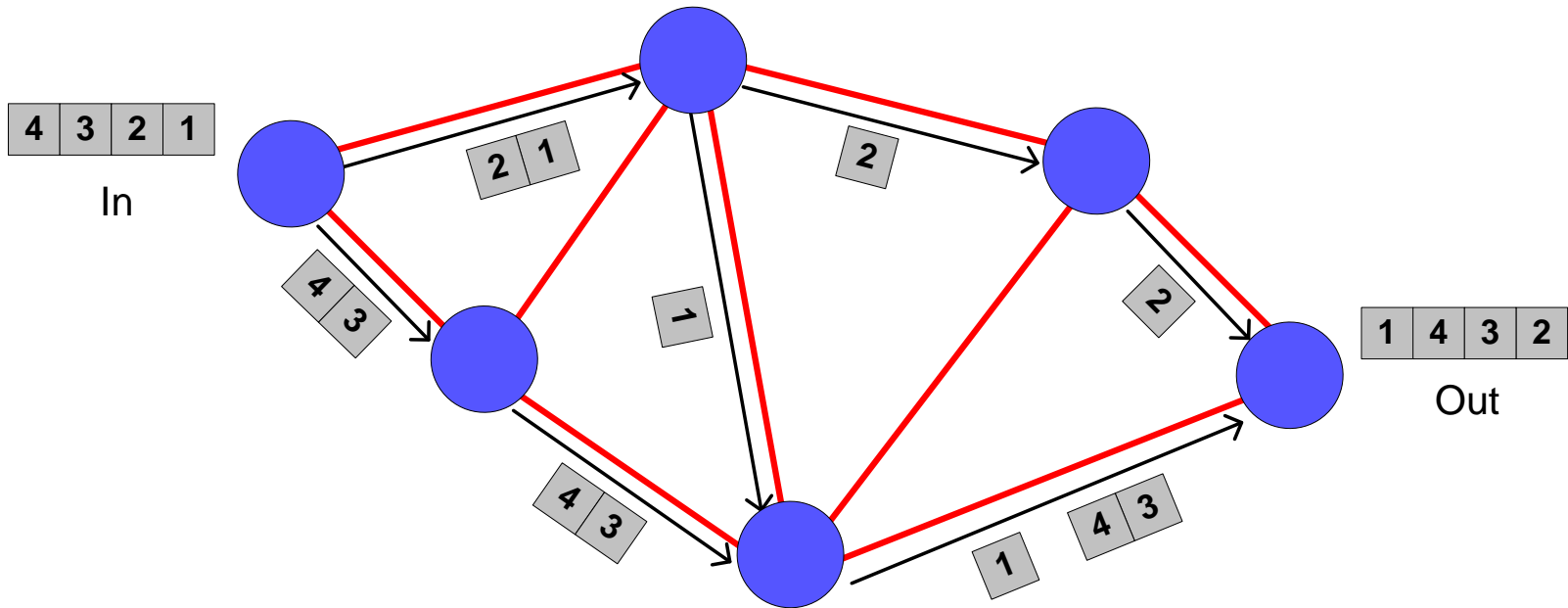
- Data communication networks typically do not send real time data
- As a result, packet switching is often used

Circuit Switching (Telecom Networks)



- When data is “circuit switched” a fixed path is established for the duration of the transfer

Packet Switching



- When data is switched packet by packet, individual packets (or frames) can follow separate paths