# CN8861 - References

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- Websites
  - Cisco PRIME
    http://www.cisco.com/en/US/netsol/ns1222/networking_solutions_solution_category.html
  - Alcatel-Lucent SAM
    http://www.alcatel-lucent.com/products/5620-service-aware-manager/details
  - Junos Space Platform
    http://www.juniper.net/us/en/products-services/network-management/junos-space-platform/#overview
- Books
  - Metro ethernet, By Sam Halabi, Bassam Halabi
  - CCDP Self-Study: Designing Cisco Network Architectures (ARCH)
  - Alcatel-Lucent Network Routing Specialist II (NRS II) Self-Study Guide
- RFC
  - RFC 4762 - Virtual Private LAN Services (VPLS) Using Label Distribution Protocol (LDP) Signaling

# Advanced WAN Ethernet Services

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- Advanced WAN Service Layers
- Optical Interconnections
  - CWDM
  - DWDM
- Carrier Ethernet Architecture
  - E-Line Service
  - E-LAN Service
  - E-Access Service

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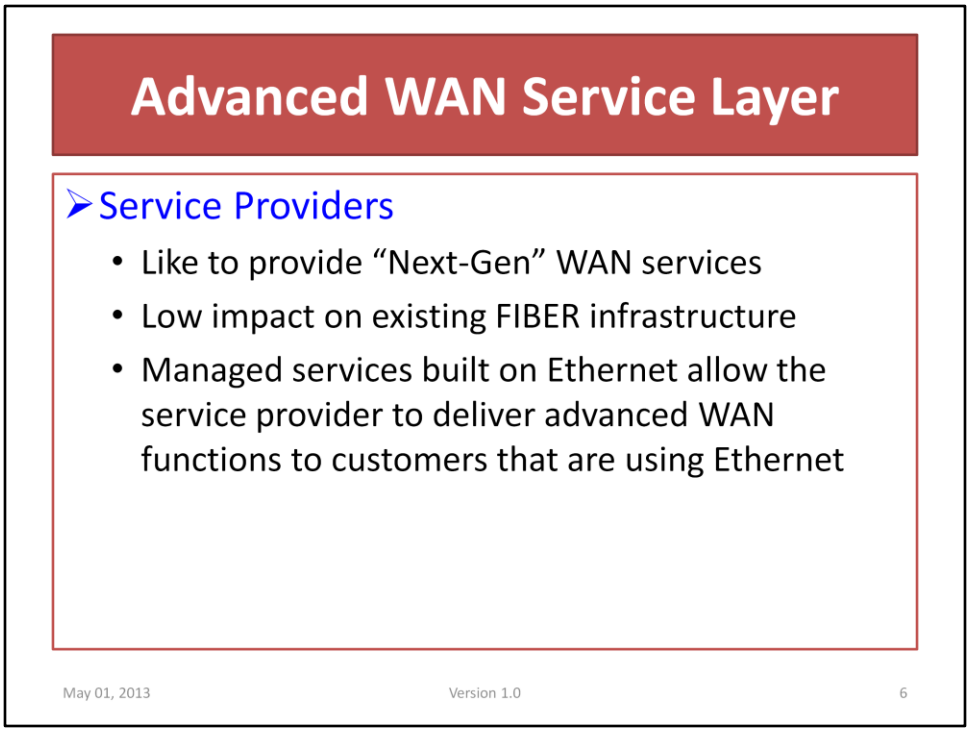



- Service providers are interested in providing advanced WAN services that can be supported with low impact on their existing fiber infrastructure.
- Managed services such as storage, content switching, web hosting, instant messaging, and security built on Ethernet allow the service provider to deliver advanced WAN functions to customers that are using Ethernet

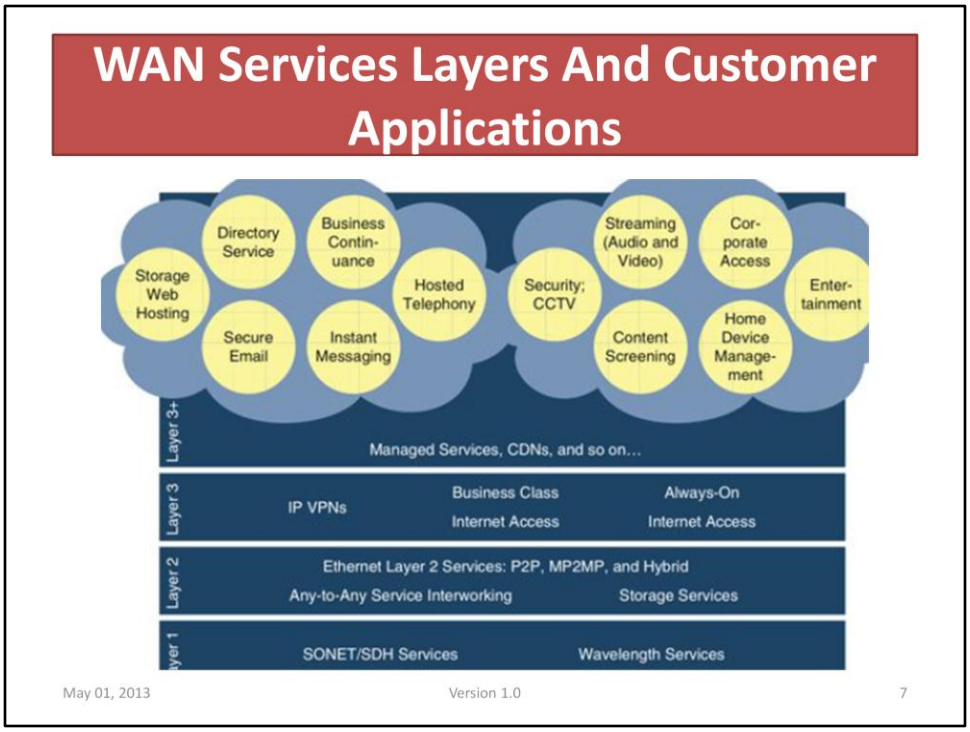
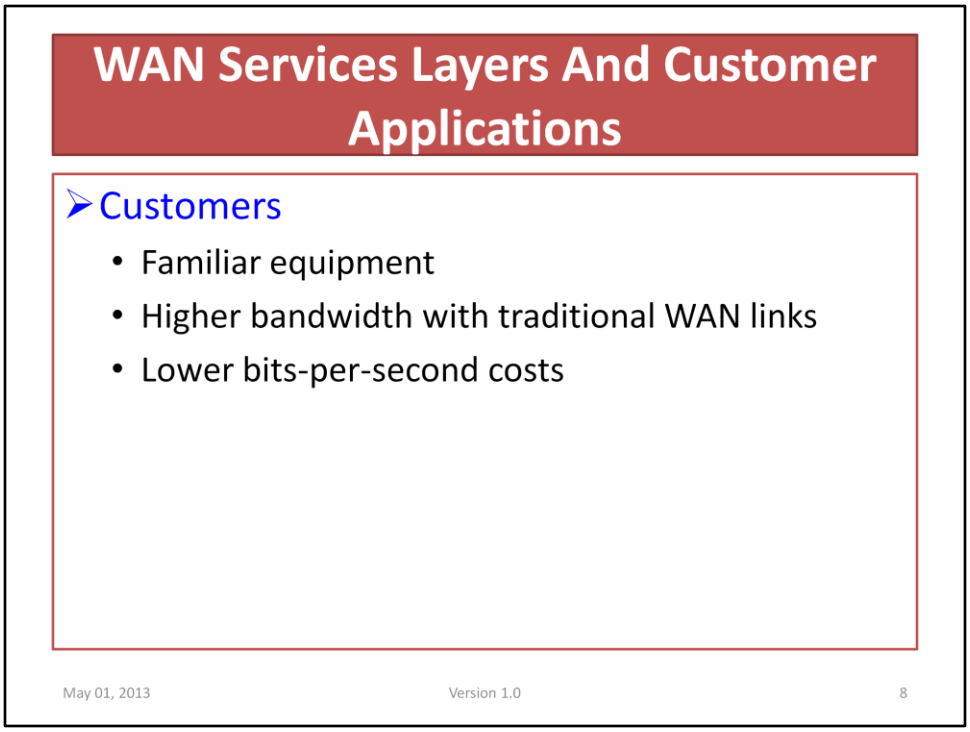



Figure illustrates the relationship between the different WAN services layers and customer applications.




Customers have multiple reasons for requesting advanced WAN services based on Ethernet:

- Familiar equipment is used. Customers can utilize their existing devices.
- Higher bandwidth is possible than with traditional WAN links. 5Mbps service on FastEthernet.
- Lower bits-per-second costs can be supported.

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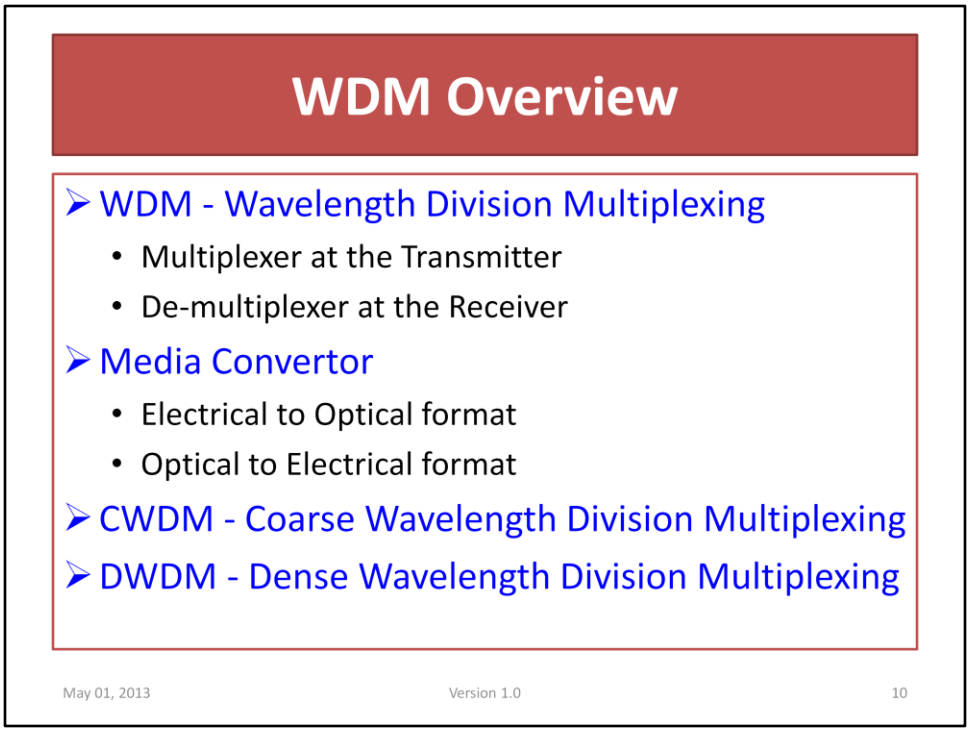
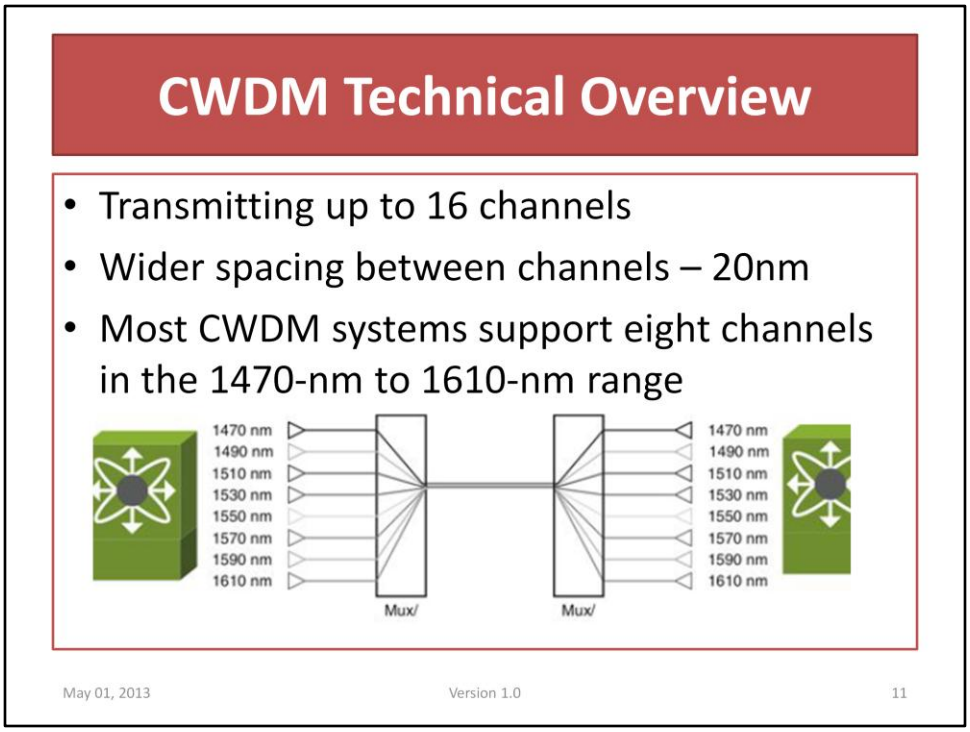



A wavelength-division multiplexing (WDM) system uses a multiplexer (mux) at the transmitter to place multiple optical signals on a fiber and a demultiplexer (demux) at the receiver to split them off of the fiber. The signals use different wavelengths.

Media Convertors: Before being multiplexed, source signals might be converted from electrical to optical format, or from optical format to electrical format and back to optical format.




- CWDM is an optical technology for transmitting up to 16 channels, each in a separate wavelength or color, over the same fiber strand.
- CWDM technology relies on wider spacing between channels. This design makes cheaper CWDM transceiver a relatively inexpensive technology for transmitting multiple gigabit-per-second signals on a single fiber strand.
- In the point-to-point configuration shown in Figure, two endpoints are directly connected through a fiber link. The ITU has standardized a 20-nm channel-spacing grid for use with CWDM, using the wavelengths between 1310 nm and 1610nm.
- Most CWDM systems support eight channels in the 1470-nm to 1610-nm range.

# CWDM Technical Overview

## ➢ Industry Standard Color Coding Scheme

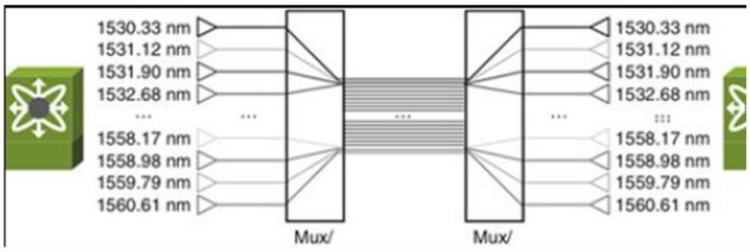
| | | | | | |
|---|---|---|---|---|---|
| 1270 | light purple | | 1450 | yellow orange | |
| 1290 | sky blue | | 1470 | gray | |
| 1310 | yellow green | | 1490 | violet | |
| 1330 | yellow ocher | | 1510 | blue | |
| 1350 | pink | | 1530 | green | |
| 1370 | beige | | 1550 | yellow | |
| 1390 | white | | 1570 | orange | |
| 1410 | silver | | 1590 | red | |
| 1430 | black | | 1610 | brown | |



For CWDM systems an industry standard color coding scheme is used.

# DWDM Technical Overview

- Transmitting from 16 to 64 channels
- For 16 channel DWDM system, spacing between channels is 0.78nm






DWDM can transmit up to 160 channels on the same fiber strand by tightly packing them.