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| A black and white logo  Description automatically generated with low confidence | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATIONSTANDARDIZATION SECTOR**STUDY PERIOD 2022-2024 | TSAG-TD538 |
| TSAG |
| Original: English |
| **Question(s):** | N/A | Geneva, 29 July - 2 August 2024 |
| **TD** |
| **Source:** | Chair, ITU-T Study Group 13 |
| **Title:** | ITU-T SG13 Lead Study Group Report |
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| **Abstract:** | This document contains the summary status and progress report on lead SG activities of ITU-T SG13 in this study period. It complements the information already delivered to the July-August 2024 TSAG meeting via a liaison statement in [TD561/TSAG](https://www.itu.int/md/T22-TSAG-240729-TD-GEN-0561/en). |

**Action**: Review, note this report and note the information in LS in [TD561/TSAG](https://www.itu.int/md/T22-TSAG-240729-TD-GEN-0561/en).

# Meetings and Events

| **Meeting/Event** | **No. of** | **Dates** | **Place** |
| --- | --- | --- | --- |
| Study Group 13 | 6 | 4 – 15 July 2022 | Geneva, Switzerland |
| 14 November 2022 | Geneva, Switzerland |
| 13 – 24 March 2023 | Geneva, Switzerland |
| 23 October – 3 November 2023 | Geneva, Switzerland |
| 4 – 15 March 2024 | Geneva, Switzerland |
| 15 – 26 July 2024 | Geneva, Switzerland |
| Working Parties | 6 | 25 November 2022  | Geneva, Switzerland |
| 26 July 2023 | Geneva, Switzerland |
| Co-located Rapporteur Groups | 1 | 14 – 25 November 2022 | Geneva, Switzerland |
| SG13 Regional Group for Africa (SG13RG-AFR) | 3 | 20 October 2022 | Virtual |
| 21 – 22 September 2023 | Abidjan, Cote D’Ivoire |
| 25 April 2024 | Virtual |
| 2 | 12 July and 17 November 2022 | Preparatory e-meetings |
| SG13 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG13RG-EECAT) |  | SG13RG-EECAT plans the meeting after WTSA-24. |  |
| JCA-IMT2020 and Beyond | 9 | 7 July 2022 | Geneva, Switzerland  |
| 20 September 2022, | Geneva, Switzerland |
| 21 November 2022 | Geneva, Switzerland |
| 14 March 2023 | Geneva, Switzerland |
| 18 April 2023, | Geneva, Switzerland |
| 31 October 2023 | Geneva, Switzerland |
| 5 March 2024 | Geneva, Switzerland |
| 8 July 2024 | Montreal, Canada |
| 22 July 2024 | Geneva, Switzerland |
| JCA-ML | 5 | 16 March 2023 | Geneva, Switzerland |
| 19 July 2023 | Geneva, Switzerland |
| 27 October 2023 | Geneva, Switzerland |
| 23 February 2024 | Geneva, Switzerland |
| 19 July 2024 | Geneva, Switzerland |
| FG-AN | 7 | 30 March – 1 April 2022, 1 – 3 June 2022, 31 August - 1 September 2022, 1 – 3 February 2023, 19 - 20 April 2023, 12 - 13 July 2023, 28 September 2023 and 18 January 2024  | Virtual |
| Workshops: | 5 |  |  |
| Workshop “[Advances in Evolutionary Autonomous Networks: Use Cases, Architecture and PoC](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2022/20221115/Pages/default.aspx)"  | 15 November 2022 | Geneva, Switzerland |
| Workshop on["Future technology trends towards 2030​"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2023/0724/Pages/default.aspx)*​* (Next IMT systems towards 2030 and beyond, web 3.0, quantum networking, deterministic communication services)  | 24 – 25 July 2023 | Geneva, Switzerland |
| 9th SG13 Regional Workshop for Africa on “[Standardization of Future Networks and Emerging Network Technologies: African perspectives​](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2023/0919/Pages/default.aspx)”  | 19-20 September 2023 | Abidjan, Côte d’Ivoire |
| Workshop on “[Advances in Autonomous Networks: 2023 and beyond](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2023/1024/Pages/default.aspx)"  | 24 October 2023 | Geneva, Switzerland |
| Workshop “[At the crossroads of Standards and Research: AI/ML datasets for future networks](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2024/0716/Pages/default.aspx)” | 16 July 2024 | Geneva, Switzerland |

Above table doesn’t include the stand-alone interim rapporteur groups meetings as well as the permanent ad-hocs and correspondence groups meetings.

# Outputs

## WP1 (5 Questions for IMT-2020 and beyond and machine learning)

### Outputs (2022): 22 Recommendations

– Y.3117: Quality of service assurance-related requirements and framework for **smart education** supported by IMT-2020 and beyond

– Y.3118: Requirements and framework for **jitter guarantee** in large scale networks including IMT-2020 and beyond

– Y.3811: Quantum key distribution networks - Functional architecture for quality of service assurance

– Y.3812: Quantum key distribution networks - Requirements for machine learning based quality of service assurance

– Y.3119: Future networks including IMT-2020: capability classification framework for dedicated networks

– Y.3120: Functional Architecture for **latency guarantee** in large scale networks including IMT-2020 and beyond

– Y.3121: QoS requirements and framework for supporting **deterministic communication services** in local area network for IMT-2020

– Y.3181: Architectural framework for **Machine Learning Sandbox** in future networks including IMT-2020

– Y.3182: **Machine learning** based end-to-end multi-domain network **slice management** and orchestration

– Y.3158: **Local shunting** for multi-access **edge computing** in IMT-2020 networks

– Y.3079: Information-Centric Networking in networks beyond IMT-2020: Framework of locally enhanced name mapping and resolution

– Y.3080: Information-Centric Networking in networks beyond IMT-2020: Requirements and Mechanisms of Transport Layer

– Y.3081: Self-Controlled Identity based on Blockchain: Requirements and Framework

– Y.3082: **Mobile network sharing** based on distributed ledger technology for networks beyond IMT-2020: Requirements and framework (TAP approved in 03/2023)

– Y.3183: Framework for **network slicing management** assisted by machine learning leveraging QoE feedback from verticals

– Y.3137: Technical requirements for supporting application addressing in edge computing for future networks including IMT-2020

– Y.3138: **Unified multi-access** edge computing for supporting fixed mobile convergence in IMT-2020 networks

– Y.3139: Fixed mobile convergence enhancements to support IMT-2020 based software-defined wide area networking service

– Y.3140: Service brokering network framework for Trusted Reality (AAP approved at SG13 meeting in 03/2023)

– Y.3201: **Fixed, mobile and satellite convergence** – Framework **for IMT-2020 networks** and beyond

– Y.3325: Framework for high-level **AI-based management** communicating with external management systems

– Y.3159: Framework for classifying **network slice** level in future networks including IMT-2020 (AAP approved at the SG meeting in 10/2023)

### Outputs (2023): 22 Recommendations

– Y.3083: Information-centric networking in networks beyond IMT-2020: Reference model of on-site, elastic, and autonomous network

– Y.3122: QoS assurance requirements and framework for **smart grid** supported by IMT-2020 and beyond

– Y.3117 Corr 1: Quality of service assurance-related requirements and framework for smart education supported by IMT-2020 and beyond – Corrigendum 1

– Y.3123: Framework of **edge computing capability exposure** for IMT-2020 networks and beyond

– Y.3124: Quality of service monitoring requirements and framework for IMT-2020 and beyond

– Y.3125: QoS assurance requirements and framework for **cloud gaming** supported by IMT-2020 network

– Y.3126: QoS requirements and framework of interworking capability for supporting **deterministic communication services** in local area network for IMT-2020 and beyond

– Y3127: Future networks including IMT-2020 - Requirements and framework for **self-organizing core** network

– Y.3128: Requirements for network function communication between Public Networks and public network integrated Non-Public Networks in IMT-2020

– Y.3061: **Autonomous Networks - Architecture** framework

– Y.3091: **Digital Twin Network** - Capability Levels and **Evaluation Methods**

– Y.3141: **Energy efficiency management** of virtual resources in IMT-2020 networks and beyond

– Y.3160: Architectural framework of end-to-end service level objective guarantee for future networks including IMT-2020

– Y.3161: Intent-based network management and orchestration for network slicing in IMT-2020 networks and beyond

– Y.3202: Fixed, mobile and satellite convergence - **Mobility management** for IMT-2020 networks and beyond

– Y.3203: Fixed, mobile and satellite convergence - **Connection management** for IMT-2020 networks and beyond

– Y.3204: Fixed, mobile and satellite convergence - **Service continuity** for IMT-2020 networks and beyond

– Y.3205: Fixed, mobile and satellite convergence - Requirements of integrated user-centric service units

– Y.3206: Fixed, mobile and satellite convergence - **Capability exposure for IMT-2020** networks and beyond

– Y.3400: Coordination of networking and computing in IMT-2020 networks and beyond - Requirements

– Y.3816: Quantum key distribution networks - Functional architecture enhancement of machine learning based quality of service assurance

– Y.3817: Quantum key distribution networks interworking - Requirements of quality of service assurance

### Outputs (2024, till 20 June 2024, the day this report was finalized): 6 Recommendations

– Y.3129: Requirements and framework for stateless fair queuing in large scale networks including IMT-2020 and beyond

– Y.3186: Requirements and framework for **distributed joint learning** to enable machine learning in future networks including IMT-2020

– Y.3142: Requirements and framework for **AI/ML-based network design optimization** in future networks including IMT-2020

– Y.3162: Evaluating **intelligence capability** for network slice management and orchestration in IMT-2020 network and beyond

– Y.3073 Amd 1: Framework for **service function chaining** in information-centric networking

– Y.3207: Fixed, mobile and satellite convergence - Integrated network control architecture framework for IMT-2020 networks and beyond

## WP2 (4 Questions for Cloud Computing and Data Handling)

### Outputs (2022): 6 Recommendations

– Y.3537: Cloud computing – Functional requirements of cloud service partner for
**multi-cloud**

– Y.3538: Cloud computing - Global management framework of **distributed cloud**

– Y.3539: Cloud computing - Framework of **risk management**

– Y.3602: Big data - Functional requirements for **data provenance**

– Y.3607: Big data – Functional architecture for **data provenance**

– Y.3655: Big data driven networking - management and control mechanisms

### **Outputs (2023): 9 Recommendations**

– Y.3656: Big data driven networking - mechanism of network service provisioning

– Y.3184: Mechanism of intelligent awareness for network status

– Y.3532: Cloud computing - Functional requirements of **Platform as a Service** for cloud native applications

– Y.3533: Cloud computing - Functional requirements for **Robotics as a Service**

– Y.3540: **Edge computing** - Overview and high-level requirements

– Y.3550: Cloud computing - Requirements for AI based cloud service development and operation management

– Y.3603: Big data - Requirements and conceptual model of **metadata for data catalogue**

– Y.3657: Big data driven networking- requirements and capabilities of network visibility

– Y.3185: Functional architecture for intelligent awareness of network requirements

### Outputs (2024, till 20 June 2024): 2 Recommendations

– Y**.**3658: Big Data Driven Networking - Functional requirements and functional architecture of **network programmability**

– Y.3551: Cloud computing - Framework and functional requirements of **cloud data mobility management** (under AAP approval process)

## WP3 (4 Questions for quantum enhanced networking, trust and innovative service scenarios)

### Outputs (2022): 5 Recommendations

– Y.2247: Framework and Requirements of Network-oriented Data Integrity Verification Service based on Blockchain in Future Network

– Y.2248: Service model for Entry-level Smart Farm

– Y.3810: Quantum key distribution network **interworking** - framework

– Y.3813: Quantum key distribution networks interworking – functional requirements

– Y.3814: Quantum key distribution networks - functional requirements and architecture for machine learning enablement

### Outputs (2023): 17 Recommendations

– Y.2345: Scenarios and requirements of **network resource sharing** based on distributed ledger technology

– Y.2346: Requirements and framework of Service Function Orchestration based on service function chaining

– Y.2073: Framework of **trusted electricity brokerage** for distributed energy resources

– Y.2249: Service model for human-centric **touring guide with augmented reality**

– Y.3818: Quantum key distribution networks **interworking – architecture**

– Y.3819: Quantum key distribution networks - Requirements and architectural model for autonomic management and control enablement

– Y.3058: Functional architecture for trust enabled service provisioning

– Y.3059: Trust Registry for Devices: requirements, architectural framework

– Y.3060: **Autonomous networks** - overview on **trust**

– Y.3815: Quantum key distribution networks - **overview of resilience**

– Y.2325: Architectural evolution for Next Generation Network control plane by applying Software-Defined Networking technology

– Y.3802 Amd 1: Quantum key distribution networks - Functional architecture

– Y.3803 Amd 1: Quantum key distribution networks – Key management

– Y.3804 Amd 1: Quantum key distribution networks – Control and management

– Y.3805 Amd 1: Quantum key distribution networks – Software-defined networking control

– Y.3811 Amd 1: Quantum key distribution networks – Functional architecture for quality of service assurance

– Y.3814 Amd 1: Quantum key distribution networks – Functional requirements and architecture for machine learning enablement

In addition, it was decided at March 2023 SG13 meeting to reinitiate the AAP Last Call for

– Y.2086: Framework and Requirements of Decentralized Trustworthy Network Infrastructure (under AAP approval process, LC will be reinitiated)

###  Outputs (2024, since last report to TSAG): 6 Recommendations

– Y.2250: Requirements and Framework of Human-oriented Message Service for Smart Learning in Future Network

– Y.2502: Computing power network - Authentication and orchestration architecture (under AAP approval process)

– Y.2344: Scenarios and requirements of Intent-Based Network for network evolution

– Y.3820: Quantum Key Distribution Network Interworking - Software Defined Networking Control

– Y.3821: Quantum key distribution networks - requirements for resilience

– Y.3062: Trustworthiness Evaluation for IMT-2020 and Beyond with Autonomous Network Functions (under AAP approval process)

## Supplements

9 Supplements:

– Sup. 40 (Y.3600-series): Big data and data handling standardization roadmap (revised)

– Sup. 71 (Y.3000-series): Use cases for Autonomous Networks

– Sup. 72 (Y.3000-series): Artificial Intelligence Standardization Roadmap

– Sup. 59 (Y.3100 series): IMT-2020 and beyond standardization roadmap (revised)

– Sup. 74 (Y.3800-series): Standardization roadmap on Quantum Key Distribution Networks

– Sup. 75 (Y.3000-series): Quantum key distribution networks – **Quantum-Enabled Future Networks**

– Sup. 79 (Y.3800-series): Quantum key distribution networks - Role in end-to-end cryptographic services with non-quantum cryptography

– Sup. 80 (Y.3800-series): Use cases of quantum key distribution networks

– Sup. 81 (Y.3200 series): Use cases of satellite communications in Developing Countries

## Technical Reports

2 reports:

– Use cases of quantum networks beyond QKDN

– Requirements of **semantic-aware networking** for future networks

# Future **Meeting Plans**

– Geneva, 3 – 14 March 2025, SG13 meeting

– Geneva, 30 June – 11 July 2025, SG13 or RGM

# Implementation of the WTSA-20 Action Plan

In response to the WTSA-20 Resolution 92 (*Enhancing the standardization activities in the ITU Telecommunication Standardization Sector related to non-radio aspects of international mobile telecommunications*) SG13

– Maintained and continued the operation of *the JCA-IMT2020 and Beyond* until the end of the study period.

– Through the JCA-IMT2020 regularly updates and maintains the online roadmap with IMT-2020 and Beyond standardization efforts taken place around the world. Roadmap currently includes **807** publications.

– Published the Supplement 59 to Y.3100-series of Recommendations “IMT-2020 standardization roadmap” (a snapshot as of November 2022, then as of October 2023 of the online roadmap mentioned above). Anticipated publication of the next revision is July 2024.

In response to the WTSA-20 Resolution 94 (*Standardization work in the ITU Telecommunication Standardization Sector for cloud-based event data technology*) contributions are invited on the cloud-based event data technology aspects.

In line with instructions found in WTSA-20 Resolution 99 (*Consideration of organizational reform of the ITU Telecommunication Standardization Sector study groups*) SG13 established in November 2022 the ad-hoc on next study period preparations. It met alongside each SG13 meeting since November 2022 as well as twice in-between the SG meetings, agreed the text of the SG13 mandate for WTSA Resolution 2 and preliminary agreed the text of 13 Questions. Two Questions’ texts are still to be assessed. One new Question proposal (on coordination) was withdrawn by the author.

# Coordination between Study Groups

Continuous coordination is going on with

– SG2 on management aspects (including the joint meetings of the subgroups concerned, for example, coordination on draft Recommendation ITU-T Y.CNAO (Q20/13) and AITOM (SG2)),

– SG5 on energy saving aspects of networks,

– SG11 on multiple topics, including the Network Softwarization Standardization Roadmap, launched by SG11.

– SG12 on QoS, QoS assurance and deterministic networking topics,

– SG17 on security aspects and QKDN,

– SG20 on IoT related work.

In addition, SG13 provided its opinion to the SG16 about the metaverse topic study and passed over its accomplished work on *the quantum key distribution networks roadmap* to new JCA-QKDN for maintenance.

In March 2024 meeting SG13 received request and provided the guidance to ITU-T SGs on the use of the IMT-related terminology.

# Report of lead SG activities

**WTSA-20 assigned to the SG13 the following lead Study Group roles:**

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

SG13 approved **37** new Recommendations one Corrigendum and agreed one Supplement, listed above, has **73** work items in progress, continued the JCA-IMT2020 operation (with revised Terms of Reference) until 2024.

Supplement 59 to Y.3100-series (11/2023) is the snapshot of the online database with collection of the IMT-2020 and Beyond related Recommendations, Supplements, technical specifications of other SDOs and various technical reports. Per WTSA-20 Resolution 92 this Supplement is annually revised, so currently had editions of 2020, 2022, 2023 (in force) and anticipated new revision for July 2024.

An information session on [the ITU-R work towards IMT-2030](https://www.itu.int/md/T22-SG13-230313-TD-GEN-0144/en) was convened on 17 March 2023 alongside SG13 meeting.

Next IMT systems towards 2030 and beyond were one of the topics of the workshop of 24-25 July 2023 in Geneva, as well as of 9th regional workshop for Africa “Standardization of Future Networks and Emerging Network Technologies: African perspectives” of 19-20 September 2023 in Abidjan, Cote D’Ivoire.

Five Questions are currently dealing with IMT-2020 and beyond network aspects work in SG13. Those with the focus towards 2030 systems are developed and preliminary agreed for being proposed to the next study period.

The correspondence group *on Artificial Intelligence in IMT-2030 (CG-AI6G),* set up in November 2023, transformed in March 2024 into the correspondence group on *Artificial Intelligence Native for Telecommunication Networks (CG-AINN),* works on elaboration of the precise rationale and Terms of Reference for the new *Focus Group on* *Artificial Intelligence Native for Telecommunication Networks (FG-AINN).*

In addition, FG-AN convened a workshop “[Advances in Evolutionary Autonomous Networks: Use Cases, Architecture and PoC](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2022/20221115/Pages/default.aspx)” on 24 October 2023 in Geneva.

## SG13 has a leading role in fixed-mobile convergence.

This study topic and its extension for the fixed, mobile and satellite convergence is well progressing in SG13 with **9** Recommendations approved, as listed above. Work programme counts **28** work items on FMC/FMSC in progress.

SG13 is going to propose to change this Lead SG role to become Lead study group on fixed-mobile and satellite convergence.

## SG13 was entrusted a leading SG role in cloud computing.

On the above technical topic, **7** Recommendations were developed and approved, including the first Recommendation on edge computing. **25** work items are under study.

Furthermore, in July 2022 SG13 set up an ad-hoc “*Future ICT Evolution for emerging Web Era*”**.** By end of June 2024, the group had 12 meetings.Web 3.0 was one of the focuses of the workshop of 24 – 25 July 2023 in Geneva.

A session was dedicated to the Cloud Computing and Data Handling topics at the9th regional workshop for Africa “[Standardization of Future Networks and Emerging Network Technologies: African perspectives](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2023/0919/Pages/prog.aspx)” of 19-20 September 2023 in Abidjan, Cote D’Ivoire.

## SG13 has a lead study group responsibility for machine learning.

From this perspective, SG13 approved **10** Recommendations on machine learning.

In July 2022 SG13 initiated the new JCA on ML. First meeting took place on 16 March 2023 in Geneva. That meeting started two coordination projects: **machine learning standardization roadmap** and glossary of terms and definitions for machine learning. To date (20 June 2024), group met four times. Second, third and fourth meetings received a presentation each of current standardization efforts in ITU-T Study Group 16, 13 and 17 respectively. Presentations from other SDOs, and Forums were invited to the future meetings of JCA-ML.

Supplement 71 (to Y.3000-series) “Use cases for Autonomous Networks” was approved for publication on 15 July 2022.

Supplement 72 (to Y.3000-series) “Artificial Intelligence Standardization Roadmap” was agreed for publication on 25 November 2022.

A questionnaire *“*[*Requirements and Framework for the exploitation of Big Data/Artificial Intelligence technologies in developing countries*](https://www.itu.int/md/T22-TSB-CIR-0159/en)*”* was agreed for dissemination (to the attention of the developing countries) on 3 November 2023. It accepts inputs until 1 July 2024.

Machine Learning and Artificial Intelligence for future Networks were the topics of the 9th regional workshop for Africa, 19 – 20 September 2023, Abidjan, Cote D’Ivoire.

A workshop “[*At the crossroads of Standards and Research: AI/ML datasets for future networks*](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2024/0716/Pages/default.aspx)**”​**, SG13 convenes on 16 July 2024 in Geneva will touch base on AI/ML use cases for future networks, name particular datasets and models (large language models,precise models or their combination), toolsets as well as will develop the recommendations for future standardization and research activities.

There are **17** ongoing work items related to the machine learning and artificial intelligence in the SG13 work programme.

The correspondence group *for datasets applicable for AI/ML in networks,* set up in July 2022, convened 15 meetings (by 20 June 2024) and progressed the work on its deliverable - the technical insights and recommendations for a standardization approach for datasets applicable for AI/ML in networks. This group encompasses the participation from external to ITU experts. Its operation was extended by mid of 2024.

Deliberations about the set up of the new *Focus Group on Artificial Intelligence Native for Telecommunication Networks (FG-AINN)* are given in clause 6.1 above.

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