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| World Telecommunication Standardization Assembly (WTSA-20)Geneva, 1-9 March 2022 |  |
| INTERNATIONAL TELECOMMUNICATION UNION |  |
|  |  |
| PLENARY MEETING | Document 9-E |
|  | January 2022 |
|  | Original: English |
|  |
| ITU‑T Study Group 11 |
| Signalling requirements, protocols, test specifications and combating counterfeit products |
| Report of ITU-T SG11 to the World Telecommunication Standardization Assembly (WTSA-20), Part I: GENERAL |

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| --- | --- |
| **Abstract:** | This contribution contains the report of ITU-T Study Group 11 to WTSA-20 concerning its activities during the 2017-2021 study period. |
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**Note by the TSB:**

The report of Study Group 11 to the WTSA-20 is presented in the following documents:

Part I: **Document 9** – General

Part II: **Document 10** – Questions proposed for study during the study period 2022-2024

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# 1 Introduction

## 1.1 Responsibilities of Study Group 11

Study Group 11 was entrusted by the World Telecommunications Standardization Assembly (Hammamet, 2016) with the study of 15 Questions in the area of signalling-system architecture, signalling requirements and protocols, for all types of networks and technologies, future networks (FN), software‑defined networking (SDN), network function virtualization (NFV), cloud-computing networks, VoLTE/ViLTE‑based networks interconnection, virtual networks, IMT‑2020 technologies, multimedia, next-generation networks (NGN), flying ad-hoc networks, tactile Internet, augmented reality and signalling for legacy network interworking.

Study Group 11 was also responsible for studies to combat counterfeiting products including telecommunication/ICT and mobile device theft.

Study Group 11 developed test specifications for testing conformance and interoperability (C&I) for all types of networks, technologies and services, a testing methodology and test suites for standardized network parameters in relation to the framework for Internet-related performance measurement, as well as for existing technologies (e.g., NGN) and emerging technologies (e.g., FN, cloud, SDN, NFV, IoT, VoLTE/ViLTE, IMT-2020 technologies, flying ad-hoc networks, tactile Internet, augmented reality, etc.).

In addition, Study Group 11 studied a way to implement a testing laboratory recognition procedure in ITU‑T through the work of ITU‑T Conformity Assessment Steering Committee (CASC).

**The above mandate is stated in Annex A to WTSA-16 Resolution 2, which also states the following lead study group responsibilities for Study Group 11 “Signalling requirements, protocols, test specifications and combating counterfeit products”:**

* Lead study group on signalling and protocols, including for IMT-2020 technologies;
* Lead study group on establishing test specifications, conformance and interoperability testing for all types of networks, technologies and services that are the subject of study and standardization by all ITU-T study groups;
* Lead study group on combating counterfeiting of ICT devices;
* Lead study group on combating the use of stolen ICT devices.

**Annex B to WTSA-16 Resolution 2 states the following points of guidance to Study Group 11 for the development of the post-2016 work programme:**

ITU-T Study Group 11 will develop Recommendations on the following subjects:

* Network signalling and control architectures in emerging telecommunication environments (e.g., SDN, NFV, FN, cloud computing, VoLTE/ViLTE, IMT-2020 technologies, etc.);
* Services and application control and signalling requirements and protocols;
* Session control and signalling requirements and protocols;
* Resource control and signalling requirements and protocols;
* Signalling and control requirements and protocols to support attachment in emerging telecommunication environments;
* Signalling and control requirements and protocols to support broadband network gateways;
* Signalling and control requirements and protocols to support emerging multimedia services;
* Signalling and control requirements and protocols to support emergency telecommunication services (ETS);
* Signalling requirements for establishing the interconnection of packet-based networks, including VoLTE/ViLTE-based networks, IMT-2020 and beyond;
* Test methodologies and test suites as well as monitoring of parameters set for emerging network technologies and their applications, including cloud computing, SDN, NFV, IoT, VoLTE/ViLTE, IMT-2020 technologies, etc., to enhance interoperability;
* Conformance, interoperability testing and network/system/service testing, including benchmark testing, a testing methodology and testing specification of standardized network parameters in relation to the framework for Internet-related performance measurement, etc.;
* Combating counterfeiting of ICT devices.

Study Group 11 is to lend assistance to developing countries in the preparation of Technical Reports and guidelines on the deployment of packet-based networks as well as emerging networks.

The development of signalling requirements, protocols and test specifications will be as follows:

* Study and develop signalling requirements;
* Develop protocols to meet the signalling requirements;
* Develop protocols to meet the signalling requirements of new services and technologies;
* Develop protocol profiles for the existing protocols;
* Study existing protocols to determine if they meet the requirements, and work with the relevant standards development organizations (SDOs) to avoid duplication and for necessary enhancements or extensions;
* Study existing open-source codes from open-source communities (OSCs) to support the implementation of ITU-T Recommendations;
* Develop signalling requirements and relevant test suites for interworking between new signalling protocols and existing ones;
* Develop signalling requirements and relevant test suites for interconnection between packet-based networks (e.g., VoLTE/ViLTE-based networks, IMT-2020 and beyond);
* Develop test methodologies and test suites for the relevant signalling protocols.

Study Group 11 is to work on enhancements to existing Recommendations on signalling protocols of legacy networks and systems, e.g., Signalling System Number 7 (SS7), digital subscriber signalling 1 and 2 (DSS1 and DSS2), etc. The objective is to satisfy business needs of member organizations that wish to offer new features and services using networks based on existing Recommendations.

Study Group 11 is to continue coordination of the ITU-T/IEC certification scheme intended to develop procedures for applying the ITU Testing Laboratories recognition procedure and establishing collaboration with existing conformance assessment programmes.

Study Group 11 is to continue its work on any test specifications for use in benchmarks testing and testing specification for standardized network parameters in relation to the framework for Internet-related measurements.

Study Group 11 is to continue its work with relevant standards organizations and forums on subject areas established by the cooperation agreement.

When meeting in Geneva, Study Group 11 will hold collocated meetings with Study Group 13.

**Annex C to WTSA-16 Resolution 2 states the following list of Recommendations under the responsibility of Study Group 11:**

* ITU-T Q-series, except those under the responsibility of Study Groups 2, 13, 15, 16 and 20
* Maintenance of the ITU-T U-series
* ITU-T X.290-series (except ITU-T X.292) and ITU-T X.600 – ITU-T X.609
* ITU-T Z.500-series

## 1.2 Management team and meetings held by Study Group 11

Study Group 11 met ten times in Plenary (due to COVID-19, four of them run fully virtually) and twelve times in Working Parties(due to COVID-19, five of them run fully virtually) in the course of the study period (see Table 1) under the chairmanship of Mr Andrey KUCHERYAVY assisted by Vice-Chairmen Isaac BOATENG, Jose HIRSCHSON ALVAREZ PRADO, Shin-Gak KANG, Karim LOUKIL, Awad Ahmed Ali Hmed MULAH, Khoa NGUYEN VAN, João Alexandre Moncaio ZANON and Xiaojie ZHU.

In addition various Rapporteur group meetings (including e-meetings) took place during the study period in different locations, see Table 1-bis.

TABLE 1
Meetings of Study Group 11 and its Working Parties

| Meetings | Place, date | Reports |
| --- | --- | --- |
| Study Group 11 | Geneva, 6-15 February 2017 | SG11 – R 1 to R 4 |
| Working Party 1/11Working Party 2/11 | Geneva, 12-13 July 2017 | SG11 – R 5 to R 6 |
| Study Group 11 | Geneva, 8-17 November 2017 | SG11 – R 7 to R 10 |
| Study Group 11 | Geneva, 18-27 July 2018 | SG11 – R 11 to R 14 |
| Working Party 2/11Working Party 3/11 | Geneva, 31 October 2018 | SG11 – R 16 to R 17 |
| Study Group 11 | Geneva, 6-15 March 2019 | SG11 – R 18 to R 21 |
| Working Party 1/11Working Party 2/11Working Party 3/11 | Geneva, 26 June 2019 | SG11 – R 22 to R 24 |
| Study Group 11 | Geneva, 16-25 October 2019 | SG11 – R 26 to R 29 |
| Study Group 11 | Geneva, 4-13 March 2020 | SG11 – R 31 to R 34 |
| Study Group 11 | Virtual, 22-31 July 2020 | SG11 – R 35 to R 38 |
| Working Party 1/11 | Virtual, 19 November 2020 | SG11 – R 39 |
| Working Party 3/11 | Virtual, 4 December 2020 | SG11 – R 40 |
| Study Group 11 | Virtual, 18 December 2020 | SG11 – R 41 |
| Study Group 11 | Virtual, 17-26 March 2021 | SG11 – R 42 to R 46 |
| Working Party 1/11Working Party 2/11Working Party 3/11 | Virtual, 15-16 July 2021 | SG11 – R 47 to R 49 |
| Study Group 11 | Virtual, 1-10 December 2021 | SG11 – R 50 to R 54 |

TABLE 1-bis
Rapporteur meetings organized under Study Group 11 during the study period

| **Dates** | **Place/Host** | **Question(s)** | **Event name** |
| --- | --- | --- | --- |
| 2016-11-22to2016-11-24 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2017-03-28to2017-03-29 | Austria [Vienna] | Q2/11, Q9/11, Q11/11 | Joint Q2/11, Q9/11 and Q11/11 Rapporteur group meeting (with ETSI TC INT) |
| 2017-05-22to2017-05-26 | E-Meeting | Q8/11 | Q8/11 Rapporteur group meeting |
| 2017-06-13to2017-06-14 | E-Meeting | Q2/11, Q9/11, Q11/11 | Joint Q2/11, Q9/11 and Q11/11 Rapporteur group e-meeting (with ETSI TC INT) |
| 2017-07-03to2017-07-12 | Switzerland [Geneva] | Q1/11, Q3/11, Q4/11, Q6/11, Q7/11, Q8/11, Q13/11, Q14/11 | Rapporteur Group Meetings (Q1, 3, 4, 6, 7, 8, 13, 14/11) |
| 2017-07-05 | E-Meeting | Q5/11 | Q5/11 Rapporteur group meeting |
| 2017-08-28to2017-09-01 | E-Meeting | Q8/11 | Q8/11 Rapporteur group meeting |
| 2017-09-04to2017-09-08 | E-Meeting | Q7/11 | Q7/11 Rapporteur group meeting |
| 2017-09-06to2017-09-08 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2018-01-22 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2018-02-19to2018-02-23 | E-Meeting | Q7/11 | Q7/11 Rapporteur group meeting |
| 2018-03-20 | Czech Rep. [Prague] | Q9/11, Q11/11 | Joint Q9/11 and Q11/11 Rapporteur group meeting with ETSI TC INT |
| 2018-04-09to2018-04-18 | Switzerland [Geneva] | Q1/11, Q2/11, Q3/11, Q4/11, Q5/11, Q6/11, Q7/11, Q8/11, Q12/11, Q14/11 | Rapporteur group meetings (Qs1, 2, 3, 4, 5, 6, 7, 8, 12, 14/11) |
| 2018-04-09to2018-04-18 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2018-05-28to2018-06-01 | E-Meeting | Q7/11 | Q7/11 Rapporteur group meeting |
| 2018-06-19to2018-06-20 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2018-09-17to2018-09-21 | E-Meeting | Q8/11 | Q8/11 Rapporteur group meeting |
| 2018-09-18to2018-09-20 | China [Beijing] | Q4/11 | Q4/11 Rapporteur group meeting |
| 2018-10-02to2018-10-03 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2018-10-22to2018-10-31 | Switzerland [Geneva] | Q1/11, Q2/11, Q3/11, Q4/11, Q5/11, Q6/11, Q8/11, Q10/11, Q14/11 | Interim rapporteur groups meetings of Study Group 11 |
| 2019-04-10to2019-04-12 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2019-06-17to2019-06-26 | Switzerland [Geneva] | Q1/11, Q2/11, Q3/11, Q4/11, Q5/11, Q6/11, Q7/11, Q8/11, Q10/11, Q13/11, Q14/11 | Interim Rapporteur group meetings of SG11 |
| 2019-06-21to2019-06-24 | E-Meeting | Q12/11 | Q12/11 Rapporteur group meeting |
| 2019-06-24 | E-Meeting | Q9/11 | Q9/11 Rapporteur group meeting |
| 2019-06-24to2019-06-26 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2019-09-02to2019-09-06 | E-Meeting | Q8/11 | Q8/11 Rapporteur group meeting |
| 2019-11-19to2019-11-21 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2019-12-19to2019-12-20 | E-Meeting | Q4/11 | Q4/11 Rapporteur group meeting |
| 2020-01-14to2020-01-15 | E-Meeting | Q14/11 | Q14/11 Rapporteur group meeting |
| 2020-02-04to2020-02-06 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2020-04-16to2020-04-17 | E-Meeting | Q12/11 | Q12/11 Rapporteur group meeting |
| 2020-05-11to2020-05-15 | E-Meeting | Q8/11 | Q8/11 Rapporteur group meeting |
| 2020-05-19to2020-05-22 | E-Meeting | Q15/11 | Q15/11 Rapporteur group meeting |
| 2020-05-25to2020-05-29 | E-Meeting | Q7/11 | Q7/11 Rapporteur group meeting |
| 2020-05-26 | E-Meeting | Q9/11 | Q9/11 Rapporteur group meeting |
| 2020-06-03to2020-06-05 | E-Meeting | Q3/11 | Q3/11 Rapporteur group meeting |
| 2020-06-24to2020-06-26 | E-Meeting | Q12/11 | Q12/11 Rapporteur group meeting |
| 2020-09-08to2020-09-10 | E-Meeting | Q15/11 | Q15/11 Rapporteur Group Meeting |
| 2020-11-04to2020-11-05 | E-Meeting | Q3/11 | Q3/11 Rapporteur Group Meeting |
| 2020-11-11to2020-11-13 | E-Meeting | Q6/11 | Q6/11 Rapporteur Group Meeting |
| 2020-12-01 | E-Meeting | Q9/11 | Joint Q9/11 & ETSI TC INT Rapporteur Group Meeting |
| 2020-12-01to2020-12-02 | E-Meeting | Q15/11 | Q15/11 Rapporteur Group Meeting |
| 2021-02-25 | E-Meeting | Q16/11 | Joint Q16/11 & ETSI TC INT Rapporteur Group Meeting |
| 2021-04-22 | E-Meeting | Q16/11 | Joint Q16/11 & ETSI TC INT Rapporteur Group Meeting |
| 2021-05-10to2021-05-14 | E-Meeting | Q8/11 | Q8/11 Rapporteur Group Meeting |
| 2021-05-18to2021-05-19 | E-Meeting | Q4/11 | Q4/11 Rapporteur Group Meeting |
| 2021-07-07to2021-07-16 | E-Meeting | Q1/11, Q2/11, Q3/11, Q4/11, Q5/11, Q6/11, Q7/11, Q8/11, Q12/11, Q14/11, Q15/11, Q16/11, Q17/11 | Interim Rapporteur Group Meetings of SG11 |
| 2021-07-08 | E-Meeting | Q16/11 | Joint Q16/11 & ETSI TC INT Rapporteur Group Meeting |
| 2021-08-31to2021-09-02 | E-Meeting | Q4/11 | Q4/11 Rapporteur Group Meeting |
| 2021-09-27to2021-10-01 | E-Meeting | Q7/11 | Q7/11 Rapporteur Group Meeting |
| 2021-09-27to2021-10-01 | E-Meeting | Q8/11 | Q8/11 Rapporteur Group Meeting |
| 2021-09-27to2021-09-28 | E-Meeting | Q2/11 | Q2/11 Rapporteur Group Meeting |
| 2022-01-19to2022-01-21 | E-Meeting | Q4/11 | Q4/11 Rapporteur Group Meeting |

# 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 11 decided to establish three Working Parties. However, due to COVID-19 pandemic, following TSAG endorsement of set of Questions of SG11 for remainder study period, SG11 changed the scope of Working Party 3 and established the Working Party 4 in March 2021.

**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.

**2.1.3** ITU-T Study Group 11 reconfirmed for this study period the following groups that were established by SG11 in the previous study period: [SG11RG-EECAT](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/sg11eecat/Pages/default.aspx), [SG11RG-AFR](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/sg11rgafr/Pages/default.aspx), [CASC](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/Pages/CASC.aspx) and [FG-TBFxG](https://www.itu.int/en/ITU-T/focusgroups/tbfxg/Pages/default.aspx) (see Table 3).

TABLE 2
Organization of Study Group 11

| Designation | Questions to be studied | Title of the Working Party | Chairman and Vice-Chairmen |
| --- | --- | --- | --- |
| WP1/11 | Q1/11; Q2/11; Q3/11; Q4/11; Q5/11 | Signalling requirements and protocols for emerging telecommunications networks | Zhu Xiaojie(Chairman) |
| WP2/11 | Q6/11; Q7/11; Q8/11 | Control and management protocols for IMT-2020 | Kang Shin-Gak(Chairman) |
| WP3/11 | Q12/11; Q13/11; Q14/11; Q16/11 | Conformance and interoperability testing | Kenyoshi Kaoru(Chairman)Mulah Awad Ahmed Ali Hmed(Vice-chairman)Nguyen Van Khoa(Vice-chairman) |
| WP4/11 | Q15/11; Q17/11 | Combating counterfeit telecommunication/ICT devices/software and mobile device theft | Zanon João Alexandre Moncaio(Chairman)Boateng Isaac(Vice-chairman) |

TABLE 3
Other groups (if any)

|  |  |  |
| --- | --- | --- |
| Title of the Group | Chairmnan | Vice-Chairmen |
| Study group 11 regional group for Africa | Boateng Isaac | Alhafyan Alrayan AmnaLoukil KarimRaliou Sidi Mohamed |
| Study group 11 regional group for Eastern Europe, Central Asia and Transcaucasia (EECAT)Note: in November 2017, the title of the SG11RG-RCC was changed to ITU-T SG11 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG11RG-EECAT). | Borodin Alexey | Solovyov Evgeniy |
| Conformity Assessment Steering Committee (CASC) | Boateng Isaac | Nguyen Van KhoaLoukil Karim |
| ITU-T Focus Group on Testbeds Federations for IMT-2020 and beyond (FG-TBFxG) | Maggiore Giulio | Elkotob Muslim |

## 2.2 Questions and Rapporteurs

**2.2.1** WTSA-16 assigned to Study Group 11 the 15 Questions. In January 2021, due to COVID-19 pandemic, TSAG endosed set of 14 Questions for remainder study period (Table 4).

**2.2.2** Accoding to cl.2.2.1, the new Questions listed in Table 5 have been adopted during this period.

**2.2.3** Accoding to cl.2.2.1, the Questions listed in Table 6 have been deleted during this period.

TABLE 4
Study Group 11 – Questions assigned by WTSA-16, endorsed by TSAG (January 2021) and Rapporteurs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Questions endorsed by TSAG(January 2021)** | Status | WP | Rapporteur | Questions assigned by WTSA-16 |
| **Number** | Question title | Number | Question title |
| 1/11 | Signalling and protocol architectures for telecommunication networks and guidelines for implementations | Continued | 1/11 | Deng Huan (Rapporteur)Zhang Jianyin (Associate rapporteur) | 1/11 | Signalling and protocol architectures in emerging telecommunication environments and guidelines for implementations |
| 2/11 | Signalling requirements and protocols for services and applications in telecommunication environments | Continued | 1/11 | Li Cheng (Rapporteur)Brand Martin (Associate rapporteur) | 2/11 | Signalling requirements and protocols for services and applications in emerging telecommunication environments |
| 3/11 | Signalling requirements and protocols for emergency telecommunications | Continued | 1/11 | Zhu Xiaojie (Acting rapporteur) | 3/11 | Signalling requirements and protocols for emergency telecommunications |
| 4/11 | Protocols for control, management and orchestration of network resources | Continued | 1/11 | Cheng Ying (Rapporteur)Huang Cancan (Associate rapporteur) | 4/11 | Protocols for control, management and orchestration of network resources |
| 5/11 | Signalling requirements and protocols for border network gateway in the context of network virtualization and intelligentization | Continued | 1/11 | Ma Junfeng (Rapporteur)Guo Aipeng (Associate rapporteur) | 5/11 | Protocols and procedures supporting services provided by broadband network gateways |
| 6/11 | Protocols supporting control and management technologies for IMT-2020 network and beyond | Continued | 2/11 | Xu Dan (Rapporteur)Liu Tangqing (Associate rapporteur) | 6/11 | Protocols supporting control and management technologies for IMT-2020 |
| 7/11 | Signalling requirements and protocols for network attachment and edge computing for future networks, IMT-2020 network and beyond | Continued | 2/11 | Lee Jongmin (Rapporteur)Kim Kwihoon (Associate rapporteur) | 7/11 | Signalling requirements and protocols for network attachment including mobility and resource management for future networks and IMT-2020 |
| 8/11 | Protocols supporting distributed content networking, information centric network (ICN) technologies for future networks, IMT-2020 network and beyond | Continued | 2/11 | Lee Changkyu (Rapporteur) | 8/11 | Protocols supporting distributed content networking and information centric network (ICN) for future networks and IMT-2020, including end-to-end multi-party communications |
| 12/11 | Testing of internet of things, its applications and identification systems | Continued | 3/11 | Kirichek Ruslan (Rapporteur) | 12/11 | Testing of internet of things, its applications and identification systems |
| 13/11 | Monitoring parameters for protocols used in emerging networks, including cloud/edge computing and software-defined networking/network function virtualization (SDN/NFV) | Continued | 3/11 | Shi Minrui (Rapporteur)Liu Yongsheng (Associate rapporteur) | 13/11 | Monitoring parameters for protocols used in emerging networks, including cloud computing and software-defined networking/network function virtualization (SDN/NFV) |
| 14/11 | Testing of cloud, SDN and NFV | Continued | 3/11 | Wu Linze (Rapporteur) | 14/11 | Cloud interoperability testing |
| 15/11 | Combating counterfeit and stolen telecommunication/ICT devices | Continued | 4/11 | Zanon João Alexandre Moncaio (Rapporteur)Boateng Isaac (Associate rapporteur) | 15/11 | Combating counterfeit and stolen ICT equipment |
| 16/11 | Test specifications for protocols, networks and services for emerging technologies, including benchmark testing | Continuation of Q9/11, Q10/11 and Q11/11 | 3/11 | Brand Martin (Rapporteur)Kenyoshi Kaoru (Associate rapporteur) | 9/11 | Service and networks benchmark testing, remote testing including Internet related performance measurements |
| 10/11 | Testing of emerging IMT-2020 technologies |
| 11/11 | Protocols and networks test specifications; frameworks and methodologies |
| 17/11 | Combating counterfeit or tampered telecommunication/ICT software | New | 4/11 | Zanon João Alexandre Moncaio (Rapporteur) | – | – |

TABLE 5
Study Group 11 – New Questions adopted and Rapporteurs

| Questions | Title of the Questions | WP | Rapporteur |
| --- | --- | --- | --- |
| 16/11 | Test specifications for protocols, networks and services for emerging technologies, including benchmark testing | 3/11 | Brand Martin (Rapporteur)Kenyoshi Kaoru (Associate rapporteur) |
| 17/11 | Combating counterfeit or tampered telecommunication/ICT software | 4/11 | Zanon João Alexandre Moncaio (Rapporteur) |

TABLE 6
Study Group 11 – Questions deleted

| Questions | Title of Questions | Rapporteurs | Results |
| --- | --- | --- | --- |
| Q9/11 | Service and networks benchmark testing, remote testing including Internet related performance measurements | Brand Martin (Rapporteur) | DISCONTINUED - Q9/11, Q10/11 and Q11/11 were merged into new Q16/11 on 18 January 2021, following endorsement by TSAG |
| Q10/11 | Testing of emerging IMT-2020 technologies | Kenyoshi Kaoru (Rapporteur) | DISCONTINUED - Q9/11, Q10/11 and Q11/11 were merged into new Q16/11 on 18 January 2021, following endorsement by TSAG |
| Q11/11 | Protocols and networks test specifications; frameworks and methodologies | Brand Martin (Rapporteur)Kenyoshi Kaoru (Associate rapporteur) | DISCONTINUED - Q9/11, Q10/11 and Q11/11 were merged into new Q16/11 on 18 January 2021, following endorsement by TSAG |

# 3 Results of the work accomplished during the 2017-2021 study period

## 3.1 General

SG11 achieved outstanding results within this study period. The statistics are as follows:

* Number of Contributions: 660 (503 in the previous SP)
* Number of Liaison Statements 243 (130 in the previous SP)
* Number of TDs 2186 (1427 in the previous SP)
* Number of Participants: 1231 (803 in the previous SP)
* Approved new/revised Recommendations,
Corrigendum and Amendment: 81 (99 in the previous SP)
* Consented new Recommendations 7
* Agreed non-normative texts: 12 (10 in the previous SP)

From the observations based on this statistical data and initial Action plan agreed by SG11 at its first meeting ([SG11-TD173/GEN](https://www.itu.int/md/T17-SG11-170206-TD-GEN-0173/en)), it is recognized the following general achievements:

a) Number of contributions and participants was growing in study period (2017-2021). Moreover, once all meetings were turned to virtual, the number of participants have increased in 58%. It is a considerable scale for a stand-alone SG.

b) SG11 developed implementable solutions related to signalling aspects, which are currently used by different stakeholders to resolve existing issues, such as roaming/interconnection of VoLTE-based networks, ENUM implementation, IMS interconnection, security of signalling protcols including SS7, peer-to-peer communications for multimedia streaming, 5G slice management, QKDN protocols and etc.

c) Test specifications and implementation of ITU Conformance and Interoperability programme became one of the common part of SG11 activities within this study period. Among the results is the ITU Testing Laboratories Recognition procedure which was established based on result of close collaboration between CASC and ILAC.

d) Combating counterfeit and stolen ICT devices has become an important and very dynamic topic in SG11. SG11 adopted several Recommendations which define framework for combating counterfeit ICT devices and the use of stolen mobile ICT devices. Among other outcomes, this subject enabled to involve several new ITU members and triggered relevant discussion over Africa and EECAT regions.

e) Three SMEs joined SG11 in order to take a part in development of standards on signalling requeirements, combat counterfeiting and security of signalling protocols, which are widely used for digital financial services (DFS).

f) Seven regional group meetings were organized and there is a high rate of multi-country contributions submitted to SG11.

g) 76 Countries all over the globe participated and contributed to SG11.

Also, during this study period, SG11 conducted seventen Workshops and Forums on the topics related to its main activities (in average, three events per year), as follows:

* [ITU Workshop on "Improving the security of signalling protocols"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2021/1129/Pages/default.aspx)
Virtual, 29 November 2021
* [ITU-Forum on "Future Networks and Conformance and Interoperability (C&I)"](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/Events/2021/SPB-Oct.aspx)
St Petersburg, Russia, 19-22 October 2021
* [ITU Workshop on "Protocol Enhancements for IMS to be used in LTE/IMT-2020 Networks and Beyond"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2021/0705/Pages/default.aspx)
Virtual, 5 July 2021
* [Joint ITU/MWF Webinar "Combating Counterfeit and Irregular Mobile Devices: How to address the Problem"](https://www.itu.int/en/ITU-T/webinars/20210531/Pages/default.aspx)
Virtual, 31 May 2021
* [WSIS Forum 2021. Session 406 – Combating counterfeit telecommunication/ICT devices and software](https://www.itu.int/net4/wsis/forum/2021/Agenda/Session/406)
Virtual, 7 May 2021 ([WSIS Forum 2021 Outcome](https://www.itu.int/net4/wsis/forum/2021/Files/outcomes/draft/WSISForum2021_OutcomeDocument.pdf))
* [ITU-ETSI-IEEE Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G & Beyond: Interoperability, Standardization, Reference Model & APIs](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20210316/Pages/default.aspx)Virtual, 15-16 March 2021
* [ITU Brainstorming session on SS7 vulnerabilities and the impact on different industries including digital financial services](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/102019/Pages/default.aspx)
Geneva, Switzerland, 22 October 2019
* [Third ITU-T Study Group 11 Regional Workshop for Africa on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201909/Pages/default.aspx)
Tunis, Tunisia, 30 September 2019
* [ITU Workshop on Benchmarking of emerging technologies and applications. Internet related performance measurements](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190311/Pages/default.aspx)
Geneva, Switzerland, 11 March 2019
* [ITU Regional Workshop on Deployment of VoLTE/ViLTE networks based on IMS: from Standardization to Implementation](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2018/10_Samarkand/10_Samarkand.aspx)
Samarkand, Republic of Uzbekistan, 2-3 October 2018
* [ITU Workshop on Global approaches on combating counterfeiting and stolen ICT devices](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180723/Pages/default.aspx)
Geneva, Switzerland, 23 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)
Geneva, Switzerland, 18 July 2018
* [ITU Regional Forum on “Internet of Things, Telecommunication Networks and Big Data as basic infrastructure for Digital Economy”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180604/Pages/default.aspx)
Saint Petersburg, Russia, 4-6 June 2018
* [Second ITU-T Study Group 11 Regional Workshop for Africa on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180423/Pages/default.aspx)
Tunis, Tunisia, 23 April 2018
* [Workshop on "Control plane of IMT-2020 and emerging networks. Current issues and the way forward"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201711/Pages/default.aspx)
Geneva, Switzerland, 15 November 2017
* [ITU Regional Workshop for CIS on "Internet of Things (IoT) and future networks"](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2017/06_Saint_Petersburg/06_Saint_Petersburg.aspx)
St Petersburg, Russia, 19-20 June 2017
* [SG11 Regional Workshop for Africa on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20170405/Pages/default.aspx)
Cairo, Egypt, 5 April 2017

## 3.2 Highlights of achievements

The main results achieved on the various Questions assigned to Study Group 11 are briefly summarized below. Formal replies to the Questions are given in a synoptic table in Annex 1 of this report.

**Q1/11 – Signalling and protocol architectures for telecommunication networks and guidelines for implementations**

During this study period, Q1/11 has been responsible for developing Recommendatiosn related to the signalling architecture. Work was completed on four new Recommendations published in the Q.30xx‑series and Q.36xx-series, as follows:

* ITU-T Q.3053 “Signalling architecture and requirements for IP based short message service over ITU-T defined NGN”;
* ITU-T Q.3054 “Signalling architecture for virtualization of control network entities”;
* ITU-T Q.3058 “Signalling architecture of orchestration in NGNe”;
* ITU-T Q.3643 “Signalling architecture of distributed infrastructure ENUM networking for IMS”.

Five work items are planned to be completed in the next study period, as follows:

* Q.CPN-TP-SA “Signalling architecture of transaction platform in CPN”;
* Q.DC-SA “Signalling architecture of data channel enhanced IMS network”;
* Q.IBN-SA “Signalling architecture of Intent-Based Network for network evolution”;
* Q.LiteIMS-SA “Signalling architecture of Lite IMS for IMT-2020 advanced network”;
* Q.NICE-SA “Signalling architecture of NICE (Network intelligence capability enhancement) in support of awareness capabilities”.

**Q2/11 – Signalling requirements and protocols for services and applications in telecommunication environments**

During this study period Q2/11 focused on security issues of existing protocols including revision of SS7 stack and their impact on digital financial services (DFS), signalling aspects for VoLTE/ViLTE, including signalling architecture of ENUM and IMS interconnection.

Among its outcomes, Q2/11 developed seven new Recommendations published in the Q.30xx and Q.36xx-series, two Techincal Reports, revised eight SS7-related protocols Q.731.3-Q.731.6, Q.850 including its Amendum 1, SIP-BICC interworking Q.1912.5 and its Corrigendum, as follows:

* Revised ITU-T Q.731.3 “Stage 3 Description for number identification supplementary services using Signalling System no.7 - Calling Line Identification Presentation”;
* Revised ITU-T Q.731.4 “Stage 3 Description for number identification supplementary services using Signalling System no.7 - Calling Line Identification Restriction”;
* Revised ITU-T Q.731.5 “Stage 3 Description for number identification supplementary services using Signalling System no.7 - Connected Line Identification Presentation”;
* Revised ITU-T Q.731.6 “Stage 3 Description for number identification supplementary services using Signalling System no.7 - Connected Line Identification Restriction”;
* Revised ITU-T Q.850 “Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN user part”;
* Ammedment 1 to ITU-T Q.850 “Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN user part”;
* Revised ITU-T Q.1912.5 “Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part”;
* Corrigendum 1 to ITU-T Q.1912.5 “Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part”;
* ITU-T Q.3057 “Signalling requirements and architecture for interconnection between trustable network entities”;
* ITU-T Q.3630 v.1 “Inter-IMS Network to Network Interface (NNI) - Protocol specification”;
* ITU-T Q.3640 “Framework of interconnection of VoLTE/ViLTE-based networks”;
* ITU-T Q.3641 “IMS references to Release 11 for communication between IMS and NGN Networks in order to support end-to-end service interoperability”;
* ITU-T Q.3642 “IMS references to Release 12 for communication between IMS and NGN networks to support end-to-end service interoperability”;
* ITU-T Q.3644 “Requirements for signalling network analyses and optimization in VoLTE”;
* ITU-T Q.3645 “Protocol at interface between two distributed ENUM servers for IMS”;
* TR-SS7-DFS “SS7 vulnerabilities and mitigation measures for digital financial services transactions”;
* QSTR-USSD “Low resource requirement, quantum resistant, encryption of USSD messages for use in financial services”.

At its last meeting in December 2021, SG11 consented two draft Recommendations related to Q2/11, as follows:

* ITU-T Q.3631 (ex. Q.ISDN-SIP) “Interworking between ISDN and the IP Multimedia (IM) Core Network (CN) subsystem”;
* ITU-T Q.3646 (ex. Q.VoLTE-SAO-FP) “Framework and protocols for signalling network analyses and optimization in VoLTE”.

Finally, Q2/11 has made progress on several work items which are planned to be approved in the next study period:

* Q.CIDA “Signalling requirements of calling line identification authentication”;
* Q.IMT2020-SAO “Requirement, framework and protocols for signalling network analyses and optimization in IMT-2020”;
* Q.Pro-Trust “Signalling procedures and protocols for enabling interconnection between trustable network entities in support of existing and emerging networks”;
* Q.QKDN\_Ak “Protocols for Ak interface for QKDN”;
* Q.QKDN\_Ck “Protocols for Ck interface for QKDN”;
* Q.QKDN\_Kq-1 “Protocols for Kq-1 interface for QKDN”;
* Q.QKDN\_Kx “Protocols for Kx interface for QKDN”;
* Q.QKDN\_profr “Quantum key distribution networks – Protocol framework”;
* TR-NCDP “Session layer network coding protocol for multicast data transmission”.

**Q3/11 – Signalling requirements and protocols for emergency telecommunications**

Q3/11 focused on issues related to emergency telecommunications. One Recommendation and three Supplements were approved during this study period, as follows:

* ITU-T Q.3060 “Signalling architecture of the fast deployment emergency telecommunication network to be used in a natural disaster”;
* ITU-T Q.Supplement 72 “Signalling requirements for IMS emergency telecommunications service in support of multiple accesses”;
* ITU-T Q.Supplement 70 “Signalling requirements for IMS and GSM/UMTS network supporting Multi-device emergency telecommunications service”;
* ITU-T Q.Supplement 69 “Framework for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS)”.

One work item Q.Sig\_Req\_ETS\_IMS\_roaming “Signalling requirements for emergency telecommunication service in IMS roaming environment” is supposed to be approved in the next study period.

**Q4/11 – Protocols for control, management and orchestration of network resources**

Q4/11 focused on issues related to signalling requirements and protocols for Software-Defined Networking (SDN), Network Function Virtualization (NFV), International Mobile Telecommunication system 2020 (IMT-2020), future networks (FN), network virtualization, IPv6 transition, etc.

During this study period, Q4/11 has been very active and published seven new Recommendations, namely:

* ITU-T Q.3059 “Signalling requirements for service function discovery”;
* ITU-T Q.3405 “IPv6 protocol procedures for broadband services”;
* ITU-T Q.3716 “Signalling Requirements for Mapping between Physical and Virtual Networks”;
* ITU-T Q.3718 “Signalling requirements of the Sew interface for Virtual Data Center”;
* ITU-T Q.3740 “Signalling Requirements for SDN and NFV based Central Office services”;
* ITU-T Q.3741 “Signalling Requirements for SD-WAN service”;
* ITU-T Q.4067 “Signalling requirements for VNF lifecycle management under the testing environment”.

At its last meeting in December 2021, SG11 consented draft Recommendation ITU-T Q.3061 (ex. Q.SFPtr) “Signalling requirements for service function paths load balancing traceroute in service function chaining”.

Finally, Q4/11 has made progress on several work items which are planned to be approved in the next study period:

* Q.CPN “Signalling requirements for computing power network”;
* Q.hns “Signalling requirements for hierarchical network slicing service”;
* Q.SCC “Signalling requirements and information model of Cooperative Controller”;
* Q.SD-DCI “Signalling requirements and information model of SD-DCI service”;
* Q.Suppl.heter\_SI “Signalling requirements of SFC based on heterogeneous service index in mobile scenarios”;
* Q.Suppl.pSFC “Signalling requirements for parallel SFC packet processing”;
* Q.telemetry-VBNS “Signalling requirements for telemetry of virtual broadband network services”.

**Q5/11 – Signalling requirements and protocols for border network gateway in the context of network virtualization and intelligentization**

Q5/11 focused on issues related to broadband network gateway including its virtual implementations.

Among outcomes of Q5/11 achieved in this study period are development of six new Recommendations, namely:

* ITU-T Q.3055 “Signalling protocol for Heterogeneous IoT gateways”;
* ITU-T Q.3713 “Signalling requirements for Broadband Network Gateway (BNG) pool”;
* ITU-T Q.3715 “Signalling requirements for dynamic bandwidth adjustment on demand on broadband network gateway implemented by software-defined networking technologies”;
* ITU-T Q.3717 “Signalling requirements for automatic management of IP address pool by SDN technologies on BNG”;
* ITU-T Q.3719 “Signalling requirements for the separation of control plane and user plane in vBNG (Broadband Network Gateway)”;
* ITU-T Q.3720 “Procedures for vBNG acceleration with programmable acceleration card”.

Finally, there are three ongoing work items which are planed to be approved in the next study period:

* ITU-T Q.BNG-INC “Requirements and signalling of intelligence control for the border network gateway in computing power network”;
* ITU-T Q.BNG-P4switch “Procedures for Programming Protocol-Independent Packet Processors(p4) Switch-based vBNG”;
* Q.CNCG-IC “Signalling requirements for intelligent control of cloud-network-converged networks gateway”.

**Q6/11 – Protocols supporting control and management technologies for IMT-2020 network and beyond**

Q6/11 focused on issues related to protocols to be used in control and management technologies for IMT-2020.

During this study period, Q6/11 published four new Recommendations, namely:

* ITU-T Q.5020 “Protocol requirements and procedures for network slice lifecycle management”;
* ITU-T Q.5021 “Protocol for managing capability exposure APIs in IMT-2020 network”;
* ITU-T Q.5022 “Signalling procedure of energy efficient device-to-device communication for IMT-2020 network”;
* ITU-T Q.5023 “Protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 network”.

At its last meeting in December 2021, SG11 consented draft Recommendation ITU-T Q.5024 (ex. Q.IMT2020-PIAS) “Protocol for providing intelligent analysis services in IMT-2020 network”.

Finally, Q6/11 has made progress on several work items which are planned to be approved in the next study period:

* Q.DIVS-IMT2020 “Signalling Requirements and Protocol for Providing Network-oriented Data Integrity Verification Service based on Blockchain in IMT-2020 network”;
* Q.IITSN “Protocol for IMT-2020 network Integration with Time Sensitive Network”;
* Q.IMT2020-PFW “Protocol Framework for IMT-2020”;
* Q.PCNC-FMSC “Protocol for supporting computing and network convergence in fixed, mobile and satellite convergence in IMT-2020 network and beyond”;
* Q.PMMC “Protocol for traffic flow coordination of multi-modality communication”;
* Q.PMUPF “Protocol for managing User Plane function in IMT-2020 network”.

**Q7/11 – Signalling requirements and protocols for network attachment and edge computing for future networks, IMT-2020 network and beyond**

Q7/11 focused on issues related to signalling requirements and protocols for network attachment and resource management of IMT-2020.

During this study period, Q7/11 published four new Recommendations, namely:

* ITU-T Q.3714 “Signalling requirements of SDN-based access networks with media independent management capabilities”;
* ITU-T Q.3745 “Protocol for time constraint IoT-based applications over SDN”;
* ITU-T Q.5001 “Signalling requirements and architecture of intelligent edge computing”;
* ITU-T Q.5002 “Signalling requirement and architecture for media service entity attachment”.

At its last meeting in December 2021, SG11 consented draft Recommendation ITU-T Q.5003 (ex. Q.FMEC-SRA) “Signalling requirement and architecture for federated multi-access edge computing”.

Finally, Q7/11 has made progress on three work items which are planned to be approved in the next study period:

* Q.AIS-SRA “Signalling requirements and architecture to support AI based vertical services in future network, IMT2020 and beyond”;
* Q.IEC-PRO “Protocols for microservices based intelligent edge computing”;
* Q.WLAN5G-REQ “Signalling requirements of WLAN access network for interworking with 5G network”.

**Q8/11 – Protocols supporting distributed content networking, information centric network (ICN) technologies for future networks, IMT-2020 network and beyond**

Q8/11 was very active during this study period. It focused on signalling requirements and protocols for managed peer-to-peer and hybrid peer-to-peer communications.

During this study period, Q8/11 published ten new/revised Recommendations, namely:

* ITU-T Q.4100 “Hybrid peer-to-peer (P2P) communications: Functional architecture”;
* ITU-T Q.4101 “Hybrid peer-to-peer (P2P) communications: Tree and data recovery procedures”;
* ITU-T X.609.3 “Managed P2P communications: Multimedia streaming signalling requirements”;
* ITU-T X.609.4 “Managed P2P communications: Multimedia streaming peer protocol”;
* ITU-T X.609.5 “Managed P2P communications: Overlay management protocol”;
* ITU-T X.609.6 “Managed P2P communications: Content distribution signalling requirements”;
* ITU-T X.609.7 “Managed P2P communications: Content distribution peer protocol”;
* ITU-T X.609.8 “Managed P2P communications: Management protocol for live data sources”;
* ITU-T X.609.9 “Managed P2P communications: Overlay content management protocol”;
* ITU-T X.609.10 “Managed P2P communications: Signalling requirements for data streaming”.

At its last meeting in December 2021, SG11 consented two draft Recommendations related to Q8/11, as follows:

* ITU-T Q.4102 (ex. Q.HP2P-pp) “Hybrid peer-to-peer (P2P) communications: Peer protocol”;
* ITU-T Q.4103 (ex. Q.HP2P-omp) “Hybrid P2P communications: overlay management protocol”.

Finally, Q8/11 has made progress on Q.HP2P-dss “Hybrid peer-to-peer (P2P) communications: Data streaming service”, which is planned to be approved in the next study period.

**Q12/11 – Testing of Internet of things, its applications and identification systems**

Q12/11 developed testing specifications for IoT.

During this study period, Q12/11 published four new Recommendations, namely:

* ITU-T Q.3952 “The architecture and facilities of Model network for IoT testing”;
* ITU-T Q.4060 “The structure of the testing of heterogeneous Internet of Things gateways in a laboratory environment”;
* ITU-T Q.4062 “Framework for IoT Testing”;
* ITU-T Q.4063 “The framework of testing of identification systems used in IoT”.

Finally, Q12/11 has made progress on two work items which are planned to be approved in the next study period:

* Q.GDC-IoT-test “Testing requirements and procedures for Internet of Things based green data centres”;
* Q.TSRT\_IoT “Test specifications for remote testing of Internet of Things using the probes”.

**Q13/11 – Monitoring parameters for protocols used in emerging networks, including cloud/edge computing and software-defined networking/network function virtualization (SDN/NFV)**

Q13/11 developed specifications related to monitoring parameters to be used in emerging networks.

During this study period, Q13/11 published four new Recommendations and one Corrigendum, namely:

* ITU-T Q.3914 “Set of parameters of cloud computing for monitoring”;
* ITU-T Q.3915 “Set of parameters of vBNG for monitoring”;
* ITU-T Q.3916 “Signalling requirements and architecture for the Internet service quality monitoring system”;
* ITU-T Q.3961 “Parameters for evaluating bottleneck of web-browsing service” and relevant Corrigendum 1.

Finally, Q13/11 has made progress on two work items which are planned to be approved in the next study period:

* Q.joint\_tr “Requirements and Reference Model for optimized traceroute of joint IP/MPLS”;
* Q.PIS “Monitoring Parameters for Intelligent Speech Service in Future Networks”.

**Q14/11 – Testing of cloud, SDN and NFV**

Q14/11 focused on development testing specifications to ensure cloud interoperability.

During this study period, Q14/11 published five new Recommendations, namely:

* ITU-T Q.4041.1 “Cloud computing infrastructure capabilities interoperability testing - part 1: Interoperability testing between CSC and CSP”;
* ITU-T Q.4042.1 “Cloud interoperability testing about web application - part 1: Interoperability testing between CSC and CSP”;
* ITU-T Q.4043 “Interoperability testing requirements of virtual switch”;
* ITU-T Q.4044 “Test suite for interoperability testing of virtual switch”;
* ITU-T Q.4064 “Interoperability testing requirements of virtual Broadband Network Gateway”.

Finally, Q14/11 has made progress on three work items which are planned to be approved in the next study period:

* Q.BaaS-iop-reqts “Interoperability testing requirements of blockchain as a service”;
* Q.vbng-iop-ts “Test suite for interoperability testing of virtual BNG”;
* Q.N-att-framework “Framework of NFV automated testing”.

**Q15/11 – Combating counterfeit and stolen telecommunication/ICT devices**

Q15/11 focused on the development of Recommendations and Technical Reports on combating counterfeit ans stolen ICT equipment.

During this study period, Q15/11 published four new Recommendations, three Supplements and two Technical Reports, namely:

* ITU-T Q.5050 “Framework for solution to combat counterfeit ICT Devices”;
* ITU-T Q.5051 “Framework for combating the use of stolen mobile devices”;
* ITU-T Q.5052 “Addressing mobile devices with duplicate unique identifier”;
* ITU-T Q.5053 “Mobile device access list audit interface”;
* ITU-T Q.Supplement 73 “Guidelines for Permissive versus Restrictive System Implementations to address counterfeit, stolen and illegal mobile devices”;
* ITU-T Q.Supplement 74 “Roadmap for the Q.5050-series - Combat of Counterfeit ICT and Stolen Mobile Devices”;
* ITU-T Q.Supplement 75 “Use Cases on the Combat of Counterfeit ICT and Stolen Mobile Devices”;
* ITU-T QTR-RLB-IMEI “Reliability of IMEI”;
* ITU-T QTR-CICT “Survey report on counterfeit ICT devices in Africa region”.

Finally, Q15/11 has made progress on three work items which are planned to be approved in the next study period:

* Q.Sup.CEIR-EIR-int “Common approaches and interfaces for data exchange between CEIR and EIR”;
* Q.Sup.CFS-AFR “Guidelines on combating counterfeit and stolen mobile devices in African region”;
* TR-CF-QoS “Impact of Counterfeit Mobile devices on Quality of Service”.

**Q16/11 – Test specifications for protocols, networks and services for emerging technologies, including benchmark testing**

Q16/11 (merged Q9/11, Q10/11 and Q11/11) focused on development of testing specifications for emerging IMT-2020 technologies, remote testing, testing methodologies of Internet related performance measurements, tesbed federations and development test specifications on conformance and interoperability.

During this study period, Q16/11 (merged Q9/11, Q10/11 and Q11/11) published 11 new Recommendations and one Supplement, namely:

* ITU-T Q.3940 “NGN/IMS interconnection tests between network operators at the IMS 'Ic' interface and NGN NNI / SIP-I”;
* ITU-T Q.3953 “VoLTE/ViLTE interconnection testing for interworking and roaming scenarios”;
* ITU-T Q.3056 “Signalling procedures of the probes to be used for remote testing of network parameters”;
* ITU-T Q.3963 “The compatibility testing of SDN-based equipment using OpenFlow protocol”;
* ITU-T Q.4014.1 “PSTN/ISDN terminal equipment using IP Multimedia core network subsystem; Conformance testing; Part 1: PICS”;
* ITU-T Q.4014.2 “PSTN/ISDN terminal equipment using IP Multimedia core network subsystem; Conformance testing; Part 2: TSS&TP”;
* ITU-T Q.4016 “Testing specification of call establishment procedures based on SIP/SDP and ITU-T H.248 for a real-time fax over IP service”;
* ITU-T Q.4061 “Framework of SDN controller testing”;
* ITU-T Q.4065 “Framework of model network for Tactile Internet testing”;
* ITU-T Q.4066 “Testing procedures of Augmented Reality applications”;
* ITU-T Q.4068 “Open API for interoperable testbed federations”;
* ITU-T Q.Supplement 71 “Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operator's networks”.

The Technical Report TP-TEST-UE-MS “Guideline for general test procedure and specification for measurements of the LTE, 3G/2G user Equipment/mobile stations (UE/MS) for over-the-air performance testing” was withdrawn by SG11 as the matter is under responsibility of the ITU-R.

Finally, Q16/11 has made progress on Q.PR-MF “Methodology of performance requirements for reliable comparison of measurement results”, which is planned to be approved in the next study period.

**Q17/11 – Combating counterfeit or tampered telecommunication/ICT software**

Q17/11 focused on development of Recommendations and Technical Reports on combating counterfeit or tampered ICT software and data misappropriation and its adverse impacts.

Q17/11 started in March 2021 and has made progress on TR-MCM-Use-Cases “Use Cases on the combat of Multimedia Content Misappropriation”, which is planned to be approved in the next study period.

## 3.3 Report of lead study group activities, ITU-T CASC, FG-TBFxG and regional groups

### 3.3.1 Lead study group activities on signalling and protocols, including for IMT-2020 technologies

Study Group 11 continues its studies related to development and maintenance of signalling requirements and protocols to be used in legacy, existing and future networks.

Most of ICT operators migrate to all-over-IP concept where LTE plays a significant role at the access stratum providing customers the voice/video services, so called VoLTE/ViLTE. The IP Multimedia Subsystem (IMS) becomes a common control platform for such services and E.164/URI resolving system is extremely important for its deploying. In this regard, there is a need for operators to interconnect to each other providing VoLTE/ViLTE services within their countries and on international level.

During the study period (2017-2021), following the tasks given to SG11 in [Resolution 93](https://www.itu.int/pub/T-RES-T.93-2016) (WTSA-16) “Interconnection of 4G, IMT-2020 networks and beyond”, SG11 in close collaboration with ETSI TC INT considered signalling aspects related to the VoLTE/ViLTE interconnection and roaming issues.

SG11 developed Recommendation ITU-T Q.3640 “Framework of interconnection of VoLTE/ViLTE-based networks”, which describes the framework and procedures that should be implemented by operators for establishing an interconnection between VoLTE/ViLTE-based networks to achieve worldwide interoperability. This Recommendation identifies additional scenarios and requirements for VoLTE/ViLTE interconnection, which have not been defined in existing 3GPP standards and GSMA guidelines. Also, to achieve interoperability, SG11 as a lead group on testing, developed Recommendation ITU-T Q.3953 which contains test specifications for VoLTE/ViLTE interconnection testing for interworking and roaming scenarios.

In addition, SG11 in close collaboration with SG2 developed Recommendation ITU-T Q.3643 “Signalling architecture of distributed infrastructure ENUM networking for IMS”, which defines the framework and signalling architecture for distributed ENUM networking in support of IMS interconnection. Based on the signalling architecture of a distributed ENUM model, this Recommendation specifies the signalling procedures of ENUM profile management and ENUM resolution. Moreover, it defines the signalling requirements and protocols to be applied for interfaces of distributed ENUM networking. It is complemented by Recommendation ITU-T Q.3645 “Protocol at interface between two distributed ENUM servers for IMS”, which defines the reference model, procedures, protocol, and message specification for the interface between two Distributed ENUM Servers.

All Recomemndations related to signalling aspects of VoLTE/ViLTE and IMS interconnection are found in new sub-series Q.3640-Q.3655: VoLTE/ViLTE network signalling.

Also, SG11 promoted its activities through [ITU Regional Workshop](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2018/10_Samarkand/10_Samarkand.aspx) on “Deployment of VoLTE/ViLTE networks based on IMS. From standardization to implementation”, Samarkand, Uzbekistan, 2-3 October 2018, [ITU Regional Forum](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180604/Pages/default.aspx) on “Internet of Things, Telecommunication Networks and Big Data as basic infrastructure for Digital Economy”, Saint-Petersburg, Russian Federation, 4-6 June 2018 and [ITU Workshop](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2021/0705/Pages/default.aspx) on "Protocol Enhancements for IMS to be used in LTE/IMT-2020 Networks and Beyond", virtual, 5 July 2021.

Another area of study of SG11 was security of protocols, including Signalling System No. 7 (SS7). SS7 is a stack of signalling protocols, which was initially developed by ITU (CCITT) in the mid-1980s. Since then, SS7 standards have become a generic stack which is widely applied in public switched telephone network (PSTN) all over the globe. With the current network environment, including interconnection over the Internet, SS7-based networks have become vulnerable and can be easily attacked. Moreover, the latest move to Diameter protocol has not solved any of the basic vulnerabilities found in SS7. Presently, there have been multiple cases where SS7 vulnerabilities have been used for different hackers’ attacks. Amongst well-known attacks on SS7 networks include telephone spam, spoofing numbers, location tracking, subscriber fraud, intercept calls and messages, DoS, infiltration attacks, routing attacks, etc.

During this study period (2017-2021), ITU-T SG11 published a number of documents on this subject matter:

* Revised SS7 related standards – Recommendations ITU-T Q.731.3, ITU-T Q.731.4, ITU-T Q.731.5 and ITU-T Q.731.6 in order to accommodate some Member States’ urgent demands relating to the spoofing of calling party number; the revised ITU-T Q.731.3 specifies an exceptional procedure for transit exchange connected to CPE (Customer Premises Equipment) with the purpose of providing predefined calling party number by the originating operator.
* Recommendation ITU-T Q.3057 “Signalling requirements and architecture for interconnection between trustable network entities”, which specifies the signalling architecture and requirement for interconnection between trustable network entities in support of existing and emerging networks. Based on the architecture, it specifies the interfaces and signalling requirements between the functional entities and signalling procedures to be applied.
* Technical Report ITU-T QSTR-SS7-DFS “SS7 vulnerabilities and mitigation measures for digital financial services transactions”. The goal of this Technical Report is to advance the implementation of countermeasures and mitigation strategies within the telcos by advancing regulation and standardization of such measures both for telcos and for financial institutions.
* Technical Report ITU-T QSTR-USSD “Low resource requirement, quantum resistant, encryption of USSD messages for use in financial services” which surveys the available and upcoming encryption technologies that can mitigate the USSD-based financial fraud.

SG11 organized a [Brainstorming session](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/102019/Pages/default.aspx) on SS7 vulnerabilities and the impact on different industries including digital financial services in Geneva on 22 October 2019. The objective of the event was to discuss the potential way forward to enhance the security mechanisms of existing protocols and its adoption rate among telecom operators in order to defend all stakeholders such as Telco operators, banks, operators of financial services, regulators and individual clients from related attacks.

SG11 continues its study and currently develops signalling requirements for some reference points defined in ITU-T Q.3057 as well as signalling procedures of calling line identification authentication (Q.PRO-Trust and Q.CIDA). These signalling procedures allow to tackle different types of attacks by inserting digital signatures into signalling exchange, which will be further validated by the Trusted Signalling Certification Authority (TSCA). Those work items are supposed to be completed in the next study period.

Following the progress made so far, SG11 in close collaboration with SG2 and SG17 organized ITU Workshop on “Improving the security of signalling protocols” (virtual, 29 November 2021, [www.itu.int/go/WS-SSP](http://www.itu.int/go/WS-SSP)). Among other issues, the brainstorming session discussed the need to standardize the identity verification process of a party requesting a certificate, its issuance process and the distribution of the issued certificate to the operators. According to the key takeaways of the Workshop, there is a need to build a hierarchy of trust, country/regional first, then global where each local regulator will have to determine how to implement the certification depending on their local forms of identification and rules. It was noted that the digital certificates must be interoperable across domains (SIP, SS7, etc.). Finally, it was highlighted that the trust anchor needs to be a globally trusted SDO, preferably one already in charge of numbering and this anchor must interoperate with existing repositories. Therefore, it was pointed out that there is a need to formulate a way to standardize these local/regional certification processes in order to keep the bad actors out. This standardization process should involve as many countries as possible in order to improve its applicability on the global scale.

In January 2021, TSAG agreed on demarcation lines between to SG11 and SG17 on security related issues, including security of signalling protocols, combating counterfeiting and the use of stolen ICT devices ([TSAG-TD934](https://www.itu.int/md/T17-TSAG-210111-TD-GEN-0934/en)).

In addition, during this study period (2017-2021) SG11 focused its development on signalling requirements and protocols for IMT-2020 aligning its efforts on the architecture defined in ITU-T Y.3102. Among SG11 outcomes are intelligent edge computing based on AI-technologies for data processing (ITU-T Q.5001), signalling requirements and architecture for media service entity attachment (ITU-T Q.5002), the life cycle management protocol (LCMP) requirements and procedures for network slice life cycle management (ITU-T Q.5020), protocols for managing capability exposure in IMT-2020 (ITU-T Q.5021), signalling for d2d communication for IMT-2020 networks (ITU-T Q.5022) and protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 networks (ITU-T Q.5023). The ful set of standards related to signalling aspects for IMT-2020 networks are available in sub-series Q.5000-Q.5049: Signalling requirements and protocols for IMT-2020.

With regards to peer-to-peer communications, SG11 continued its development of protocols for managed P2P communications along with the X.series, SG11 started a new sub-series Q.4100-Q.4139: Protocols and signalling for P2P communications. Two new Recommendations were developed under this category, including hybrid peer-to-peer communications: Functional architecture (ITU-T Q.4100) and h[ybrid peer-to-peer communications: Tree and data recovery procedures](https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14766) (ITU-T Q.4101). In December 2021, SG11 consented two more Recommendations ITU-T Q.4102 and ITU-T Q.4103. Eight new Recomemndations on managed P2P communications were developed under X.series (ITU-T X.609.3-X.609.10).

To support the above-mentioned activities SG11 conducted [Workshop](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201711/Pages/default.aspx) on "Control plane of IMT-2020 and emerging networks. Current issues and the way forward", Geneva, Switzerland,15 November 2017, [ITU Regional Workshop for CIS](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2017/06_Saint_Petersburg/06_Saint_Petersburg.aspx) on "Internet of Things (IoT) and future networks", Saint Petersburg, Russia, 19-20 June 2017 and [ITU Regional Forum](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180604/Pages/default.aspx) on “Internet of Things, Telecommunication Networks and Big Data as basic infrastructure for Digital Economy”, Saint Petersburg, Russia, 4-6 June 2018.

SG11 started the study of the protocols for Quantum Key Distribution Networks (QKDN). Among ongoing work items are the QKDN protocols framework and relevant protocols for different interfaces (Ak, Kx, Kq-1, Ck). This work follows the outcomes achieved by FG-QIT4N. The relevant information session, which was organized in order to present FG-QIT4N deliverables and suggestions for the way forward for QIT-related standardization, took place during SG11 virtual meeting in December 2021 ([SG11-TD1818/GEN](https://www.itu.int/md/T17-SG11-211201-TD-GEN-1818/en)).

For more details on the signalling and protocols achievements in this study period, please see the results of each single Question, especially Questions 1, 2, 3, 4, 5, 6, 7 and 8 as mentioned above in clause 3.2.

### 3.3.2 Lead study group activities on establishing test specifications, conformance and interoperability testing for all types of networks, technologies and services that are the subject of study and standardization by all ITU‑T study groups

Study Group 11 was very active in the field of test specifications, conformance and interoperability testing and acted as coordinator among ITU-T Study Groups and other Sectors through the study period.

Below are summarised the activities and achievements of Study Group 11 in this field:

* Maintained a reference table of ITU-T Recommendations and corresponding test specifications used for C&I testing (<http://itu.int/go/reference-table>).
* Maintained a living list of conformity assessment pilot projects against ITU-T Recommendations, which were established in collaboration with various ITU-T Study Groups (<http://itu.int/go/pilot-projects>).
* Continued its collaboration with ETSI TC INT on test specifications development. The areas of joint studies are: test specifications for VoLTE interconnection, Internet performance measurements and APIs for interoperable tesbed federations.
* Agreed a new [Supplement 71](https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14125) “Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operators' networks” following the approval of ITU-T Q.3960 in 2016. The Supplement 71 describes the testing procedures of data transmission speed within the fixed and mobile operators' networks. The concept and approaches defined in this Supplement were presented and discussed at the [ITU Workshop](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190311/Pages/default.aspx) on “Benchmarking of emerging technologies and applications. Internet related performance measurements”, Geneva, 11 March 2019. It was noted that Supplement 71 is compliant with Net Neutrality regulation 2015/2120 from BEREC and OECD 2014 report, underlying that TCP protocol is widely used by customer application. The event was attended by different stakeholders including BEREC.
* Approved two Recommendations to be used for remote testing, including signalling requirements for the probes (ITU-T Q.3056) and o[pen application program interfaces (APIs) for interoperable testbed federations](https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14765) (ITU-T Q.4068).
* Approved several ITU-T Recommendations which define testing specifications for different technologies such as SDN controller, SIP-IMS, Augumented Reality, Tactile internet, VNG lifecycle management, VoLTE/ViLTE interconnection, IoT.
* Approved set of specifications on monitoring and interoperability testing of cloud computing.

SG11 conducted several Workshops in EECAT and Africa Region in order to promote its activities:

* [First ITU-T Study Group 11 Regional Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20170405/Pages/default.aspx) on Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa, Cairo, Egypt, 5 April 2017.
* [Second ITU-T Study Group 11 Regional Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180423/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”, Tunis, Tunisia, 23 April 2018.
* [Third ITU-T Study Group 11 Regional Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201909/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”, Tunis, Tunisia, 30 September 2019.
* [ITU-Forum on “Future Networks and Conformance and Interoperability (C&I)”](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/Events/2021/SPB-Oct.aspx), St.Petersburg, Russia, 19-22 October 2021

For more details on achievements related to development of testing specifications in this study period, please see the results of each single Question, especially Questions 12, 13, 14 and 16/11 (merged Q9/11, 10/11 and 11/11) as mentioned above in clause 3.2.

### 3.3.3 Lead study group activities on combating counterfeiting of ICT devices

The growing usage of ICT Equipment in people’s daily lives in recent years resulted in increased problems related to the sale, circulation and use of counterfeit equipment in most markets as well as their adverse consequences for manufacturers, users and governments. This has led to calls by ITU Member States, particularly those in developing countries to address the issue, especially the negative effects and to study any positive impact of measures taken.

During the study period (2017-2021), Study Group 11 achived the following outcomes:

* + Approved a survey report on counterfeit ICT devices in Africa region, which recognized that counterfeit and substandard ICT devices pose a lot of challenges in developing countries, particularly within the Africa region. The survey identified strong demand for an African Regional Group within Study Group 11. Then, a number of Regional workshops were conducted respectively:
	+ The first Regional [Workshop for Africa](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/20170405/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa” (5 April 2017, Cairo, Egypt). The event gave an overview of the current situation on combating counterfeiting, new trends and mechanisms in ICT counterfeiting, tampering and/or duplication of unique device identifiers and the implementation of C&I regimes in the region. The outcomes of the Workshop identify the key priorities for African countries in standardization of issues highlighted during the event.
	+ The second ITU-T Study Group 11 regional [Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180423/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa” took place in Tunis, Tunisia on 23 April 2018, followed by the second ITU-T SG11 Regional Group meeting for Africa (SG11RG-AFR) (23-25 April 2018). During SG11RG-AFR meeting, it was noted that duplication/cloning and tampering of unique identifiers of ICT devices, such as IMEI, are still a huge problem in the African Region. Also, it was stated that ITU should address this problem by proposing secure mechanisms to be used for identification of ICT devices, not limited to mobile phones (see [SG11RG-AFR–R2](https://www.itu.int/md/T17-SG11RG.AFR-R-0002/en)).
	+ The third ITU-T Study Group 11 Regional [Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201909/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa” took place in Tunis, Tunisia on 30 September 2019, followed by the third ITU-T SG11 Regional Group meeting for Africa (SG11RG-AFR) (30 September – 2 October 2019). It was noted that counterfeit devices particularly mobile phones in the region is a major concern. There is the need to find mechanisms to secure supply chain and so it was commended to establish a regional or sub-regional CEIR to combat counterfeit and stolen ICT devices.
	+ Approved Recommendation ITU-T Q.5050 “Framework for solution to combat counterfeit ICT devices”, which defines the reference framework and requirements to be considered when deploying solutions to combat the circulation and use of counterfeit ICT devices.
	+ Approved Recommendation ITU-T Q.5052 “Addressing mobile devices with duplicate unique identifiers”, which identifies challenges and proposes mechanisms to enable the detection of mobile devices with duplicate identifiers present on operator networks as well as recommending mechanisms for validating the legitimacy of such devices.
	+ Approved Recommendation ITU-T Q.5053 “Mobile device access list audit interface” which defines the methodologies and interfaces between mobile device access list audit system (MDALAS) and mobile network operators' equipment identity register (EIR) to audit and reconcile whether the mobile network operators (MNOs) are complying with the defined mobile device access list requirements.
	+ Conducted Questionnaire on Reliability of International Mobile Equipment Identity (IMEI), which was initiated according to the ITU-T SG11 decision in October 2019 (TSB Circular 207).
	+ Agreed the Technical Report ITU-T QTR-RLB-IMEI “Reliability of IMEI”, which among other issues, addresses key challenges faced by a range of stakeholders that arise from cloned/tampered IMEIs, including concerns about the misuse of IMEI numbers raised by Member States at ITU Council-17 and ITU Council-18. It also proposes ways to improve IMEI reliability and preventive steps for solving the issues on a national and international level.
	+ Agreed ITU-T Q.Supplement 73 “Guidelines for permissive versus restrictive system implementations to address counterfeit, stolen and illegal mobile devices” which provides guidelines for permissive versus restrictive system deployments that should be considered when deciding what approach to employ in order to address the issues of counterfeit, illegal and stolen mobile devices.
	+ Agreed ITU-T Q.Supplement 74 “Roadmap for the Q.5050-series - Combat of Counterfeit ICT and Stolen Mobile Devices” which provides an overall index and relation of the ITU-T Q.5050-series of Recommendations. Additionally, it provides a cross-reference of the macro-process for combating counterfeit ICT and stolen mobile devices with the related Recommendations, Technical Reports and Supplements.
	+ Agreed ITU-T Q.Supplement 75 “Use Cases on the Combat of Counterfeit ICT and Stolen Mobile Devices” which contains use cases from ITU Members that reflects challenges, opportunities and results on the combat of counterfeit ICT and stolen mobile devices.
	+ In 2018, ITU-T SG11 organized a [Workshop on "Global approaches on combating counterfeiting and stolen ICT devices"](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180723/Pages/default.aspx). One of the aims of the Workshop was to focus on concerns raised by ITU Member States during Council-18 on tampering with unique telecommunication device identifiers used in ICT devices such as IMEI. During the Workshop, it was noted that the reliability of ICT identifiers are still a key important issue for most of countries. Also, a demo zone “IMEI-DOA solution to combat counterfeiting ICT devices” was deployed by Rostelecom. Following the outcomes of the Workshop, ITU-T SG11 was encouraged to take some actions, which aim is to increase reliability of existing ICT identifiers.
	+ In 2021, ITU-T SG11 organized [Session 406 “Combating counterfeit telecommunication/ICT devices and software”](https://www.itu.int/net4/wsis/forum/2021/Agenda/Session/406) during WSIS Forum 2021. It provided an overview of existing challenges, solutions and standardization activities on combating counterfeiting of ICT devices and software. Also, it became a platform to exchange views among different stakeholders about the key challenges that they now face and identify the potential new standardization areas which ITU may need to consider.
	+ In 2021, ITU-T SG11 organized joint [ITU/MWF Webinar “Combating Counterfeit and Irregular Mobile Devices: How to address the Problem”](https://www.itu.int/en/ITU-T/webinars/20210531/Pages/default.aspx) which provided an overview of ITU-T SG11 activities on combating counterfeiting, presented a geographically diverse overview of the different use cases and also discussed potential open-source solutions to address these issues.
	+ TSB secretariat gave an overview of ITU-T activities on combating counterfeit and stolen ICT devices at the coordination meeting of IGOs working in the area of building respect for Intellectual Property (IP) and participated in the Online Dialog “New Developments in Combating Counterfeiting and Piracy on the Internet” organized by the Advisory Committee on Enforcement (ACE) of WIPO (WIPO/ACE/OD/1) on 21 September 2021.

For more details on achievements related to combating counterfeiting of ICT devices in this study period, please see the results of Question 15/11 as mentioned above in clause 3.2. More information is also available in the dedicated [webpage](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/Pages/counterfeit.aspx).

### 3.3.4 Lead study group activities on combating the use of stolen ICT devices

The demand for services, resulting in the increased production and availability of ICT equipment, has seen the rise of stolen equipment. Some of these equipments are returned to the market after they have been tampered with and their identity modified, hence bypassing identity blacklisting solutions implemented by Governments and mobile network operators. Consequently, most countries worldwide are not only engaged in combating counterfeit ICT equipment, but also have put in place measures against theft of ICT equipment and some of them to tackle stolen equipment with modified identities from reactivating on networks and to effectively manage the situation.

During this study period (2017-2021), Study Group 11 achived the following outcomes:

* Established a plan for implementation of the Resolution 97 (WTSA-16).
* Approved Recommendation ITU-T Q.5051 “Framework for Combating the use of Stolen Mobile Devices”.
* Informed OECD, WIPO, WTO, 3GPP, MWF, GSMA as well as regional organizations (APT, ATU, CITEL, CEPT, RCC) and ITU SGs on the current activities related to mobile device theft.
* TSB secretariat gave an overview of ITU-T activities on combating counterfeit and stolen ICT devices at the coordination meeting of IGOs working in the area of building respect for Intellectual Property (IP) and participated in the Online Dialog “New Developments in Combating Counterfeiting and Piracy on the Internet” organized by the Advisory Committee on Enforcement (ACE) of WIPO (WIPO/ACE/OD/1) on 21 September 2021.
* During [Workshop on “Global approaches on combating counterfeiting and stolen ICT devices”](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180723/Pages/default.aspx), Deutsche Telekom, SAP and Camelot ITLab deployed a demo zone on “Combat Mobile Device Theft with blockchain-based Global IMEI Storage and Services Innovation”.
* The discussion on combating the use of stolen ICT devices was one of the topics of Regional Workshops for Africa Region. It was noted that there is a need to find mechanisms to secure supply chain and so it was commended to establish of regional or sub-regional CEIR to combat counterfeit and stolen ICT devices.

For more details on achievements related to combating the use of stolen ICT devices in this study period, please see the results of Question 15/11 as mentioned above in clause 3.2.

### 3.3.5 ITU-T CASC

According to Resolution 76 (WTSA-16), the Conformity Assessment Steering Committee([ITU-T CASC](https://www.itu.int/en/ITU-T/studygroups/2013-2016/11/Pages/CASC.aspx)), which works under auspices of SG11, elaborated detailed procedures for the implementation of a test laboratory recognition procedure in ITU-T and identified list of Recommendations to set up joint certification schemes.

The Terms of References is available in ANNEX 3 (ref. [SG11-TD314/GEN](https://www.itu.int/md/T17-SG11-171108-TD-GEN-0314/en)).

During this study period, ITU-T CASC achieved the following outcomes:

* Approved and further revised Guideline “ITU-T CASC procedure to appoint ITU-T technical expert”, which allows CASC to appoint technical experts who have competence in particular ITU-T Recommendatuions, to assess Testing Laboratories.
* Appointed 11 technical [experts](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-191016-TD-GEN-1020) proposed by ITU-T SG2, SG5 and SG16 and several individuals who applied to be appointed as ITU-T technical experts.
* Identified technologies which may become subject of joint ITU/IEC certification schemes, such as: safe listening, video surveillance and Accessibility features in IPTV systems.
* Conducted survey via questionnaire on evaluation of market needs for joint ITU/IEC TL recognition procedure and certification schemes on ITU-T Recommendations. The aim of the questionnaire was to evaluate the market needs of the in-progress joint ITU/IEC work to establish a peer assessment laboratory service (testing laboratory recognition procedure) and the joint conformity assessment program (joint ITU/IEC certification schemes) on ITU-T Recommendations. According to the [results of the survey](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-200304-TD-GEN-1142), most of the replies are positive and the outcomes show interest of different stakeholders to the new joint ITU/IEC services. However, financial implications for Testing Laboratories (TLs) and ITU itself were not clarified by IEC and were not anticipated.
* IEC specified the roles and requirements for the TLs and the Certification Bodies using the IECEE CB Scheme. IEC highlighted that as a non-for-profit Organisation, there is a need to cover IECEE cost of operations and so the Operational Document (OD 2026), which specifies the requirements for TL recognition process will be implemented for ITU. This means IECEE programme with ITU will have financial implication, as follows:
* TL shall pay around 14 000 Swiss Francs (CHF) for the TL recognition assessment;
* ITU shall also pay 45 000 Swiss Francs (CHF) annually to IEC to maintain such new scheme.
* CASC planed to implement a simple and transparent procedure that allows TL to be recognized by ITU in order to populate ITU Product Conformity Database. According to Resolution 76 (WTSA-16), ITU is not able to do it by its own, but WTSA-16 requested ITU to collaborate with IECEE and ILAC on this matter. Therefore, it was decided that the standalone ITU/IECEE TL recognition procedure, which comes with extra costs for TLs, is not needed, as there is no financial benefit in return for TLs who might wish to populate the ITU Product Conformity Database only.
* Due to lack of proposals on joint certification schemes taking into consideration the financial implications presented by IECEE, CASC decided to discontinue collaboration with IECEE on the TL recognition procedure and on joint certification scheme for the time being.
* CASC is collaborating with ILAC and received list of Testing Laboratories accredited to perform testing in accordance with ITU-T Recommendations. In March 2021, following detailed presentation delivered by ILAC representative, CASC decided that ITU may recognize TLs that have been accredited by ILAC MRA signatories Acreditation Bodies which have ITU Recommendations in its scope of accreditation. It was noted that there are no financial implications for ITU for implementing such procedures. Financial implications for TLs are to be covered by the cost structures of the Accreditation Bodies (ABs).
* A new ITU Testing Laboratory Database was launched by ITU-T. The application needs to be submitted by TL through [online form](https://www.itu.int/net/itu-t/cdb/secured/reg-tldb.aspx) which is available on ITU C&I Portal ([www.itu.int/go/citest](http://www.itu.int/go/citest)). The recognized testing laboratory will be listed in the ITU Testing Laboratory Database accordingly.
* Any TL including non-ITU members, which expresses its interest to be accredited against ITU-T Recommendations to be further recognized by ITU, needs to approach Accreditation Body (AB) that is a signatory to the ILAC MRA. The list of ABs is available at: <https://ilac.org/signatory-search/>. Afterwards, once the accreditation is given to the TL and relevant application form submitted to ITU by TL, the TL can be recognized by ITU accordingly.
* All ICT products tested against ITU-T Recommendation by TLs recognized by ITU may be registered in the [ITU Product Conformity Database](https://www.itu.int/net/itu-t/cdb/ConformityDB.aspx), based on the request. The relevant requests need to be submitted via [online form](https://www.itu.int/net/itu-t/cdb/secured/Register16.aspx) accordingly.

### 3.3.6 ITU-T Focus Group on Testbeds Federations for IMT-2020 and beyond (FG-TBFxG)

SG11 established a new ITU-T Focus Group on Testbeds Federations for IMT-2020 and beyond (FG-TBFxG) on its virtual plenary on 10 December 2021. The agreed ToR of the FG-TBFxG are available in [SG11-TD1804-R1/GEN](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-211201-TD-GEN-1804) as well as in ANNEX 4 of this report.

The Focus Group will serve as a platform to harmonize testbeds specifications across SDOs/Fora. The FG-TBFxG will develop the required application program interfaces (APIs) aligned with the Testbeds Federations Reference Model defined in Recommendation ITU-T Q.4068, developed in collaboration with ETSI TC INT, and define a set of use cases for Federated Testbeds and APIs.

The Focus Group will play a role in providing a platform to share views, to develop a series of deliverables and it will also offer a platform to different stakeholders to share their initiatives and projects aligned with the outlined vision and the desired Ecosystem on Testbeds Federations. The Focus Group will develop technical specifications that may become a basis for further standardization in the area of Testbeds Federations.

The first meeting is scheduled to be held fully virtually from 4 to 7 April 2022. More details are available on the Focus Group webpage at: [www.itu.int/go/fgtbf](http://www.itu.int/go/fgtbf).

### 3.3.7 Regional Group SG11RG-EECAT

SG11RG-RCC continues its work since last study period (2012-2016), when it was established. In November 2017, the title of the SG11RG-RCC was changed to ITU-T SG11 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG11RG-EECAT).

The terms of references of SG11RG-EECAT can be found in [SG11-TD313/GEN](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-171108-TD-GEN-0313) as well as in ANNEX 5 of this report. The management of the SG11RG-EECAT was appointed by SG11 at the first meeting. The vice-chairman was appointed later, at the SG11RG-EECAT meeting.

In this study period (2017-2021), SG11RG-EECAT conducted three physical meetings and one virtual meeting, which were organized back to back with a Workshop and Forum, which outcomes became subject of additional discussion at the Regional Group level. Among events were:

* [ITU Forum](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/Events/2021/SPB-Oct.aspx) on “Future Networks and C&I”, St.Petersburg, 19-22 October 2021.
* [ITU Forum](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201905/Pages/default.aspx) on “Future Applications and Services. Perspective 2030”, St.Petersburg, 21-23 May 2019.
* The [ITU Regional Forum](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180604/Pages/default.aspx) on “Internet of Things, Telecommunication Networks and Big Data as basic infrastructure for Digital Economy”, St.Petersburg, 4-6 June 2018.
* [ITU Regional Workshop for CIS](https://www.itu.int/en/ITU-D/Regional-Presence/CIS/Pages/EVENTS/2017/06_Saint_Petersburg/06_Saint_Petersburg.aspx) on the “Internet of Things (IoT) and Future Networks”, St.Petersburg, 19-20 June 2017.

Following discussion at the SG11RG-EECAT meetings, 24 multi-countries contributions were drafted based on received contributions from CIS Region. Those joint contributions were further submitted to the SG11 meetings respectively. The scope of contributions covers different topics which are under study in SG11, including testing specifications, protocols for IMT-2020, signalling architectures for emergency telecommunication networks, signalling architecture for ENUM, VoLTE interconnection, Internet-related performance measurements to name but a few.

### 3.3.8 Regional Group SG11RG-AFR

SG11RG-AFR continues its work since last study period (2012-2016), when it was established.

The terms of references of SG11RG-AFR can be found in [SG11-TD312/GEN](https://www.itu.int/md/T17-SG11-171108-TD-GEN-0312/en) as well as in ANNEX 6 of this report. The management of the SG11RG-AFR was appointed by SG11 at the first meeting. At a second stage, SG11RG-AFR appointed new vice-chairmen.

In this study period (2017-2021), SG11RG-AFR conducted three physical meetings, which were organized back to back with Regional Workshops, which outcomes became subject of additional discussion at the Regional Group level. Among events were:

* [The third ITU-T Study Group 11 Regional Workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/201909/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”, 30 September 2019, Tunis, Tunisia.
* [The second ITU-T Study Group 11 regional workshop for Africa](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180423/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”, 23 April 2018 Tunis, Tunisia.
* [The first Regional workshop for Africa](http://www.itu.int/en/ITU-T/Workshops-and-Seminars/20170405/Pages/default.aspx) on “Counterfeit ICT Devices, Conformance and Interoperability Testing Challenges in Africa”, 5 April 2017, Cairo, Egypt.

Following discussion at the SG11RG-AFR meetings, eight multi-countries contributions were drafted based on received contributions from Africa Region. Those joint contributions were further submitted to the SG11 meetings respectively. The scope of contributions covers testing specifications, combat couneterfeit and the use of stole ICT devices.

# 4 Observations concerning future work

## 4.1 General

Following the results achieved at the study period (2017-2021), SG11 activities in the next study period will be focused on all aspects defined in its mandate.

SG11 will keep developing standards which aim is to improve the security of signalling protocols in order to mitigate the attacks on different ICT applications including DFS applications and platforms. SG11 will continue its studies on inserting digital signatures (certificate) into signalling exchange. This work will be done in close collaboration with SG2 and SG17 on standardization of identity verification process of a party requesting a certificate, its issuance process by the Trusted Signalling Certification Authority (TSCA) and the distribution of the issued certificate to the operators.

SG11 will also continue its research related to signalling protocols for IMT-2020, Computing Power Network, Edge Computing, Intent-Based Network, QKDN, Hybrid P2P communications, as well as existing and future networks. The future studies will also consider the possibility to integrate the AI and machine learning-based algorithms into the signalling procedures/protocols. Those studies may bring additional benefits for operators to identify and fix rapidly any connectivity issues in existing and future networks. Following the success on VoLTE/ViLTE interconnection and Resolution 93 (WTSA-16) that SG11 achieved in the study period (2017-2021), in next study period SG11 will focus its future studies on interconnection for IMT-2020 networks and beyond.

From testing perspective, SG11 will focus on remote testing platforms and their interconnection that might be used as a kind of reference model for building virtual testing environment. Due to COVID-19 pandemic, such virtual telecommunication environment becomes very attractive for different stakeholders, such as vendors, operators, laboratories, customers, etc. Among potential outcomes, SG11 expects overview of the use cases collected by the FG-TBFxG, which will become a basis for APIs for testbed federations to be developed.

Following the ITU Testing Laboratory Recognition procedure established by CASC, SG11 expects Testing Laboratories to be registered in relevant ITU database. SG11 will continue its collaboration with ILAC, IAF and IECEE on this subject matter.

Moreover, SG11 will pursue its studies related to development of monitoring procedures and test specifications including those that might be used for remote testing. The future studies will also consider the possibility to integrate the AI and machine learning-based algorithms into the testing specifications.

With regard to combating counterfeit telecommunication/ICT devices/software and mobile device theft, SG11 will study use cases on the combat of multimedia content misappropriation and interfaces for data exchange between equipment identity registers. SG11 will develop guideline on combating counterfeit and stolen mobile devices in African region.

Finally, SG11 will keep organizing thematical Workshops, Brainstorming sessions, Forums and Webinars that will promote and facilitate ongoing activities and studies.

## 4.2 SG11 preparation for the WTSA-20

SG11 organized special sessions on SG11 preparation for WTSA-20 during its meetings in October 2019, March 2020, July 2020, December 2020 and December 2021. SG11 developed proposals to revisions of the mandate, lead study areas and Questions texts which were finally agreed in July 2020. During its meeting in December 2021, SG11 agreed to remove the requirement to organize collocated meetings with SG13 from SG11 points of guidance.

The title of ITU-T Study Group 11 has been slightly modified in order to align with the current SG11 actitivities on combating counterfeit, as follows – “Signalling requirements, protocols, test specifications and combating counterfeit telecommunication/ICT devices”.

In general, ITU-T Study Group 11 should continue to be responsible for studies related to signalling architectures, requirements, protocols and its security for all types of networks, including IMT-2020 and beyond. SG11 will also be responsible for studies related to combat counterfeiting of ICT equipment and to support the ITU conformance and interoperability testing (C&I) programme as well as studies related to any network/system/service measurements including benchmark testing, Internet-related measurements, etc.

SG11 proposes the following four leading areas for the next study period:

* Lead study group on signalling and protocols;
* Lead study group on establishing test specifications, conformance and interoperability testing for all types of networks, technologies and services that are the subject of study and standardization by all ITU‑T study groups;
* Lead study group on combating counterfeiting of ICT devices;
* Lead study group on combating the use of stolen ICT devices.

ITU-T SG11 finalized and agreed on Questions texts, mandate and Lead Study Group roles of ITU‑T SG11 for the next study period (2022-2024), as follows:

* The agreed consolidated text of the proposed updates to the Study Group 11 mandate and Lead Study Group roles (WTSA Resolution 2) for next study period is available in [SG11-TD1799/GEN](https://www.itu.int/md/T17-SG11-211201-TD-GEN-1799/en);
* The final agreed Questions texts of SG11, which were endorsed by TSAG (11-18 January 2021), are proposed for next study period (2022-2024). The endorsed set is available in [TSAG-R16](https://www.itu.int/md/T17-TSAG-R-0016/en).

Additionally, at the SG11 meeting in December 2020 consensus was not reached with regard to two new Questions related to Vertical Communication Networks (O/11 and P/11) as a proposal for the next study period. The detailed explanation is given in [SG11-R41](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-R-0041).

The ITU-T CASC ([Conformity Assessment Steering Committee](https://www.itu.int/en/ITU-T/studygroups/2013-2016/11/Pages/CASC.aspx)), which aim is to elaborate detailed procedures for the implementation of a test laboratory recognition procedure in ITU-T and set up a joint certification schemes, will continue its activities for the next study period under the auspices of SG11.

## 4.3 SG11 management position on restructuring

SG11 received [TSAG-LS27](http://handle.itu.int/11.1002/ls/sp16-tsag-oLS-00027.zip) from TSAG, which contains consolidation of restructuring proposals.

SG11 Management considerations on SGs restructuring are the following:

* Historically, SG11 and SG13 meetings are collocated and they work in parallel very well. Therefore, there are no obvious reasons and benefits why they should be merged.
* SG11 has three common study areas – signalling, testing and combating counterfeiting/theft, which, in general, do not overlap with SG13 activities but need to be synchronized on signalling issues (as with other SGs). However, SG11 and SG13 have a good opportunity to have collocated meetings (it helps both groups to reduce additional correspondence).
* Merging SG13 and SG11 would lead to have a unique, thus huge SG, without reduction of the workload. Currently, SG11 has forteen Questions, all very active, while SG13 has thirtheen Questions, which makes a total of 27 Questions. It would require to extend the duration of the SG meeting or to reduce the number of Questions (both cases may cause significant reduction of the SG’s outcomes – less participation, less number of approved standards).
* SG11 is ITU’s brand on signalling, which is well known for the past 40 years. As of now, 50 signalling standards approved in the study period (2017-2021), compared with 37 in last study period (2013-2016). So, currently SG11 is climbing the hill again and SG11 expects new proposals on signalling issues in the upcoming study period.
* Some experts participate in two or more activities of SG11 which are linked to each other such as signalling/testing and/or testing/counterfeiting, meaning that the group is well balanced. Splitting these activities over different SGs would cause the necessity for those experts to participate in different SGs meetings and as a result to increase the number of their missions/virtual meetings (which may overlap with each other), travel expenses, etc. So, their companies may not support it (high probability), which could lead in having less participation, less standards.

# 5 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 11 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 11 is found in Table 8.

The list of Recommendations and Technical Reports deleted by Study Group 11 during the study period is found in Table 9.

The List of Recommendations submitted by Study Group 11 to WTSA-20 for approval is found in Table 10.

Tables 11 onwards list other publications agreed by Study Group 11 during the study period.

TABLE 7
Study Group 11 – Recommendations approved during the study period

| **Recommendation** | **Approval** | **Status** | **TAP/AAP** | **Title (English)** |
| --- | --- | --- | --- | --- |
| [Q.731.3](http://handle.itu.int/11.1002/1000/13878) | 2019-04-29 | In force | AAP | Stage 3 description for number identification supplementary services using Signalling System No.7 – Calling line identification presentation |
| [Q.731.4](http://handle.itu.int/11.1002/1000/13879) | 2019-04-29 | In force | AAP | Stage 3 description for number identification supplementary services using Signalling System No.7 – Calling line identification restriction |
| [Q.731.5](http://handle.itu.int/11.1002/1000/13880) | 2019-04-29 | In force | AAP | Stage 3 description for number identification supplementary services using Signalling System No.7 – Connected line identification presentation |
| [Q.731.6](http://handle.itu.int/11.1002/1000/13881) | 2019-04-29 | In force | AAP | Stage 3 description for number identification supplementary services using Signalling System no.7 – Connected line identification restriction |
| [Q.850](http://handle.itu.int/11.1002/1000/13695) | 2018-10-14 | In force | AAP | Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN user part |
| [Q.850 (2018) Amd. 1](http://handle.itu.int/11.1002/1000/13882) | 2019-04-29 | In force | AAP |  |
| [Q.1912.5](http://handle.itu.int/11.1002/1000/13481) | 2018-01-13 | In force | AAP | Interworking between session initiation protocol (SIP) and bearer independent call control protocol or ISDN user part |
| [Q.1912.5 (2018) Cor. 1](http://handle.itu.int/11.1002/1000/13693) | 2018-07-27 | In force | Agreement |  |
| [Q.3053](http://handle.itu.int/11.1002/1000/13245) | 2017-03-29 | In force | AAP | Signalling architecture and requirements for IP-based short message service over ITU-T defined NGN |
| [Q.3054](http://handle.itu.int/11.1002/1000/13883) | 2019-04-29 | In force | AAP | Signalling architecture for virtualization of control network entities |
| [Q.3055](http://handle.itu.int/11.1002/1000/14141) | 2019-12-14 | In force | AAP | Signalling protocol for heterogeneous Internet of things gateways |
| [Q.3056](http://handle.itu.int/11.1002/1000/14142) | 2019-12-14 | In force | AAP | Signalling procedures of the probes to be used for remote testing of network parameters |
| [Q.3057](http://handle.itu.int/11.1002/1000/14242) | 2020-04-29 | In force | AAP | Signalling requirements and architecture for interconnection between trustable network entities |
| [Q.3058](http://handle.itu.int/11.1002/1000/14411) | 2020-09-29 | In force | AAP | Signalling architecture of orchestration in next generation network evolution |
| [Q.3059](http://handle.itu.int/11.1002/1000/14412) | 2020-09-29 | In force | AAP | Signalling requirements for service function discovery |
| [Q.3060](http://handle.itu.int/11.1002/1000/14413) | 2020-12-07 | In force | AAP | Signalling architecture of fast deployment emergency telecommunication networks to be used in a natural disaster |
| [Q.3405](http://handle.itu.int/11.1002/1000/13696) | 2018-10-14 | In force | AAP | IPv6 protocol procedures for broadband services |
| [Q.3630 v1](http://handle.itu.int/11.1002/1000/13246) | 2017-03-29 | In force | AAP |  Inter-IMS network to network interface – Protocol specification |
| [Q.3640](http://handle.itu.int/11.1002/1000/13482) | 2018-01-13 | In force | AAP | Framework of interconnection of VoLTE/ViLTE-based networks |
| [Q.3641](http://handle.itu.int/11.1002/1000/13697) | 2018-10-14 | In force | AAP | IMS references to Release 11 for communication between IMS and NGN networks to support end-to-end service interoperability  |
| [Q.3642](http://handle.itu.int/11.1002/1000/13884) | 2019-04-29 | In force | AAP | IMS references to Release 12 for communication between IMS and NGN networks to support end-to-end service interoperability |
| [Q.3643](http://handle.itu.int/11.1002/1000/14243) | 2020-07-22 | In force | TAP | Signalling architecture of distributed infrastructure ENUM networking for IMS |
| [Q.3644](http://handle.itu.int/11.1002/1000/14143) | 2019-12-14 | In force | AAP | Requirements for signalling network analyses and optimization in VoLTE |
| [Q.3645](http://handle.itu.int/11.1002/1000/14414) | 2020-09-29 | In force | AAP | Protocol at the interface between two distributed ENUM servers for IMS |
| [Q.3713](http://handle.itu.int/11.1002/1000/13247) | 2017-03-29 | In force | AAP | Signalling requirements for broadband network gateway pool |
| [Q.3714](http://handle.itu.int/11.1002/1000/13483) | 2018-01-13 | In force | AAP | Signalling requirements of SDN-based access networks with media-independent management capabilities |
| [Q.3715](http://handle.itu.int/11.1002/1000/13484) | 2018-01-13 | In force | AAP | Signalling requirements for dynamic bandwidth adjustment on demand on broadband network gateway implemented by software-defined networking technologies |
| [Q.3716](http://handle.itu.int/11.1002/1000/13485) | 2018-01-13 | In force | AAP | Signalling requirements for mapping between physical and virtual networks |
| [Q.3717](http://handle.itu.int/11.1002/1000/13698) | 2018-10-14 | In force | AAP | Signalling requirements for automatic management of IP address pools by software-designed network technologies on a broadband network gateway |
| [Q.3718](http://handle.itu.int/11.1002/1000/13699) | 2018-10-14 | In force | AAP | Signalling requirements of the Sew interface for virtual data centres |
| [Q.3719](http://handle.itu.int/11.1002/1000/14144) | 2019-12-14 | In force | AAP | Signalling requirements for the separation of control plane and user plane in a virtualized broadband network gateway (vBNG)  |
| [Q.3720](http://handle.itu.int/11.1002/1000/14415) | 2020-09-29 | In force | AAP | Procedures for virtualized broadband network gateway acceleration with programmable acceleration card |
| [Q.3740](http://handle.itu.int/11.1002/1000/13486) | 2018-01-13 | In force | AAP | Signalling requirements for software-defined networking and network function virtualization-based central office services |
| [Q.3741](http://handle.itu.int/11.1002/1000/13978) | 2019-07-29 | In force | AAP | Signalling requirements for SD-WAN service |
| [Q.3745](http://handle.itu.int/11.1002/1000/14244) | 2020-04-29 | In force | AAP | Protocol for time constraint Internet of things-based applications over software-defined networking |
| [Q.3914](http://handle.itu.int/11.1002/1000/13487) | 2018-01-13 | In force | AAP | Set of parameters of cloud computing for monitoring |
| [Q.3915](http://handle.itu.int/11.1002/1000/14416) | 2020-09-29 | In force | AAP | Set of parameters for virtualized broadband network gateway monitoring |
| [Q.3916](http://handle.itu.int/11.1002/1000/14145) | 2019-12-14 | In force | AAP | Signalling requirements and architecture for the Internet service quality monitoring system |
| [Q.3940](http://handle.itu.int/11.1002/1000/13488) | 2018-01-13 | In force | AAP | NGN/IMS interconnection tests between network operators at the IMS 'Ic' interface and NGN NNI / SIP-I |
| [Q.3952](http://handle.itu.int/11.1002/1000/13489) | 2018-01-13 | In force | AAP | The architecture and facilities of a model network for Internet of things testing |
| [Q.3953](http://handle.itu.int/11.1002/1000/13490) | 2018-01-13 | In force | AAP | VoLTE/ViLTE interconnection testing for interworking and roaming scenarios |
| [Q.3961](http://handle.itu.int/11.1002/1000/14417) | 2020-09-29 | In force | AAP | Parameters for bottleneck evaluation of the web-browsing service |
| [Q.3961 (2020) Cor. 1](http://handle.itu.int/11.1002/1000/14616) | 2021-05-14 | In force | AAP |  |
| [Q.3963](http://handle.itu.int/11.1002/1000/14245) | 2020-04-29 | In force | AAP | The compatibility testing of SDN-based equipment using OpenFlow protocol |
| [Q.4014.1](http://handle.itu.int/11.1002/1000/13885) | 2019-04-29 | In force | AAP | PSTN/ISDN terminal equipment using IP Multimedia core network subsystem; Conformance testing; Part 1: PICS |
| [Q.4014.2](http://handle.itu.int/11.1002/1000/13886) | 2019-04-29 | In force | AAP | PSTN/ISDN terminal equipment using IP multimedia core network subsystem; Conformance testing – Part 2: Test suite structure and test purposes |
| [Q.4016](http://handle.itu.int/11.1002/1000/13491) | 2018-01-13 | In force | AAP | Testing specification of call establishment procedures based on SIP/SDP and ITU-T H.248 for a real-time fax over IP service |
| [Q.4041.1](http://handle.itu.int/11.1002/1000/13492) | 2018-01-13 | In force | AAP | Cloud computing infrastructure capabilities interoperability testing - part 1: Interoperability testing between the CSC and CSP |
| [Q.4042.1](http://handle.itu.int/11.1002/1000/13800) | 2018-12-14 | In force | AAP | Cloud interoperability testing for web applications - part 1: Interoperability testing between the CSC and CSP |
| [Q.4043](http://handle.itu.int/11.1002/1000/13979) | 2019-07-29 | In force | AAP | Interoperability testing requirements of a virtual switch |
| [Q.4044](http://handle.itu.int/11.1002/1000/14764) | 2021-08-29 | In force | AAP | Test suite for interoperability testing of a virtual switch |
| [Q.4060](http://handle.itu.int/11.1002/1000/13700) | 2018-10-14 | In force | AAP | The structure of the testing of heterogeneous Internet of things gateways in a laboratory environment  |
| [Q.4061](http://handle.itu.int/11.1002/1000/13887) | 2019-04-29 | In force | AAP | Framework of software-defined network controller testing |
| [Q.4062](http://handle.itu.int/11.1002/1000/14387) | 2020-09-29 | In force | AAP | Framework for IoT testing |
| [Q.4063](http://handle.itu.int/11.1002/1000/14391) | 2020-09-29 | In force | AAP | Framework for testing identification systems used in Internet of things |
| [Q.4064](http://handle.itu.int/11.1002/1000/14418) | 2020-09-29 | In force | AAP | Interoperability testing requirements for a virtual broadband network gateway |
| [Q.4065](http://handle.itu.int/11.1002/1000/14617) | 2021-05-14 | In force | AAP | Framework of model network for tactile Internet testing |
| [Q.4066](http://handle.itu.int/11.1002/1000/14419) | 2020-09-29 | In force | AAP | Testing procedures of augmented reality applications |
| [Q.4067](http://handle.itu.int/11.1002/1000/14610) | 2021-05-14 | In force | AAP | Signalling requirements for the virtualized network function lifecycle management in a testing environment |
| [Q.4068](http://handle.itu.int/11.1002/1000/14765) | 2021-08-29 | In force | AAP | Open application program interfaces (APIs) for interoperable testbed federations |
| [Q.4100](http://handle.itu.int/11.1002/1000/14420) | 2020-09-29 | In force | AAP | Hybrid peer-to-peer communications: Functional architecture |
| [Q.4101](http://handle.itu.int/11.1002/1000/14766) | 2021-08-29 | In force | AAP | Hybrid peer-to-peer communications: Tree and data recovery procedures |
| [Q.5001](http://handle.itu.int/11.1002/1000/13701) | 2018-10-14 | In force | AAP | Signalling requirements and architecture of intelligent edge computing |
| [Q.5002](http://handle.itu.int/11.1002/1000/14146) | 2019-12-14 | In force | AAP | Signalling requirements and architecture for media service entity attachment |
| [Q.5020](http://handle.itu.int/11.1002/1000/13888) | 2019-04-29 | In force | AAP | Protocol requirements and procedures for network slice lifecycle management |
| [Q.5021](http://handle.itu.int/11.1002/1000/13980) | 2019-07-29 | In force | AAP | Protocol for managing capability exposure APIs in IMT-2020 networks |
| [Q.5022](http://handle.itu.int/11.1002/1000/14246) | 2020-04-29 | In force | AAP | Signalling procedure of energy efficient device-to-device communication for IMT-2020 network |
| [Q.5023](http://handle.itu.int/11.1002/1000/14767) | 2021-08-29 | In force | AAP | Protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 networks |
| [Q.5050](http://handle.itu.int/11.1002/1000/13702) | 2019-03-15 | In force | TAP | Framework for solutions to combat counterfeit ICT devices |
| [Q.5051](http://handle.itu.int/11.1002/1000/14140) | 2020-03-13 | In force | TAP | Framework for combating the use of stolen mobile devices |
| [Q.5052](http://handle.itu.int/11.1002/1000/14392) | 2020-09-29 | In force | AAP | Addressing mobile devices with a duplicate unique identifier |
| [Q.5053](http://handle.itu.int/11.1002/1000/14587) | 2021-01-13 | In force | AAP | Mobile device access list audit interface |
| [X.609.3](http://handle.itu.int/11.1002/1000/13345) | 2017-08-29 | In force | AAP | Managed P2P communications: Multimedia streaming signalling requirements |
| [X.609.4](http://handle.itu.int/11.1002/1000/13493) | 2018-01-13 | In force | AAP | Managed P2P communications: Multimedia streaming peer protocol |
| [X.609.5](http://handle.itu.int/11.1002/1000/13494) | 2018-01-13 | Superseded | AAP | Managed P2P communications: Multimedia streaming overlay management protocol |
| [X.609.5](http://handle.itu.int/11.1002/1000/14247) | 2020-04-29 | In force | AAP | Managed P2P communications: Overlay management protocol |
| [X.609.6](http://handle.itu.int/11.1002/1000/13801) | 2018-12-14 | In force | AAP | Managed P2P communications: Content distribution signalling requirements |
| [X.609.7](http://handle.itu.int/11.1002/1000/13802) | 2018-12-14 | In force | AAP | Managed P2P communications: Content distribution peer protocol |
| [X.609.8](http://handle.itu.int/11.1002/1000/14147) | 2019-12-14 | In force | AAP | Managed P2P communications: Management protocol for live data sources |
| [X.609.9](http://handle.itu.int/11.1002/1000/14421) | 2020-09-29 | In force | AAP | Managed P2P communications: Overlay content management protocol |
| [X.609.10](http://handle.itu.int/11.1002/1000/14422) | 2020-09-29 | In force | AAP | Managed P2P communications: Signalling requirements for data streaming |

TABLE 8
Study Group 11 – Recommendations consented/determined at the last meeting

| Recommendation | Consent/Determination | TAP/AAP | Title |
| --- | --- | --- | --- |
| [Q.3061](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16386) | 2021-12-10 | AAP | Signalling requirements for service function paths load balancing traceroute in service function chaining |
| [Q.3631](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16938) | 2021-12-10 | AAP | Interworking between ISDN and the IP Multimedia (IM) Core Network (CN) subsystem |
| [Q.3646](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16385) | 2021-12-10 | AAP | Framework and protocols for signalling network analyses and optimization in VoLTE |
| [Q.4102](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16389) | 2021-12-10 | AAP | Hybrid peer-to-peer (P2P) communications: Peer protocol |
| [Q.4103](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16751) | 2021-12-10 | AAP | Hybrid peer-to-peer (P2P) communications: Overlay management protocol |
| [Q.5003](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16508) | 2021-12-10 | AAP | Signalling requirement and architecture for federated multi-access edge computing |
| [Q.5024](http://www.itu.int/itu-t/workprog/wp_item.aspx?isn=16387) | 2021-12-10 | AAP | Protocol for providing intelligent analysis services in IMT-2020 network |

TABLE 9
Study Group 11 – Recommendations and Technical Reports deleted during study period (2017-2021)

| Recommendation/Technical Report | Last version | Withdrawal date | Title |
| --- | --- | --- | --- |
| [QSTP-TEST-UE-MS](https://www.itu.int/pub/publications.aspx?lang=en&parent=T-TUT-TEST-2019) | - | 2021-03-26 | Guideline for general test procedure and specification for measurements of the LTE, 3G/2G user equipment/mobile stations (UE/MS) for over-the-air performance testing |

TABLE 10
Study Group 11 – Recommendations submitted to WTSA-20

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

TABLE 11
Study Group 11 – Supplements agreed during study period (2017-2021)

| Supplement | Approval | Status | Title (English) |
| --- | --- | --- | --- |
| [Q Suppl. 69](http://handle.itu.int/11.1002/1000/13694) | 2018-07-27 | In force | Framework for interconnection between VoLTE-based network and other networks supporting emergency telecommunications service (ETS) |
| [Q Suppl. 70](http://handle.itu.int/11.1002/1000/13981) | 2019-06-26 | In force | Signalling requirements for IMS and GSM/UMTS network supporting multi-device emergency telecommunications service |
| [Q Suppl. 71](http://handle.itu.int/11.1002/1000/14125) | 2019-10-25 | In force | Testing methodologies of Internet related performance measurements including e2e bit rate within the fixed and mobile operators' networks |
| [Q Suppl. 72](http://handle.itu.int/11.1002/1000/14388) | 2020-07-31 | In force | Signalling requirements for IP multimedia subsystem (IMS) emergency telecommunications service in support of multiple accesses |
| [Q Suppl. 73](http://handle.itu.int/11.1002/1000/14608) | 2021-03-26 | In force | Guidelines for permissive versus restrictive system implementations to address counterfeit, stolen and illegal mobile devices |
| [Q Suppl. 74](http://handle.itu.int/11.1002/1000/14609) | 2021-03-26 | In force | Roadmap for the ITU-T Q.5050-series - Combat of counterfeit ICT and stolen mobile devices |
| [Q Suppl. 75](http://handle.itu.int/11.1002/1000/14885) | 2021-12-10 | In force | Use Cases on the Combat of Counterfeit ICT and Stolen Mobile Devices |

TABLE 12
Study Group 11 – Technical Papers agreed during study period (2017-2021)

|  |  |  |  |
| --- | --- | --- | --- |
| Technical Paper | Date | Status | Title |
| [QTR-CICT](https://www.itu.int/pub/publications.aspx?lang=en&parent=T-TUT-CCICT-2017) | 2017-02-15 | New | Survey report on counterfeit ICT devices in Africa region |

TABLE 13
Study Group 11 – Technical Reports agreed during study period (2017-2021)

| Technical Report | Date | Status | Title |
| --- | --- | --- | --- |
| [QSTR-SS7-DFS](https://www.itu.int/pub/publications.aspx?lang=en&parent=T-TUT-PROTO-2019) | 2019-10-25 | New | SS7 vulnerabilities and mitigation measures for digital financial services transactions |
| [QTR-RLB-IMEI](https://www.itu.int/pub/publications.aspx?lang=en&parent=T-TUT-CCICT-2020) | 2020-07-31 | New | Reliability of IMEI |
| [QSTR-USSD](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG11-211201-TD-GEN-1834) | 2021-12-10 | New | Low resource requirement, quantum resistant, encryption of USSD messages for use in financial services |

TABLE 14
Study Group 11 – Other publications agreed during study period (2017-2021)

| Publication | Date | Status | Title |
| --- | --- | --- | --- |
| [Guideline-RP\_ITU-expert](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/Documents/Guideline_CASC_EXP_RP.pdf) | 2017-02-15 | New | Guideline on ITU-T CASC procedure to appoint ITU-T technical experts |
| [Guideline-RP\_ITU-expert](https://www.itu.int/en/ITU-T/studygroups/2017-2020/11/Documents/Guideline_CASC_EXP_RP-10-2019.pdf) | 2019-10-25 | Revised | Guideline on ITU-T CASC procedure to appoint ITU-T technical experts |

ANNEX 2

Proposed updates to the Study Group 11 mandate and Lead Study Group roles

**(WTSA Resolution 2)**

The following are the proposed changes to the Study Group 11 mandate and Lead Study Group roles (WTSA Resolution 2) for next study period (2022-2024) agreed at the last Study Group 11 meeting (virtual, 1-10 December 2021), based on the relevant portions of [WTSA-16 Resolution 2](https://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.2-2016-PDF-E.pdf) (ref. [SG11-TD1799/GEN](https://www.itu.int/md/T17-SG11-211201-TD-GEN-1799/en)).

#### PART 1 – General areas of study

…

ITU‑T Study Group 11

Signalling requirements, protocols, test specifications and combating counterfeit telecommunication/ICT devices

ITU‑T Study Group 11 has been attributed the responsibility for studies related to signalling-system architecture, signalling requirements and protocols, for all types of networks such as future networks (FN), cloud-computing networks, VoLTE/ViLTE‑based network interconnection, virtual networks, multimedia, next-generation networks (NGN), signalling for legacy network interworking, satellite-terrestrial networks, software‑defined networking (SDN) technologies, network function virtualization (NFV) technologies, IMT-2020 network and beyond, QKDN and related technologies, augmented reality.

Study Group 11 is also responsible for studies to combat counterfeit telecommunication/ICT devices and mobile device theft.

Study Group 11 will also develop test specifications for testing conformance and interoperability (C&I) for all types of networks, technologies and services, a testing methodology and test suites for standardized network parameters in relation to the framework for Internet-related performance measurement, as well as for existing technologies and emerging technologies.

In addition, Study Group 11 will study a way to implement a testing laboratory recognition procedure and joint ITU/IEC certification schemes in ITU‑T through the work of the ITU‑T Conformity Assessment Steering Committee (CASC).

…

#### PART 2 ‑ LEAD STUDY GROUPS IN SPECIFIC AREAS OF STUDY

…

SG11 Lead study group on signalling and protocols
Lead study group on establishing test specifications, conformance and interoperability testing for all types of networks, technologies and services that are the subject of study and standardization by all ITU‑T study groups
Lead study group on combating counterfeiting of ICT devices
Lead study group on combating the use of stolen ICT devices

…

Annex B
(to WTSA Resolution 2)

Points of guidance to study groups for the development
of the post-2021 work programme

…

ITU‑T Study Group 11 will develop Recommendations on the following subjects:

• network signalling and control architectures in existing and emerging telecommunication environments (e.g. SDN, NFV, FN, cloud computing, VoLTE/ViLTE, IMT-2020 network and beyond, QKDN and related technologies, etc.);

• signalling requirements and protocols for services and applications;

• security of signalling protocols;

• session control and signalling requirements and protocols;

• resource control and signalling requirements and protocols;

• signalling and control requirements and protocols to support attachment in emerging telecommunication environments;

• signalling and control requirements and protocols to support broadband network gateways;

• signalling and control requirements and protocols to support emerging multimedia services;

• signalling and control requirements and protocols to support emergency telecommunication services (ETS);

• signalling requirements for establishing the interconnection of packet-based networks, including VoLTE/ViLTE-based networks, IMT-2020 and beyond;

• test methodologies and test suites as well as monitoring of parameters set for emerging network technologies and their applications, including cloud computing, SDN, NFV, IoT, VoLTE/ViLTE, IMT-2020 technologies, etc., to enhance interoperability;

• conformance, interoperability testing and network/system/service/device testing, including benchmark testing, a testing methodology and testing specification of standardized network parameters in relation to the framework for Internet-related performance measurement, etc.;

• combating counterfeiting of ICT devices;

• combating the use of stolen ICT devices.

Study Group 11 is to lend assistance to developing countries in the preparation of technical reports and guidelines on the deployment of packet-based networks as well as emerging networks.

The development of signalling requirements, protocols and test specifications will be as follows:

• Study and develop signalling requirements;

• Develop protocols to meet the signalling requirements;

• Develop protocols to meet the signalling requirements of new services and technologies;

• Develop protocol profiles for the existing protocols;

• Study existing protocols to determine if they meet the requirements, and work with the relevant standards development organizations (SDOs) to avoid duplication and for necessary enhancements or extensions;

• Study existing open-source codes from open-source communities (OSCs) to support the implementation of ITU‑T Recommendations;

• Develop signalling requirements and relevant test suites for interworking between new signalling protocols and existing ones;

• Develop signalling requirements and relevant test suites for interconnection between packet-based networks (e.g. VoLTE/ViLTE‑based networks, IMT-2020 network and beyond);

• Develop test methodologies and test suites for the relevant signalling protocols.

Study Group 11 is to work on enhancements to existing Recommendations on signalling protocols of legacy networks and emerging networks, in order to guarantee signalling and control security. The objective is to satisfy business needs of member organizations that wish to offer new features and services using networks based on existing Recommendations.

Study Group 11 is to continue coordination of the ITU‑T/IEC certification scheme intended to develop procedures for applying the ITU Testing Laboratories recognition procedure and establishing collaboration with existing conformance assessment programmes.

Study Group 11 is to continue its work on any test specifications for use in benchmarks testing and testing specification for standardized network parameters in relation to the framework for Internet-related measurements.

Study Group 11 is to continue its work with relevant standards organizations and forums on subject areas established by the cooperation agreement.

Study Group 11 is to continue its work on development ITU-T Recommendations, technical reports and guidelines to assist ITU Members on combating counterfeit, tampered, stolen ICT equipment and the adverse impacts they pose.

…

Annex C
(to WTSA Resolution 2)

List of Recommendations under the responsibility of the respective
study groups and TSAG in the 2022-2024 study period

…

**ITU-T Study Group 11**

*[There are no changes]*

ITU‑T Q-series, except those under the responsibility of Study Groups 2, 13, 15, 16 and 20

Maintenance of the ITU‑T U-series

ITU‑T X.290-series (except ITU‑T X.292) and ITU‑T X.600 − ITU‑T X.609

ITU‑T Z.500-series

…

ANNEX 3

Conformity Assessment Steering Committee (CASC)

**(Terms of References, ref. SG11-TD314/GEN)**

**Scope**

The ITU-T CASC (Conformity Assessment Steering Committee) is working under the auspices of ITU-T SG11 with the participation of ITU-T experts from all ITU-T SGs.

The ITU-T Telecommunication Standardization Bureau (TSB) will provide secretariat and facilities as required by ITU-T CASC.

The ITU-T CASC will collaborate with existing conformity assessment scheme in order to implement the ITU-T testing laboratory (TL) recognition procedure that are competent to testing against ITU-T Recommendations.

**Objectives**

The main objectives of the ITU-T CASC are:

1. to provide the ITU-T view and position to the management organs of the established Conformity Assessment Systems and Schemes such as that of the IEC, GCF and ILAC;
2. to provide ITU-T’s technical experts to perform relevant TL’s assessment against ITU-T Recommendations through:
* defining criteria, rules and procedures for the appointment of ITU-T technical experts by working with established Conformity Assessment Systems and Schemes of IEC, in collaboration with ILAC aiming for a common testing and conformity assessment;
* processing applications from candidate experts from ITU-T membership;
* appointing the ITU-T technical expert(s);
* recommending to the recognizing bodies, such as IECEE or ILAC accreditation bodies (signatories to the ILAC Mutual Recognition Arrangement) the relevant ITU-T technical experts with respective competence who may join assessment team to provide technical assistance to assess Testing Laboratories

Any expert from ITU-T membership can be appointed by CASC as an ITU-T technical expert according to the requirements in paragraph 7 of the ITU-T SG11 Guideline “Testing Laboratories recognition procedure”. Initially the editors of ITU-T Recommendations which are specified in [The living list of Recommendations and related specifications within key technologies suitable for C&I testing](https://www.itu.int/en/ITU-T/C-I/Pages/CI-living-list-table.aspx), the [Reference table of ITU-T Recommendations to be used for Conformity/Interoperability assessment](http://www.itu.int/en/ITU-T/C-I/Pages/CI-reference.aspx) as well as focal points of pilot projects in the [Living list of pilot project for conformity assessment against ITU-T Recs](https://www.itu.int/en/ITU-T/C-I/Pages/CI-projects-table.aspx) could be candidates for appointment by the ITU-T CASC as technical experts. The list of ITU-T technical experts will be made publicly available.

Bearing in mind that the ITU-T CASC cooperates with international accreditation bodies, the ITU T technical experts appointed by ITU-T CASC can work directly as part of the accreditation body teams.

1. to develop a procedure to recognize Testing Laboratories that are competent to test against ITU-T Recommendations
2. to recognize TL(s) with a scope of ITU-T Recommendation(s) which is assessed by IEC or by ILAC accreditation bodies and register it in the ITU recognized TL list;
3. To collect a list of ITU-T Recommendations from ITU-T SGs, which could be candidates for the joint IEC/ITU certification scheme, taking into account the user needs and market demand.

**Working Method**

The ITU-T CASC will work mostly using electronic working methods and have face-to-face meetings which will normally occur concurrently with SG11 meetings. Meetings will be held as determined by the Chairman of ITU-T CASC as soon as a pool of applications have been gathered and will be announced to its participants. The ITU-T CASC will follow the working rules and procedures which are applied to a Working Party.

The ITU-T CASC will report its activities to ITU-T SG11.

ANNEX 4

ITU-T Focus Group on “Testbeds Federations for IMT-2020 and beyond”
(FG-TBFxG)

**(Terms of References, ref. SG11-TD1804-R1/GEN)**

**1 Rationale and Scope**

Over the years, ICT Research Communities (including publicly funded R&D Projects in US, Europe, China, Japan, South Korea, and in many other parts of the world), together with the Industry, have been working on various topics on building and implementing Testbeds for various purposes, including ICT Testbeds and Testbeds for industrial sectors (such as certain applications in the areas of transportation, finance & banking, healthcare, automotive, manufacturing, production plants, retail, entertainment & broadcasting, etc., that leverage ICT technologies and infrastructures).

Today, there are many Testbeds available for Research purposes and many Testbeds continue to be built by the Research Communities and by the Industry as well. The Industry continues to build its own Testbeds that are used internally within organizations such as Network Operators (or Communications Service Providers) or Vendors, and in some cases some industrial Testbeds are useable to multiple organizations based on certain collaboration agreements that are closed only to the partners.

Over the years it has increasingly been experienced that singly isolated standalone Testbeds are not sufficient to test and trial out certain technology use cases because the use cases rather require the use of components and resources located in various Testbeds (due to the varying capabilities of the different Testbeds that need to be used, and due to the fact that it is more sustainable when the burden of investing in Testbed facilities is shared among various potential Testbed suppliers/providers). New ICT Technologies, Networks and Industry-oriented Applications are becoming increasingly complex to test using Standalone Testbeds. Hence, Federated Testbeds bring sustainability in fostering environments for quick innovations and testing of complex technologies and use cases, and for enabling quicker time to market for products and services.

In this regard, federated testbeds may bring a lot of value to “research use-cases” and “industry real technology deployment use cases”. In general, there is an urgent need to build an Ecosystem for enabling Sustainable Testbeds Development, Evolutions, and Federations. This becomes important for the whole ICT Industry and different domains, especially in this era of automation and consideration of emerging impacts of pandemics like COVID-19 on products developments and lifecycle management.

ITU-T SG11 in close collaboration with ETSI TC INT developed draft Recommendation ITU-T Q.4068 “Open APIs for interoperable testbed federations” which defines a generic Reference Model for Testbeds Federations and describes the main elements of this Reference Model.

In addition, ITU-T SG11, ETSI TC INT and IEEE co-organized Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G and Beyond: Interoperability, Standardization, Reference Model and APIs which was held fully virtual on 15-16 March 2021 ([www.itu.int/go/BTF4-5G](http://www.itu.int/go/BTF4-5G)). It was noted that Research Communities and the Industry (Solutions vendors/suppliers, CSPs, Enterprises, and Standards Development Organizations (SDOs)/Fora) all have roles to play in this desired Ecosystem that should be built around the Testbeds Federations Reference Model now and into the future, in this era of “*Software’rization*” and *Disaggregation* of ICT Networks, IMT-2020 and beyond.

Taking into account the importance of the desired Ecosystem, including APIs for the Testbed Federations that affect various stakeholders, this Focus Group on “Testbeds Federations for IMT-2020 and beyond” (FG-TBFxG) would play a role in providing a platform to share views, to develop a series of deliverables, and showcasing initiatives, projects, and standards activities linked to Testbed Federations.

The FG-TBFxG will serve as a platform to help bring about Harmonization of Testbeds specifications across SDOs/Fora. The FG-TBFxG will leverage and align with the Testbeds Federations Reference Model being standardized jointly by ETSI TC INT and ITU-T SG11 in researching, developing and specifying the required APIs, and defining a set of use cases for Federated Testbeds and use of the APIs. FG-TBFxG encourages all Stakeholders, SDOs/Fora, to:

1. Contribute to the development of the APIs being prescribed by the Testbeds Federations Reference Model;
2. Share the burden on APIs Specifications and Standardization and on Roadmaps in a harmonized and collaborative way;
3. Develop New use cases and services for Testbeds Suppliers that derive from the Testbeds Federations Reference Model and associated APIs, such as “Testbed-as-a Service” (TaaS).

NOTE: Among the expected Stakeholders are: SDOs/Fora, Research Communities, Researchers on IMT-2020 and beyond, Industry Users of Testbeds, Testbeds Suppliers for IMT-2020 Testbeds and other Testbeds, CSPs (Communications Service Providers), Network Operators, Infrastructure Vendors/Suppliers for ICT and Verticals, Open Source & Open Hardware Projects, Regulators.

The Focus Group will also seek to elucidate the roles that can be played by the various Stakeholders in the Ecosystem for Testbeds Federations Standards and Use Cases. For that the FG-TBFxG will play a role in providing a platform to share views, to develop a series of deliverables associated with the topics above, and it will also offer a platform to players that may like to showcase initiatives and projects that align with the outlined vision and the desired Ecosystem on Testbeds Federations. The Focus Group will develop Specifications that may become a basis for further Standardization in the area of Testbeds Federations. It will invite non ITU-T members to participate in this work.

**2. Objectives of the FG-TBFxG**

FG-TBFxG will have the following objectives:

* To define a set of APIs definitions that complement the ongoing ITU-T SG11 study activities related to Testbed Federations and APIs of the Testbeds Federations Reference Model;
* To collect Use Cases for Testbeds Federations of relevance to IMT-2020 and beyond;
* To identify use cases and services based on Testbed Federations reference model that should be considered for various types of Stakeholders on the benefits of them joining the ecosystem around Testbeds Federations for IMT-2020 and beyond;
* To study the various Topics/Points compiled in the Key Takeaways from the ITU-T, ETSI, IEEE Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G & Beyond ([www.itu.int/go/BTF4-5G](http://www.itu.int/go/BTF4-5G)) in order to take them into consideration in the work of the Focus Group;
* To identify Metrics/Key Performance Indicators (KPIs) of relevance to Use Cases for Testbed Federations per and across ICT industry sectors in different domains (verticals); and propose methods/mappings by which E2E relationships among various metrics (e.g., KPIs) across Testbeds can be defined (see NOTE below):

NOTE: Among KPIs for Testbed Federations are:
**(1)** KPIs of relevance to a Technology or combined Technologies that are being Tested using Federated Testbeds such that the measured KPIs help in the Test Cases verdicts setting;
**(2)** KPIs of relevance to utilization, availability, capabilities, customer-experience (satisfaction) of the Testbeds and their resources being consumed or can be consumed in Testbed usage in a Test Scenario;
**(3)** Non-technical KPIs that relate to Testbed Service Offerings and Consumption

* To develop guidance to Research and Industry communities working on IMT-2020and beyond on how to use the Testbeds Reference Model to contribute to the development of the APIs being prescribed by the Testbeds Reference Model, and also contribute to various instantiations cases of the Reference Model
* To facilitate discussions by which various SDOs/Fora can share ideas on how they can potentially share the burden on APIs Specifications and Standardization and on Roadmaps in a harmonized and collaborative way, based on the Testbeds Federations Reference Model, and produce a matrix that maps SDOs/Fora and other Stakeholders to APIs types they will be addressing or have interest to address;
* To define Potential New use cases and services for Testbeds Suppliers that derive from the Testbeds Federations Reference Model and associated APIs, such as “Testbed-as-a Service” (TaaS);
* To develop guidelines to Owners of Existing Testbeds and Platforms for IMT-2020 and beyond on how they could embark on Transformation or Evolution of existing Testbeds (Industry-grade, and potential Research Testbeds as well) and their Federation APIs to meet the requirements of the Testbeds Federation reference model (ITU-T Q.4068);
* To develop guidelines to the Industry on how to address the Challenges that need to be addressed as guided by the Reference Model and APIs for Testbeds Federations for IMT-2020 and beyond;
* To identify any Regulatory requirements and other aspects of relevance to Testbeds Federations and engage the relevant Stakeholders on how such aspects can be addressed;
* To define steps that can be pursued by the Industry towards Developing and Maintaining ONPs (Open Networking Platforms) for IMT-2020 and beyond, and the Use of the Testbeds Federations Reference Model and APIs to build ONPs;
* To develop reports of the FG activities on reference model and APIs for testbeds federation after the FG finished its work;
* To encourage participation from various projects and fora in the activities of the FG-TBFxG.

**3. Structure**

The FG-TBFxG may establish sub-groups as needed. To coordinate operations and provide guidance to subgroups, there will be a chair and vice-chairs.

**4. Specific Tasks and Deliverables**

Tasks and deliverables developed by FG-TBFxG may include the following:

* Gathering information about ongoing standardization initiatives on Testbed Federations and related APIs being standardized by SDOs/Fora (e.g., ITU-T SG11, IEEE INGR, ETSI TC INT, TM Forum, BroadBand Forum (BBF)). The aim of this task is to amend the ongoing SG11 standardization work on this subject matter;
* Developing an APIs Invocations Framework as part of the Testbeds Federations Reference Model being standardized by ITU-T SG11, by which Generic APIs invoke Testbed-specific specialized APIs in specific Testbeds Types during execution of Use Cases for Testbeds and Testbeds Federations;
* Defining use cases for Testbeds Federations of relevance to IMT-2020 and beyond for different ICT industrial sectors based on the Testbeds Federations Reference Model and solicitations of inputs from relevant players in different domains (verticals) (e.g., IoT, Autonomic/Autonomous Networks (ANs);
* Studying existing and ongoing Initiatives in Research and Industry on IMT-2020 and beyond, on APIs of relevance to the Testbeds Federations Reference Model (ITU-T Q.4068), and provide guidelines on how the stakeholders can implement the standardized Testbeds Federations Reference Model or its Instantiations for various types of Testbeds;
* Providing a Framework on how transformations or enhancements/evolutions may be pursued by the community to make existing IMT-2020 related Testbeds APIs fit to the Reference Model and its APIs Invocations Framework;
* Defining Potential New use cases and services for Testbeds Suppliers or Owners that derive from the Testbeds Federations Reference Model and associated APIs, such as “Testbed-as-a Service” (TaaS);
* Organising thematic workshops and forums on Testbeds Federations for IMT-2020 and beyond. These workshops and forums are expected to bring together all stakeholders including policy makers, ICT sector members, national telecommunication authorities, academia, SDOs/Fora, UN agencies to discuss various aspects related to Testbeds Federations for IMT-2020 and beyond;
* Identifying and selecting relevant projects and fora that can be used in Testbed Federations for IMT-2020 and beyond that conform to the SG11’s Reference Model for Testbeds Federations and its APIs; and promote the vision to the relevant Open Source/Hardware Projects/Forums;
* Developing Technical Reports and Specifications which address the outlined items such as APIs and Frameworks, while also identifying future standardization work for ITU-T study groups in the area of Federated Testbeds for IMT-2020 and beyond (as described in the objectives);
* Communicating the final list of deliverables to SG11, at least four calendar weeks before the parent group’s next meeting.

**5. Relationships**

This Focus Group will work closely with SG11 through collocated meetings where and when possible and will work in close coordination with all ITU-T Study Groups as appropriate.

This FG–TBF5G will also collaborate (as required) with other relevant entities, in accordance with Recommendation ITU-T A.7.

It will establish close collaboration with other SDOs/Fora (e.g., IEEE, ETSI, TMForum, BroadBand Forum (BBF), TIP, ORAN, NGMN, 3GPP, etc.), municipalities, non-governmental organizations (NGOs), policy makers, companies, academic institutions, research institutions and other relevant organizations.

**6. Parent group**

The parent group of the FG-TBFxG is ITU-T Study Group 11 “Signalling requirements, protocols, test specifications and combating counterfeit products”.

Among others, SG11 leads ITU activities on establishing test specifications, conformance and interoperability testing for all types of networks, technologies and services that are the subject of study and standardization by all ITU‑T study groups.

**7. Leadership**

The stipulations in clause 2.3 of Recommendation ITU-T A.7 apply.

**8. Participation**

See clause 3.1 of Recommendation ITU-T A.7.

Any individual from a country that is a member of ITU and who is willing to contribute actively to the work may participate in the focus group. This includes individuals who are also members of international, regional and national organizations.

A list of participants will be maintained for reference purposes and reported to the parent group.

All participants are strongly encouraged to contribute to the FG’s activities.

**9. Administrative support**

The stipulations in clause 5 of Recommendation ITU-T A.7 apply.

**10. General financing**

FG-TBFxG will follow the guidance in clause 4 of Recommendation ITU-T A.7 with regard to financing of focus groups and their meetings and clause 10.2 of Recommendation ITU-T A.7 with regard to printing and distribution of deliverables.

**11. Meetings**

The frequency and locations of meetings will be determined by the Focus Group management. The overall meetings plan will be announced after the approval of the terms of reference. The Focus Group will use remote collaboration tools to the maximum extent, and collocation with ITU-T SG11 meetings is encouraged.

The meeting dates will be announced by electronic means (e.g., e-mail and website, etc.) at least six weeks in advance.

**12. Technical contributions**

See clause 8 of Recommendation ITU-T A.7.

Any participant may submit a technical contribution directly to FG-TBFxG, in accordance with the time schedule adopted. A template for contributions can be found on the ITU-T website. Electronic document transfer methods should be used whenever possible.

Deadline for contributions will be announced by FG Chairman for each particular meeting.

**13. Working language**

The working language is English.

**14. Approval of deliverables**

Approval of deliverables shall be taken by consensus.

**15. Working guidelines**

Working procedures shall follow the procedures of Rapporteur group meetings.

FG-TBFxG will exchange draft deliverables and other outcomes on a regular basis with its parent group, to ensure efficient transfer of deliverables to streamline future activities (see ITU-T A.7 Appendix I).

No additional working guidelines are defined.

**16. Progress reports**

Regular progress reports will be provided at each meeting of the parent group, as per the guidance in clause 11 of Recommendation ITU-T A.7.

**17. Announcement of Focus Group formation**

The creation of the FG-TBFxG will be announced via TSB Circular to all ITU membership. ITU-T Newslog, press releases and other means, including communication with other involved organizations could be utilized.

**18. Milestones and duration of the Focus Group**

The Focus Group lifetime is set for one year from the first meeting (see ITU-T A.7, clause 2.2), with the possibility for a further year subject to the agreement of the parent study group.

**19. Patent policy**

See clause 9 of Recommendation ITU-T A.7.

ANNEX 5

ITU-T SG11 Regional Group for Eastern Europe, Central Asia and Transcaucasia (SG11RG-EECAT)

**(Terms of References, ref. SG11-TD313/GEN)**

Regional group for countries which in collaboration with relevant regional standardization entities (regional organizations, regional standardization bodies, ITU regional office and so forth) and will facilitate contributions to the ITU-T SG11 meeting on particular subjects which are points of interest of Eastern Europe, Central Asia and Transcaucasia countries which are member states of RCC/CIS relating to Signalling requirements, protocols, test specifications, combating counterfeit products and mobile device theft.

1. To encourage the active participation of Administrations, regulators and operators of the region in the activities and efforts of ITU-T Study Group 11 (SG11), as well as in the implementation of ITU-T Recommendations;
2. To act as a forum, using both face to face meetings as well as electronic communications, for information-sharing related to SG11 activities among local and regional experts from the private sector and the Government;
3. To facilitate the broader inclusion and more active participation of region countries in SG11 activities, given the limited abilities to attend SG11 meetings in Geneva;
4. To encourage and coordinate participation of the region’s countries in workshops, SG11 Rapporteur meetings and other SG11 events;
5. To coordinate and foster the organization of regional events, e.g., workshops, on SG11 selected emerging topics;
6. to reflect the relevant priorities of the study to the ITU-T SG11 mandate – Resolution 2 (Rev. Hammamet, 2016)
7. To strengthen standard-making capabilities of the region’s countries in accordance with Resolution 44 on “Bridging the Standardization Gap”; Resolution 65 – Calling party number delivery, calling line identification and origin identification information; Resolution 76 – Studies related to conformance and interoperability testing, assistance to developing countries[[1]](#footnote-2)1, and a possible future ITU Mark programme; Resolution 78 – Information and communication technology applications and standards for improved access to e-health services; Resolution 90 – Open source in the ITU Telecommunication Standardization Sector; Resolution 92 – Enhancing the standardization activities in the ITU Telecommunication Standardization Sector related to non-radio aspects of international mobile telecommunications; Resolution 93 – Interconnection of 4G, IMT-2020 networks and beyond; Resolution 96 – ITU Telecommunication Standardization Sector studies for combating counterfeit telecommunication/information and communication technology devices; Resolution 97 – Combating mobile telecommunication device theft;
8. To identify needs for training and seminars on current ITU-T SG11 standardization areas, hot topics and future technologies which are points of interest for operators, regulatory authorities, vendors and testing laboratories in the region’s countries, and to coordinate the organization of such technical tutorials in the region on such topics, in coordination with ITU-T SG11;
9. To identify the regional priorities as they relate to the mandate of SG11, focusing initially on conformance and interoperability (C&I) testing for all types of networks, technologies and services, ITU-T testing laboratory recognition procedure and relevant work of the ITU-T conformity assessment steering committee (ITU-T CASC), combating counterfeiting of ICT equipment and mobile device theft, VoLTE/ViLTE interconnection, remote and performance testing, including Internet-related performance measurements, as well as for existing technologies (e.g., NGN) and emerging technologies (e.g., FN, cloud, SDN, NFV, IoT, VoLTE/ViLTE, IMT-2020 technologies, flying ad-hoc networks, tactile Internet, augmented reality, etc.). In particular the regional group will aim to:

1) foster discussion across the region’s countries and to seek regional consensus on telecommunications ICTs aspects related to the interconnection of IP-based networks (e.g., 4G, 5G IMT-2020 and beyond) especially towards an efficient delivery of services such as voice and video calls;

2) involve regional certification bodies to participate in ITU-T CASC meetings, fostering their proposals on possible ITU-T Recommendations which may become candidate of the new joint IEC ITU certification scheme;

3) support regional contributions on combating counterfeiting and mobile device theft based on inputs provided by different regional parties, e.g., customs, vendors, regulators, certification bodies, testing laboratories, etc.;

1. To identify ITU-T Recommendations which are adopted at National level in the region’s countries and therefore propose to develop relevant test specifications when this need is recognised;
2. To discuss both traditional and emerging topics in SG11, from the region’s countries perspective, aiming at drafting relevant contributions to be submitted to SG11;
3. To coordinate the regional support towards the development of new and revised ITU-T Recommendations focusing on both traditional and emerging areas of interest in SG11;
4. To improve liaison and collaboration between the region’s countries and other world regions, through other regional groups and or the parent group, on relevant standardization matters under the mandate of SG11.

ANNEX 6

ITU-T SG11 Regional Group for Africa (SG11RG-AFR)

**(Terms of References, ref. SG11-TD312/GEN)**

A) To facilitate active participation in development of relevant Recommendations and promote capacity building through workshops, meetings and training with regards to combating counterfeiting and conformance and interoperability issues;

B) To encourage the active participation of Administrations, regulators, manufacturers and operators and service providers of the region in the activities of ITU-T Study Group 11 (SG11), as well as in the implementation of ITU-T Recommendations;

C) To act as a forum, using both face to face as well as electronic meetings, for information-sharing related to SG11 activities;

D) To facilitate the broader inclusion and more active participation of African countries in SG11 activities, given the limited abilities to attend SG11 meetings in Geneva;

E) To encourage and promote participation of African countries in workshops, SG11 Rapporteur meetings and other SG11 events;

F) To assist African Administrations in the organization of SG11 events, e.g., workshops, trainings, seminars, etc. on SG11 selected emerging topics;

G) To strengthen standard-making capabilities of African countries in accordance with Resolution 44 on “Bridging the Standardization Gap” (Rev. Dubai, 2012);

H) To identify needs for training and develop and implement training plans on current ITU-T SG11 standardization areas, topical issues and future technologies, in coordination with ITU-T SG11 and ITU-D as appropriate;

I) To identify the regional priorities as they relate to the mandate of SG11, focusing initially on conformance and interoperability (C&I) testing as well as combating counterfeiting of ICT equipment:

1) support regional contributions on C&I issues based on inputs provided by different African parties;

2) support regional contributions on combating counterfeiting based on inputs provided by different African stakeholders, e.g., customs, vendors, regulators, certification bodies, testing laboratories, etc.;

3) involve African stakeholders to participate in ITU-T Conformity Assessment Steering Committee (ITU-T CASC) meetings, fostering their proposals on possible ITU-T Recommendations which may become candidate of the new joint IEC/ITU certification scheme;

J) To identify ITU-T Recommendations which are adopted at National level in the African region and therefore propose to develop relevant test specifications when this need is recognised;

K) To discuss both traditional and emerging topics in ITU-T SG11 (e.g., VoLTE/ViLTE interconnection), from the African regional perspective, aiming at drafting regional contributions to be submitted to SG11;

L) To coordinate the African regional support towards the development of new and revised ITU‑T Recommendations focusing on both traditional and emerging areas of interest in SG11;

M) To improve liaison, collaboration and representation between the African region and other world regions, through other regional groups and/or the parent group, on relevant standardization matters under the mandate of SG11;

N) To serve as a forum to promote the recognition and/or development of C&I testing labs and centres in Africa, development of MRAs and sharing of information among African countries;

O) To encourage African countries to have regulatory framework for C&I;

P) To cooperate with ITU-T SG11 in the development of framework, standards, guidelines to control counterfeit and substandard ICT equipment;

Q) To educate our citizenry about the possible dangers posed by the counterfeit devices including environmental disposal issues.

**Working Methods**

The management team, including Chairman and Vice-Chairman of the SG11RG-AFR, shall be appointed for two terms only.

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1. 1 These include the least developed countries, small island developing states, landlocked developing countries and countries with economies in transition. [↑](#footnote-ref-2)