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Brand-Rex *technical brief 018*

10 GigaBit Ethernet and OM3 fibre

IEEE 802.3ae describes ten-gigabit Ethernet, or 10GBASE-xyz, and its capability on different types of optical fibres.

ISO 11801 2nd Edition has redefined optical fibres for premises cabling to cope with the arrival of new ten-gigabit technologies.

The 'xyz' at the end of the 10GBASE-xyz description gives the detail about which particular option or technology is being defined, and there are quite a few options.

'x' denotes the wavelength of operation:

'S' for shortwave, 850-nm
'L' for longwave, 1310-nm
'E' for extra longwave, 1550-nm

'y' denotes the technology used for transmission:

'W' for Wide Area Network, using a 10Gb/s SONET ST-192 encoding
'R' is for serial transmission LANs
'X' is for Coarse Wavelength Division Multiplexing, CWDM

'z' denotes the number of channels used if CWDM is selected

Table 1 shows the transmission distances possible with the different transmission techniques and different optical fibres

Fibre type	62.5/125	62.5/125	50/125	50/125	50/125	Singlemode
Bandwidth 850/1300 nm	160/500	200/500	400/400	500/500	2000/500	
ISO 11801 2nd Ed designation	-	**OM1**	**-**	**OM2**	**OM3**	**OS1**
10GBASE-LX4 1310 nm CWDM	300 m	300 m	240 m	300 m	300 m	10 km
10GBASE-SR 850 nm serial	26 m	33 m	66 m	82 m	300 m	-
10GBASE-LW 1310 nm serial	-	-	-	-	-	10 km
10GBASE-EW 1550 nm serial	-	-	-	-	-	40 km

The row of most interest is shaded and entitled '10GBASE-SR'. This technology uses the 850-nm VCSEL laser and is the cheapest equipment option. However if users try and use this equipment on their 'standard' 62.5/125 fibre they will only achieve a transmission distance of 26 metres. This grade of multimode fibre was the most popular style installed throughout the whole of the 1990s for premises cabling.

The new OM3 optical fibre is a 50/125 multimode fibre but specially designed and made to be particularly suitable for laser transmission and with a 2000 MHz.km bandwidth at the first window of operation, i.e. 850-nm. OM3 allows a 300 metre transmission range at 850-nm.

The wavelength division multiplexing option puts 2.5 Gb/s over four different wavelengths, or colours, of light centred around 1300-nm. This allows legacy optical fibre to transmit 10 Gigabit Ethernet up to 300 metres, but at great cost. 10GBASE-LX4 equipment will typically cost 5 – 10 times more than the cost of recabling with OM3 optical fibre.

The options are;

- More than 300 metres?
  - *Install singlemode fibre (OS1)*
- Less than 300 metres and want to use existing multimode fibre?
  - *Use 10GBASE-LX4 CWDM equipment, but this is very expensive*
- Less than 300 metres and want to install new fibre?
  - *Install singlemode (OS1). This is the lowest cost fibre but the transmission equipment is still very expensive*
  - *Install OM3. This is a more expensive fibre but the transmission equipment is the lowest price and will give the lowest overall system cost*

ISO 11801 2nd Edition defines the optical fibres by a speed versus distance table.

	Transmission distance		
Max. Transmission speed	300 m	500 m	2000 m
10 Mb/s	OM1	OM1	OM1
100 Mb/s	OM1	OM1	OM1
1000 Mb/s	OM1	OM2	OS1
10,000 Mb/s	OM3	OS1	OS1

Brand-Rex Ltd. can supply OM1, OM2, OM3 and OS1 fibre in optical cable or blown fibre format, all as part of the MillenniuM structured cabling system.