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| World Telecommunication Standardization Assembly (WTSA-20) Geneva, 1-9 March 2022 | A picture containing text, clipart  Description automatically generated |
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| PLENARY MEETING | Revision 1 to  Document 13-E |
|  | January 2022 |
|  | Original: English |
|  | |
| ITU‑T Study Group 13 | |
| Future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures | |
| Report of ITU-T SG13 to the World Telecommunication Standardization Assembly (WTSA-20), Part I: GENERAL | |

|  |  |  |
| --- | --- | --- |
| **Abstract:** | This contribution contains the report of ITU-T Study Group 13 to WTSA-20 concerning its activities during the 2017-2021 study period. Revision 1 introduces the change with regards to the Recommendations approved and interim meetings held since January 2022. | |
| **Contact:** | Mr Leo Lehmann Chairman ITU-T SG13 Switzerland | Tel: +41 32 327 5752 Email: [Leo.Lehman@bakom.admin.ch](mailto:Leo.Lehman@bakom.admin.ch) |
| **Contact:** | Mr Yoshinori Goto Acting Chairman ITU-T SG13 NTT Japan | Tel: +81-422-59-6489 Email: [yoshinori.gotou.zr@hco.ntt.co.jp](mailto:yoshinori.gotou.zr@hco.ntt.co.jp) |

Note by the TSB:

The report of Study Group 13 to the WTSA-20 is presented in the following documents:

Part I: **Document 13** – General

Part II: **Document 14** – Questions proposed for study during the study period 2022-2024

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# 1 Introduction

## 1.1 Responsibilities of Study Group 13

Study Group 13 was entrusted by the World Telecommunications Standardization Assembly (Hammamet, 2016) with the study of 13 Questions in the area of future networks, with focus on IMT-2020, cloud computing and trusted network infrastructures. Study Group 13 was designated the lead study group for future networks such as IMT-2020 networks (non-radio related parts), mobility management, cloud computing and trusted network infrastructures.

## 1.2 Management team and meetings held by Study Group 13

Study Group 13 met 11 times in Plenary and five times in Working Partiesin the course of the study period (see Table 1) under the chairmanship of Mr Leo Lehmann (Switzerland) in 2017 – middle 2021 and of Mr Yoshinoi Goto (Japan) for the second half of 2021 and occasionally in 2019. The SG13 Chairman was assisted by Vice-Chairmen Mr Ahmed El-Raghy (Egypt) until June 2021, Mr Yoshinori Goto (Japan), Mr Hyung-Soo (Hans) Kim (Republic of Korea), Mr Mohammed Al Tamimi (Saudi Arabia), Mr Brice Murara (Rwanda), Mr Scott Mansfield (Ericsson Canada), Ms Rim Belhassine-Cherif (Tunisia), Mr Fidelis Onah (Nigeria), Mr Juan Carlos Minuto (Argentina), Mr Heyuan Xu (China) and Mr Cao Jiguang who replaced Mr Heyuan Xu in the management team from March 2021.

From 30 June 2021 Mr Yoshinori Goto performed the Acting chairman functions to replace SG13 chairman, Mr Leo Lehmann, who was not able to continue with his chairman’s duties. Mr Yoshinori Goto thus chaired the last SG13 meeting in the reported study period, held virtually on 29 November – 10 December 2021.

TABLE 1  
Meetings of Study Group 13 and its Working Parties

| Meetings | Place, date | Reports |
| --- | --- | --- |
| Meeting of Study Group 13 | Geneva, 6-17 February 2017 | SG13 –R 1 to R 4 |
| Meeting of Working Parties 1, 2 and 3/13 | Geneva, 14 July 2017 | SG1313–R 5 to R 7 |
| Meeting of Study Group 13 | Geneva, 6-17 November 2017 | SG1313–R 8 to R 12 |
| Meeting of Working Parties 1, 2 and 3/13 | Geneva, 18 April 2018 | COM13 –R 13 to R 15 |
| Meeting of Study Group 13 | Geneva, 16-27 July 2018 | COM13 –R 16 to R 19 |
| Meeting of Working Parties 1, 2 and 3/13 | Geneva, 2 November 2018 | COM13 –R 20 to R 22 |
| Meeting of Study Group 13 | Victoria Falls, Zimbabwe,  4-14 March 2019 | COM13 –R 23 to R 26 |
| Meeting of Working Parties 1, 2 and 3/13 | Geneva, 28 June 2019 | COM13 –R 27 to R 29 |
| Meeting of Study Group 13 | Geneva, 14-25 October 2019 | COM13 –R 30 to R 33 |
| Meeting of Study Group 13 | Geneva, 13 March 2020 | COM13 –R 34 |
| Meeting of Study Group 13 | Virtual meeting, 20-31 July 2020 | COM13 –R 35 to R 38 |
| Meeting of Study Group 13 | Virtual meeting, 7 December 2020 | COM13 –R 39 |
| Meeting of Study Group 13 | Virtual meeting, 17 December 2020 | COM13 –R 40 |
| Meeting of Study Group 13 | Virtual meeting, 1-12 March 2021 | COM13 –R 41 to R 44 |
| Meeting of Working Parties 1, 2 and 3/13 | Virtual meetings, 16 July 2021 | COM13 –R 45 to R 47 |
| Meeting of Study Group 13 | Virtual meeting, 29 November – 10 December 2021 | COM13 –R 48 to R 51 |

In addition many Rapporteurs’ meetings took place during the study period in different locations and electronically, see Table 1-bis.

TABLE 1-bis  
Rapporteur meetings organized under Study Group 13 during the study period

| **Dates** | **Place/Host** | **Question(s)** | **Event name** |
| --- | --- | --- | --- |
| 7 - 9 November 2016 | E-meeting | Q18/13 | Q18/13 Rapporteur group meeting |
| 14 – 18 November 2016 | Poland, Warsaw/ Orange Polska | Q17/13 | Q17/13 Rapporteur group meeting |
| 14 – 18 November 2016 | Poland, Warsaw/ Orange Polska | Q19/13 | Q19/13 Rapporteur group meeting |
| 15 – 18 November 2016 | Poland, Warsaw/ Orange Polska | Q18/13 | Q18/13 Rapporteur group meeting |
| 8 December 2016 | E-meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 20-22 December 2016 | E-meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 12 – 13 January 2017 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 16 January 2017 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 18 – 20 January 2017 | Korea (Rep. of), Seoul/TTA | Q1/13 | Q1/13 Rapporteur group meeting |
| 16 March 2017 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 19 April 2017 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 21 April 2017 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 19 – 21 April 2017 | E-Meeting | Q18/13 | Q18/13 Rapporteur group meeting |
| 24 – 28 April 2017 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 8 May 2017 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 17 – 19 May 2017 | Korea (Rep. of), Seoul/TTA | Q1/13 | Q1/13 Rapporteur group meeting |
| 23 May 2017 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 22 – 24 May 2017 | E-Meeting | Q18/13 | Q18/13 Rapporteur group meeting |
| 22 – 26 May 2017 | Korea (Rep. of), Seoul/TTA | Q16/13 | Q16/13 Rapporteur group meeting |
| 19 June 2017 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 3 – 14 June 2017 | Switzerland, Geneva | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 3 August 2017 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 21 – 22 August 2017 | Korea (Rep. of), Busan/Inje University | Q1/13 | Q1/13 Rapporteur group meeting |
| 31 August 2017 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 5 – 8 September 2017 | Poland, Warsaw/ Orange Polska | Q18/13 | Q18/13 Rapporteur group meeting |
| 5 – 8 September 2017 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 4 – 8 September 2017 | Poland, Warsaw/ Orange Polska | Q19/13 | Q19/13 Rapporteur group meeting |
| 4 – 8 September 2017 | Poland, Warsaw/ Orange Polska | Q17/13 | Q17/13 Rapporteur group meeting |
| 20 September 2017 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 11 January 2018 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 17 – 19 January 2018 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 26 January 2018 | E-Meeting | Q22/13 | Q22/13 Rapporteur group meeting |
| 29 January 2018 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 1 February 2018 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 30 January – 1 February 2018 | E-Meeting | Q18/13 | Q18/13 Rapporteur group meeting |
| 8 February 2018 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 5 – 8 February 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 21 - 22 February 2018 | Korea (Rep. of), Busan/TTA | Q1/13 | Q1/13 Rapporteur group meeting |
| 7 – 13 March 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 9 – 18 April 2018 | Switzerland, Geneva | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 10 May 2018 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 31 May 2018 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 28 – 31 May 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 5 June 2018 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 7 – 8 June 2018 | Korea (Rep. of), Busan/DongEui University | Q1/13 | Q1/13 Rapporteur group meeting |
| 15 June 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 13 – 14 August 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 23 August 2018 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 5 – 7 September 2018 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 13 September 2018 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 13 – 14 September 2018 | Korea (Rep. of), Busan/TTA | Q1/3 | Q1/13 Rapporteur group meeting |
| 12 – 19 September 2018 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 27 – 28 September 2018 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 18 October 2018 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 22 October – 2 November 2018 | Switzerland, Geneva | Q1/13, Q2/13,  Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 10 – 11 January 2019 | Korea (Rep. of), Seoul/KT | Q16/13 | Q16/13 Rapporteur group meeting |
| 24 - 25 January 2019 | Korea (Rep. of), Busan/DongEui University | Q1/13 | Q1/13 Rapporteur group meeting |
| 21 – 29 January 2019 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 12 – 22 February 2019 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 29 – 30 April 2019 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 14 – 16 May 2019 | Japan, Tokyo/NICT Japan | Q16/13 | Q16/13 Rapporteur group meeting |
| 28 May 2019 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 30 – 31 May 2019 | Korea (Rep. of), Busan | Q1/13 | Q1/13 Rapporteur group meeting |
| 17 – 28 June 2019 | Switzerland, Geneva | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 5 – 7 August 2019 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 13 – 14 August 2019 | Korea (Rep. of), Busan/DongEui University | Q1/13 | Q1/13 Rapporteur group meeting |
| 21 – 23 August 2019 | China, Beijing/CAS Quantum Network Co., Ltd. and QuantumCTek Co., Ltd | Q16/13 | Q16/13 Rapporteur group meeting |
| 26 – 29 August 2019 | Korea (Rep. of)/KAIST | Q16/13 | Q16/13 Rapporteur group meeting |
| 3 – 4 September 2019 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 5 September 2019 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 2 – 6 September 2019 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 10 – 11 September 2019 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 17 – 23 September 2019 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 30 September 2019 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 14 November 2019 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 28 November 2019 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 16 – 19 December 2019 | E-Meeting | Q20/13 | Q21/13 Rapporteur group meeting |
| 16 – 20 December 2019 | Korea (Rep. of), Seoul/KT | Q16/13 | Q16/13 Rapporteur group meeting |
| 7 – 8 January 2020 | E-Meeting | Q17/13, Q18/13, Q19/13 | Q17/13, Q18/13, Q19/13 Joint rapporteur group meetings |
| 10 – 13 January 2020 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 14 – 16 January 2020 | Japan, Tokyo/TTC | Q16/13 | Q16/13 Rapporteur group meeting |
| 13 – 17 January 2020 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 3 February 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 3 – 6 February 2020 | E-Meeting | Q20 /13 | Q20/13 Rapporteur group meeting |
| 4 – 6 February 2020 | Korea (Rep. of)/KAIST | Q23/13 | Q23/13 Rapporteur group meeting |
| 10 February 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 17 – 18 February 2020 | Korea (Rep. of), Busan/DongEui University | Q1/13 | Q1/13 Rapporteur group meeting |
| 2 – 13 March 2020 | Switzerland, Geneva | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q19/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 6 April 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 27 April 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 27 – 28 April 2020 | E-Meeting | Q22/13 | Q22/13 Rapporteur group meeting |
| 14 May 2020 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 19 May 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 20 May 2020 | E-Meeting | Q23/13 | Q23/13 Rapporteur group meeting |
| 18 – 22 May 2020 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 18 – 22 May 2020 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 18 – 22 May 2020 | E-Meeting | Q16/13 | Q20/13 Rapporteur group meeting |
| 29 May – 2 June 2020 | E-Meeting | Q18/13 | Q20/13 Rapporteur group meeting |
| 27 May – 2 June 2020 | E-Meeting | Q17/13 | Q17/13 Rapporteur group meeting |
| 8 June 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 18 June 2020 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 19 June 2020 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 29 June 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 10 September 2020 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 28 – 29 September 2020 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 13 October 2020 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 12 – 16 October 2020 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 26 – 29 October 2020 | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 7 – 17 December 2020 | E-Meeting | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 15 January 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 18 – 22 January 2021 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 8 – 9 February 2021 | E-Meeting | Q1/13 | Q1/13 Rapporteur group meeting |
| 8 – 10 February 2021 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 12 February 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 23 April 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 10 – 14 May 2021 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 12 – 14 May 2021 | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 12 – 14 May 2021 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 21 May 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 27 – 28 May 2021 | E-Meeting | Q1/13 | Q1/13 Rapporteur group meeting |
| 5 - 16 July 2021 | E-Meeting | Q1/13, Q2/13, Q5/13, Q6/13, Q7/13, Q16/13, Q17/13, Q18/13, Q19/13, Q20/13, Q21/13, Q22/13, Q23/13 | SG13 Co-located rapporteur group meetings |
| 19 August 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 16 September 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 15 – 16 September 2021 | E-Meeting | Q6/13, Q16/13 | Q6/13, Q16/13 Joint rapporteur group meetings |
| 14 – 16 September 2021 | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 14 – 16 September 2021 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 21 September 2021 | E-Meeting | Q6/13; Q16/13 | Q6/13, Q16/13 Joint rapporteur group meetings |
| 20 – 22 September 2021 | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 22 – 24 September 2021 | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 27 – 28 September 2021 | E-Meeting | Q22/13 | Q22/13 Rapporteur group meeting |
| 28 – 30 September 2021 | E-Meeting | Q17/13 | Q17/13 Rapporteur group meeting |
| 28 – 30 September 2021 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 21 October 2021 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 21 October 2021 | E-Meeting | Q6/13; Q16/13 | Q6/13, Q16/13 Joint rapporteur group meetings |
| 20 – 22 October 2021 | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 20 – 22 October 2021 | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 27 January 2022 | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting |
| 15 February 2022 | E-Meeting | Q1/13 | Q1/13 Rapporteur group meeting |
| 15 – 17 February 2022 | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 16 – 18 March 2022\* | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 16 – 18 March 2022\* | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| 29 – 31 March 2022\* | E-Meeting | Q7/13 | Q7/13 Rapporteur group meeting |
| 29 – 31 March 2022\* | E-Meeting | Q17/13 | Q17/13 Rapporteur group meeting |
| Second half of March 2022\* | E-Meeting | Q5/13 | Q5/13 Rapporteur group meeting (Date TBC) |
| April 2022\* | E-Meeting | Q22/13 | Q22/13 Rapporteur group meeting (Dates TBC) |
| April 2022\* | E-Meeting | Q23/13 | Q23/13 Rapporteur group meeting (Dates TBC) |
| 25 – 29 April 2022\* | E-Meeting | Q21/13 | Q21/13 Rapporteur group meeting |
| 26 – 28 April 2022\* | E-Meeting | Q20/13 | Q20/13 Rapporteur group meeting |
| 10 – 12 May 2022\* | E-Meeting | Q19/13 | Q19/13 Rapporteur group meeting |
| 18 – 20 May 2022\* | E-Meeting | Q6/13 | Q6/13 Rapporteur group meeting |
| 18 – 20 May 2022\* | E-Meeting | Q16/13 | Q16/13 Rapporteur group meeting |
| May and June 2022\* | E-Meetings | Q21/13 | Q21/13 Rapporteur group meeting (Dates TBC) |

\* NOTE – Planned meetings at the time of preparation of this report.

# 2 Organization of work

## 2.1 Organization of studies and allocation of work

**2.1.1** At its first meeting of the study period, Study Group 13 decided to establish three Working Parties.

**2.1.2** Table 2 shows the number and title of each Working Party, together with the number of Questions assigned to it and the name of its Chairman. As part of implementation of the *ITU-T work continuity plan until WTSA in 2022* TSAG meeting in January 2021 endorsed the new set of Questions for SG13 (found in Table 5). Further to changes of the titles and Question’s texts March 2021 SG13 meeting agreed to change the titles of the SG13 Working Parties as appears in Table 2-bis.

TABLE 2  
Organization of Study Group 13 (2017-2020)

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation** | **Questions to be studied** | **Title of the Working Party** | **Chairman and Vice-Chairmen** |
| WP1/13 | Q6/13; Q20/13; Q21/13; Q22/13; Q23/13; | IMT-2020: Networks & Systems | Mr Hyung-Soo (Hans) Kim (KT Corporation) and  Mr Luca Pesando (Telecom Italia), Chairmen, and Mr Yachen Wang\* (China Mobile), Mr Alojz Hudobivnik (Slovenia) [from 2019],  Ms Lu Lu (China Moble) [from 2019], Mr Brice Murara (RURA, Rwanda), Vice-chairmen |
| WP2/13 | Q7/13; Q17/13; Q18/13; Q19/13; | Cloud Computing & Big Data | Mr Yoshinori Goto (NTT Japan),  Mr Fidelis Onah (NCC, Nigeria), Chairmen and Mr Juan Carlos Minuto (Argentina), Mr Ahmed Raghy (NTRA, Egypt), Vice-chairmen |
| WP3/13 | Q1/13; Q2/13; Q5/13; Q16/13; | Network Evolution & Trust | Mr Gyu Myoung Lee (Republic of Korea), Mr Heyuan Xu (China), Chairmen and  Mr Mohammed Al Tamimi (CITC, Saudi Arabia),  Mr Maurice Ghazal\* (Lebanon),  Ms Rim Belhassine-Cherif (Tunisia Telecom) [from 2018], Vice-chairmen |

Legend: \* - resigned from this position

TABLE 2 - bis  
Organization of Study Group 13 (2021-2022)

|  |  |  |  |
| --- | --- | --- | --- |
| **Designation** | **Questions to be studied** | **Title of the Working Party** | **Chairman and Vice-Chairmen** |
| WP1/13 | Q6/13; Q20/13; Q21/13; Q22/13; Q23/13; | IMT-2020 and Beyond:  Networks & Systems | Mr Hyung-Soo (Hans) Kim (KT Corporation) and  Mr Luca Pesando (Telecom Italia), Chairmen, and Mr Alojz Hudobivnik (Slovenia),  Ms Lu Lu (China Mobile) and  Mr Brice Murara (RURA, Rwanda), Vice-chairmen |
| WP2/13 | Q7/13; Q17/13; Q18/13; Q19/13; | Cloud Computing & Data Handling | Mr Yoshinori Goto (NTT Japan),  Mr Fidelis Onah (NCC, Nigeria), Chairmen and Mr Juan Carlos Minuto (Argentina),  Mr Ahmed Raghy\* (NTRA, Egypt), Vice-chairmen |
| WP3/13 | Q1/13; Q2/13; Q5/13; Q16/13; | Network Evolution, Trust and Quantum Enhanced Networking | Mr Gyu Myoung Lee (Republic of Korea),  Mr Heyuan Xu\* (China),  Mr JiGuang Cao (China) [from 03-2021], Chairmen and  Mr Mohammed Al Tamimi (CITC, Saudi Arabia),  Ms Rim Belhassine-Cherif (Tunisia Telecom), Vice-chairmen |

Legend: \* - resigned from this position

In addition, Mr Marco Carugi served as the SG13 mentor in this study period.

**2.1.3** Table 3 lists other groups created by Study Group 13 during the study period.

**2.1.4** In line with Resolution 54 (rev., Hammamet, 2016), the new ITU-T Study Group 13 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG13RG-EECAT) was created in March 2019. ITU-T Study Group 13 Regional Group for Africa (SG13RG-AFR) continued its operation in this study period. Both Regional Groups will continue their activities in the next study period.

**2.1.5** Focus Group on IMT-2020 was established in the previous study period (May 2015) and it was in operation until December 2016. The first SG13 meeting in the reported study period (February 2017) closed FG-IMT-2020.

**2.1.6** Focus Group on Machine Learning for Future Networks including 5G (FG-ML5G) was established by SG13 in November 2017 and finished its activities in July 2020.

**2.1.7** Focus Group on Technologies for Network 2030 (FG-NET2030) was created by the SG13 in July 2018 and was in operation until July 2020.

**2.1.8** Focus Group on Autonomous Network (FG-AN) was set up by the SG13 in December 2021 and it has been in operation until the day this report was written. It has a mandate to continue its work until first SG13 meeting in 2023.

**2.1.9** The Joint Coordination Activity on Software-Defined Networking (JCA-SDN) was carried over from the previous study period. The first TSAG meeting in the reported study period approved its continuation with the revised terms of references for year 2017. November 2017 Study Group 13 meeting agreed to terminate the JCA-SDN activities as accomplishing its mandate regarding coordination of the cloud computing studies across ITU-T study groups.

**2.1.10** In line with Resolution 92 (Hammamet, 2016), SG13, at its first meeting in the reported study period (February 2017), established the new Joint Coordination Activity on IMT-2020 (JCA-IMT2020). JCA-IMT2020 will continue its activities through year 2022 under the name *Joint Coordination Activity on IMT2020 and Beyond (JCA-IMT2020)*.

**2.1.11** Per the instruction from TSAG (July 2016 meeting) SG13 at its meeting of February 2017 established *the Ad-hoc group on Guidance for drafting technical Recommendations* to elaborate some directions how to draft the technical Recommendations in ITU-T. Through its journey in many meetings the Ad-hoc fulfilled its objectives and delivered the output document “Guidelines and methodologies for developing technical Recommendations”. With this, the ad-hoc group ceased its activities and was dismissed in March 2019. The Guidelines document was passed over to the TSAG for further consideration.

**2.1.12** The Correspondence Group with SG2 (WP2/2) on network management issues for IMT-2020 was set up at SG13 July 2018 meeting and SG2 July 2018 meeting. It was in operation until August 2020.

**2.1.13** The activities of the Joint Rapporteur Group on Cloud Computing Management (JRG-CCM) came to the completion at the end of the previous study period, at the first meeting of the SG13 in the reported study period (February 2017) the JRG-CCM was formally closed.

**2.1.14** Table 3 shows all the above groups along with their respective leaders.

TABLE 3  
Other Groups

|  |  |  |
| --- | --- | --- |
| Title of the Group | Chairman | Vice-Chairmen |
| ITU-T SG13 Regional Group for Africa (SG13RG-AFR) | Mr Simon Bugaba\*\*\*, Uganda Communications Comission, Uganda,  succeeded in December 2021 by Ms Rim Belhassine-Cherif,  Tunisia Telecom, Tunisia | Ms Soumaya Benbartaoui, Algeria  Mr Brice Murara, Rwanda  Ms Rim Belhassine-Cherif\*\*, Tunisia Telecom, Tunisia (until December 2021) |
| ITU-T SG13 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG13RG-EECAT) | Mr Alexey Borodin, Rostelecom, Russian Federation |  |
| Focus Group on IMT-2020  (FG-IMT-2020)\* | Mr Peter Ashwood-Smith, Huawei Technologies, Canada | Mr Yachen Wang, China Mobile, China  Mr Nam-Seok Ko, ETRI, Korea  Mr Yoshinori Goto, NTT, Japan (from 2016)  Mr Luca Pesando, Telecom Italia, Italy |
| Focus Group on Machine Learning for Future Networks including 5G  (FG-ML5G)\* | Mr Slawomir Stanczak, Fraunhofer HHI, Germany | Mr Charles Chike Asadu, University of Nigeria  Mr Seongbok Baik, Republic of Korea  Mr Villiam Sarian, Russian Federation  Mr Salih Ergut, Turkcell, Turkey (from 2018)  Ms Mingjun Sun\*\*, CAICT, China (in 2017- 11/2019)  Mr Qiang Cheng, China (in 11/2019-2020) |
| Focus Group on Technologies for Network 2030  (FG-NET2030)\* | Mr Richard Li,  Huawei Technologies, USA | Mr Mehmet Toy, Verizon, USA  Mr Alexey Borodin, Rostelecom, Russian Federation  Ms Yuan Zhang, China Telecom, China  Mr Yutaka Miyake, KDDI, Japan  Mr Dong-Hi Sim, SK Telecom, Korea (from 2019)  Mr Sundeep Bhandari, National Phisical Laboratory, UK (from 2019) |
| Focus Group on Autonomous Network (FG-AN) | Mr Leon Wong, Rakuten, Japan | Ms Xu Dan (China Telecom, China)  Mr Salih Ergut (OREDATA, Turkey)  Mr Gyu Myoung Lee (KAIST, Korea)  Mr Vishnu Ram OV (Independent Expert)  Mr Cao Xi (China Mobile, China) |
| Joint Coordination Activity on Software-Defined Networking (JCA-SDN)\* | Ms Ying Cheng,  China Unicom, China | Mr Scott Mansfield, Ericsson, Canada |
| Joint Coordination Activity on IMT2020 (JCA-IMT2020)  *Since 2021 Joint Coordination Activity on IMT2020 and Beyond (JCA-IMT2020)* | Mr Scott Mansfield,  Ericsson, Canada | Ms Ying Cheng, China Unicom, China |
| Ad-hoc group on Guidance for drafting technical Recommendations\* | Conveners:  Mr Wu Tong, China Telecom, China, and Mr Marco Carugi, Huawei, China |  |
| Correspondence group with SG2 (WP2/2) on network management issues for IMT-2020\* | Conveners:  Mr Wei Chen\*\*, China Mobile, China (in 2018), Mr Kazunori Tanikawa, NEC, Japan (from 2019) and  Ms Yushuang Hu, China Mobile, China (from 2019) [from SG13],  Mr Qian Hu, China Telecom, China [from SG2] |  |
| Joint Rapporteur Group on Cloud Computing Management (JRG-CCM)\* | Co-Rapporteur  (from SG13):  Mr Emil Kowalczyk, Orange, Poland  Co-Rapporteur (from SG2):  Ms Wang Yanchuan, China Telecom |  |

Legend: \* - Closed in the reported study period.

\*\* - Resigned from this position.

\*\*\* - Passed away.

## 2.2 Study Group 13 organized and conducted 19 workshops in the 2017-2020 study period:

* Cairo, Egypt, 2-3 April 2017: [Fifth SG13 Regional Workshop for Africa on "ITU-T  
  Standardization Work on Future Networks: Towards a Better Future for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/standardization/20170402/Pages/default.aspx)"
* Geneva, 11 July 2017: [IMT-2020/5G workshop and demo day](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201707/Pages/default.aspx)
* Geneva, 29 January 2018: [Workshop on Machine Learning for 5G and beyond](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180129/Pages/default.aspx)
* Abidjan, Cote D'Ivoire, 26-27 March 2018: [Sixth SG13 Regional Workshop for Africa on "Standardization of future networks: What opportunities for Africa? "](file:///C:\Users\karimova\Desktop\SG13\wtsa\Sixth%20SG13%20Regional%20Workshop%20for%20Africa%20on%20%22Standardization%20of%20future%20networks:%20What%20opportunities%20for%20Africa%3f%20%22)
* Xi'an, China, 25 April 2018:[Workshop on Impact of AI on ICT Infrastructures](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180425/Pages/default.aspx)
* Geneva, 18 July 2018: [Third annual ITU IMT-2020/5G Workshop and Demo Day - 2018](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201807/Pages/default.aspx)
* San Jose, Unites States, 7 August 2018: [Workshop on Machine Learning in 5G and beyond](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180807/Pages/default.aspx)
* New York City, United States, 2 October 2018: [First Workshop on Network 2030](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201810/Pages/default.aspx)
* Hong Kong, China, 18 December 2018: [Second Workshop on Network 2030](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20181218/Pages/default.aspx)
* London, 18 February 2019: [Third Workshop on Network 2030](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190218/Pages/default.aspx)
* Shenzhen, China 6 March 2019: [Workshop on Towards a New Era - AL in 5G](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201903/Pages/default.aspx)
* Saint Petersburg, 21-23 May 2019: [Fourth Workshop on Network 2030](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201905/Pages/default.aspx)
* Geneva, 17 June 2019: [Workshop on Machine Learning for 5G and beyond ​](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190617/Pages/default.aspx)
* Geneva, 14-16 October 2019: [Fifth Workshop on Network 2030](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2019101416/Pages/default.aspx)
* Berlin, 5 November 2019: [Workshop on Machine Learning for 5G and beyond](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201911/Pages/default.aspx)
* Lisbon, 13 January 2020: [Sixth Workshop on Network 2030 and Demo Day​](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20200113/Pages/default.aspx)
* Abuja, Nigeria, 3-4 February 2020: [Sixth SG13 Regional Workshop for Africa on "Standardization of future networks: What opportunities for Africa? "](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/standardization/20180326/Pages/default.aspx)
* 16 March 2020, virtual: Joint ITU-ETSI [Workshop on "Machine Learning in communication networks”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20200318/Pages/default.aspx)
* 1 June 2021, virtual: [Eighth 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)

In addition, members of the Study Group 13 leadership team and others participated in SG Leadership Assemblies and multiple events organized by ITU-T and ITU-D as well as related events organized by others contributing to their success both as speaker, panellist and participants.

# 3 Questions and Rapporteurs

**3.1** WTSA-16 assigned to Study Group 13 the 13 Questions listed in Table 4.

**3.2** The Questions listed in Table 5 were endorsed at the Telecommunication Standardization Advisory Group (TSAG) meeting held from 11 to 18 January 2021. The endorsed Questions contained in [TSAG-R18](https://www.itu.int/md/T17-TSAG-R-0018/en) became effective on 18 January 2021 for the remainder of the study period. The proposed Question texts in Part II of this report are the same with the exception to QN/13 (continuation of Q1/13) that was updated at the last SG13 meeting in the study period, November – December 2021.

**3.3** The Questions listed in Table 6 have been deleted during this period.

TABLE 4  
Study Group 13 – Questions assigned by WTSA-16 and Rapporteurs

| **Questions** | **Title of the Questions** | **WP** | **Rapporteur**  **(Associate Rapporteur)** |
| --- | --- | --- | --- |
| 1/13 | Innovative services scenarios, deployment models and migration issues based on Future Networks | 3/13 | Mr Heechang Chung  (Mr Miao Xue from 2021) |
| 2/13 | NGN evolution with innovative technologies including SDN and NFV | 3/13 | Ms Yuan Zhang |
| 5/13 | Applying networks of future and innovation in developing countries | 3/13 | Mr Simon Bugaba\*\*  Mr Elliot Kabalo  (Mr Sakho Mamadou Oury  from 2018) |
| 6/13 | QoS aspects including IMT-2020 networks | 1/13 | Mr Taesang Choi (Mr Guosheng Zhu) |
| 7/13 | Big data driven networking (bDDN) and Deep packet inspection (DPI) | 2/13 | Mr Jinyou Dai |
| 16/13 | Knowledge-centric trustworthy networking and services | 3/13 | Mr Gyu Myoung Lee (Mr Zhangchao Ma and Mr Mark McFadden, both from 2021) |
| 17/13 | Requirements, ecosystem, and general capabilities for cloud computing and big data | 2/13 | Mr Kangchan Lee  (Mr Nan Chen\*, until 10-2019  Mr Xiaowu He, from 10-2019) |
| 18/13 | Functional architecture for cloud computing and big data | 2/13 | Mr Dong Wang\*, until 10-2019  Ms Zheng Huang, from 10-2019 (Ms Tingting Zhang, from 2021,  Mr Olivier Le Grand\* until 2020) |
| 19/13 | End-to-end cloud computing management, cloud security and big data governance | 2/13 | Mr Emil Kowalczyk \*, until 2020  Ms Ying Cheng, from 2021  (Ms Ying Cheng\*, until 2020,  Ms Tingting Zhang, from 2021) |
| 20/13 | IMT-2020: Network requirements and functional architecture | 1/13 | Mr Nam Seok Ko  Mr Marco Carugi, from 2021 (Mr Marco Carugi\*, until 2020,  Mr Olivier Le Grand, from 2021) |
| 21/13 | Network softwarization including software-defined networking, network slicing and orchestration | 1/13 | Mr Naotaka Morita\*, until 07-2018  Mr Wei Chen\* until 2018  Ms Yushuang Hu, from 2019  Mr Kazunori Tanikawa, from 07-2018  (Mr Sangwoo Kang and  Mr Aki Nakao\*, until 2018) |
| 22/13 | Upcoming network technologies for IMT-2020 & Future Networks | 1/13 | Mr Ved P. Kafle  Mr Cao Jiguang \*, until 2020 (Ms Jie Zhang, from 2021) |
| 23/13 | Fixed-Mobile Convergence including IMT-2020 | 1/13 | Mr Yachen Wang\*, until 10-2018  Mr Seng-Kyoun Jo\*, until 10-2018  Mr Jeong Yun Kim, from 11-2018  Mr Nanxiang Shi, from 2019 |

Legend: \* - Resigned from this position.

\*\* - Passed away.

Study Group 13 revised the text of the Questions 19/13, 20/13 (twice) and 21/13, in this study period. The above table shows the title of these Questions as they were in force by the end of 2020 before TSAG meeting in January 2021 endorsed updated Questions.

TABLE 5  
Study Group 13 – New Questions adopted and Rapporteurs

| **Questions** | **Title of the Questions** | **WP** | **Rapporteur**  **(Associate Rapporteur)** |
| --- | --- | --- | --- |
| 1/13 | Future Networks: Innovative Service Scenarios, including Environmental and Socio Economical Aspects | 3/13 | Mr Chung Heechang  (Mr Xue Miao) |
| 2/13 | Next-generation Network (NGN) Evolution with Innovative Technologies including Software-Defined Networking (SDN) and Network Function Virtualization (NFV) | 3/13 | Ms Yuan Zhang |
| 5/13 | Applying Future Networks and Innovation in Developing Countries | 3/13 | Mr Elliot Kabalo  (Mr Sakho Mamadou Oury) |
| 6/13 | Networks beyond IMT2020: Quality of service (QoS) mechanisms | 1/13 | Mr Taesang Choi  (Mr Guosheng Zhu) |
| 7/13 | Future Networks: Deep Packet Inspection and Network Intelligence | 2/13 | Mr Jinyou Dai |
| 16/13 | Future Networks: Trustworthy and Quantum Enhanced Networking and Services | 3/13 | Mr Gyu Myoung Lee  (Mr Zhangchao Ma,  Mr Mark McFadden) |
| 17/13 | Future Networks: Requirements and Capabilities for Computing including Cloud Computing and Data Handling | 2/13 | Mr Lee Kangchan  (Mr Xiaowu He) |
| 18/13 | Future Networks: Functional Architecture for Computing including Cloud Computing and Data Handling | 2/13 | Ms Zheng Huang  (Ms Tingting Zhang) |
| 19/13 | Future Networks: End-to-end Management, Governance, and Security for Computing including Cloud Computing and Data Handling | 2/13 | Ms Ying Cheng |
| 20/13 | Networks beyond IMT-2020 and Machine Learning: Requirements and Architecture | 1/13 | Mr Marco Carugi,  Mr Nam Seok Ko  (Mr Olivier Legrand) |
| 21/13 | Networks beyond IMT-2020: Network softwarization | 1/13 | Ms Yushuang Hu,  Mr Kazunori Tanikawa  (Mr Sangwoo Kang) |
| 22/13 | Networks beyond IMT2020: Emerging network technologies | 1/13 | Mr Ved P. Kafle,  Ms Jie Zhang |
| 23/12 | Networks beyond IMT2020: Fixed, mobile and satellite convergence | 1/13 | Mr Jeong Yun Kim,  Mr Nangxiang Shi |

Table 5 lists the Questions and Rapporteurs in force by the end of the study period.

TABLE 6  
Study Group 13 – Questions deleted

| Questions | Title of Questions | Rapporteurs | Results |
| --- | --- | --- | --- |
| None |  |  |  |

# 4 Results of the work accomplished during the 2017-2020 study period

## 4.1 General

During the study period, Study Group 13 examined 1310 contributions and generated a large number of TDs and liaison statements. It also:

– drew up 116 new Recommendations;

– amended two Recommendations, revised three Recommendations and issued Corrigendum to five existing Recommendations;

– developed 15 Supplements and one Implementer’s guide;

– produced two technical reports and two technical papers.

## 4.2 Highlights of achievements

The main results achieved on the various Questions assigned to Study Group 13 are briefly summarized below. Formal replies to the Questions are given in a synoptic table in Annex 1 of this report.

**Machine Learning for IMT-2020**

The Focus Group on Machine Learning for Future Networks including 5G was in operation from November 2017 until July 2020. It looked at the machine learning in bringing more automation and intelligence to ICT network design and management. It elaborated 10 Deliverables that were passed over to the SG13 for further action. Based on one of those Deliverables, SG13 further elaborated and approved the milestone Recommendation ITU-T Y.3172 “Architectural framework for machine learning in future networks including IMT-2020” (06/2019) dealing with the basics of machine learning technology as applied to networks. This Recommendation was very well received and recognized in the telecommunications industry. The main outcomes of Recommendation ITU-T Y.3172 were further elaborated in the Recommendations ITU-T Y.3170-series on evaluating intelligence level of future networks, framework for data handling to enable machine learning in future networks and some others.

Having approved 12 Recommendations on machine leaning, the work on different aspects of network intelligence continues in SG13 with 8 ongoing work items.

**Quantum Key Distribution Networks**

SG13 has started working on quantum key distribution networks (QKDN) since July 2018. It opened the path for the quantum communications related Recommendations in ITU-T by approving of Recommendation ITU-T Y.3800 “Overview on networks supporting quantum key distribution” in October 2019. It was further complemented by 8 other Recommendations in Y.3800-series on functional requirements and functional architecture for QKDN, software-defined networking control for QKDN, key management and control and management for QKDN. Two [technical tutorials](https://www.itu.int/en/ITU-T/studygroups/2017-2020/13/Pages/Tutorial-on-QKD.aspx) on QKDN took place in 2018 and 2019. Studies in this direction will continue in the next study period.

**Mobile Networks**

Study Group 13 continues its studies of mobile communications and approved 49 Recommendations covering such particularities of mobile networks as terms and definitions, requirements for IMT-2020 network, IMT-2020 network management framework and orchestration requirements, capability exposure in IMT-2020 network and many others. SG13 has currently about 60 ongoing work items on mobile communication at its work programme.

**Network Softwarization**

Network softwarization proved to be a successful network technology in improving flexibility and better management and operation of the networks. SG13 contributed to further development of this technology by approving Recommendations ITU-T Y.3150-series on technical characteristic of network softwarization for IMT-2020, multiple network slicing and network slice configuration.

**Trust in ICT**

The work on application of trust concept to the networks continues in SG13 in the reported study period with the approval of 10 Recommendation, covering, in particular, basic principles of a trusted environment in ICT infrastructure, trust provisioning in ICT infrastructures, inter-cloud trust management, trust index model for ICT infrastructures and few others.

**Cloud Computing**

24 Recommendations and two Supplements, SG13 approved in the domain of cloud computing, include Network as a Service, trusted inter-cloud, functional architecture of inter-cloud computing, inter-cloud data management, edge cloud management, data storage federation, cloud service brokerage, distributed cloud, data provenance, requirements for containers and micro-services and many others.

In the next study period SG13 will continue to elaborate the concept of computing and network convergence.

**Fixed, Mobile and Satellite Convergence**

In this study period SG13 introduced a new element to the known concept of fixe-mobile convergence – satellite component. To this end, it approved 8 Recommendations on requirements for IMT-2020 fixed-mobile convergence, service scheduling for supporting FMC in IMT-2020 network and few more. The work on fixed, mobile and satellite convergence will continue in the next study period.

**Autonomous Networks**

SG13 daughter group, Focus Group on Autonomous Networks, delivered the use cases document (collection of use case for autonomous networks) with 40 cases for potential application of the standardization efforts in the future.

**Digital Twin Network**

SG13 started working on the concept of the digital twin network with the approval of the first Recommendation Y.3090 “Digital twin network - Requirements and architecture” in February 2022. Work on digital twin network will expand into the next study period.

## 4.3 Report of lead study group activities, JCAs, regional groups and Focus Groups

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

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

The lead study group role on future networks and IMT-2020 networks (non-radio related parts), in particular, were performed by the SG13 through its daughter group, JCA-IMT2020. The latter coordinates work with the focus on the non-radio aspects within ITU-T and leads coordination of the communication with standards development organizations, consortia and forums also working on IMT-2020 related standards. A tool used for this is the [*IMT-2020 and beyond standardization roadmap*](https://www.itu.int/net4/ITU-T/landscape#?topic=0.130&workgroup=1&searchValue=&page=1&sort=Revelance). It represents a snapshot of who is doing what in this area in the standardization world with the pointers to the Recommendations/specifications. (See clause 3.3.5.2 for more details.)

In 2017 SG13 published three flipbooks about IMT-2020, one of which represents the collection of all ITU-T Recommendations related to this technical topic.

Three dedicated annual workshops on IMT-2020 (having exhibition and demonstrations along its side each) were convened in the period from December 2016 to July 2018 to promote the SG13 and ITU-T work in this area.

In addition, Study Group 13 created a focus group on technologies for Network 2030 (FG-NET2030) to study networks to be in operation around year 2030-2035. It studied the capabilities of networks for the year 2030 and beyond, when it is expected to support novel forward-looking scenarios, such as holographic type communications, extremely fast response in critical situations and high-precision communication demands of emerging market verticals. FG was in operation from 2018 to 2020, prepared in total 8 Deliverables, held seven FG meetings having six dedicated to Network 2030 workshop alongside of most of its meetings.

Finally, both of the SG13 Regional Groups have Future Networks/Network 2030 among their priorities for application of standardizations efforts.

### 4.3.2 Lead study group activities on mobility management

In its activities devoted to the lead study group’s function for mobility management Study Group 13 developed ten new Recommendations in this domain. Currently it has 15 new ongoing work items related to mobility management on its work programme.

In preparations for the next study period, SG13 drafted the new Question text with particular focus on fixed-mobile and satellite convergence for the networks beyond IMT-2020.

### 4.3.3 Lead study group activities on cloud computing

SG13 was instrumental in achieving the goals of coordination the studies in the area of cloud computing including the interactions with other relevant study groups and SDOs. As one of its activities, SG13 elaborated towards its completion *the cloud computing standardization roadmap*. SG13 published “[Cloud computing standardization roadmap](https://www.itu.int/rec/T-REC-Y.Sup49/en)” as Supplement 49 to Y.3500-seires of ITU-T Recommendations in 2018.

In addition, in 2019 and 2020 SG13 published the flipbook on Big Data and on Cloud Computing respectively. Each publication encompasses the collection of ITU-T standardization work on these technical topics.

Both of the SG13 Regional Groups have cloud computing among their priorities for application of standardizations efforts.

Cloud computing was a topic at 4 workshops SG13 convened during 2017 – 2021.

Current SG13 work programme counts 22 ongoing work items on cloud/edge computing.

### 4.3.4 Lead study group activities on trusted network infrastructures

In its leading role on trusted network infrastructures SG13 maintains and updates *the Standardization roadmap on Trustworthy Networking and Services* and *Standardization roadmap on Quantum Key Distribution Networks*. Each roadmap represents the landscape with related technical areas of trust technologies and QKDN respectively from an ITU-T perspective and lists the related standards and publications developed in standards development organizations (SDOs).

In 2017 SG13 published a flipbook “Trust in ICT” that captures the ITU-T Recommendations and technical reports related to the technical topic of trust in ICT.

Among others trust was a topic at 4 workshops SG13 convened during 2017 – 2021.

Currently progressing work include studies on trust with 6 work items and on QKDN with 12 work items.

In preparations for the next study period, SG13 drafted the new Question text with particular focus on trustworthy networks and services and quantum enhanced networking.

Finally, trust, as technical topic, is identified as one of the key area for standardization by SG13RG-AFR.

## 4.3.5 Joint coordination activities (JCAs)

Study Group 13 is the group responsible for JCA-IMT-2020 and was a group to which JCA-SDN reported to since 2015.

4.3.5.1 The Joint Coordination Activity on Software-Defined Networking (**JCA-SDN**) held three meetings under the chairmanship of Ms Ying Chen (China Unicom), assisted by JCA-SDN Vice-chairman Mr Scott Mansfield (Ericsson, Canada) in 2017. JCA-SDN periodically reported its progress to Study Group 13. As one of its tasks the JCA-SDN developed and kept up-dated at each meeting the SDN standardization roadmap.

JCA-SDN was instrumental in achieving the goals of coordination the studies in the area of network softwarization including the interactions with other relevant study groups and SDOs. (See also clause 2.1.9 of this report.) JCA-SDN brought value to visibility of the software-defined networking studies at ITU-T.

It ceased its activities in November 2017 having reached the end of its lifetime. The main output of the group, SDN standardization roadmap, was entrusted for maintenance to the JCA-IMT2020.

4.3.5.2 The Joint Coordination Activity on IMT-2020 (**JCA-IMT2020**) held 11 meetings under the chairmanship of Mr Scott Mansfield (Ericsson, Canada) assisted by JCA-IMT2020 Vice-chairman Ms Ying Chen (China Unicom), in the period 2017 - 2021. JCA-IMT2020 periodically reported its progress to Study Group 13. (See also clauses 2.1.10 and 3.3.1 above.)

From its set up in 2017 JCA-IMT2020 established the good communication with different standards development organizations working in the area of mobile communications.

JCA-IMT2020 initiated the roadmap for IMT-2020 standardization. This roadmap is maintained up to date after each meeting of the group. In addition, a snapshot of this roadmap was published in 2020 as Supplement 59 to Y.3100-series of ITU-T Recommendations “IMT-2020 standardization roadmap”.

At its last meeting in the reported Study Period SG13 agreed to continue the activities of JCA-IM2020 for year 2022 in the next study period with the new name Joint Coordination Activity on IMT-2020 and Beyond.

### 4.3.6 Regional Groups

4.3.6.1 ITU-T SG13 Regional Group for Africa (**SG13RG-AFR**) continued its operation from the previous study period. In April 2016, in preparations for the current study period, the group reviewed and updated its mandate, that was confirmed at the first SG13 meeting in this study period. Updates to the group’s terms of reference touched mainly the shift in standardization priorities for this part of the world to IMT-2020, big data and trust in ICT. The SG13RG-AFR added value in improving understanding of the technological challenges faced by the African countries, where the standardization efforts may be applied by the SG13. The contributions from Africa to the work of the SG13 tripled in this study period because of the promotion and increased visibility of the SG13 standards development work in Africa, performed by the SG13RG-AFR. The SG13RG-AFR will continue its activities in the next study period having as priorities to be talked machine learning and artificial intelligence.

4.3.6.2 ITU-T SG13 Regional Group for Eastern Europe, Central Asia and Transcaucasia (**SG13RG-EECAT**) was set up in March 2019 with the main objective to encourage national authorities and operators, manufactures and scientific-research institutions from CIS/RCC countries of Eastern Europe, Central Asia and Transcaucasia region to work together towards coordinated standardization proposals and increase quality and quantity of contributions to ITU-T SG13 in general and to Big Data/Cloud Computing and future networks (2030+) in particular in line with SG13 mandate. It had inaugural meeting in May 2019 in St Petersbourg, Russia, and put its activities on hold since then because of the pandemics. A new Recommendation ITU-T Y.3116 “Traffic typization IMT-2020 management based on an artificial intelligent approach”, consented by SG13 in December 2021, was originated from the contribution submitted to the May 2019 SG13RG-EECAT meeting.

**4.3.7 Focus Groups**

## 4.3.7.1 Focus group on IMT-2020 (FG-IMT-2020)

Focus Group on IMT-2020 (**FG-IMT-2020**) was established in the previous study period (May 2015) with the objective to foster the studies on the network aspects of 5G networks (leaving all the work on frequencies and radio interfaces to a counterpart in ITU-R (SG5 and its WP5D)). It was in operation until December 2016, held 8 meetings and two workshops, delivered 9 technical specifications/technical reports and gap analysis document for further use by its parent group, SG13. The first SG13 meeting in the reported study period (February 2017) closed FG-IMT-2020.

## 4.3.7.2 Focus group on Machine Learning for Future Networks including 5G (FG-ML5G)

The Focus Group on Machine Learning for Future Networks including 5G (**FG-ML5G**) was established by SG13 on 17 November 2017 with the objective to look at the machine learning in bringing more automation and intelligence to ICT network design and management. That included the technical aspects such as use cases, possible requirements, architectures and others.

FG-ML5G was in operation until July 2020, held nine meetings and seven workshops, and delivered 10 technical specifications/technical reports covering such areas as machine learning (ML) for future networks, including interfaces, network architectures, protocols, algorithms and data formats. SG13 further developed and approved 4 Recommendations and a Supplement based on the Deliverables of the FG-ML5G.

The work of the FG-ML5G was very well recognized by the industry.

## 4.3.7.3 Focus group on Technologies for Network 2030 (FG-NET2030)

The Focus Group on Technologies for Network 2030 (**FG-NET2030**) was established by Study Group 13 on 16 July 2018 with the objectives to study the capabilities of networks for the year 2030 and beyond, when it is expected to support novel forward-looking scenarios, such as holographic type communications, extremely fast response in critical situations and high-precision communication demands of emerging market verticals. The study aimed to answer specific questions on what kinds of network architecture and the enabling mechanisms are suitable for such novel scenarios.

Focus Group held seven meetings and six workshops worldwide and accomplished its work in July 2020 with 8 Deliverables, including the gap analysis and White Paper “A Blueprint of Technology, Applications and Market Drivers Towards the Year 2030 and Beyond”.

SG13 inherited 6 outputs from FG-NET2030 for further elaboration.

(See also clause 3.3.1 above.)

## 4.3.7.4 Focus group on Autonomous Network (FG-AN)

The Focus Group on Autonomous Network (**FG-AN**) was established on 17 December 2020 by Study Group 13 with the objective to elaborate the draft technical reports and specifications for autonomous networks, including exploratory evolution in future networks, real-time responsive experimentation, dynamic adaptation to future environments, technologies, and use cases. Since its creation Focus Group held six electronic meetings and accomplished its first big project by delivering the use cases for autonomous networks document. The latter was included as draft Supplement “Use Cases for Autonomous Networks” into the SG13 work programme.

Currently the group is working on a number of technical reports to cover architecture framework and core technical enablers for autonomous network, Proof of Concepts, trust in autonomous networks as well as on a gap analysis in the standardization of autonomous networks and definitions glossary.

It has a mandate to continue its work until first SG13 meeting in 2023. Its deliverables will then be passed over to the Study Group 13 (its parent study group) for further consideration and development as ITU-T Recommendations.

# 5 Observations concerning future work

This clause contains the Study Group 13 vision on its area of responsibility and mandate for the next study period (2022 - 2024). Material provided below was agreed by the SG13 meetings in July 2020 and November – December 2021. Study Group 13 proposes 13 Questions covering network related technical areas including future networks, data handling and processing, computing and network convergence, networks beyond IMT-2020, quantum enhanced networking, digital twin network, machine leaning and programmable networking solutions towards autonomous operation.

It sees its continuation as a stand-alone study group with the reshaped set of Questions as appears in Part II of the SG13 report.

Co-location with SG11 works well and it is recommended to be kept in the future whenever practicable.

# 6 Updates to the WTSA Resolution 2 for the 2022-2024 study period

Annex 2 contains the updates to WTSA Resolution 2 proposed by Study Group 13 concerning the general areas of study, title, mandate, lead roles and points of guidance in the next study period.

ANNEX 1  
  
List of Recommendations, Supplements and  
other materials produced or deleted during the study period

The list of new and revised Recommendations approved during the study period is found in Table 7.

The list of Recommendations determined/consented at the last meeting of Study Group 13 is found in Table 8.

The list of Recommendations deleted by Study Group 13 during the study period is found in Table 9.

The List of Recommendations submitted by Study Group 13 to WTSA-20 for approval is found in Table 10.

Tables 11 onwards list other publications approved and/or deleted by Study Group 13 during the study period.

TABLE 7  
Study Group 13 – Recommendations approved during the study period

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Recommendation** | **Approval** | **Status** | **TAP/AAP** | **Title** |
| [I.570](http://handle.itu.int/11.1002/1000/13442) | 2018-01-13 | In force | AAP | Public/private ISDN interworking |
| [I.570](https://www.itu.int/rec/T-REC-I.570-199303-S/en) | 03-1993 | Superseded | TAP | Public/private ISDN interworking |
| [Y.2029 (2015) Amd. 1](http://handle.itu.int/11.1002/1000/14253) | 2020-04-29 | In force | AAP | New Annex A – Network equipment-based multipath transmission |
| [Y.2041](http://handle.itu.int/11.1002/1000/13248) | 2017-03-29 | In force | AAP | Policy control mechanism in multi-connection |
| [Y.2072](http://handle.itu.int/11.1002/1000/13614) | 2018-05-29 | In force | AAP | Framework for an energy-sharing and trading platform |
| [Y.2241](http://handle.itu.int/11.1002/1000/13348) | 2017-09-13 | In force | AAP | Service framework to support web objects based ubiquitous self-directed learning |
| [Y.2242](http://handle.itu.int/11.1002/1000/13804) | 2018-12-14 | In force | AAP | Service function chaining in mobile networks |
| [Y.2243](http://handle.itu.int/11.1002/1000/13982) | 2019-08-13 | In force | AAP | A service model for risk mitigation service based on networks |
| [Y.2244](http://handle.itu.int/11.1002/1000/14126) | 2019-12-14 | In force | AAP | Service model for a cultivation plan service at the pre-production stage |
| [Y.2245](http://handle.itu.int/11.1002/1000/14389) | 2020-09-29 | In force | AAP | Service model of the agriculture information based convergence service |
| [Y.2246](http://handle.itu.int/11.1002/1000/14758) | 2021-09-13 | In force | AAP | Smart farming education service based on u-learning environment |
| [Y.2255](http://handle.itu.int/11.1002/1000/13462) | 2018-01-13 | In force | AAP | Voice and video call continuity over LTE, Wi-Fi and 2G/3G |
| [Y.2304](http://handle.itu.int/11.1002/1000/13249) | 2017-03-29 | In force | AAP | Network intelligence capability enhancement - Requirements and capabilities to support mobile content delivery optimization |
| [Y.2305](http://handle.itu.int/11.1002/1000/13615) | 2018-05-29 | In force | AAP | Unified management of content delivery networks |
| [Y.2322](http://handle.itu.int/11.1002/1000/13463) | 2018-01-13 | In force | AAP | The functional architecture of virtualized control network entities management and orchestration in next generation network evolution |
| [Y.2323](http://handle.itu.int/11.1002/1000/13805) | 2018-12-14 | In force | AAP | Requirements and capabilities of orchestration in next generation network evolution |
| [Y.2324](http://handle.itu.int/11.1002/1000/14127) | 2019-12-14 | In force | AAP | Functional architecture of orchestration in next generation network evolution (NGNe) |
| [Y.2341](http://handle.itu.int/11.1002/1000/13250) | 2017-03-29 | In force | AAP | Next generation network evolution - Requirements and capabilities for supporting authorized account messaging service |
| [Y.2342](http://handle.itu.int/11.1002/1000/14128) | 2019-12-14 | In force | AAP | Scenarios and capability requirements of blockchain in next generation network evolution |
| [Y.2343](http://handle.itu.int/11.1002/1000/14611) | 2021-04-29 | In force | AAP | Scenarios and capability requirements of programmable log analysis in next generation networks |
| [Y.2501](http://handle.itu.int/11.1002/1000/14768) | 2021-09-13 | In force | AAP | Computing power network – Framework and architecture |
| [Y.2618](http://handle.itu.int/11.1002/1000/13464) | 2018-01-13 | In force | AAP | The M interface in public packet telecommunication data networks |
| [Y.2619](http://handle.itu.int/11.1002/1000/13608) | 2018-05-29 | In force | AAP | Operation, administration and maintenance functions and mechanisms for the public packet telecommunication data network (PTDN) |
| [Y.2620](http://handle.itu.int/11.1002/1000/13889) | 2019-04-29 | In force | AAP | T interface for the public packet telecommunication data network |
| [Y.2623](http://handle.itu.int/11.1002/1000/14612) | 2021-04-29 | In force | AAP | Requirements and framework of industrial Internet networking based on future packet based network evolution |
| [Y.2773](http://handle.itu.int/11.1002/1000/13015) | 2017-02-17 | In force | TAP | Performance models and metrics for deep packet inspection |
| [Y.2774](http://handle.itu.int/11.1002/1000/13495) | 2019-03-14 | In force | TAP | Functional requirements of deep packet inspection for future networks |
| [Y.2775](http://handle.itu.int/11.1002/1000/13983) | 2019-08-13 | In force | AAP | Functional architecture of deep packet inspection for future networks |
| [Y.2814](http://handle.itu.int/11.1002/1000/13689) | 2018-09-29 | In force | AAP | Mobility management framework over reconfigurable networks |
| [Y.2815](http://handle.itu.int/11.1002/1000/13806) | 2018-12-14 | In force | AAP | Mobility-supporting architecture for mobile peer-to-peer services in heterogeneous wireless networks |
| [Y.3051](http://handle.itu.int/11.1002/1000/13251) | 2017-03-29 | In force | AAP | The basic principles of trusted environment in information and communication technology infrastructure |
| [Y.3052](http://handle.itu.int/11.1002/1000/13252) | 2017-03-29 | In force | AAP | Overview of trust provisioning for information and communication technology infrastructures and services |
| [Y.3053](http://handle.itu.int/11.1002/1000/13465) | 2018-01-13 | In force | AAP | Framework of trustworthy networking with trust-centric network domains |
| [Y.3053 (2018) Amd. 1](http://handle.itu.int/11.1002/1000/13807) | 2018-12-14 | In force | AAP | Trustworthy networking deployment architecture and procedures |
| [Y.3054](http://handle.itu.int/11.1002/1000/13609) | 2018-05-29 | In force | AAP | Framework for trust-based media services |
| [Y.3055](http://handle.itu.int/11.1002/1000/14393) | 2020-09-29 | In force | AAP | Framework for trust-based personal data management |
| [Y.3056](http://handle.itu.int/11.1002/1000/14594) | 2021-02-13 | In force | AAP | Framework for bootstrapping of devices and applications for open access to trusted services in distributed ecosystems |
| [Y.3057](http://handle.itu.int/11.1002/1000/14769) | 2021-12-06 | In force | AAP | A trust index model for information and communication technology infrastructures and services |
| [Y.3071](http://handle.itu.int/11.1002/1000/13253) | 2017-03-29 | In force | AAP | Data aware networking (information centric networking) – Requirements and capabilities |
| [Y.3072](http://handle.itu.int/11.1002/1000/13890) | 2019-04-29 | In force | AAP | Requirements and capabilities of name mapping and resolution for information-centric networking in IMT-2020 |
| [Y.3073](http://handle.itu.int/11.1002/1000/13984) | 2019-08-13 | In force | AAP | Framework for service function chaining in information-centric networking |
| [Y.3074](http://handle.itu.int/11.1002/1000/13985) | 2019-08-13 | In force | AAP | Framework for directory service for management of large numbers of heterogeneously-named objects in IMT-2020 |
| [Y.3075](http://handle.itu.int/11.1002/1000/14394) | 2020-09-29 | In force | AAP | Requirements and capabilities of information-centric networking routing and forwarding based on control and user plane separation in IMT-2020 |
| [Y.3076](http://handle.itu.int/11.1002/1000/14395) | 2020-09-29 | In force | AAP | Architecture of ICN-enabled edge network in IMT-2020 |
| [Y.3077](http://handle.itu.int/11.1002/1000/14775) | 2021-09-13 | In force | AAP | Framework for interworking of heterogeneous application domain connected objects through information-centric networking in IMT-2020 |
| [Y.3100](http://handle.itu.int/11.1002/1000/13349) | 2017-09-13 | In force | AAP | Terms and definitions for IMT-2020 network |
| [Y.3100 (2017)  Cor. 1](http://handle.itu.int/11.1002/1000/13617) | 2018-04-25 | In force | Agreement | Terms and definitions for IMT-2020 network - Corrigendum 1 |
| [Y.3101](http://handle.itu.int/11.1002/1000/13466) | 2018-01-13 | In force | AAP | Requirements of the IMT-2020 network |
| [Y.3101 (2018)  Cor. 1](http://handle.itu.int/11.1002/1000/13618) | 2018-04-25 | In force | Agreement | Requirements of IMT-2020 network - Corrigendum 1 |
| [Y.3102](http://handle.itu.int/11.1002/1000/13610) | 2018-05-29 | In force | AAP | Framework of the IMT-2020 network |
| [Y.3103](http://handle.itu.int/11.1002/1000/13690) | 2018-09-29 | In force | AAP | Business role-based models in IMT-2020 |
| [Y.3104](http://handle.itu.int/11.1002/1000/13808) | 2018-12-14 | In force | AAP | Architecture of the IMT-2020 network |
| [Y.3105](http://handle.itu.int/11.1002/1000/13809) | 2018-12-14 | In force | AAP | Requirements of capability exposure in the IMT-2020 network |
| [Y.3106](http://handle.itu.int/11.1002/1000/13891) | 2019-04-29 | In force | AAP | Quality of service functional requirements for the IMT-2020 network |
| [Y.3107](http://handle.itu.int/11.1002/1000/13986) | 2019-08-13 | In force | AAP | Functional architecture for QoS assurance management in the IMT-2020 network |
| [Y.3108](http://handle.itu.int/11.1002/1000/14129) | 2019-12-14 | In force | AAP | Capability exposure function in IMT-2020 networks |
| [Y.3109](http://handle.itu.int/11.1002/1000/14396) | 2021-04-06 | In force | AAP | Quality of service assurance-related requirements and framework for virtual reality delivery using mobile edge computing supported by IMT-2020 |
| [Y.3110](http://handle.itu.int/11.1002/1000/13350) | 2017-09-13 | In force | AAP | IMT-2020 network management and orchestration requirements |
| [Y.3111](http://handle.itu.int/11.1002/1000/13351) | 2017-09-13 | In force | AAP | IMT-2020 network management and orchestration framework |
| [Y.3112](http://handle.itu.int/11.1002/1000/13611) | 2018-05-29 | Superseded | AAP | Framework for the support of multiple network slicing |
| [Y.3112](http://handle.itu.int/11.1002/1000/13810) | 2018-12-14 | In force | AAP | Framework for the support of network slicing in the IMT-2020 network |
| [Y.3113](http://handle.itu.int/11.1002/1000/14595) | 2021-02-13 | In force | AAP | Requirements and framework for latency guarantee in large-scale networks including the IMT-2020 network |
| [Y.3130](http://handle.itu.int/11.1002/1000/13467) | 2018-01-13 | In force | AAP | Requirements of IMT-2020 fixed mobile convergence |
| [Y.3131](http://handle.itu.int/11.1002/1000/13987) | 2019-08-13 | In force | AAP | Functional architecture for supporting fixed mobile convergence in IMT-2020 networks |
| [Y.3132](http://handle.itu.int/11.1002/1000/14130) | 2019-12-14 | In force | AAP | Mobility management for fixed mobile convergence in IMT-2020 networks |
| [Y.3133](http://handle.itu.int/11.1002/1000/14131) | 2019-12-14 | In force | AAP | Capability exposure enhancement for supporting fixed mobile convergence in IMT-2020 networks |
| [Y.3134](http://handle.itu.int/11.1002/1000/14397) | 2020-09-29 | In force | AAP | IMT-2020 fixed mobile convergence functional requirements for management and orchestration |
| [Y.3135](http://handle.itu.int/11.1002/1000/14596) | 2021-02-13 | In force | AAP | Service scheduling to support fixed-mobile convergence in the IMT 2020 network |
| [Y.3136](http://handle.itu.int/11.1002/1000/14398) | 2020-09-29 | In force | AAP | Session management for fixed mobile convergence in IMT-2020 networks |
| [Y.3150](http://handle.itu.int/11.1002/1000/13468) | 2018-01-13 | Superseded | AAP | High-level technical characteristics of network softwarization for IMT-2020 |
| [Y.3150](http://handle.itu.int/11.1002/1000/14399) | 2020-09-29 | In force | AAP | High-level technical characteristics of network softwarization for IMT-2020 |
| [Y.3151](http://handle.itu.int/11.1002/1000/13892) | 2019-04-29 | In force | AAP | High-level technical characteristics of network softwarization for IMT-2020 - Part: SDN |
| [Y.3152](http://handle.itu.int/11.1002/1000/13893) | 2019-04-29 | In force | AAP | Advanced data plane programmability for IMT-2020 |
| [Y.3153](http://handle.itu.int/11.1002/1000/14132) | 2019-12-14 | In force | AAP | Network slice orchestration and management for providing network services to 3rd party in the IMT-2020 network |
| [Y.3154](http://handle.itu.int/11.1002/1000/14254) | 2020-04-29 | In force | AAP | Resource pooling for scalable network slice service management and orchestration in the IMT-2020 network |
| [Y.3155](http://handle.itu.int/11.1002/1000/14400) | 2020-09-29 | In force | AAP | Enhanced software-defined networking data plane for IMT-2020 |
| [Y.3156](http://handle.itu.int/11.1002/1000/14401) | 2020-09-29 | In force | AAP | Framework of network slicing with AI-assisted analysis in IMT-2020 networks |
| [Y.3157](http://handle.itu.int/11.1002/1000/14597) | 2021-02-13 | In force | AAP | IMT-2020 network slice configuration |
| [Y.3170](http://handle.itu.int/11.1002/1000/13691) | 2018-09-29 | In force | AAP | Requirements for machine learning-based quality of service assurance for the IMT-2020 network |
| [Y.3172](http://handle.itu.int/11.1002/1000/13894) | 2019-06-22 | In force | AAP | Architectural framework for machine learning in future networks including IMT-2020 |
| [Y.3173](http://handle.itu.int/11.1002/1000/14133) | 2020-02-06 | In force | AAP | Framework for evaluating intelligence levels of future networks including IMT-2020 |
| [Y.3174](http://handle.itu.int/11.1002/1000/14134) | 2020-02-06 | In force | AAP | Framework for data handling to enable machine learning in future networks including IMT-2020 |
| [Y.3175](http://handle.itu.int/11.1002/1000/14255) | 2020-04-29 | In force | AAP | Functional architecture of machine learning-based quality of service assurance for the IMT-2020 network |
| [Y.3176](http://handle.itu.int/11.1002/1000/14402) | 2020-09-29 | In force | AAP | Machine learning marketplace integration in future networks including IMT-2020 |
| [Y.3177](http://handle.itu.int/11.1002/1000/14598) | 2021-02-13 | In force | AAP | Architectural framework for artificial intelligence-based network automation for resource and fault management in future networks including IMT-2020 |
| [Y.3178](http://handle.itu.int/11.1002/1000/14613) | 2021-07-07 | In force | AAP | Functional framework of artificial intelligence-based network service provisioning in future networks including IMT-2020 |
| [Y.3179](http://handle.itu.int/11.1002/1000/14614) | 2021-04-29 | In force | AAP | Architectural framework for machine learning model serving in future networks including IMT-2020 |
| [Y.3302](http://handle.itu.int/11.1002/1000/13017) | 2017-01-12 | In force | AAP | Functional architecture of software-defined networking |
| [Y.3324](http://handle.itu.int/11.1002/1000/13811) | 2018-12-14 | In force | AAP | Requirements and architectural framework for autonomic management and control of IMT-2020 networks |
| [Y.3505](http://handle.itu.int/11.1002/1000/13616) | 2018-05-29 | In force | AAP | Cloud computing - Overview and functional requirements for data storage federation |
| [Y.3506](http://handle.itu.int/11.1002/1000/13612) | 2018-05-29 | In force | AAP | Cloud computing - Functional requirements for cloud service brokerage |
| [Y.3507](http://handle.itu.int/11.1002/1000/13812) | 2018-12-14 | In force | AAP | Cloud computing - Functional requirements of physical machine |
| [Y.3508](http://handle.itu.int/11.1002/1000/13988) | 2019-08-13 | In force | AAP | Cloud computing - Overview and high-level requirements of distributed cloud |
| [Y.3509](http://handle.itu.int/11.1002/1000/14135) | 2019-12-14 | In force | AAP | Cloud computing - Functional architecture for data storage federation |
| [Y.3514](http://handle.itu.int/11.1002/1000/13254) | 2017-05-22 | In force | AAP | Cloud computing - Trusted inter-cloud computing framework and requirements |
| [Y.3514 (2017)  Cor. 1](http://handle.itu.int/11.1002/1000/13813) | 2018-12-14 | In force | AAP | Cloud computing - Trusted inter-cloud computing framework and requirements - Corrigendum 1 |
| [Y.3515](http://handle.itu.int/11.1002/1000/13255) | 2017-07-07 | In force | AAP | Cloud computing – Functional architecture of Network as a Service |
| [Y.3516](http://handle.itu.int/11.1002/1000/13352) | 2017-09-13 | In force | AAP | Cloud computing - Functional architecture of inter-cloud computing |
| [Y.3517](http://handle.itu.int/11.1002/1000/13814) | 2018-12-14 | In force | AAP | Cloud computing - Overview of inter-cloud trust management |
| [Y.3518](http://handle.itu.int/11.1002/1000/13815) | 2018-12-14 | In force | AAP | Cloud computing - functional requirements of inter-cloud data management |
| [Y.3519](http://handle.itu.int/11.1002/1000/13816) | 2018-12-14 | In force | AAP | Cloud computing - Functional architecture of big data as a service |
| [Y.3523](http://handle.itu.int/11.1002/1000/13989) | 2019-08-13 | In force | AAP | Metadata framework for NaaS service lifecycle management |
| [Y.3524](http://handle.itu.int/11.1002/1000/14136) | 2019-12-14 | In force | AAP | Cloud computing maturity requirements and framework |
| [Y.3525](http://handle.itu.int/11.1002/1000/14403) | 2020-09-29 | In force | AAP | Cloud computing – Requirements for cloud service development and operation management |
| [Y.3526](http://handle.itu.int/11.1002/1000/14759) | 2021-11-06 | In force | AAP | Cloud computing - Functional requirements of edge cloud management |
| [Y.3527](http://handle.itu.int/11.1002/1000/14760) | 2021-09-13 | In force | AAP | Cloud computing - End-to-end fault and performance management framework of network services in inter-cloud |
| [Y.3530](http://handle.itu.int/11.1002/1000/14404) | 2020-09-29 | In force | AAP | Cloud computing - Functional requirements for blockchain as a service |
| [Y.3531](http://handle.itu.int/11.1002/1000/14405) | 2020-09-29 | In force | AAP | Cloud computing - Functional requirements for machine learning as a service |
| [Y.3601](http://handle.itu.int/11.1002/1000/13469) | 2018-05-07 | In force | AAP | Big data - framework and requirements for data exchange |
| [Y.3602](http://handle.itu.int/11.1002/1000/13817) | 2018-12-14 | In force | AAP | Big data - Functional requirements for data provenance |
| [Y.3603](http://handle.itu.int/11.1002/1000/14137) | 2019-12-14 | In force | AAP | Big data - Requirements and conceptual model of metadata for data catalogue |
| [Y.3604](http://handle.itu.int/11.1002/1000/14138) | 2020-02-06 | In force | AAP | Big data - Overview and requirements for data preservation |
| [Y.3605](http://handle.itu.int/11.1002/1000/14406) | 2020-09-29 | In force | AAP | Big data - Reference architecture |
| [Y.3606](http://handle.itu.int/11.1002/1000/14776) | 2021-12-06 | In force | AAP | Big data – Deep packet inspection mechanism for big data in network |
| [Y.3650](http://handle.itu.int/11.1002/1000/13470) | 2018-01-13 | In force | AAP | Framework of big-data-driven networking |
| [Y.3651](http://handle.itu.int/11.1002/1000/13818) | 2018-12-14 | In force | AAP | Big-data-driven networking - mobile network traffic management and planning |
| [Y.3652](http://handle.itu.int/11.1002/1000/14256) | 2020-06-22 | In force | AAP | Big data driven networking – requirements |
| [Y.3653](http://handle.itu.int/11.1002/1000/14615) | 2021-04-29 | In force | AAP | Big data driven networking – functional architecture |
| [Y.3800](http://handle.itu.int/11.1002/1000/13990) | 2019-10-25 | In force | AAP | Overview on networks supporting quantum key distribution |
| [Y.3800 (2019)  Cor. 1](http://handle.itu.int/11.1002/1000/14257) | 2020-04-29 | In force | AAP | Overview on networks supporting quantum key distribution - Corrigendum 1 |
| [Y.3801](http://handle.itu.int/11.1002/1000/14258) | 2020-04-29 | In force | AAP | Functional requirements for quantum key distribution networks |
| [Y.3802](http://handle.itu.int/11.1002/1000/14407) | 2020-12-07 | In force | AAP | Quantum key distribution networks - Functional architecture |
| [Y.3802 (2020)  Cor. 1](http://handle.itu.int/11.1002/1000/14605) | 2021-04-13 | In force | AAP | Quantum key distribution networks - Functional architecture - Corrigendum 1 |
| [Y.3803](http://handle.itu.int/11.1002/1000/14408) | 2020-12-07 | In force | AAP | Quantum key distribution networks – Key management |
| [Y.3804](http://handle.itu.int/11.1002/1000/14409) | 2020-09-29 | In force | AAP | Quantum key distribution networks - Control and management |
| [Y.3805](http://handle.itu.int/11.1002/1000/14770) | 2021-12-06 | In force | AAP | Quantum Key Distribution Networks - Software Defined Networking Control |
| [Y.3806](http://handle.itu.int/11.1002/1000/14777) | 2021-09-13 | In force | AAP | Quantum key distribution networks – Requirements for quality of service assurance |
| [Y.3078](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15180) | 2022-02-13 | In force | AAP | Information centric networking for IMT-2020 and beyond - Requirements and capabilities of data object segmentation |
| [Y.3090](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16339) | 2022-02-13 | In force | AAP | Digital twin network - Requirements and architecture |
| [Y.3114](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16346) | 2022-02-13 | In force | AAP | Future networks including IMT-2020: requirements and functional architecture of lightweight core for dedicated networks |
| [Y.3116](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16341) | 2022-02-13 | In force | AAP | Traffic typization IMT-2020 management based on an artificial intelligent approach |
| [Y.3180](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=14619) | 2022-02-13 | In force | AAP | Mechanism of traffic awareness for application-descriptor-agnostic traffic based on machine learning |
| [Y.3200](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16494) | 2022-02-13 | In force | AAP | Fixed, mobile and satellite convergence - Requirements for IMT-2020 network and beyond |
| [Y.3505](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16744) | 2022-02-13 | In force | AAP | Cloud computing – Overview and functional requirements for data storage federation |
| [Y.3528](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15191) | 2022-02-13 | In force | AAP | Cloud computing - Framework and requirements of container management in inter-cloud |
| [Y.3529](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15188) | 2022-02-13 | In force | AAP | Cloud computing - Data model framework for NaaS OSS virtualized network function |
| [Y.3535](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=13641) | 2022-02-13 | In force | AAP | Cloud Computing - Functional requirements for container |
| [Y.3536](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15186) | 2022-02-13 | In force | AAP | Cloud computing - Functional architecture for cloud service brokerage |
| [Y.3654](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15183) | 2022-02-13 | In force | AAP | Big data driven networking - Machine learning mechanism |
| [Y.3680](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=15014) | 2022-02-13 | In force | AAP | Framework of human-like networking |
| [Y.3807](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16350) | 2022-02-13 | In force | AAP | Quantum Key Distribution networks - QoS parameters |
| [Y.3808](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16743) | 2022-02-13 | In force | AAP | Framework for integration of quantum key distribution network and secure storage network |

TABLE 8  
Study Group 13 – Recommendations consented at the last meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **Recommendation** | **Consent/Determination** | **AAP/TAP** | **Title** |
| [Y.3115](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16347) | 2021-12-10 | AAP | AI enabled cross-domain network architectural requirements and framework for future networks including IMT-2020 |
| [Y.3809](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16332) | 2021-12-10 | AAP | Quantum Key Distribution Networks - Business role-based models |
| [Y.20861](https://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=15083)) | 2021-07-16 | AAP | Framework and Requirements of Decentralized Trustworthy Network Infrastructure |

1. Note: Draft new Recommendation Y.2086 “Framework and Requirements of Decentralized Trustworthy Network Infrastructure” was consented at the 16 July 2021 WP3/13 meeting. By the time this report was ready it was in the AAP Last Call comments resolution process.

TABLE 9  
Study Group 13 – Recommendations deleted during study period

| Recommendation | Last version | Withdrawal date | Title |
| --- | --- | --- | --- |
| None |  |  |  |

TABLE 10  
Study Group 13 – Recommendations submitted to WTSA-20

| Recommendation | Proposal | Title | Reference |
| --- | --- | --- | --- |
| None |  |  |  |

TABLE 11  
Study Group 13 – Supplements

| **Supplement** | **Date** | **Status** | **Title** |
| --- | --- | --- | --- |
| [Y.1900-series](http://handle.itu.int/11.1002/1000/13244)  [Supplement 43](http://handle.itu.int/11.1002/1000/13244) | 2017-02-17 | New | Deployment Models of N-screen services |
| [Y.3100-series](http://handle.itu.int/11.1002/1000/13353)  [Supplement 44](http://handle.itu.int/11.1002/1000/13353) | 2017-07-14 | New | Standardization and open source activities related to network softwarization of IMT-2020 |
| [Y.3500-series Supplement 46](https://www.itu.int/rec/T-REC-Y.Sup46-201711-I/en) | 2017-11-17 | New | Requirements and challenges regarding provision and consumption of cloud computing services in developing countries |
| [Y.3070-series Supplement 47](http://handle.itu.int/11.1002/1000/13588) | 2018-04-18 | New | Information-centric networking - Overview, standardization gaps and proof-of-concept |
| [Y.3070-series Supplement 48](http://handle.itu.int/11.1002/1000/13655) | 2018-07-27 | New | Proof-of-concept for data service using information centric networking in IMT-2020 |
| [Y.3500 -series](http://handle.itu.int/11.1002/1000/13829)  [Supplement 49](http://handle.itu.int/11.1002/1000/13829) | 2018-11-02 | New | Cloud computing standardization roadmap |
| [Y.3650-series](http://handle.itu.int/11.1002/1000/13827)  [Supplement 50](http://handle.itu.int/11.1002/1000/13827) | 2018-11-02 | New | Use case and application scenario for big-data driven networking |
| [Y.2000-series](http://handle.itu.int/11.1002/1000/13828)  [Supplement 51](http://handle.itu.int/11.1002/1000/13828) | 2018-11-02 | New | Device independent screen-free service models and scenarios |
| [Y.3170-series](http://handle.itu.int/11.1002/1000/14100)  [Supplement 55](http://handle.itu.int/11.1002/1000/14100) | 2019-10-25 | New | Machine learning in future networks including IMT-2020: use cases |
| [Y.3100-series](http://handle.itu.int/11.1002/1000/14233)  [Supplement 59](http://handle.itu.int/11.1002/1000/14233) | 2020-03-13 | New | IMT-2020 standardization roadmap |
| [Y.3100-series](http://handle.itu.int/11.1002/1000/14383)  [Supplement 64](http://handle.itu.int/11.1002/1000/14383) | 2020-07-31 | New | Awareness on use cases and migration aspects of IMT-2020 |
| [Y.3600-series](http://handle.itu.int/11.1002/1000/14384)  [Supplement 65](http://handle.itu.int/11.1002/1000/14384) | 2020-07-31 | New | Big data adoption in developing countries |
| [Y.3000-series](http://handle.itu.int/11.1002/1000/14385)  [Supplement 66](http://handle.itu.int/11.1002/1000/14385) | 2020-07-31 | New | Network 2030 services: Capabilities, performance and design of new communication services for the Network 2030 applications |
| [Y.3000-series](http://handle.itu.int/11.1002/1000/14386)  [Supplement 67](http://handle.itu.int/11.1002/1000/14386) | 2020-07-31 | New | Representative use cases and key network requirements for Network 2030 |
| [Y.3800-series](http://handle.itu.int/11.1002/1000/14757)  [Supplement 70](http://handle.itu.int/11.1002/1000/14757) | 2021-07-16 | New | Quantum key distribution networks - Applications of machine learning |

TABLE 12  
Study Group 13 – Technical Papers

| Document | Date | Status | Title |
| --- | --- | --- | --- |
| [White Paper](https://www.itu.int/pub/T-FG-NET2030-2019) | 05-2019 | New | A Blueprint of Technology, Applications  and Market Drivers Towards the Year 2030  and Beyond |
| [Guideline document](https://www.itu.int/md/T17-SG13-190304-TD-PLEN-0172/en) | 14-03-2019 | New | Guidelines and methodologies for developing technical Recommendations |

TABLE 13  
Study Group13 – Technical Reports

| Report | Date | Status | Title |
| --- | --- | --- | --- |
| [Technical Report](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16497) | 13-03-2020 | New | Driving Forces and Vision towards Network 2030 |
| [Technical Report](https://www.itu.int/ITU-T/workprog/wp_item.aspx?isn=16325) | 31-07-2020 | New | Use of ITU-T Recommendations by Developing Countries |

TABLE 14  
Study Group 13 – Other publications

| Document | Date | Status | Title |
| --- | --- | --- | --- |
| [Y.110 Impl. Guide](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=17242) | 10-12-2021 | New | Implementers' guide for Recommendation Y.110 "Global Information Infrastructure principles and framework architecture” |
| [Cloud Computing](https://www.itu.int/en/publications/Documents/tsb/2020-Cloud-computing-From-paradigm-to-operation/index.html)  [Flipbook](https://www.itu.int/en/publications/Documents/tsb/2020-Cloud-computing-From-paradigm-to-operation/index.html) | 2020 | New | Cloud computing: From paradigm to operation |
| [Big Data Flipbook](https://www.itu.int/en/publications/Documents/tsb/2019-Big-data/index.html#p=166) | 2019 | New | Big Data - Concept and application for telecommunications |
| [FG-IMT-2020 Flipbook](https://www.itu.int/en/publications/Documents/tsb/2017-IMT2020-deliverables/mobile/index.html#p=4) | 2017 | New | ITU-T Focus Group IMT-2010 deliverables flipbook, 2017 |
| [Flipbook on Trust](https://www.itu.int/en/publications/Documents/tsb/2017-Trust-in-ICT-2017/index.html) | 2017 | New | Trust in ICT |
| [5G Flipbook](https://www.itu.int/en/publications/Documents/tsb/2017-5G_Basics/index.html) | 2017 | New | 5G Basics, 2017, flipbook |
| [5G Proof of Concept flipbook](https://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-IMT-2017-PDF-E.pdf) | 2017 | New | 5G Proof-of-Concept Demonstrations |

ANNEX 2  
  
Proposed updates to the Study Group 13 mandate and Lead Study Group roles

**(WTSA Resolution 2)**

The following are the proposed changes to the Study Group 13 mandate and Lead Study Group roles agreed at the July 2020 Study Group 13 meeting, based on the relevant portions of [WTSA-16 Resolution 2](https://www.itu.int/pub/publications.aspx?lang=en&parent=T-RES-T.2-2016http://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.2-2008-MSW-E.doc).

#### PART 1 ‑ General areas of study

ITU‑T Study Group 13

Future networks and emerging network technologies

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) including the application of machine learning technologies. It develops standards related to information-centric networking (ICN) and content-centric networking (CCN) . Regarding IMT2020 and beyond it particularly focuses on non-radio related parts . SG13 responsibility also includes IMT-2020 and beyond project management coordination across all ITU‑T study groups and release planning.

It is also responsible for studies relating to future computing including cloud computing and data handling in telecommunication networks. This covers capabilities and technologies from network side to support data utilization, exchange, sharing, and data quality assessment and computing-aware networking as well as end to end awareness, control and management of future computing including cloud, cloud security and data handling.

SG13 studies aspects relating to fixed, mobile and satellite convergence for multi access networks, mobility management, and enhancements to existing ITU‑T Recommendations on mobile communications, including the energy-saving aspects. Study Group 13 develops standards for quantum key distribution networks (QKDN) and related technologies. It further studies the 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.

#### PART 2 ‑ Lead Study Groups in specific areas of study

SG13 Lead study group on future networks such as IMT-2020 networks and beyond (non-radio related parts)   
Lead study group on fixed mobile convergence  
Lead study group on cloud computing

Lead study group on Machine Learning

Annex A  
(to WTSA Resolution 2)  
  
Points of guidance to study groups for the development  
of the post-2021 work programme

The key areas of competence of ITU‑T Study Group 13 include:

• IMT-2020 and beyond network aspects: Studies on the requirements and capabilities for networks based on the service scenarios of IMT-2020 and beyond. This includes development of Recommendations on the framework and architecture design including also network-related aspects of reliability, quality of service (QoS) and security. Furthermore, it includes interworking with current networks including IMT-Advanced, etc.

• Application of machine learning technologies aspects for future networks: Studies on how to incorporate network intelligence into IMT-2020 and beyond. Development of Recommendations on overall requirements, functional architecture and application support capabilities for the networks which include artificial intelligence and machine learning mechanism, based on but not limited to and the gap analysis identified by FG on Machine Learning for Future Networks including 5G.

• Software‑defined networking (SDN), network slicing and orchestration aspects: Studies on SDN and data plane programmability to support functions such as network virtualization and network slicing necessary for exploding and diversifying services taking into account scalability, security and distribution of functions. Development of Recommendations on the orchestration and related management-control continuum capabilities/policies of network function components, softwarized network and network slices, including enhancement and support of distributed networking capabilities.

• Information-centric networking (ICN) and public packet telecom data network aspects: Studies related to analysis of ICN applicability to IMT-2020 and beyond Development of new Recommendations on ICN general requirements, functional architecture and mechanisms of ICN networking and use‑case specific mechanisms and architectures, including deployment of corresponding identifiers. Development of Recommendations on packet data network based on the study of requirements, frameworks and candidate mechanisms. Development of Recommendations on architecture, network virtualization, resource control and other technical issues of future packet-based network (FPBN), including migration from the conventional IP-based network to FPBN.

• Fixed, mobile and satellite convergence aspects: Studies related to access-agnostic core, which integrates fixed, mobile and satellite, and the application of innovative technologies to enhance such convergence, such as AI/ML., etc. This also includes the development of Recommendations on full connectivity for various types of user equipment

• Knowledge-centric trustworthy networking and services aspects: Studies related to requirements and functions to support the building of trusted ICT infrastructures. Development of Recommendations regarding environmental and socio-economic awareness in order to minimize the environmental impact of future networks, as well as to reduce the barriers to entry for various actors involved in the network ecosystem.

• Quantum enhanced networks: Studies related to quantum key distribution networks (QKDN). Furthermore development of new Recommendations related to user networks interacting with quantum enhanced networks.

• Aspects related to future computing including cloud computing and data handling in telecommunication networks: Studies of the requirements, functional architectures and their capabilities, mechanisms and deployment models of future computing including cloud computing and data handling, covering inter- and intra-cloud scenarios as well as the applications of future computing in vertical domains. Studies include the development of technologies from network aspect to support end to end awareness, control and management of future computing including cloud, cloud security and data handling.

Study Group 13 activities will also cover regulatory implications, including deep packet inspection, and lower energy consumption networks. Furthermore, it includes activities related to innovative service scenarios, deployment models and migration issues based on future networks.

In order to assist countries with economies in transition, developing countries and especially the least developed countries in the application of networks of the future, including IMT-2020 and beyond and other innovative technologies, Study Group 13 maintains a dedicated Question on this topic and its regional group for Africa. Consultations should thereby be enabled with representatives of the ITU Telecommunication Development Sector (ITU-D) with a view to identifying how this assistance might best be done through an appropriate activity conducted in conjunction with ITU‑D.

Joint rapporteur group activities of different study groups shall be seen as complying with the WTSA expectations for collocation.

Annex B  
(to WTSA Resolution 2)  
  
List of Recommendations under the responsibility of the respective   
study groups and TSAG in the 2022-2024 study period

*[No changes requested to the List of Recommendations under the responsibility of SG13]*

ITU‑T Study Group 13

ITU‑T F.600-series

ITU‑T G.801, ITU‑T G.802, ITU‑T G.860-series

ITU‑T I-series, except those under the responsibility of Study Groups 2, 12 and 15, and those having double/triple numbering in other series

ITU‑T Q.933, ITU‑T Q.933*bis*, ITU‑T Q.10xx-series and ITU‑T Q.1700-series

ITU‑T X.1 − ITU‑T X.25, ITU‑T X.28 − ITU‑T X.49, ITU‑T X.60 − ITU‑T X.84, ITU‑T X.90 − ITU‑T X.159, ITU‑T X.180 − ITU‑T X.199, ITU‑T X.272, ITU‑T X.300-series

ITU‑T Y-series, except those under the responsibility of Study Groups 12, 15, 16 and 20

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