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IEEE Standard for Packet-based Fronthaul Transport Network

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IEEE Standard for Packet-based Fronthaul Transport Networks

Developed by the

Mobile Communication Networks Standards Committee
of the
IEEE Communications Society

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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 has 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.

IEEE Standards downloads and executable files

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

Contents

1. Overview 14
   1.1 Scope 14
   1.2 Purpose 14

2. Normative references 14

3. Definitions, acronyms, and abbreviations 15
   3.1 Definitions 15
   3.2 Acronyms and abbreviations 16

4. NGFI networks architecture and use cases 19
   4.1 Introduction 19
   4.2 Reference architecture 19
   4.3 NGFI use cases 20

5. NGFI deployment models 23
   5.1 NGFI general deployment 23
   5.2 Single split 24
   5.3 Double split 25
   5.4 Network slicing 26
   5.5 NGFI OAM 28

6. NGFI network requirements 30
   6.1 Overall 30
   6.2 NGFI CoS 30
   6.3 Latency measurement 32
   6.4 Network slicing 33
   6.5 Throughput and scalability 33
   6.6 Synchronization 34
   6.7 Transfer time 40
   6.8 Availability 40
   6.9 Converged transport network 40
   6.10 Configuration management 41
   6.11 Operation, administration, and maintenance 42
   6.12 Security 42

7. FTN Requirements 42
   7.1 Processing time 42
   7.2 Interface rate 42
   7.3 Synchronization 43
   7.4 Operational requirements 44

Annex A (normative) NGFI requirement conformance statement proforma 45

Annex B (informative) NGFI transport latency 56

Annex C (informative) NGFI deployment examples 57

Annex D (informative) Network slice-unaware and network slice-aware modes 66

Annex E (informative) Traffic profiles 69

Annex F (informative) Throughput considerations 70

Annex G (informative) Time distribution and TE for NGFI networks 72
Annex H (informative) Example NGFI TE requirements 82
Annex I (informative) Performance factors for PTP 84
Annex J (informative) Tunneling timing through different timing domains 88
Annex K (informative) Bibliography 91

List of Figures

Figure 1—NGFI network reference architecture 20
Figure 2—Illustrative massive MIMO macro base station deployment 21
Figure 3—Illustrative URLLC or cMTC base station deployment 22
Figure 4—Network slicing applications for mobility deployment 23
Figure 5—NGFI deployments and geographical implications 24
Figure 6—Single split network model: RU ↔ {DU+CU} 25
Figure 7—Single split network model: {RU+DU} ↔ CU 25
Figure 8—Double split network model 26
Figure 9—High-level view of the transport modes under network slicing 27
Figure 10—Overview of NGFI networks with multiple organizations 29
Figure 11—MA overview for NGFI with double split 29
Figure 12—NGFI Networks latency measurement points 32
Figure 13—Logically converged transport network, example of splits for different services 41
Figure C.1—NGFI deployment scenarios with single split 57
Figure C.2—NGFI deployment scenarios with double split 58
Figure C.3—Single split fronthaul (low layer) 60
Figure C.4—Single split fronthaul deployment with URLLC/cMTC 61
Figure C.5—Single split fronthaul (high layer) 62
Figure C.6—Double split fronthaul deployment 63
Figure C.7—Double split fronthaul deployment with URLLC/cMTC 65
Figure D.1—Example of comparison of two modes 66
Figure D.2—Example of "per NGFI CoS" network slice in NGFI network 67
Figure D.3—Example of "per transport user" network slice in NGFI network 68
Figure G.1—Overview of time distribution in NGFI networks 73
Figure G.2—Timing topology 1a and 1b, from common reference to co-located radios or to remote radios . 75
Figure G.3—Timing topology 2, from non-FTN T-TSC to its co-located radios 76
Figure G.4—Timing topology 3, from nearest common FTN T-BC to a cluster of radios 77
Figure G.5—Timing topology 4, from universal timing reference to all radios 79
Figure G.6—TE for single split network model [RU ↔ {DU+CU}] 80

Figure G.7—TAE for single spilt network model: {RU+DU} ↔ CU 80
Figure G.8—TAE for double split network model: RU ↔ DU ↔ CU 81
Figure J.1—Example of Ethernet time tunneling through Ethernet..... 88
Figure J.2—Example of Ethernet time tunneling through OTN 89
Figure J.3—OTN-based T-TC 90

List of Tables

Table 1—Transport requirements for the defined 3GPP RAN functional split options 19

Table 2—NGFI CoS 31

Table 3—Maximum one-way transport latency values 31

Table 4—TAE requirements at the radios 34

Table 5—NGFI availability classes 40

Table 6—FTN processing time classes 42

Table C.1—Transport connection summary with single split 58

Table C.2—Transport connection summary with double split 58

Table E.1—EMIX frame sizes 69

Table E.2—Recommended EMIX profiles for IEEE 1914.3 [B16] RoE traffic 69

Table F.1—Fronthaul dimensioning tool assumptions 70

Table F.2—Fronthaul dimensioning tool example 71

Table G.1—Time error parameters 72

Table H.1—Example TE_{ngfi} requirements 82

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