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| **Telecommunication StandardizationBureau** |  |
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 Geneva, 2 July 2013

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| - To Administrations of Member States of the Union**Copy:**- To ITU-T Sector Members;- To ITU-T Associates;- To ITU-T Academia; To the Chairman and Vice-Chairmen of Study Group 13;- To the Director of the Telecommunication Development Bureau;- To the Director of the Radiocommunication Bureau |

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| Subject  | **Approval of revised Questions 2, 3, 6, 8, 9, 11 and 14/13** |

Dear Sir/Madam,

1 At the request of the Chairman of Study Group 13, *Future networks including cloud computing, mobile and next-generation networks*, I have the honour to inform you that, in accordance with the procedure described in Resolution 1, Section 7, § 7.2.2, of WTSA (Dubai, 2012), Member States and Sector Members present at the last meeting of this Study Group which was held in Geneva from 18 February to 1 March 2013, agreed by reaching consensus to approve the following revised Questions:

***Question 2/13****, Requirements for NGN evolution (NGN-e) and its capabilities including support of IoT and use of software-defined networking* (see Annex 1)

***Question 3/13****, Functional architecture for NGN evolution (NGN-e) including support of IoT and use of software-defined networking* (see Annex 2)

***Question 6/13****, Requirements and mechanisms for network QoS enablement (including support for software-defined networking)* (see Annex 3)

***Question 8/13****, Security and identity management in evolving managed networks (including software-defined networking)* (see Annex 4)

***Question 9/13****, Mobility management (including support for software-defined networking)* (see Annex 5)

***Question 11/13****, Evolution of user-centric networking, services, and interworking with networks of the future including Software-Defined Networking* (see Annex 6)

***Question 14/13****, Software-Defined Networking and Service-aware networking of future networks* (see Annex 7).

2 **Questions 2, 3, 6, 8, 9, 11 and 14/13 are therefore approved.**

3 The resulting Recommendations in Q8/13 are assumed to fall under the Traditional Approval Process (TAP).

4 The resulting Recommendations in Qs 2, 3, 6, 9, 11 and 14/13 are assumed to fall under the Alternative Approval Process (AAP).

Yours faithfully,

Malcolm Johnson
Director of the Telecommunication
Standardization Bureau

**Annexes: 7**

ANNEX 1
(to TSB Circular 37)

**Question 2/13 - Requirements for NGN evolution (NGN-e) and its capabilities including support of IoT and use of software-defined networking**

**1 Motivation**

With the ever increasing number of services and applications, demand has been continuously increasing for enhancing capabilities of NGN and for its evolution. Emerging services and applications are placing more and more requirements on networks and are resulting in the need to make them more and more intelligent with the provisioning of new service and network capabilities. One essential objective is the maximization of the usage of common capabilities in order to provide support to a broad range of services and applications in different vertical markets, in a cost efficient, multi-vendor and easily deployable manner.

On the other hand, the increasing integration and convergence of advanced communication technologies (e.g., content delivery, distributed service networking and service delivery platform technologies) with advanced information technologies (e.g., cloud computing, big data management, SOA, Web services and composition technologies) are making available a large set of advanced capabilities for the support of new promising services and applications.

Emerging services and applications to be considered include:

* Internet of Things (IoT) services and applications in different vertical market areas (key identified market areas include e-health, Intelligent Transportation Systems, smart home, smart city, emergency management, etc.)
* Advanced multimedia conversational services, IPTV and content delivery network based services (e.g., communication centre services, mobile IPTV)
* Advanced network intelligence based services (e.g., enabling application customization according to third parties or other users’ requirements).

Consideration will be also given to applications and services based on the integration of the above services and applications with advanced information and communication technologies, including software-defined networking (SDN).

The following major Recommendations, in force at the time of approval of this Question, fall under its responsibility:

* Y.1901, Y.1991, Y.1902, Y.2006, Y.2007, Y.2091, Y.2201, Y.2211, Y.2212, Y.2215, Y.2216, Y.2233, Y.2236, Y.2807, Supplement 5 to Y.1900 series, Supplements 1 and 7 to Y.2000 series (IPTV, NGN aspects)
* Y.2234, Y.2240 (service environment aspects)
* Y.2213, Y.2221, Y.2060, Y.2061 (IoT aspects).

An up-to-date status of work under this Question is contained in the SG13 Work Programme:

<http://www.itu.int/ITU-T/workprog/wp_search.aspx?Q=2/13>

**2 Question**

The Question addresses the support of emerging services and applications in NGN and its evolution. On the basis of use cases and related ecosystem aspects, the requirements and capabilities imposed on networks (including user networks) will be specified. The study of requirements and capabilities will include the usage in an evolving NGN of advanced enabling technologies such as SDN.

Study items include, but are not limited to:

* What are the requirements and capabilities needed for the support of emerging services and applications in an evolving NGN?

Capabilities subject to specification include:

* advanced capabilities for the support of IoT services and applications: autonomic networking and autonomic service provisioning; location based capabilities; time sensitivity; ad-hoc/device to device networking; gateway and device capabilities specific to IoT;
* advanced capabilities for the support of emerging multimedia conversational services, IPTV and content delivery network based services;
* advanced capabilities for network intelligence enablement (NICE): data mining, analytics and reasoning; content awareness; dynamic policy control and traffic scheduling; user self-assignment of network and service resources; flexible accounting and charging;
* advanced capabilities for an enhanced service environment (service delivery platform for NGN and its evolution including support of IoT): capabilities which are application specific or common to applications in different vertical market areas; distributed service environment capabilities; service environment capabilities for advanced user devices; application publishing and integration with portals and application stores.

**3 Tasks**

Tasks include, but are not limited to:

* Development of Recommendations for the support of emerging services and applications in an evolving NGN, covering:
	+ use cases;
	+ ecosystem aspects taking into account business models and use cases;
	+ requirements for services and applications (including service interface requirements);
	+ capabilities (including capability framework, capabilities covering network and user domains).
* Maintenance and enhancement of the Recommendations for which the Question is responsible.

**4 Relationships**

Recommendations:

* Y-series, F-series, H-series

Questions:

* Other relevant Questions of SG13

Study Groups:

* SG9, SG11, SG16 and other ITU-T Study Groups as appropriate, ITU-R Study Groups as appropriate

Standardization bodies, fora and consortia including, but not limited to:

* IETF
* OMA
* IEEE
* ATIS
* ETSI
* ISO/IEC
* 3GPP/3GPP2

ANNEX 2
(to TSB Circular 37)

**Question 3/13 - Functional architecture for NGN evolution (NGN-e) including support of IoT and use of software-defined networking**

**1 Motivation**

As NGN establishes its position as an underlying mechanism for various applications, attentions are being paid to how advanced ICT systems are designed based on NGN and related architectures. Given rich features of NGN, highly capable ICT systems meeting industry demands can be realized by supplementary development based on NGN architecture. This is a promising way in terms of efficiency and time to market.

To support this approach, the NGN architecture defined in Recommendation ITU-T Y.2012 needs to be maintained and updated taking into account the latest industry situations. In addition, this work will stimulate the evolution of NGN architecture, especially, the support of intelligence capability enhancement (NICE) and use of SDN (software-defined networking) technologies.

Similarly to NGN, the maintenance and evolution of IPTV architecture defined in Recommendation ITU-T Y.1910 will be an important consideration.

**2 Question**

What new and revised framework and/or architecture Recommendations are required to realize convergence based on the NGN, IPTV and their evolutions?

**3 Tasks**

* Study on general reference models of the NGN evolution for support of IPTV and emerging industry needs.
* Preparation of frameworks to identify the basic architectural compositions of the NGN evolutions such as NICE for support of IPTV. These will be based on the identification of architectural requirements derived from the industry needs.
* Study on general reference models of the NGN evolution for support of IoT
* Identification of entities, their functions, and reference points, required to provide telecommunications services to support IoT. This includes the need for functional reference models, taking into consideration key themes to support ubiquitous environments, and the addition of new functions and/or modification of existing functions. This analysis should include consider the impact on existing Recommendations and interworking cases.
* Study on using of SDN technologies on the architecture of NGN and its evolution
* Implementation framework related to provision of emergency telecommunications in NGN Identify the technical issues, measures, and functions of particular networking technologies that may be involved in meeting the requirements and capabilities of Recommendation ITU-T Y.1271, and develop any new Recommendations or enhance existing Recommendations (e.g., Y.2205) deemed to be required.
* Maintenance of existing Recommendations
* Maintenance and enhancement of the following Recommendations are included:
* Y.1271 – Framework(s) on network requirements and capabilities to support emergency telecommunications over evolving circuit-switched and packet-switched networks
* Y.1910 – IPTV functional architecture
* Y.2001 – General overview of NGN
* Y.2002 – Overview of ubiquitous networking and of its support in NGN
* Y.2011 – General principles and general reference model for NGN
* Y.2012 – Functional requirements and architecture of the NGN
* Y.2013 – Converged services framework functional requirements and architecture
* Y.2014 – Network attachment control functions in Next Generation Networks
* Y.2015 – General requirements for ID/locator separation in NGN
* Y.2016 – Functional requirements and architecture of the NGN for applications and services using tag-based identification
* Y.2017 – Multicast functions in next generation networks
* Y.2018 – Mobility management and control framework and architecture within the NGN transport stratum
* Y.2019 – Content delivery functional architecture in NGN
* Y.2020 – Open service environment functional architecture for next generation networks
* Y.2021 – IMS for Next Generation Networks
* Y.2022 – Functional architecture for the support of host-based separation of node identifiers and routing locators in next generation networks
* Y.2023 – Functional requirements and architecture for the NGN for multimedia communication centre service
* Y.2031 – PSTN/ISDN emulation architecture
* Y.2055 – Framework of object mapping using IPv6 in next generation networks
* Y.2056 – Framework of vertical multihoming in IPv6-based next generation networks
* Y.2057 – Framework of node identifier and routing locator separation in IPv6-based next generation networks
* Y.2205 – Next Generation Networks – Emergency telecommunications –Technical considerations

The latest work programme under the responsibility of this Question is available at:

<http://www.itu.int/ITU-T/workprog/wp_search.aspx?Q=3/13>

**4 Relationships**

Study Groups:

* All ITU-T study groups
* ITU-R Study Groups as appropriate

Standardization bodies, fora and consortia including, but not limited to:

* ATIS
* IETF
* ETSI
* ISO
* IEC
* 3GPP/3GPP2

ANNEX 3
(to TSB Circular 37)

**Question 6/13 - Requirements and mechanisms for network QoS enablement (including support for software-defined networking)**

**1 Motivation**

A key characteristic of existing and emerging networks is the use of a smart transport for supporting all applications and services. Different types of applications/services (e.g. Web Services, IP telephony, IPTV and Context/Content-aware services), however, have varied QoS/QoE requirements, all of which must be supported by this smart transport. Hence appropriate mechanisms are needed to achieve the required levels of QoS/QoE, especially for applications that are delay-and loss-sensitive. Such applications may also require a large amount of bandwidth and strict quality assurance, which makes the support for QoS/QoE challenging.

To support QoS/QoE in a consistent, efficient, dynamic and secure fashion, considerations need to be given to the following aspects:

* QoE and Application QoS requirements
* Varied types of transport technology including evolutionary and revolutionary technologies (e.g. Ethernet, IP and MPLS in the core network; DSL, UMTS, WiFi, WiMAX, LTE, and LTE-advanced in the access network) and endpoints (e.g. smart phone/tablet, laptop, and set-top box), and multiple administrative domains (e.g. home networks, enterprise networks, provider networks, and private/public clouds) in an end-to-end path
* Availability and accuracy of network topology and load information
* Use of multicast and other emerging content distribution mechanisms (e.g., Content-Centric Networking (CCN))
* QoS/QoE for Software-defined networking (SDN)
* QoS/QoE for content delivery networks and their interconnection
* Granularity of QoS control
* User nomadicity and mobility from QoS perspective
* Service level agreement between providers or between a provider and a customer
* QoS related policy taking into account the policy continuum (e.g. business policy, system policy, administrator policy, and device policy, and the mapping relationship among them)
* Use of overlay technology (peer-to-peer or otherwise) for routing around network congestion, reliable multicast support, etc.

Recommendations under responsibility of this Question can be found at <http://www.itu.int/ITU-T/studygroups/com13/sg13-q4.html>

**2 Question**

Study items to be considered include, but are not limited to:

* What new Recommendations or enhancements to existing Recommendations are needed to enable QoS/QoE support in the Future Networks (including software defined and autonomic networking), especially for performance-sensitive and bandwidth-demanding applications/services (e.g. IPTV, Telepresence)?
* What new Recommendations or enhancements to existing Recommendations are needed to leverage NGN QoS mechanisms in overlay, content delivery networks, and content centric networks, such as those for intelligent content delivery and reliable multicast?
* What new Recommendations or enhancement to existing Recommendations are needed for QoS/QoE support for network operating systems?
* What new Recommendations are needed to provide the resource control and management for achieving end-to-end QoS in a heterogeneous environment involving different QoS mechanisms and multiple provider domains?
* What new Recommendations or enhancement to existing Recommendations related to policy control are needed for deep packet inspection?
* What guidance is needed for ensuring that QoS/QoE matters raised by other Questions in Study Group 13 are addressed satisfactorily?
* What enhancements to existing Recommendations are required to provide energy savings directly or indirectly in information and communication technologies (ICTs) or in other industries? What enhancements to developing or new Recommendations are required to provide such energy savings?

Note: All new study items will take into account existing standards from other SDO’s (e.g. IETF and 3GPP).

**3 Tasks**

Tasks include, but are not limited to:

* Maintenance of the Recommendations in force that are under the responsibility of this Question
* Development of new Recommendations or enhancement to existing Recommendations on QoS/QoE support for
	+ Overlay and content delivery networks
	+ Network Intelligence Capability Enhancement (NICE)
	+ Smart Ubiquitous Networks (SUN)
	+ Software-Defined Networking (SDN)
	+ Future networks
	+ Network operating systems
* Development of new Recommendations or enhancement to existing Recommendations on end-to-end QoS/QoE
* Development of new Recommendations or enhancement to existing Recommendations in support of deep packet inspection
* Guidance to other Questions on QoS/QoE matters

**4 Relationships**

Recommendations: Y-series and Q-series

Questions: All NGN, Future Networks, cloud computing, IoT, IPTV and QoS related Questions

Study groups: SG12 on QoS and study groups related to NGN, Future Networks, cloud computing, IoT, and IPTV

Standardization bodies, fora and consortia:

* 3GPP
* ATIS CSF, IIF, PTSC, and PRQC
* Broadband Forum
* ETSI AFI ISG
* IEEE 802 LAN/MAN
* IETF

ANNEX 4
(to TSB Circular 37)

**Question 8/13 - Security and identity management in evolving managed networks (including software-defined networking)**

**1 Motivation**

SG13 is responsible for network-based security and identity management requirements and mechanisms in the context of all architectures developed within SG13. This particular Question, leads security studies, and coordinates security matters across all Questions in SG13.

While service providers of managed networks strive to provide the traditionally high degree of security, the threats on the evolving network infrastructure are on the increase – both in frequency and in complexity. This issue is complicated by the large number of organizations working on various aspects of security, making coordination and cooperation difficult and challenging. Recognizing that security is one of the defining features of the evolving managed networks, it is essential to put in place a set of standards that will guarantee, to the maximum degree possible, the expected levels of security. A few examples of new subjects under study in SG13 that require new managed networks’ capabilities are cloud computing, content delivery, programmability, smart ubiquitous networking, self-configured networks, context-aware services, social media, peer-to-peer services, and machine-to-machine communications. In addition to responding to the end-users’ security demands, all of these, as well as other services, must meet stringent security requirements for provision of emergency telecommunications (ET). To this end, ET has special security needs that must be addressed by standards.

As SG13 defines the respective managed networks’ architectures, it is evident that there is a need to address the relevant security aspects as part of the overarching effort. Consequently, this Question is motivated to provide the necessary network security specifications and guidance to accommodate the architecture-related work developed in SG13.

In addition, Study Group 13 needs to address, in the context of the architectures it develops, the broad IdM issues of concern to service providers, governments, and end users.

As networks evolve and new security threats appear, for which there is no known remedy, such threats must be properly documented so as to enable the network administrators and end users to mitigate them. Accordingly, the security studies must address managed networks’ architectures to provide for

* the appropriate network protection and information protection;
* security solutions that apply over multiple administrative domains;
* secure identity management.

The latest work program under the responsibility of this Question is available at:

<http://www.itu.int/ITU-T/workprog/wp_search.aspx?Q=8/13>

The default approval procedure for all Recommendations developed in this Question is the Traditional Approval Process (TAP).

**2 Question**

Study Questions to be considered include, but are not limited to:

* What are the security and identity management requirements for evolving managed networks as driven by new technologies (including software-defined networking (SDN)) under the responsibility of SG13?
* What security mechanisms are needed to meet these requirements?
* What enhancements to existing Recommendations are required to provide energy savings directly or indirectly in information and communication technologies (ICTs) or in other industries?

**3 Tasks**

Tasks include, but are not limited to:

* Lead the security studies within Study Group 13
* Ensure that the developed architecture is consistent with accepted security principles developed in ITU-T SG17
* Ensure that security solutions proposed in support of new technologies are consistent with security requirements of managed networks.

Specifically,

* Define the interoperable identity management (IdM) constructs in support of all managed networks’ architectures under the responsibility of SG13
* Specify framework for the support of new authentication and authorization services within the managed network and define the appropriate mechanisms and procedures
* Develop new ITU-T Recommendations or enhancements to the existing ITU-T Recommendations on security and identity management requirements and mechanisms in support of the above technologies
* Help other Questions in SG13 with developing the Security Considerations clauses of their respective ITU-T Recommendations
* Consider what enhancements to existing Recommendations are required to provide energy conservation directly or indirectly in information and communication technologies (ICTs) or in other industries. Consider enhancements to developing of new Recommendations required to provide energy conservation.

**4 Relationships**

Recommendations:

* Y.2700-series

Questions:

* All SG13 Questions

Study groups:

* All ITU-T Study Groups, ITU-R, ITU-D

Standardization bodies, fora, and consortia:

* ISO/IEC JTC1 SC 27
* ATIS
* ETSI
* TIA
* IETF
* 3GPP and 3GPP2
* OMA
* TM Forum

ANNEX 5
(to TSB Circular 37)

**Question 9/13 - Mobility management (including support for software-defined networking)**

**1 Motivation**

Towards the ultimate migration to interoperable and harmonized network architectures, there is an industry requirement to provide global roaming and seamless mobility for the users of different access technologies and/or different operators so that they can enjoy seamless services while moving within or across networks. The work on mobility management (MM) is based on the requirements established in Recommendations ITU-T Q.1706/Y.2801, Q.1707/Y.2804 and Q.1762/Y.2802.

In order to support mobility and feature ubiquity in various scenarios in the scope of SG13, it is necessary to first identify the issues and challenges concerning MM in evolving IMT and NGN, as well as other networks (including software-defined networking (SDN)) within the mandate of SG13.

Based on this identification study, the work will focus on developing common and generic building blocks of MM for service continuity over various heterogeneous systems and networks studied by SG13, while harmonizing with area-specific technologies covered by individual other Questions.

The overall work includes all aspects required in terminals, customer networks, access networks (both wired and wireless), core networks and application service networks. The outputs from this Question would be referred and used by the other Questions as a common framework to support MM requirements for their specific work areas.

Recommendations under responsibility of this Question include:

* Q.1706/Y.2801, Mobility management requirements for NGN
* Q.1707/Y.2804, Generic framework of mobility management for NGN
* Q.1708/Y.2805, Framework of location management for NGN
* Q.1709/Y.2806, Framework of Handover Control for NGN
* Q.1762/Y.2802, Fixed-mobile convergence general requirements
* Q.1763/Y.2803, FMC service using legacy PSTN or ISDN as the fixed access network for mobile network users
* Y.2808, Fixed mobile convergence with a common IMS session control domain
* Y.2809, Framework of mobility management in the service stratum for NGN.

Ongoing draft Recommendations under responsibility of this Question can be found at:

<http://www.itu.int/ITU-T/workprog/wp_search.aspx?Q=9/13>

**2 Question**

Study items to be considered include, but are not limited to:

* What is needed to support global roaming, seamless mobility and delivery of services within or across both evolving IMT and NGN?
* What is needed to provide access independent services across existing and evolving IMT and fixed networks?
* What enhancements are required to provide energy savings directly or indirectly in information and communication technologies or in other industries?
* What could be common and generic MM requirements to support mobility and feature ubiquity in emerging networks (including SDN) in the mandate of SG13?
* What is needed to develop common and generic MM frameworks to be referred and used for core capability of those emerging networks and services?

**3 Tasks**

Tasks include, but are not limited to:

* Identify or define the user and operator’s perspective of MM capabilities for evolving IMT and NGN, as well as emerging networks (including SDN) and services in the scope of SG13.
* Define the functional requirements and suggest common design principles for the MM capabilities for those emerging networks and services.
* Develop the general framework and the reference architecture including functional entities (FEs) and information flows required to provide the MM capabilities, which would be referred and used commonly by the other specific work areas.
* Allocate the FEs to physical entities in order to determine which interfaces can use or enhance existing protocols and which interfaces need development of new protocols for the necessary MM capabilities.
* Identify and study the applicability of convergence related standards in the context of the NGN architecture and MM requirements and documents these.
* Identify and study architectural and network interface issues relating to MM specific functions in the overall NGN architecture, and documents these.

**4 Relationships**

The execution of tasks of this Question will require close coordination and collaboration with:

Recommendations:

* Q.17xx-series, Y-series

Questions:

* All evolving IMT and NGN related Questions

Study groups:

* ITU Study Groups involved with MM and FMC studies

Standardization bodies:

* 3GPPs
* IETF
* IEEE
* Broadband Forum
* Other relevant bodies

ANNEX 6
(to TSB Circular 37)

**Question 11/13 - Evolution of user-centric networking, services, and interworking with networks of the future including Software-Defined Networking**

**1 Motivation**

Developments in information and communication technologies (ICTs) have wide impacts especially in enhancing the end user experience, not only by providing devices, but also advanced networking and services which will form part of smart user environments. Consequently these enhancements are also impacting the networks with variety of communication capabilities derived from various services and applications. Services and applications, especially coming from end user environments, are having more importance to whole process of communications such as configuration of resources, provision of capabilities and managements.

Considering Future Networks (FNs) environments identified in Recommendation ITU-T Y.3001, various awareness features are becoming important for communications. It is noticed that knowledge about the status of end user environments (in terms of services/applications and communication capabilities including end user networks) should be one of the important requirements for providing such awareness features.

User-centric networking and services enables end users to cooperate by sharing services and resources for interactions among people and objects using awareness features to support specific applications/services through dynamically organizing a collaboration group and sharing media in end user environment.

This question will investigate such importance of user centric networking and services and identify requirements and functions to support building of smart end user environments. This study will also provide end user requirements to the network side, especially to emerging networks in the scope of SG13.

In addition, as a continuation of previous study period, interworking aspects between different networks and services should be studied, and this study should be focused on the interworking between other networks and FNs including SDN whenever necessity of interworking is identified.

Thus the focus of this Question will include activities related to user centric networking and services considering end user environments including interworking.

Recommendations under responsibility of this Question include:

• Y.1911, Y.2281, Y.2291, Y.2062

**2 Question**

Study items to be considered include, but are not limited to:

• What new Recommendations should be developed for end user networks, including their ability to support specific applications/services?

• What new Recommendations should be developed to support object-to-object communication?

• What new Recommendations should be developed to support user centric services?

• What enhancements to the existing Recommendations should be made to enable interworking between the emerging networks (e.g., FNs including SUN) and end user networks (e.g., customer premises networks)?

• What new Recommendations should be developed for interworking fixed and mobile networks, networks of the future including Software-Defined Networking.

**3 Tasks**

Tasks include but are not limited to:

• Maintenance and enhancements of Recommendations ITU-T Y.1911, Y.2281, Y.2291 and Y.2062

• Development of new Recommendations related to end user networks and their specific applications/services in end users perspective (e.g., enhancement of home networks, personal area networks, etc.)

• Development of new Recommendations related to object-to-object communication among users with associate objects and their services considering Web of Things/Objects

• Development of new Recommendations related to user-centric services using knowledge-based context awareness in support of FNs including SUN

• Development of new Recommendations related to interworking of fixed/mobile networks (including specific networks, e.g., vehicular networks, smart grid networks) and services considering heterogeneous and constraint networking environments in end user side.

NOTE – An up-to-date status of work under this Question is contained in the SG13 Work Program(<http://www.itu.int/ITU-T/workprog/wp_search.aspx?Q=11/13>)

**4 Relationships**

Recommendations:

• I-, Q-, X- and Y-series

Questions:

• All SUN, SDN, FNs, IoT/M2M and home network related Questions

Study groups:

• All SUN, SDN, FNs, IoT/M2M and home network related study groups

Standardization bodies, fora and consortia:

• ETSI TC M2M

• IETF

* ONF

• 3GPP

• DSL Forum

• HGI (Home Gateway Initiative)

• IPSO Alliance

• OMA (Open Mobile Alliance)

• OGC (Open Geospatial Consortium)

ANNEX 7
(to TSB Circular 37)

**Question 14/13 – Software-Defined Networking and Service-aware networking of future networks**

**1 Motivation**

The number of network services is continuously increasing, and they are becoming even more diverse not only in traditional properties such as bandwidth and delay, but also power consumption, mobility, delay tolerance, security and so on. Future Networks (FNs) are necessary to accommodate these services without drastic increases in easiness and costs of deployment and operation. At the same time, to make diverse service flourish, it is preferable for networks to provide easy methods to do evaluation and/or small-scale deployment of new services. Considering these requirements, Recommendation Y.3001 identifies service awareness as one of the basic objectives of FNs to establish more effective way to tackle this conundrum.

Software-Defined Networking (SDN) and network virtualization are among promising technologies because they enable network operators to divide networks into partitions to make problem size smaller, and to control their networks in unified, programmable manner. This realizes multiple isolated and flexible networks in order to support a broad range of network architectures, services, and users that do not interfere with others. It is considered as one of the key technologies for FNs, and various SDOs have started to study these technologies in intensive manner, but overall framework that covers all telecom industry has not yet been defined. And there are other approaches to mitigate the diversity and complexity by e.g., introducing easily-manageable network architecture such as carefully-designed decentralization and autonomicity.

The Recommendations that specifies framework, service scenarios, requirements, and architecture of service-aware networking, in particular network virtualization and SDN technologies, fall under the responsibility of this question. As for SDN, the focus is on common part of SDN that is applicable to various networks, and its application to future networks.

**2 Question**

Study items to be considered, but not limited to:

• Requirements for the architecture to manage and to operate exploding and diversifying services and supporting functions in particular SDN and network virtualization

• Analysis of gaps between SDN, service-aware networking and existing standards and/or technologies

• Approaches, architectures and mechanisms for highly-scalable and distributed SDN and service-aware networking easy to control, operate and manage

• Issues and solutions for migrating from current IP-based network to SDN and service aware networking.

**3 Tasks**

Tasks include, but are not limited to:

• Produce new Recommendations on requirements, functional architecture and mechanisms of generic SDN, its application to future networks, and service aware networking.

• Produce Recommendations on general overview of service aware networking

**4 Relationships**

Recommendations:

• Y.3011, Y-series Recommendations

Questions:

• All SDN and FN related Questions

Study Groups:

• ITU-T Study Groups involved in SDN and FN studies

Standardization bodies, fora and consortia:

• ISO/IEC JTC1 SC 6

• ETSI ISGNetwork Functions Virtualization (NFV)

• Open Networking Foundation

• IETF/IRTF

• TMF

• BBF

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