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Abstract: This TD contains draft Supplement 59 to ITU-T Y-series Recommendation ITU-T Y.3100 “IMT-2020 standardization roadmap” revised in SG13 RGM meeting, Geneva, 2-13 March 2020. The draft is proposed for agreement at SG13 Plenary on 13 March 2020.

Draft new Supplement 59 to ITU-T Y.3100 of Recommendations (formerly SupY.IMT2020std-rm)

IMT-2020 standardization roadmap

Summary

The Supplement represents the snapshot of the current status of standardization activities on IMT-2020. It is based on [the IMT-2020 standards roadmap](#), an online project maintained by the JCA-IMT2020 since its establishment.

Keywords

IMT-2020 standardization roadmap

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Introduction

The Supplement represents the collection/pointers to the standards and publications of IMT-2020, essential and instrumental for the telecommunication industry showing the full map of activities, technical domains and achievements of ITU, different regional standard development organizations, fora, consortia, and associations operating in the IMT-2020 arena.

1 Scope

This Supplement provides the standardization roadmap for IMT-2020 area in the telecommunication sector. It addresses the following subjects:

- the collection/pointers to the standards and publications of IMT-2020 deliverables in ITU-T study groups (SGs) and other standards development organisations (SDOs);
- responsible group (owner) of subject;
- status of subject;
- subject of the subject; and
- topics of subject.

2 References

[ITU-T Y.3100] ITU-T Recommendation Y.3100 Cor.1 (2018), “Terms and definitions for IMT-2020 network”

[ITU-T Y.3101] ITU-T Recommendation Y.3101 (2018), “Requirements of the IMT-2020 network”

[ITU-T Y.3102] ITU-T Recommendation Y.3102 (2018), “Framework of the IMT-2020 network”

[ITU-T Y.3104] ITU-T Recommendation Y.3104 (2018), “Architecture of the IMT-2020 network”

[ITU-T Y.3110] ITU-T Recommendation Y.3110 (2017), “IMT-2020 network management and orchestration requirements”

[ITU-T Y.3111] ITU-T Recommendation Y.3111 (2017), “IMT-2020 network management and orchestration framework”

3 Definitions

3.1 Terms defined elsewhere

This Supplement uses the following terms defined elsewhere:

3.1.1 backhaul [ITU-T Y.3100]: A network path between base station systems and a core network.

3.1.2 fixed mobile convergence [ITU-T Y.3100]: In the context of IMT-2020, the capabilities that provide services and applications to end users regardless of the fixed or mobile access technologies being used and independently of the users' location.

3.1.3 fronthaul [ITU-T Y.3100]: A network path between centralized radio controllers and remote radio units of a base station function.

3.1.4 functional architecture [ITU-T Y.4406]: A set of functional entities used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define

the distribution of functions. The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementations and between administrative domains.

3.1.5 IMT-2020 [ITU-T Y.3100]: (Based on [ITU-R M.2083-0]) Systems, system components, and related technologies that provide far more enhanced capabilities than those described in [b-ITU-R M.1645].

NOTE – [b-ITU-R M.1645] defines the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 for the radio access network.

3.1.6 management [ITU-T Y.3100]: In the context of IMT-2020, the processes aiming at fulfilment, assurance, and billing of services, network functions, and resources in both physical and virtual infrastructure including compute, storage, and network resources.

3.1.7 network function [ITU-T Y.3100]: In the context of IMT-2020, a processing function in a network.

NOTE 1 – Network functions include but are not limited to network node functionalities, e.g., session management, mobility management and transport functions, whose functional behaviour and interfaces are defined.

NOTE 2 – Network functions can be implemented on a dedicated hardware or as virtualized software functions.

NOTE 3 – Network functions are not regarded as resources, but rather any network functions can be instantiated using the resources.

3.1.8 network slice [ITU-T Y.3100]: A logical network that provides specific network capabilities and network characteristics.

NOTE 1 – Network slices enable the creation of customized networks to provide flexible solutions for different market scenarios which have diverse requirements, with respect to functionalities, performance and resource allocation.

NOTE 2 – A network slice may have the ability to expose its capabilities.

NOTE 3 – The behaviour of a network slice is realized via network slice instance(s).

3.1.9 network slice blueprint [ITU-T Y.3100]: A complete description of the structure, configuration and work flows on how to create and control a network slice instance during its life cycle.

NOTE – A network slice template can be used synonymously with a network slice blueprint.

3.1.10 network slice instance [ITU-T Y.3100]: An instance of network slice, which is created based on a network slice blueprint.

NOTE 1 – A network slice instance is composed of a set of managed run-time network functions, and physical/logical/virtual resources to run these network functions, forming a complete instantiated logical network to meet certain network characteristics required by the service instance(s).

NOTE 2 – A network slice instance may also be shared across multiple service instances provided by the network operator. A network slice instance may be composed of none, one or more sub-network slice instances which may be shared with another network slice instance.

3.1.11 network softwarization [ITU-T Y.3100]: An overall approach for designing, implementing, deploying, managing and maintaining network equipment and/or network components by software programming.

NOTE – Network softwarization exploits the nature of software such as flexibility and rapidity all along the lifecycle of network equipment and/or components, for the sake of creating conditions that

enable the re-design of network and services architectures, the optimization of costs and processes, self-management and bring added values in network infrastructures.

3.1.12 network virtualization [ITU-T Y.3011]: A technology that enables the creation of logically isolated network partitions over shared physical networks so that heterogeneous collection of multiple virtual networks can simultaneously coexist over the shared networks. This includes the aggregation of multiple resources in a provider and appearing as a single resource.

3.1.13 orchestration [ITU-T Y.3100]: In the context of IMT-2020, the processes aiming at the automated arrangement, coordination, instantiation and use of network functions and resources for both physical and virtual infrastructures by optimization criteria.

3.1.14 service instance [ITU-T Y.3100]: An instance of a service that is realized within a network slice.

NOTE 1 – A service may be represented by one or more service instances.

NOTE 2 – A service instance may be provided by the network slice operator or a third party.

3.1.15 software-defined networking [ITU-T Y.3300]: A set of techniques that enables to directly program, orchestrate, control and manage network resources, which facilitates the design, delivery and operation of network services in a dynamic and scalable manner.

3.1.16 user plane [ITU-T Y.1714]: Refers to the set of traffic forwarding components through which traffic flows.

NOTE – "User plane" is referred to as "transport plane" in other ITU-T Recommendations.

3.1.18 virtualized network function [ITU-T Y.3321]: A network function whose functional software is decoupled from hardware, and runs on virtual machine(s).

3.2 Terms defined in this Supplement

None.

4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

3GPP 3rd Generation Partnership Project

5GCN 5G Core Network

5GS 5G System

AGF Aggregator Gateway Function

AMS Analog/Mixed-Signal

API Application programming interface

BBF Broadband Forum

BNG Broadband Network Gateway

CM Configuration Management

CUPS Control and User Plane Separation

D2D Device to Device

DPU Distribution-Point Unit

E2E End to End

EE	Energy Efficiency
eMBB	Enhanced Mobile Broadband
EMC	Electromagnetic Compatibility
EMF	Electromagnetic field
ENNI	External Network Network Interface
EPS	Evolved Packet System
ETSI	European Telecommunications Standards Institute
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
EVC	Ethernet Virtual Connection
FlexE	Flexible Ethernet
FM	Fault Management
FMC	Fixed-mobile Convergence
FMC	Fixed-Mobile Convergence
FMIF	Fixed Mobile Interworking Function
FTTdp	Fiber to the Distribution Point
GPRS	General Packet Radio Service
ICNIRP	International Commission for Non-Ionizing Radiation Protection
ICT	Information and communications technology
IEEE	Institute of Electrical and Electronics Engineers
IMT	International Mobile Telecommunications
IMT-Advanced	International Mobile Telecommunications-Advanced
IoT	Internet of Things
IP	Intellectual Property
ITS	Intelligent Transportation Systems
KPI	Key Performance Indicator
LAN	Local Area Network
LCM	Life Cycle Management
LCS	Location Services
LR-WPAN	Low-Rate Wireless Personal Area Network
MAC	Medium Access Control
MAN	Metro Area Network
MANO	Management and Orchestration
MEC	Mobile Edge Computing
MEF	Metro Ethernet Forum
MPLS	Multiprotocol Label Switching

MTC	Massive Machine Type Communications
NaaS	Network as a Service
NAS	Non-Access-Stratum
NFV	Network Functions Virtualisation
NFVI	Network Function Virtualization Infrastructure
NGMN	Next Generation Mobile Networks
NGSON	Next Generation Service Overlay Network
NRM	Network Resource Model
NSA	Non-standalone
OTN	Optical Transport Network
PAC	Peer Aware Communication
PHY	Physical Layer
PICS	Protocol Implementation Conformance Statement
PM	Performance Management
PMA	Persistent Management Agent
PON	Passive Optical Network
QoS	Quality of Service
RAN	Radio Access Network
REST	Representational state transfer
RF-EMF	Radio frequency electromagnetic field
RFID	Radio Frequency Identification
ROOF	Real-time Onsite Operations Facilitation
SA	Standalone
SAR	Specific Absorption Rate
SDN	Software Defined Networking
SOAM FM IA	Service OAM Fault Management Implementation Agreement
SOAM	Service OAM
SoC	System on Chip
TEDS	Transducer Electronic Data Sheet
TM Forum	TeleManagement Forum
UE	User Equipment
ULI	Upper Layer Interface
UML	Unified Modeling Language
URLLC	Ultra-Reliable Low Latency Communications
V2X	Vehicle to Everything

VHDL	VHSIC Hardware Description Language
vNID	Virtual NID
WAVE	Wireless Access in Vehicular Environments
WLAN	Wireless Local Area Network
WPAN	Wireless Personal Area Networks
WRAN	Wireless Regional Area Networks
YANG	Yet Another Next Generation

5 Conventions

None.

6 IMT-2020 network overview

The IMT-2020 network will enable a variety of services, including enhanced mobile broadband (eMBB) services, massive machine type communications (MTC) based services and ultra-reliable low latency communications (URLLC) based services [ITU-T Y.3101], on an infrastructure of network and computing resources.

Among the numerous features of the IMT-2020 network, the following are specific key features which characterize the IMT-2020 network:

- distributed architecture based on softwarized network functions,
- access network agnostic common core network,
- network slicing.

The following requirements constitute design considerations for the IMT-2020 network architecture:

- support of network slicing,
- support of network capability exposure,
- common interface to support access network agnostic common core network,
- separation of control plane and user plane,
- efficient support of different mobility requirements,
- support of low latency requirements,
- leveraging existing techniques including NFV/SDN.

7 IMT-2020 standards roadmap

7.1 3GPP

The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as "Organizational Partners" and provides their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies.

The project covers cellular telecommunications network technologies, including radio access, the core transport network, and service capabilities – including work on codecs, security, and quality of service – and thus provides complete system specifications. The specifications also provide hooks for non-radio access to the core network (CN), and for interworking with Wi-Fi networks.

There are three Technical Specification Groups (TSG) in 3GPP are; Radio Access Networks (RAN), Services and Systems Aspects (SA), and Core Network and Terminals (CT).

The current main focus of 3GPP is specifications for IMT-2020/5G.

Table 7-1 provides a list of 3GPP deliverables associated with IMT-2020 networks.

Table 7-1 – 3GPP deliverables

Name	Responsible group	Status	Subject	Topics
3GPP TS 22.261	3GPP TSG SA	Under change control	Service requirements for the 5G system; Stage 1	IMT-2020
3GPP TS 23.273	3GPP TSG SA	Under change control	5G System (5GS) Location Services (LCS); Stage 2	IMT-2020
3GPP TS 23.278	3GPP TSG CT	Under change control	Service requirements for the Evolved Packet System (EPS)	IMT-2020
3GPP TS 23.288	3GPP TSG SA	Under change control	Architecture enhancements for 5G System (5GS) to support network data analytics services	IMT-2020
3GPP TS 23.316	3GPP TSG SA	Under change control	Wireless and wireline convergence access support for the 5G System (5GS)	IMT-2020
3GPP TS 23.401	3GPP TSG SA	Under change control	General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access	IMT-2020
3GPP TS 23.501	3GPP TSG SA	Under change control	System Architecture for the 5G System; Stage 2	IMT-2020
3GPP TS 23.502	3GPP TSG SA	Under change control	Procedures for the 5G System; Stage 2	IMT-2020
3GPP TS 23.503	3GPP TSG SA	Under change control	Policy and Charging Control Framework for the 5G System; Stage 2	IMT-2020
3GPP TS 24.501	3GPP TSG CT	Under change control	Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3	IMT-2020

Name	Responsible group	Status	Subject	Topics
3GPP TS 24.502	3GPP TSG CT1	Under change control	Access to the 3GPP 5G Core Network (5GCN) via non-3GPP access networks	IMT-2020
3GPP TS 24.526	3GPP TSG CT	Under change control	User Equipment (UE) policies for 5G System (5GS); Stage 3	IMT-2020
3GPP TS 28.310	3GPP TSG SA	Under change control	Management and orchestration; Energy Efficiency (EE) of 5G; Concepts, use cases and requirements	IMT-2020
3GPP TS 28.500	3GPP TSG SA	Under change control	Telecommunication management; Management concept, architecture and requirements for mobile networks that include virtualized network functions	IMT-2020
3GPP TS 28.510	3GPP TSG SA	Under change control	Telecommunication management; Configuration Management (CM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
3GPP TS 28.511	3GPP TSG SA	Under change control	Telecommunication management; Configuration Management (CM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
3GPP TS 28.515	3GPP TSG SA	Under change control	Telecommunication management; Fault Management (FM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
3GPP TS 28.516	3GPP TSG SA	Under change control	Telecommunication management; Fault Management (FM) for mobile networks that include virtualized network functions; Procedures	IMT-2020

Name	Responsible group	Status	Subject	Topics
3GPP TS 28.517	3GPP TSG SA	Under change control	Telecommunication management; Fault Management (FM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020
3GPP TS 28.518	3GPP TSG SA	Under change control	Telecommunication management; Fault Management (FM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
3GPP TS 28.520	3GPP TSG SA	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
3GPP TS 28.521	3GPP TSG SA	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
3GPP TS 28.523	3GPP TSG SA5	Under change control	Telecommunication management; Performance Management (PM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
3GPP TS 28.525	3GPP TSG SA5	Under change control	Telecommunication management; Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
3GPP TS 28.526	3GPP TSG SA5	Under change control	Telecommunication management; Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
3GPP TS 28.527	3GPP TSG SA5	Under change control	Life Cycle Management (LCM) for mobile networks	IMT-2020

Name	Responsible group	Status	Subject	Topics
			that include virtualized network functions; Stage 2	
3GPP TS 28.528	3GPP TSG SA5	Under change control	Telecommunication management; Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
3GPP TS 28.530	3GPP TSG SA5	Under change control	Management and orchestration; Concepts, use cases and requirements	IMT-2020
3GPP TS 28.531	3GPP TSG SA	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
3GPP TS 28.532	3GPP TSG SA5	Under change control	Management and orchestration; Generic management services	IMT-2020
3GPP TS 28.533	3GPP TSG SA5	Under change control	Management and orchestration; Architecture framework	IMT-2020
3GPP TS 28.541	3GPP TSG SA5	Under change control	Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3	IMT-2020
3GPP TS 29.500	3GPP TSG CT4	Under change control	5G System; Technical Realization of Service Based Architecture; Stage 3	IMT-2020
3GPP TS 29.501	3GPP TSG CT4	Under change control	5G System; Principles and Guidelines for Services Definition; Stage 3	IMT-2020
3GPP TS 29.502	3GPP TSG CT4	Under change control	Session Management Services Stage 3	IMT-2020
3GPP TS 29.503	3GPP TSG CT4	Under change control	5G System; Unified Data Management Services; Stage 3	IMT-2020
3GPP TS 29.507	3GPP TSG CT3	Under change control	Access and Mobility Policy Control Service; Stage 3	IMT-2020

Name	Responsible group	Status	Subject	Topics
3GPP TS 29.508	3GPP TSG CT3	Under change control	Session Management Event Exposure Service; Stage 3	IMT-2020
3GPP TS 29.509	3GPP TSG CT4	Under change control	5G System; Authentication Server Services; Stage 3	IMT-2020
3GPP TS 29.510	3GPP TSG CT4	Under change control	5G System; Network function repository services; Stage 3	IMT-2020
3GPP TS 29.511	3GPP TSG CT4	Under change control	5G System; Equipment Identity Register Services; Stage 3	IMT-2020
3GPP TS 29.512	3GPP TSG CT3	Under change control	5G System; Session Management Policy Control Service; Stage 3	IMT-2020
3GPP TS 29.513	3GPP TSG CT3	Under change control	5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3	IMT-2020
3GPP TS 29.514	3GPP TSG CT3	Under change control	5G System; Policy Authorization Service; Stage 3	IMT-2020
3GPP TS 29.519	3GPP TSG CT3	Under change control	5G System; Usage of the Unified Data Repository Service for Policy Data, Application Data and Structured Data for Exposure; Stage 3	IMT-2020
3GPP TS 29.520	3GPP TSG CT3	Under change control	5G System; Network Data Analytics Services; Stage 3	IMT-2020
3GPP TS 29.531	3GPP TSG CT4	Under change control	5G System; Network Slice Selection Services; Stage 3	IMT-2020
3GPP TS 29.540	3GPP TSG CT4	Under change control	5G System; SMS Services; Stage 3	IMT-2020
3GPP TS 29.561	3GPP TSG CT3	Under change control	5G System; Interworking between 5G Network and external Data Networks; Stage 3	IMT-2020

Name	Responsible group	Status	Subject	Topics
3GPP TS 29.571	3GPP TSG CT4	Under change control	5G System; Common Data Types for Service Based Interfaces; Stage 3	IMT-2020
3GPP TS 32.972	3GPP TSG SA5	Under change control	Telecommunication management; Study on system and functional aspects of energy efficiency in 5G networks	IMT-2020
3GPP TS 33.501	3GPP TSG SA3	Under change control	Security Architecture and Procedures for 5G System	IMT-2020
3GPP TS.28.522	3GPP TSG SA5	Under change control	Telecommunication management; Performance Management (PM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020
TS 22.261	3GPP TSG SA	Under change control	Service requirements for next generation new services and markets	IMT-2020
TS 23.501	3GPP TSG SA2	Under change control	System Architecture for the 5G System; Stage 2	IMT-2020
TS 23.502	3GPP TSG SA2	Under change control	Procedures for the 5G System; Stage 2	IMT-2020
TS 23.503	3GPP TSG SA2	Under change control	Policy and Charging Control Framework for the 5G System; Stage 2	IMT-2020
TS 24.501	3GPP TSG CT1	Under change control	Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3	IMT-2020
TS 24.502	3GPP TSG CT1	Under change control	Access to the 3GPP 5G System (5GS) via non-3GPP access networks; Stage 3	IMT-2020
TS 28.500	3GPP TSG SA5	Under change control	Management concept, architecture and requirements for mobile networks that include virtualized network functions	IMT-2020

Name	Responsible group	Status	Subject	Topics
TS 28.510	3GPP TSG SA5	Under change control	Configuration Management (CM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
TS 28.511	3GPP TSG SA5	Under change control	Configuration Management (CM) for mobile networks that include virtualized network functions: Procedures	IMT-2020
TS 28.512	3GPP TSG SA5	Under change control	Configuration Management (CM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020
TS 28.513	3GPP TSG SA5	Under change control	Configuration Management (CM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
TS 28.515	3GPP TSG SA5	Under change control	Fault Management (FM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
TS 28.516	3GPP TSG SA5	Under change control	Fault Management (FM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
TS 28.517	3GPP TSG SA5	Under change control	Fault Management (FM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020
TS 28.518	3GPP TSG SA5	Under change control	Fault Management (FM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
TS 28.520	3GPP TSG SA5	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
TS 28.523	3GPP TSG SA5	Under change control	Performance Management (PM) for mobile networks	IMT-2020

Name	Responsible group	Status	Subject	Topics
			that include virtualized network functions; Stage 3	
TS 28.525	3GPP TSG SA5	Under change control	Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Requirements	IMT-2020
TS 28.526	3GPP TSG SA5	Under change control	Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
TS 28.527	3GPP TSG SA5	Under change control	Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020
TS 28.528	3GPP TSG SA5	Under change control	Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Stage 3	IMT-2020
TS 28.530	3GPP TSG SA5	Under change control	Management of network slicing in mobile networks; Concepts, use cases and requirements	IMT-2020
TS 28.531	3GPP TSG SA5	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Procedures	IMT-2020
TS 29.500	3GPP TSG CT4	Under change control	Technical Realization of Service Based Architecture; Stage 3	IMT-2020
TS 29.501	3GPP TSG CT4	Under change control	Principles and Guidelines for Services Definition	IMT-2020
TS 29.502	3GPP TSG CT4	Under change control	Session Management Services Stage 3	IMT-2020
TS 29.503	3GPP TSG CT4	Under change control	Unified Data Management Services Stage 3	IMT-2020
TS 29.507	3GPP TSG CT4	Under change control	Access and Mobility Policy Control Service; Stage 3	IMT-2020

Name	Responsible group	Status	Subject	Topics
TS 29.508	3GPP TSG CT3	Under change control	Session Management Event Exposure Service; Stage 3	IMT-2020
TS 29.509	3GPP TSG CT4	Under change control	Authentication Server Services; Stage 3	IMT-2020
TS 29.510	3GPP TSG CT4	Under change control	5G System; Network function repository services; Stage 3	IMT-2020
TS 29.511	3GPP TSG CT4	Under change control	5G System; Equipment Identity Register Services; Stage 3	IMT-2020
TS 29.512	3GPP TSG CT3	Under change control	5G System; Session Management Policy Control Service; Stage 3	IMT-2020
TS 29.513	3GPP TSG CT3	Under change control	5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3	IMT-2020
TS 29.514	3GPP TSG CT3	Under change control	5G System; Policy Authorization Service; Stage 3	IMT-2020
TS 29.518	3GPP TSG CT4	Under change control	5G System; Access and Mobility Management Services; Stage 3	IMT-2020
TS 29.519	3GPP TSG CT3	Under change control	5G System; Usage of the Unified Data Repository Service for Policy Data, Application Data and Structured Data for Exposure; Stage 3	IMT-2020
TS 29.520	3GPP TSG CT3	Under change control	5G System; Network Data Analytics Services; Stage 3	IMT-2020
TS 29.531	3GPP TSG CT4	Under change control	5G System; Network Slice Selection Services; Stage 3	IMT-2020
TS 29.540	3GPP TSG CT4	Under change control	5G System; SMS Services; Stage 3	IMT-2020
TS 29.561	3GPP TSG CT3	Under change control	5G System; Interworking between 5G Network and	IMT-2020

Name	Responsible group	Status	Subject	Topics
			external Data Networks; Stage 3	
TS 29.571	3GPP TSG CT4	Under change control	5G System; Common Data Types for Service Based Interfaces; Stage 3	IMT-2020
TS 33.501	3GPP TSG SA3	Under change control	Security Architecture and Procedures for 5G System	IMT-2020
TS.28.522	3GPP TSG SA5	Under change control	Performance Management (PM) for mobile networks that include virtualized network functions; Stage 2	IMT-2020

7.2 Broadband Forum

The Broadband Forum, a non-profit industry organization, is focused on engineering smarter and faster broadband networks. Their work defines best practices for global networks, enables service and content delivery, establishes technology migration strategies, engineers critical device and service management tools, and is key to redefining broadband. Free technical reports and white papers can be found at broadband-forum.org.

Table 7-2 provides a list of Broadband Forum deliverables associated with IMT-2020 networks.

Table 7-2 – Broadband Forum deliverables

Name	Responsible group	Status	Subject	Topics
BBF TR-293	Broadband Forum	published	Energy Efficient Mobile Backhaul White Paper	IMT-2020
BBF MR-427	Broadband Forum	published	5G Fixed Mobile Convergence - white paper	IMT-2020
BBF MR-464	Broadband Forum	published	Migrating Fixed Access to 5G Core	IMT-2020
BBF SD-406	Broadband Forum	draft	End-to-End Network Slicing	IMT-2020
BBF SD-407	Broadband Forum	draft	5G Fixed Mobile Convergence	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>BBF WT-521</u>	Broadband Forum	draft	Study Document for 5G Transport Networks	IMT-2020
<u>BBF SDxFlexEMPLS45G</u>	Broadband Forum	draft	Flexible Ethernet (FlexE) use with MPLS networks	IMT-2020
<u>BBF TR-355 Amendment 2</u>	Broadband Forum	published	YANG Modules for FTTdp Management	IMT-2020
<u>BBF TR-383 Amendment 2</u>	Broadband Forum	published	Common YANG Modules for Access Networks	IMT-2020
<u>BBF TR-221a2</u>	Broadband Forum	published	Technical Specifications for MPLS in Mobile Backhaul Networks, Amendment 2	IMT-2020
<u>BBF WT-456</u>	Broadband Forum	draft	AGF Functional Requirements	IMT-2020
<u>BBF WT-458</u>	Broadband Forum	draft	CUPS for 5G FMC	IMT-2020
<u>BBF MR-459</u>	Broadband Forum	published	Control and User Plane Separation for a Disaggregated BNG	IMT-2020
<u>BBF WT-460</u>	Broadband Forum	draft	YANG Modules for Broadband Network Gateways	IMT-2020
<u>BBF WT-521</u>	Broadband Forum	draft	5G Transport Networks	IMT-2020
<u>WT-457</u>	Broadband Forum	draft	FMIF Functional Requirements	IMT-2020

7.3 ETSI

The European Telecommunications Standards Institute (ETSI) is an independent, not-for-profit, standardization organization in the telecommunications industry (equipment makers and network operators) in Europe, headquartered in Sophia-Antipolis, France, with worldwide projection. ETSI

produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.

Table 7-3 provides a list of ETSI deliverables associated with IMT-2020 networks.

Table 7-3 – ETSI deliverables

Name	Responsible group	Status	Subject	Topics
<u>ETSI DGS/MEC-0028WlanAPI</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); WLAN Information API	IMT-2020
<u>ETSI DGS/NFV-SOL011 (GS)</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Or-Or Reference Point	IMT-2020
<u>ETSI DMI/MEC-DEC34</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC) MEC Sandbox	IMT-2020
<u>ETSI DMI/NFV-SOL008 (MI)</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV); Protocol and Data Models; Creation and Management of the OpenAPI Work Programme	IMT-2020
<u>ETSI ETSI GS NFV-TST 009</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Testing; Specification of Networking Benchmarks and Measurement Methods for NFVI	IMT-2020
<u>ETSI GR MEC 017</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Deployment of Mobile Edge Computing in an NFV environment	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GR MEC 018</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); End to End Mobility Aspects	IMT-2020
<u>ETSI GR MEC 022</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Study on MEC Support for V2X Use Cases	IMT-2020
<u>ETSI GR MEC 024</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); MEC support for network slicing	IMT-2020
<u>ETSI GR MEC 027</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Study on MEC support for containers alternative virtualization technologies	IMT-2020
<u>ETSI GR MEC 031</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC) MEC 5G Integration	IMT-2020
<u>ETSI GR MEC-DEC 023</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); Describing ETSI MEC RESTful APIs using the OpenAPI specification	IMT-2020
<u>ETSI GR MEC-DEC 025</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); MEC Testing Framework	IMT-2020
<u>ETSI GR mWT 012</u>	ETSI ISG mWT	published	5G Wireless Backhaul/X-Haul	IMT-2020
<u>ETSI GR mWT 016</u>	ETSI ISG mWT	published	Applications and use cases of Software Defined Networking (SDN) as related to microwave and millimetre wave transmission	IMT-2020

Name	Responsible group	Status	Subject	Topics
ETSI GR NFV 001	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Use Cases	IMT-2020
ETSI GR NFV-EVE 008	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Charging; Report on Usage Metering and Charging Use Cases and Architectural Study	IMT-2020
ETSI GR NFV-EVE 016	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV); Connection Based Virtual Services; Report on Connection Based Virtual Services Support with ETSI NFV Architecture Framework	IMT-2020
ETSI GR NFV-EVE 017	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV); Management and Orchestration; Report on the support of real-time/ultra-low latency aspects in NFV related to service and network handling	IMT-2020
ETSI GR NFV-IFA 012	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on Os-Ma-Nfvo reference point - application and service management use cases and recommendations	IMT-2020
ETSI GR NFV-IFA 015	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Report	IMT-2020

Name	Responsible group	Status	Subject	Topics
			on NFV Information Model	
<u>ETSI GR NFV-IFA 016</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Information Modeling; Papyrus Guidelines	IMT-2020
<u>ETSI GR NFV-IFA 017</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Information Modeling; UML Modeling Guidelines	IMT-2020
<u>ETSI GR NFV-IFA 021</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on management of NFV-MANO and automated deployment of EM and other OSS functions	IMT-2020
<u>ETSI GR NFV-IFA 022</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on Management and Connectivity for Multi-Site Services	IMT-2020
<u>ETSI GR NFV-IFA 023</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Management and Orchestration; Report on Policy Management in Mano; Release 3	IMT-2020
<u>ETSI GR NFV-IFA 024</u>	ETSI ISG NFV	published	Network Function Virtualisation (NFV) Release 2; Information Modeling; Report on External Touchpoints related to NFV Information Model	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GR NFV-IFA 028</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on architecture options to support multiple administrative domains	IMT-2020
<u>ETSI GR NFV-IFA 029</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"	IMT-2020
<u>ETSI GR NFV-IFA 034</u>	ETSI ISG NFV	draft	Network Function Virtualization (NFV) Release 3; Management and Orchestration; Report on Architectural enhancement for VNF License Management support and use of VNF licenses	IMT-2020
<u>ETSI GR NFV-REL 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Reliability; Report on the resilience of NFV-MANO critical capabilities	IMT-2020
<u>ETSI GR NFV-REL 008</u>	ETSI ISG NFV	draft -stopped	Network Functions Virtualisation (NFV); Reliability; Report on Error Handling: Detection, Correlation, Notification	IMT-2020
<u>ETSI GR NFV-REL 010</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Reliability; Report on NFV Resiliency for the	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Support of Network Slicing	
<u>ETSI GR NFV-SEC 005</u>	ETSI ISG NFV	published	Network Functions Virtualization (NFV); Trust; Report on Certificate Management	IMT-2020
<u>ETSI GR NFV-SEC 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Trust; Report on Attestation Technologies and Practices for Secure Deployments	IMT-2020
<u>ETSI GR NFV-SEC 011</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Security; Report on NFV LI Architecture	IMT-2020
<u>ETSI GR NFV-SEC 016</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV); Security; Report on location, timestamping of VNFs	IMT-2020
<u>ETSI GR NFV-SEC 017</u>	ETSI ISG NFV	draft -stopped	Network Functions Virtualisation (NFV); Security; Security Policy Guidelines Report	IMT-2020
<u>ETSI GR NFV-TST 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Testing; Guidelines for Test Plan on Path Implementation through NFVI	IMT-2020
<u>ETSI GR NFV-TST 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Continuous Development and Integration; Report on use cases and recommendations for VNF Snapshot	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GR NFV-TST 006</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Testing; Report on NFV CICD and Devops	IMT-2020
<u>ETSI GR NFV-TST 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Testing; Guidelines on Interoperability Testing for MANO	IMT-2020
<u>ETSI GR NFV-TST 011</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Testing; Test Domain and Description Language Recommendations	IMT-2020
<u>ETSI GR NFV-TST 012</u>	ETSI ISG NFV	draft	Network Function Virtualisation (NFV); Testing; VIM & NFVI Control and Management Performance Evaluation	IMT-2020
<u>ETSI GS MEC 001</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Terminology	IMT-2020
<u>ETSI GS MEC 002</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Phase 2: Use Cases and Requirements	IMT-2020
<u>ETSI GS MEC 003</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Framework and Reference Architecture	IMT-2020
<u>ETSI GS MEC 009</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); General principles for MEC Service APIs	IMT-2020
<u>ETSI GS MEC 010-1</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Mobile Edge	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Management; Part 1: System, host and platform management	
<u>ETSI GS MEC 010-2</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Mobile Edge Management; Part 2: Application lifecycle, rules and requirements management	IMT-2020
<u>ETSI GS MEC 011</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Mobile Edge Platform Application Enablement	IMT-2020
<u>ETSI GS MEC 012</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Radio Network Information API	IMT-2020
<u>ETSI GS MEC 013</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Location API	IMT-2020
<u>ETSI GS MEC 014</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); UE Identity API	IMT-2020
<u>ETSI GS MEC 015</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); Bandwidth Management API	IMT-2020
<u>ETSI GS MEC 016</u>	ETSI ISG MEC	published	Mobile Edge Computing (MEC); UE application interface	IMT-2020
<u>ETSI GS MEC 021</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); MEC Application Mobility Service API	IMT-2020
<u>ETSI GS MEC 026</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Support for regulatory requirements	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GS MEC 028</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); WLAN Information API	IMT-2020
<u>ETSI GS MEC 029</u>	ETSI ISG MEC	published	Multi-access Edge Computing (MEC); Fixed Access Information API	IMT-2020
<u>ETSI GS MEC 030</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); MEC V2X API	IMT-2020
<u>ETSI GS MEC 033</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC) IoT API	IMT-2020
<u>ETSI GS MEC-DEC 032-1</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); API Conformance Test Specification Part 1: Test Requirements and Implementation Conformance Statement (ICS)	IMT-2020
<u>ETSI GS MEC-DEC 032-2</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); API Conformance Test Specification Part 2: Test Purposes (TP)	IMT-2020
<u>ETSI GS MEC-DEC 032-3</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); API Conformance Test Specification; Part 3: Abstract Test Suite (ATS)	IMT-2020
<u>ETSI GS MEC-IEG 004</u>	ETSI ISG MEC	published	Mobile-Edge Computing (MEC); Service Scenarios	IMT-2020
<u>ETSI GS MEC-IEG 005</u>	ETSI ISG MEC	published	Mobile-Edge Computing (MEC); Proof of Concept Framework	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GS MEC-IEG 006</u>	ETSI ISG MEC	published	Mobile Edge Computing; Market Acceleration; MEC Metrics Best Practice and Guidelines	IMT-2020
<u>ETSI GS NFV 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Architectural Framework	IMT-2020
<u>ETSI GS NFV 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV	IMT-2020
<u>ETSI GS NFV 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Virtualisation Requirements	IMT-2020
<u>ETSI GS NFV-EVE 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Virtualisation Technologies; Hypervisor Domain Requirements specification; Release 3	IMT-2020
<u>ETSI GS NFV-EVE 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Ecosystem; Report on NFVI Node Physical Architecture Guidelines for Multi-Vendor Environment	IMT-2020
<u>ETSI GS NFV-EVE 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Virtualisation Technologies; Report on the application of Different Virtualisation Technologies in the NFV Framework	IMT-2020
<u>ETSI GS NFV-EVE 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV);	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Ecosystem; Report on SDN Usage in NFV Architectural Framework	
<u>ETSI GS NFV-EVE 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; NFV Evolution and Ecosystem; Hardware Interoperability Requirements Specification	IMT-2020
<u>ETSI GS NFV-EVE 011</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Virtualised Network Function; Specification of the Classification of Cloud Native VNF implementations	IMT-2020
<u>ETSI GS NFV-IFA 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Acceleration Technologies; Report on Acceleration Technologies & Use Cases	IMT-2020
<u>ETSI GS NFV-IFA 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Acceleration Technologies; vSwitch Benchmarking and Acceleration Specification	IMT-2020
<u>ETSI GS NFV-IFA 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Acceleration Technologies; Management Aspects Specification	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GS NFV-IFA 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA 006</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Vi-Vnfm reference point - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA 008</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA 009</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Management and Orchestration; Report on Architectural Options	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GS NFV-IFA 011</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; VNF Descriptor and Packaging Specification	IMT-2020
<u>ETSI GS NFV-IFA 013</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Os-Ma-Nfvo reference point - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA 014</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Network Service Templates Specification	IMT-2020
<u>ETSI GS NFV-IFA 018</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Acceleration Technologies; Network Acceleration Interface Specification; Release 3	IMT-2020
<u>ETSI GS NFV-IFA 019</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Acceleration Technologies; Acceleration Resource Management Interface Specification; Release 3	IMT-2020
<u>ETSI GS NFV-IFA 026</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3;	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Management and Orchestration; Architecture enhancement for Security Management Specification	
<u>ETSI GS NFV-IFA 027</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Performance Measurements Specification	IMT-2020
<u>ETSI GS NFV-IFA 030</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Multiple Administrative Domain Aspect Interfaces Specification	IMT-2020
<u>ETSI GS NFV-IFA 031</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Requirements and interfaces specification for management of NFV-MANO	IMT-2020
<u>ETSI GS NFV-IFA 033</u>	ETSI ISG NFV	draft	Network Functions Virtualization (NFV) Release 3; Management and Orchestration; Sc-Or, Sc-Vnfm, Sc-Vi reference points - Interface and Information Model Specification	IMT-2020
<u>ETSI GS NFV-IFA012</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV)	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Release 3; Management and OrchestrationOs-Ma- Nfvo reference point – Application and Service Management Interface and Information Model Specification	
<u>ETSI GS NFV-INF 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Infrastructure Overview	IMT-2020
<u>ETSI GS NFV-INF 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Infrastructure; Compute Domain	IMT-2020
<u>ETSI GS NFV-INF 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Infrastructure; Hypervisor Domain	IMT-2020
<u>ETSI GS NFV-INF 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Infrastructure; Network Domain	IMT-2020
<u>ETSI GS NFV-INF 007</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Infrastructure; Methodology to describe Interfaces and Abstractions	IMT-2020
<u>ETSI GS NFV-INF 010</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Service Quality Metrics	IMT-2020
<u>ETSI GS NFV-MAN 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Management and Orchestration	IMT-2020
<u>ETSI GS NFV-PER 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); NFV Performance &	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Portability Best Practises	
<u>ETSI GS NFV-PER 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Proofs of Concept; Framework	IMT-2020
<u>ETSI GS NFV-REL 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Resiliency Requirements	IMT-2020
<u>ETSI GS NFV-REL 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Reliability; Report on Scalable Architectures for Reliability Management	IMT-2020
<u>ETSI GS NFV-REL 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Reliability; Report on Models and Features for End-to-End Reliability	IMT-2020
<u>ETSI GS NFV-REL 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Assurance; Report on Active Monitoring and Failure Detection	IMT-2020
<u>ETSI GS NFV-REL 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Accountability; Report on Quality Accountability Framework	IMT-2020
<u>ETSI GS NFV-REL 006</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Reliability; Maintaining Service Availability and Continuity Upon Software Modification	IMT-2020
<u>ETSI GS NFV REL 009</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV);	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Reliability; Specification of Requirements to Support NFV Reliability and Availability	
<u>ETSI GS NFV-SEC 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); NFV Security; Cataloguing security features in management software	IMT-2020
<u>ETSI GS NFV-SEC 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); NFV Security; Security and Trust Guidance	IMT-2020
<u>ETSI GS NFV-SEC 004 V1.1.1 (2015-09)</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV);NFV Security;Privacy and Regulation;Report on Lawful Interception Implications	Lawful interception; Network security; Privacy; IMT-2020
<u>ETSI GS NFV-SEC 006 V1.1.1</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Security Guide;Report on Security Aspects and Regulatory Concerns	Security management standards and guidance documents; IMT-2020
<u>ETSI GS NFV-SEC 009 V1.1.1</u>	NFV ISG NFV	published	Network Functions Virtualisation (NFV);NFV Security;Report on use cases and technical approaches for multi-layer host administration	Network security; Security Architectures, Models and Frameworks; IMT-2020
<u>ETSI GS NFV-SEC 010 V1.1.1</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV);NFV Security;Report on Retained Data problem	Sector-specific security standards; IMT-2020

Name	Responsible group	Status	Subject	Topics
			statement and requirements	
<u>ETSI GS NFV-SEC 012 V3.1.1</u>	NFV ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Security; System architecture specification for execution of sensitive NFV components	Security Architectures, Models and Frameworks; Security mechanisms; IMT-2020
<u>ETSI GS NFV-SEC 013 V3.1.1</u>	NFV ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Security; Security Management and Monitoring specification	Security Architectures, Models and Frameworks; Security management standards and guidance documents; IMT-2020
<u>ETSI GS NFV-SEC 014</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; NFV Security; Security Specification for MANO Components and Reference points	IMT-2020
<u>ETSI GS NFV-SEC 015</u>	ETSI ISG NFV	draft -stopped	Network Function Virtualization (NFV) Release 3; NFV Security; Security Specification for other MANO reference points	IMT-2020
<u>ETSI GS NFV-SEC 020</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Security; Identity Management and Security Specification	IMT-2020
<u>ETSI GS NFV-SEC021</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Security;	IMT-2020

Name	Responsible group	Status	Subject	Topics
			VNF Package Security Specification	
<u>ETSI GS NFV-SOL 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point	IMT-2020
<u>ETSI GS NFV-SOL 003</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point	IMT-2020
<u>ETSI GS NFV-SOL 004</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; VNF Package specification	IMT-2020
<u>ETSI GS NFV-SOL 005</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point	IMT-2020
<u>ETSI GS NFV-SOL 006</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; NFV descriptors based on YANG Specification	IMT-2020
<u>ETSI GS NFV-SOL 007</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; Network Service	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Descriptor File Structure Specification	
<u>ETSI GS NFV-SOL 009</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models: RESTful protocols specification for the management of NFV-MANO	IMT-2020
<u>ETSI GS NFV-SOL 010</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; VNF Snapshot Package specification	IMT-2020
<u>ETSI GS NFV-SOL 012</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Policy Management Interface	IMT-2020
<u>ETSI GS NFV-SOL 013</u>	ETSI ISG NFV	draft	Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; Specification of common aspects for RESTful NFV MANO APIs	IMT-2020
<u>ETSI GS NFV-SWA 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Virtual Network Functions Architecture	IMT-2020
<u>ETSI GS NFV-TST 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Pre-deployment Testing; Report on Validation of NFV Environments and Services	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ETSI GS NFV-TST 002</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology	IMT-2020
<u>ETSI GS NFV-TST 008</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Release 3; Testing; NFVI Compute and Network Metrics Specification	IMT-2020
<u>ETSI GS NFV-TST 009</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV) Testing Specification of Networking Benchmarks and Measurement Methods for NFVI	IMT-2020
<u>ETSI MI/MEC-DEC23OpenAPI</u>	ETSI ISG MEC	draft	Multi-access Edge Computing (MEC); Describing ETSI MEC RESTful APIs using the OpenAPI specification	IMT-2020
<u>ETSI White Paper No. 25</u>	ETSI ISG mWT	published	Microwave and Millimetre wave for 5G Transport	IMT-2020
<u>GS NFV-SEC 001</u>	ETSI ISG NFV	published	Network Functions Virtualisation (NFV); NFV Security; Problem Statement	IMT-2020

7.4 IEEE

IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE and its members inspire a global community through IEEE's highly cited publications, conferences, technology standards, and professional and educational activities.

Table 7-4 provides a list of IEEE deliverables associated with IMT-2020 networks.

Table 7-4 – IEEE deliverables

Name	Responsible group	Status	Subject	Topics
IEEE 1076-2008	IEEE	published	IEEE Standard VHDL Language Reference Manual	IMT-2020
IEEE 1076.1-2017	IEEE	published	IEEE Standard VHDL Analog and Mixed-Signal Extensions	IMT-2020
IEEE 1451.1-1999	IEEE	published	IEEE Standard for a Smart Transducer Interface for Sensors and Actuators - Network Capable Application Processor Information Model	IMT-2020
IEEE 1451.5-2007	IEEE	published	IEEE Standard for a Smart Transducer Interface for Sensors and Actuator -- Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats	IMT-2020
IEEE 1528-2013	IEEE	published	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	IMT-2020
IEEE 1609.0-2013	IEEE	published	IEEE Guide for Wireless Access in Vehicular Environments (WAVE) - Architecture	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards; Definitions and Taxonomy
IEEE 1609.11-2010	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments (WAVE)-- Over-the-Air	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards; Short and Mid-Range

Name	Responsible group	Status	Subject	Topics
			Electronic Payment Data Exchange Protocol for Intelligent Transportation Systems (ITS)	Devices/Networks; V2I
IEEE 1609.12-2016	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments (WAVE) - Identifier Allocations	IMT-2020; Short and Mid-Range Devices/Networks
IEEE 1609.2-2016	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments--Security Services for Applications and Management Messages	Wireless; IMT-2020; Cybersecurity (ITS)
IEEE 1609.2a-2017 (Amendment to IEEE Std 1609.2-2016)	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments--Security Services for Applications and Management Messages - Amendment 1	IMT-2020
IEEE 1609.3-2016	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments (WAVE) -- Networking Services	IMT-2020; Short and Mid-Range Devices/Networks
IEEE 1609.4-2016	IEEE	published	IEEE Standard for Wireless Access in Vehicular Environments (WAVE) -- Multi-Channel Operation	Security protocol standards; IMT-2020; Short and Mid-Range Devices/Networks
IEEE 1647-2016	IEEE	published	IEEE Standard for the Functional Verification Language e	IMT-2020
IEEE 1666-2011	IEEE	published	IEEE Standard System C(R) Language Reference Manual	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>IEEE 1666.1-2016</u>	IEEE	published	IEEE SystemC Analog/Mixed-Signal (AMS) extensions Language Reference Manual	IMT-2020
<u>IEEE 1685-2014</u>	IEEE	published	IEEE Standard for IP-XACT, Standard Structure for Packaging, Integrating, and Reusing IP within Tool Flows	IMT-2020
<u>IEEE 1720-2012</u>	IEEE	published	IEEE Recommended Practice for Near-Field Antenna Measurements	IMT-2020
<u>IEEE 1734-2011</u>	IEEE	published	IEEE Standard for Quality of Electronic and Software Intellectual Property Used in System and System on Chip (SoC) Designs	IMT-2020
<u>IEEE 1735-2014</u>	IEEE	published	IEEE Recommended Practice for Encryption and Management of Electronic Design Intellectual Property (IP)	IMT-2020
<u>IEEE 1735-2014/Cor 1-2015</u>	IEEE	published	IEEE Recommended Practice for Encryption and Management of Electronic Design Intellectual Property (IP) - Corrigendum 1: Correction to Rights Digest Description	IMT-2020
<u>IEEE 1785.2-2016</u>	IEEE	published	IEEE Standard for Rectangular Metallic Waveguides and Their Interfaces for Frequencies of 110 GHz and AbovePart 2: Waveguide Interfaces	Security protocol standards; IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>IEEE 1800-2017</u>	IEEE	published	IEEE Standard for SystemVerilog--Unified Hardware Design, Specification, and Verification Language	IMT-2020
<u>IEEE 1800.2-2017</u>	IEEE	published	IEEE Standard for Universal Verification Methodology Language Reference Manual	IMT-2020
<u>IEEE 1801-2015</u>	IEEE	published	IEEE Standard for Design and Verification of Low Power, Energy Aware Electronic Systems	IMT-2020
<u>IEEE 1903-2011</u>	IEEE	published	IEEE Standard for the Functional Architecture of Next Generation Service Overlay Networks	IMT-2020
<u>IEEE 802.11-2016</u>	IEEE 802	published	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	IMT-2020
<u>IEEE 802.11ac-2013</u>	IEEE 802	published	IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Access Control (MAC) and Physical Layer (PHY) Specificatio	
<u>IEEE 802.11ad-2012</u>	IEEE	published	(adopted as ISO/IEC/IEEE 8802-11:2012/Amd 3:2014)	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.11ah-2016</u>	IEEE 802	published	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) Specificatio	IMT-2020
<u>IEEE 802.15.11</u>	IEEE 802.15	draft	New activity to develop a standard supporting Multi-Gigabit/sec Optical Wireless Communications	IMT-2020
<u>IEEE 802.15.3-2016</u>	IEEE 802.15	published	Standard for High Data Rate Wireless Multi-Media Networks	IMT-2020
<u>IEEE 802.15.3e-2017</u>	IEEE 802.15	published	IEEE Standard for Information Technology-- Local and Metropolitan Area Networks-- Specific Requirements-- Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPAN) Amendmen	IMT-2020
<u>IEEE 802.15.4-2015</u>	IEEE	published	IEEE Standard for Local and metropolitan area networks--Part 15.4:	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards

Name	Responsible group	Status	Subject	Topics
			Low-Rate Wireless Personal Area Networks (LR-WPANs)	
<u>IEEE 802.15.7-2011</u>	IEEE	published	IEEE Standard for Local and Metropolitan Area Networks--Part 15.7: Short-Range Wireless Optical Communication Using Visible Light	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.16-2012</u>	IEEE	published	IEEE Standard for Air Interface for Broadband Wireless Access Systems	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.16-Conformance04-2006</u>	IEEE 802.16	published	Conformance to IEEE 802.16 - Part 4: Protocol Implementation Conformance Statement (PICS) Proforma for Frequencies below 11 GHz.	IMT-2020
<u>IEEE 802.16.1-2012</u>	IEEE 802.16	published	IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems	IMT-2020
<u>IEEE 802.16.1-2012</u>	IEEE 802.16	published	IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems	IMT-2020
<u>IEEE 802.16.1a-2013</u>	IEEE 802.16	published	IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems – Amendment 2: Higher Reliability Networks	IMT-2020
<u>IEEE 802.16.1b-2012</u>	IEEE	published	IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems -	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards

Name	Responsible group	Status	Subject	Topics
			Amendment: Enhancements to Support Machine-to- Machine Applications	
<u>IEEE 802.16.2-2004</u>	IEEE 802.16	published	IEEE Recommended Practice for Local and Metropolitan Area Networks - Recommended Practice for Coexistence of Fixed Broadband Wireless Access Systems	IMT-2020
<u>IEEE 802.16n-2013</u>	IEEE	published	IEEE Standard for Air Interface for Broadband Wireless Access Systems--Amendment 2: Higher Reliability Networks	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.16p-2012</u>	IEEE	published	IEEE Standard for Air Interface for Broadband Wireless Access Systems Amendment: Enhancements to Support Machine-to-Machine Applications	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.16q-2015</u>	IEEE 802.16	published	IEEE Standard for Air Interface for Broadband Wireless Access Systems –Amendment 3: Multi-tier Networks	IMT-2020
<u>IEEE 802.19.1-2014</u>	IEEE 802	published	IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 19: TV White Space Coexistence Methods	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>IEEE 802.1CB Frame Replication and Elimination</u>	IEEE 802.1	published	IEEE Std 802.1CB-2017 - IEEE Standard for Local and metropolitan area networks--Frame Replication and Elimination for Reliability	IMT-2020
<u>IEEE 802.1Qbv Enhancements for Scheduled Traffic</u>	IEEE 802.1	published	IEEE Std 802.1Qbv-2015 (Amendment to IEEE Std 802.1Q-2014 as amended by IEEE Std 802.1Qca-2015, IEEE Std 802.1Qcd-2015, and IEEE Std 802.1Q-2014/Cor 1-2015) - IEEE Standard for Local and metropolitan area networks -- Bridges and Bridged Networks - Amendme	IMT-2020
<u>IEEE 802.1Qbv Enhancements for Scheduled Traffic</u>	IEEE 802.1	published	This standard specifies Media Access Control (MAC) Bridges that interconnect individual Local Area Networks (LANs), each supporting the IEEE 802 MAC service using a different or identical media access control method, to provide Bridged Local Area Networks	IMT-2020
<u>IEEE 802.1Qch Cyclic Queueing and Forwarding</u>	IEEE 802.1	published	IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks-- Amendment 29: Cyclic Queueing and Forwarding	IMT-2020
<u>IEEE 802.1Qci Per-Stream Filtering and Policing</u>	IEEE 802.1	published	IEEE Std 802.1Qci-2017 (Amendment to IEEE Std 802.1Q-2014 as amended by IEEE Std 802.1Qca-2015, IEEE	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Std 802.1Qcd-2015, IEEE Std 802.1Q-2014/Cor 1-2015, IEEE Std 802.1Qbv-2015, IEEE Std 802.1Qbu-2016, and IEEE Std 802.1Qbz-2016) - IEEE Standard for Local	
<u>IEEE 802.21-2017</u>	IEEE	published	802.21-2017 - IEEE Standard for Local and metropolitan area networks--Part 21: Media Independent Services Framework	Multimedia; Network security; IMT-2020
<u>IEEE 802.21.1-2017</u>	IEEE 802	published	IEEE Standard for Local and metropolitan area networks -- Part 21.1: Media Independent Services	IMT-2020
<u>IEEE 802.22-2011</u>	IEEE	published	(adopted as ISO/IEC/IEEE 8802-22:2015)	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.22.1-2010</u>	IEEE	published	IEEE Standard for Information Technology-- Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements Part 22.1: Standard to Enhance Harmful Interference Protection for Low-	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE 802.22.2-2012</u>	IEEE	published	IEEE Standard for Information Technology-- Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards

Name	Responsible group	Status	Subject	Topics
			requirements Part 22.2: Installation and Deployment of IEEE 802.22 Systems	
IEEE 802.22a-2014	IEEE 802	published	IEEE Standard for Information Technology-- Telecommunications and information exchange between systems Wireless Regional Area Networks (WRAN)--Specific Requirements - Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Spec	IMT-2020
IEEE 802.22b-2015	IEEE	published	IEEE Standard for Information Technology-- Telecommunications and information exchange between systems - Wireless Regional Area Networks (WRAN)--Specific requirements - Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Sp	Security mechanisms; Network Management; Security protocol standards; Wireless; IMT-2020; IoT & Smart Sustainable Cities Standards
IEEE 802.3 - 2018 - 1000BASE-LX10 and 1000BASE-BX10	IEEE 802.3	published	IEEE Standard for Ethernet - 1000BASE-LX10 and 1000BASE-BX10: Physical Layer specification for point-to-point 1 Gb/s Ethernet links over single-mode optical fiber and multimode optical fiber- IEEE Std 802.3, Clause	IMT-2020

Name	Responsible group	Status	Subject	Topics
			56, Clause 59 and Clause 66	
<u>IEEE 802.3 - 2018 - 100BASE-LX10 and 100BASE-BX10</u>	IEEE 802.3	published	IEEE Standard for Ethernet - 100BASE-LX10 and 100BASE-BX10: Physical Layer specification for point-to-point 100 Mb/s Ethernet links over single-mode optical fiber - IEEE Std 802.3, Clause 56, Clause 58 and Clause 66	IMT-2020
<u>IEEE 802.3 - 2018 - 10GBASE-PR and 10/1GBASE-PRX</u>	IEEE 802.3	published	IEEE Standard for Ethernet - 10GBASE-PR and 10/1GBASE-PRX: Physical Layer specification for point-to-multipoint 10 Gb/s connections over Ethernet-based passive optical networks (10G-EPON) - IEEE Std 802.3, Clause 56, Clause 75, Clause 76 and Clause 77	IMT-2020
<u>IEEE 802.3.1-2013</u>	IEEE	published	IEEE Standard for Management Information Base (MIB) Definitions for Ethernet	IoT; IoT & Smart Sustainable Cities Standards; IMT-2020
<u>IEEE 802.3.2-2019 YANG Data Model</u>	IEEE 802.3	published	IEEE Standard for Ethernet - YANG Data Model Definitions	YANG data models; YANG models for PtP systems; YANG models for PON systems; IMT-2020
<u>IEEE 802.3cd - 2018</u>	IEEE 802.3 Working Group	published	IEEE Standard for Ethernet - Amendment 3: Media Access Control Parameters for 50 Gb/s and Physical Layers and Management Parameters for 50 Gb/s, 100 Gb/s, and 200 Gb/s Operation	IMT-2020

Name	Responsible group	Status	Subject	Topics
IEEE P1451-99	IEEE	draft	Standard for Harmonization of Internet of Things (IoT) Devices and Systems	IMT-2020
IEEE P1451.4a	IEEE	draft	IEEE Draft Standard for A Smart Transducer Interface for Sensors and Actuators--Mixed-Mode Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats – Amendment	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
IEEE P1451.8	IEEE	draft	Standard for Wind Turbine Health Monitoring System Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Format	IMT-2020
IEEE P149	IEEE	draft	IEEE Draft Recommended Practice for Antenna Measurements	IMT-2020
IEEE P1609.2.1	IEEE	draft	Wireless Access in Vehicular Environments (WAVE) --Certificate Management Interfaces for End-entities	IMT-2020
IEEE P1609.2b	IEEE	draft	Standard for Wireless Access in Vehicular Environments - Security Services for Applications and Management Messages Amendment	IMT-2020
IEEE P1765	IEEE	draft	Trial-Use Recommended Practice for Estimating the Uncertainty in Error Vector Magnitude of	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Measured Digitally Modulated Signals for Wireless Communications	
IEEE P1770	IEEE	draft	Recommended Practice for The Usage of Terms Commonly Employed In the Field of Large-Signal Vector Network Analysis	IMT-2020
IEEE P1857.6	IEEE	draft	IEEE Draft Standard for Digital Media Content Description	IMT-2020
IEEE P1857.9	IEEE	draft	IEEE Draft Standard for Immersive Visual Content Coding	IMT-2020
IEEE P1903.1-2017	IEEE	published	IEEE Approved Draft Standard for Content Delivery Protocols of Next Generation Service Overlay Network	IMT-2020
IEEE P1903.2-2017	IEEE	published	IEEE Approved Draft Standard for Service Composition Protocols of Next Generation Service Overlay Network (NGSON)	IMT-2020
IEEE P1903.3-2017	IEEE	published	IEEE Approved Draft Standard for Self-Organizing Management Protocols of Next Generation Service Overlay Network	IMT-2020
IEEE P1912	IEEE	draft	Standard for Privacy and Security Architecture for Consumer Wireless Devices	IMT-2020
IEEE P1913	IEEE	draft	Draft Standard for Software-Defined Quantum Communication	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>IEEE P1914.1</u>	IEEE	draft	Standard for Packet-based Fronthaul Transport Networks	IMT-2020
<u>IEEE P1914.3</u>	IEEE 1914	draft	IEEE Draft Standard for Radio Over Ethernet Encapsulations and Mappings	IMT-2020
<u>IEEE P1915.1</u>	IEEE	draft	IEEE Draft Standard for Software Defined Networking and Network Function Virtualization Security	IMT-2020
<u>IEEE P1916.1</u>	IEEE	draft	IEEE Draft Standard for Software Defined Networking and Network Function Virtualization Performance	IMT-2020
<u>IEEE P1917.1</u>	IEEE	draft	IEEE Draft Standard for Software Defined Networking and Network Function Virtualization Reliability	IMT-2020
<u>IEEE P1918.1</u>	IEEE	draft	IEEE Draft Standard for Tactile Internet: Application Scenarios, Definitions and Terminology, Architecture, Functions, and Technical Assumptions	IMT-2020
<u>IEEE P1918.1.1</u>	IEEE	draft	IEEE Draft Standard for Haptic Codecs for the Tactile Internet	IMT-2020
<u>IEEE P1920.1</u>	IEEE	draft	IEEE Draft Standard for Aerial Communications and Networking Standards	IMT-2020
<u>IEEE P1921.1</u>	IEEE	draft	IEEE Draft Standard for Software-Defined	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Networking (SDN) Bootstrapping Procedures	
<u>IEEE P1930.1</u>	IEEE	draft	IEEE Draft Recommended Practice for Software Defined Networking (SDN) based Middleware for Control and Management of Wireless Networks	IMT-2020
<u>IEEE P1931.1</u>	IEEE	draft	IEEE Draft Standard for an Architectural Framework for Real- time Onsite Operations Facilitation (ROOF) for the Internet of Things	IMT-2020
<u>IEEE P211</u>	IEEE	draft	Standard Definitions of Terms for Radio Wave Propagation	IMT-2020
<u>IEEE P2413</u>	IEEE	draft	IEEE Draft Standard for an Architectural Framework for the Internet of Things (IoT)	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE P287.1</u>	IEEE	draft	Standard for Precision Coaxial Connectors at RF, Microwave and Millimeter-wave Frequencies	IMT-2020
<u>IEEE P3333.2.4</u>	IEEE	draft	IEEE Draft Standard for Three-Dimensional (3D) Medical Simulation	IMT-2020
<u>IEEE P802.11ax</u>	IEEE 802	draft	IEEE Draft Standard for Information technology-- Telecommunications and information exchange between systems Local and metropolitan area networks--Specific Requirements Part 11: Wireless LAN Medium	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Access Control (MAC) and Physical Layer (PHY) Specificatio	
<u>IEEE P802.11ay</u>	IEEE 802	draft	IEEE Draft 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) Specificatio	IMT-2020
<u>IEEE P802.15.12</u>	IEEE 802.15	draft	IEEE Draft Standard for Upper Layer Interface (ULI) for IEEE 802.15.4 Low-Rate Wireless Networks	IMT-2020
<u>IEEE P802.15.3d</u>	IEEE 802.15	draft	IEEE Draft Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPAN) --A	IMT-2020
<u>IEEE P802.15.8</u>	IEEE	draft	IEEE Draft Standard for Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Peer Aware Communications (PAC)	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>IEEE P802.16s</u>	IEEE 802.16	published	IEEE Draft Standard for Air Interface for Broadband Wireless	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Access Systems – Amendment: Fixed and Mobile Wireless Access in Channel Bandwidth up to 1.25 MHz	
<u>IEEE P802.19.1a-2017</u>	IEEE 802	published	IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 19: TV White Space Coexistence Methods – Amendment: Coexistence Methods for	IMT-2020
<u>IEEE P802.19.1b</u>	IEEE 802	draft	New activity to develop a recommended practice with the purpose of is to identify performance enhancement settings that provide improvements for IEEE 802 wireless devices in automotive environments.	IMT-2020
<u>IEEE P802.1CF</u>	IEEE 802.1	draft	IEEE Draft Recommended Practice for Network Reference Model and Functional Description of IEEE 802 Access Network	IMT-2020
<u>IEEE P802.1CM</u>	IEEE 802.1	draft	IEEE Draft Standard for Time-Sensitive Networking for Fronthaul	IMT-2020
<u>IEEE P802.21-2017/Cor 1</u>	IEEE 802	draft	IEEE Standard for Local and Metropolitan Area Networks - Part 21: Media Independent Services Framework -	IMT-2020

Name	Responsible group	Status	Subject	Topics
			Corrigendum 1: Clarification of Parameter Definition in Group Session Key Derivation	
IEEE P802.22.3	IEEE 802	draft	IEEE Draft Standard for Spectrum Characterization and Occupancy Sensing	IMT-2020
IEEE P802.3bs	IEEE 802.1	published	IEEE Draft Standard for Ethernet – Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 200 Gb/s and 400 Gb/s Operation	IMT-2020
IEEE P802.3ca	IEEE 802.3 Working Group	draft	IEEE Draft Standard for Ethernet – Amendment: Physical Layer Specifications and Management Parameters for 25 Gb/s, 50 Gb/s, and 100 Gb/s Passive Optical Networks	IMT-2020
IEEE P802.3cc	IEEE 802.3 Working Group	draft	IEEE Draft Standard for Ethernet – Amendment: Physical Layer and Management Parameters for Serial 25 Gb/s Ethernet Operation Over Single-Mode Fiber	IMT-2020
IEEE P802.3cd	IEEE 802.3 Working Group	draft	IEEE Draft Standard for Ethernet – Amendment: Media Access Control Parameters for 50 Gb/s and Physical Layers and Management Parameters for 50 Gb/s, 100 Gb/s, and 200 Gb/s Operation	IMT-2020
ISO/IEC/IEEE 21450:2010 (adoption of IEEE 1451.0-2007)	IEEE	published	Information technology – Smart Transducer Interface for Sensors	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards

Name	Responsible group	Status	Subject	Topics
			and Actuators – Common Functions	
<u>ISO/IEC/IEEE 21451-2:2010 (adoption of IEEE 1451.2-1997)</u>	IEEE	published	Information technology – Smart Transducer Interface for Sensors and Actuators – Transducer to Microprocessor Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ISO/IEC/IEEE 21451-4:2010 (adoption of IEEE 1451.4-2004)</u>	IEEE	published	Information technology – Smart Transducer Interface for Sensors and Actuators – Mixed-Mode Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ISO/IEC/IEEE 21451-7:2011</u>	IEEE	published	Information technology – Standard for a Smart Transducer Interface for Sensors and Actuators – Transducers to Radio Frequency Identification (RFID) Systems Communication Protocols and Transducer Electronic Data Sheet Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ISO/IEC/IEEE P21451-1-4</u>	IEEE	draft	Information technology -- Standard for a Smart Transducer Interface for Sensors	IoT; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>P802.1CF Network Reference Model and Functional Description</u>	IEEE 802.1	draft	This Recommended Practice specifies an access network, which connects terminals to their access routers, utilizing technologies based on the family of	IMT-2020

Name	Responsible group	Status	Subject	Topics
			IEEE 802 Standards by providing an access network reference model, including entities and reference	
<u>P802.1CM TSN for Fronthaul</u>	IEEE 802.1	draft	The purpose of this standard is to enable the transport of time sensitive fronthaul streams in Ethernet bridged networks.	IMT-2020
<u>Standard for Packet-based Fronthaul Transport Networks</u>	IEEE 1914	draft	Use cases, Architecture, Requirements	IMT-2020
<u>Standard for Radio over Ethernet Encapsulations and Mappings</u>	IEEE 1914	draft	Protocol	IMT-2020

7.5 ISO/IEC

The International Organization for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organizations. The organization promotes worldwide proprietary, industrial, and commercial standards. The International Electrotechnical Commission (IEC) is the world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies. When appropriate, IEC cooperates with ISO or ITU to ensure that International Standards fit together seamlessly and complement each other. Joint committees ensure that International Standards combine all relevant knowledge of experts working in related areas.

Table 7-5 provides a list of ISO/IEC deliverables associated with IMT-2020 networks.

Table 7-5 – ISO/IEC deliverables

Name	Responsible group	Status	Subject	Topics
<u>ISO/IEC/IEEE 21450:2010 (adoption of IEEE 1451.0-2007)</u>	IEEE	published	Information technology – Smart Transducer Interface for Sensors and Actuators – Common Functions	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards

Name	Responsible group	Status	Subject	Topics
<u>ISO/IEC/IEEE 21451-2:2010 (adoption of IEEE 1451.2-1997)</u>	IEEE	published	Information technology – Smart Transducer Interface for Sensors and Actuators – Transducer to Microprocessor Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ISO/IEC/IEEE 21451-4:2010 (adoption of IEEE 1451.4-2004)</u>	IEEE	published	Information technology – Smart Transducer Interface for Sensors and Actuators – Mixed-Mode Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ISO/IEC/IEEE 21451-7:2011</u>	IEEE	published	Information technology – Standard for a Smart Transducer Interface for Sensors and Actuators – Transducers to Radio Frequency Identification (RFID) Systems Communication Protocols and Transducer Electronic Data Sheet Formats	Sensor and Actuator; IMT-2020; IoT & Smart Sustainable Cities Standards

7.6 ITU-R

The ITU Radiocommunication Sector (ITU-R) is one of the three sectors of the International Telecommunication Union (ITU) and is responsible for radio communication. Its role is to manage the international radio-frequency spectrum and satellite orbit resources and to develop standards for radiocommunication systems with the objective of ensuring the effective use of the spectrum.

Table 7-6 provides a list of ITU-R deliverables associated with IMT-2020 networks.

Table 7-6 – ITU-R deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-R M.2440-0</u>	ITU-R WP 5D	published	The use of the terrestrial component of International Mobile Telecommunications for narrowband and broadband machine-type communications	IMT-2020
<u>ITU-R M.2012-3</u>	ITU-R WP 5D	published	Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT-Advanced)	IMT-2020
<u>ITU-R M.2070-1</u>	ITU-R WP 5D	published	Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-Advanced	IMT-2020
<u>ITU-R M.2071-1</u>	ITU-R WP 5D	published	Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced	IMT-2020
<u>ITU-R M.2083-0</u>	ITU-R WP 5D	published	IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond	IMT-2020
<u>ITU-R M.2090-0</u>	ITU-R WP 5D	published	Specific out-of-band emission limit of IMT mobile stations operating in the frequency band 694-790 MHz for protection of existing services in Region 1 in the frequency band below 694 M	IMT-2020
<u>ITU-R M.2101-0</u>	ITU-R WP 5D	published	Modelling and simulation of IMT networks and systems for use in sharing and compatibility studies	IMT-2020
<u>ITU-R M.2410-0</u>	ITU-R WP 5D	published	Minimum requirements related to technical performance for IMT-2020 radio interface(s)	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-R M.2411-0</u>	ITU-R WP 5D	published	Requirements, evaluation criteria and submission templates for the development of IMT-2020	IMT-2020
<u>ITU-R M.2412-0</u>	ITU-R WP 5D	published	Guidelines for evaluation of radio interface technologies for IMT-2020	IMT-2020
<u>ITU-R M.2441-0</u>	ITU-R WP 5D	published	Emerging usage of the terrestrial component of International Mobile Telecommunication (IMT)	IMT-2020

7.7 ITU-T SG2

ITU-T Study Group 2 is responsible for studies relating to operational aspects of service provision and telecommunications management. SG2 is also responsible for standards on the management of telecom services, networks and equipment. Telecom management systems are a crucial part of the business processes at the heart of service providers' operations. Standards focus on fault, configuration, accounting, performance and security management (FCAPS) interfaces. FCAPS interfaces sit between network elements and management systems and also between two management systems.

Table 7-7 provides a list of ITU-T SG2 deliverables associated with IMT-2020 networks.

Table 7-7 – ITU-T SG2 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T M.3041 (02/2020)</u>	ITU-T SG2	published	Framework of smart operation, management and maintenance	IMT-2020
<u>ITU-T M.AITOM</u>	ITU-T SG2	draft	Framework of AI enhanced Telecom Operation and Management (AITOM)	IMT-2020
<u>ITU-T M.3041 (ex. M.somm)</u>	ITU-T SG2	published	Framework of smart operation, management and maintenance	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T M.resm-AI (under study)</u>	ITU-T SG2	draft	Requirements for energy saving management of 5G RAN system with AI	IMT-2020

7.8 ITU-T SG5

ITU-T Study Group 5 (SG5) is responsible for studies on methodologies for evaluating ICT effects on climate change and publishing guidelines for using ICTs in an eco-friendly way. Under its environmental mandate, SG5 is also responsible for studying design methodologies to reduce ICTs and e-waste's adverse environmental effects, for example, through the recycling of ICT facilities and equipment.

Table 7-8 provides a list of ITU-T SG5 deliverables associated with IMT-2020 networks.

Table 7-8– ITU-T SG5 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T K Suppl. 10 (11/2017)</u>	ITU-T SG5	published	Analysis of EMC aspects and definition of requirements for 5G mobile systems	IMT-2020
<u>ITU-T K Suppl. 14 (09/2019)</u>	ITU-T SG5	published	The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment	IMT-2020
<u>ITU-T K Suppl. 16 (05/2019)</u>	ITU-T SG5	published	Electromagnetic field compliance assessments for 5G wireless networks	IMT-2020
<u>ITU-T K Suppl. 8 (11/2017)</u>	ITU-T SG5	published	Resistibility analysis of 5G systems	IMT-2020
<u>ITU-T K Suppl. 9 (05/2019)</u>	ITU-T SG5	published	5G technology and human exposure to RF EMF	IMT-2020
<u>ITU-T K Suppl. 9 (11/2017)</u>	ITU-T SG5	published	5G technology and human exposure to RF EMF	IMT-2020

Name	Responsible group	Status	Subject	Topics
ITU-T K.116 (07/2019)	ITU-T SG5	published	Electromagnetic compatibility requirements and test methods for radio telecommunication terminal equipment	IMT-2020
ITU-T K.136 (11/2018)	ITU-T SG5	published	Electromagnetic Compatibility requirements for radio telecommunication equipment	IMT-2020
ITU-T K.5G-Lightning (under study)	ITU-T SG5	draft	Practical guide for lightning protection, earthing and bonding, and safety consideration of 5G radio base station	IMT-2020
ITU-T K.Sup.5G.EMC (under study)	ITU-T SG5	draft	Impacts of Electromagnetic compatibility test methods for 5G AAS	IMT-2020
ITU-T K.Supp.16 to ITU-T K.series (5/2019) (ex K.Supp 5G EMF Compliance)	ITU-T SG5	published	Electromagnetic field (EMF) compliance assessments for 5G wireless networks	IMT-2020
ITU-T L Suppl. 36 (11/2017)	ITU-T SG5	published	Study on methods and metrics to evaluate energy efficiency for future 5G systems	IMT-2020
ITU-T L.1022 (10/2019) (ex L.CE concepts)	ITU-T SG5	published	Circular Economy: Definitions and concepts for material efficiency for ICT	IMT-2020
ITU-T L.1210 (12/2019)	ITU-T SG5	published	Sustainable power feeding solutions for 5G networks	IMT-2020
ITU-T L.1220 (08/2017)	ITU-T SG5	published	Innovative energy storage technology for stationary use - Part 1: Overview of energy storage	Cloud Computing; IMT-2020; Energy management

Name	Responsible group	Status	Subject	Topics
				and power supply
<u>ITU-T L.1221 (11/2018)</u>	ITU-T SG5	published	Innovative energy storage technology for stationary use - Part 2: Battery	IMT-2020; Energy management and power supply; IoT & Smart Sustainable Cities Standards
<u>ITU-T L.1222 (05/2018)</u>	ITU-T SG5	published	Innovative energy storage technology for stationary use - Part 3: Supercapacitor technology	IMT-2020; Energy management and power supply; IoT & Smart Sustainable Cities Standards
<u>ITU-T L.1310 (07/2017)</u>	ITU-T SG5	published	Energy efficiency metrics and measurement methods for telecommunication equipment	IMT-2020; Energy management and power supply
<u>ITU-T L.1320 (03/2014)</u>	ITU-T SG5	published	Energy efficiency metrics and measurement for power and cooling equipment for telecommunications and data centres	Cloud Computing; IMT-2020
<u>ITU-T L.1325 (12/2016)</u>	ITU-T SG5	published	Green ICT solutions for telecom network facilities	IMT-2020; Energy management and power supply
<u>ITU-T L.1331 (04/2017)</u>	ITU-T SG5	published	Assessment of mobile network energy efficiency	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T L.1331 (under study)</u>	ITU-T SG5	draft	Assessment of mobile network energy efficiency	IMT-2020
<u>ITU-T L.1350 (10/2016)</u>	ITU-T SG5	published	Energy efficiency metrics of a base station site	IMT-2020
<u>ITU-T L.1351 (08/2018)</u>	ITU-T SG5	published	Energy efficiency measurement methodology for base station sites	Security assessment and evaluation criteria; Security policy and policy mechanisms; IMT-2020
<u>ITU-T L.1380 (11/2019)</u>	ITU-T SG5	published	Smart energy solution for telecom sites	IMT-2020
<u>ITU-T L.1410 (12/2014)</u>	ITU-T SG5	published	Methodology for environmental life cycle assessments of information and communication technology goods, networks and services	Cloud Computing; IMT-2020
<u>ITU-T L.1470 (01/2020)</u>	ITU-T SG5	published	GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement	IMT-2020
<u>ITU-T L.1210 (12/2019) (ex L.5G powering)</u>	ITU-T SG5	published	Sustainable power feeding solutions for 5G network	IMT-2020
<u>ITU-T L.5G sav (under study)</u>	ITU-T SG5	draft	Energy saving technologies and best practices for 5G RAN equipment	IMT-2020
<u>ITU-T L.EE 5G (under study)</u>	ITU-T SG5	draft	Energy efficiency Metrics and measurement methodology for 5G solutions	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T L.EE_slicing (under study)</u>	ITU-T SG5	draft	Environmental KPIs/metrics for 5G architectures	IMT-2020
<u>ITU-T L.1316 (11/2019) (ex L.EEframe)</u>	ITU-T SG5	published	Energy efficiency framework	IMT-2020
<u>ITU-T L.ENV-KPI-5G-ARCH (under study)</u>	ITU-T SG5	draft	Environmental KPIs/metrics for 5G architectures	IMT-2020
<u>ITU-T L.ewaste-base_station (under study)</u>	ITU-T SG5	draft	Scheduled waste management for base station (inclusive of e-waste)	IMT-2020
<u>ITU-T L.ICT_CE (under study)</u>	ITU-T SG5	draft	ICT response to circular economy	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T L.methodology_arch (under study)</u>	ITU-T SG5	draft	Methodology to assess the environmental impact of the different proposed architectures	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T L.1380 (11/2019) (ex L.SE_BS)</u>	ITU-T SG5	published	Smart energy solution for telecom sites	IMT-2020
<u>ITU-T L.1470 (01/2020) (ex L.Trajectories)</u>	ITU-T SG5	published	Recommendation on GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement	IMT-2020

7.9 ITU-T SG9

ITU-T Study Group 9 is responsible for studies relating to television and sound transmission and integrated broadband cable networks.

Table 7-9 provides a list of ITU-T SG9 deliverables associated with IMT-2020 networks.

Table 7-9 – ITU-T SG9 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Q.5021 (07/2019)</u>	ITU-T SG9	published	Protocol for managing capability exposure APIs in IMT-2020 network	IMT-2020

7.10 ITU-T SG11

Study Group 11 is responsible for developing test specifications for testing conformance and interoperability (C&I) for all types of networks, technologies and services, a testing methodology and test suites for standardized network parameters in relation to the framework for Internet-related performance measurement, as well as for existing technologies (e.g., NGN) and emerging technologies (e.g., FN, cloud, SDN, NFV, IoT, VoLTE/ViLTE, IMT-2020 technologies, flying ad hoc networks, tactile Internet, augmented reality, etc.).

Table 7-10 provides a list of ITU-T SG11 deliverables associated with IMT-2020 networks.

Table 7-10 – ITU-T SG11 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Q.3054 (04/2019)</u>	ITU-T SG11	published	Signalling architecture for virtualization of control network entities	Security Architectures, Models and Frameworks; Security protocol standards; IMT-2020
<u>ITU-T Q.3714 (01/2018)</u>	ITU-T SG11	published	Signalling requirements of SDN-based access networks with media independent management capabilities	IMT-2020
<u>ITU-T Q.3715 (01/2018)</u>	ITU-T SG11	published	Signalling requirements for dynamic bandwidth adjustment on demand on broadband network gateway implemented by	IMT-2020

Name	Responsible group	Status	Subject	Topics
			software-defined networking technologies	
<u>ITU-T Q.3716 (01/2018)</u>	ITU-T SG11	published	Signalling Requirements for Mapping between Physical and Virtual Networks	IMT-2020
<u>ITU-T Q.3740 (01/2018)</u>	ITU-T SG11	published	Signalling Requirements for SDN and NFV based Central Office services	IMT-2020
<u>ITU-T Q.3741 (07/2019)</u>	ITU-T SG11	published	Signalling requirements for SD-WAN service	IMT-2020
<u>ITU-T Q.4061 (04/2019)</u>	ITU-T SG11	published	Framework of SDN controller testing	IMT-2020
<u>ITU-T Q.5001 (10/2018)</u>	ITU-T SG11	published	Signalling requirements and architecture of intelligent edge computing	IMT-2020
<u>ITU-T Q.5020 (04/2019)</u>	ITU-T SG11	published	Protocol requirements and procedures for network slice lifecycle management	IMT-2020
<u>ITU-T Q.5021 (07/2019) (ex Q.CE-APIMP)</u>	ITU-T SG11	draft	Protocol for managing capability exposure APIs in IMT-2020 network	IMT-2020
<u>ITU-T Q.D2D-EECP (under study)</u>	ITU-T SG11	draft	Energy efficient D2D communication protocol for IMT 2020 network	IMT-2020
<u>ITU-T Q.IEC-PRO (under study)</u>	ITU-T SG11	draft	Protocols for microservices based intelligent edge computing	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Q.5001 (10/2018) (ex Q.IEC-REQ)</u>	ITU-T SG11	published	Signalling requirement and architecture of intelligent edge computing	IMT-2020
<u>ITU-T Q.IMT2020-PFW (under study)</u>	ITU-T SG11	draft	Protocol Framework for IMT-2020	IMT-2020
<u>ITU-T Q.IMT2020-PIAS (under study)</u>	ITU-T SG11	draft	Protocol for providing intelligent analysis services in IMT-2020 network	IMT-2020
<u>ITU-T Q.INS-PM (under study)</u>	ITU-T SG11	draft	Protocol for managing Intelligent Network Slicing with AI-assisted analysis in IMT-2020 network	IMT-2020
<u>ITU-T Q.LiteIMS-SA (under study)</u>	ITU-T SG11	draft	Signalling architecture of Lite IMS for IMT-2020 advanced network	IMT-2020
<u>ITU-T Q.5020 (04/2019) (ex Q.NS-LCMP)</u>	ITU-T SG11	published	Protocol requirements and procedures for network slice lifecycle management	IMT-2020
<u>ITU-T Q.QMP-TCA (under study)</u>	ITU-T SG11	draft	QoS management protocol for time constraint applications over SDN	IMT-2020
<u>ITU-T Q.4061 (04/2019) (ex Q.SDN-CT)</u>	ITU-T SG11	published	Framework of SDN controller testing	IMT-2020
<u>ITU-T Q.SDN-OFT (under study)</u>	ITU-T SG11	draft	The compatibility testing of SDN-based equipment using OpenFlow protocol	IMT-2020
<u>ITU-T Q.telemetry-VBNS (under study)</u>	ITU-T SG11	draft	Signalling requirements for telemetry of virtual	IMT-2020

Name	Responsible group	Status	Subject	Topics
			broadband network services	
<u>ITU-T Q.TP_AR (under study)</u>	ITU-T SG11	draft	Testing procedures of Augmented Reality applications	IMT-2020
<u>ITU-T Q.VNFT-req (under study)</u>	ITU-T SG11	draft	Signaling requirements for VNF lifecycle management under testing environment	IMT-2020
<u>ITU-T Q.WLAN5G-REQ</u>	ITU-T SG11	draft	Signalling requirements of WLAN access network for interworking with 5G network	IMT-2020

7.11 ITU-T SG12

ITU-T Study Group 12 is responsible for Recommendations on performance, quality of service (QoS) and quality of experience (QoE) for the full spectrum of terminals, networks, services and applications ranging from speech over fixed circuit-based networks to multimedia applications over networks that are mobile and packet based. Included in this scope are the operational aspects of performance, QoS and QoE; the end-to-end quality aspects of interoperability; and the development of multimedia quality assessment methodologies, both subjective and objective.

Table 7-11 provides a list of ITU-T SG12 deliverables associated with IMT-2020 networks.

Table 7-11 – ITU-T SG12 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Y.1550 (01/2019)</u>	ITU-T SG12	published	Considerations for Realizing Virtual Measurement Systems	IMT-2020

7.12 ITU-T SG13

ITU-T Study Group 13 is responsible for studies relating to the requirements, architectures, capabilities, and APIs as well as softwarization and orchestration aspects of converged future networks (FN), specifically focusing on IMT-2020 non-radio related parts. This also includes IMT-2020 project management coordination across all ITU-T study groups and release planning and

implementation scenarios. It is responsible for studies relating to cloud-computing technologies, big data, virtualization, resource management, reliability and security aspects of the considered network architectures. It is responsible for studies relating to FMC, mobility management, and enhancements to existing ITU-T Recommendations on mobile communications, including the energy-saving aspects. Furthermore, Study Group 13 responsibility includes studies on emerging network technologies for IMT-2020 networks and future networks, such as Information Centric Networking (ICN)/Content Centric Networking (CCN). Study Group 13 is also responsible for studies relating to standardization of concepts and mechanisms to enable trusted ICT, including framework, requirements, capabilities, architectures and implementation scenarios of trusted network infrastructures and trusted cloud solutions in coordination with all study groups concerned.

Table 7-12 provides a list of ITU-T SG13 deliverables associated with IMT-2020 networks.

Table 7-12 – ITU-T SG13 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Y.3071 (03/2017)</u>	ITU-T SG13	published	Data aware networking (information centric networking) – Requirements and capabilities	IMT-2020; Cloud Computing
<u>ITU-T Y.3100 (09/2017)</u>	ITU-T SG13	published	Terms and definitions for IMT-2020 network	IMT-2020
<u>ITU-T Y.3110 (09/2017)</u>	ITU-T SG13	published	IMT-2020 Network Management and Orchestration Requirements	IMT-2020
<u>ITU-T Y.3111 (09/2017)</u>	ITU-T SG13	published	IMT-2020 Network Management and Orchestration Framework	IMT-2020
<u>ITU-T Y.3131 (08/2019) (ex Y.FMC-ARCH)</u>	ITU-T SG13	published	Functional architecture for supporting fixed mobile convergence in IMT-2020 networks	IMT-2020
<u>ITU-T Y.3132 (12/2019) (ex Y.FMC-MM)</u>	ITU-T SG13	published	Mobility management for fixed mobile convergence in IMT-2020 networks	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Y.3130 (01/2018) (ex Y.FMC-REQ)</u>	ITU-T SG13	published	Requirements of IMT-2020 fixed-mobile convergence	IMT-2020
<u>ITU-T Y.FMC- ReqMO (under study)</u>	ITU-T SG13	draft	IMT-2020 FMC functional requirements for management and orchestration	IMT-2020
<u>ITU-T Y.IMT- 2020.qos-mon (under study)</u>	ITU-T SG13	draft	IMT-2020 network QoS monitoring architectural framework	IMT-2020
<u>ITU-T Y.3104 (12/2018) (ex Y.IMT2020-arch)</u>	ITU-T SG13	published	Architecture of the IMT-2020 network	IMT-2020
<u>ITU-T Y.3105 (12/2018) (ex Y.IMT2020-CE- Req)</u>	ITU-T SG13	published	Requirements of capability exposure in the IMT-2020 networks	IMT-2020
<u>ITU-T Y.3108 (12/2019) (ex Y.IMT2020-CEF)</u>	ITU-T SG13	published	Capability exposure function in the IMT-2020 networks	IMT-2020
<u>ITU-T Y.3102 (05/2018) (ex Y.IMT2020-frame)</u>	ITU-T SG13	published	Framework of IMT-2020 network	IMT-2020
<u>ITU-T Y.3112 (12/2018) (ex Y.IMT2020- MultiSL)</u>	ITU-T SG13	published	Framework for the support of Multiple Network Slicing	IMT-2020
<u>ITU-T Y.3150 (01/2018) (ex Y.IMT2020- NetSoft)</u>	ITU-T SG13	published	High level technical characteristic of network softwarization for IMT-2020	IMT-2020
<u>ITU-T Y.3101 (01/2018) (ex Y.IMT2020-reqts)</u>	ITU-T SG13	published	Requirements of the IMT-2020 network	IMT-2020
<u>ITU-T Y.3172 (09/2018) (ex Y.qos-ml)</u>	ITU-T SG13	published	Requirements for machine learning-based QoS assurance	IMT-2020

Name	Responsible group	Status	Subject	Topics
			for the IMT-2020 network	

7.13 ITU-T SG15

ITU T Study Group 15 is responsible in ITU T for the development of standards for the optical transport network, access network, home network and power utility network infrastructures, systems, equipment, optical fibres and cables. This includes related installation, maintenance, management, test, instrumentation and measurement techniques, and control plane technologies to enable the evolution toward intelligent transport networks, including the support of smart-grid applications.

Table 7-13 provides a list of ITU-T SG15 deliverables associated with IMT-2020 networks.

Table 7-13 – ITU-T SG15 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T G Suppl. 66 (07/2019)</u>	ITU-T SG15	published	5G wireless fronthaul requirements in a passive optical network context	IMT-2020; Wireless – Fibre Access Networks
<u>ITU-T G Suppl. 67 (07/2019)</u>	ITU-T SG15	published	Application of optical transport network Recommendations to 5G transport	IMT-2020
<u>ITU-T G.709.4 (ex-G.709.25-50)</u>	ITU-T SG15	draft	OTU 25 and OTU 50G short reach interfaces	IMT-2020
<u>ITU-T G.8261/Y.1361 (08/2019)</u>	ITU-T SG15	published	Timing and synchronization aspects in packet networks	IMT-2020
<u>ITU-T G.8262.1 Amd.1 (08/2019)</u>	ITU-T SG15	published	Timing characteristics of synchronous equipment slave clock - Amendment 1	IMT-2020
<u>ITU-T G.8262.1/Y.1362.1 (01/2019)</u>	ITU-T SG15	published	Timing characteristics of an enhanced synchronous equipment slave clock	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T G.8271.1/Y.1366.1 (2017) Amd.1</u>	ITU-T SG15	published	Network limits for time synchronization in Packet networks - Amendment 1	IMT-2020
<u>ITU-T G.8272.1/Y.1367.1 (2016) Amd.2</u>	ITU-T SG15	published	Timing characteristics of enhanced primary reference time clocks - Amendment 2	IMT-2020
<u>ITU-T G.8273.2/Y.1368.2 (08/2019)</u>	ITU-T SG15	published	Timing characteristics of telecom boundary clocks and telecom time slave clocks	IMT-2020
<u>ITU-T G.8273.2/Y.1368.2 Amd.2 (under study)</u>	ITU-T SG15	published	Timing characteristics of telecom boundary clocks and telecom time slave clocks - Amendment 2	IMT-2020
<u>ITU-T G.8275/Y.1369 (2017) Amd.2</u>	ITU-T SG15	published	Architecture and requirements for packet-based time and phase distribution - Amendment 2	IMT-2020
<u>ITU-T G.8300 (02/2020) (ex. G.ctn5g)</u>	ITU-T SG15	draft	Characteristics of transport networks to support IMT-2020/5G	IMT-2020
<u>ITU-T G.mtn (under study)</u>	ITU-T SG15	draft	Interfaces for a metro transport network	IMT-2020
<u>ITU-T G.mtn-arch (under study)</u>	ITU-T SG15	draft	Functional architecture for metro transport network	IMT-2020
<u>ITU-T G.mtn-eqpt (under study)</u>	ITU-T SG15	draft	Characteristics of MTN equipment functional blocks	IMT-2020
<u>ITU-T G.mtn-mgmt (under study)</u>	ITU-T SG15	draft	Management and Control for metro transport network	IMT-2020
<u>ITU-T G.mtn-prot (under study)</u>	ITU-T SG15	draft	MTN linear protection	IMT-2020

Name	Responsible group	Status	Subject	Topics
ITU-T G.Sup.67	ITU-T SG15	published	Application of OTN to 5G Transport	IMT-2020
ITU-T G.suppl.66 (07/2019)(ex G.sup.5GP)	ITU-T SG15	published	5G Wireless Fronthaul Requirements in a PON Context	IMT-2020
ITU-T GSTR-TN5G (under study)	ITU-T SG15	published	Transport network support of IMT-2020/5G	IMT-2020

7.14 ITU-T SG17

ITU-T Study Group 17 (SG17) coordinates security-related work across all ITU-T Study Groups. Often working in cooperation with other standards development organizations (SDOs) and various ICT industry consortia, SG17 deals with a broad range of standardization issues. SG17 is currently working on cybersecurity; security management; security architectures and frameworks; countering spam; identity management; the protection of personally identifiable information; and the security of applications and services for the Internet of Things (IoT), smart grids, smartphones, software-defined networking (SDN), web services, big data analytics, social networks, cloud computing, mobile financial systems, IPTV and telebiometrics.

Table 7-14 provides a list of ITU-T SG17 deliverables associated with IMT-2020 networks.

Table 7-14 – ITU-T SG17 deliverables

Name	Responsible group	Status	Subject	Topics
ITU-T X.1038 (10/2016)	ITU-T SG17	published	Security requirements and reference architecture for software-defined networking	Threats and threat assessment; Security management standards and guidance documents; IMT-2020
ITU-T X.1042 (01/2019)	ITU-T SG17	published	Security services using software-defined networking	Network security; Security services; IMT-2020
ITU-T X.1043 (03/2019)	ITU-T SG17	published	Security framework and requirements for service function chaining based on	Threats and threat assessment; Network security; Security Architectures,

Name	Responsible group	Status	Subject	Topics
			software-defined networking	Models and Frameworks; IMT-2020
<u>ITU-T X.5Gsec-ecs (under study)</u>	ITU-T SG17	draft	Security Framework for 5G Edge Computing Services	IMT-2020
<u>ITU-T X.5Gsec-guide (under study)</u>	ITU-T SG17	draft	Security guideline for 5G communication system based on ITU-T X.805	IMT-2020
<u>ITU-T X.5Gsec-netec (under study)</u>	ITU-T SG17	draft	Security capabilities of network layer for 5G edge computing	IMT-2020
<u>ITU-T X.5Gsec-q (under study)</u>	ITU-T SG17	draft	Security guidelines for applying quantum-safe algorithms in 5G systems	IMT-2020
<u>ITU-T X.5Gsec-t (under study)</u>	ITU-T SG17	draft	Security framework based on trust relationship in 5G ecosystem	IMT-2020
<u>ITU-T X.1042 (01/2019) (ex X.sdnsec-1)</u>	ITU-T SG17	published	Security services using the software-defined networking	IMT-2020
<u>ITU-T X.1043 (03/2019) (ex X.sdnsec-3)</u>	ITU-T SG17	published	Security framework and requirements for service function chaining based on software-defined networking	IMT-2020
<u>ITU-T X.SDSec (under study)</u>	ITU-T SG17	draft	Guideline on Software-defined Security in SDN/NFV Network	IMT-2020
<u>ITU-T X.1044 (10/2019) (ex X.srvn)</u>	ITU-T SG17	published	Security Requirements of Network Virtualization	IMT-2020
<u>ITU-T X.1045 (10/2019) (ex X.ssc)</u>	ITU-T SG17	draft	Security service chain architecture for	IMT-2020

Name	Responsible group	Status	Subject	Topics
			networks and applications	

7.15 ITU-T SG20

Study Group 20 is responsible for studies relating to Internet of things (IoT) and its applications, and smart cities and communities (SC&C). This includes studies relating to big data aspects of IoT and SC&C, e-services and smart services for SC&C.

Table 7-15 provides a list of ITU-T SG20 deliverables associated with IMT-2020 networks.

Table 7-15 – ITU-T SG20 deliverables

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Y Suppl. 45 (09/2017)</u>	ITU-T SG20	published	ITU-T Y.4000-series - An overview of smart cities and communities and the role of information and communication technologies	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T Y.4100/Y.2066 (06/2014)</u>	ITU-T SG13	published	Common requirements of the Internet of things	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T Y.4113 (09/2016)</u>	ITU-T SG20	published	Requirements of the network for the Internet of things	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T Y.4114 (07/2017)</u>	ITU-T SG20	published	Specific requirements and capabilities of the Internet of things for big data	IMT-2020; IoT & Smart Sustainable Cities Standards
<u>ITU-T Y.4208 (01/2020)</u>	ITU-T SG20	published	IoT requirements for support of edge computing	IMT-2020
<u>ITU-T Y.IoT-EC-GW (under study)</u>	ITU-T SG20	draft	Capabilities and framework of edge computing-enabled gateway in the IoT	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>ITU-T Y.4208 (01/2020) (ex Y.IoT-EC-reqts)</u>	ITU-T SG20	published	IoT requirements for support of edge computing	IMT-2020
<u>ITU-T Y.UAV.arch (under study)</u>	ITU-T SG20	draft	Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks	IMT-2020

7.16 MEF

MEF, founded in 2001 as the Metro Ethernet Forum is a nonprofit international industry consortium, dedicated to adoption of assured services orchestrated across a global ecosystem of automated networks. The work of MEF includes Optical, Carrier Ethernet, IP, SD-WAN Services and Cloud Services, as well as orchestration of the service lifecycle.

Table 7-16 provides a list of MEF deliverables associated with IMT-2020 networks.

Table 7-16 – MEF deliverables

Name	Responsible group	Status	Subject	Topics
<u>MEF 10.4</u>	MEF	published	Subscriber Ethernet Services Attributes	IMT-2020
<u>MEF 22.3</u>	MEF	published	Implementation Agreement – Transport Services for Mobile Networks	IMT-2020
<u>MEF 23.2</u>	MEF	published	Class of Service Phase 3 Implementation Agreement	IMT-2020
<u>MEF 23.2.1</u>	MEF	published	Models for Bandwidth Profiles with Token Sharing	IMT-2020
<u>MEF 26.2</u>	MEF	published	External Network Network Interface (ENNI) and Operator Service Attributes	IMT-2020

Name	Responsible group	Status	Subject	Topics
MEF 30.1	MEF	published	Service OAM Fault Management Implementation Agreement Phase 2	IMT-2020
MEF 30.1.1	MEF	published	Amendment to SOAM FM IA	IMT-2020
MEF 35.1	MEF	published	Service OAM Performance Monitoring Implementation Agreement	IMT-2020
MEF 43	MEF	published	Virtual NID (vNID) Functionality for E-Access Services	IMT-2020
MEF 51.1	MEF	published	Operator Ethernet Service Definitions	IMT-2020
MEF 6.2	MEF	published	EVC Ethernet Services Definitions Phase 3	IMT-2020
MEF 61	MEF	published	IP Service Attributes for Subscriber IP Services	IMT-2020
MEF 62	MEF	published	Managed Access E-Line Service Implementation Agreement	IMT-2020
MEF 63	MEF	published	Subscriber Layer 1 Service Attributes	IMT-2020

7.17 NGMN

The Next Generation Mobile Networks (NGMN) Alliance is a mobile telecommunications association of mobile operators, vendors, manufacturers and research institutes. It was founded by major mobile operators in 2006 as an open forum to evaluate candidate technologies to develop a common view of solutions for the next evolution of wireless networks. Its objective is to ensure the successful commercial launch of future mobile broadband networks through a roadmap for technology and friendly user trials. The NGMN Alliance complements and supports standards organizations by providing a coherent view of what mobile operators require.

Table 7-17 provides a list of NGMN deliverables associated with IMT-2020 networks.

Table 7-17 – NGMN deliverables

Name	Responsible group	Status	Subject	Topics
<u>Architectural Proposal for the Handling of Network Operations Data with Specific Focus on Virtualized Networks</u>	NGMN	draft	Network Management & Orchestration	IMT-2020
<u>Final Report on 5G NSA & SA IoT</u>	NGMN	draft	Trial & Testing	IMT-2020
<u>Final report on 5G pre-commercial trials</u>	NGMN	draft	Trial & Testing	IMT-2020
<u>First Version of Framework document to 3GPP and others</u>	NGMN	draft	E2E Architecture Framework	IMT-2020
<u>First version of pre-commercial trials framework document</u>	NGMN	draft	Trial & Testing	IMT-2020
<u>Initial report on 5G pre-commercial trials</u>	NGMN	draft	Trial & Testing	IMT-2020
<u>Intermediate Report on 5G NSA IoT</u>	NGMN	draft	Trial & Testing	IMT-2020
<u>Position Paper on “Additional spectrum bands for 5G and the WRC-19”</u>	NGMN	draft	Spectrum	IMT-2020
<u>Spectrum White Paper on "Spectrum licensing and other regulatory issues for 5G"</u>	NGMN	draft	Spectrum	IMT-2020
<u>Technology Building Blocks</u>		draft	Trial & Testing	IMT-2020
<u>V2X White Paper</u>	NGMN	draft	V2X	IMT-2020
<u>White Paper on 5G and IPR Related Questions</u>	NGMN	draft	IPR	IMT-2020
<u>White Paper on 5G RAN CU-DU network architecture, dimensioning and performance requirements</u>	NGMN	draft	RAN functional split & X-haul	IMT-2020

Name	Responsible group	Status	Subject	Topics
<u>White Paper on Active Antenna Requirements</u>	NGMN	draft	Base Station Antenna Requirements	IMT-2020
<u>White Paper on Extreme 5G Requirements</u>	NGMN	draft	Extreme 5G Requirements	IMT-2020
<u>White Paper on Passive Antenna Requirements</u>	NGMN	draft	Base Station Antenna Requirements	IMT-2020
<u>White Paper on recommendations for RAN functional decomposition</u>	NGMN	draft	RAN functional split & X-haul	IMT-2020
<u>White Paper on Service-Based Architecture in 5G</u>	NGMN	draft	Service-Based Architecture in 5G	IMT-2020

7.18 TM Forum

TM Forum is the global member association for digital business. It provides a platform for hundreds of global members across a wide range of industries: communications, technology, cities and municipal government, finance, healthcare and so on, to collaborate and partner to co-create, prototype, deliver, and monetize innovative digital services for their billions of customers

Table 7-18 provides a list of TM Forum deliverables associated with IMT-2020 networks.

Table 7-18 – TM Forum deliverables

Name	Responsible group	Status	Subject	Topics
<u>GB922 Logical and Compound Resource R19.0.1</u>	TM Forum	published	Network function virtualization NaaS	IMT-2020
<u>TM Forum GB922 Information Framework (SID) R17.0.1</u>	TM Forum	published	Network function virtualization NaaS	IMT-2020
<u>TM Forum GB922 Standards Addenda for Information Framework R17.0.1</u>	TM Forum	draft	Network function virtualization NaaS	IMT-2020

Name	Responsible group	Status	Subject	Topics
TM Forum IG1139 Business Rationale and Technical Overview for Orchestration and Autonomic Control Loops R16.0.1	TM Forum	published	Network function virtualization NaaS	IMT-2020
TM Forum TMF070 Hybrid Environment Implementation Blueprints Suite R17.0.1	TM Forum	draft	Network function virtualization NaaS	IMT-2020
TM Forum TMF070B Advanced Platform Deployment Blueprints R17.5.1	TM Forum	published	Network function virtualization NaaS	IMT-2020
TM Forum TMF628 Performance Management API REST Specification R14.5.1	TM Forum	published	NaaS, OpenAPIs	IMT-2020
TM Forum TMF664 Resource Function Activation and Configuration API REST Specification R17.5.1	TM Forum	published	NaaS, OpenAPIs	IMT-2020
TM Forum TR255 Resource Function Activation and Configuration Suite R17.0.1	TM Forum	draft	Network function virtualization NaaS	IMT-2020
TM Forum TR262 Hybrid Infrastructure Platform Blueprint R17.0.1	TM Forum	published	NaaS	IMT-2020