

More Bandwidth. Less Fiber.

Application

It should come as no surprise that data traffic is growing exponentially. A recent study commissioned by Cisco predicts that monthly IP traffic will reach 25 GB per capita by 2020, up from 10 GB per capita in 2015. This means that almost every telecommunications, public internet, educational or enterprise network will see a dramatic increase demand for bandwidth.

Dealing with this massive growth in data traffic can be a daunting prospect and your immediate response may be to make a substantial investment in the physical fiber cabling infrastructure. This is however, easier said than done and should therefore be carefully considered.

Growing your fiber assets

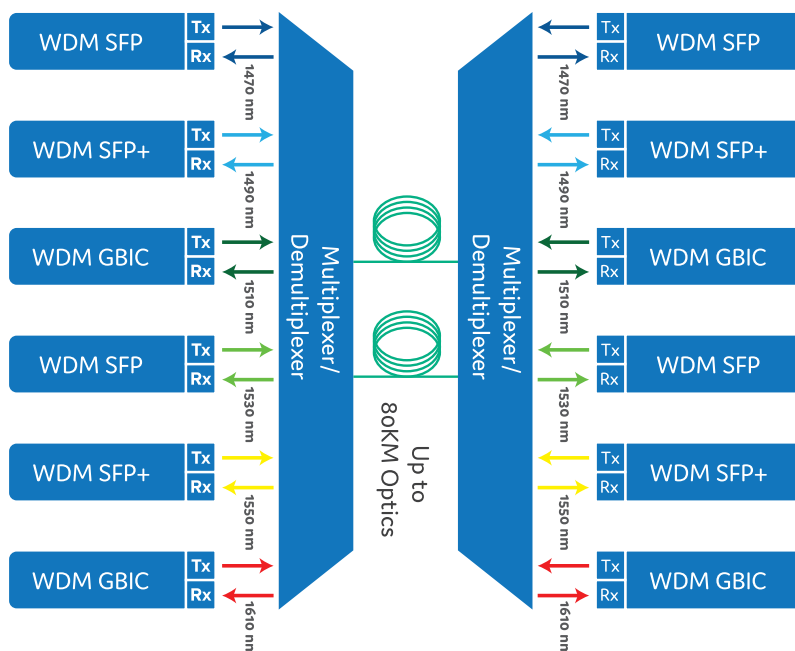
Growing a physical fiber infrastructure may be very challenging from both an economical and practical angle.

When connections are leased, the cost of a physical fiber expansion may be prohibitive. You may also be confronted with lack of availability and long lead times.

Some suppliers offer “deployment priority” but this often comes at a high price. To top it all, some suppliers may even charge excess construction charges if there is no or restricted capacity.

If you own your own fiber assets, you may be confronted with the practical aspects of the additional infrastructure deployment. A number of years ago, a single fiber pair looked more than sufficient in terms of capacity, many direct burial cables with a limited number of fiber pairs were used. Adding capacity here means re-trenching which may be expensive, disruptive and is often subject to road traffic management and way-leave agreements.

Likewise with ducted systems, these are often lacking accessibility, may have collapsed over time or are often overfilled already. When cables are routed through buildings, for example above suspended ceilings and through risers, with the added complication of having to breach fire-stops etc. It is obvious that deploying additional fiber can be a very challenging and disruptive prospect. So what is the alternative? Wavelength Division Multiplexing may be the answer for you.



What is Wavelength Division Multiplexing?

Wavelength Division Multiplexing (WDM) is a way of transmitting multiple simultaneous data streams over the same fiber. Because of the fact that this happens simultaneously.

WDM does not impact transmission speed, latency or bandwidth. This is in stark contrast with other multiplexing or sharing technologies.

The easiest way to explain how this works is by comparing this with driving in the dark (in Europe). When a car drives towards you and plans to turn, you receive two bits of information simultaneously. The first one is the white headlights (one wavelength) informing you that the car is coming towards you. The second is the amber light (a different wavelength), telling you that the car is about to turn.

WDM works in a similar way by giving different data streams, different “colors” or to be more precise wavelength and travel through a single fiber pair independently.

Wave Division Multiplexing for Capacity Increase

From an infrastructure perspective the implementation of WDM technologies is relatively simple. A WDM setup comprises of the following:

xWDM transmit devices, each operating at a different wave length.

Multiplexer, a passive device that combines the different light sources into a blended one.

Fiber infrastructure.

De- Multiplexer, a passive device that splits the blended light source into separate ones.

xWDM receive devices.

In practice transmit and receive devices are often combined into a single transceiver.

What capacity can one expect

There are two variants, Coarse WDM (CWDM) and Dense WDM (DWDM).

The only difference is the band in which they operate and the spacing of the Wavelengths and thus the number of Wavelengths or channels that can be used.

Regular Transmission
(1 Fibre, 1 Signal)



CWDM Transmission
(Up to 18 Signals)



DWDM Transmission
(Up to 160 Signals)



Which technology is appropriate depends on your financial budget and what interfaces are available for your connected hardware.

In addition if WDM is considered with existing fiber cabling, the type of fiber (single-mode or multi-mode) and loss level are to be considered.

In the case of CWDM, 8 to 18 devices may be possible. In the case of DWDM, most common is up to 40 channels, but up to 160 channels is a possibility although not as widely deployed.

With WDM, it is obvious that a single fiber pair has become a lot more valuable overnight.

It is obvious that such a network can be a security nightmare. Because of the fact that in WDM, channels are segregated by optical wavelengths, they are invisible to each other and thus fully segregated.

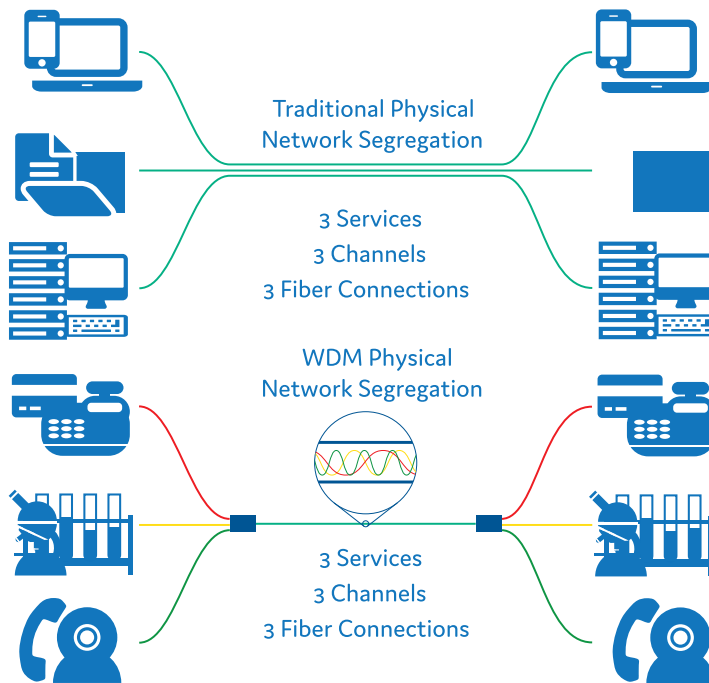
They are not switched and do not rely upon firewall or other active equipment that can be compromised. This allows the secure operation of completely disparate networks whilst still sharing the same fiber pair.

From a security perspective eavesdropping on optical networks is difficult but not impossible, a full risk assessment should be considered. This is irrespective of whether the solution being multiple segregated networks or a single WDM solution.

How do I Get Started?

The WDM technology offers many advantages and even if capacity or flexibility is not a concern today, it may be a good idea to consider a WDM ready infrastructure from the onset. There are however a number of considerations to ensure that a WDM deployment is a success. Cost effectiveness and reliability, including network planning and resilience are aspects that need careful consideration.

ProLabs is the leading global provider of infrastructure and connectivity products for applications in Telecom (MSO, ISP and Carrier), data center and enterprise markets. The company offers an extensive range of high-quality compatible products including optical and copper transceivers; direct attach cables, active optical cables, media converters and WDM Mux's. Our US offices are based in Minnesota with our headquarters located in the UK with key staff in other locations across the US as well as in EMEA and China. We believe strongly in ensuring our products are manufactured and tested to the highest quality, providing 100% compatibility.



WDM: Shared and yet separate

Take a university hospital campus as an example. These typically require many different types of data networks and services:

Physical Campus Area



Patient Internet



Patient Related Medical Data



Back Office Systems



Hospitality and Retail Systems



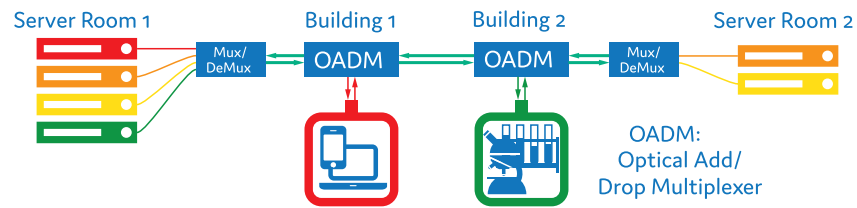
Medical Research



VoIP and Video Conferencing

Embarking along the way

Most networks these days have to cover multiple sites or floors. WDM allows sites or floors to be added to a fiber run in an easy way, making WDM solutions even more cost effective. The local drops do not require power, making this an easy to deploy option.



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