

Recent Activities of ITU-T SG13 on Future Networks

Yoshinori Goto

Abstract

This article introduces the recent activities of the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) Study Group 13 (SG13), which is responsible for the study on *future networks*. The study area covers, but not limited to, mobile networks, cloud computing, and quantum key distribution. Standardization organizations and groups are working toward implementing future networks in 2030. SG13 is expected to define the concept of future networks in this global standardization community.

Keywords: future networks, IMT, quantum key distribution

1. Introduction

As International Mobile Telecommunications-2020 (IMT-2020), which is also known as the 5th generation mobile communication system (5G), becomes mature, the global standardization community is moving toward *future networks*, which is sometime referred to as 6G and expected to be implemented in 2030. The International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) Study Group 13 (SG13) is responsible for defining the concept of future networks. A wide range of subjects, such as virtualization, artificial intelligence and machine learning (AI/ML), computing and network convergence, and quantum information technology, are being discussed. Different from the fora and consortia in which experts are mostly from developed countries, SG13 attracts many experts from developing countries who have different motivations and unique ideas. This article introduces the activities of SG13 focusing on future-network technologies that will be applied in next-generation mobile networks.

2. Overview of SG13

The major objective of SG13 is to define the concept of future networks. While other SGs are working on detailed technical specifications to be used in the

implementation of technologies, the deliverables of SG13 are published as requirement and architecture documents showing abstractive views of the targeted systems and technologies. With high-level architecture, the targeted systems and technologies will be developed in various implementations optimized for real situations.

As the entrance of new ideas in ITU-T, SG13 welcomes new technical concepts that will drive the future information and communication technology (ICT) industry. Many proposals asking for new studies are submitted in SG13. Some of these proposals are more relevant for discussion in Focus Groups (FGs) in which the work methods are more friendly to academic experts as defined in ITU-T Recommendation A.7. FGs work intensively on specific subjects with limited lifetime in a flexible working environment.

In the more competitive environment of global standardization, where standard developing organizations (SDOs) are pursuing similar subjects with slightly different focuses, collaboration among SDOs to strengthen the value of standards is becoming important. SG13 uses the mechanism of Joint Coordination Activity (JCA) as defined in ITU-T Recommendation A.1. Although JCA does not produce any technical deliverable, it contributes to the global standardization community by providing a platform

Table 1. List of groups associated with SG13.

Group	Note
FG-AN	This FG is conducting pre-standardization work on autonomous networks since its establishment in 2020.
JCA-ML	This group coordinates the standardization work on machine learning among the SDOs and groups.
JCA-IMT2020	This group coordinates the standardization work on IMT-2020, which is equivalent to 5G, among the SDOs and groups.
JCA-QKDN	This group coordinates the standardization work on quantum key distribution networks coordination among the SDOs and groups.
SG13 RG-EECAT	This group promotes SG13 related activities in the region of Eastern Europe, Central Asia, and Transcaucasia.
SG13 RG-AFR	This group promotes SG13 related activities in the African region.

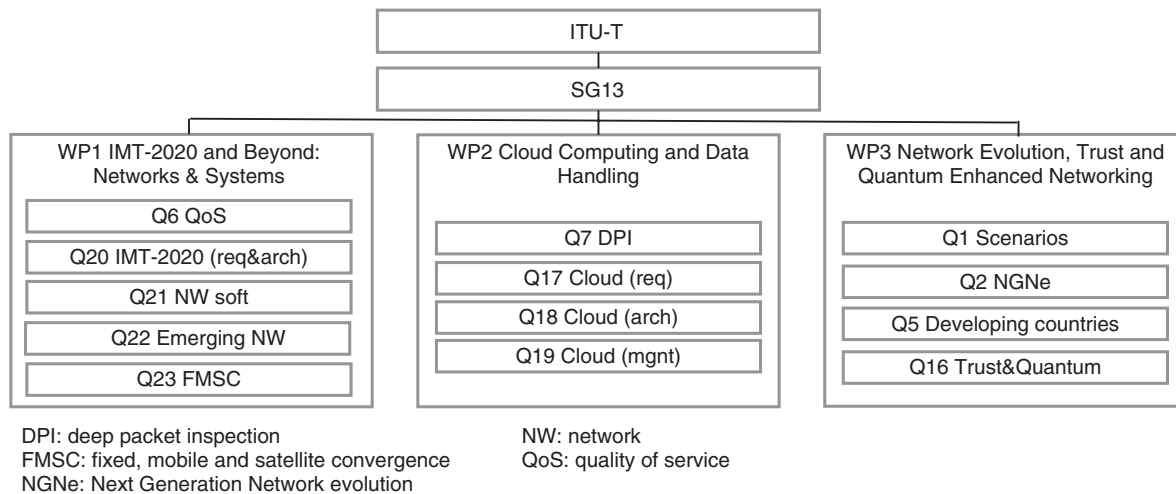


Fig. 1. Structure of SG13.

of information exchange among different groups within ITU-T as well as SDOs. The FGs and JCAs under the responsibility of SG13 or associated with SG13 are listed in **Table 1**.

The actual technical discussion of SG in ITU-T is carried out at Questions, which are small groups responsible for specific study subjects. There are 13 Questions grouped in 3 Working Parties (WPs), as shown in **Fig. 1**.

The SG13 meeting is held every 9 months. To accelerate the discussion, Joint Rapporteur Meetings consisting of all Questions and WP Plenary are held between SG meetings. This means SG13 has three chances of having intensive discussion across the entire SG and launching the approval process of its deliverables. SG13 attracts about 200 contributions and several hundred experts around the world. This

fact shows that SG13 is not only one of the largest SGs in ITU-T but also its importance is critical to the standardization work of ITU-T.

3. Technical subjects

3.1 Mobile networks including IMT-2020

Mobile networks including IMT-2020 is one of the major study subjects of SG13. A mobile network consists of the wired section, which is under the responsibility of ITU-T, and the wireless section, which is under the responsibility of ITU Radiocommunication Sector (ITU-R). Therefore, the study scope of mobile networks in SG13 does not include the wireless section.

In the standardization work for IMT-2020 predating the work of FG-IMT2020, SG13 focused on the

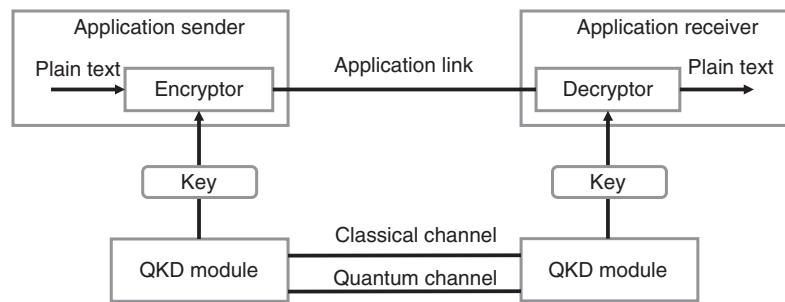


Fig. 2. Configuration of QKD networks.

concept of network resource virtualization, including the management of virtual networks called network slice. This study evolved to the application of AI/ML technologies for network management, which are conducted in FG-ML5G (Focus Group on Machine Learning for Future Networks including 5G) and FG-AN (Focus Group on Autonomous Networks). The standardization work in this field has progressed in collaboration with other SDOs such as ETSI (European Telecommunications Standards Institute) ISG ZSM (Industry Specification Group Zero Touch Network and Service Management).

3.2 Cloud computing

The cloud-computing study in ITU-T was launched from Focus Group on Cloud Computing (FG-Cloud) established in 2010. After conclusion of FG-Cloud in 2012, the work on cloud computing was transferred to the Questions of SG13 WP2, which was established to advance the work toward ITU-T recommendations. The computing industry has established its own ecosystem of standardization. Thus, it is important to consider the focus area of SG13 to avoid unnecessary duplication of this work. SG13 identified the inter-cloud, which is a use case of cloud computing connecting multiple datacenters via a wide area network, as relevant. The concept of inter-cloud is produced as ITU-T Recommendation Y.3511.

As the importance of data is being recognized by industry experts, the focus area of SG13 in the work on cloud computing has moved to data-related technologies. Particularly, cloud computing as the platform for big data is gaining momentum. A series of ITU-T recommendations for data providers, data brokerage, and data consumption have been produced.

3.3 Quantum key distribution

Quantum key distribution (QKD) (see Fig. 2) is a mechanism to share encryption keys between distant locations based on quantum physics. The safety of QKD does not rely on mathematical difficulties. Therefore, the safety of QKD is maintained regardless of the advancement of computing technologies, which will undermine the traditional key exchange technologies. The technology of QKD is becoming mature; thus, several implementations are being conducted in the field.

The study on QKD in SG13 was launched in 2018. It is well known that the transmission distance of QKD is limited within several 10 km. This makes the construction of a QKD network covering the whole nation difficult. Therefore, a wide area QKD network needs to deploy a number of intermediate nodes located every 10–20 km. A series of ITU-T recommendations, such as Y.3800 (general overview), Y.3801 (requirements), and Y.3802 (architecture), was produced on the basis of this idea. As shown in Fig. 3, further studies, such as key management, management systems, software-defined QKD, and secure storage, are progressing. The study on QKD is progressing mainly in Question 16, while its quality of service (QoS) aspect is being discussed in Question 6. The study items are also being coordinated with SG17, which is the lead study group on security.

3.4 Other subjects

Question 7 is conducting a study on deep packet inspection (DPI), which is a technical idea of using analysis of information contained in packets for network security and QoS. This technical idea is gaining the attention from national governments imposing the obligation of confidentiality of communications to their telecommunication carries. ITU-T recommendations on DPI contain text mentioning the compliance

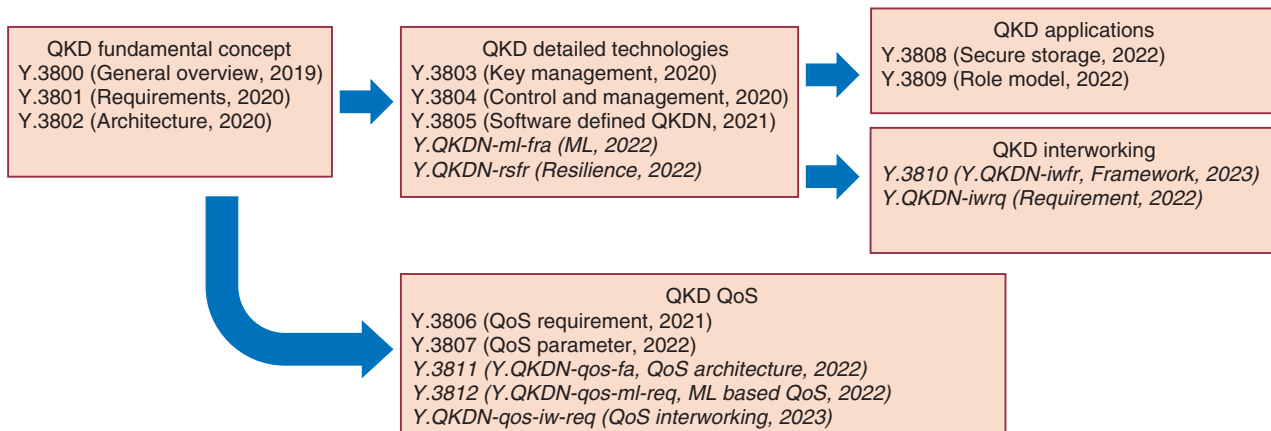


Fig. 3. ITU-T recommendations on QKD networks.

with national laws and regulations. Even with this notification, SG13 is continuing the debate on the use of DPI technology in networks.

The standardization discussions are being conducted mostly by experts from advanced countries. However, the majority of the Member States of ITU-T are categorized as developing countries and their opinions are still not well considered in the standardization discussion. SG13 has Question 5, a Question addressing the issues of developing countries. The participants of Question 5 are mostly from the African region and discuss the issues of, for example, the development of telecommunication infrastructure such as mobile networks and cloud computing. Their motivation is high. They submit contributions about the telecommunication infrastructure and economic development in the ICT industry and contain interesting information of the reality of developing countries that the participants from the advanced countries do not know. SG13 also established 2 regional groups, SG13 RG-AFR (Regional Group for Africa) and SG13 RG-EECAT (Regional Group for Eastern Europe, Central Asia and Transcaucasia), to encourage participation from these regionals.

4. Future activities of SG13

SG13 as an entrance of new technologies of standardization focuses on the concept of future networks. Currently, SDOs are working toward the vision of future networks targeting 2030, and ITU-R is working on the concept of future mobile networks. SG13 will accelerate the work on the wired section of future mobile networks.

In the study of IMT-2020, SG13 established FG-IMT2020 in 2015 and produced new concepts such as network slicing and network softwarization. Similar activities are expected for future mobile networks. Expected subjects are network management using AI/ML and computing/network convergence for supporting AI/ML, which are being discussed as beyond IMT-2020. Computing/network convergence is a relevant subject for SG13, which has been working in the area of cloud computing. The study on emerging technologies needs new participants with new ideas and culture. FG is the best platform to accommodate these new participants and promote the discussion of future network technologies.



Yoshinori Goto

Senior Engineer, NTT Advanced Technology Corporation.

He received a B.E. and M.E. in applied physics from Tohoku University, Miyagi, in 1992 and 1994. He joined NTT Basic Research Laboratories in 1994 and conducted research and development of cable television systems, Internet protocol television (IPTV), and machine-to-machine technology. He has been engaged in the standardization of IPTV in ITU-T as a member of the IPTV Focus Group and Global Standards Initiative since 2006. He has also served as a rapporteur of Question 11 of ITU-T SG9, Questions 5 and 25 of ITU-T SG13, and Question 21 of ITU-T SG16. He has been a vice-chair of ITU-T SG13 since 2013. He is a member of the Institute of Electronics, Information and Communication Engineers. He has been with NTT Advanced Technology Corporation since 2022.
