



Optical Wireless for Broadband Access

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OUTLINE

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Access Requirements Evolution

- From Voice to Gigabit Ethernet
- Convergence of Services
- The Rise of the Internet
- Residential 3x HDTV + Data ~ 75Mbps
- Business 10/100/1000/10,000 Mbps



Broadband Point-to-Point transmission technologies

- Optical 200 - 500 THz
 - Fiber
 - Wireless
- Radio Frequency
 - Cable to 1 GHz
 - Wireless to 100 GHz



Problems with fiber/wireline solutions

- Fiber in short supply - long delays
 - Fiber needs planning - rights of way
 - Fiber deployment is expensive
 - Wirelines vulnerable to errant backhoes
 - Upgrading existing wirelines requires sophisticated linecodes and channel equalisation to achieve many bits/Hz.
- ∴ Wireless solutions are attractive**



Impact of Frequency on Wireless Systems

- Capacity \propto frequency
- Beamspread \propto 1/frequency
- Antenna Size \propto 1/frequency
- Near Field Extent \propto frequency

Optical Wireless has 10^4 factor edge



Optical Wireless vs. Microwave

- Optical Wireless
 - High Capacity
 - Small Antennae
 - Narrow Beamwidth
 - No licensing
 - Window compatible
- Microwave
 - Fog tolerant



Impact of Narrow Beamwidth



- Low geometric loss
- Low power requirement
- No multipath impairments
- Higher security
- No interference
- Dense deployment capability



LEDs vs. Lasers

■ LEDs

- No material or modal dispersion issues as in fiber
- More reliable
- Eyesafe - retinal power density 3/4 orders less
- No coherence impairment effects
- No transient atmospheric absorption
- Rates up to 155 Mbps



LEDs vs Lasers (Cont'd)

- Lasers
 - Higher modulation rates
 - Lower drive currents



A 4th generation OW System Specification

- LED based
- Up to 155 Mbps
- 30 db Margin @ 1 km
- 25 yr MTBF
- Auto Acquisition
- Remote Monitoring and Control
- Overhead Management Channel



Conclusion

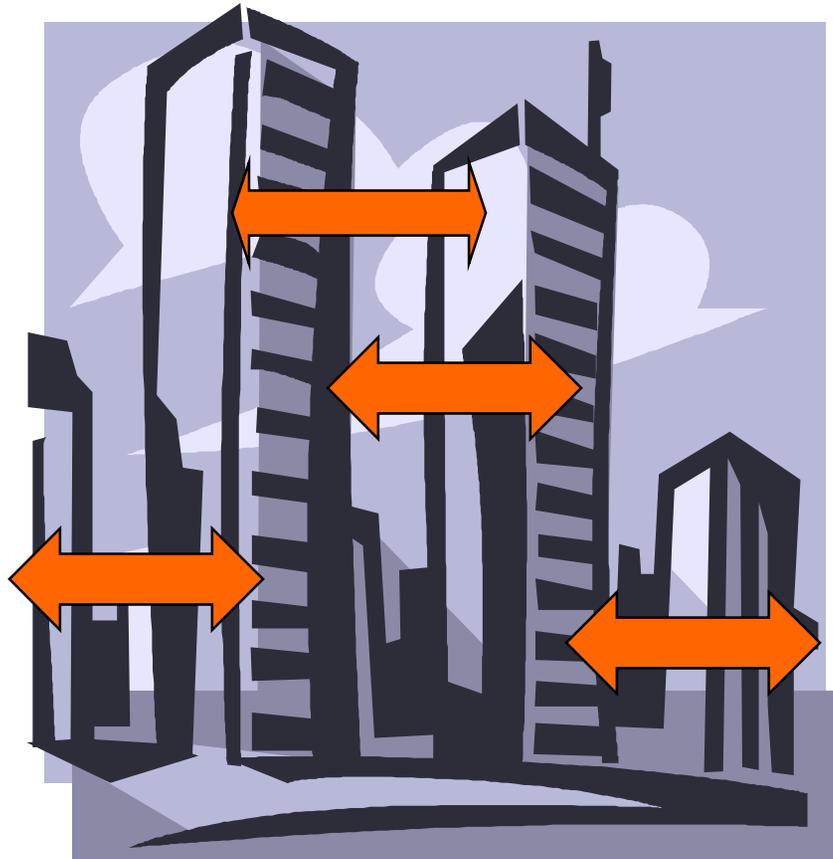
- Optical Wireless can play a major role in bringing broadband access to the existing subscriber base
- Systems using LEDs have the reliability, safety, speed and margin to provide quality services up to 155 Mbps
- Systems using lasers have almost unlimited capacity but eye-safety and reliability issues must be addressed.



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SWITCH TO WIRELESS

Infrared Wireless LANs



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