Solutions

FTTA - 4G/5G optical networks

Telenco

The FTTA Digital Revolution

The 3rd generation mobile technology, the 3G, offered speed rates of about 1.9Mbit/s. Based on the LTE standard, the 4G offers speeds of up to 150Mbit/s. With theoretical speeds of 6 to 60 times higher and almost zero latency, the fifth generation -the 5G-, opens up a very broad range of possibilities.

Well beyond the simple data and voice exchange, the challenge of today's mobile networks consists into opening up new possibilities in all sectors: industry, health, mobility, economics, Smart Cities, machine learning, services,… Yet, it is also a real bridge towards enabling access to new technologies for many territories that are poorly covered or not covered at all by wired networks.

It's in this context of digital revolution and driven by its expertise in outside plant optical infrastructures that Telenco networks has addressed the challenge of FTTA 4G/5G. Telenco networks designs, manufactures and markets reliable and quality optical solutions for FTTA 4G/5G by applying eco-design principles and taking into account climatic conditions and harsh mechanical environments. By carefully considering the technical, economic and environmental aspects, Telenco networks offers genuine solutions for all 4G/5G cabling configurations, irrespective of the given network architecture.

In FTTA 4G/5G fibre optic cabling architectures there are two main instances of use: the deployment of a new site and the upgrade of an existing one. Whatever the objective, increasing coverage, integrating new operators or simply upgrading to a newer generation technology, congestion issues are being raised. To overcome these issues or to anticipate as much as possible future deployments, two optical cabling structures are commonly used on 4G/5G sites:

- 4G/5G direct cabling structure
- 4G/5G indirect cabling structure

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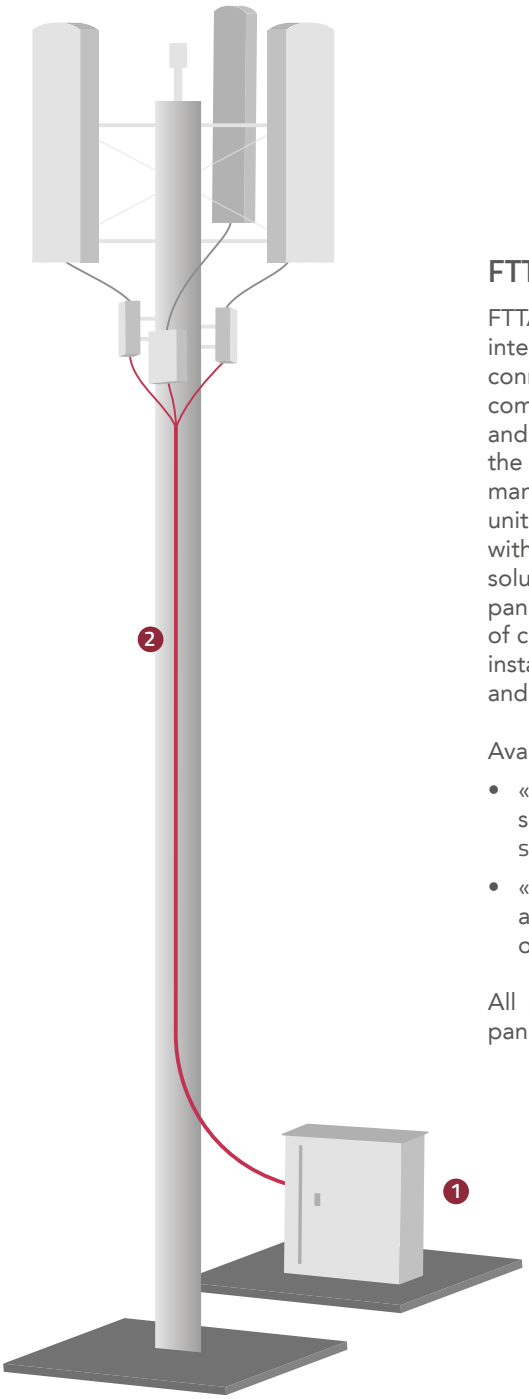
4G/5G DIRECT CABLING STRUCTURE

This first scenario is mainly applied to new 4G/5G sites and/or in case of low cabling density. The fibre network is available at the BTS/BBU level. In this case, one or more FTTA optical patch panels 1 are installed at the BTS/BBU. These optical patch panels are equipped with fibre optic connectors, mainly LC/UPC, enabling to link patching fibres to the FTTA outdoor pre-terminated breakouts 2FO 2. These latter ones run along the sites before being directly connected to the RRU/RRH. This architecture makes it possible for each antenna, and thus each RRU/RRH, to have its own FTTA outdoor pre-terminated breakout 2FO linked to the BTS/BBU. Various types of fibre optics can be used with the 4G/5G direct cabling structure: multimode OM2, OM3 or OM4 and single mode G.652D and G.657A2.



FTTA optical patch panel 1

FTTA optical patch panels are integrated in BTS/BBU to enable connections between fibre optics coming from active equipment and those running towards the RRU/RRH. Developed and manufactured in our production unit in Portugal they are equipped with premium optical connectivity solutions for a full compatibility with 4G/5G FTTA installations. Our patch panels are 100% configurable to best adapt to all type of installations. Made of corrosion-resistant steel, they are rugged solutions, perfectly suitable for installation in harsh environments. These patch panels are available in 1U and 2U versions for a maximum capacity of 96FO.

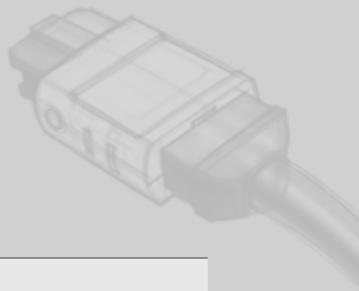
Available models:

- « For splicing »: factory terminated with optical connectors, pigtails and splice trays for the installation of fibre optics and their connection by fusion splicing with bare breakouts on the BTS/BBU side.
- « Trunk »: factory terminated with optical connectors, for the installation and connection of pre-terminated fibres with pre-terminated breakouts on the BTS/BBU side, by a simple plug-in action.

All possible connectors for breakouts are available on our optical patch panels: SC/UPC, SC/APC, LC/UPC, LC/APC.

TECHNICAL FOCUS

Optical connectivity solutions for FTTA networks



Depending on the RRU/RRH model, the protection of the connectors installed on the FTTA outdoor pre-terminated breakouts may be different, although the basic connector remains the duplex LC/UPC.

Duplex LC/UPC connectors without protection

There is no dedicated protection for the connectors, the protection of these latter ones is made within the RRU/RRH.

Duplex LC/UPC connectors with NSN type protection

The NSN boot (Nokia Siemens Networks), also known as flexible boot, is a system enabling to reliably protect connectors against dust and water. Thanks to its simple structure, this boot is easy to implement while also compatible with a small footprint use.

Duplex LC/UPC connectors with FullAXS type protection

The FullAxs is an IP67 waterproof system offering both a high mechanical protection and a complete dust protection. This boot locks onto a compatible base thanks to a rugged bayonet mount system.

SC/APC & SC/UPC connectors

Less used than the previous ones, these connectors are mainly integrated at the BTS/BBU level.

FTTA Outdoor pre-terminated breakout 2FO ❷

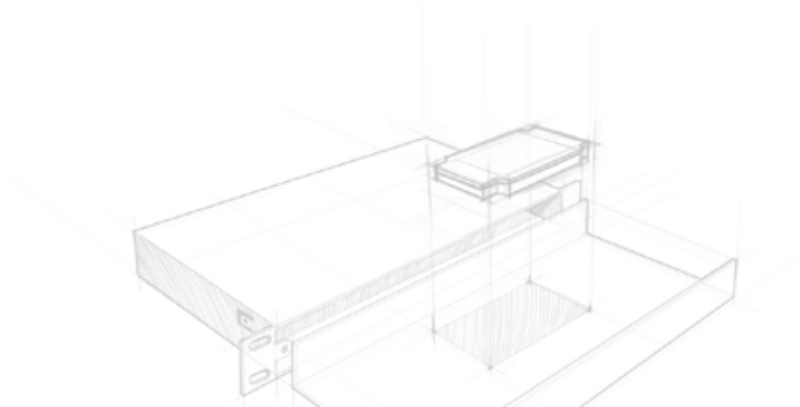
The FTTA Outdoor pre-terminated breakouts 2FO have been especially developed to link BTS/BBU to RRU/RRH within the 4G/5G direct cabling structure or the junction box (FTTA, or HTTA) to the RRU within the 4G/5G indirect cabling structure. Thanks to its extended know-how and expertise in overhead cable roll-out, Telenco networks has developed a cabling solution with a lightweight yet highly resistant structure able to withstand harsh environmental conditions. The FTTA outdoor pre-terminated breakouts 2FO present a 5.0mm Ø, which guarantees flexibility and easy installation.

They are available in various symmetrical versions:

- Duplex LC/UPC - Duplex LC/UPC
- Duplex LC/UPC with NSN protection - Duplex LC/UPC with NSN protection
- Duplex LC/UPC with FullAxs protection - Duplex LC/UPC with FullAxs protection

Or asymmetrical versions:

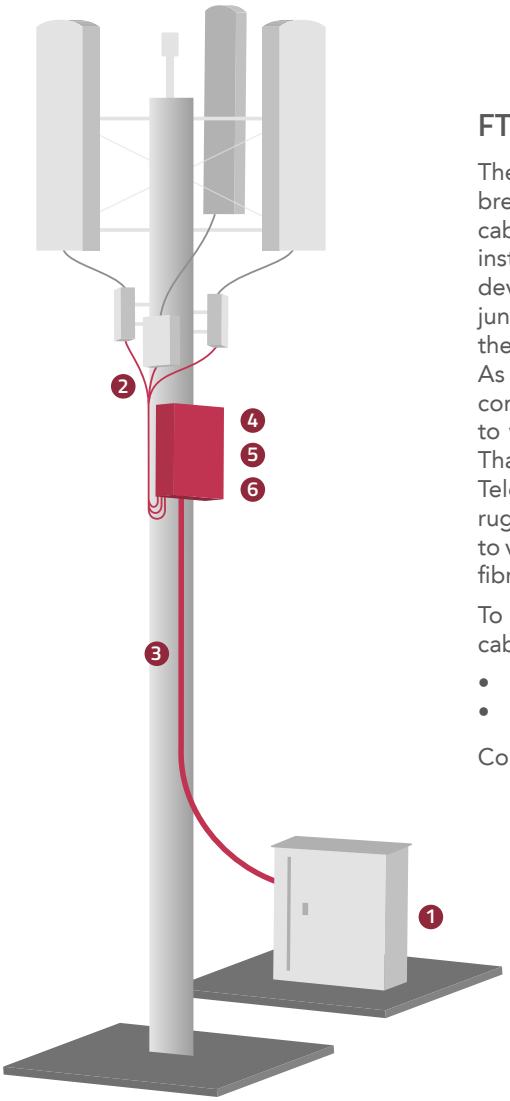
- Duplex LC/UPC - Duplex SC/APC
- Duplex LC/UPC - Duplex SC/UPC
- Duplex LC/UPC - Duplex LC/UPC with NSN protection
- Duplex LC/UPC - Duplex LC/UPC with FullAxs protection



4G/5G INDIRECT CABLING STRUCTURE

This second scenario is mainly applied for upgrading existing sites to 4G/5G and/or with a high cabling density. The fibre optic network is available at the BTS/BBU level. In this situation, one or several FTTA patch panels 1 (description p.4) are installed at the BTS/BBU. They enable the link between patch fibres and FTTA outdoor pre-terminated breakouts 12-24FO 3 .

This optical patch panel is equipped with optical connectors only, when the FTTA outdoor pre-terminated breakout 12-24FO presents connectors at both ends. It is also available in a version with pigtails and optical connectors for splicing applications between the patch fibres and the FTTA 12-24FO, when this last one presents a connector at only one end. The FTTA outdoor pre-terminated breakout 12-24FO runs along the site to finally end inside the FTTA outdoor optical box 24FO 4. Therefore, a single cable can supply 6 or 12 RRUs/RRHs. As a solution for reducing network congestion, the FTTA outdoor optical box 24FO is placed as close as possible from the RRU/RRH and enables to connect the FTTA outdoor pre-terminated breakout 12-24FO to FTTA outdoor pre-terminated breakout 2FO 2 (description p.5). This solution enables a lower cabling density upstream the optical box and the possibility to later add a fibre optic link between the optical box and the RRU/RRH. It must be emphasised that the optical box can also serve for the management of power distribution, in which case the HTTA outdoor hybrid box 5 should be used. If the power distribution was to be managed independently, the PTTA outdoor power box 6 should be used. For this 4G/5G indirect cabling structure, the most commonly used fibres are the single mode G.652D and G.657A2 type.



FTTA outdoor pre-terminated breakout 12-24FO 3

The FTTA outdoor pre-terminated breakouts 12-24FO are high performance cabling systems used for outside plant installations. They were specifically developed to link the BTS/BBU to the junction box (FTTA or HTTA) within the 4G/5G indirect cabling structure. As they are subject to harsh climatic conditions, these breakouts are designed to withstand significant temperature variations and high mechanical stress. Thanks to its extended know-how and expertise in overhead cable roll-out, Telenco networks has developed a cabling solution with a lightweight yet rugged structure, able to withstand harsh environmental conditions, suitable to various type of installations. This cable is available in versions with different fibre counts: 12 and 24, pre-terminated at one end or at both ends.

To provide each customer with the most suitable products to its needs, this cabling solution is also available in 2 different diameter ranges:

- 12FO: Ø 6.4mm - 24FO: Ø 8.0mm (minimum tensile strength 660N)
- 12FO: Ø 11.1mm - 24FO: Ø 11.1mm (minimum tensile strength 2000N)

Compatible connectors: LC/UPC - LC/APC - SC/UPC - SC/APC

HTTA outdoor hybrid box 5

The HTTA outdoor hybrid boxes 24FO have been specifically developed to enable the connection and distribution of optical and power links within the 4G/5G indirect cabling structure. They are associated with FTTA outdoor optical boxes 24FO and PTTA outdoor power boxes. HTTA outdoor hybrid boxes are placed as close as possible from the RRU/RRH. They enable the connection and management of the FTTA outdoor pre-terminated breakout 12 or 24FO and the FTTA outdoor pre-terminated breakout 2FO, as well as the management and distribution of power cables. For these latter ones, the HTTA outdoor hybrid boxes also present protection and switch features, as they include circuit breakers and earthing. HTTA outdoor hybrid boxes are made to withstand harsh weather conditions, as well as significant temperature changes and high mechanical stress.

Up to 24FO:

- 12 Duplex LC connectors
- 1 cable gland input (optical or hybrid cable)
- 4 outputs 3 holes per cable gland Ø 7mm max

Up to 6 circuit breakers:

- 3 or 6 circuit breakers 48VDC / 32A
- 2 cable gland inputs (power cable)
- 6 cable gland outputs (power distribution) + 1 earthing output

PTTA outdoor power box 6

The PTTA outdoor power boxes have been developed to enable the connection of power cables within the 4G/5G cabling structure. They also have a protection and switch function, as they include circuit breakers and earthing and enable the management and distribution of power cables. The PTTA box can be used as a complement to a FTTA outdoor optical box 24FO or in case of 4G/5G direct cabling structure.
These boxes are designed to withstand harsh weather conditions and are able to resist to significant temperature variations and high mechanical stress.

Up to 6 circuit breakers:

- 3 or 6 circuit breakers 48VDC / 32A
- 1 cable gland input (power cable)
- 6 cable gland outputs (power distribution)
- 1 earthing output

FTTA outdoor optical box 24FO 4

FTTA outdoor optical boxes 24FO have been designed to enable the optical connection within the 4G/5G indirect cabling structure. Located as close as possible from the RRU/RRH, they enable the connection and management of the FTTA outdoor pre-terminated breakout 12 or 24FO and of FTTA outdoor pre-terminated breakout 2FO. These boxes are made to withstand harsh weather conditions, as well as significant temperature changes and high mechanical stress. Several mounting systems are available in order to adapt these boxes for a façade, pole or metal tower mount. With a compact size, the FTTA outdoor optical boxes have been designed for a simple installation and integration in their environment.

Up to 24FO:

- 12 Duplex LC connectors
- 1 cable gland input (optical or hybrid cable)
- 4 outputs 3 holes per cable gland Ø 7mm max

TECHNICAL FOCUS

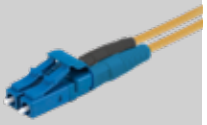
Glossary of terms FTTA

- **BTS** = Base Transceiver Stations
- **BBU** = Base Band Unit
- **RRU** = RRH = Remote Radio Unit = Remote Radio Head
- **FTTA** = Fiber to the Antenna
- **HTTA** = Hybrid to the Antenna (optical/power cable)
- **PTTA** = Power to the Antenna
- **Breakout** = Trunk = Optical cable terminated at one or both ends

TECHNICAL FOCUS

LC connector

The optical LC connector (Lucent Connector) is one of the first compact connectors introduced on the market.



This connector has the particularity of being twice as small as a SC connector and presents a Zirconia ferrule of Ø 1.25mm, which is twice as small as the standard SC/ST/FC/E2000 ferrules of Ø 2.5 mm.

The LC connector is defined by the IEC 61754-20 standard and presents the same optical standard characteristics as the SC connectors:

- IL = Grade B, 0.12dB on average, 97% of values <0.25dB at 1550nm according to IEC61300- 3-34 standard, Method 1.
- RL > 50dB for UPC polishing and > 60dB for APC polishing.

Another special feature of the LC connector is that it presents a clip locking system that requires a specific action to unlock it. The LC connector in its classic version is therefore rather a « lockable » connector than a « push-pull » connector. However, innovative and genuinely « push-pull » solutions do exist, such as for instance the Huber+Suhner LC push-pull connectors, enabling an easy handling even when access is difficult or in case of high density cabling.

The LC connector is being increasingly used for various reasons:

- Its compact size: 2x LC = 1x SC, which was a challenge at the beginning of data networks, is now a global economic stake: multiplying the connections in the smallest possible space.
- Its format is widely used for transceiver interfaces, which makes this connector a must for those network parts integrating active equipment.
- Democratisation. Although the LC connector has long been reserved to high-density applications, today its wide use makes it more affordable. Some networks characterised by high volume such as FTTH use nowadays this connector.

The LC connector in brief:

DESIGN	Lucent Corporation
SIZE	Duplex LC = SC
FERRULE	Ø 1.25mm
TYPE OF CONNECTOR	Latch locking system

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TELENCO: INNOVATION AT THE SERVICE OF WORLDWIDE NETWORKS

Telenco is a group of entities specialised in the design, manufacture and global marketing of future-proof solutions for telecom and connectivity infrastructures. Since 1999, the Group has organized its business activity on offering innovative solutions meeting the field challenges of each specific market.

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Over 20 years
of R&D expertise and
an integrated test laboratory

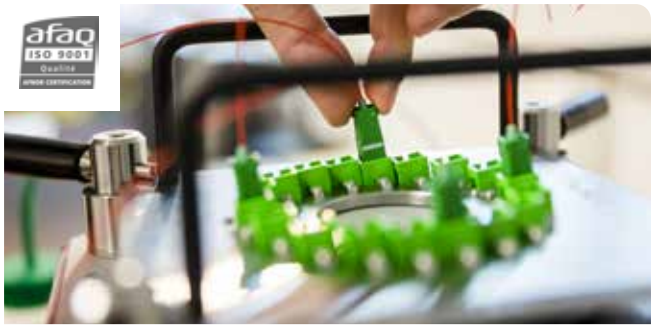
MANUFACTURE

18 000 m²
of production units
in Europe and Tunisia

LOGISTICS

21 000 m²
of storage area
in the world

A CERTIFIED INDUSTRIAL PLAYER...



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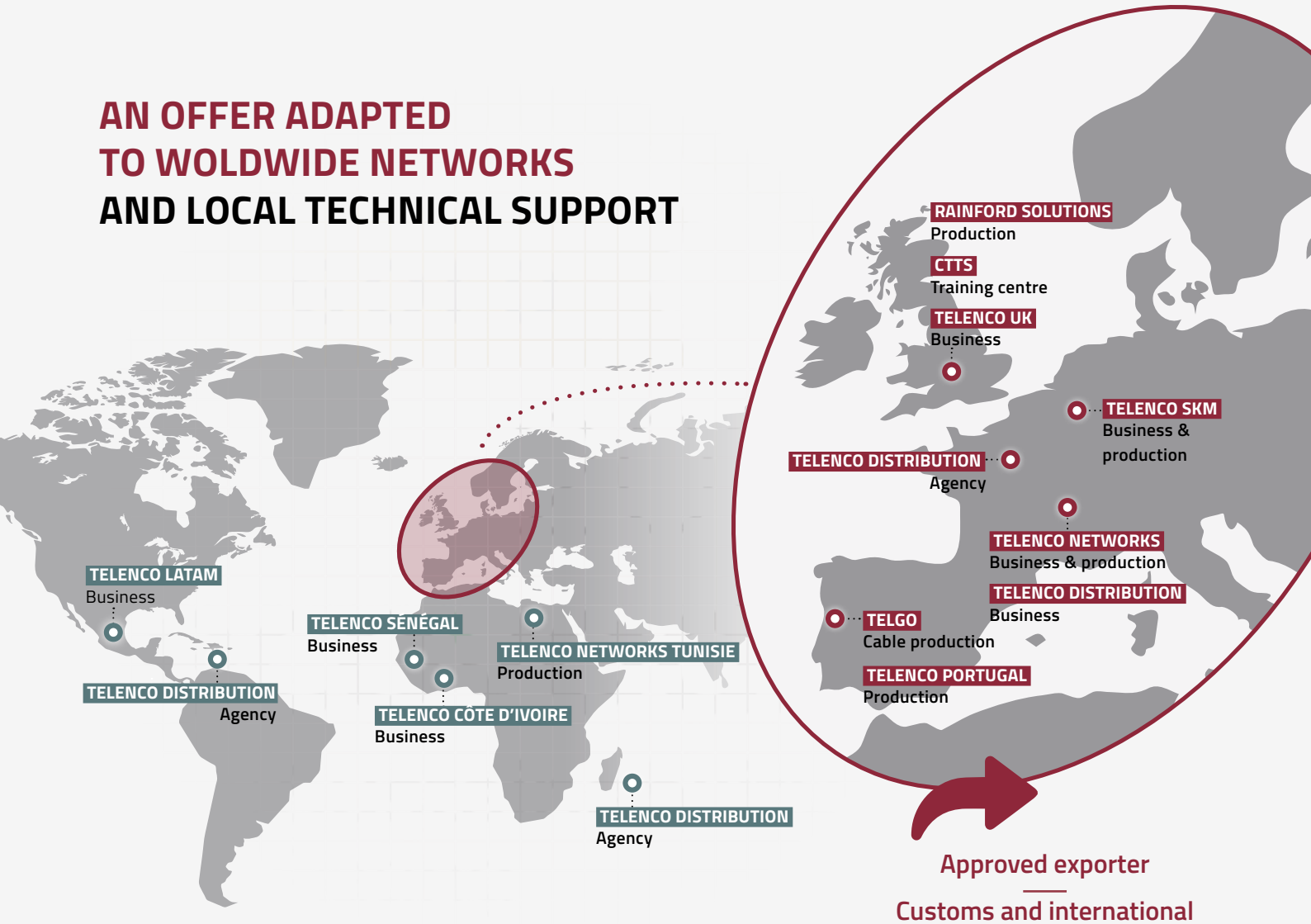

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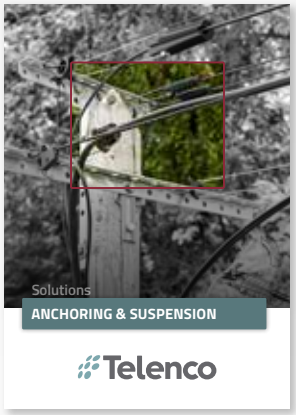

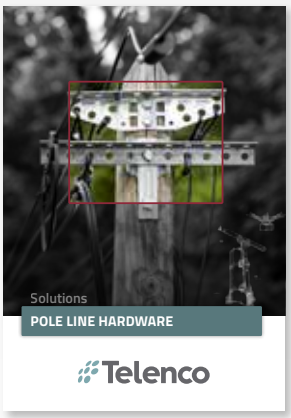

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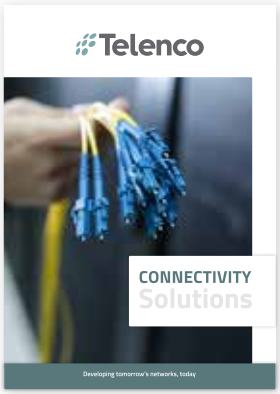

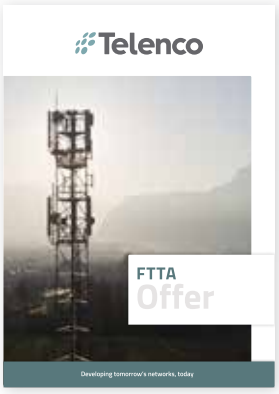

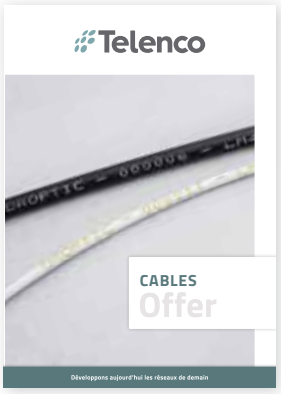

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