



# **Deployment of indoor cabling system with invisible optic cables or Optical/Electrical Hybrid Cable**

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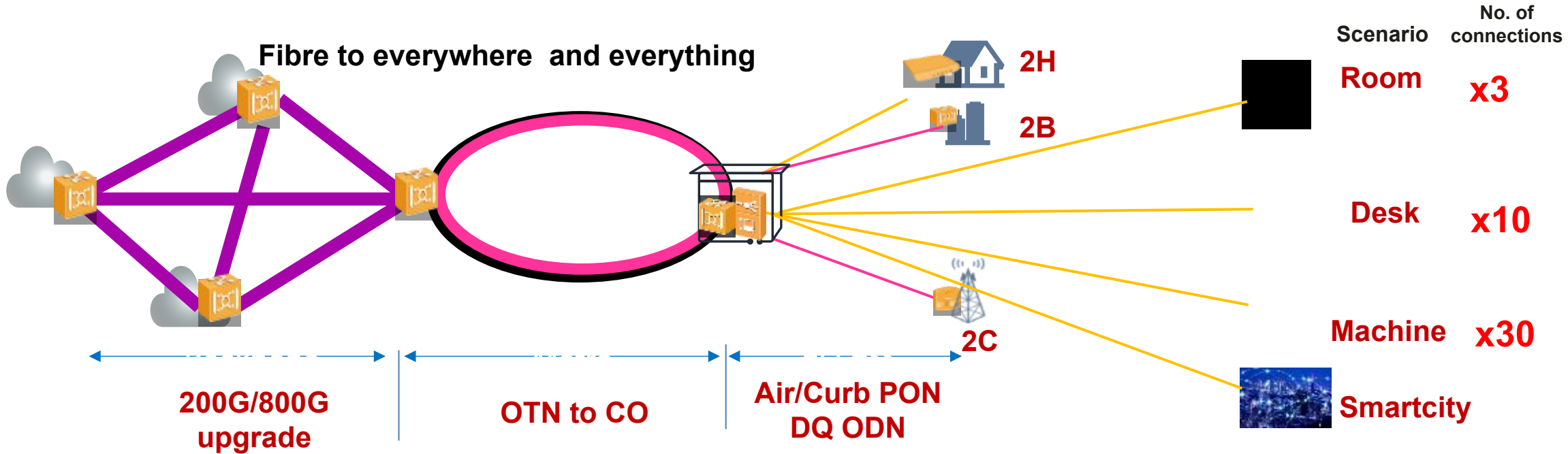
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Materials in FTTR**

# 1. Fibre Turns to Be the 4th Infrastructure



Fibre is now the 4<sup>th</sup> infrastructure after transportation, hydraulic and power grid

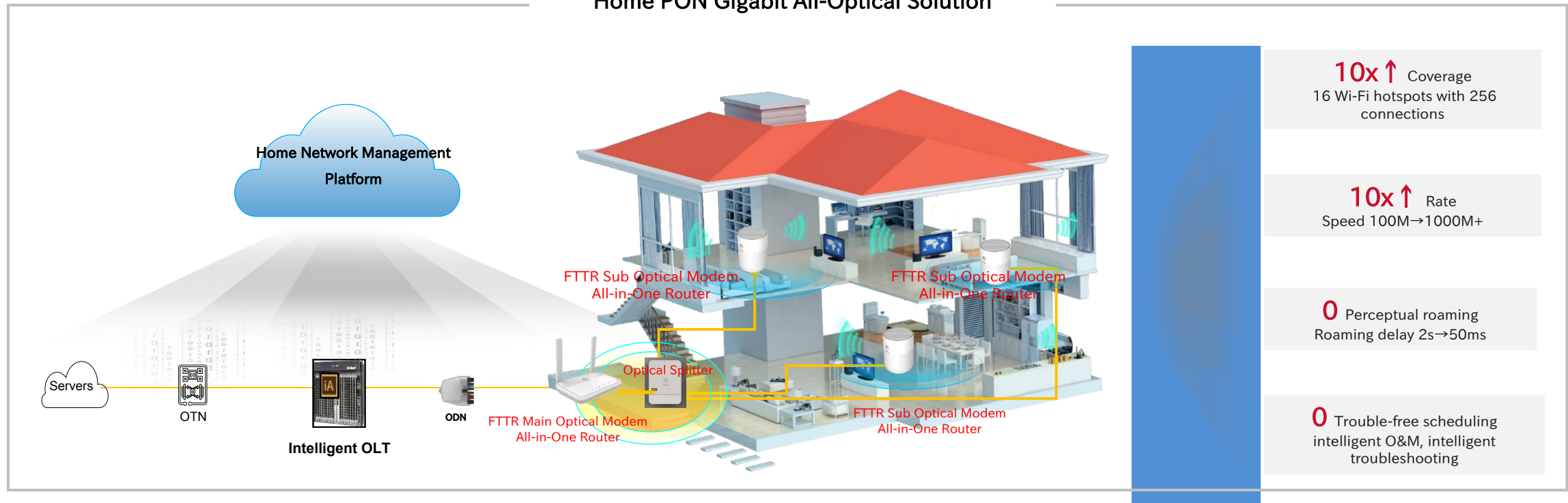
|   |   |   |   |
|---|---|---|---|
|  |  |  |  |
| <b>Transportation</b>   | <b>Hydraulic</b>  | <b>Power grid</b>   | <b>All-Optical Network</b>  |

FTTR is the last hundred meters of all optical networks and a crucial part of the universal layout cables in households. 3

## 2. FTTR fiber network experience

### 2.1 Home PON: Building an Ultimate All-optical FTTR Gigabit Experience

#### Home PON Gigabit All-Optical Solution



**10x ↑** Coverage  
16 Wi-Fi hotspots with 256 connections

**10x ↑** Rate  
Speed 100M→1000M+

**0** Perceptual roaming  
Roaming delay 2s→50ms

**0** Trouble-free scheduling  
intelligent O&M, intelligent troubleshooting

#### Full Fiber Connection

- Fiber extends from the doorway to each room
- Whole-house fiber connection

#### Full Gigabit Coverage

- Wi-Fi6 160MHz bandwidth
- Measured speeds of over a gigabit in all rooms

#### Full Wi-Fi Roaming

- AC+AP architecture for seamless roaming throughout the house
- Switching without perception, time delay <50ms

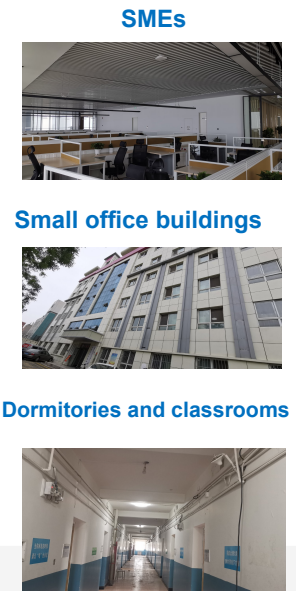
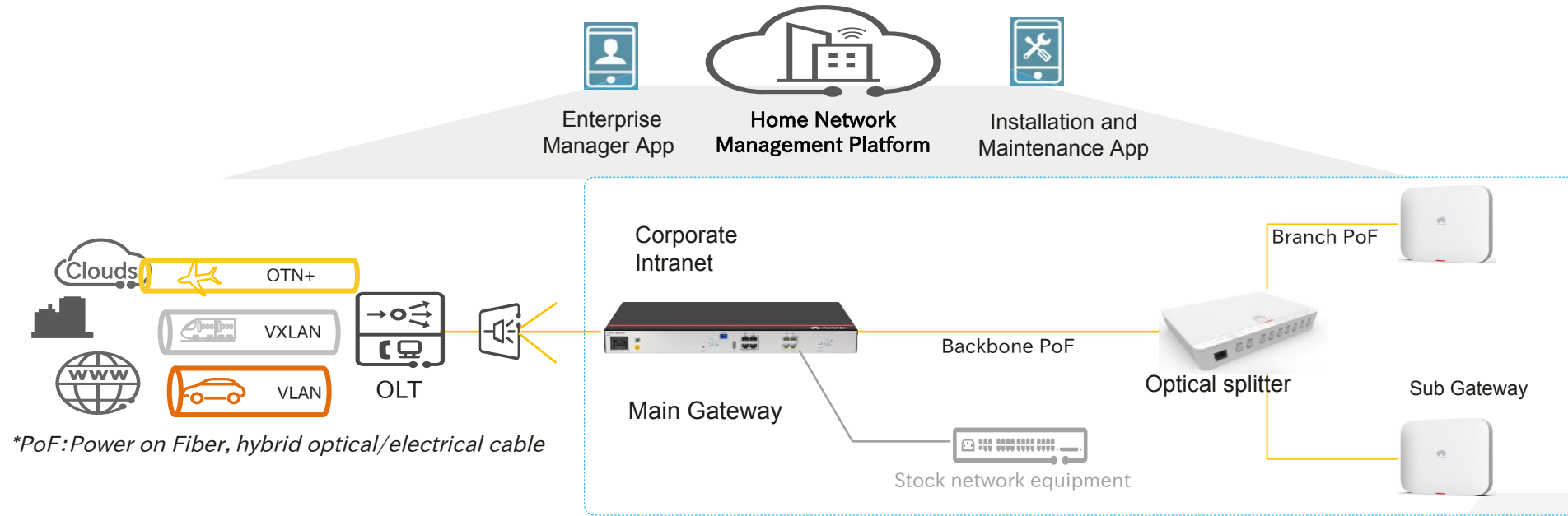
#### Total Intelligence for Troubleshooting

- Intelligent O&M platform, visible and manageable
- Automatic identification and analysis of network faults

Home FTTR fiber network achieves the ultimate experience of true gigabit, low latency, and full coverage.



# 2.2 Business PON: Re-create an Indoor Gigabit Optical Network to Build a Digital Base for the Enterprise

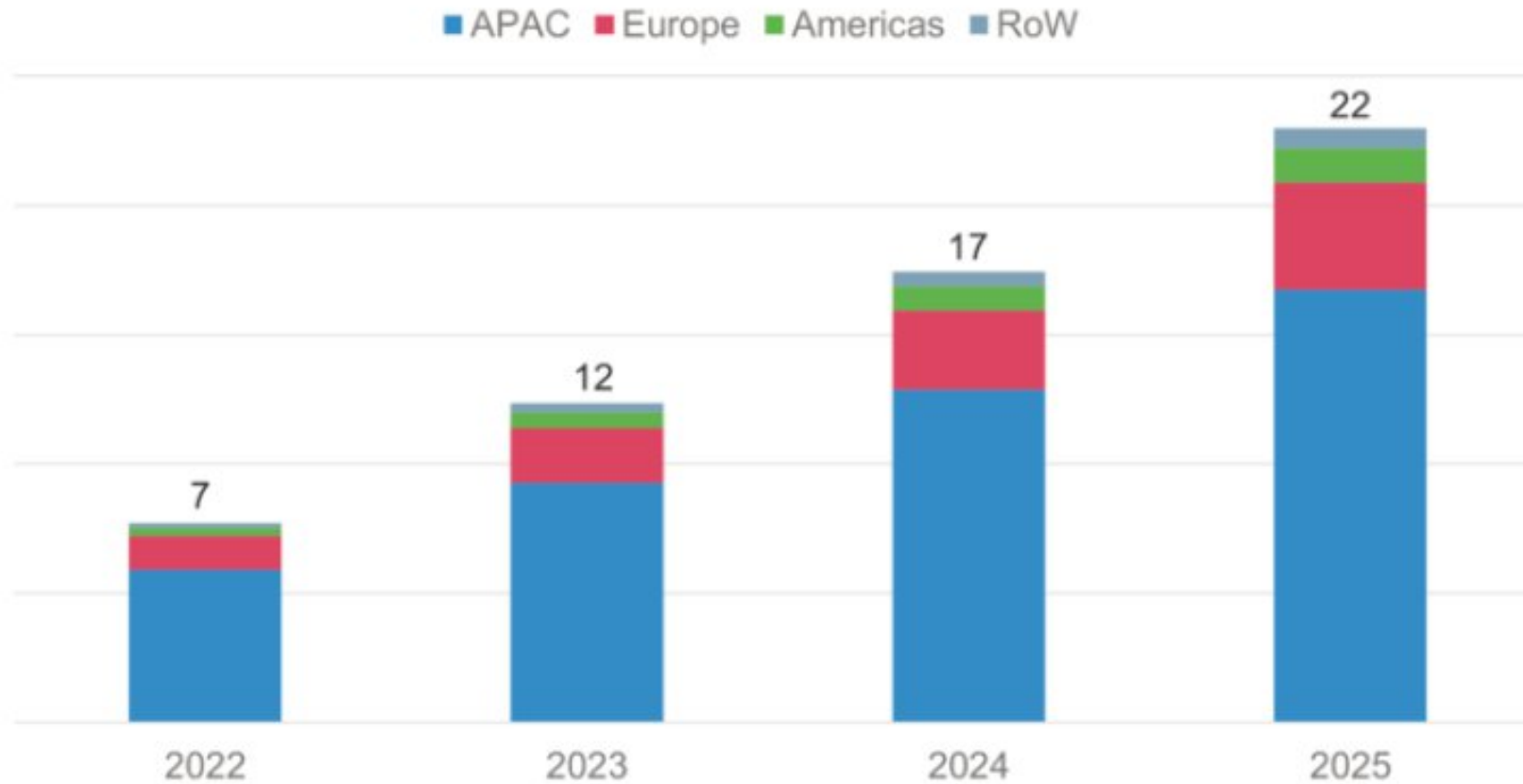


- 1** all-optical private network
- 1** 50m optical/electrical hybrid cable
- 1** .2G Wi-Fi6 reachable rate makes an ultimate experience
- 2** 2-tier PtMP minimalist architecture
- 2** 20+ years life of optical fiber
- 3** 300 users online
- 4** 4-stage series connection, max. 32\*AP
- 5** 5 in 1, built-in AC+PoF
- 5** 5Mbps @ 64 ends with guaranteed bandwidth
- +** Ultimate Experience
- X** Exclusive butler: Government & Enterprise View / Intranet Visibility
- Exclusive roaming: switching delay 100ms
- Proprietary antennas: smart antennas, beamforming

Enterprise FTTR fiber network achieves the seamless experience of true gigabit, multi connection, and full coverage.

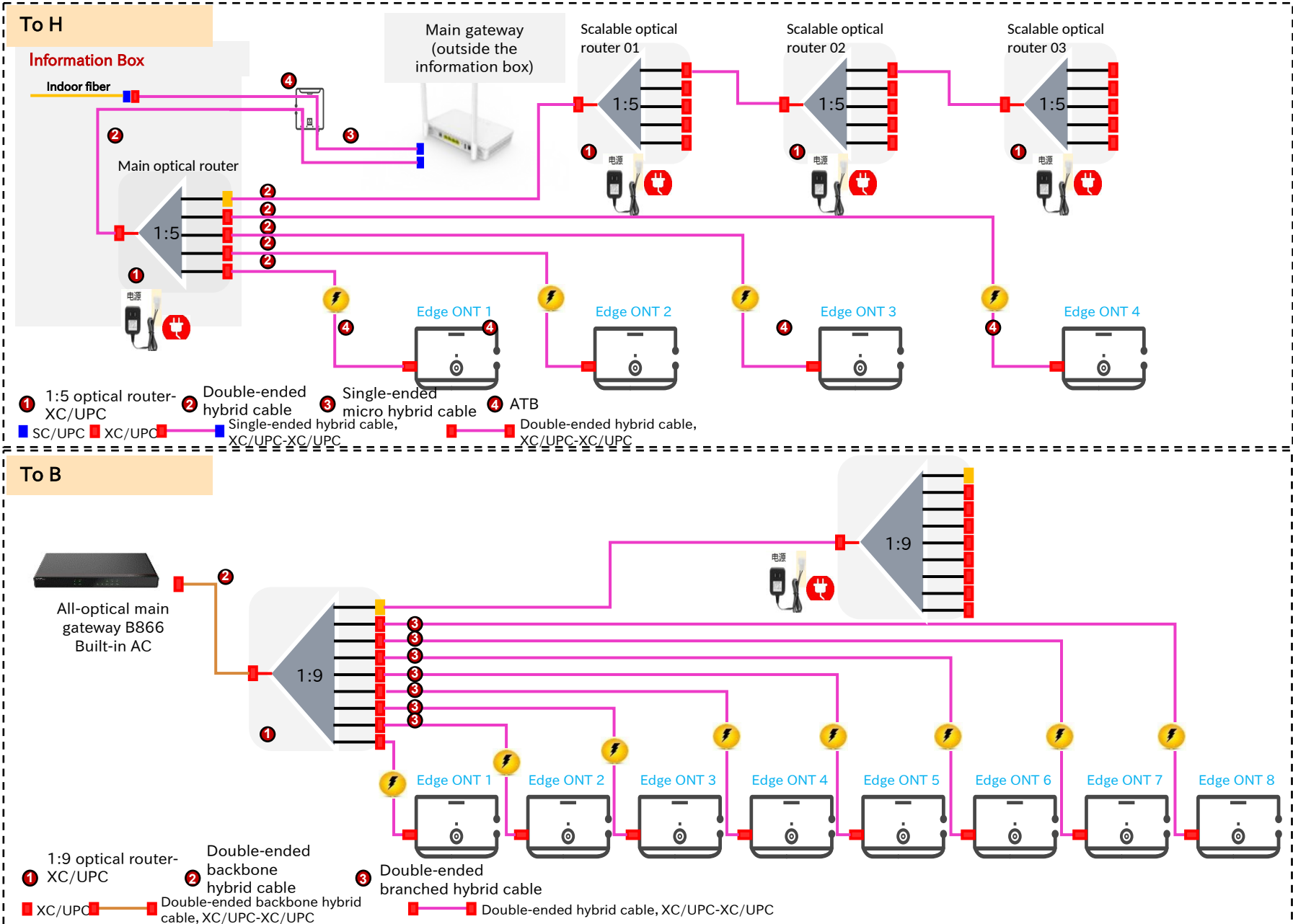
## 2.3 The Global Development Assessment of FTTR

### WORLDWIDE FTTR HOUSEHOLDS' DEPLOYMENTS (MILLIONS)



FTTR fiber networks are developing rapidly worldwide, with mature technology and broad application prospects.

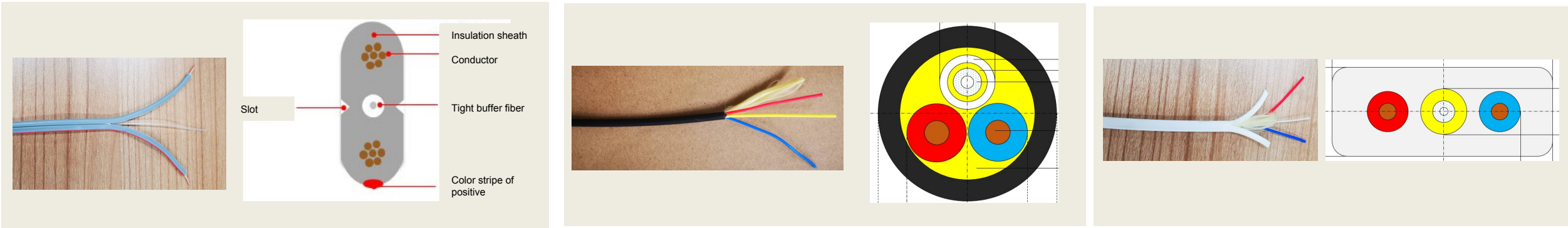
# 3. FTTR@2H&2B FTTR Structured Cabling solution



- Indoor unequal networking**
  - Up to 16 APs
  - Single-core tandem networking, avoiding duplicate cabling and reducing construction difficulties.
  - Good scalability: each splitter supports 8 APs, 1:9 expandable splitter, maximum 32 APs
- Power supply splitter + hybrid cable + edge ONT, build the whole network stickiness**
  - Adopt micro hybrid cable and own interface, remove the optical fiber, local free power extraction, build the whole network stickiness, support pre-installation in front installation market
  - Eliminate ATB node products to enhance the overall competitiveness
- Easy to pass through pipe, no fusion**
  - Smallest photoelectric connector in the industry. Innovative process and design reduces the size of the small micro-connector by 50%, allowing for easy traction and fusion-free construction
  - Low friction, with a coefficient of 0.25 for optical cables, helping to improve passing pipe performance
- Scalable and widely available, while ONT not require independent power connection**
  - Using the main gateway for remote power supply, the panel ONT does not require independent external power connection, greatly enhancing customer perception and satisfaction
- The indoor cabling distance exceeds the 100m distance limit and can support up to km level.**

# 4 Typical products used in FTTR

## 4.1 FTTR Structured Cabling Core Component I: Optical/Electrical Hybrid Cable



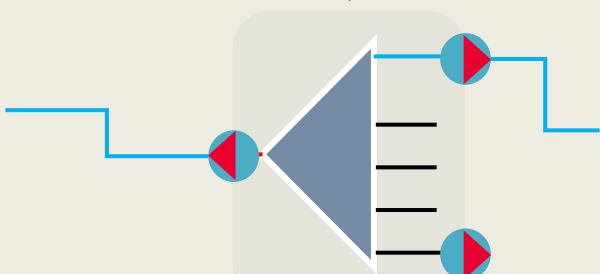
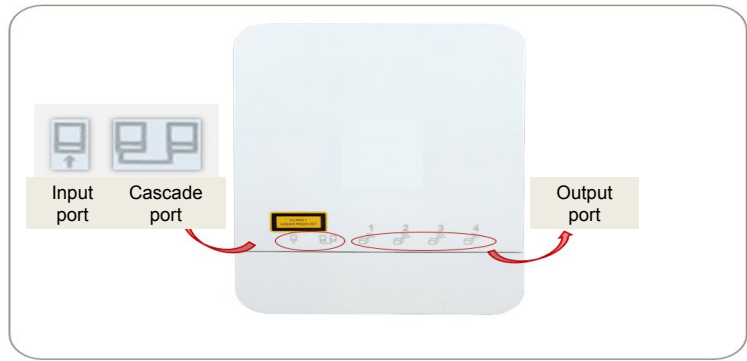
### Characteristics:

- Optical and electrical integration, providing both data transmission and remote power supply to the equipment
- Network side can be connected to Hybrid SC pigtail cable
- User side can be connected to SC/UPC connectors and wires with RJ45
- Small outer diameter, light weight and minimum space occupied
- Excellent bending performance, good flexibility, and easy construction
- **Standardization Progress:**
- The draft version of ITU-T SG15/Q5 has been released, and the final version was released in August 2022.
- IEC 62807-2 has been incorporated into SC46B, and the first draft was released in 2022.

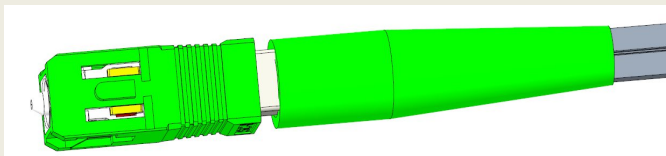
|                                      |                 |                                      |
|--------------------------------------|-----------------|--------------------------------------|
| <b>Optica fiber</b>                  | Number of fiber | 1 core                               |
|                                      | Type of fiber   | G.657A2                              |
| <b>Tight buffer</b>                  | OD (unit:mm)    | 0.9±0.05                             |
| <b>Conductor</b>                     | Material        | copper                               |
|                                      | Quantity        | 2                                    |
| <b>Insulation sheath</b>             | Material        | LSZH (Friction coefficient≤ 0.25)    |
|                                      | Color           | Pantone 430U grey or black           |
| <b>Color stripe of positive</b>      | Color           | Red                                  |
| <b>Cable Size (H x L, unit: mm)</b>  |                 | 2.2x 5.3; Φ4.3; 4.2 x 1.8            |
| <b>Cable Weight (unit: kg/km)</b>    |                 | approx 28                            |
| <b>Cable length (Unit: m)</b>        |                 | 1km/drum                             |
| <b>Max. transmission power</b>       |                 | 90W                                  |
| <b>Max. transmission voltage</b>     |                 | 60V                                  |
| <b>Max. transmission performance</b> |                 | POE:800m<br>POE+:400m<br>POE++: 200m |



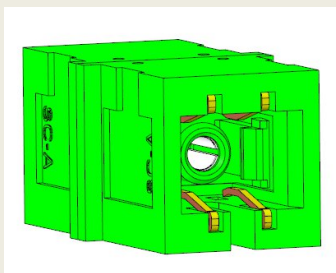
## 4.2 FTTR Structured Cabling Core Component II: Splitter & Connector



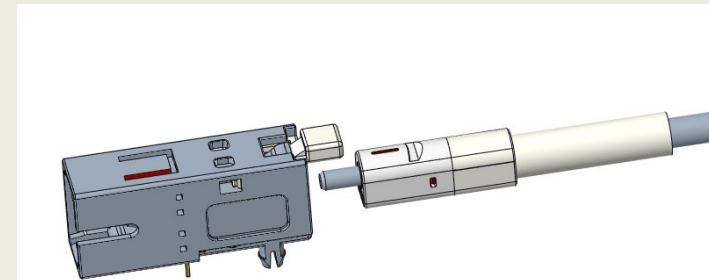
Optical splitter



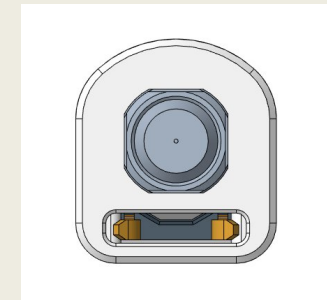
SC-type optical/electrical connector



SC-type adapter



Miniature Optical/electrical Connectors & Adapters (XC -type)



Cross-section of optical/electrical connector

Input-cascade end insertion loss

$\leq 2\text{dB}$

Input-Loss of insertion at the entry end

$\leq 16\text{dB}$

Typical insertion loss

$\leq 0.3\text{dB}$

Characteristics

Compatible with conventional SC adapters, low resistance

Typical insertion loss

$\leq 0.5\text{dB}$

Characteristics

Push to unlock, pipeable, extra short XC connector

**Standardization Progress:**

**Splitter:** Meet IEC61753-031

**Connector:** In March 2024, the project was successfully initiated in SC48B/WG3.

# 4.3 FTTR Structured Cabling Core Component III: Invisible optical cable jumper

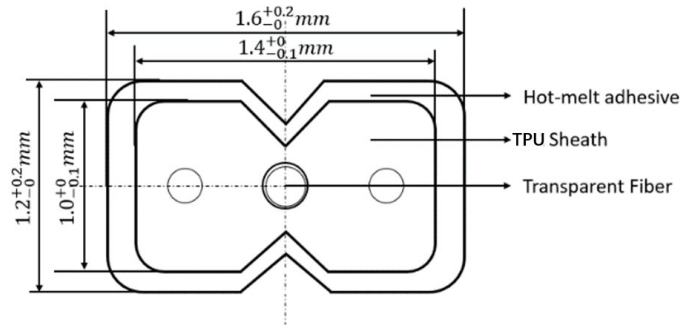


Using conventional connectors, strong compatibility, and small outer diameters.

The G.657B3 with excellent bending resistance performance.

The outer sheath uses TPU transparent material to achieve the best stealth effect.

After hot melting, it can self-adhesive, making construction convenient.



## 5. FTTR construction guide

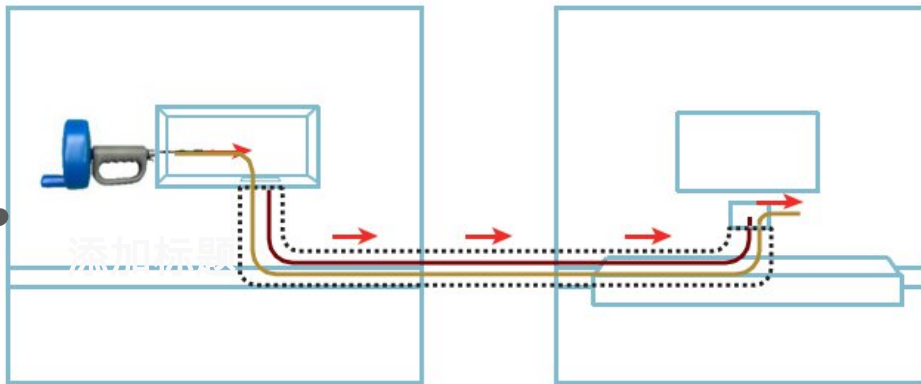
### 5.1 Hidden-line construction upgrade

wall drop cable



This method is frequently used in upgrade and renovation projects. When transitioning from traditional Ethernet or telephone cables to hybrid fiber optic cables or optical cables. In this process, the cables that need to be replaced are temporarily fixed to the existing cables using tape or similar tools. Once the original cables are pulled out, the new cables are simultaneously guided into the conduit to complete the transition.

Using old cables to pull and install



Threading a spring conduit snake into the conduit, followed by securely wrapping the hybrid cable around the snake. Then, the cable is guided into the conduit, extending it to the other end, thus completing the cabling process.

Installation of bullet head spring piercing device

## 5. FTTR construction guide

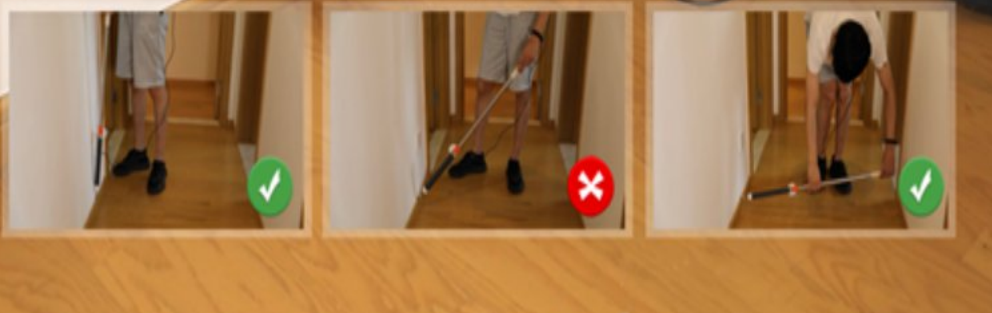
### 5.2 Open-line construction wiring

Open-line



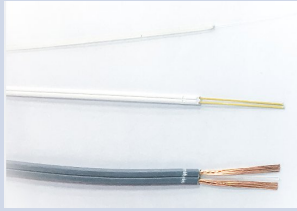
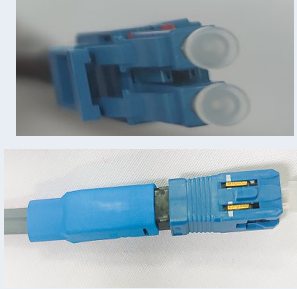

Construction of self-adhesive invisible drop cable

The self-adhesive invisible drop cable construction is convenient and fast, with minimal impact on the original decoration and layout. This makes it the best recommended solution for visible cabling.

Skirting line



## 6. Research on Key Products and Materials in FTTR

| Product classification     | Product picture   | Product specifications                 | Product features  | SDGI independent production status |
|----------------------------|---|--|---|------------------------------------|
| Splitter                   |    | Proportional splitter                  | The required number of beam splitting points is relatively small, and the beam splitting is consistent          | Y                                  |
|                            |   | Unequal ratio splitter                 | Used for cascading to meet different spectral requirements  | Y                                  |
|                            |   | Optical splitter                       | Provide optical signals for grid splitting light  | Y                                  |
|                            |   | Optical/electrical splitter            | Provide optical signals and power inputs for sub gateways   | Under development                  |
| Fiber                      |    | G.657.A2                               | Bending radius less than 7.5mm  | Y                                  |
|                            |   | G.657.B3                               | Bending radius less than 5mm  | Third party                        |
| Cable                      |    | Butterfly cable                        | Introduced for household use, with ultra-fine and high-strength performance                                     | Y                                  |
|                            |   | Invisible cable                        | Indoor use, with transparent invisibility and built-in hot melt adhesive function                               | Y                                  |
|                            |   | Optical/electrical hybrid cable        | A hybrid cable integrating optical fiber and transmission copper wire   | Y                                  |
| Connector                  |   | Ordinary connector                     | Mainly SC, FC, LC types   | Y                                  |
|                            |   | Micro connector                        | Using small specially designed connectors XC type, it can support the demand characteristics of threading pipes | Y                                  |
|                            |   | On site terminal connector             | Convenient construction of concealed pipes and control of excess length of optical cables                       | Y                                  |
|                            |   | Optical/electrical connector           | Integrated optical/electrical interface   | Y                                  |
| Routing all-in-one machine |  | Optical/electrical connector interface | Power is taken from the upper level photoelectric splitter through a photoelectric composite cable              | Third party                        |
|                            |   | Optical connector interface            | Connect the power cord and power it separately  | Third party                        |





Thank you for listening