

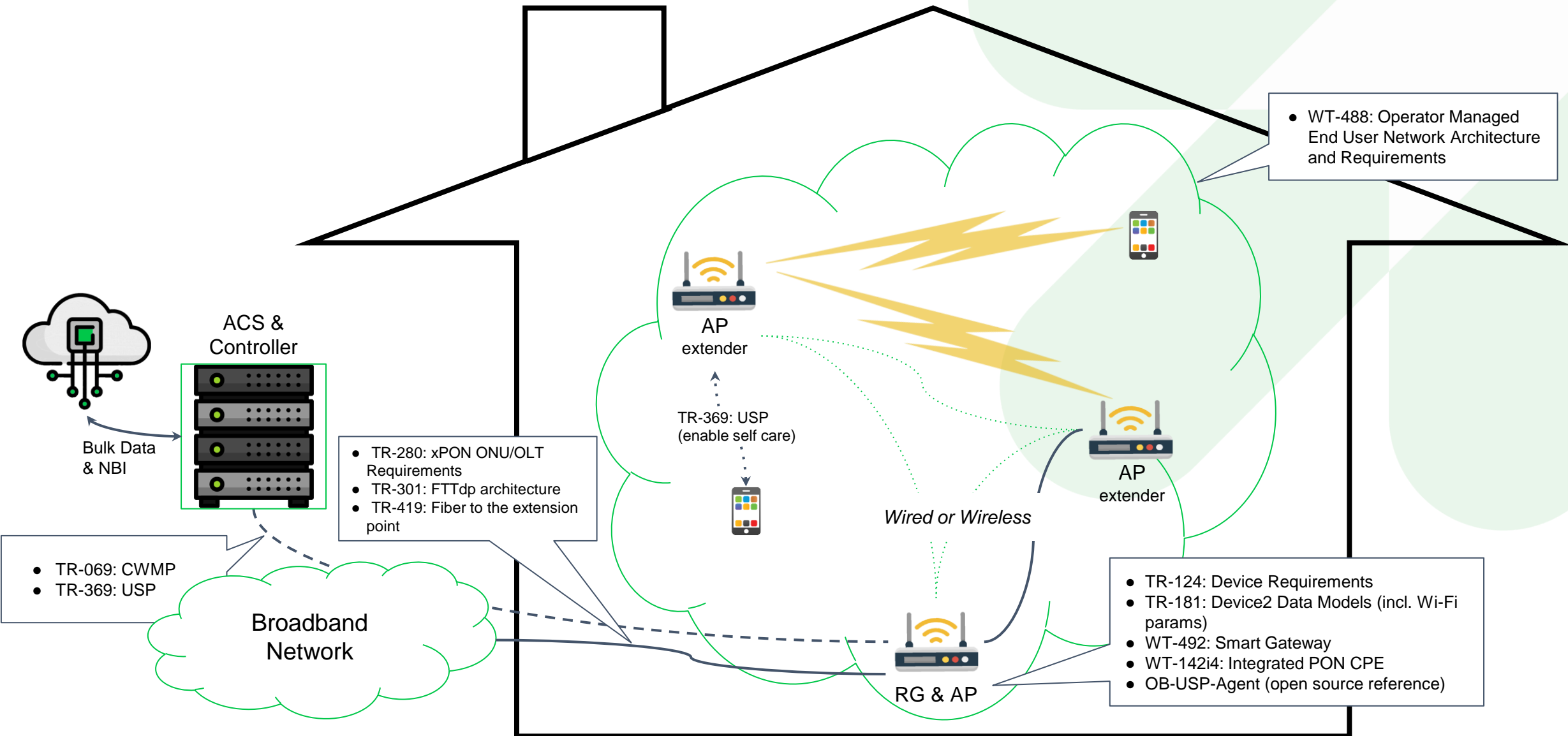
Joint Workshop on FTTR

June 28, 2022

Architecture and Management of the Subscriber Network

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Operator Managed End User Network Specifications



What is WT-488 about?

- WT-488 defines Operator Managed End User Network Architecture and Requirements
- Managed Infrastructure Network (MIN) in WT-488 comprises of a combination of wireless (Wi-Fi, Li-Fi) and wireline (current: Ethernet/MoCA/G.hn) and (future: fiber) backhaul technologies and primarily wireless fronthaul links for connecting End Users to the BB/NB services.
- WT-488 provides guidelines for service providers/network operators on how to implement MIN and help equipment manufacturers/system integrators understand the requirements for MIN and the End User devices(EUD and EUCD).
- It examines typical Use Cases and Services in the MIN and defines the management reference architecture and operation requirements, as well as the End User devices requirements specific to the MIN (RGW, Wi-Fi mesh controller)

WT-488 Use Cases

1. **Direct connectivity to RGW:** Best-effort type of connectivity to end user devices (EUD)

This is the typical basic wireless connectivity for nomadic devices to the RGW or retail IoT gateway. Fixed EUD devices may be connected to the RGW through an Ethernet cable or powerline/MoCA adapters.

2. **Improved connectivity to RGW:** Best-effort-and-patches type of connectivity to end user devices (EUD) using wired or wireless Wi-Fi Repeater/Extender devices

This use case amends the direct connectivity use case in case of a limited Wi-Fi network coverage and performance. In this case, users are typically reaching for retail or service provider Repeater/Extender devices, usually Wi-Fi but often powerline.

3. **Mesh Network - Class 1:** Improved wireless connectivity (coverage and performance) to end user devices (EUD) by using Mesh Wi-Fi network without leveraging the existing in-home communication infrastructure

Mesh Wi-Fi network is composed primarily of wireless links between a primary access point (often integrated in the RGW) and multiple multi-band networking devices (secondary or extender access points/nodes) that create a seamless and reliable Wi-Fi connection throughout the entire home. This retail approach is most beneficial for minimizing customer installation costs being that it is easy to install and extend.

WT-488 Use Cases (cntd.)

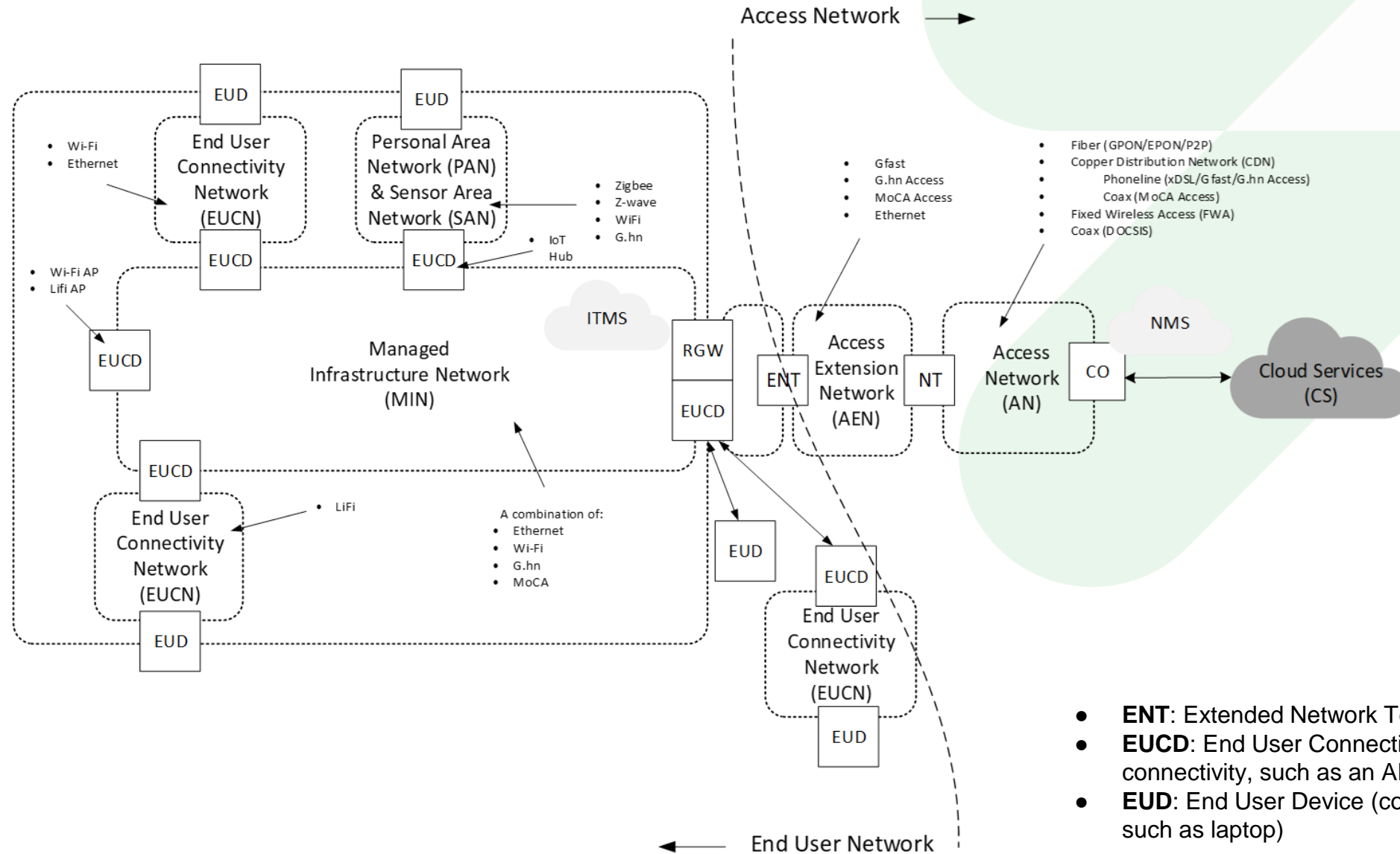
- 4. Mesh Network - Class 2:** Advanced wireless connectivity (coverage and performance) to end user devices (EUD) by using Mesh Wi-Fi network and leveraging the existing in-home communication infrastructure

Mesh Wi-Fi network is composed of wired and wireless links between a primary access point (often integrated in the RGW) and multiple multi-band networking devices (secondary or extender access points/nodes) that creates performance optimized and reliable Wi-Fi connection throughout the entire home.

- 5. Mesh Network - Class 3:** Assured wireless connectivity (coverage and performance) to end user devices (EUD) by using Mesh Wi-Fi network and building new in-home communication infrastructure

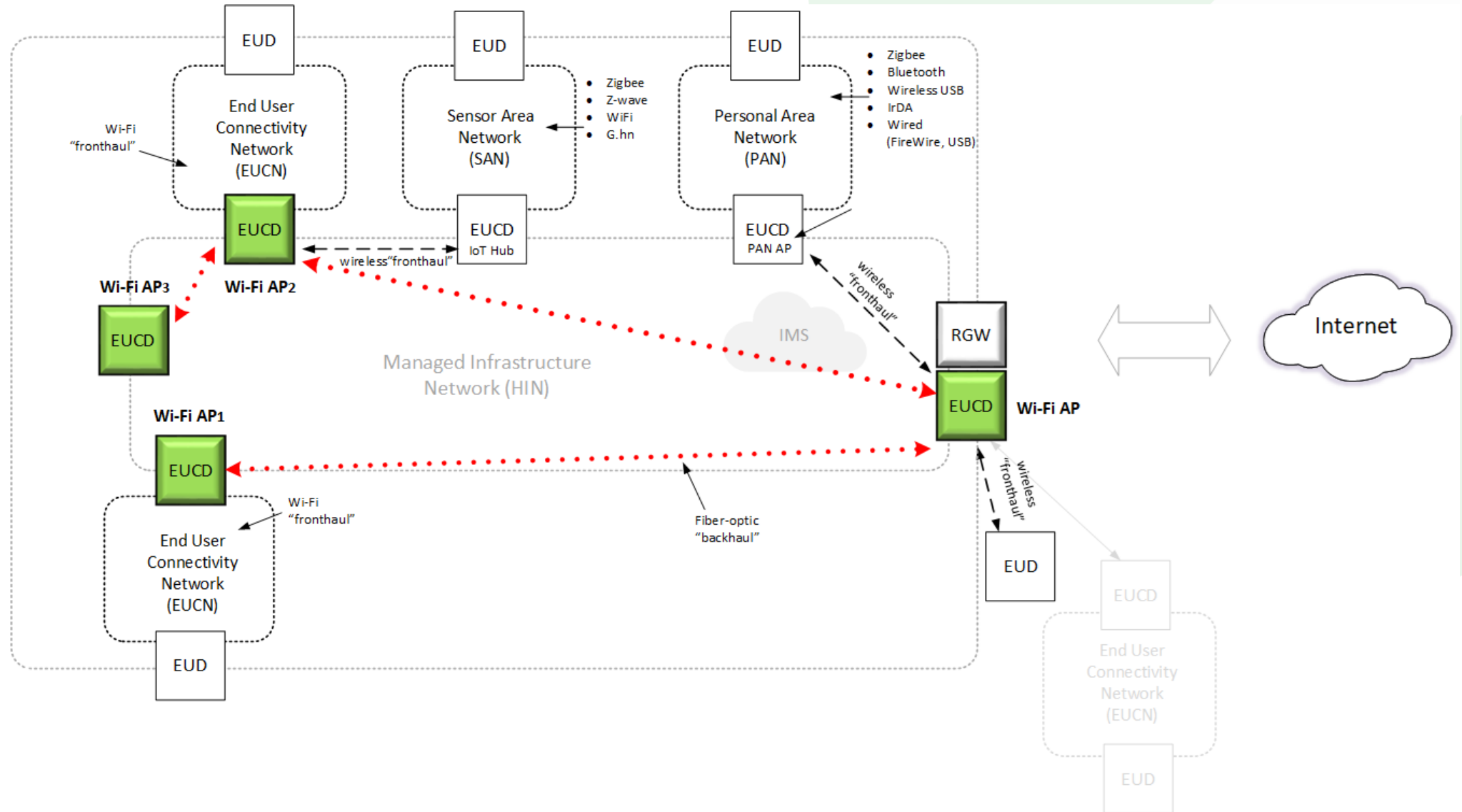
This approach is commonly used by service providers in greenfield deployments. The Wi-Fi mesh network radio spectrum resources are optimally shared between the “backhaul” (wired and wireless) links and “fronthaul” (primarily wireless) links, in that different technology options for connecting multiple access points are available. For example, Cat6 Ethernet, fiber-to-the room (FTTR), fiber-to-the-premises (FTTP) or other multi-gigabit solutions not currently existing in premises.

Operator Managed End User Network Reference Architecture

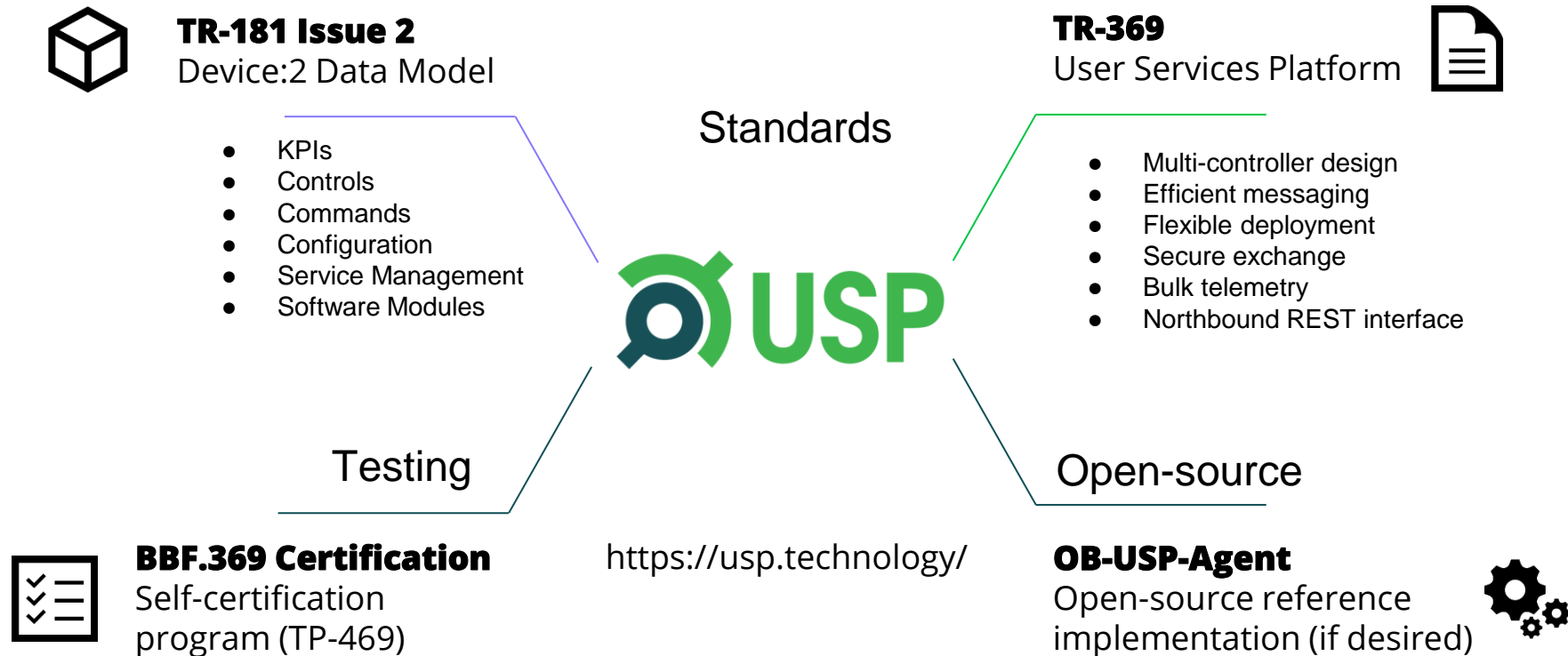


- **ENT:** Extended Network Terminal
- **EUCD:** End User Connectivity Device (provides connectivity, such as an AP)
- **EUD:** End User Device (consumes connectivity, such as laptop)

Mapping Use Case “Mesh Network – Class 3” to Reference Architecture



What makes up the User Services Platform?



Complemented by:



Wi-Fi Data Elements Certification

QuickTrack certification method

<https://www.wi-fi.org/discover-wi-fi/Wi-Fi-Data-Elements>

USP key features

- Multi-controller architecture to let many applications control the same devices from different roles
- Standardized data model (TR-181)
- Secure end-to-end communication
- Flexible deployment
- Restful Controller Northbound Interface (NBI) to work with native Cloud solutions

What is a data model?

- Standardized description of software and hardware capabilities that can be addressed by USP messages
- Objects, parameters, commands, events that describe things like network interfaces, hosts, services, firmware, software modules, sensors, controls, and more
- Developed with industry collaboration, **most notably Wi-Fi Alliance Data Elements** for standardization of Wi-Fi optimization and management and 5G data model for FMC
- <https://usp-data-models.broadband-forum.org/>

Data Model Collaboration

- BBF has a positive history of incorporating information model data into TR-181 Device Data Model in an open and transparent manner.
- We work through joint members and liaisons to adopt MIB data and allow management and control via CWMP or USP.
- BBF often seeks feedback and clarifications on data types, data validation restrictions, special commands, oevents, etc.
- See work on PON, DSL, Wi-Fi, and other interfaces

Additional BBF standards

- TR-124 - Functional Requirements for Broadband Residential Gateway Devices
 - Resource for operators to create checklist of design requirements and expectations for developers
- WT-492 - Software Based Architecture [Smart] Gateway Design Principles
 - Focused on outlining the use cases and architectural guidelines for containerized services operating on CPE

Industry collaboration

- As mentioned, WFA and Data Elements
- Working with groups like prpl Foundation on microservice enablement (High Level API) via USP & expansion of software module management capabilities (look for USP 1.3 and TR-181 Device:2.16)
- 3GPP collaboration on data model and requirements for 5G wireline/wireless convergence (data model TR-181 & requirements in TR-124)
- Backhaul technologies (ITU-T, HGF, MoCA)

Where can we sync?

1

Data model development for FTTR use cases, including defining new interfaces, statistics, and controls

2

Incorporating FTTR into the overall end-user network management architectures and requirements

3

Requirements on multi-vendor interoperability between EUCDs (i.e. “OLT” and “ONU” within FTTR)

Upcoming Meetings and Where To Next

- BBF Meetings

- See https://www.broadband-forum.org/category_meetings_and_events/upcoming-meetings
- Q2 2022 Meeting, June 13-17, 2022
 - post-Q2 2022 interim meetings (teleconferences)
- Q3 2021 Meeting, September 13-16, 2022
 - post-Q3 2022 interim meetings (teleconferences)
- Q4 2022 Meeting, December 5-8, 2022
 - post-Q3 2022 interim meetings (teleconferences)

