

CWDM/DWDM SYSTEMES



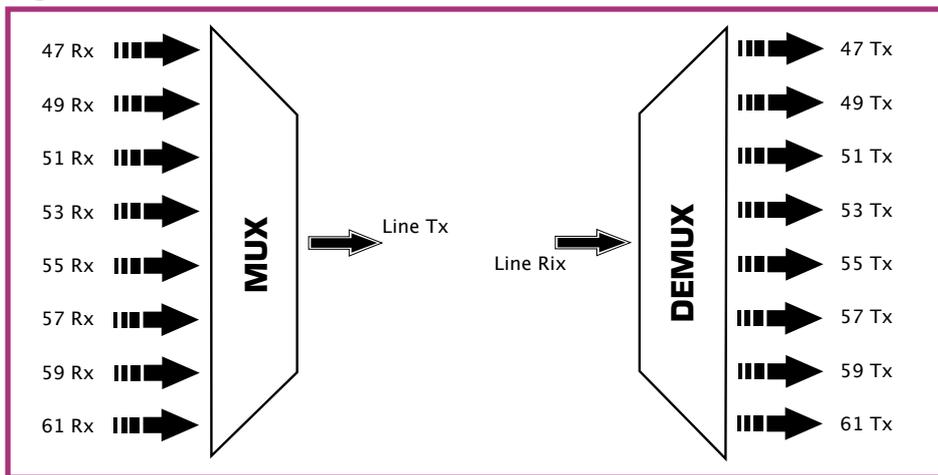
CWDM/DWDM systems

Formerly, only one wavelength or colour was transmitted (1310 or 1550nm), but now it has become more and more common to transmit, using different colours (wavelengths) at the same time. This is called WDM or Wavelength Division Multiplexing. There are different variants of WDM. One of the variants is CWDM Coarse with room for 16 different colours/channels and speeds up to 2,5Gbit per colour/channel. CWDM is used at distances up to 100 km. Another variant is DWDM Dense, offering speeds up to 10Gbit or more and many channels. In return, the dense variant is much more expensive.

How do these systems actually work ?

To begin with, let us have a look at the principles of multiplexing.

Figure 1



A conventional system could be TDM, Time Division Multiplexing, which means that every channel is divided with regard to time, and every user gets 1/8 of the bandwidth, as shown in figure 1. In this way, everyone is able to communicate, but not at the same speed.



Figure 2

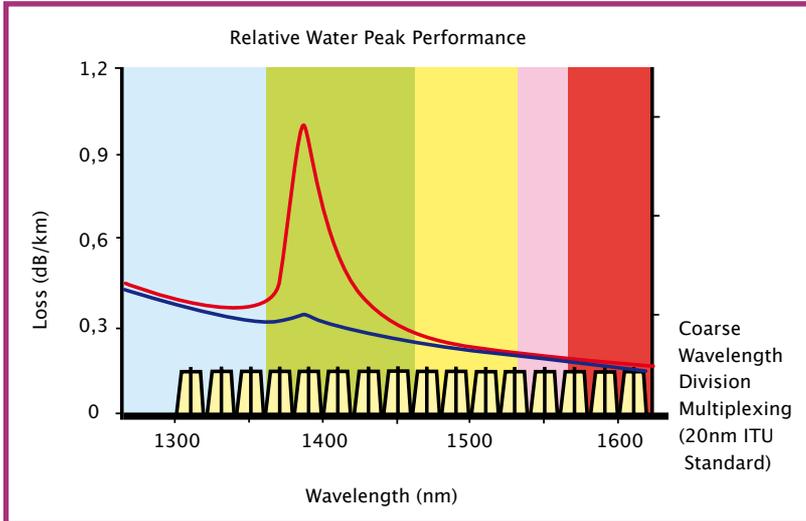
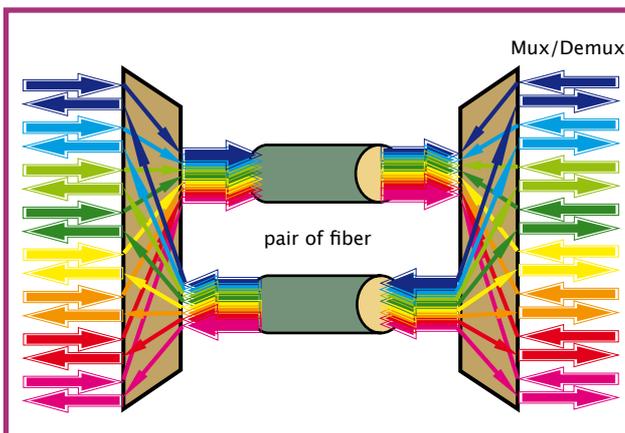


Figure 2 shows the bandwidth from 1300nm to 1600nm, divided into 16 channels. It is also demanded that you use fiber with a low water peak, that is, fiber without high attenuation at 1400nm (the so called water peak). The red curve represents old fiber, the blue curve representing new fiber.

Figure 3

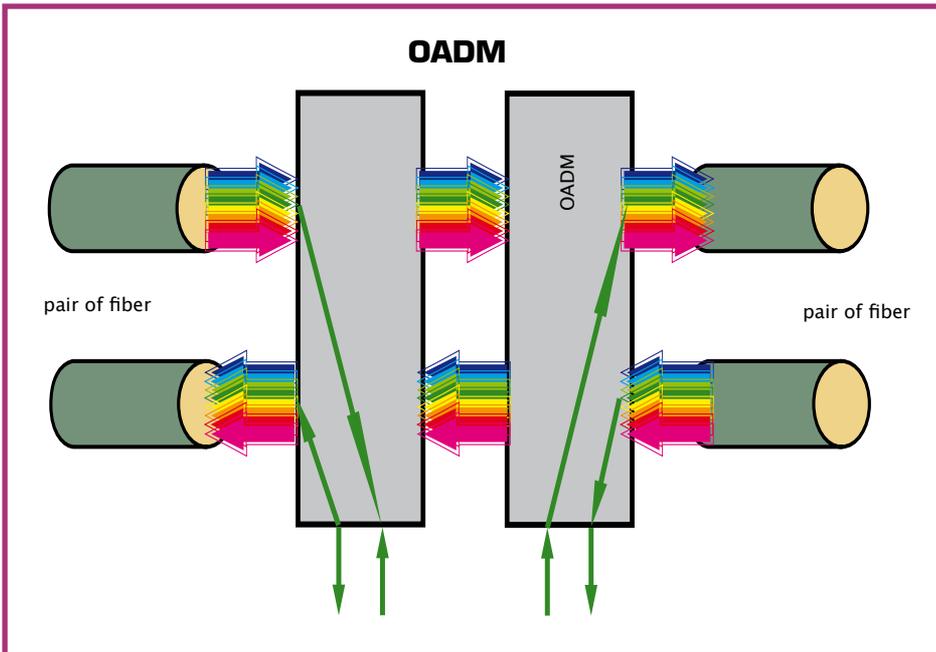


This is an example of using two fibers, one for transmission of data from left to right, the other one transmitting data from right to left. By using different colours or wavelengths you will be able to transmit with 8 times the original bandwidth (please remember, that all colours are invisible, in the fiber).

So if we are dealing with a 2,5Gbit system it will be possible to transmit 20Gbit, totally.

Another component turning up these days is OADM, Optical Add Drop Multiplexer.

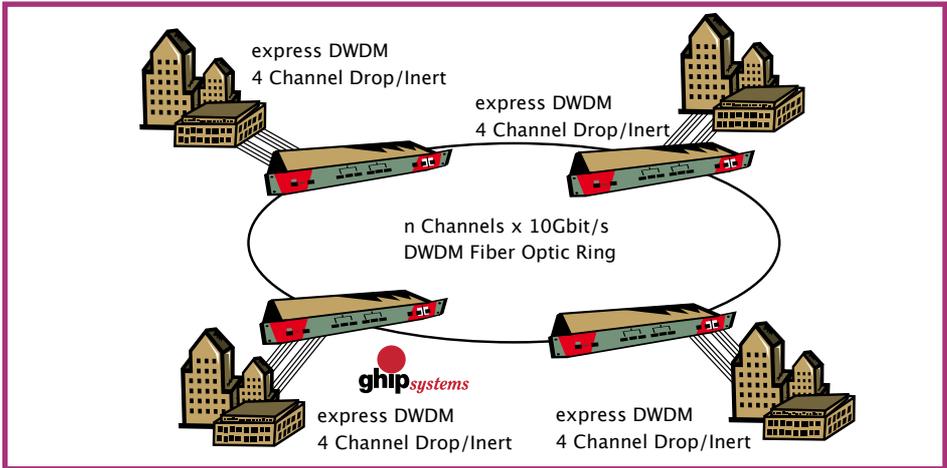
Figure 4



Using OADM you will be able to pick out one single wavelength from a fiber. This technique offers a lot of opportunities.

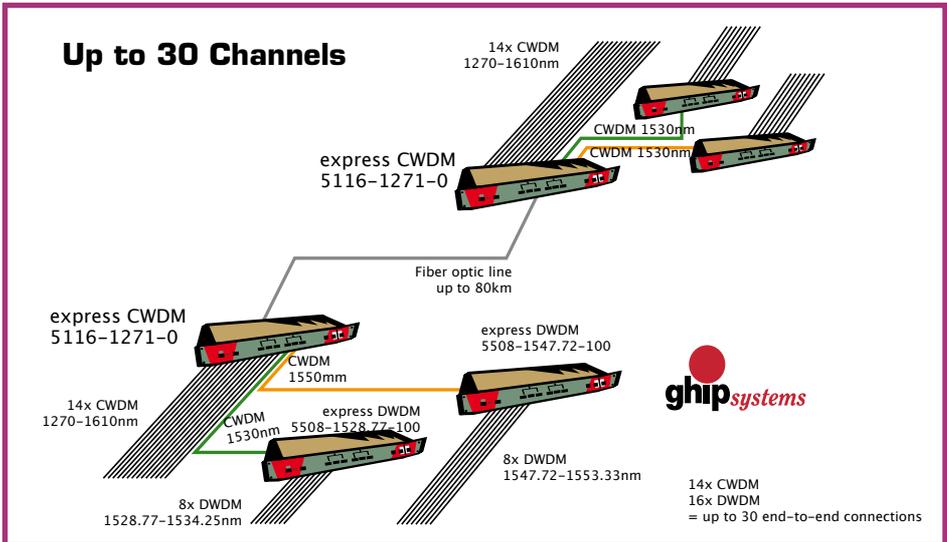


Figure 5



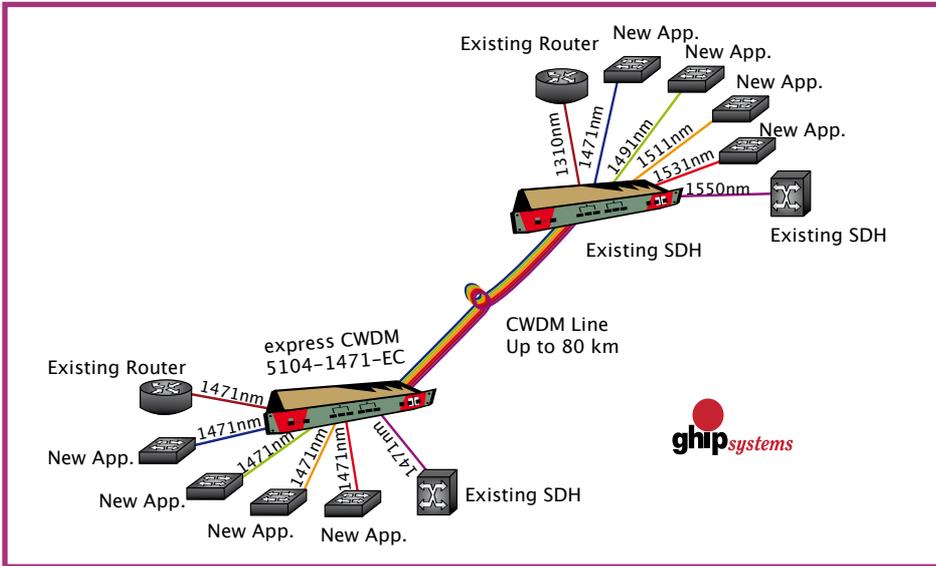
This is a good example of how to implement OADM's. Figure 5 illustrates how to connect different divisions, by means of one single pair of fiber.

Figure 6



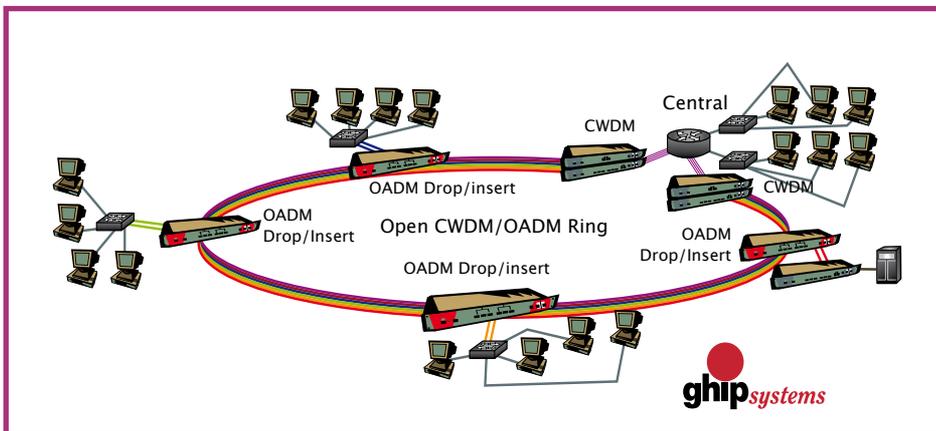
An example showing that one pair of fiber can connect 30 connections, all using full bandwidth.

Figure 7



An example of a CWDM line. The distance of a line can be as long as 80 km, supporting different applications.

Figure 8



The last example, showing how to make a circular connection and remember, everything is based on one single fiber pair.