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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 December 2018 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:

* ITU-T Y.3106: QoS functional requirements for the IMT-2020 network
* ITU-T Y.3107: Functional architecture for QoS assurance management in the IMT-2020 network
* ITU-T Y.3172: Architectural framework for machine learning in future networks including IMT-2020
* ITU-T Y.3073: Framework for service function chaining in information centric networking
* ITU-T Y.3074: Framework for directory service for management of huge number of heterogeneously named objects in IMT-2020
* ITU-T Y.3131: Functional architecture for supporting fixed mobile convergence in IMT-2020 networks
* ITU-T Y.3152: Advanced Data Plane Programmability for IMT-2020
* ITU-T Y.3151:  High level technical characteristics of network softwarization for IMT-2020 - part: SDN
* ITU-T Y.3072: Requirements and Capabilities of Name Mapping and Resolution for Information Centric Networking in IMT-2020
* ITU-T Y.3070-series: Proof-of-Concept for Data Service using Information Centric Networking in IMT-2020

Currently progressing work items include FMC (Y.FMC-MM,- ReqMo,-EC,-CE, -SS,-SM), Softwarization (Y.IMT2020-ESDP, -CEF, -NSAA-reqts, Y.3MO, Y.NetSoft-SSMO, Y.LSMEC), QoS (Y.IMT2020 QoS-mon, -qos-map, QoS-II-req, qos-ec-vr-req, -qos-ml-arch), ICN (Y.ICN-Edge, -DOS, -interworking, -NMR, -RF, -TL,) and machine learning (Y.ML-IMT2020-Intellignce-level, -Data-Handling, -Use-Cases). 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.

## *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.

## *2.3 JCA 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 and on 2 July 2019.

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, TMF.

Next meeting of JCA IMT2020 will be alongside SG13 meeting (14 - 25 October 2019) on 17th October 2019 in Geneva.

## *2.4 IMT2020/5G 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 IMT2020/5G. Such activities include

***SG2***

* M.somm (Framework of smart operation, management and maintenance);
* M.rcsnsm (Requirements for synergy management of cloud and SDN-based network)

***SG5:***

* L.1221 “Innovative energy storage technology for stationary use - Part 2: Battery”
* L.1022 (ex L.CE\_concepts) “Circular Economy: Definitions and concepts for material efficiency for ICT”
* L.ICT\_CE “ICT response to circular economy”
* L.SE\_BS “Smart energy solution for telecom base stations”
* L.methodology\_arch “Methodology to assess the environmental impact of the different proposed architectures”
* L-Trajectories “Recommendation on GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement”
* L.1331 rev. Assessment of mobile network energy efficiency”
* L.5G\_sav “Energy saving technologies and best practices for 5G RAN equipment”
* L.5G powering: Sustainable power feeding solutions for 5G network,
* L.EE\_5G: Energy efficiency Metrics and measurement methodology for 5G base station;
* L.EE\_slicing: Energy efficiency and Slicing of IMT2020/5G, L.ENV-KPI-5G-ARCH: Environmental KPIs/metrics for 5G architectures,
* K.Supp-5G\_EMF\_Compliance: Electromagnetic field (EMF) compliance assessments for 5G wireless networks; recommendations
* K.112 , K,116 and K.78 also related to 5G, even the term 5G is not explicitly mentioned in the title;

***SG11***

* Q.D2D-EECP: Energy efficient D2D communication protocol for IMT 2020 network
* Q.IMT2020-PFW: Protocol Framework for IMT-2020
* Q.INS-PM: Protocol for managing Intelligent Network Slicing with AI-assisted analysis in IMT-2020 network
* Q.IEC-PRO: Protocols for microservices based intelligent edge computing
* Q.QMP-TCA: QoS management protocol for time constraint applications over SDN
* Q.MEA-SRA: Signalling requirement and architecture for media service entity attachment
* Q.NS-LCMP: Protocol for network slice lifecycle management
* Q.CE-APIMP: Protocol for managing capability exposure APIs in IMT-2020 network
* Q.SDN-CT: Framework of SDN controller testing

Since last TSAG meeting (December 2018), SG11 approved the following Recs:

* Q.5001 “Signalling requirements and architecture of intelligent edge computing”
* Q.5020 “Protocol requirements and procedures for network slice lifecycle management”
* Q.4061 “Framework of software-defined network controller testing”
* Q.5021 “Protocol for managing capability exposure APIs in IMT-2020 network"

***SG12***

* G.IMT2020: QoS framework for IMT-2020; G.QoE-5G: QoE factors for new services in 5G networks
* Y.1550: Considerations for realizing virtual measurement systems

Related active SG12 work items

* G.QoE-VR: Influencing factors on QoE for virtual reality (VR) services
* G.QoE-AR: QoE factors of augmented reality (AR) services
* P.360-VR: Subjective test methodologies for 360 degree video on HMD
* G.QoE-5G: QoE factors for new services in 5G networks
* G.IMT2020: QoS framework for IMT 2020.

***SG15***

* G Suppl.66 on 5G wireless fronthaul requirements in a PON context,
G Suppl.55: Radio-over-fibre (RoF) technologies and their applications, G.9803: Radio over Fiber systems; 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.Sup.5gotn: Application of OTN to 5G Transport, G Suppl.56: OTN transport of CPRI signals, GSTR-TN5G: Transport network support of IMT-2020/5G;
* G.9803 Amd.1 (ex. G.RoF): Radio over Fiber systems
* G.709/Y.1331 (2016) Amd.3: Interfaces for the optical transport network (OTN): Amendment 3
* G Suppl.66 (ex. G.sup.5GP) : 5G wireless fronthaul requirements in a PON context
* G Suppl.67 (ex. G.Sup.5gotn): Application of OTN to 5G Transport

Current work items on IMT-2020/5G

* G.672: Characteristics of multi-degree reconfigurable optical add/drop multiplexers
* G.9710: Multi-gigabit fast access to subscriber terminals (MGfast) – Power spectral density specification (Determined in July 2019, under TAP)
* G.709/Y.1331 (2016) Cor.2: Interfaces for the optical transport network (OTN) (Consented in July 2019, under AAP)
* G.9807.3 (ex. G.SuperPON): Wavelength multiplexed point-to-multipoint 10-Gigabit-capable passive optical network
* 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

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

* G.695, G.698.2, G.698.4, G.959.1 - 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

***SG17***

* X.5Gsec-q: Security guidelines for applying quantum-safe algorithms in 5G systems
* X.5Gsec-t: Security framework based on trust relationship in 5G ecosystem
* X.5Gsec-guide: Security framework for 5G edge computing services
* X.5Gsec-netec: Security capabilities of network layer for 5G edge computing
* X.5Gsec-q: Security guidelines for applying quantum-safe algorithms in 5G systems; X.5Gsec-t: Security framework based on trust relationship in 5G ecosystem

***SG20***

* Y.IoT-EC-reqts:IoT requirements for edge computing, Y.IoT-EC-GW: Capabilities and framework of edge computing-enabled gateway in the IoT

For further work 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 are being carried out by Q.23/13.

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

* ITU-T Y.3131: Functional architecture for supporting fixed mobile convergence in IMT-2020 networks

Currently progressing work items include MM aspect (Y.FMC-MM,- ReqMo,-EC,-CE, -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:

* ITU-T Y.3508: Cloud computing - Overview and high-level requirements of distributed cloud
* ITU-T Y.3523: Metadata framework for NaaS service lifecycle management​

The Supplement with the Cloud Computing Standard Roadmap is an ongoing activity. The latest roadmap can be found on the web site as [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.BDDP-reqts, Y.BD-arch, Y.bDDN-FunArch, -req, - MCMec, -MLMec, Y.bdi-reqts, Y.bdm-sch, Y.sup.bdsr2), on Cloud Computing (Y. scb-arch, Y.ccm-reqts, Y.cccm-reqts, , Y.ccrm, Y.mc-reqts, Y.ccfrcm, Y.cccsdaom-req, Y.ccgmfdc, Y.e2efapm, Y.dsf-arch, Y.ccvnf-dm, , Y.BaaS-reqts, Y.MLaaS-reqts). For details see SG13 work program which can be found at SG13 homepage.

## *4.2 Cloud Computing 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 Cloud Computing. Such activities include

***SG2***

* M.rcsnsm: Requirements for synergy management of cloud and SDN-based network
* M.rmacbe: Requirements for management of applications over cloud and broadband ecosystems

**SG3**

* D.princip\_bigdata: ITU-T D. policy framework and principles for data protection in the context of big data relating to international telecommunication services.Technical Paper on economic and policy aspects of Big Data in international telecommunication services and networks

***SG5***

* L.DCIM: Specifications of data centre infrastructure management (DCIM) system based on Big Data and AI technology, L.Proc DC: Procurement Criteria for Sustainable Data Centres, L.SE DC: Smart energy solution for data centre and telecom centre
* L.AI-Env effects: AI environmental effect on Networks goods and services

***SG9***

* TP.b-catv: Broadband CATV system using server-side reception and processing

***SG11***

* Q.IEC-PRO: Protocols for microservices based intelligent edge computingSG12:
* Y.1550: Considerations for realizing virtual measurement systems

***SG16***

* F.743.7: Requirements for big data enhanced visual surveillance services
* H.CCVS: Architecture for cloud computing in visual surveillance
* F.CDN-MEC: Requirements for mobile edge computing enabled content delivery networks
* F.743.8: Requirements for cloud computing platform supporting a visual surveillance system,
* H.CCVS: Architecture for cloud computing in visual surveillance
* F.ECVSReqs: Requirements for edge computing in visual surveillance
* F.AFBDI: Assessment framework for big data infrastructure

***SG17***

* X.GSBDaaS: Guidelines on security of big data as a service (BDaaS)
* X.sgBDIP: Security guidelines for big data infrastructure and platform
* X.sgtBD: Security guidelines of lifecycle management for telecom big data
* X.nssa-cc: Requirements of network security situational awareness platform for cloud computingX.sgcc: Security guidelines for container in cloud computing environment
* X.sgdc: Security guidelines for distributed cloud
* X.sgmc: Security guidelines for multi-cloud
* X.edrsec: Security guidelines for cloud-based event data recorders in automotive environment
* X.sr-cphr: Security requirements of cloud-based platform under low latency and high reliability application scenarios
* X.itssec-5: Security guidelines for vehicular edge computing
* TR.BaaS-sec: Technical Report: Guideline on blockchain as a service (BaaS) security
* X.5Gsec-ecs: Security framework for 5G edge computing services

***SG20***

* Y.IoT-EC-GW: Capabilities and framework of edge computing-enabled gateway in the IoT
* Y.IoT-EC-reqts: IoT requirements for edge computing

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

# 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. Currently progressing work items include studies on Y.trust-index, Y.trust-arch, Y.SNS-trust, Y.trust-pdm, Y.SBN-TR, Y.energy-brokerage and Y.DNI-fr. For details see SG13 work program which can be found at SG13 homepage.

## *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

***SG2***

* E.156 (Guidelines for ITU-T action on reported misuse of E.164 number resources)
* E.sup.spoofing to E.157 (Spoofing)
* M.rtafm (Requirements for synergy management of cloud and SDN-based network)

***SG11***

* Q.SR-Trust: Signalling requirements and architecture for interconnection between trustable network entities.

***SG17***

* X.1212 (ex X.cogent): Design considerations for improved end-user perception of trustworthiness indicators
* X.sec-QKDN-tn: Security requirements for quantum key distribution networks - trusted node
* X.rdda: Requirements for data de-identification assurance
* X.1254rev: Entity authentication assurance framework
* X.sa-dlt: Security assurance for distributed ledger technology
* X.sr-cphr: Security requirements of cloud-based platform under low latency and high reliability application scenarios

***SG20***

* Y.IoT-IoD-PT: Identity of IoT devices based on secure procedures and ensures privacy and trust of IoT systems

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

# 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.

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

## *7.1. Focus Group ML5G lifetime extension*

SG13 agreed at its meeting in March 2019 to continue the lifetime of the FG ML5G until July 2020.

## *7.2 Workshops related to SG13 lead activities*

The new Focus Group FG-NET-2030 held the “First ITU Workshop on Network 2030” on 2 October 2018 in New York/ US, preceding the inaugural FG meeting form 3-4 October 2018 (see also <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201810/Pages/default.aspx>)

The second workshop of this series was convened on 18 December 2018 in Hong Kong/ China, preceding the 2nd meeting of FG-NET-2030 19-20 December 2018 (https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20181218/Pages/default.aspx).

Further workshops were held in the week of 18 February 2019 (London, United Kingdom, <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190218/Pages/default.aspx>), week of
20 May 2019 (St Petersburg, Russia <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201905/Pages/default.aspx>). Next, [5th, workshop](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2019101416/Pages/default.aspx) is taking place in October 2019 in Geneva.

FG ML5G Workshop *Towards a New Era –AL in 5G* took place on 6 March 2019 in Shenzhen, China (<https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201903/Pages/default.aspx>) and Workshop on *Machine Learning for 5G and beyond* took place 17 June 2019 in Geneva (<https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190617/Pages/default.aspx>)

Next workshop is planned for 5 November 2019 in Berlin, Germany.

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

***6.3 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. See companion TD of this issue, [TD599/TSAG](https://www.itu.int/md/T17-TSAG-190923-TD-GEN-0599/en).

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