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| **Abstract:**  | This document reports a progress to date on each of the lead study group roles of SG13. It covers the period from end of TSAG meeting, January 2021, and addresses some anticipated activities. |

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# Assigned lead study group duties

WTSA-16 assigned Study Group 13 to be the lead study group:

* on future networks such as IMT-2020 networks (non-radio related parts)
* on mobility management
* on cloud computing
* on trusted network infrastructures

# Lead study group activities on future networks such as IMT-2020 networks (non-radio related parts)

The studies on IMT-2020 networks are being carried out by Q2/13, Q6/13, Q20/13, Q21/13, Q22/13 and Q23/13 belonging to WP1/13 “IMT-2020 and Beyond: Networks & Systems” and WP3/13 “Network Evolution, Trust and Quantum Enhanced Networking”.

## *2.1 SG13 related studies*

SG13 has continued its active role in IMT2020/5G standardization by approving the following **new standards** since the last TSAG meeting:

* [Y.3113](https://www.itu.int/rec/T-REC-Y.3113/en) “Requirements and framework for latency guarantee in large-scale networks including the IMT-2020 network”
* [Y.3177](https://www.itu.int/rec/T-REC-Y.3177/en) “Architectural framework for artificial intelligence-based network automation for resource and fault management in future networks including IMT-2020”
* [Y.3157](https://www.itu.int/rec/T-REC-Y.3157/en) “IMT-2020 network slice configuration”
* [Y.3178](https://www.itu.int/rec/T-REC-Y.3178/en) “Functional framework of artificial intelligence-based network service provisioning in future networks including IMT-2020”
* [Y.3179](https://www.itu.int/rec/T-REC-Y.3179/en) “Architectural framework for machine learning model serving in future networks including IMT-2020”
* [Y.3077](https://www.itu.int/rec/T-REC-Y.3077/en) “Framework for interworking of heterogeneous application domain connected objects through information-centric networking in IMT-2020”
* [Y.3109](https://www.itu.int/rec/T-REC-Y.3109/en) “Quality of service assurance-related requirements and framework for virtual reality delivery using mobile edge computing supported by IMT-2020”

**Liaison relations** concerning Future Networks including IMT2020 include besides ITU-T SG’s organizations outside ITU as IETF, IRTF, IEEE, 3GPP, ETSI, TTA, ONF, MEF, OASIS, NGMN Alliance, GSMA, Broadband Forum, oneM2M, ONAP, OSSDN, SCF, TM Forum, TSDSI.

Currently progressing **work items** (about **50**) include, *among others,* Y.IMT2020-qos-req-cg on QoS requirements for cloud gaming supported by IMT-2020, Y.IMT2020-qos-req-ti on QoS requirements for the tactile internet, Y.IMT2020-qos-req-tcn on QoS requirements for train communication network supported by IMT-2020,  Y.IMT2020-fa-lg-lsn on Functional architecture for latency guarantee in large scale networks including IMT-2020 and beyond, Y.IMT2020-det-qos-reqts-lan on Framework and QoS requirements to support of inter-domain deterministic communication services in local area network for IMT-2020, Y.IMT2020-DN-CCF on Future networks including IMT-2020: capability classification framework for dedicated networks, Y.IMT2020-AIICDN-arch on AI integrated cross-domain network architecture for future networks including IMT-2020, Y.IMT2020-CEFEC on Framework of capability exposure function in edge computing for IMT-2020 networks and beyond, Y.IMT2020-SOCN-req-frame on Future networks including IMT-2020: requirements and framework for self-organizing core networks, Y.ML-IMT2020-MLFO on Requirements and architecture for machine learning function orchestrator, Y.ML-IMT2020-SANDBOX on Machine learning sandbox for future networks including IMT-2020: requirements and architecture framework, Y.ML-IMT2020-VNS on Framework for network slicing management enabled by machine learning including input from verticals, Y.IMT2020-EIL on Evaluating intelligence capability for network slice management and orchestration in IMT-2020, Y.IMT2020-DL-AINW-fra on a communication model for AI-based management in IMT-2020 and beyond, Y.IMT2020-IBNMO on Intent-based network management and orchestration for network slicing in IMT-2020 networks and beyond, Y.IMT2020-STI-NS on Network slicing in satellite-terrestrial integration in IMT-2020 networks and beyond, Y.IMT2020-mAI on Traffic typization IMT-2020 management based on an artificial intelligent approach, Y.ICN-core-arch on Architecture of information centric core network, Y.ICN-NMR on Framework of locally enhanced name mapping and resolution for information centric networking in IMT-2020, Y.MNS-DLT-fr on Requirements and framework of mobile network sharing based on distributed ledger technology for IMT-2020 and beyond, Y.ICN-TL on Requirements and Capabilities of Transport Layer for ICN in IMT-2020, Y.ICN-SEAN on Architecture and Functional Framework for on-Site Elastic and Autonomous ICN, Y.ICN-DOS on Requirements and capabilities of data object segmentation in information centric networking for IMT-2020, Y.FMSC-frame on Framework of fixed, mobile and satellite convergence in IMT-2020 network and beyond, Y. FMSC-MEC on Multi-access Edge Computing for fixed, mobile and satellite convergence in IMT-2020 networks and beyond, Y.FMC-SDWAN on Fixed Mobile Convergence enhancements to support IMT-2020 based Software-defined wide area networking service, Y. FMSC-TS on Traffic scheduling for fixed, mobile and satellite convergence in IMT-2020 network and beyond, Y.FMC-EC on Unified edge computing for supporting fixed mobile convergence in IMT-2020 networks and Y.FMSC-req on Requirements of fixed, mobile and satellite convergence in IMT-2020 network and beyond.

For details see [SG13 work program](https://www.itu.int/itu-t/workprog/wp_search.aspx?sg=13) which can be found at [SG13 homepage](https://www.itu.int/en/ITU-T/studygroups/2017-2020/13/Pages/default.aspx).

Considering the activities related to IMT, the development of Q.174X-series of Recs in collaboration with organizational partners of 3GPP and 3GPP2 (ARIB, ETSI, TIA, ATIS, TTC, TTA, CCSA) is currently on hold due to lack of editors.

## *2.2 JCA IMT-2020*

SG13, through its JCA-IMT2020, coordinates work with the focus on the non-radio aspects within ITU-T and coordination of the communication with standards development organizations, consortia and forums also working on IMT2020 related standards. Tool for this is the **IMT-2020 and beyond standardization roadmap**. It represents a snapshot who is doing what in this area in the standardization world.

The latest published revision of the roadmap can be found in [Supplement 59](https://www.itu.int/rec/T-REC-Y.Sup59/en) to ITU-T Y.3100-series. The roadmap is also regularly updated online at <https://www.itu.int/net4/ITU-T/roadmap#?topic=0.130&workgroup=1&searchValue=&page=2&sort=Revelance>.

Next meeting of JCA IMT2020 is scheduled to take place alongside the November – December 2021 meeting of the SG13.

## *2.3 IMT2020/5G related activities by other ITU-T study groups*

For IMT2020/5G related activities of other ITU-T Study Groups (as SG2, SG5, SG11, SG15, SG17 and S20) it is referred to the corresponding [Work Program](https://www.itu.int/itu-t/workprog/) of those Study Groups.

# Lead study group activities on mobility management

The studies on mobility management (MM) are being carried out by Q23/13 “Networks beyond IMT2020: Fixed, mobile and satellite convergence”.

Since the last TSAG meeting SG13 approved one **new standard** [Y.3135](https://www.itu.int/rec/T-REC-Y.3135/en) “Service scheduling to support fixed-mobile convergence in the IMT 2020 network” in the area of mobility management.

Currently progressing **work items** include MM aspect: Y.FMSC-frame on Framework of fixed, mobile and satellite convergence in IMT-2020 network and beyond, Y.FMSC-MEC on Multi-access Edge Computing for fixed, mobile and satellite convergence in IMT-2020 networks and beyond, Y.FMSC-MM on Mobility Management for fixed mobile, NGSO-satellite convergence in IMT-2020 networks, Y.FMSC-CM on Connection Management for fixed, mobile and satellite convergence in IMT-2020 network and beyond, Y. FMSC-SMSB on Session Management for fixed mobile and satellite convergence with satellite backhaul in IMT-2020 networks and beyond and nine more. For details see SG13 work program which can be found at SG13 homepage.

# Lead study group activities on cloud computing

The studies on Cloud Computing are being carried out by Q17/13, Q18/13 and Q19/13 belonging to WP2/13 “Cloud Computing & Data Handling”.

## *4.1* *SG13 related studies*

Since last report to TSAG SG13 approved one and consented one **new standard** on cloud computing a follows:

* [Y.3527](https://www.itu.int/rec/T-REC-Y.3527/en) “Cloud computing - End-to-end fault and performance management framework of network services in inter-cloud” (09/2021)
* Y.3526 “Cloud Computing – Functional requirements of edge cloud management” (on 06.10.21 was under the AAP LC judgement).

Q17/13 “Future Networks: Requirements and Capabilities for Computing including Cloud Computing and Data Handling” continues to maintain/update *the* [*Big Data Standard Roadmap*](https://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15199)and [*Artificial Intelligence Standard Roadmap*](https://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15184). Each roadmap represents a snapshot who is doing what in this area in the standardization world.

**Liaison** relations concerning cloud computing and big data include beside ITU-T SG’s organizations outside ITU as W3C, OASIS, DMG, ISO/IEC JTC1 (in particular, with SC 38), TM Forum.

## Currently progressing work items include studies on Big Data (revised Y.3602 “Big data - Functional requirements for data provenance”, new version of the Supplement 40 to Y.3600-series “Big data standardization roadmap”, revised Y.3603 “Big data - Requirements and conceptual model of metadata for data catalogue”, Y.bdi-reqts “Big Data - Overview and functional requirements for data integration”, Y.bdp-arch “Big data - Functional architecture for data provenance” and five more), on Cloud Computing (Y.CAN-req “Cloud computing - Functional requirements of computing-aware networking”, revised Y.3505 “Cloud computing - Overview and functional requirements for data storage federation”, Y.cccm-reqts “Cloud Computing - Requirements for Containers”, Y.cccnp-reqts “Cloud computing - Functional requirements of cloud native platform as a service”, Y.csb-arch “Cloud Computing - Functional architecture for cloud service brokerage”, Y.ccdm-reqts “Cloud computing - Framework and functional requirements of cloud data mobility management”, Y.ccfrcm “Cloud Computing - Framework and requirements of container management in inter-cloud”, Y.ccrm “Cloud computing - Framework of risk management” and twelve other), on edge computing (Y.ec-reqts “Edge computing - Overview and requirements”, Y.ecloud-reqts “Cloud computing - Functional requirements of edge cloud”, Y. FMSC-MEC “Multi-access Edge Computing for fixed, mobile and satellite convergence in IMT-2020 networks and beyond’’, Y.FMC -AAEC-req “Use cases and Technical requirements for supporting application addressing in edge computing for future networks including IMT-2020 network”, Y.FMC-EC “Unified edge computing for supporting fixed mobile convergence in IMT-2020 networks” and four other).

## For details see SG13 [work program](https://www.itu.int/itu-t/workprog/wp_search.aspx?sg=13) which can be found at SG13 homepage.

## *4.2 Cloud Computing related activities by other ITU-T study groups*

For Cloud Computing activities of other ITU-T Study Groups it is referred to the corresponding Work Program of those Study Groups.

# Lead study group activities on trusted network infrastructures

The studies on trusted network infrastructures are being carried out by Q16/13 “Future Networks: Trustworthy and Quantum Enhanced Networking and Services” belonging to WP3/13 “Network Evolution, Trust and Quantum Enhanced Networking”.

## *5.1 SG13 related studies*

Since summer 2018 SG13 start working on quantum key distribution network. SG13 has continued its active role in trusted network infrastructures standardization by approving/consenting the following new standards since the last TSAG meeting:

* [Y.3056](https://www.itu.int/rec/T-REC-Y.3056/en) “Framework for bootstrapping of devices and applications for open access to trusted services in distributed ecosystems” (02/2021)
* Y.3806 “Quantum key distribution networks - Requirements for QoS assurance” (09/2021)
* Y.3057 “A trust index model for ICT infrastructures and services” (on 06.10.21 was in Last Call judgement)
* Y.3805 “Quantum Key Distribution Networks - Software Defined Networking Control” (on 06.10.21 was in Last Call judgement)
* Y.2086 “Framework and Requirements of Decentralized Trustworthy Network Infrastructure” (on 06.10.21 was in Last Call judgement)
* Supplement 70 to Y.3800-series “Quantum Key Distribution Networks - Applications of Machine Learning” was agreed for publication.

Q16/13 “Future Networks: Trustworthy and Quantum Enhanced Networking and Services” continues to maintain/update *the* [*Standardization roadmap on Trustworthy Networking and Services*](https://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17189)and the newly created (separated from the trustworthy roadmap) [*Standardization roadmap on Quantum Key Distribution Networks*](https://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17189). Each roadmap represents the landscape with related technical areas of trust technologies and QKDN respectfully from an ITU-T perspective and lists the related standards and publications developed in standards development organizations (SDOs).

Currently progressing **work items** include studies on trust with 6 work items (for instance, Y.trust-arch, “Functional architecture for trust enabled service provisioning”), and on QKDN with 12 work items (for example, Y.QKDN-frint “Framework for integration of QKDN and secure storage network”, Y.QKDN-qos-fa “Functional architecture of QoS assurance for quantum key distribution networks”, Y.QKDN-qos-ml-req “Requirements of machine learning based QoS assurance for quantum key distribution networks”, Y.QKDN-BM “Quantum Key Distribution Networks - Business role-based models”, Y.QKDN-iwfr “Quantum key distribution networks - interworking framework”). This work is performed by Qs 2/13, 6/13 and 16/13.

For details see SG13 work programme which can be found at SG13 homepage.

## *5.2 Trusted network infrastructures related activities by other ITU-T study groups*

For Trusted network infrastructures related activities of other ITU-T Study Groups it is referred to the corresponding Work Program of those Study Groups (SG17).

# 6. Other important activities of SG13 related to its Lead Study Group mandate

## *6.1 Workshops related to SG13 lead activities*

8th SG13 Regional Workshop for Africa “[Standardization and Future Networks: Opportunities for Africa beyond 2020​"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20210601) was convened online on 1 June 2021. Its sessions covered the lead SG13 areas of work.

A tutorial on autonomous networks took place online on 7 July 2021. Material presented may be retrieved in [SG13 TD563/GEN](https://www.itu.int/md/T17-SG13-210716-TD-GEN-0563/en).

***6.2 Next Study Period preparations***

SG13’s set of 13 Questions for study in 2022-2024 study period was endorsed by the TSAG meeting in January 2021 as appeared in [TSAG TD 979](https://www.itu.int/md/T17-TSAG-210111-TD-GEN-0979/en).

In addition, [TSAG TD 1130](https://www.itu.int/md/T17-TSAG-211025-TD-GEN-1130/en)  reports the current status of the SG13 preparations to the WTSA-20, 1 – 9 March 2022, Geneva.

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