E4-E5 (CFA)

Dense Wavelength Division Multiplexing DWDM

AGENDA

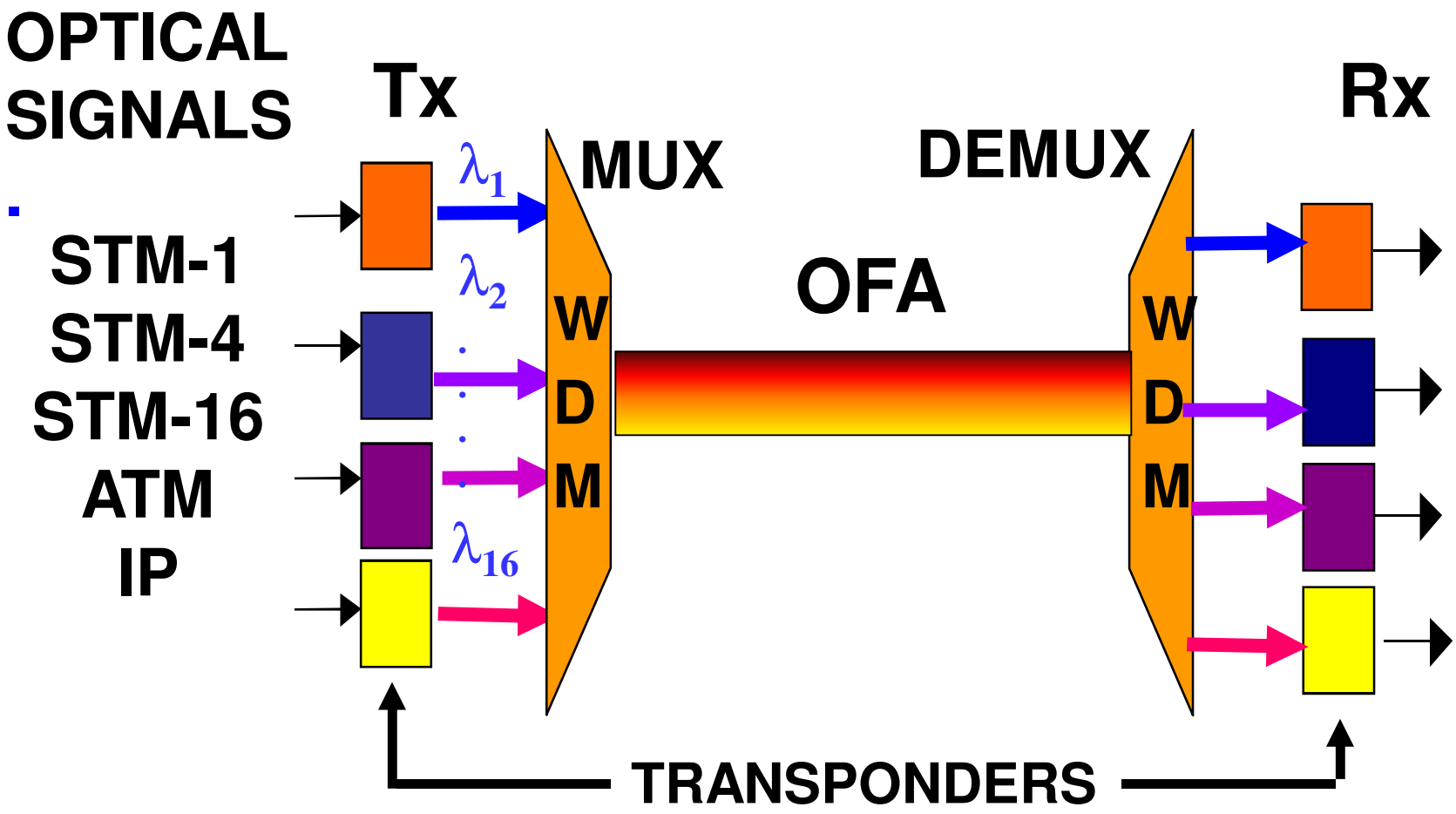
- The Challenges of Today's Telecommunications Network
- Resolving the Capacity Crisis
- Capacity Expansion and Flexibility
- Capacity Expansion Potential
- Optical Layer as the Unifying Layer

DWDM

Definition

Dense wavelength division multiplexing (DWDM) is a fiber-optic transmission technique that employs multiple light wavelengths to transmit data in parallel through a single fiber.

BLOCK SCHEMATIC



CHALLENGES OF TODAY'S TELECOMMUNICATIONS NETWORK

- The forecasts of the amount of bandwidth capacity needed for networks were calculated on the presumption

- Challenge of deploying and integrating diverse technologies in one physical infrastructure.

CHALLENGES OF TODAY'S TELECOMMUNICATIONS NETWORK

- DWDM provides unique bandwidth management capabilities by offering services such as e-mail, video, and multimedia carried as IP data over ATM and voice carried over SDH.

RESOLVING THE CAPACITY CRISIS

- Challenges of increased bandwidth needs as well as of laying new fiber after fiber exhaust.
- By increasing the bit rate using time division multiplexing (TDM), service providers purchase more capacity than they initially need and it may remain unutilized in the near future.

CAPACITY EXPANSION AND FLEXIBILITY

- By combining multiple optical signals and transporting over a single fiber of different rate and of different format (SDH, ATM, data, etc.) i.e. DWDM can carry 80 wavelengths, each of STM-16 capacity i.e. total of 200 Gbps.

CAPACITY EXPANSION AND FLEXIBILITY

- High-speed, high-volume transmission is possible through deployment of optical amplifier. Optical amplifiers operate in a specific band of the frequency spectrum while ultra wideband optical-fiber amplifiers can boost light wave signals carrying over 100 channels (or wavelengths) of light.

CAPACITY EXPANSION POTENTIAL

- Flexibility to expand capacity in networks.
- Compared with repeater-based applications it increases the distances between nodes.
- Using fewer regenerators in long-distance networks results in fewer interruptions and improved efficiency.

OPTICAL LAYER AS THE UNIFYING LAYER

- Optical layer integrates the diverse technologies of their existing networks into one physical infrastructure
- DWDM is Bit-rate and format independent and can accept any combination of interface rates
- Optical layer carries signals without any additional multiplexing, i.e. ATM or IP without deploying an overlay network

DWDM SYSTEM CHARACTERISTICS

- Well-engineered DWDM systems offer component reliability, system availability, and system margin.
- Automatic adjustment of the optical amplifiers when channels are added or removed ensures optimal system performance.

DWDM SYSTEM CHARACTERISTICS

- In the 1530- to 1565-nm range, silica-based optical amplifiers with filters and fluoride-based optical amplifiers perform equally well. However, fluoride-based optical amplifiers are intrinsically more costly to implement

WHY OPTICAL (DWDM) NETWORKING

- Fibre Exhaust : Tapping the unlimited bandwidth on a fibre pair
- Bit Rate Transparency
- Format/Protocol Transparency : IP, ATM etc

ECONOMICS OF DWDM

- Saving of regeneration costs by multiplexing multiple wavelengths on a single fiber, can decrease the number of amplifiers by a huge factor at each regenerator site.
- Cost effective compared to laying new fibers

EDFA

- **Erbium Doped Fiber Amplifier (EDFA)**

  Optical fiber that is doped with the element erbium and the amplifier. When a pump laser is used to energize the erbium with light at a specific wavelength, the erbium acts as a gain medium that amplifies the in coming optical signal.

Conclusion

- Support existing and emerging technologies with almost limitless amounts of bandwidth
- OXC,OADM, and optical switches provides a unified infrastructure capable of meeting the telecommunications demands of today and tomorrow
- Transparently moving Trillions of bits of information efficiently and cost-effectively

Thanks