

IEEE Standard for Packet-based Fronthaul Transport Network

IEEE Communications Society

Developed by the
Mobile Communication Networks Standards Committee

IEEE Std. 1914.1™-2019

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Developed by the

Mobile Communication Networks Standards Committee
of the
IEEE Communications Society

Approved 7 November 2019

IEEE SA Standards Board

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Abstract: The architecture and requirements for next generation fronthaul networks are specified in this standard. NGFI-I is defined as the next generation fronthaul network with low layer splits in a baseband station. NGFI-II is defined as the next generation fronthaul network with high layer splits in a baseband station. The requirements of fronthaul transport nodes in these networks are also specified.

Keywords: central unit, CU, distributed unit, DU, fronthaul transport node, FTN, IEEE 1914.1™, Next Generation Fronthaul Interface, NGFI, NGFI networks, NGFI-I, NGFI-II, radio unit, RU

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Introduction

This introduction is not part of IEEE Std 1914.1-2019, IEEE Standard for Packet-based Fronthaul Transport Networks.

This standard specifies the architecture and requirements for the next generation packet-based fronthaul networks. It is an integral part of the IEEE 1914™ family of standards, which facilitates the implementation of key technologies for next generation (5G) cellular services, from a transport networking perspective.

The transport networking solution for these cellular services is expected to provide, at least, the following:

- High link capacity
- High link efficiency
- Load balancing for pooled resources (Cloud-RAN)
- Latency guarantees
- Phase alignment of radio data
- Flexible mapping (e.g., different functional splits of radio data) of radio traffic for transport between radio units, aggregation points, and/or centralized baseband unit pools

Today's transport networking solutions cannot satisfy all of these expectations. On the other hand, packet-based technologies (e.g., Ethernet) have experienced steady and cost-efficient speed and capacity growth, driven by the enterprise, access, and data-center markets, and have inherent characteristics that allow it to satisfy the other expectations.

IEEE Std 1914.1™-2019 specifies details that allow packet-based fronthaul transport networks to be a flexible and efficient solution for the transport of 5G cellular services.

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Files are available in 1914.1-2019_downloads.zip in the IEEE 1914.1-2019 directory located at: <https://standards.ieee.org/downloads>.

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IEEE Standard for Packet-based Fronthaul Transport Networks

1. Overview

1.1 Scope

This standard specifies the following:

- Architecture for the transport of mobile fronthaul traffic over packet-based networks (e.g., Ethernet), including user data traffic, and management and control plane traffic
- Requirements and definitions for the fronthaul networks, including data rates, timing and synchronization, and quality of service (QoS)

The standard also analyzes functional partitioning schemes between remote radio units (RRUs) and baseband units (BBUs) that improve fronthaul link efficiency and interoperability among transport equipment, and that facilitate the realization of cooperative radio functions, such as massive multiple input multiple output (MIMO) operational modes, coordinated multi-point (CoMP) transmission, and reception.

1.2 Purpose

The fronthaul packet transport standard supports enabling the implementation of critical 5G technologies, such as massive MIMO, beamforming, carrier aggregation, CoMP, and scalable centralized/virtualized radio access network (C-RAN/V-RAN) functions.

This standard simplifies network design and operation, increases network flexibility and efficiency in resource utilization, and lowers cost by leveraging existing, mature packet-based solutions (e.g., Ethernet) for vital functions, such as QoS, synchronization, and data security.

The fronthaul architecture provides unified management and control solutions, common networking protocols, and universal network elements, thus facilitating migration to future C-RAN/V-RAN mobile networks.

This standard improves bandwidth efficiency, network scalability, timing, and synchronization performance; and preserves and enhances the ability to deploy cooperative radio functions.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is