







Optics vc Electronics         Optical domain       Electrical domain         Image: photonic technology is well suited to certain simple (linear) signal-routing and switching functions       Image: electronics is needed to perform more complex (nonlinear) functions signal detection, regeneration and buffering logic functions (e.g. reading and filtering wavelength multiplexing, demultiplexing and routing channelizing needed to make efficient use of enormous bandwidth of the fiber       Image: However, these complex functions limit the throughput electronics also gives a possibility to include in-band control information (e.g. in packet headers) enabling a high degree of virtual connectivity different wavelengths share each fiber         Image: optics is fast but dumb - connectivity bottleneck       Image: electronics is slow but smart - electronic bottleneck	Optics vc Electronics         Optical domain <ul> <li>photonic technology is well suited to certain simple (linear) signal-routing and switching functions</li> <li>optical power combining, dividing and filtering wavelength multiplexing, demultiplexing and routing channelizing needed to make efficient use of enormous bandwidth of the fiber</li> <li>by wavelength division multiplexing (WDM) many signals operating on different wavelengths share each fiber</li> </ul> incl (e.g high different wavelengths share each fiber	
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	- connectivity bottleneck - el	ctronic bottleneck

Components of Optical Networks		
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Optical Sources		
<ul><li>LED</li><li>LASER</li></ul>		
Optical Detectors		
<ul> <li>Photoconductor</li> <li>Photodiode</li> <li>Phototransistors</li> <li>Optical Devices</li> </ul>		
<ul> <li>Optical Amplifier</li> <li>Second Harmonic Generation</li> <li>Splitter and Coupler</li> <li>Polarization Controller</li> <li>Lens and Prism</li> <li>Diffraction Gratings</li> <li>Modulator and Switch</li> </ul>		
DiplIng. Kaan Avsar Asan, M.Sc	November 2014	AA/ BB



Optical Networks and Systems
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Definition
"Optical networks are high capacity telecommunication networks based on optical technologies that provide <b>routing, grooming</b> and <b>restoration</b> at the <u>wavelength level</u> as well as <u>wavelength based services</u> "
An optical network is a telecommunications network
<ul> <li>with transmission links that are optical fibers, and</li> <li>with an architecture designed to exploit the unique features of fibers</li> <li>And they do not necessarily be pure optical</li> </ul>
Characteristics of Optical Networks
<b>Transmission :</b> Optical <b>Switching :</b> all-optical / all-electronic / hybrid / circuit / packet / burst
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Optical Networks and Systems - continued	
Bandwidth	
Usable band in a fiber ■ 1.30µm - 1.65µm ≡ 40 THz ■ λ spaced at 100 GHz ⇒ 400 λ per fiber	
<ul> <li>Link Speeds up to 40 Gbps per λ</li> <li>OC-3 ≡ 155Mbps</li> <li>OC-768 ≡ 40Gbps becoming available</li> </ul>	
Total link capacity 400 λ * 40Gbps = 16 Tbps!	
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