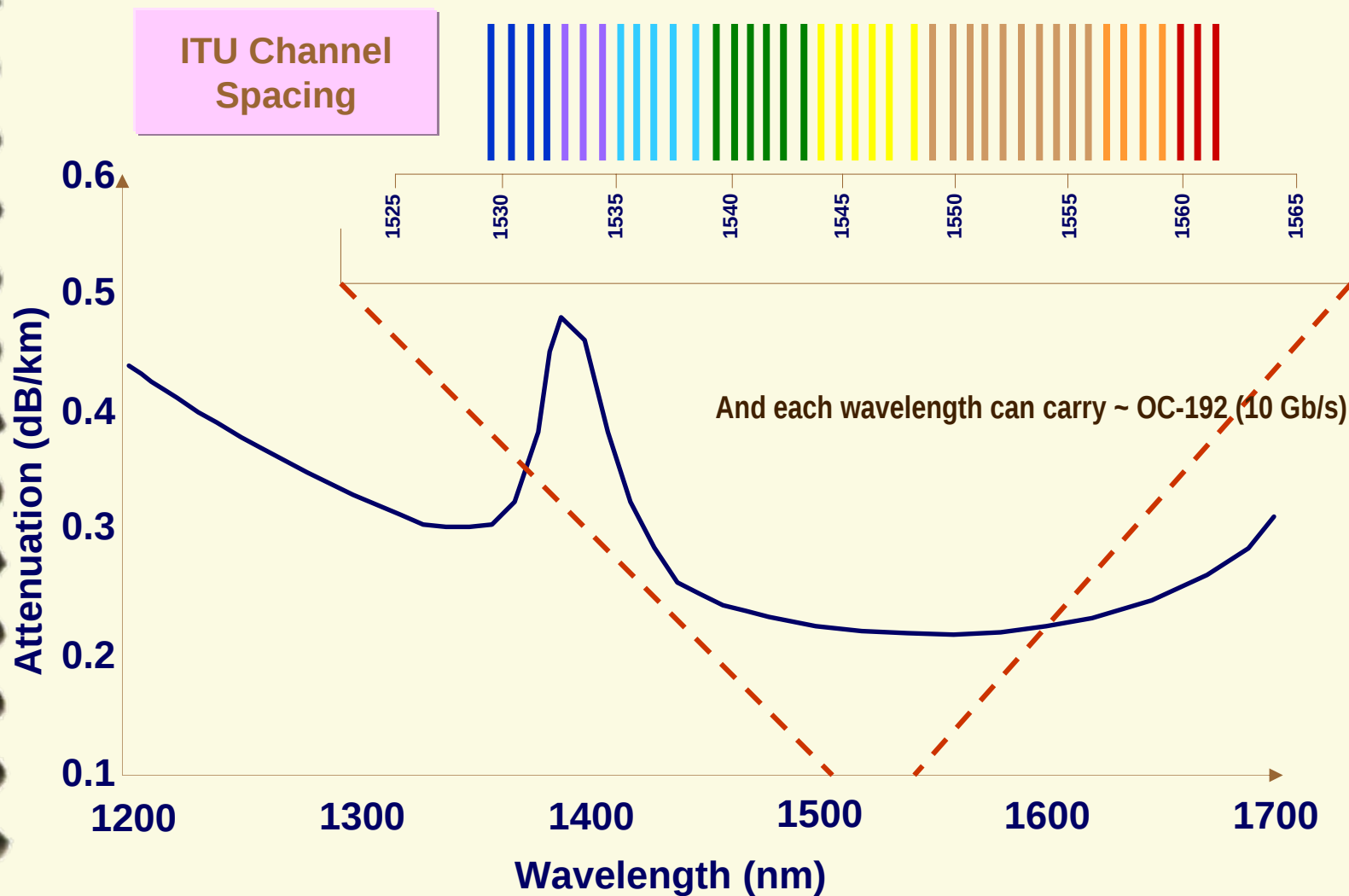




波分复用 (WDM) 技术



WDM的重要意义

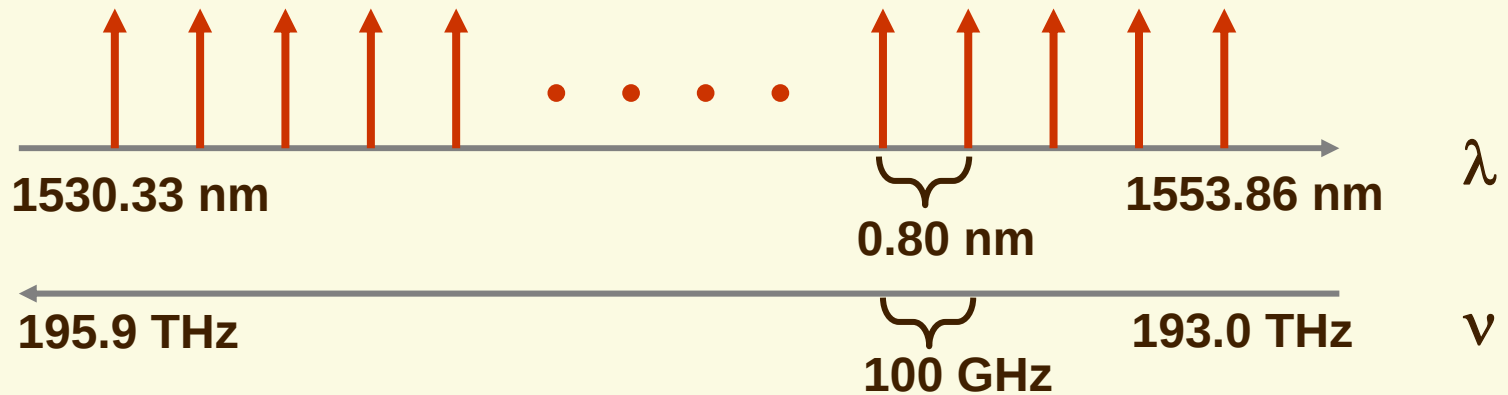
If 64Kb/s = 1 lane



Then Based on today's WDM Technology,
a single fiber would = 25 Million Lanes,
or a Highway that was 60,000 Miles Wide



ITU Wavelength Grid



- ITU-T λ grid is based on 193.1 THz (1552.52nm) $\pm$ (25, 50, 100, 200) GHz
- It is a standard for **laser** in DWDM systems



Optical Transmission Bands

Band	Wavelength (nm)
	820 - 900
	1260 – 1360
“New Band”	1360 – 1460
S-Band	1460 – 1530
C-Band	1530 – 1565
L-Band	1565 – 1625
U-Band	1625 – 1675

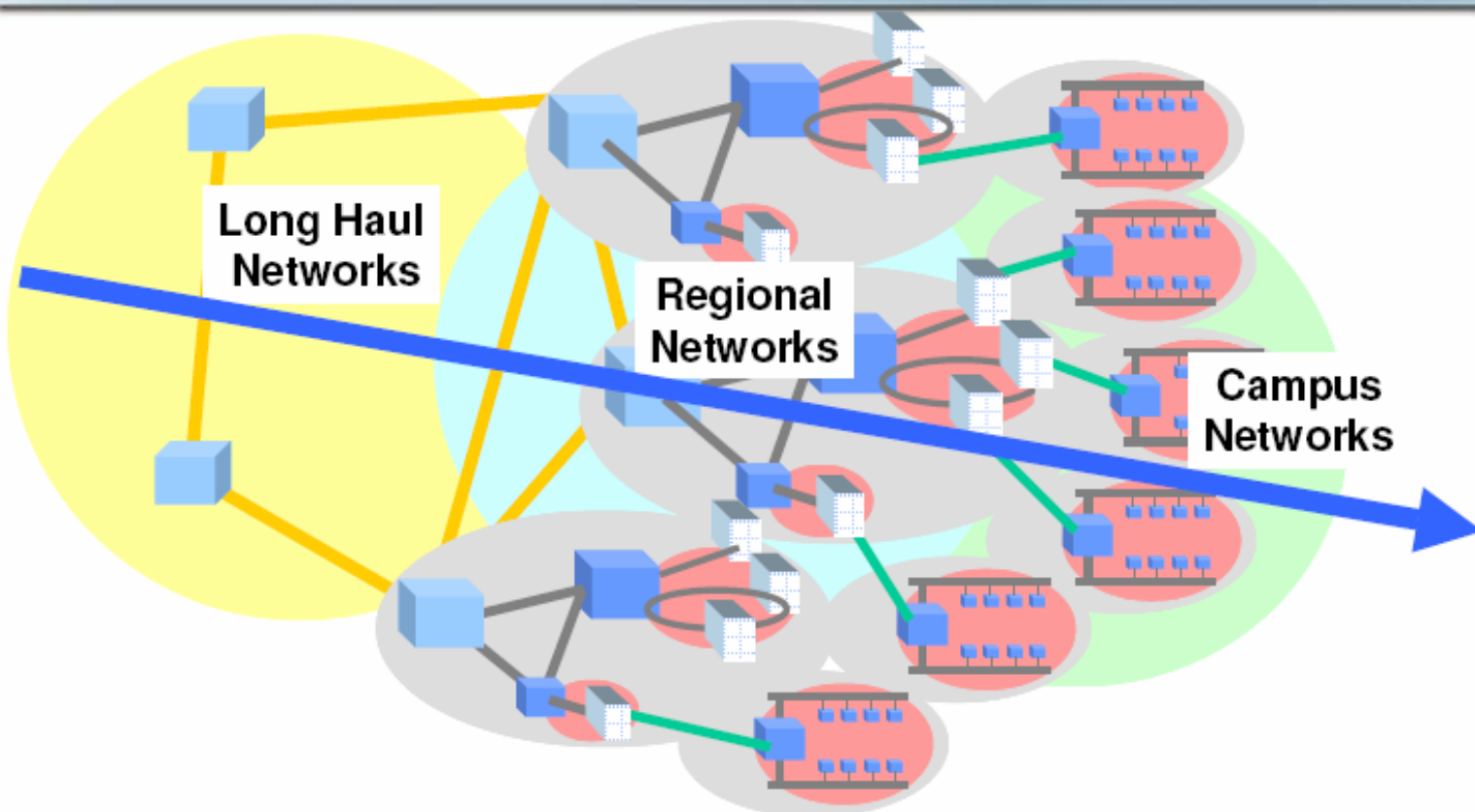


WDM技术前沿研究热点

- 符合ITU-T标准的宽带可调谐激光器技术
- 适用于不同波段的掺杂光纤放大器技术
- 分布式Laman放大技术
- 各种高性能波分复用/解复用器件技术
- 动态波长转换技术
- 静态和动态全光波长上下话路（分插复用）器件（OADM）和交叉连接（OXC）技术
- 基于WDM的无源光网络（PON）和有源光网络（AON）技术

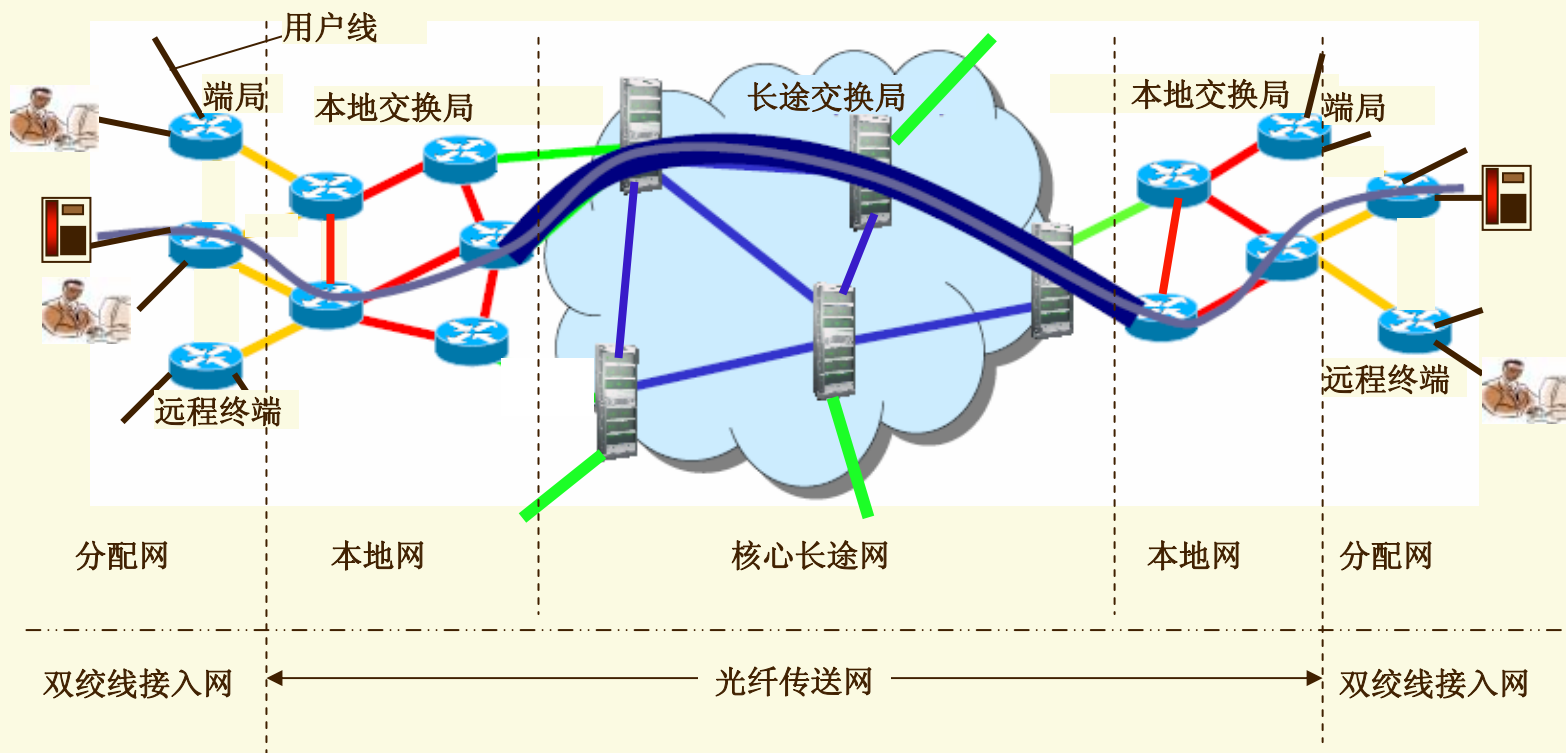
光网络技术的发展趋势

Evolution of Optical Networks



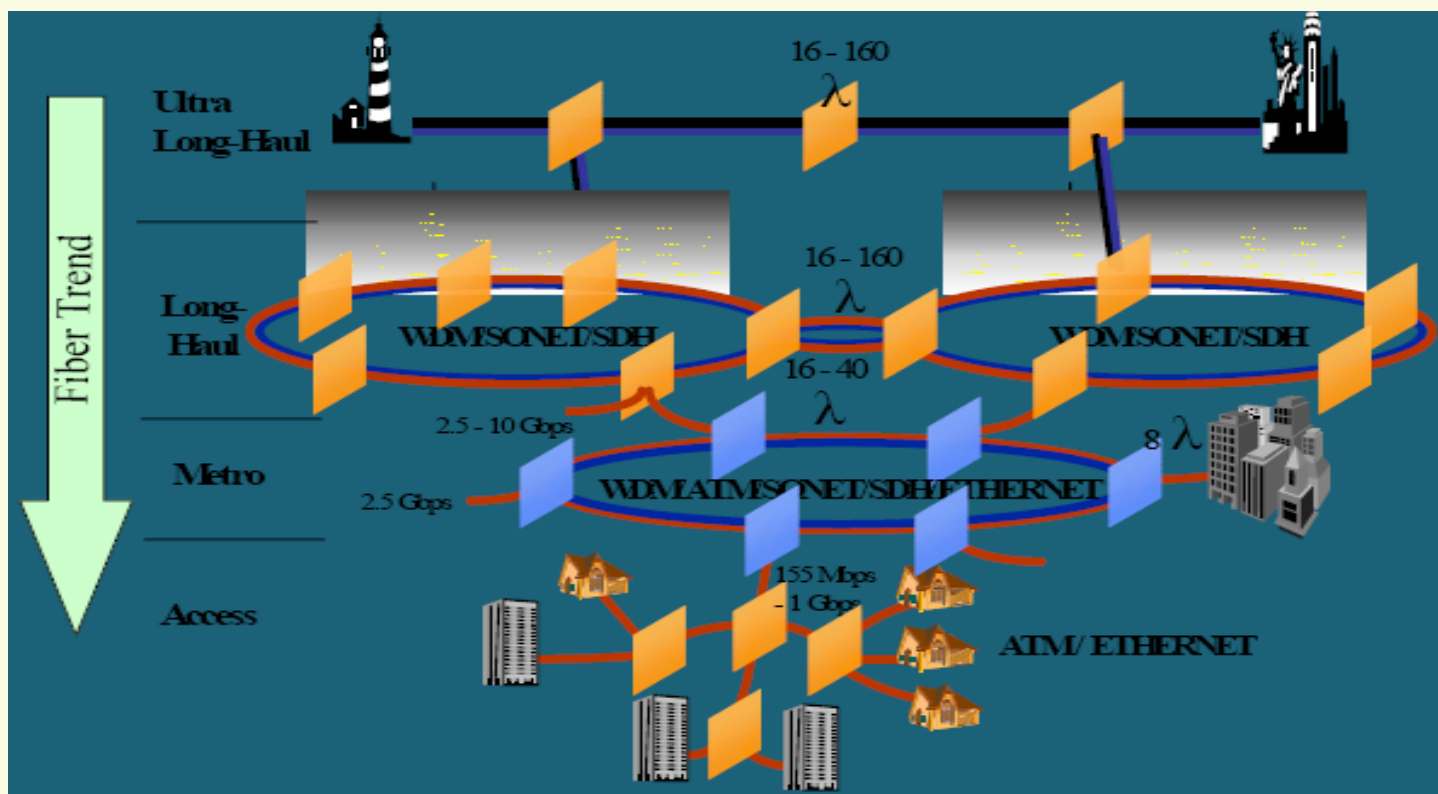
Optical networks continuously growing in scope, capability

光纤传送网与接入网



光纤正逐步走向最终用户

随着光收发器和光端机技术的日益成熟和成本的降低，光纤不断接近最终用户(FTTC, FTTZ, FTTB, FTTT), 终极目标是FTTH和FTTD。



FTTH

- Why Fibre-to-the-Home (FTTH / FTTP) ?
 - User pressure for higher bandwidth
 - » Remove last mile bottleneck between multi-Gbps worlds
 - Overcome Copper limitations
 - » Bandwidth
 - » Distance
 - » Noise / crosstalk / asymmetry
 - Convergence: voice, video, data



数字复接技术与交换技术的发展

- 早期的数字通信网采用基于**PCM**技术的**PDH**复接体系与交换技术，适合**565Mb/s**以下的传输速率
- **SONET/SDH**，适用于**10Gb/s**以下的传输速率
- 分组交换与**IP**技术，适合对实时性要求不高的数据传输业务，以实时性为代价，提高了信道利用率
- **ATM**技术，兼顾了实时性与信道利用率
- 上述技术均是在电的领域实现的，受微电子系统信号处理速率的限制，形成所谓电子瓶颈
- 由于信号传输技术的全光化，目前单根光纤的传输速率已高达**10Tb/s**
- 对全光交换技术以及网络全光化的研究是**FTTH**之外，光纤通信技术的另一个努力方向



Summary and Comments

Summary



Quick history

- **1958: Laser** discovered
- **Mid-60s: Guided wave optics** demonstrated
- **1970: Production of low-loss fibers**
 - Made **long-distance** optical transmission possible!
- **1970: invention of semiconductor laser diode**
 - Made optical **transceivers** highly refined!
- **70s-80s: Use of fiber in telephony: SONET/SDH**
- **Mid-80s: LANs/MANs: broadcast-and-select architectures**
- **1988: First trans-atlantic optical fiber** laid
- **Late-80s: EDFA (optical amplifier)** developed
 - Greatly alleviated distance limitations!
- **Mid/late-90s: DWDM** systems explode
- **Late-90s: Optical switching** systems develop

Summary

光纤的基本传输特性及其对光信号的影响

