

Multiplexing Techniques

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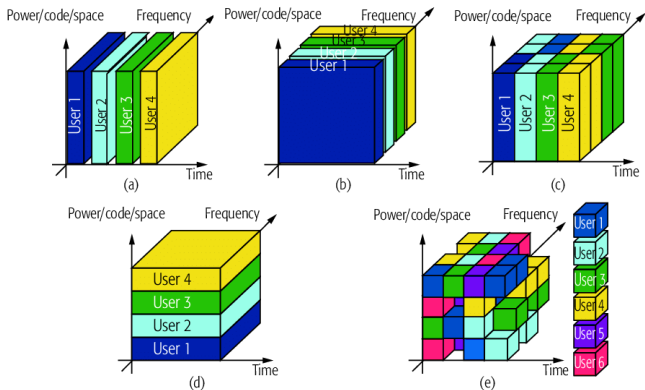


Figure: Illustrative example of different multiplexing schemes: a) TDM; b) FDM (WDM); c) OFDM; d) CDM/SDM; e) Mixed. Multiplexing allows multiple access, where several users commonly utilize various communication resources.

Multiplexing Techniques

- 1 Time Division Multiplexing (**TDM**)
- 2 Wavelength/Frequency Division Multiplexing (**WDM/FDM**)
- 3 Orthogonal Frequency Division Multiplexing (**OFDM**)
- 4 In-phase Quadrature Division Multiplexing (**IQDM**)
- 5 Code-Division Multiplexing (**CDM**)
- 6 Space Division Multiplexing (**SDM**)
- 7 Polarization Division Multiplexing (**PDM**)

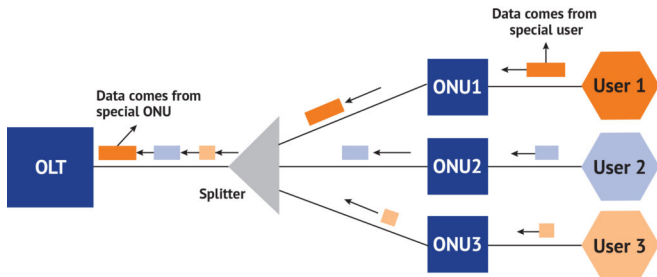


Figure: SONET/SDH, OTN, and PON systems use TDM.

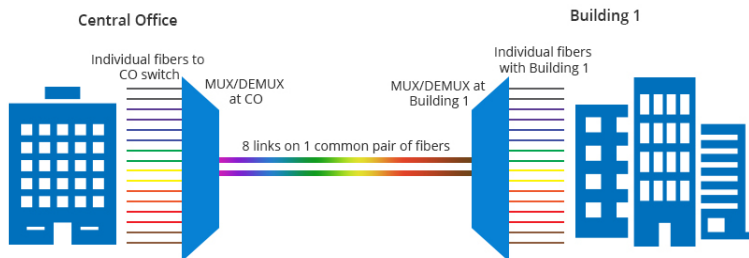
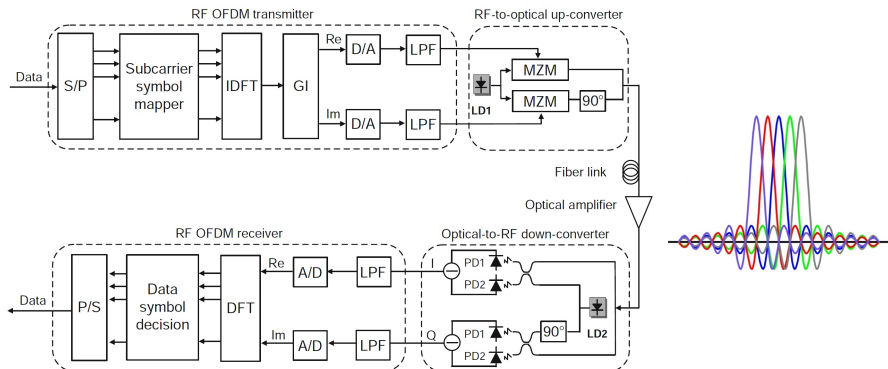


Figure: DWDM/CWDM systems use WDM.

OFDM



S/P: Serial-to-parallel GI: Guard time insertion (I)DFT: (inverse) Discrete Fourier transform
D/A: Digital-to-analog LPF: Low pass filter. MZM: Mach-Zehnder modulator PD: Photodiode
LD: Laser diode

Figure: Elastic optical networks (EONs) may use OFDM. This structure simultaneously uses IQM.

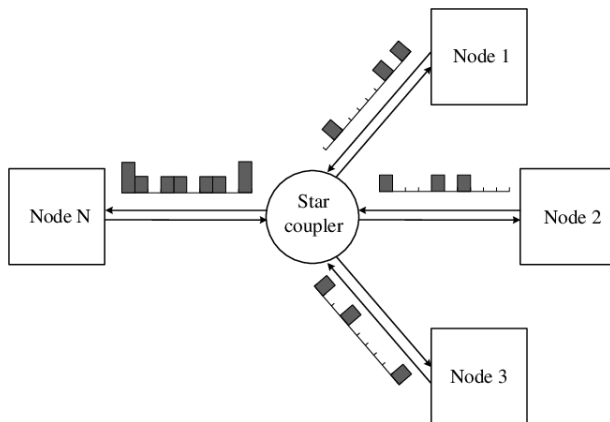


Figure: Incoherent optical communication can use CDM based on Optical Orthogonal Codes (OOC).

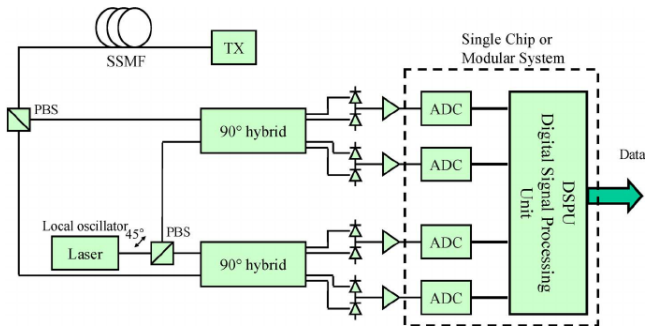


Figure: PDM can be used to increase the transmission rate of a long-haul coherent communication system. This structure simultaneously uses IQM.

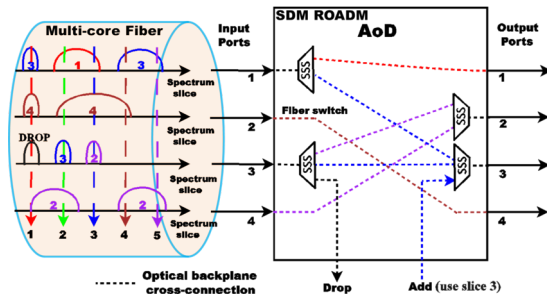


Figure: Modern high speed optical networks will probably use SDM.

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