



## **Fifth Generation Fixed Network (F5G); Technical Requirements for FTTR Network Deployment**

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# Foreword

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# Introduction

Fiber to the Room (FTTR) technology provides home users with a stable and high-speed network experience by directly laying optical fibers to every room in a building or home, and by efficiently coordinating optical and Wi-Fi® technologies. However, during the large-scale deployment of FTTR, the complexity and the difficulty in troubleshooting network faults often make it challenging to achieve the expected quality standards for FTTR network deployment. As a result, users do not fully enjoy the convenience brought by high-quality FTTR networks in real-world scenarios. They often face issues such as incomplete network coverage, substandard network speeds, severe network interference, high latency, and insufficient operations and maintenance capabilities, which significantly affect user experience. To significantly improve user experience and build truly high-quality FTTR networks, it is particularly necessary to establish standards for the deployment quality of FTTR networks.

# 1 Scope

The present document specifies the deployment requirements for building high-quality FTTR networks, covering various aspects including FTTR network coverage requirements, network connection requirements, network performance requirements, service experience requirements and network operations and maintenance requirements.

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] [Recommendation ITU-T G.9940](#): "High speed fibre-based in-premises transceivers - system architecture".
  - [2] [ETSI TS 103 933 \(V1.1.1\)](#): "Access, Terminals, Transmission and Multiplexing (ATTM); Fibre deployment for fibre-based in-premises networking".
  - [3] [Recommendation ITU-T G.9941](#): "High speed fibre-based in-premises transceivers - physical layer specification".
  - [4] [IEEE Std 802.11™-2024](#): "IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks--Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".
- NOTE: This standard incorporates previous amendments including IEEE Std 802.11ac™-2013, IEEE Std 802.11ax™-2021, IEEE Std 802.11k™-2008, IEEE Std 802.11v™-2011, and IEEE Std 802.11r™-2008. The consolidated standard IEEE 802.11™-2024 is the preferred reference.
- [5] Wi-Fi® Alliance: "[Wi-Fi EasyMesh® Specification](#)".
  - [6] [IEEE Std 802.1Q™-2022](#): "IEEE Standard for Local and Metropolitan Area Networks--Bridges and Bridged Networks".
  - [7] [Recommendation ITU-T G.9949](#): "Wireless local area network management control interface (WMCI) for in-premises networks".
  - [8] [BBF TR-069](#): "CPE WAN Management Protocol".
  - [9] [IETF RFC 2681](#): "A Round-trip Delay Metric for IPPM". G. Almes, S. Kalidindi, M. Zekauskas. September 1999.
  - [10] [IETF RFC 3393](#): "IP Packet Delay Variation Metric for IP Performance Metrics (IPPM)". C. Demichelis, P. Chimento. November 2002.

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Not applicable.

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## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the following terms apply:

**installation and maintenance APP:** application used by professional installation and maintenance personnel for FTTR network deployment, commissioning, testing and acceptance

**primary splitting point:** first splitter in the FTTR ODN network located the MFU that splits the optical signal from upper-level network (PON/OLT) to secondary splitter or directly connecting to a limited number (2 - 8 SFUs) of remote terminals.

**secondary splitting point:** subsequent splitter following after the Primary Splitting Point

NOTE: The secondary splitting point distributes the optical signal to terminals or rooms within a smaller scope.

**service serve:** remote server providing the service the user is accessing

NOTE: Examples of services include web browsing, gaming, video streaming, cloud applications.

**user APP:** application used by FTTR subscribers for self-service management of their home network

NOTE: Typical functions include network status viewing, basic Wi-Fi® configuration, one-click fault diagnosis.

### 3.2 Symbols

Void.

### 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

|      |                                                  |
|------|--------------------------------------------------|
| 5G   | 5 <sup>th</sup> Generation, 5GHz Wi-Fi® band     |
| ACK  | Acknowledgment                                   |
| AP   | Access Point                                     |
| APP  | Application                                      |
| ATTM | Access, Terminals, Transmission and Multiplexing |
| BSS  | Basic Service Set                                |
| CPU  | Central Processing Unit                          |
| DFS  | Dynamic Frequency Selection                      |
| DHCP | Dynamic Host Configuration Protocol              |
| DNS  | Domain Name System                               |
| DSCP | Differentiated Services Code Point               |
| E2E  | End-to-End                                       |

|       |                                                   |
|-------|---------------------------------------------------|
| FQDN  | Fully Qualified Domain Name                       |
| FTTH  | Fibre-To-The-Home                                 |
| FTTR  | Fibre-To-The-Room                                 |
| GE    | Gigabit Ethernet                                  |
| GO-GC | Group Owner - Group Client                        |
| GPON  | Gigabit-capable Passive Optical Network           |
| HD    | High Definition                                   |
| ID    | Identifier                                        |
| IEEE  | Institute of Electrical and Electronics Engineers |
| IFDN  | In-premises Fibre Distribution Network            |
| IoT   | Internet of Things                                |
| IP    | Internet Protocol                                 |
| IPDV  | IP Packet Delay Variation                         |
| IPTV  | Internal Protocol TeleVision                      |
| LAN   | Local Area Network                                |
| MAC   | Media Access Control                              |
| MFU   | Main FTTR Unit                                    |
| O&M   | Operations and Maintenance                        |
| ODN   | Optical Distribution Network                      |
| OLT   | Optical Line Termination                          |
| P2MP  | Point to Multipoint                               |
| PAD   | Personal Access Device                            |
| PC    | Personal Computer                                 |
| PCP   | Priority Code Point                               |
| PON   | Passive Optical Network                           |
| QoS   | Quality of Service                                |
| RSSI  | Received Signal Strength Indication               |
| RTT   | Round-Trip Time                                   |
| SFU   | Sub FTTR Unit                                     |
| SME   | Small and Medium Enterprise                       |
| SN    | Serial Number                                     |
| SNR   | Signal-to-Noise Ration                            |
| SSID  | Service Set IDentification                        |
| STA   | Station                                           |
| STB   | Set Top Box                                       |
| TR    | Technical Report                                  |
| VLAN  | Virtual Local Area Network                        |
| VoIP  | Voice over Internet Protocol                      |
| VR    | Virtual Reality                                   |
| WAN   | Wide Area Network                                 |
| WLAN  | Wireless Local Area Network                       |
| WMCI  | WLAN Management Control Interface                 |

## 4 Overview of FTTR Network Deployment Quality

### 4.1 FTTR Network Deployment Architecture

Based on the G.fin reference model defined in Recommendation ITU-T G.9940 [1], and adapted according to the actual deployment scenario. The FTTR network deployment architecture is achieved through the MFU, SFU, the indoor fibre distribution network, the FTTR management system, the Installation and Maintenance APP, and the User APP. The specific architecture is shown in Figure 1.

NOTE: APP denotes applications installed on off-the-shelf mobile terminals or computers.

FTTR extends fiber optics into every room within the home connected on Fibre-To-The-Home (FTTH), achieving full fiber coverage of the internal home network. The MFU connects upstream to the PON port of the central office OLT equipment and connects downstream to multiple SFU via optical splitters or optical-electrical composite cables. The SFU extend to the user's required deployment areas based on the internal structure, providing wired and wireless coverage for each area, achieving whole-home network coverage. User terminals access the network via Wi-Fi® or Ethernet to meet internet access needs.

The FTTR management system supports one-stop network management services for the FTTR network, enabling visibility, manageability, and maintainability by collecting information such as MFU/SFU operational status, user network configuration information, and network operational status. It supports FTTR network operational status viewing, network quality monitoring, and network fault diagnosis capabilities.

The Installation and Maintenance APP supports FTTR service information display, network configuration parameter distribution, network deployment quality acceptance, and network fault diagnosis capabilities, assisting installation and maintenance personnel in efficient, standardized deployment, testing, and acceptance.

The User APP supports user network status viewing, network function configuration, and network fault diagnosis functions, enabling FTTR users to perform self-service management and maintenance.

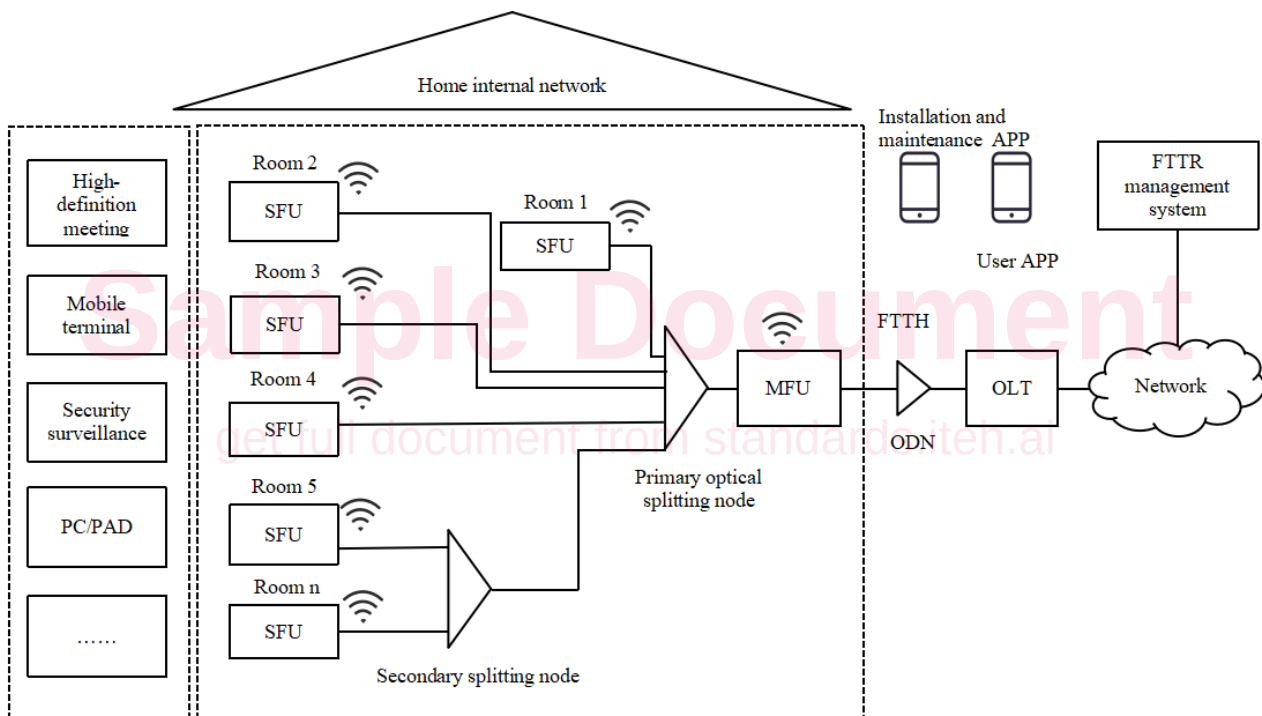


Figure 1: FTTR Network Deployment Architecture

## 4.2 Architecture of the Evaluation Indicator System

The FTTR networks deployment quality evaluation indicator system consists of five indicator classes: network coverage, network connection, network performance, service experience, and network operations and maintenance. The specific architecture is shown in Figure 2.

- a) **Network Coverage:** The network coverage indicators focus on the core dimensions of coverage completeness (such as the proportion of effective coverage throughout the house) and signal quality (such as the Wi-Fi® reception level in each area), aiming for a coverage goal of "no blind spots and strong signals". Ultimately, this ensures that FTTR users enjoy a seamless connection experience of "full-house gigabit" without any interruptions.
- b) **Network Connection:** Network connection indicators include network access methods, networking modes, FTTR devices coordination, and network configuration, ensuring the FTTR network has stable basic access capabilities, efficient topology coordination mechanisms, and standardized parameter configuration levels, supporting whole-home quality coverage and reliable service carrying.