ADVA Optical Service & Solutions GmbH
Fraunhoferstr. 22
82152 Martinsried/Munich
Germany
Phone +49 (0) 89 8 95 77-0
Fax +49 (0) 89 8 95 77-1 99
Email optotech@ams.de
Web http://www.advaoptical.com

ADVA Optical Solutions, Inc.
1000B Lake Street
Ramsey, NJ 07446
Phone 201/995-0080
Fax 201/995-0081
Email dgora@advaoptical.com

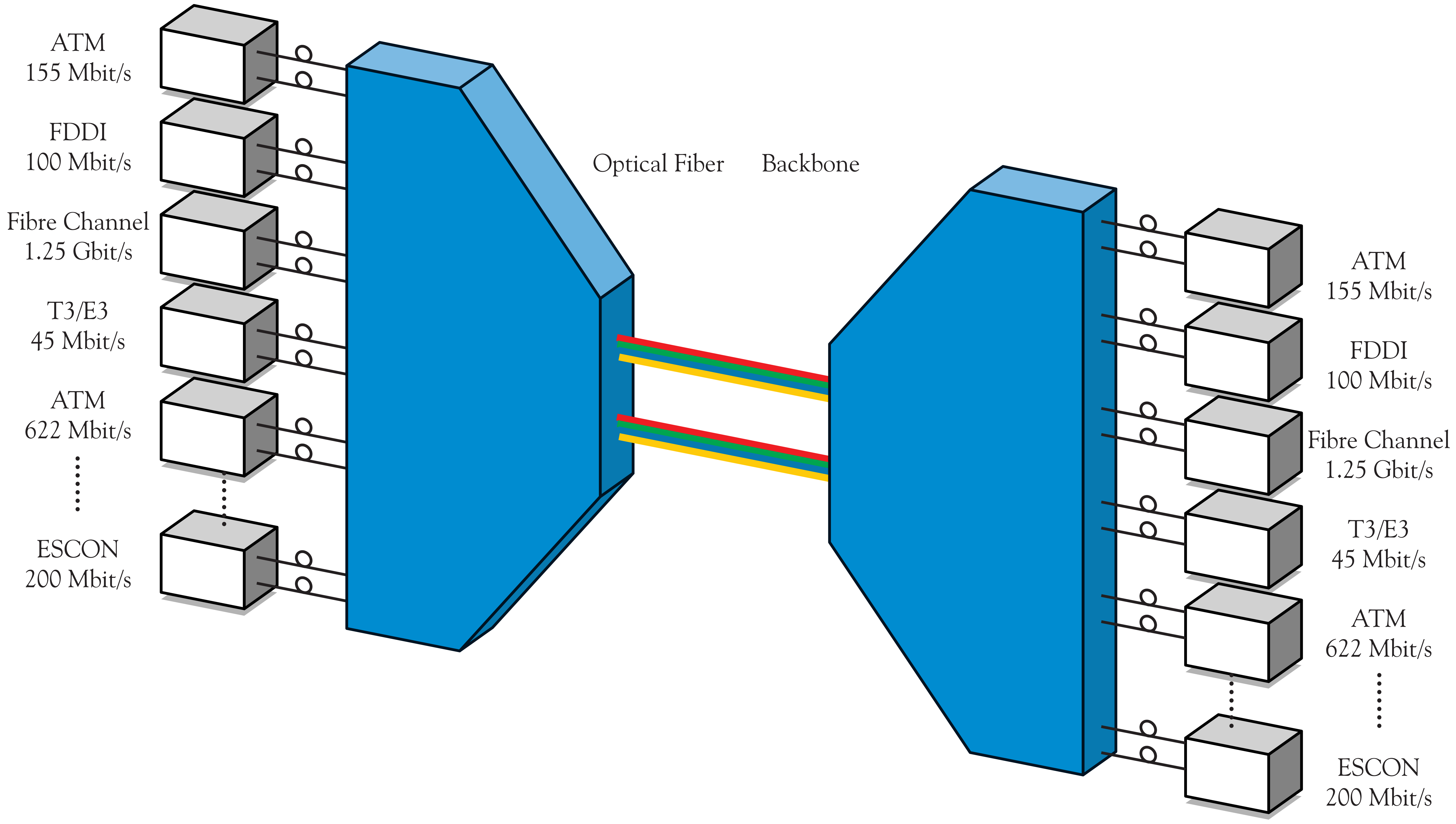
AMS ELECTRONIC S.A.R.L.
6 Avenue des Andes
ZA de Courtabœuf
91952 LES ULIS CEDEX
Phone +33 (0) 1690 70254
Fax +33 (0) 1690 78719
Email 106005.1572@compuserve.com

AMS ELECTRONIC LTD.
Optotech Division
Castle Circus House
136 Union Street
Torquay TQ2 5QG
United Kingdom
Phone +44 (0) 1803 200-000
Fax +44 (0) 117 935-0555
Email ukinfo@ams.de

ADVA Optical Service & Solutions

The ADVA Technology

ADVA Optical Service & Solutions



ADVA
Optical Service & Solutions

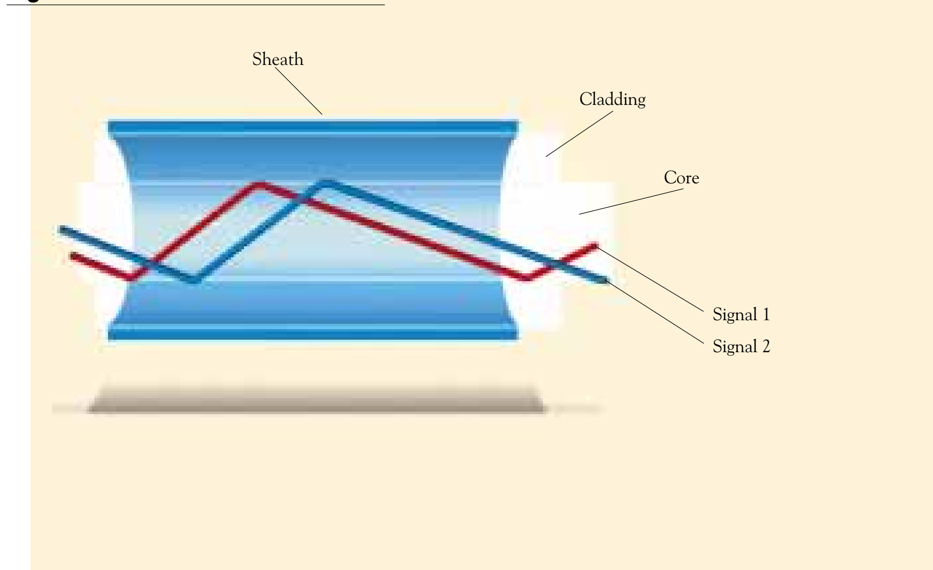
Fiber Optic Data Communications

The infrastructure of modern data communication networks is dominated by the use of fiber optic technology. Since AT&T and GTE installed the first fiber optic communication system in 1977, the obvious advantages of optical fibers compared to old fashioned copper cables led to their almost exclusive use in the physical layers (OSI-Layer 1) of wide area (WAN) and metropolitan area networks (MAN). The fast paced development of local area networks (LAN), triggered by such concepts as fiber to the desk, will clearly move in the same direction.

The Principle of Fiber Optic Data Communications

Fiber optic signals are light pulses transmitted through a thin strand of glass from one point to another. The total reflection of the light beam caused by the difference in the refractive index (density) of the fiber core and cladding keeps the light wave contained in the fiber. In principle there is no difference between copper based and optical data transmission systems. The encoded data is converted from electrical signals to optical light pulses, sent through the medium (in our case optical fiber cables), converted back and finally decoded for further processing. In short, optical fiber is to light as copper wire is to electricity.

Light wave in the fiber



The Limits of Fiber Optic Data Communications

The one problem with optical fibers is that there are never enough of them. Private networks and service providers are constantly dealing with either a limited physical resource or the high costs of installing more fiber. The limiting factor in fiber optic networks is therefore not the bandwidth of the fiber lines, but the ability needed to transmit the various new high speed applications. Considering that the rational behind all data- and telecommunication networking is economics, this obvious limitation will cause serious concern.

Optical Fibers

Optical fibers pack tremendous benefits such as:

- Information carrying capacity reaching into the terabyte range
- Transmission distance
- Small size and weight
- EM profile has no influence
- Data security

The Technology of Wavelength Division Multiplexing

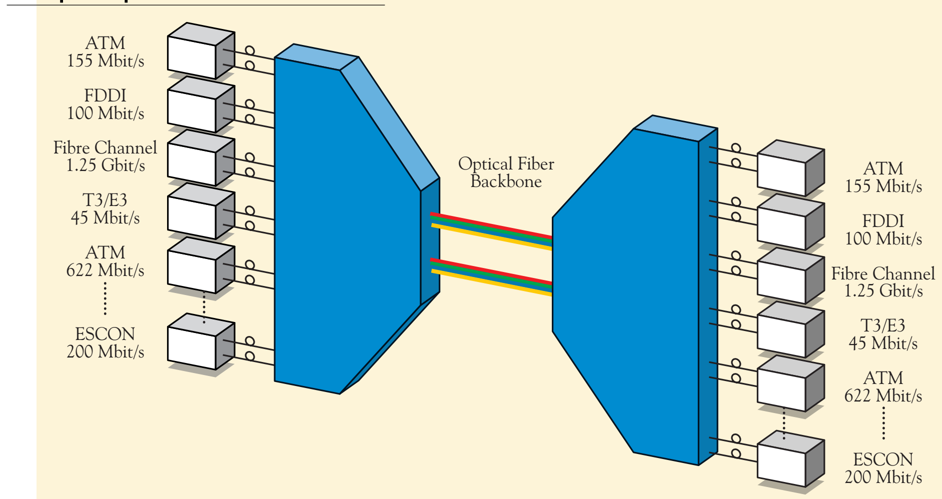
In general there are two forms of multiplexing: wavelength division multiplexing (WDM) and time division multiplexing (TDM). TDM has been the most common method to bring together many lower speed applications over one common higher speed service. TDM creates high speed time slots in the form of frames or cells that allow multiple applications to share the same channel. This solution works well when all applications are of the same platform, such as ATM. However, it is not the optimum solution for increasing network bandwidth for all environments.

Wavelength division multiplexing (WDM) is quickly becoming a critical technology for many high speed communication systems. WDM utilizes a similar principle to TDM, except the channel discriminator is a wavelength, instead of time.

The operation of a WDM system begins with the conversion of each input data stream into separate wavelengths (colors). In the case of optical communication the wavelengths are grouped in transmission windows around 850, 1300 and 1500 nm (the available hardware for optical communications is typically centered around these wavelengths). Each application creates a channel that operates at a separate wavelength. The WDM system then combines and simultaneously transmits the channels through the same optical fiber. Since each wavelength is completely isolated from the other, protocols can be mixed within the same link. The combined signals are then separated by the WDM at the other site and converted back to their original wavelength. Essentially, WDM systems create multiple „virtual fiber pairs“ from one.

Since light of different wavelengths do not interfere with each other, multiple wavelength signals can be transmitted through the same optical fiber without error. WDM begins to capture the true bandwidth potential of fiber optics by allowing multiple high speed communication applications to simultaneously share the same fiber.

The principle of WDM



The telecommunications industry has been heavily investing in wavelength division multiplexing technologies. Industry standards are now created around high speed WDM systems. A variety of 4, 8 and even 16 channel systems are now commercially available with 10, 20 and 40 Gbps transmission speeds, respectively. While these represent excellent capacity expansion alternatives for long distance central office telecommunications, they ignore the speed and cost requirements of the data communications applications and metropolitan area networks (MAN).

The ADVA Approach to Wavelength Division Multiplexing

Due to the simplicity of the WDM principle there is no additional hardware needed, besides the transmitting multiplexer unit and the receiving demultiplexer unit. Integrating the two boxes is just a matter of plug & play.

The workload of your network will grow and to meet these demands a flexible solution is needed.

To ensure the necessary flexibility, ADVA has implemented a unique approach to systems design in the multiplexing field. The fundamental concept of the fiber service platform (FSP) is based on a modular architecture; for each application or channel a seperate card is inserted into the main frame. The result is a solution precisely tailored to the demands of your fiber optic network and a solution that will be easily modified according to the ever–changing needs of your network.

The data processing demands in your company will increase both in quantity and quality. In consequence the original layout of the fiber optic network outgrows, to some extent, it's capability to cope with the onrush of new applications and newly developed transfer protocols.

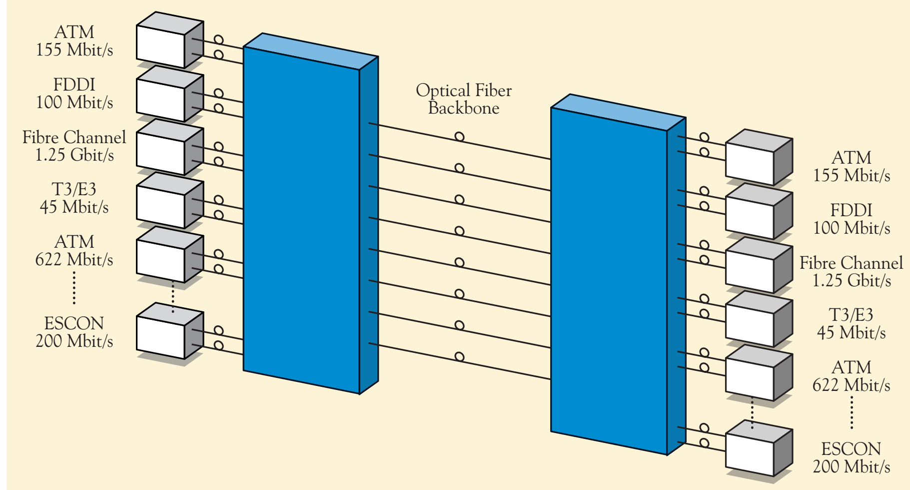
Key-Features

An all encompassing solution must relate to five key-functions in optical networks:

- Conversion
- Multiplexing
- Switching
- Amplification
- Management

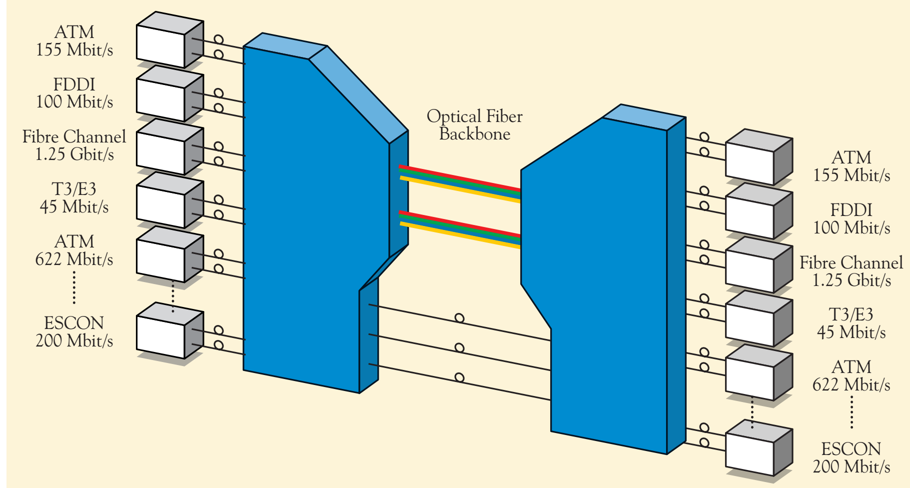
The first and basic requirement is the signal conversion from the multimode wavelength used for short distance communication to the single mode wavelength for long haul transmission. In this case the carrying capacity of the existing network is not the crucial factor. The capacity of the available fiber lines is still sufficient for handling the applications.

FSP8 Converter Configuration



If the customer becomes fiber limited, the answer is a system configuration that handles conversion and multiplexing as well. Additional transmission bandwidth is added precisely when and where it is needed.

FSP8 Mixed Configuration



A critical moment is reached, when the addition of high speed applications clearly surmounts the capability of the network and threatens the overall performance of the system. At that point the most feasible step to be taken is the implementation of the FSP with a fully configured WDM option.

FSP8 WDM Configuration