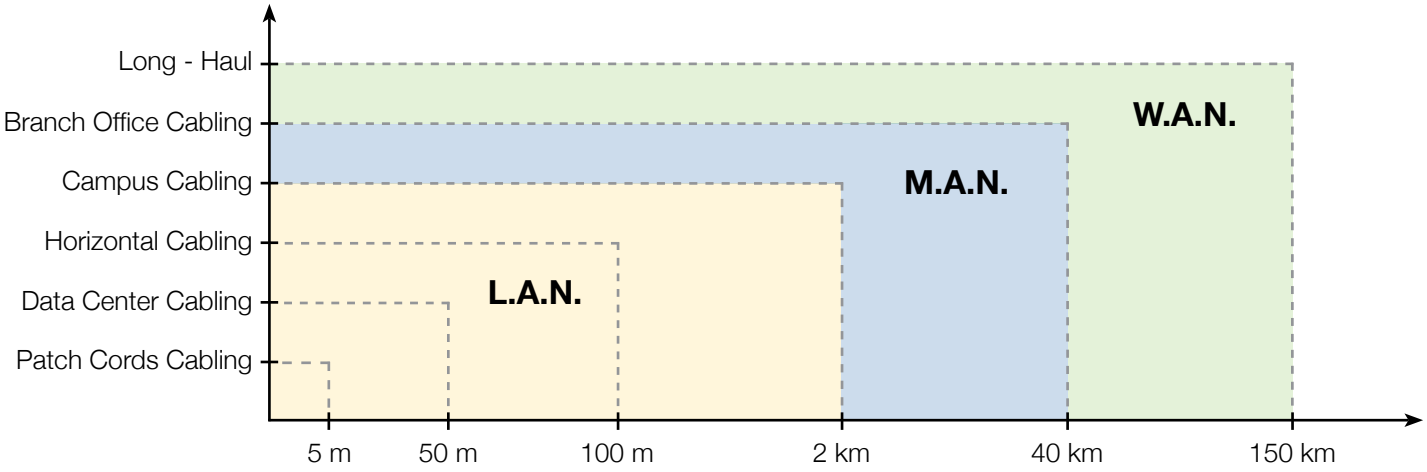
OS1 VS OS2

MATTER OF APPLICATIONS OVER DISTANCE

In Fiber optic, the maximum distance of the link is frequently linked to the type of Networks which is defined in three categories:

- LAN (Local area Network)
- MAN (Metropolitan area Network)
- WAN (Wide Area Network)



The long haul (W.A.N) links are regulated by the ITU-T organization and LAN applications (Campus, horizontal link & patch cords) are the field of ISO 11801 standards (or TIA Standards).

STANDARD ORGANIZATION	APPLICATIONS	DISTANCES
ITU-T *(International Telcommunication Union)*	GPON/CWDM for FTTH *(Share bandwidth and shared fiber)*	Maximum 150 km on OS2 equivalent fiber
ISO / IEC *(International Standard Organization)* *(International European Committee)*	Backbone Indoor links & Campus Outdoor links	10 km on OS1 40 Km on OS2

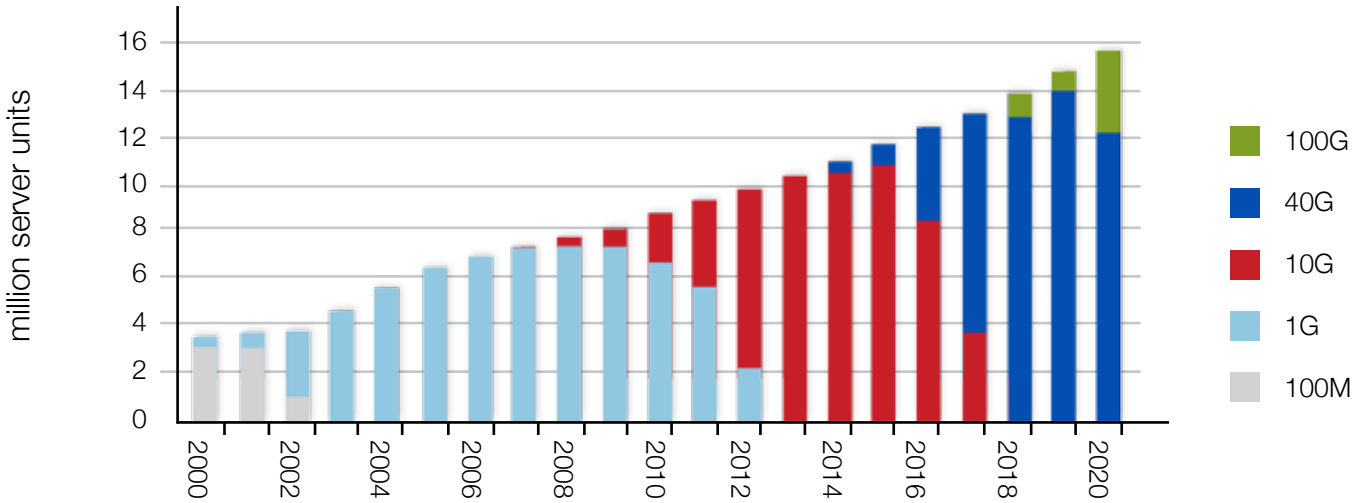
Several years ago, the maximum link lengths for Campus cabling were around 10Km when OS1 was the only standard for single mode fiber, but the higher performances of **OS2 fiber permit to propose now 40 km links**.

QUESTION OF PERFORMANCE

Like always, data network companies are looking for higher speed networks to share or store datas. This trend is not going to stop, as you can see in the following prospective graph:

40/100 GB ETHERNET

x 86 Servers by ethernet Connection Speed



Source : corning cable osystems - BICSI

During the last decade, single mode fiber was mainly used for long distance links but not considered as a good investment for future application in building.

But with the price decrease of VCSEL or Laser power source, the gap between Multimode or Single mode active materials is smaller every day.

Considering this trend, Why not using the best single mode fiber to create “future proof” and ready for new high speed data networks? The answer is easy if we consider the big performances differences between OS1/OS2 fibers. There is more than two times less losses for OS2 Fibers

Optic Fiber category	Maximum attenuation (dB/km)		
	1 300 nm	1 383 nm (Water peak)	1 550 nm
OS1	1.0	1.0	1.0
OS2	**0.4**	**0.4**	**0.4**

Another important parameter is the use of multiplexed network protocol for Local Area Network or Metropolitan Area Network.

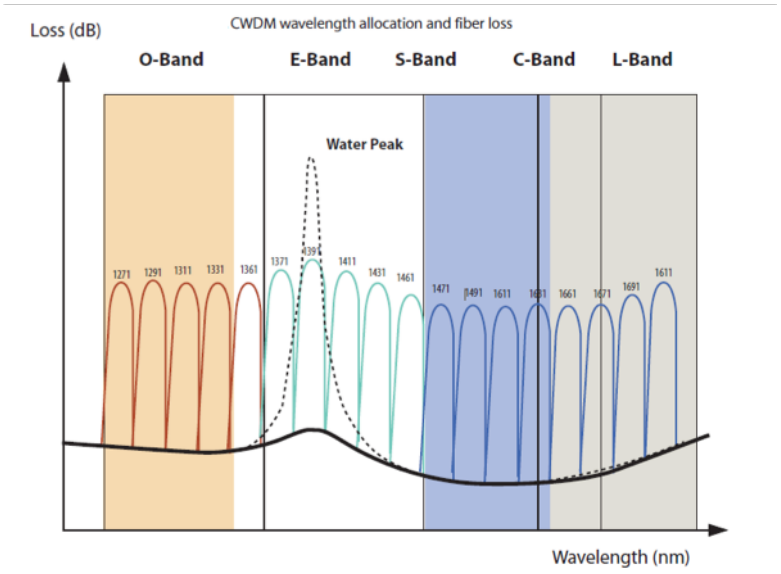
In the 90’s DWDM or CWDM networks were only dedicated to carry big quantities of data, for telecommunication channels but today they are also implemented in datacenters or Storage Area Networks.

Then the multiplexed applications are using a wavelength range called E Band or Water peak Band in which the regular OS1 has poor results

Name of BAND	O	E	S	C	L	U / XL
Wavelenght range (nm)	1260 - 1360	1360 - 1460	1460 - 1530	1530 - 1565	1565 - 1625	1625 - 1675
Note	Original Band	Water peak Band		bands used by the higher performance systems		Not used

Table 1 : ITU-T definition of telecom optical wavelenght bands. The arrow stands for the wavefenght increase and the generaltrend toward higher performance systems

The OS2 fiber is coming from a called “Low Water peak Fiber” according to its low loss in the E-Band.



By choosing OS2 fiber, the network will more easily support the IEEE 802.3 multiplexed series e.g. 40G BASE LR4, 100G BASE ER4.

CHANGING FROM OS1 TO OS2: WHAT IMPACT?

- Is there a physical and structural difference between OS1 & OS2 ?
  => Both fibers have the same geometrical structure (MFD = Mode Field Diameter).

  The OS2 has a chemical treatment to reduce the presence of hydroxyl ions that caused the high loss figures at the water peak region. The OS2 fiber is the Low Water peak fiber that permits to use the fiber for GPON (Gigabit Passive Optical Network) / CWDM (Coarse Wavelength Division Multiplexing) telecom applications.

- Can OS2 be mixed with OS1 in the same link?
  => The answer is yes, from the moment the application is not working on the E-Band wavelength, typically used for Telecom purpose such as GPON / CWDM.

- Is there any special requirement to use specific connectors, adapters and active components?
  => There is no change, active and passive components for OS1 also work with OS2.

Appendix: Supported generic ICT applications and Max Channel length Silica Singlemode fiber

APPENDIX :

Network Application	λ nm	OS1			OS2		
		CIL[a] dB	L[b] m	Class	CIL[a] dB	L[b] m	Class
ATM at 51,84 Mbit/s	1 310	10,0	2 000	OF-2000	10,0	20 000	OF-10000
ATM at 155,52 Mbit/s	1 310	7,0	2 000	OF-2000	7,0	12 500	OF-10000
ATM at 622,08 Mbit/s	1 310	7,0	2 000	OF-2000	7,0	12 500	OF-10000
DIS 14165-111: Fibre Channel (FC-PH) at 266 Mbit/s	1 310	6,0	2 000	OF-2000	6,0	10 000	OF-10000
DIS 14165-111: Fibre Channel (FC-PH) at 531 Mbit/s	1 310	14,0	2 000	OF-2000	14,0	30 000	OF-10000
DIS 14165-111: Fibre Channel (FC-PH) at 1062 Mbit/s	1 310	6,0	2 000	OF-2000	6,0	10 000	OF-10000
1 Gbit/s FC (1,0625 GBd) [c]	1 310	7,8	5 800	OF-2000	7,8	10 000	OF-10000
2 Gbit/s FC (2,125 GBd) [c]	1 310	7,8	5 800	OF-2000	7,8	10 000	OF-10000
4 Gbit/s FC (4,25 GBd) [c]	1 310	7,8	2 400	OF-2000	7,8	10 000	OF-2000
8 Gbit/s FC (8,5 GBd) [c]	1 310	6,4	4 400	OF-2000	6,4	10 000	OF-10000
16 Gbit/s FC (14,025 GBd)	1 310	6,4	4 400	OF-2000	6,4	10 000	OF-10000
IEEE 802-3ae: 1000BASE-LX [c]	1 310	4,56	2 560	OF-2000	4,56	5 000	OF-5000
ISO/IEC 9314-4: FDDI SMF-PMD [c]	1 310	10,0	2 000	OF-2000	10,0	20 000	OF-10000
IEEE 802.3: 10GBASE-LX4 [c]	1 310	6,2	4 200	OF-2000	6,2	10 000	OF-10000
IEEE 802.3: 10GBASE-LR/LW [c]	1 310	6,2	4 200	OF-2000	6,2	10 000	OF-10000
IEEE 802.3: 10GBASE-ER/EW [c]	1 550	10,9	8 900	OF-2000	10,9	22 250	OF-10000
IEEE 802.3: 40GBASE-LR4	1 310	6,7	4 700	OF-2000	6,7	10 000	OF-10000
IEEE 802.3: 100GBASE-LR4	1 310	8,3	8 300	OF-2000	8,3	10 000	OF-10000
IEEE 802.3: 100GBASE-ER4	1 550	18,0	16 000	OF-10000	18,0	40 000	OF-10000

[a] CIL is the maximum channel insertion loss (or optical power budget, as applicable) as defined in the application standard.

[b] L is the lower of:
- the maximum channel length specified in the application standard;
- a calculated length from the CIL with 2,0 dB allocated to connecting hardware.

[c] A bandwidth limited application at the channel length shown. The use of lower attenuation components to produce channels exceeding the length shown cannot be recommended.