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| **Keywords:** | SG; Lead Study Group; IMT-2020; 5G; cloud computing; trust and trusted network infrastructures; roadmap; report; workshop; cooperation; |
| **Abstract:**  | This document intends to report a progress to date on each of the lead study group roles of SG13. It covers the period from end of TSAG meeting September 2019 and addresses some anticipated activities. |

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# Assigned lead study group activities

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 Q6/13, Q20/13, Q21/13, Q22/13 and Q23/13 belonging to WP1/13.

## *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.3108 “Capability exposure function in the IMT-2020 networks”
* Y.3153 “Network slice orchestration and management for providing network services to 3rd party in the IMT-2020 network”
* Y.3132 “Mobility management for fixed mobile convergence in IMT-2020 networks”
* Y.3133 “Capability exposure function in the IMT-2020 networks”
* Y.3173 and Y.3174 on ML are consented, currently in the AAP AR (till 5 February)
* Supplement 55 to Y.3170-series “Machine learning in future networks including IMT-2020: use cases​”

Currently progressing work items include (among others) FMC (Y.FMC-ReqMo, -EC, -SS, -SM), Softwarization (Y.IMT2020-ESDP, -NSAA-reqts, -NCS, mAI, Y.3MO, Y.NetSoft-SSMO, Y.LSMEC), QoS (Y.IMT2020-qos-mon, -qos-map, -QoS-II-req, -qos-ec-vr-req, -qos-ml-arch, -qos-lg, -qos-req-tcn), ICN (Y.ICN-Edge, -DOS, -interworking, -NMR, -RF, -TL, -pubsub-arch, -inc-arch, - core-arch), machine learning (Y.3173, Y.3174, -IMT2020-MP, -IMT2020-serv-prov, -IMT2020-NA-RAFR, Y.IMT2020-AIICDN-arch), computer-aware networking (Y.IMT2020-CAN-req) and IMT-2020 standardization roadmap. For details see SG13 work program which can be found at SG13 homepage.

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.

The White Paper “[Network 2030 - A Blueprint of Technology, Applications and Market Drivers Towards the Year 2030 and Beyond](https://www.itu.int/en/ITU-T/focusgroups/net2030/Documents/White_Paper.pdf)” by the ITU-T FG NET2030 gives a vision on the network around 2030 – 2035.

“New Services and Capabilities for Network 2030: Description, Technical Gap and Performance Target Analysis” is a second Deliverable from the FG NET2030 published in October 2019.

The October SG13 meeting initiated the revision of the Q20/13 text, see [TD422/WP1](https://www.itu.int/md/T17-SG13-191014-TD-WP1-0422/en),
in order to increase the visibility to the large portion of the actual work in this Question devoted to the machine learning and beginning of artificial intelligence as applied to networks. Also this Question is a main recipient of the work from the FG ML5G. The revision of Q20/13 text may be found in [TD704/TSAG](https://www.itu.int/md/T17-TSAG-200210-TD-GEN-0704/en).

## *2.2 IMT-2020/5G related Correspondence activities with other ITU-T Study Groups*

SG2 and SG13 are running a correspondence group to tackle network management issues for IMT2020/5G. This group intends to bundle the expertise of SG2 and SG13 experts on this topic, in particular to mutual review and progress studies related to common scope. A first successful example of this common activity is recommendation ITU-T Y.3324. Another good example is the SG2 work on M.somm (Framework of smart operation, management and maintenance).

A newly established in March 2019 SG13RG-EECAT seen 5 contributions at its first meeting. All of them on IMT-2020 are with four proposing to start the new technical report/Recommendations on IMT2020.

FG ML5G had the meeting and workshop alongside the Third Berlin 5G week, November 2019, Berlin, Germany.

## *2.3 JCA IMT-2020*

SG13, through its new 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 standardization roadmap.

To date (21.01.2020) SG13 has approved 31 new Recommendations on IMT-2020, 4 Supplements. It has ~37 work items under development, 2 Recommendations in AAP AR (till 5 February 2020) and three published flipbooks on IMT-2020.

In order to promote JCA activities JCA IMT2020 has started to meet not only during SG13 meetings but also alongside other Group meetings. In particular, JCA IMT2020 has met in September 2018 alongside Q4/11 in Beijing and during SG15 meeting in Geneva in October 2018, 2 July 2019 and January 2020.

A number of inputs were agreed for incorporation into the IMT2020 standardization roadmap. The latest revision of roadmap on IMT2020 can be found on <https://www.itu.int/net4/ITU-T/roadmap#?topic=0.130&workgroup=1&searchValue=&page=2&sort=Revelance>.

Liaison relations of the JCA include beside ITU-T SG’s and ITU-R organizations outside ITU as 3GPP, ETSI, BBF, IEEE, ISO/IEC, MEF, NGMN, and TMF.

In October 2019 SG13 established a new work item, Supplement with the IMT-2020 standardization roadmap based on the roadmap maintained by the JCA. Anticipated delivery is March 2020.

Next meeting of JCA IMT2020 will be alongside SG13 rapporteur groups activities (2 – 13 March 2020) on 5 March 2020, Geneva.

## *2.4 IMT2020/5G related activities by other ITU-T study groups (since last report)*

There are also recommendations and work ongoing in other ITU-T Study Groups, which are related directly or indirectly to IMT2020/5G. Such activities include

 ***SG2***

SG2 approved the following Recommendation M.3041 Framework of smart operation, management and maintenance

Further work:

* M.AI-tom: Framework of AI enhanced Telecom Operation and Management
* M.resm-AI: Requirements for energy saving management of 5G RAN system with AI

***SG11***

SG11 approved ITU-T Q.5002 Signalling requirement and architecture for media service entity attachment

Further work:

* Q.IMT2020-PIAS Protocol for providing intelligent analysis services in IMT-2020 network
* Q.WLAN5G-REQ Signalling requirements of WLAN access network for interworking with 5G network

## *SG15*

Approved the following Recommendations:

* G.9804.1: Higher Speed Passive Optical Networks: Requirements
* G.709/Y.1331 (2016) Cor.2: Interfaces for the optical transport network (OTN): Amendment 3

Further work

* G.9710: Multi-gigabit fast access to subscriber terminals (MGfast) – Power spectral density specification (Determined in July 2019, under TAP)
* G.9807.1 (2016) Amd.2: 10-Gigabit-capable symmetric passive optical network (XGS-PON) – Amendment
* G.9807.3 (ex. G.SuperPON): Wavelength multiplexed point-to-multipoint 10-Gigabit-capable passive optical network
* G.hsp.50Gpmd: Higher Speed Passive Optical Networks: 50G PMD
* G.hsp.comTC: Higher Speed Passive Optical Networks: Common Transmission Convergence layer
* G.hsp.TWDMpmd: Higher Speed Passive Optical Networks: TWDM PMD
* G.mgfast-PHY: Multi-Gigabit fast access to subscriber terminals (MGfast) – PHY
* G.fastback: Transceiver and system specifications for backhaul applications based on G.fast
* G.ctn5g: Characteristics of transport networks to support IMT-2020/5G
* G.mtn: Interfaces for a metro transport network
* G.mtn-eqpt: Characteristics of MTN equipment functional blocks
* G.mtn-prot: MTN linear protection
* G.mtn-arch: Functional architecture for metro transport network
* G.mtn-mgmt: Management and Control for metro transport network

Note: **MTN (metro transport network)** is primarily intended to support transport of D RAN and C RAN traffic and leverage existing and emerging Pluggable Ethernet Modules and will reuse FlexE implementation logic.

Items below are not 5G specific but related (e.g., can be used for 5G support):

* G.698.1, G.698.2, G.698.4 - Wavelength division multiplex (WDM) technologies
* G.8260 series - Frequency synchronization for 5G
* G.8270 series - Time synchronization for 5G
* G.7710 series, G.870 series, G.8050 series, G.8150 series - Management & Control of Transport Network supporting IMT-2020/5G

***SG20***

SG20 consented Y.4208 (ex Y.IoT-EC-reqts) IoT requirements for support of edge computing

Further work:

* ITU-T Y.UAV.arch: Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks

For further and more detail, it is referred to the work program of the corresponding group.

#  Lead study group activities on mobility management

The studies on mobility management (MM) are being carried out by Q23/13.

SG13 has approved the following new standard since the last TSAG meeting:

* Y.3132 “Mobility management for fixed mobile convergence in IMT-2020 networks”
* Y.3133 “Capability exposure function in the IMT-2020 networks”

Currently progressing work items include MM aspect: Y.FMC--ReqMo,-EC, -SS,-SM. In addition, Q23/13 progresses work on Y.Suppl.MM-SDN (Supplement on use cases of mobility management over SDN). 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.

##  *SG13 related studies*

SG13 has continued its active role in cloud computing standardization by approving the following new standards since the last TSAG meeting:

* Y.3509: Cloud Computing - Functional architecture for data storage federation​
* Y.3603: Big Data - Requirements and conceptual model of metadata for data catalogue
* Y.3524: Cloud computing maturity requirements and framework

Consented new Recommendation ITU-T Y.3604 “Big data - Overview and requirements for data preservation” is now in AAP AR till 5 February 2020

The Supplement with the Cloud Computing Standard Roadmap is an ongoing activity. The latest roadmap can be found on the web site as well as in [TD397/WP2](https://www.itu.int/md/T17-SG13-190304-TD-WP2-0397/en).

Liaison relations concerning cloud computing include beside ITU-T SG’s organizations outside ITU as ATIS, BBF, DMFF, IEEE, ISO/IEC, MEF, TMF.

## Currently progressing work items include studies on BigData (Y.BD-arch, Y.bDDN-FunArch, -req, - MCMec, -MLMec, Y.bdi-reqts, Y.sup.bdsr2), on Cloud Computing (Y. scb-arch, Y.cccm-reqts, Y.ccrm, Y.mc-reqts, Y.ccfrcm, Y.cccsdaom-req, Y.ccgmfdc, Y.e2efapm, Y.ccvnf-dm, Y.BaaS-reqts, Y.MLaaS-reqts). 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 (since last report)*

No activities reported since previous TSAG meeting.

#  Lead study group activities on trusted network infrastructures

The studies on trusted network infrastructures are being carried out by Q16/13 belonging to WP3/13.

## *5.1 SG13 related studies*

SG13 has continued its active role in trusted network infrastructures standardization. These activities are led by Q16/13. Currently progressing work items include studies on Y.trust-index, Y.trust-arch, Y.SNS-trust, Y.trust-pdm, Y.OBF\_trust, Y.SBN-TR, Y.energy-brokerage and Y.DNI-fr. For details see SG13 work program which can be found at SG13 homepage.

Since summer 2018 SG13 start working on quantum key distribution network that resulted in approval of the first Recommendation ITU-T Y.3800 “Overview on networks supporting quantum key distribution” in October 2019.

Recommendation ITU-T Y.3800 “Overview on networks supporting quantum key distribution” sets a framework for studying a new security technics under the name quantum key distribution network.

[Newslog story](https://news.itu.int/new-itu-standard-networks-support-quantum-safe-encryption-authentication/) “New ITU standard for networks to support quantum-safe encryption and authentication” (03/12/2019) announces the approval of Y.3800.

Eight other drafts on this technology are under development (Y.QKDN-req, -arch, -KM, -CM, -SDNC, -BM, qos-gen and –qos-req).

Another flavour of the trust in the networks is traced in approved Y.2342 “Scenarios and Capability Requirements of Blockchain in Next Generation Network Evolution” , the work items by Q2/13, and in Y.BaaS-reqts “Cloud computing - functional requirements for blockchain as a service” of Q17/13.

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

There are also recommendations and work ongoing in other ITU-T Study Groups, which is related directly or indirectly to trusted network infrastructures. Such activities include

***SG17***

* X.5Gsec-t: Security framework based on trust relationship in 5G ecosystem
* X.sec-QKDN-tn: Security framework based on trust relationship in 5G ecosystem

#  External Collaboration

External collaboration and information exchange is maintained by the JCA-IMT2020 on 5G related studies. Its IMT-2020 roadmap represents a snapshot who is doing what in this area in the standardization world. SG13 cloud computing and big data roadmaps points out the current work worldwide on corresponding technical topics.

At October 2019 meeting SG13 took initial steps towards exploring the commonalities and potential close collaboration with the Open Network Automation Platform on cloud computing management and service orchestration.

A workshop and demo day on Network 2030, 13 January 2020, Lisbon, Portugal, used the open source solutions for some demos.

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

## *7.1 Workshops related to SG13 lead activities*

Focus Group FG-NET-2030 held meeting and workshop in Lisbon, Portugal (January 2020). Further meeting and workshop are considered for 20-22 May 2020 in Tokyo, Japan
<https://www.itu.int/en/ITU-T/focusgroups/net2030/Pages/default.aspx>.

Focus Group FG ML5G held meeting and workshop in Berlin, Germany (November 2019). Further meeting and workshop are scheduled for 18-20 March 2020 in Beijing, China <https://www.itu.int/en/ITU-T/focusgroups/ml5g/Pages/default.aspx>.

7th SG13 regional workshop “Standardization of future networks towards Building a better connected Africa” is held alongside the SG13RG-AFR meeting in Abuja, Nigeria, 3 – 6 February 2020.

***7.2 Next Study Period preparations***

SG13 started the preparations to the next study period from June 2019 formally via ad-hoc NSP (next study period) activities with the goal to identifying SG13 study areas that are relevant in the upcoming study period. The ad-hoc NSP has met alongside with SG13 meeting in October 2019 as well as in the form of 2 further E-Meetings which were held in November 2019 and January 2020. Intensive discussions are still ongoing and therefore no final set of proposed SG13 Question titles could be agreed so far for the next study period. However, discussion is converging regarding the following subset of SG13 Questions:

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| **Question** | **Provisional title** | **Comment** |
| Q.A | Quality of service (QoS) aspects including IMT-2020 networks and beyond | Continuation of current Q.6 extending beyond IMT-2020 in the scope |
| Q.B | Next generation of IMT networks and machine learning: Requirements and architecture | Continuation of current Q.20 extending ML in the scope |
| Q.C | Network softwarization and new networking technologies for digital transformation in the IMT-2020 network and beyond | Continuation of current Q.21 extending beyond IMT-2020 in the scope |
| Q.D | Upcoming network technologies for future networks including IMT-2020 | Continuation of current Q.22 |
| Q.E | Fixed, mobile and satellite convergence in IMT-2020 network and beyond | Continuation of current Q.23 extending beyond IMT-2020 in the scope |
| Q.H | Deep packet inspection and intelligent network-awareness | Continuation of current Q.7 with modification of scope related to intelligent network-awareness |
| Q.I | Requirements and capabilities for future computing including cloud computing and data [processing] | Continuation of current Q.17 |
| Q.J | Functional architecture for future computing including cloud computing and big data | Continuation of current Q.18 |
| Q.K | End to end management of future computing including cloud, cloud security and data [processing] | Continuation of current Q.19 |
| Q.L | Applying networks of future and innovation in developing countries | Continuation of current Q5 |
| Q-M | Trustworthy Networking and Services including Quantum Enhanced Networks | Continuation of current Q.16 extending Quantum Enhancement |

The following 2 Questions which are related to the current activities of FG network2030 are still under discussion and require further clarification regarding scope and activities.

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| **Question** | **Provisional title** | **Comment** |
| Q.F | Technical architecture and key capabilities for Net2030 including [computing aware networking and] high-precision networking | New Question for Network 2030 including part of current Q2/13 |
| Q.G | New IP based Networking Framework and Functions for ManyNets | New Question for Network 2030 including part of current Q2/13 |

Until now no contribution was received proposing the continuation of current Question Q1/13. Therefore this Question will be considered to become terminated unless proposal for continuation is made (latest at SG13 meeting in March 2020).

First full set of proposed set of SG13 Questions for next study period and first drafted modifications related to the text of Resolution 2 are expected from the upcoming SG13 meeting in March 2020.

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