Overview and Status of Future Networks Standardization in ITU-T

Takashi Miyamura† *and Akihiro Tsutsui*

Abstract

To overcome the limitations of the current Internet, research and development of future network technologies has been undertaken extensively in the USA, EU, and Asian countries including Japan. This article gives an overview of and describes the current status of Future Networks standardization in ITU-T SG13 (International Telecommunication Union, Telecommunication Standardization Sector, Study Group 13).

1. Introduction

ITU-T SG13 (International Telecommunication Union, Telecommunication Standardization Sector, Study Group 13) established the Focus Group on Future Networks (FG-FN) in January 2009 to investigate possible standardization items for Future Networks including the New-Generation Network (NWGN) and Future Internet (**Fig. 1**). Future Networks are expected to meet changing requirements into the future. The target time frame of the initial deployment or service trials of Future Networks is assumed to fall approximately between 2015 and 2020. FG-FN initiated an information exchange and discussion of the vision and possible key technologies for Future Networks [1]. FG-FN was closed in December 2010 and the discussions were taken over by SG13. The main deliverables, which are the outcome of FG-FN's activities, were published as the Y.3000 series of Recommendations at the SG13 meeting in October 2011.

Y.3001 describes the vision of Future Networks. Furthermore, to identify certain key technology areas, it was agreed in October 2011 that framework documents on network virtualization and energy savings of networks would be standardized as Y.3011 and Y.3021, respectively. In particular, discussions on network virtualization have been initiated from the FG-FN phase. Y.3011 incorporates several contributions submitted by NTT. This article presents an overview of the Recommendations for the Future Networks vision and for networks virtualization.

† NTT Network Service Systems Laboratories
Musashino-shi, 180-8585 Japan

2. Overview of Future Network vision

Y.3001 is the world's first standardization document about future network visions. This Recommendation identifies four types of awareness, twelve design goals, and key enabling technologies corresponding to each goal (**Fig. 2**). One of the twelve design goals is network virtualization, which has been identified as a key technology for achieving resource abstraction and has been standardized as Y.3011.

Service awareness describes some challenges in the creation and management of diversified services including broadband and narrowband services, diversified mobility, security, and privacy.

Environmental awareness addresses energy savings *of networks* and *by networks*. The energy saving of networks has been standardized as Y.3021.

Data awareness describes content-centric and data-centric networking architecture and identification. In identification, a framework document (Y.FNid) is being discussed for future standardization. Y.FNid includes an analysis of existing IDs (identities) and general requirements for future network IDs.

Finally, social and economic awareness addresses the need to reduce barriers to entry network

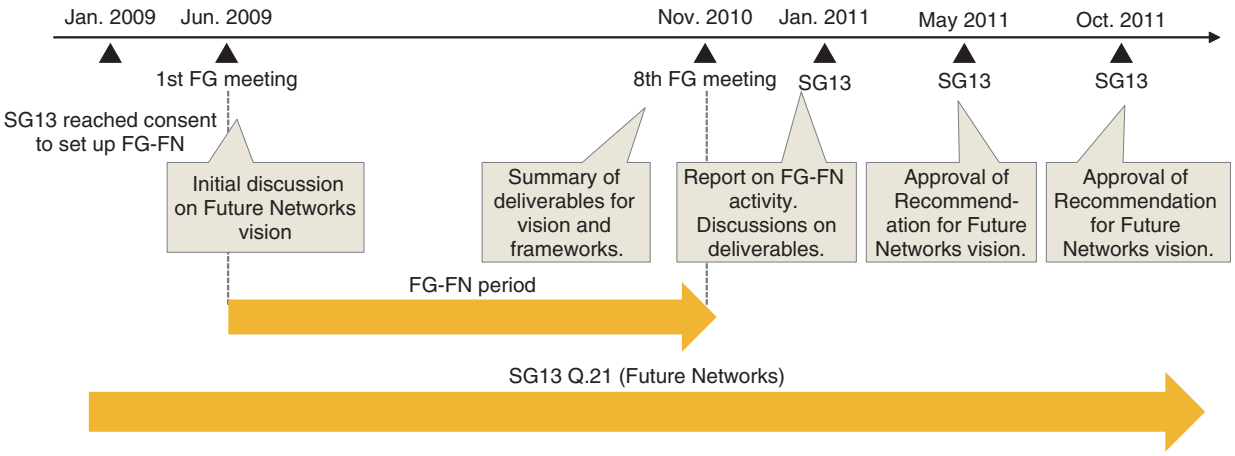

Fig. 1. FG-FN history.

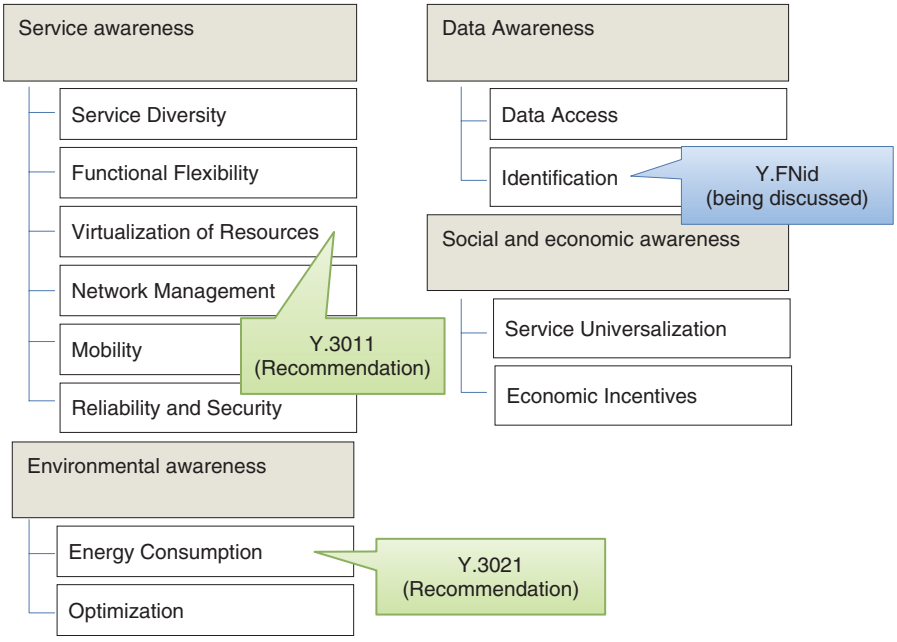

Fig. 2. Future Networks vision.

ecosystems and lifecycles cost for sustainability, which will contribute to service universalization.

3. Standardization status of network virtualization

Y.3011 identifies terminology of network virtualization technologies, technical challenges, design goals, applicability, and use cases. Network virtualization enables multiple service networks to be run over a common physical network infrastructure. It brings improved resource utilization through resource sharing, quick responsiveness to traffic changes and network failures, and simplified network management through resource abstraction. A framework for network virtualization is shown in **Fig. 3**. An

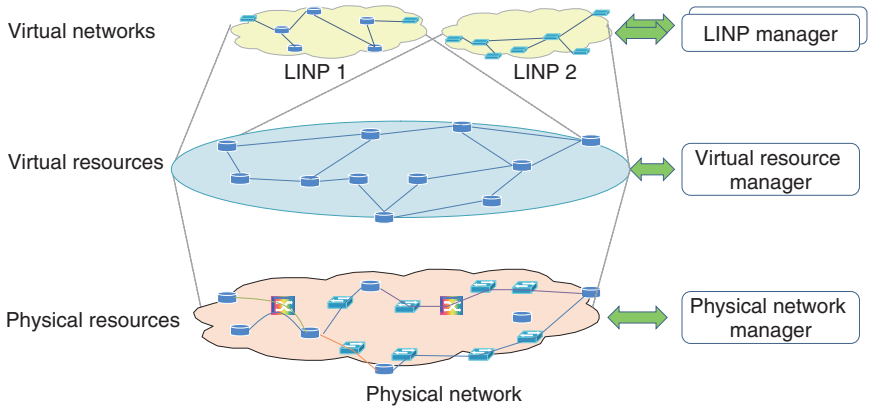

Fig. 3. Framework of network virtualization.

abstraction of physical resources is created by logically dividing and abstracting physical resources composing of physical networks such as nodes and links. The abstracted physical resources are called virtual resources. By combining multiple virtual resources, we can create a logical network called a virtual network or a logically isolated network partition (LINP).

Network virtualization enables the creation of multiple virtual networks which can be independently controlled and managed over the common physical network infrastructure. By creating different virtual networks for each service, we can accommodate multiple services with diversified requirements in the same physical network. Moreover, in network virtualization, the owner and user of network resources are separated, which means that a virtual network user is not required to own and deploy physical network equipment. This enables a virtual network to dynamically add and delete network resources from the common virtual resource pools in response to traffic demand changes and other environmental changes. Since the addition of virtual resources is much faster than the deployment of additional physical equipment, we can construct and operate service networks more efficiently and flexibly.

NTT submitted contributions concerning network virtualization requirements and use cases. For requirements, we proposed hard isolation among virtual networks; for use cases, we proposed the application of network virtualization to a carrier's transport networks. Those proposals have been included in the Recommendation.

4. Conclusion

In this article, we overviewed the Future Networks vision and network virtualization Recommendations in ITU-T. The frameworks of the two remaining types of awareness (data awareness and social & economic awareness) will be discussed to enable the publication of Recommendations. Regarding network virtualization, general requirements and high-level network architecture will be discussed. NTT will continue to contribute to Future Networks standardization.

Reference

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Takashi Miyamura
Senior Research Engineer, Backbone Networking Systems Group, Broadband Network Systems Project, NTT Network Service Systems Laboratories.

He received the B.E. and M.E. degrees from Osaka University in 1997 and 1999, respectively. In 1999, he joined NTT Network Service Systems Laboratories, where he engaged in R&D of a high-speed IP switching router. He is now researching future photonic IP networks and an optical switching system. He received the 2001 APCC Paper Award at the 7th Asia-Pacific Conference on Communications. He is a member of IEICE and the Operations Research Society of Japan.

Akihiro Tsutsui
Senior Research Engineer, Supervisor, NTT Network Innovation Laboratories.

He received the B.E. and M.E. degrees in systems engineering from Kobe University, Hyogo, in 1988 and 1990, respectively. Since joining NTT in 1990, he has been researching programmable network devices, high-performance Internet protocols, and home networking. His current interests include terabit-level scalable communication technologies and architectural modeling of the future Internet.