FIBRAS ÓPTICAS : MONOMODO Y MULTIMODO OPTIMIZADAS FRENTE A CURVATURAS

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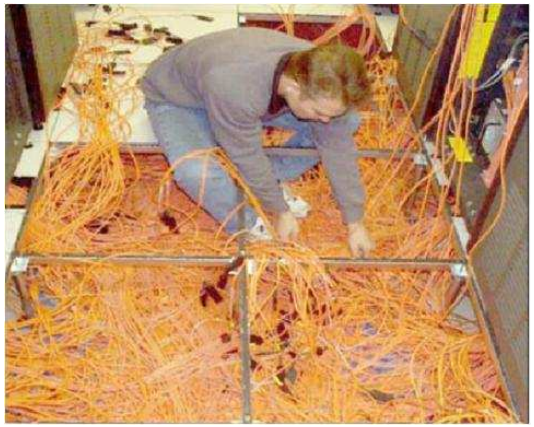
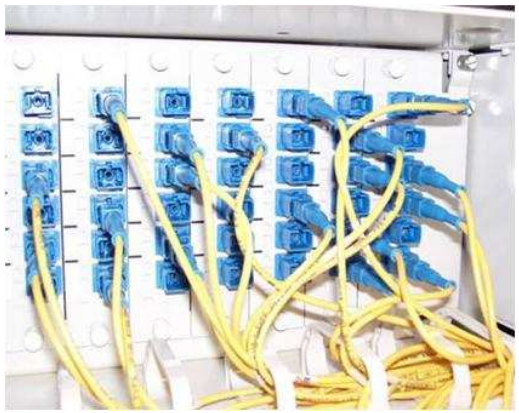
Necesidad y Factores

FTTH
Red Óptica Pasiva

NETWORKING
Data Center





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FIBRAS MONOMODO (SMF)

FTTH
Red Óptica Pasiva

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FIBRA MONOMODO
"BAJA PÉRDIDA FRENTE CURVATURA (BLI) "

ITU-T
TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

G.657 (12/2006)

Characteristics of a *bending loss insensitive* single mode optical fibre and cable for the access network

G.657 CLASS *A*	Is fully compliant with the G.652 single mode fibres and can also be used in other parts of the network Are suitable to be used in the O, E, S, C and L-band (i.e. throughout the 1260 to 1625 nm range)
G.657 CLASS *B*	is not necessarily compliant with G.652 but is capable of low values of macrobending losses at very low bend radii and is pre-dominantly intended for in-building use Are suitable for transmission at 1310, 1550, and 1625 nm for restricted distances that are associated with in-building transport of signals

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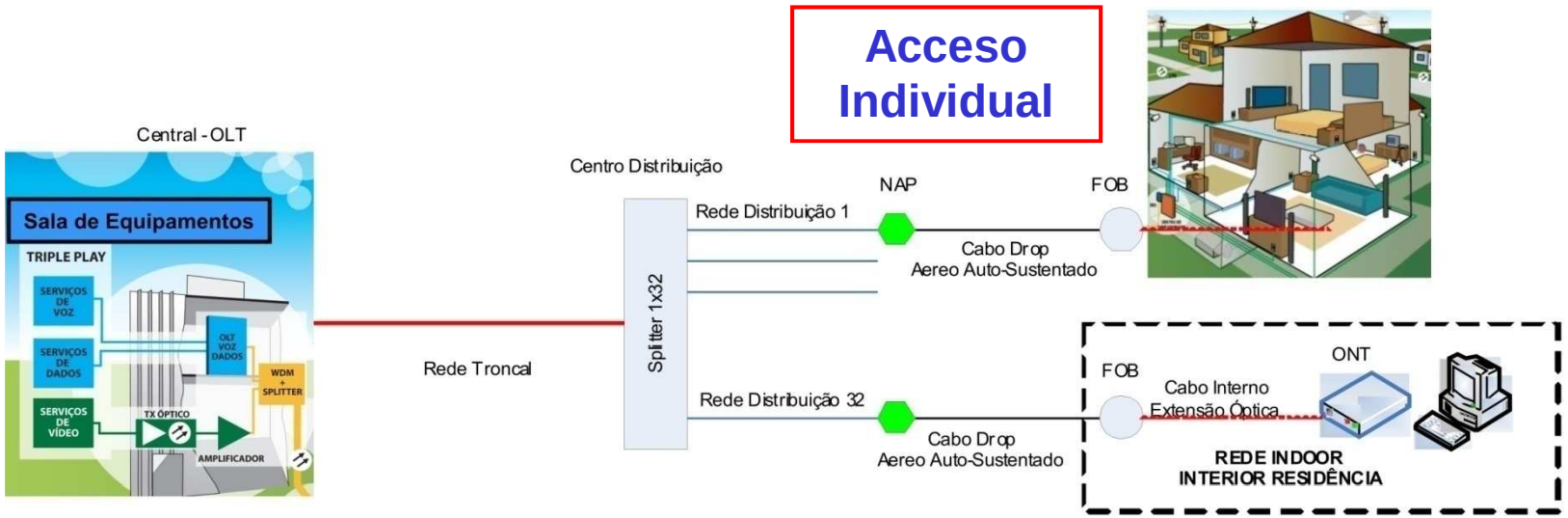
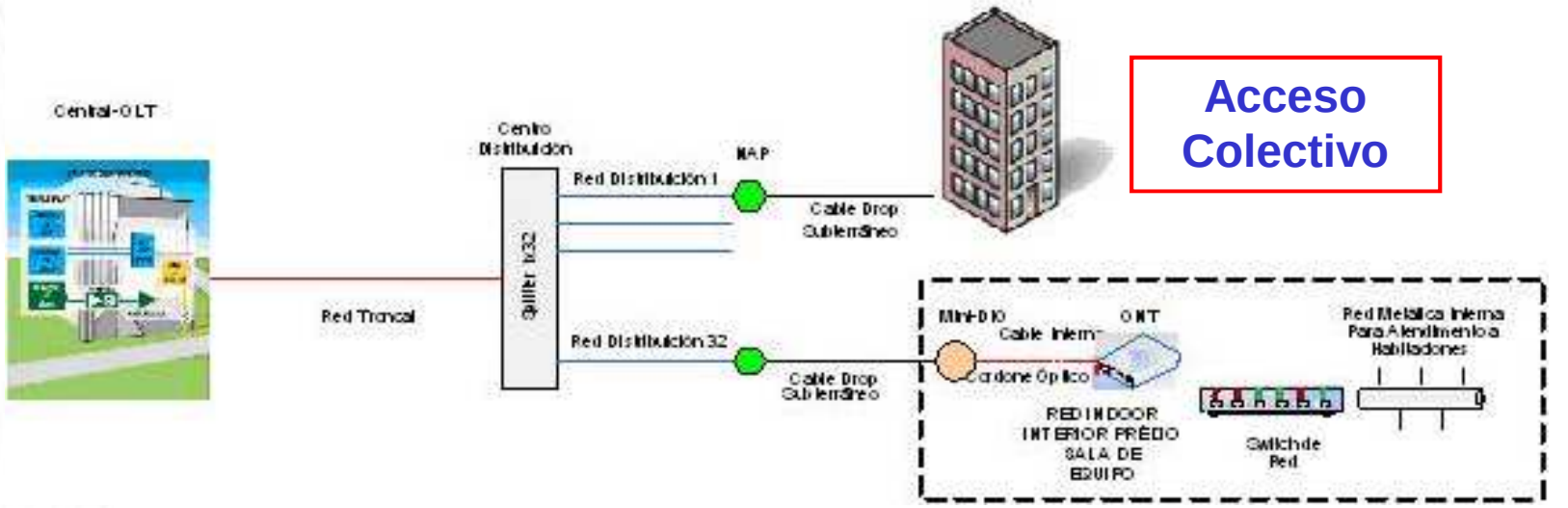
Conceptos de Redes Ópticas Pasivas





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Infraestructura de la Rede Óptica Pasiva

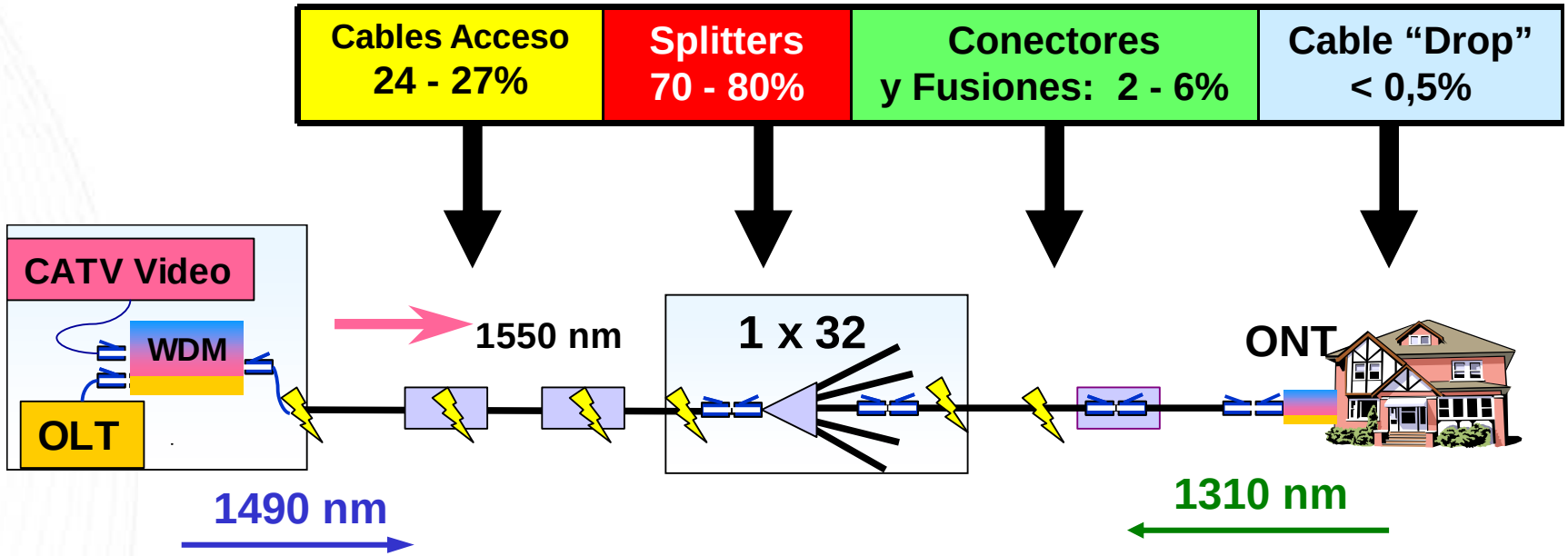
TOPOLOGIA	La particularidad de cada red FTTP exige estudio y proyecto de ingeniaría caso a caso
COMPONENTES DA REDE	Cables ópticos de Acceso, Cables de Acometida, Cajas de empalmes, bastidores, y conectores
PRESUPUESTO DE POTENCIA	La atenuación de los componentes pasivos determinan significativamente el alcance máximo da red. Exige selecto criterios de: **- Fibra óptica** - Divisores de potencia (splitters) y Filtros WDM - Conectores

Conceptos de Redes Ópticas Pasivas

Presupuesto Potencia en 1310nm Classe B+ para 20km

Table III.2/G.984.2 – Loss budgets for the G-PON system

Items	Unit	Single fibre
Minimum optical loss at 1490 nm	dB	13
Minimum optical loss at 1310 nm	dB	13
Maximum optical loss at 1490 nm	dB	28
Maximum optical loss at 1310 nm	dB	28



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Presupuesto de Potencia Óptica

G-PON – Gigabit Passive Optical Network – ITU-T G.984.2

Presupuesto de Potencia (Upstream)		
Disponible entre OLT y ONU	**PX-20U (1310nm): 28 dB en 20 km**	
Sistema de Componentes	**Común**	**Seleccionado**
4 Conectores SC	2,40	0,60
6 Empalmes por Fusión	0,50	0,33
Splitters 1 x 32	20,0	18,0
Total parcial	**22,9**	**18,93**
Atenuación de la Fibra Óptica	0,40	0,34
Alcance Máximo	**12,8 km**	**26,7 km**

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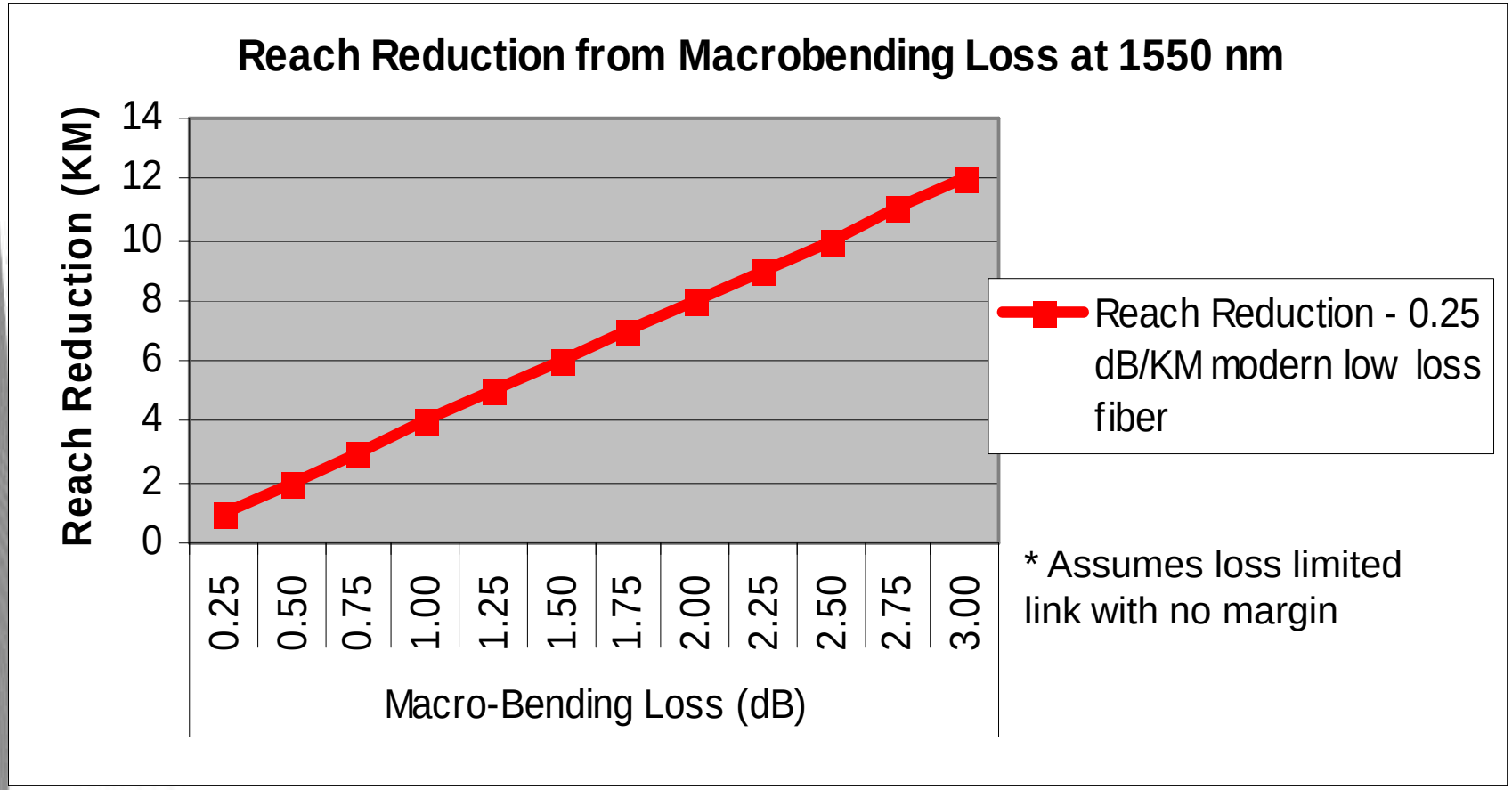
Pérdidas por curvaturas



Solamente 2 dB de pérdidas por curvatura podrá reducir en 8 km !!!

Meta para pérdida por curvatura: 0 dB

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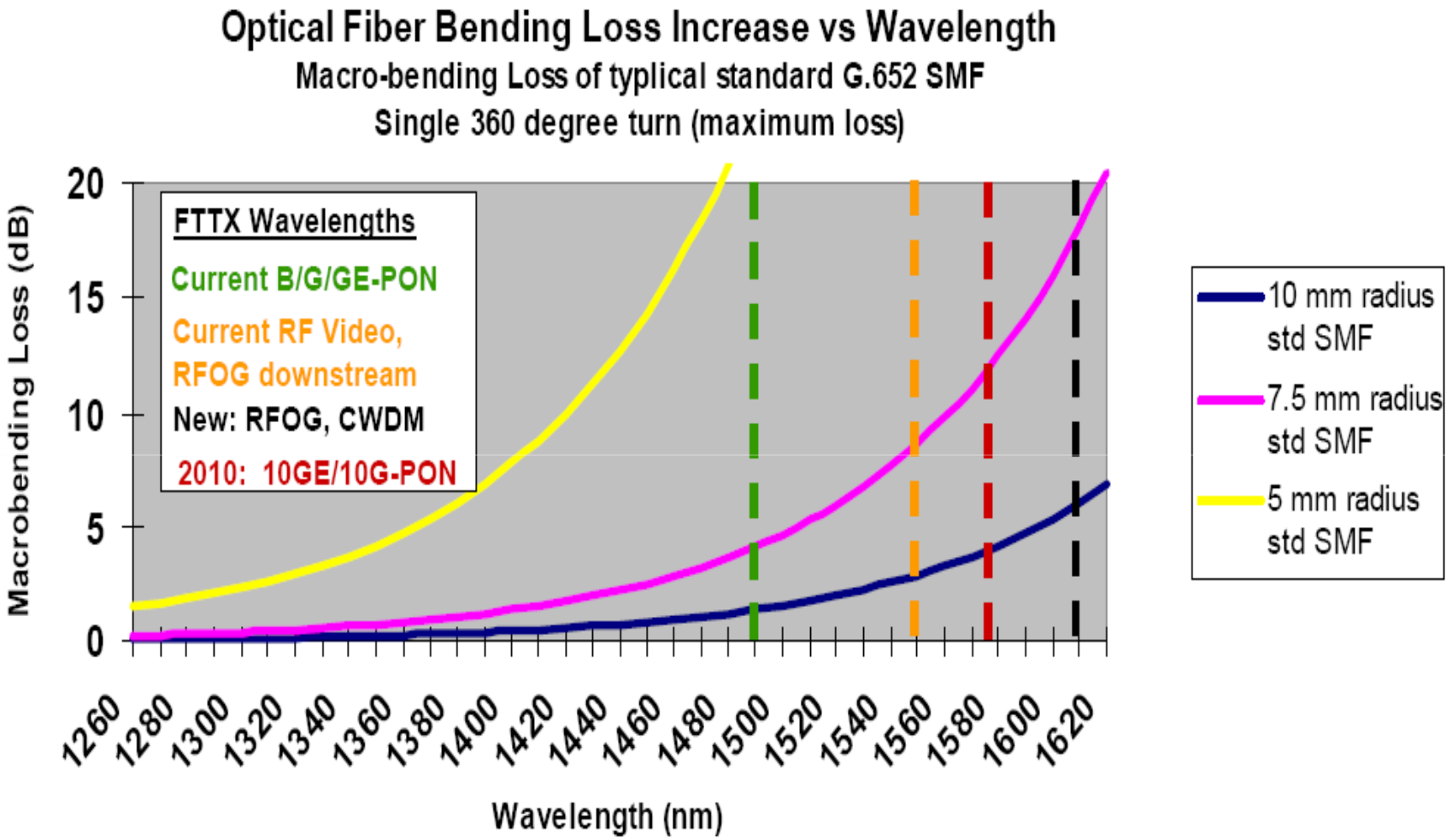
Pérdidas por curvaturas



Pérdidas por curvatura de fibra SM estándar podrán interrumpir los servicios o reducir el alcance total de la rede acceso PON

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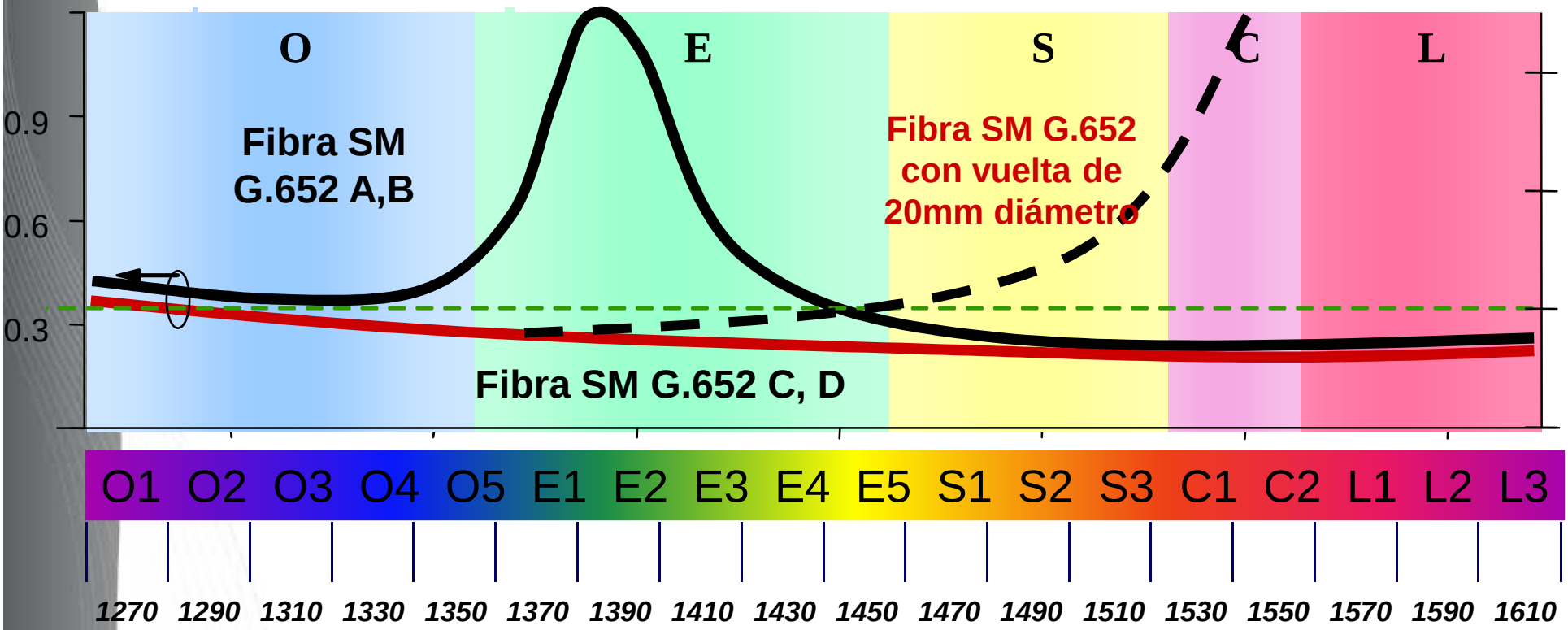
Fibras Ópticas Optimizadas frente Curvaturas

FIBRA MONOMODO ESTÁNDAR ITU-T G652 C / D



Performance por Macrocurvatura (100 vueltas x Diámetro 60mm)	Máximo 0,1 dB en 1550nm

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Fibras Ópticas Optimizadas frente Curvaturas

ITU-T TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

G.657 (12/2006)

		G.657 CLASS **A**		G.657 CLASS **B**		
Macrobending loss	Radius (mm)	*15*	*10*	*15*	*10*	*7.5*
	Number of turns	*10*	*1*	*10*	*1*	*1*
	Max. at 1550 nm (dB)	*0.25*	*0.75*	*0.03*	*0.1*	*0.5*
	Max. at 1625 nm (dB)	*1.0*	*1.5*	*0.1*	*0.2*	*1.0*

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Fibras Ópticas Optimizadas frente Curvaturas

AllWave® FLEX Fiber
Zero Water Peak

ITU/T G657 A

Radio de Curvatura Reducido para garantizar una **pérdida máxima de 0.2dB en curvatura con diámetro de 20mm**

73% superior frente límites del estándar G657A

20mm Mandrel

15mm Mandrel

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Fibras Ópticas Optimizadas frente Curvaturas

Radio mínimo Curvatura y Máxima Pérdida en 1550nm (1 vuelta)	**0,2dB en 10 mm** (G657A) **o 7,5mm** (G657B)	AllWave® *FLEX* Fiber Zero Water Peak
	0,1dB en 5 mm (excede G657 A e B)	EZ-Bend™ Optical Technology

verizon

Verizon NEBS™ Compliance: Test Requirements for MDU Drop Cables

Verizon Technical Purchasing Requirements

VZ.TPR.9424

Issue 1, April 2008

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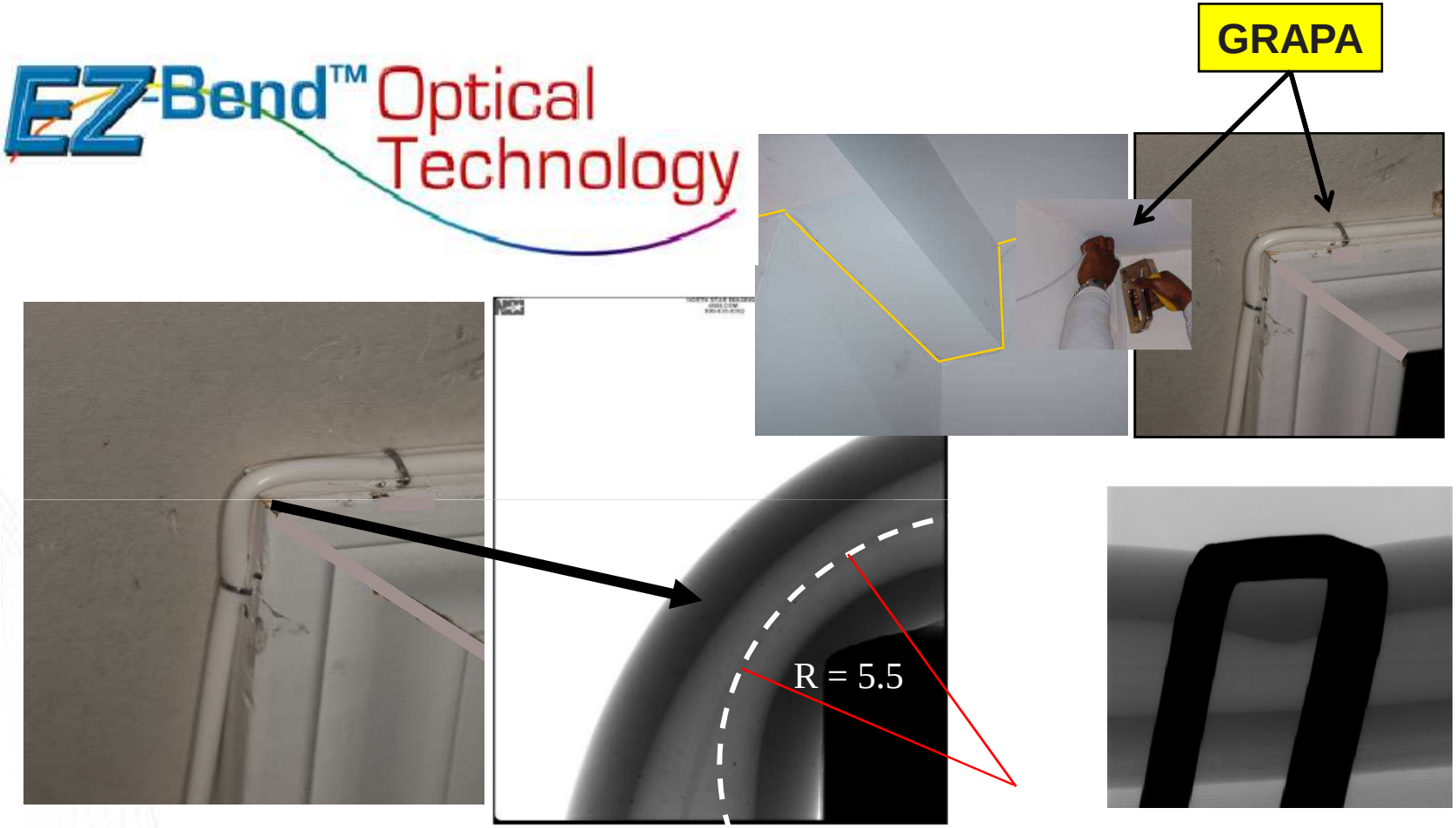
Fibras Ópticas Optimizadas frente Curvaturas

EZ-Bend™ Optical Technology



- ✓ Optimizada para aplicaciones en proyectos FTTH y MDU
- ✓ Radios de curvatura de hasta 5mm
- ✓ Productos: Cordones e Cables acometida horizontal

http://br.youtube.com/ofsmarcom

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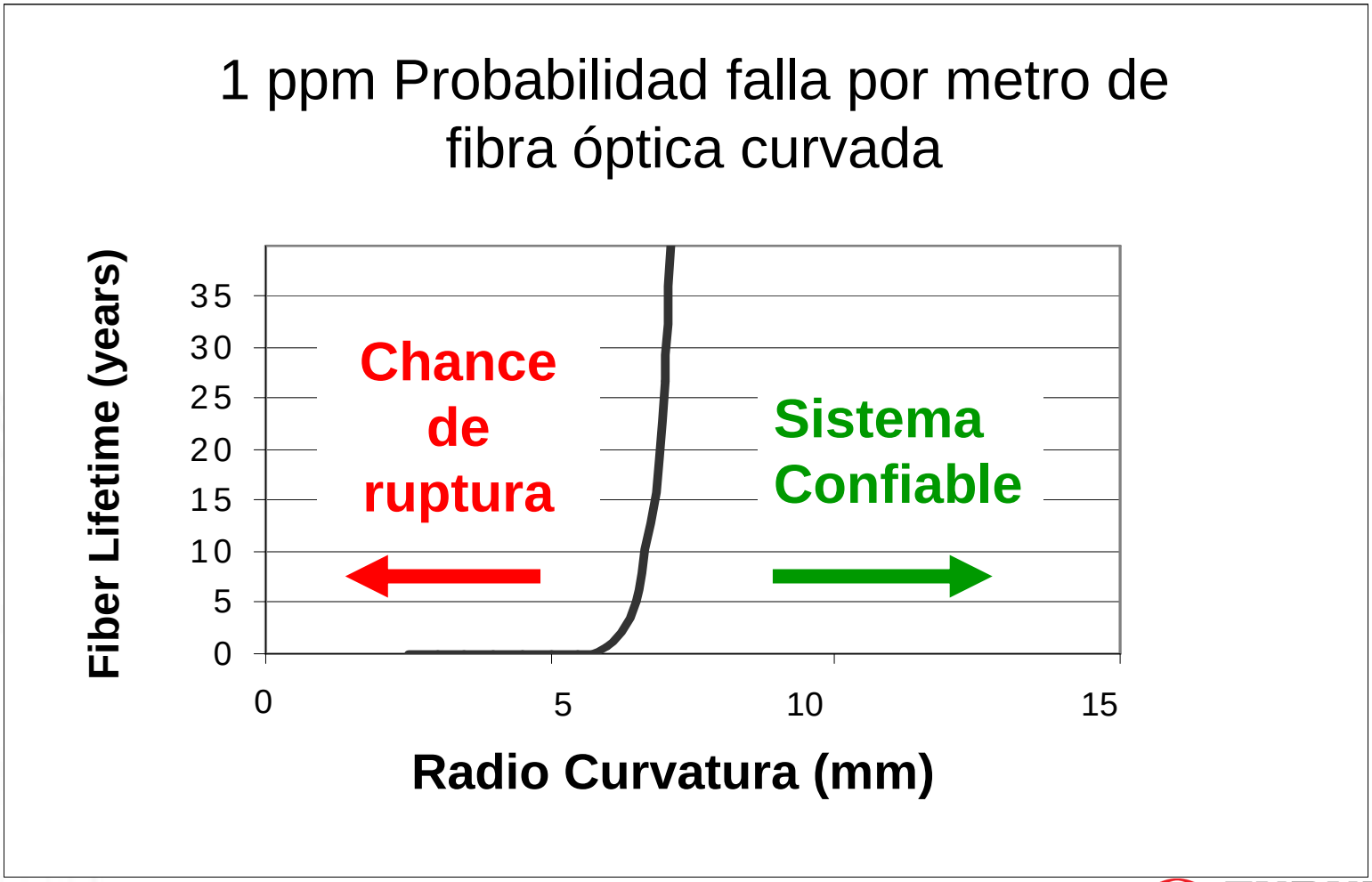
Fibras Ópticas Optimizadas frente Curvaturas

Radio mínimo de curvatura deberá ser >= 7.5mm para Garantizar 40 anos con 1 ppm confiabilidad



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Fibras Ópticas Optimizadas frente Curvaturas

ITU-T
TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

Revised Recommendation G.657 (for consent)

A = **A**ccess Network Applications
B = Indoor **B**uilding Applications

Radius (mm)	Number of turns	λ (nm)	Maximum Macrobending (dB)		
			A1	A2 & B2	B3
15	10	1550	0.25	0.03	
		1625	1	0.1	
10	1	1550	0.75	0.1	0.03
		1625	1.5	0.2	0.1
7.5	1	1550		0.5	0.08
		1625		1	0.25
5	1	1550			0.15
		1625			0.45

A1: G.652.D fiber with slightly reduced Bend Losses (**BL**) – formerly G.657.A

A2: G.652.D fiber with Strong **BL** reduction (focused on 7.5mm radius) - formerly G.652.D & G.657B

B2: Strong **BL** reduction (focused on 7.5mm radius); compliance with G.652.D is not mandatory - formerly G.657.B

B3: Strong **BL** reduction (focused on 5mm bend radius); compliance with G.652.D is not mandatory - New Table

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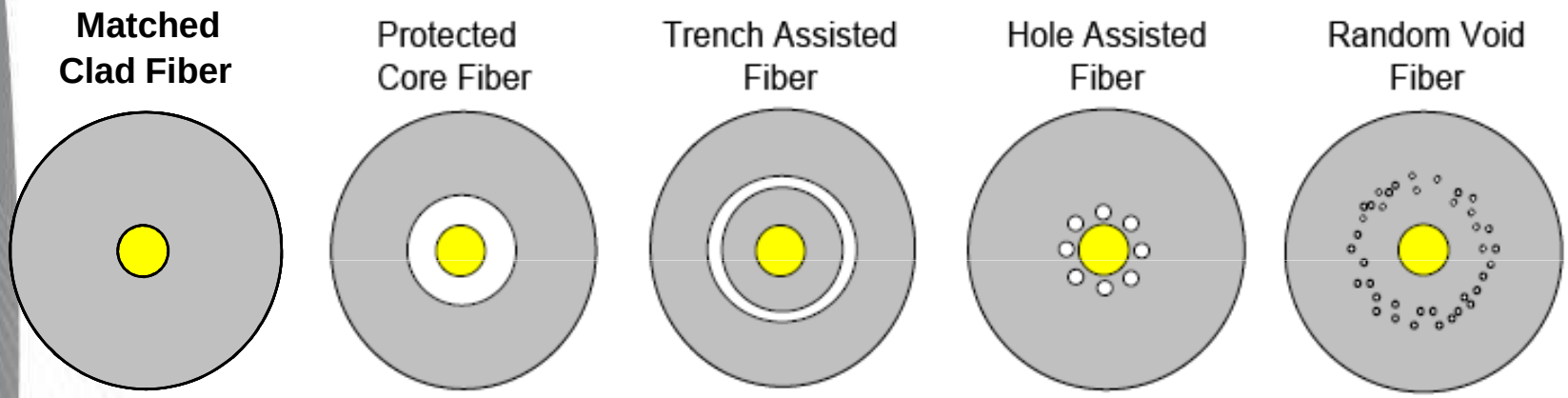
Fibras Ópticas Optimizadas frente Curvaturas

Fibras monomodo BLI (*Bending Low Insensitive*):

Tecnologías distintas entre los proveedores



- Core – carries the light signal
- Lower refractive index cladding – helps keep light in the core
- Lower refractive index bubbles or voids in cladding – helps keep light in the core
- Lower refractive index holes cladding – helps keep light in the core
- Cladding – low index – helps keep light in core

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Infraestructura da Rede Óptica Pasiva

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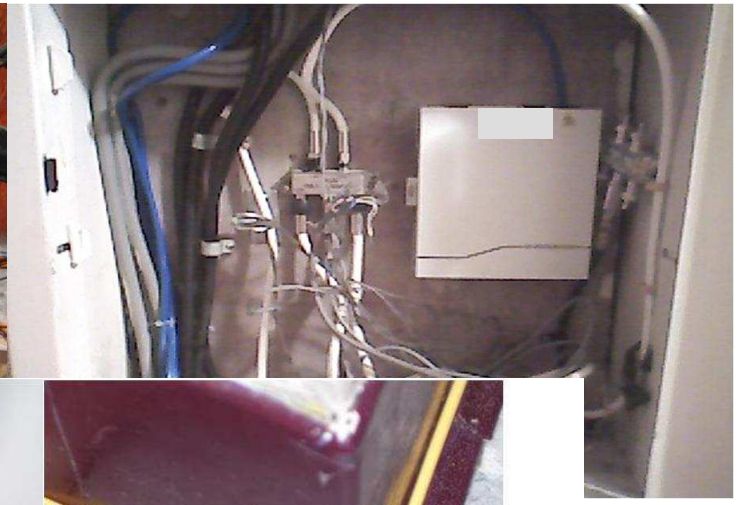
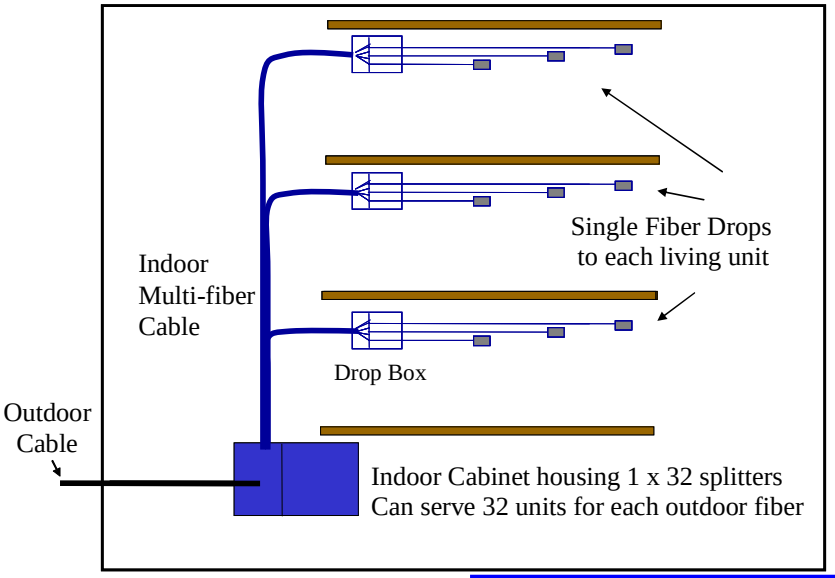
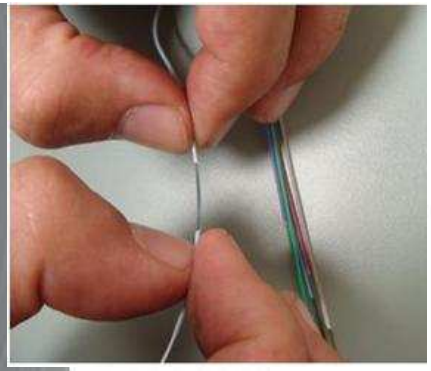
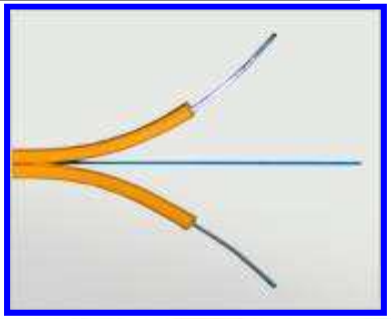
Infraestructura da Rede Óptica Pasiva



Acceso Vertical – MDU (Multi-dwelling unit)







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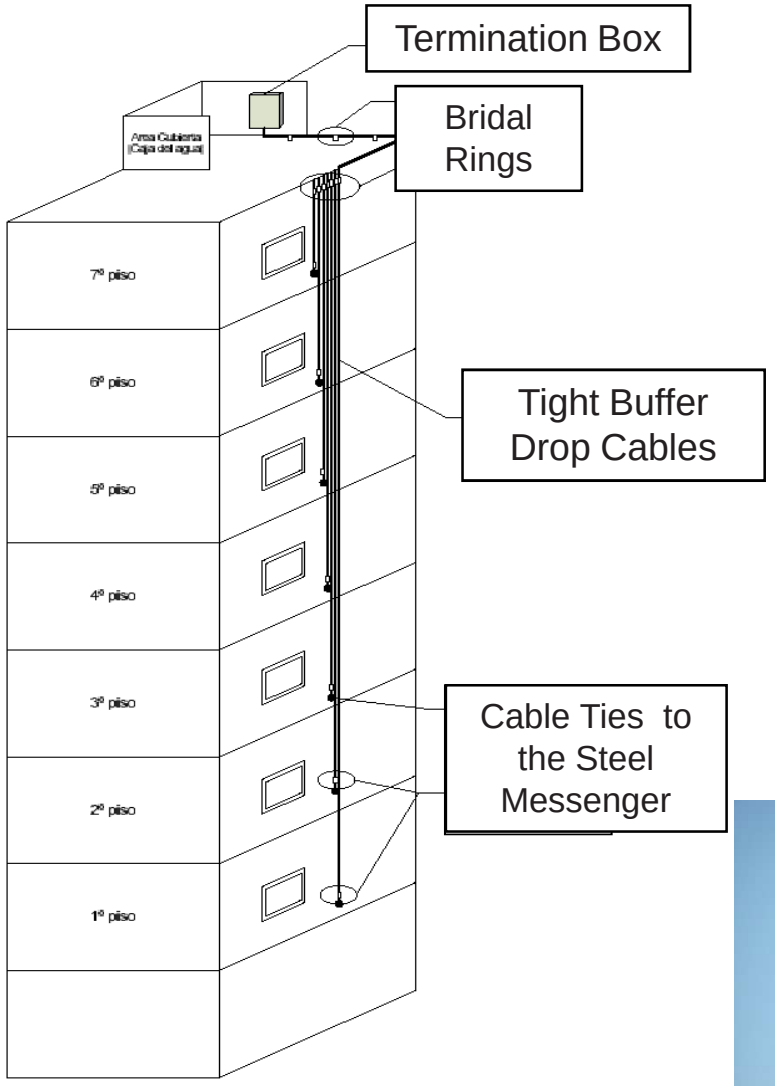
Acceso Vertical – MDU (Multi-dwelling unit)



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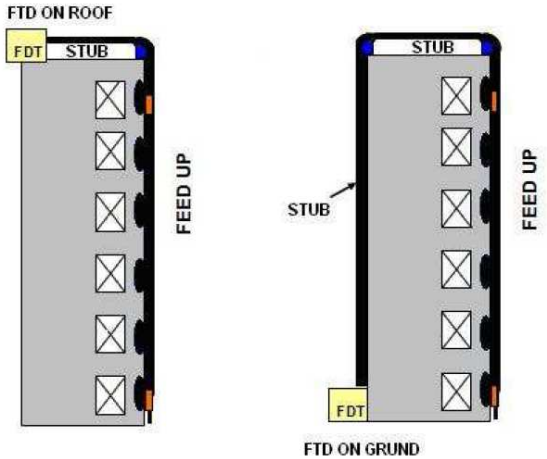
Acceso Vertical – MDU (Multi-dwelling unit)

Verizon MDU EZ Bend® OSP Bundled Drop Cable Assembly



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Fibras Ópticas Optimizadas frente Curvaturas

FIBRAS MULTIMODO (MMF)

NETWORKING
Data Center

LaserWave® *FLEX* Fiber
Bend-Optimized

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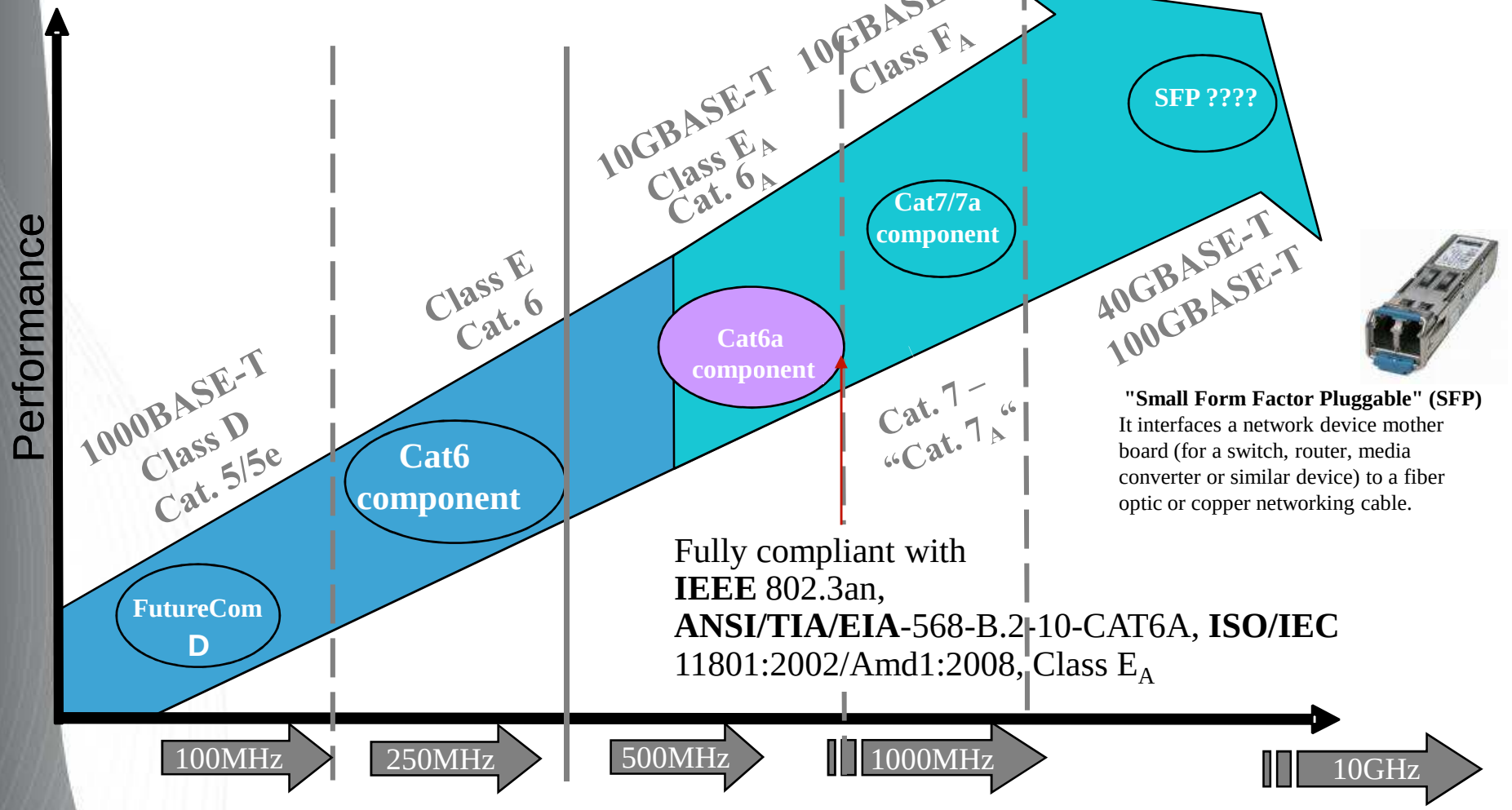
Soluciones para Cableado Estructurado



Fully compliant with **IEEE** 802.3an, **ANSI/TIA/EIA**-568-B.2-10-CAT6A, **ISO/IEC** 11801:2002/Amd1:2008, Class E_A

"Small Form Factor Pluggable" (SFP)
It interfaces a network device mother board (for a switch, router, media converter or similar device) to a fiber optic or copper networking cable.

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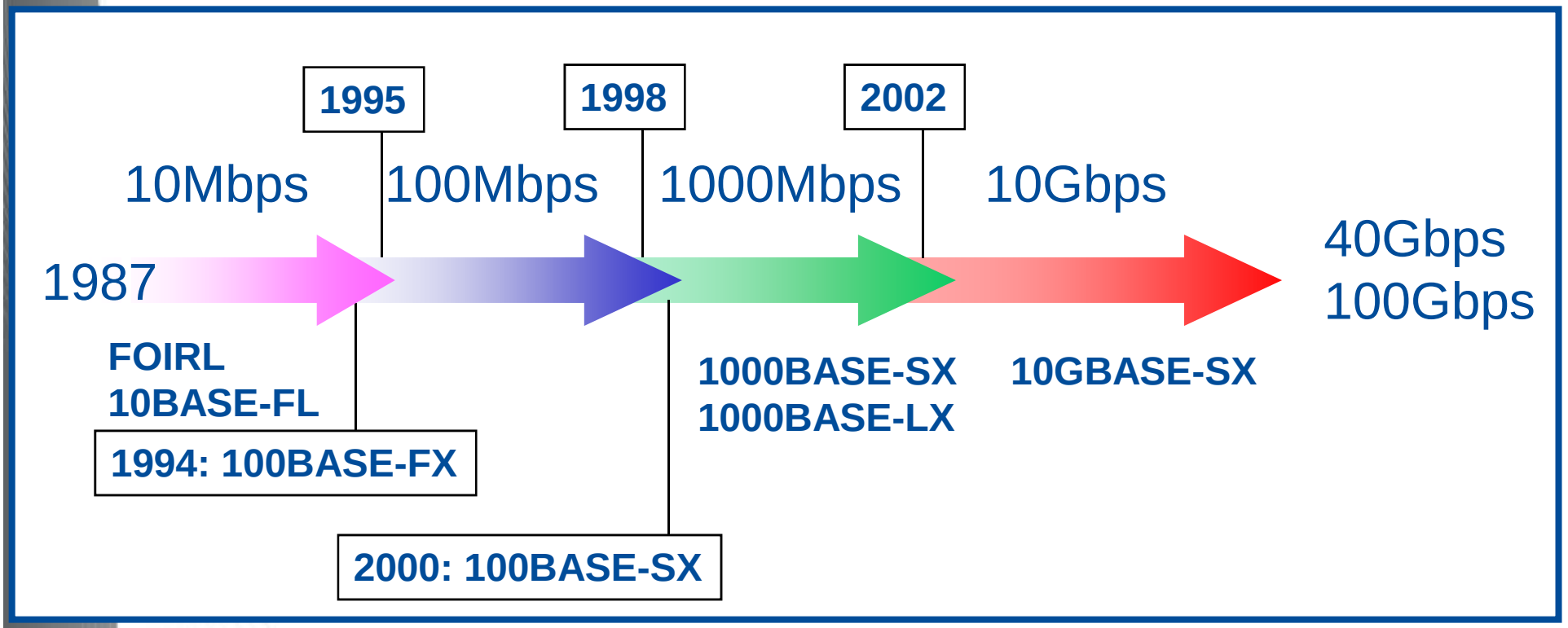
Soluciones para Cableado Estructurado

Optical fiber within the ETHERNET (IEEE 802.3)



LED 850 & 1310nm | VCSEL 850nm

50 & 62.5µm MMF | 50µm MMF (OM3 / OM4)

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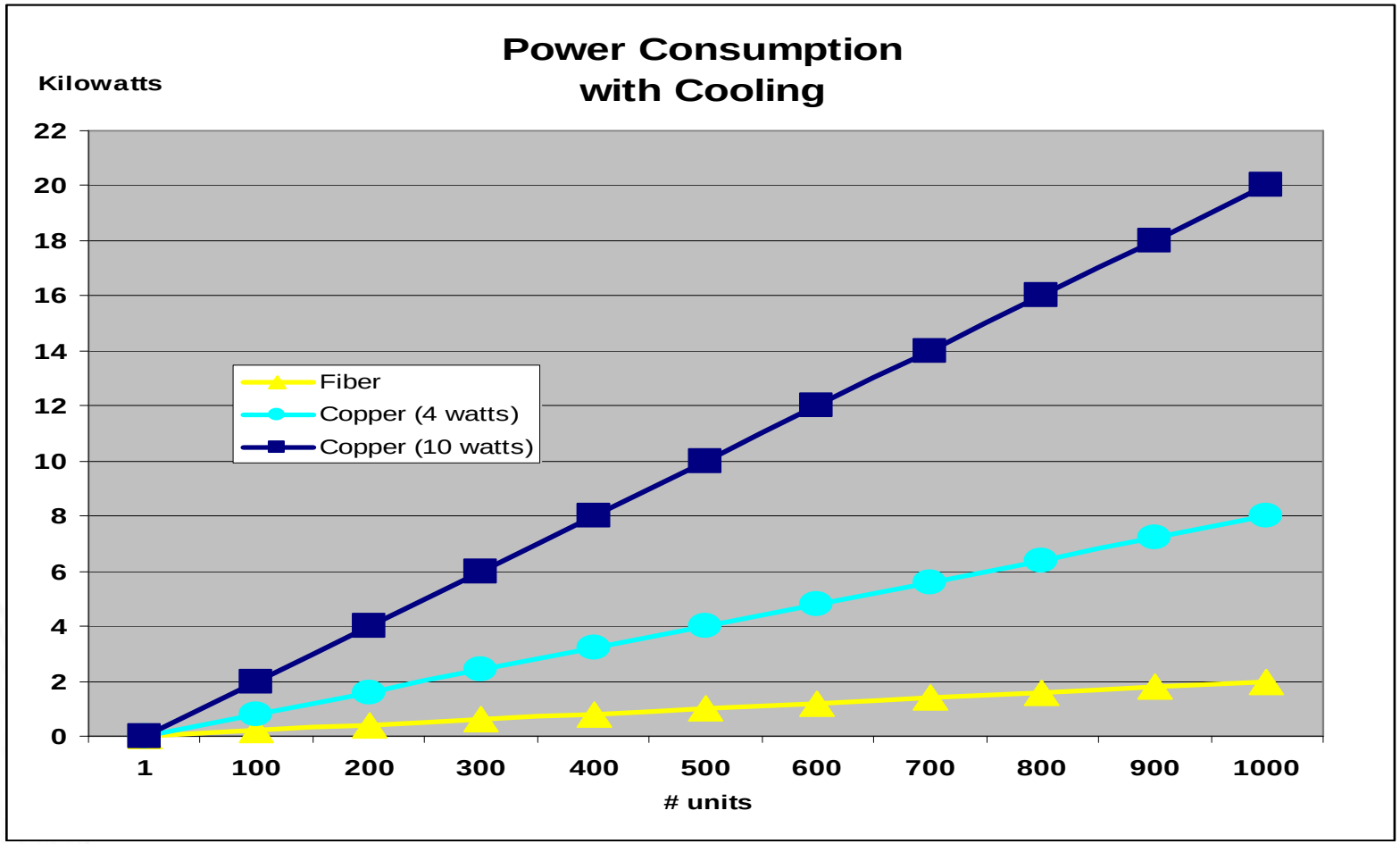
Soluciones para Cableado Estructurado



- 10Gb/s Ethernet Power Consumption
  - Copper – 10GBaseT : 4-10 Watts
  - Multimode Fiber – 10GBaseSR: ≤1 Watt

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Fibras Multimodo para Cableado Estructurado - clases

10, 40, & 100 Gb/s Transceiver Designation	Wavelength	62.5 um (OM1)	Std 50 um (OM2)	LO 50 um (OM3)	LO 50 um (OM4)	SM (OS1)
10GBase-SR (10 Gb/s)	850 nm Serial VCSEL	33	82	300	**550**	NA
10GBase-LX4 (10 Gb/s)	1300 nm CWDM Laser	300[1]	300[1]	300	300	10,000
10GBase-LRM (10 Gb/s)	1300 nm serial Laser/EDC	220[1]	220[1]	220	220	NA
40GBase-SR4 (draft) (40 Gb/s)	850 nm Parallel VCSEL Array	NA	NA	100	**150**[2]	NA
100GBase-SR10 (draft) (100Gb/s)	850 nm Parallel VCSEL Array	NA	NA	100	**150**[2]	NA

[1]Mode Conditioning Patch-cords required
[2]With 1.0dB connector loss

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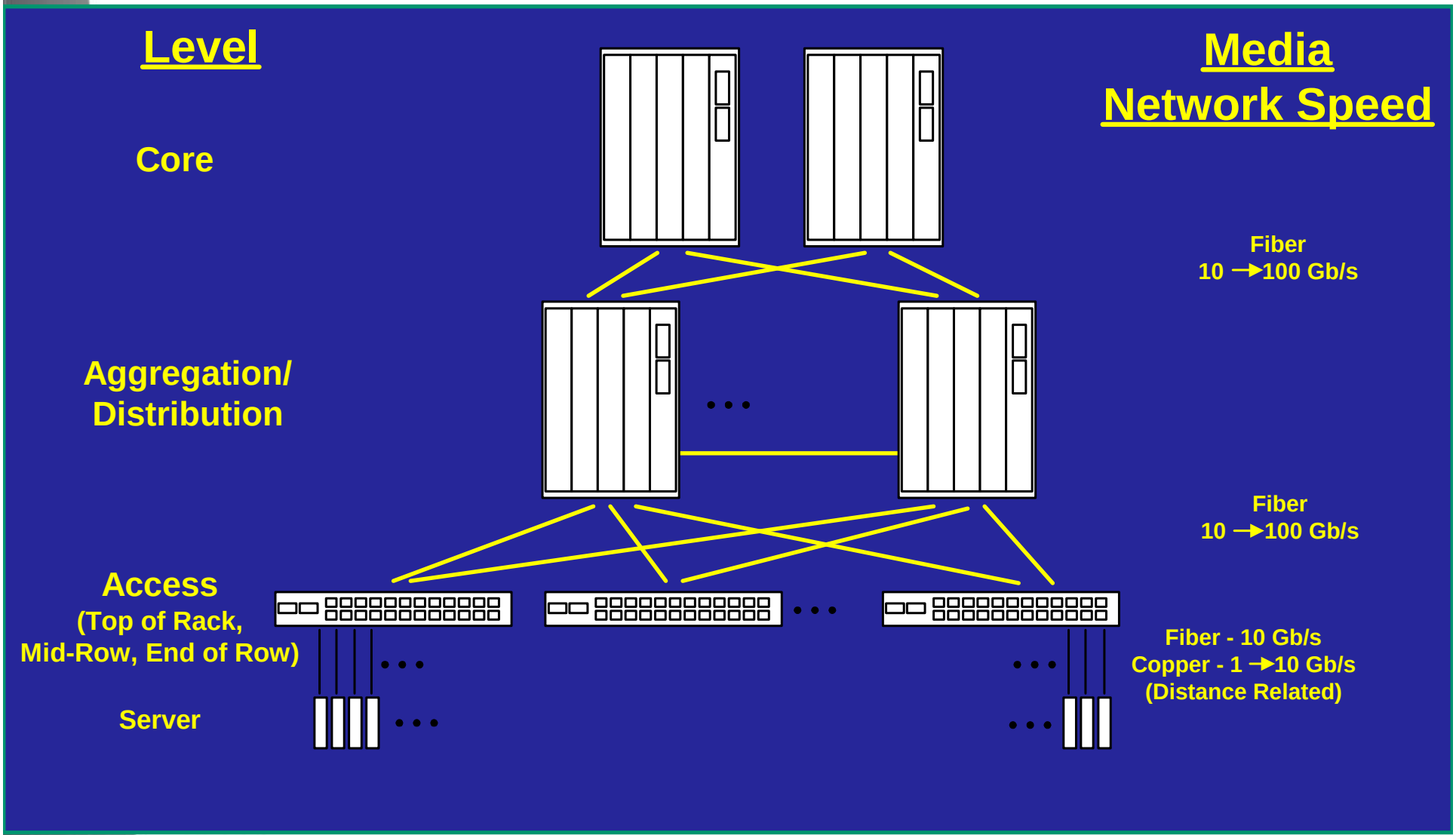
Data Center – Arquitectura típica



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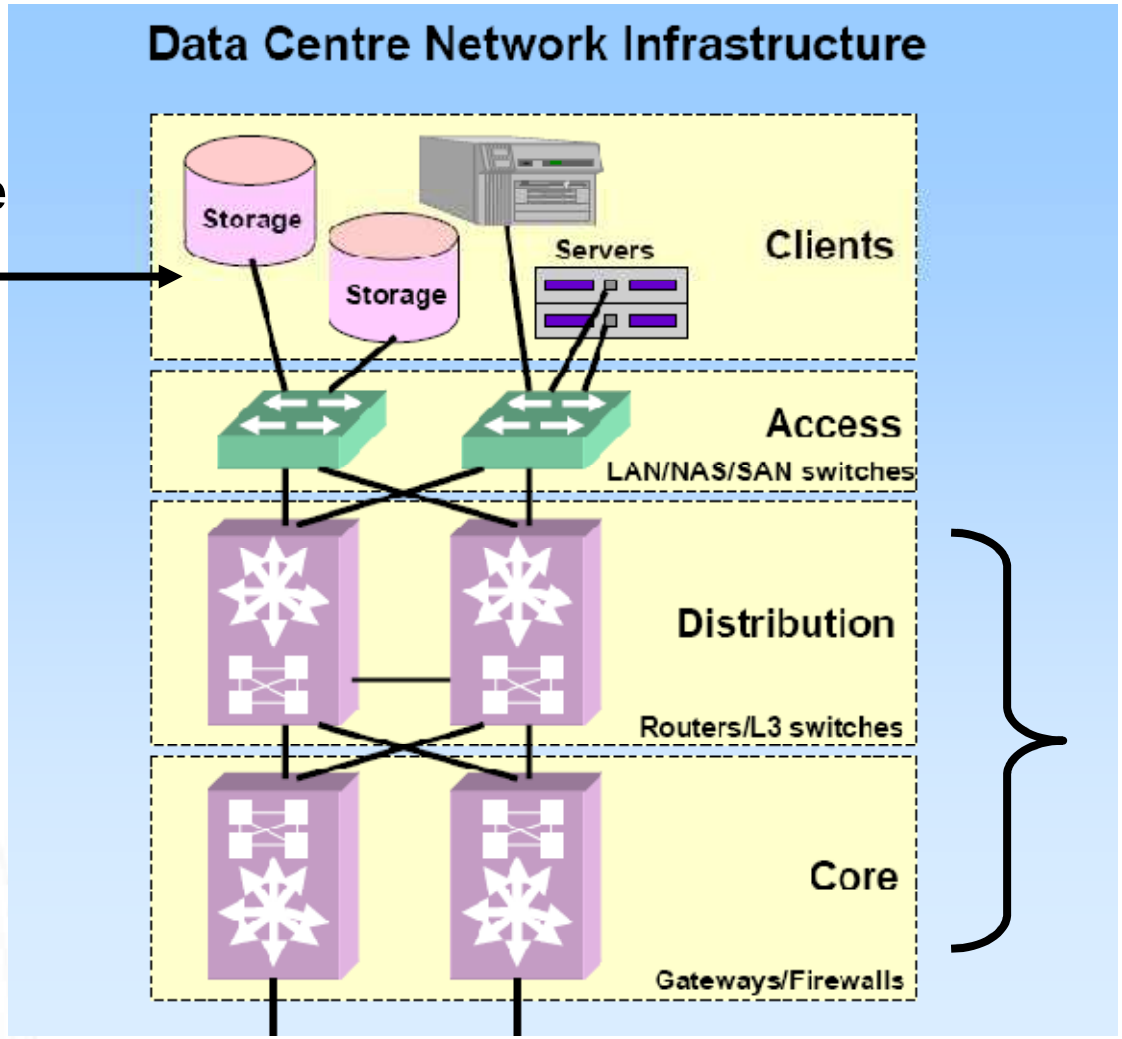
Data center link lengths

Will migrate to 16 Gb/s serial OM3 and OM4

0-2

0-2



Will move to 40-100 Gb/s Parallel OM3 and OM4

Data from Alan Flatmann presented to IEE 802.3 High speed study group January 2008

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Fibras Ópticas Optimizadas frente Curvaturas

LaserWave® *FLEX* Fiber
Bend-Optimized

MULTIMODO MM50 OM3 & OM4 "BEND-OPTIMIZED"

Transmission Distance (Link Length) Support	*LaserWave FLEX 550*	*LaserWave FLEX 300*
Gigabit Ethernet at 850 nm	1040 meters	1000 meters
Gigabit Ethernet at 1310 nm	600 meters	600 meters
10 Gigabit Ethernet at 850 nm	550 meters	300 meters
10 Gigabit Ethernet at 1310 nm	300 meters	300 meters

Macrobend Attenuation	850 nm	1300 nm
100 turns @ 37.5 mm radius	≤ 0.5 dB	≤ 0.5 dB
2 turns @ 15 mm radius	≤ 0.1 dB	≤ 0.3 dB
2 turns @ 7.5 mm radius	≤ 0.2 dB	≤ 0.5 dB

- Principales Características:

✓ Optimizada para aplicaciones en proyectos de data center
✓ Radios de curvatura de hasta 7,5mm
✓ Mayor confiabilidad para redes FTTD
✓ DMD controlado para garantizar 10 Gbps hasta 550 metros

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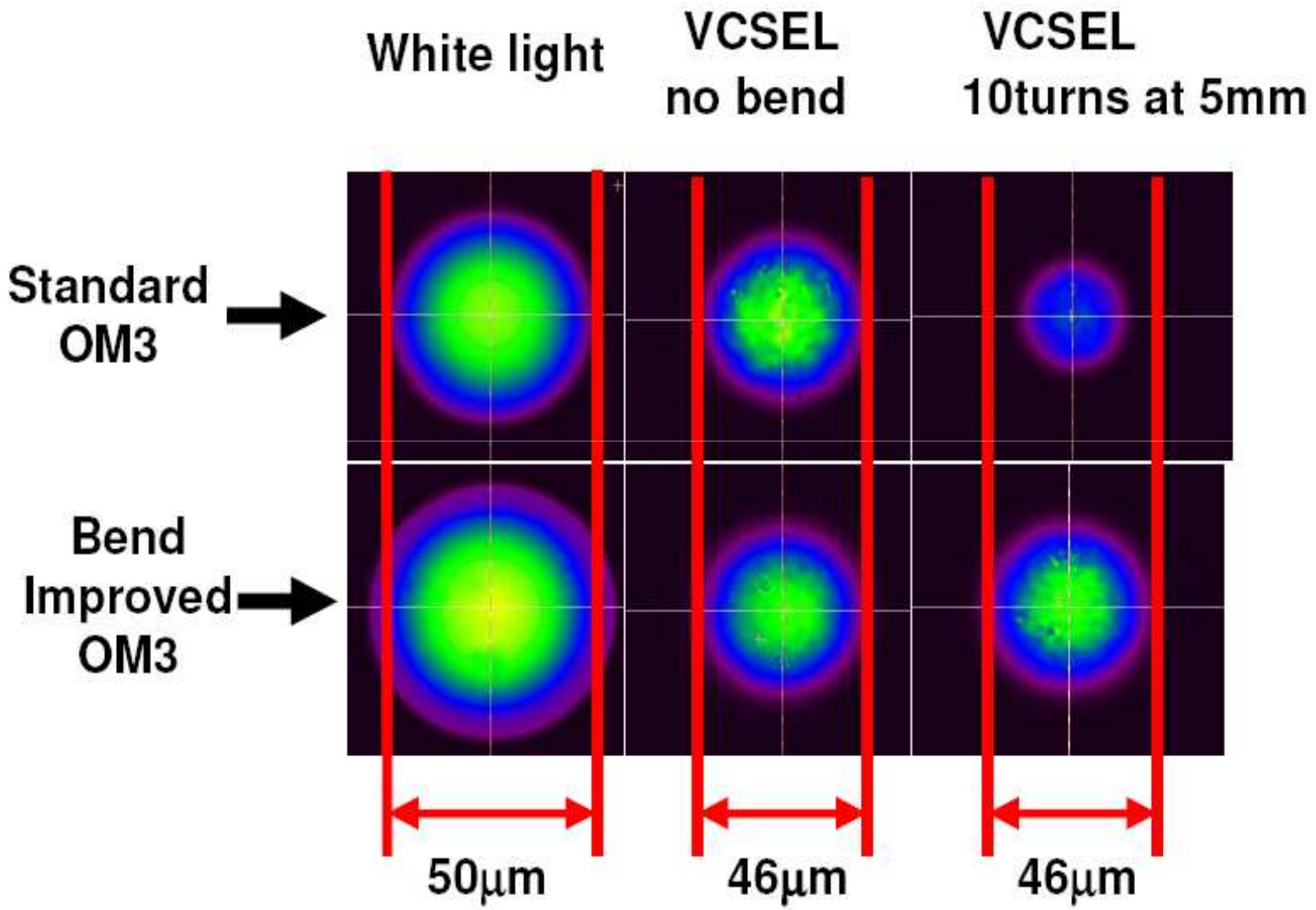
Fibras Ópticas Optimizadas frente Curvaturas



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288-port High-Density Housings in 4RU Space with Bend-Insensitive Fibers

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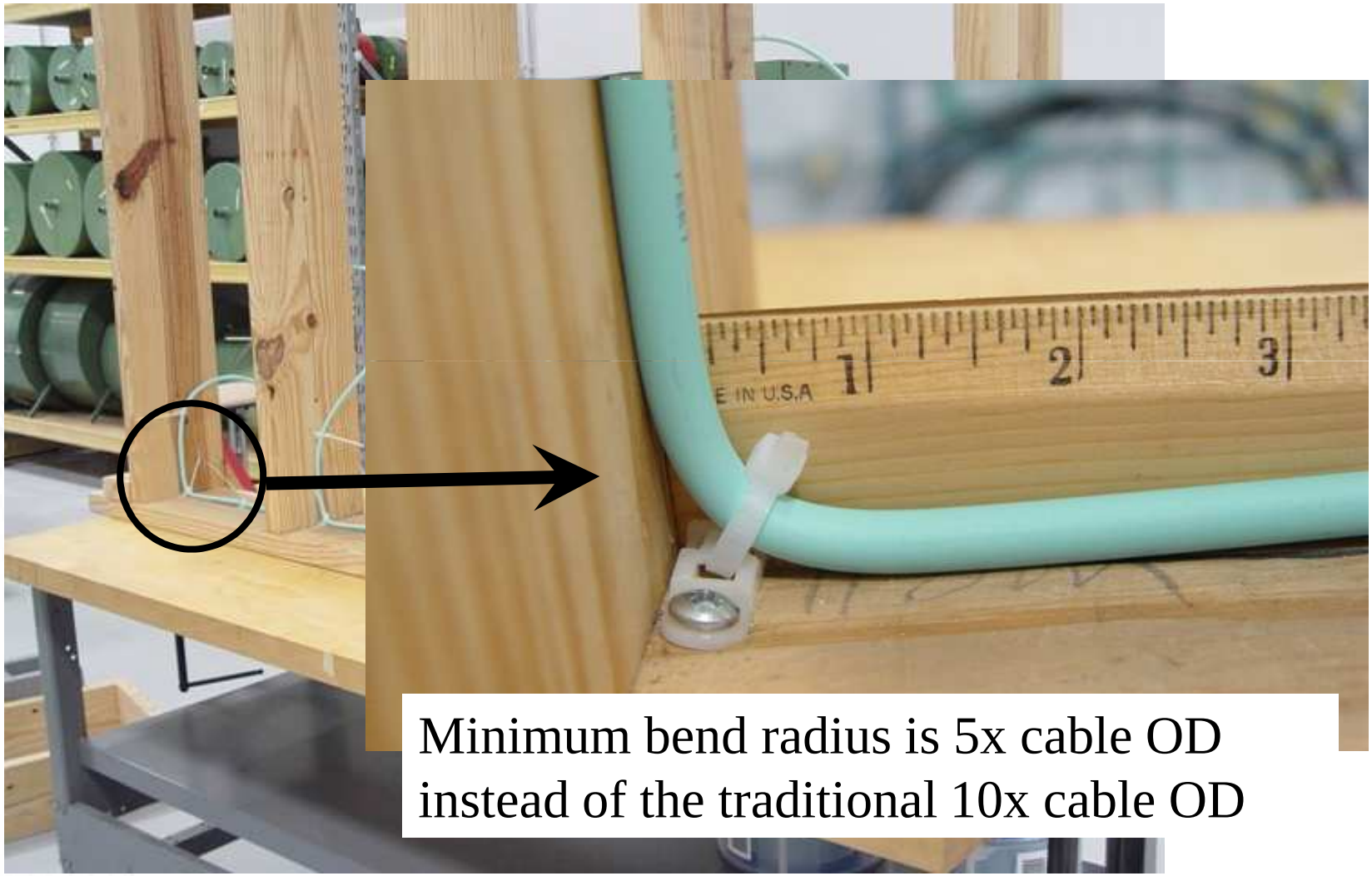
Fibras Ópticas Optimizadas frente Curvaturas



Minimum bend radius is 5x cable OD
instead of the traditional 10x cable OD

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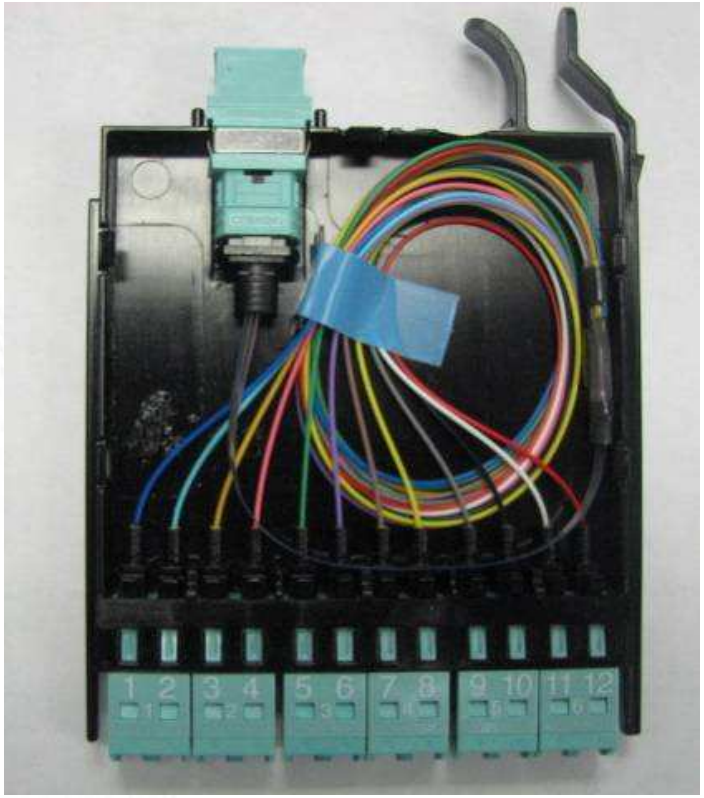
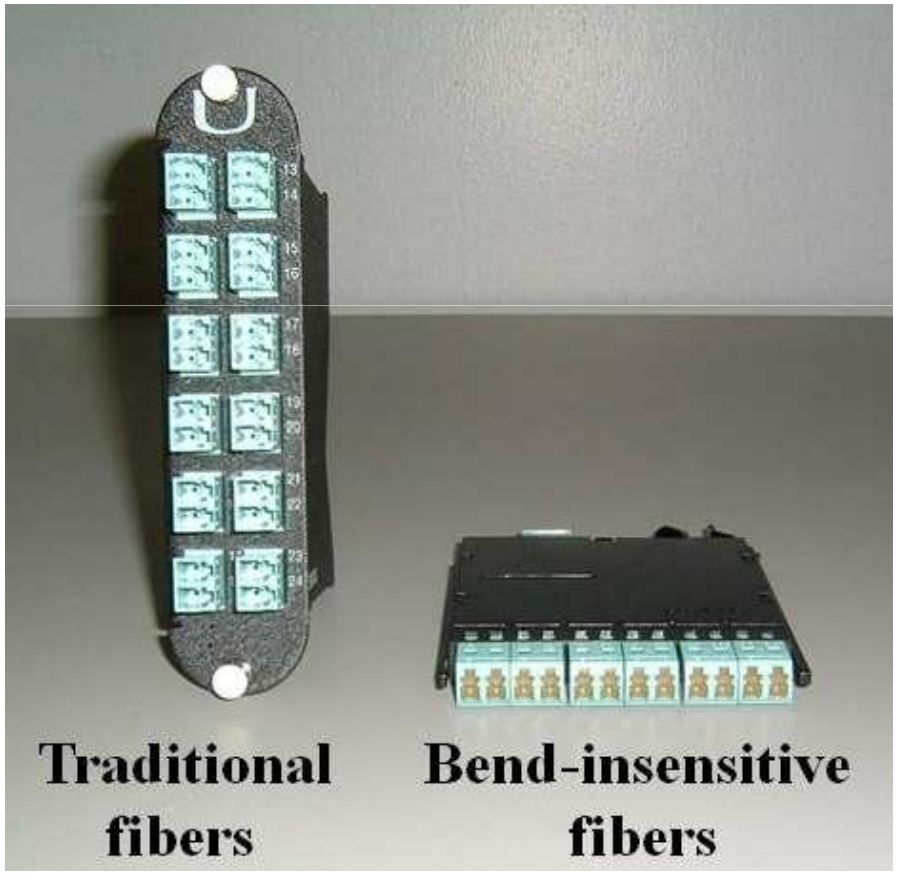
Reducción del tamaño de los módulos (Cassetes)





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Muchas Gracias!

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