The New Generation Network Promotion Forum and its Activities

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The New Generation Network Promotion Forum was established in 2007 to foster activities associated with the future network, such as R&D, studies of social and economic aspects, technical standardizations, technical verifications using testbeds, creation of strategies for future services and smooth transition from the conventional IP network to the future network. The forum pursues its tasks in industry-academia-government collaborations.

1   Introduction

The New Generation Network Promotion Forum (hereinafter "the Forum"[1]) was established in November 2007, for the purpose of gathering knowledge from various fields, and studying them strategically, to create a new-generation network based on new design concepts and technologies, free of the constraints of existing technologies.

As of December 2015, the Forum was comprised of a total 330 members, working mainly in the promotion committee and the 5 Working Groups (hereinafter "WG").

Initially, the Forum focused its activities on redesigning a new network from a clean slate, and promoting research and development of elemental technologies. As a result, it proposed the priority R&D items and their implementation strategy which gave rise to various benefits, such as the formation of international standardization Recommendations on future networks by ITU-T SG13. Currently, it continues its activities, shifting the focus to implementation in societies based on use cases and technical evaluation, etc.

2   Background and purpose for establishment of the Forum

The expansion of Internet usage has made the information network an indispensable social infrastructure, leading to the advancement of performance and functions of IP networks. On the other hand, there were growing worldwide movements towards creating a new generation network based on new design concepts and technologies, free of the constraints of existing technologies. In light of this status, the Ministry of Internal Affairs and Communications organized a "Study Group on Network Architecture" from January to July 2007. The Study Group discussed concepts for and technical issues involved in a new-generation network, and measures to promote its achievement. It expressed the importance of ensuring Japan's global competitive strength by taking the lead globally in achieving a New-Generation Network.

In response to this discussion, the Forum was established as an umbrella organization to bring together the knowledge and expertise of industry, academia and government, in order to develop a roadmap leading from fundamental research to applications, study social and economic aspects, promote international standardization, advance technical evaluation, etc.

The organizing committee started preparing to set up the Forum, and on November 6, 2007, held an organization meeting to select the board of directors, and approve the charter certificate, bylaws, activity policy and other such matters before the forum was formally established.

Based on the above background, the objective of the Forum's activities was defined as "While working on continual expansion and deployment of current networks, construct a system to incorporate knowledge from a wide range of fields in a collaborative effort between industry, academia and government, and advance activities on research and development from a more strategic and comprehensive viewpoint, towards creating the New-Generation Network based on new design concepts and technologies, free of the constraints of existing technologies" (Article 2 of its Rules).

Further, in order to achieve the above objectives, it was decided to carry out the following projects (Article 3 of its Rules).

(1) Projects for achieving the New-Generation Network
  −Study strategies for research and development, ranging from fundamental research to application
  −Study social and economic aspects of the New-Generation Network
  −Advance the development of testbed networks and technical evaluations, etc.
  −Share, communicate and inform people about the vision for the New-Generation Network
  −Encourage international cooperation with organizations of Europe, the U.S. and Asia

(2) Facilitate the smooth transition from the existing networks to the New-Generation Network

These projects were allocated to the organizations described in the next section. As shown in Fig. 1, it was decided to bring forward all the activities with the target year 2015, keeping a watch on overseas trends and cooperating with related groups as necessary.

3 Organization and activities of the Forum

Figure 2 shows the organization of the Forum. The General Assembly meeting is held regularly once a year, and may also be held additionally when necessary for replacement of an officer or otherwise (discussed through emails). The executive committee is comprised of 23 representatives of the related companies and organizations as well as academic experts, and besides approving new membership applications, it also proposes important matters concerning the operation of the Forum to the General Assembly, and votes on matters approved by the Chairman.

The activities and the results of the activities of the

New-Generation Network Promotion Committee, the R&D Strategy WG, the Assessment WG, the Testbed Network Promotion WG, the Implementation Strategy WG, and the IP Network WG, all of which carry out the core activities of the Forum, are described below.

3.1 New-Generation Network Advisory Committee

The advisory committee is comprised of 16 academic experts. It works to promote international cooperation associated with the New-Generation Network, study strategy for standardization of technologies, and survey overseas trends. The main activities of this committee are summarized below.

● In the course of its international cooperation activities, the committee has cooperated with the European Commission (EU) and the National Science Foundation (NSF), and held international symposia and workshops to discuss the New-Generation Network 8 times in total (5 times Japan with Europe, and 3 times Japan with the U.S.). Further, for joint research of Japan with Europe and Japan with the U.S., the committee has built a scheme for research funding provided from the respective countries, and is promoting joint research projects between Japan and the U.S. (14), and Japan and Europe (10).

● The matters regarding standardization of technologies are mainly discussed by the Standardization Promotion Subcommittee set up in September 2009. This subcommittee is held every 2 months approximately, and it mainly works on deliberation of strategies for standardization activities of ITU-T SG13. As a result, 16 recommendations were enacted as Y.3000 series on the New Generation Network by the end
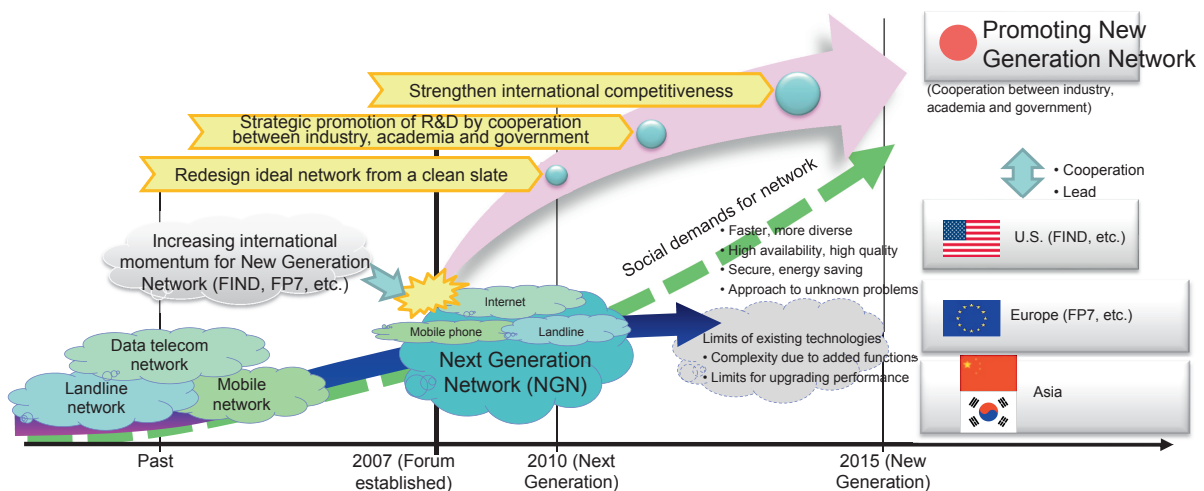

Fig. 1 Roadmap of the Forum Activities

General Assembly
Chairperson: Tadao SAITO (Prof. Emeritus, The University of Tokyo)
Vice Chairperson: Tomonori AOYAMA (Prof. Emeritus, The University of Tokyo / Visiting Professor, Faculty of Science and Technology, Keio University)
Yoshiaki UCHIDA (Managing Executive Officer and General Manager, KDDI)
Hiromichi SHINOHARA (Exec. VP, NTT)

New-Generation Network Advisory Committee
Chair: Tomonori AOYAMA (Prof. Emeritus, The University of Tokyo / Visiting Professor, Faculty of Science and Technology, Keio University)
• Advice on international collaboration from academic standpoint

Standardization Promotion Committee
Chair: Makoto IMASE (Director, NICT)

Executive Committee

R&D Strategy Working Group
Chair: Masayuki MURATA (Professor, Graduate School of Information Science and Technology, Osaka University)
• Study strategies for R&D, from fundamental research to applications (policy, roadmap)

Assessment Working Group
Chair: Osamu SUDOH (Professor, Graduate School of Interdisciplinary Informatics Studies, The University of Tokyo)
• Study social and economic aspects of the New Generation Network

Testbed Network Promotion Working Group
Chair: Yuji INOUE (Chairman of the Board, TOYOTA InfoTechnology Center Co., Ltd.)
• Promotion of use of testbed networks, technical demonstration, etc.

Implementation Strategy Working Group
Chair: Hideyuki TOKUDA (Dean of Graduate School of Media and Governance Professor, Faculty of Environment and Information Studies, Keio University)
• Study strategy for practical implementation of the New-Generation Network in societies, share, communicate and inform people about the vision of the New-Generation Network

IP Network Working Group
Chair: Shigeki GOTO (Professor, Faculty of Science and Engineering, Waseda University)
• Continual expansion and deployment of next generation IP network, promotion of migration to the New-Generation Network, etc.
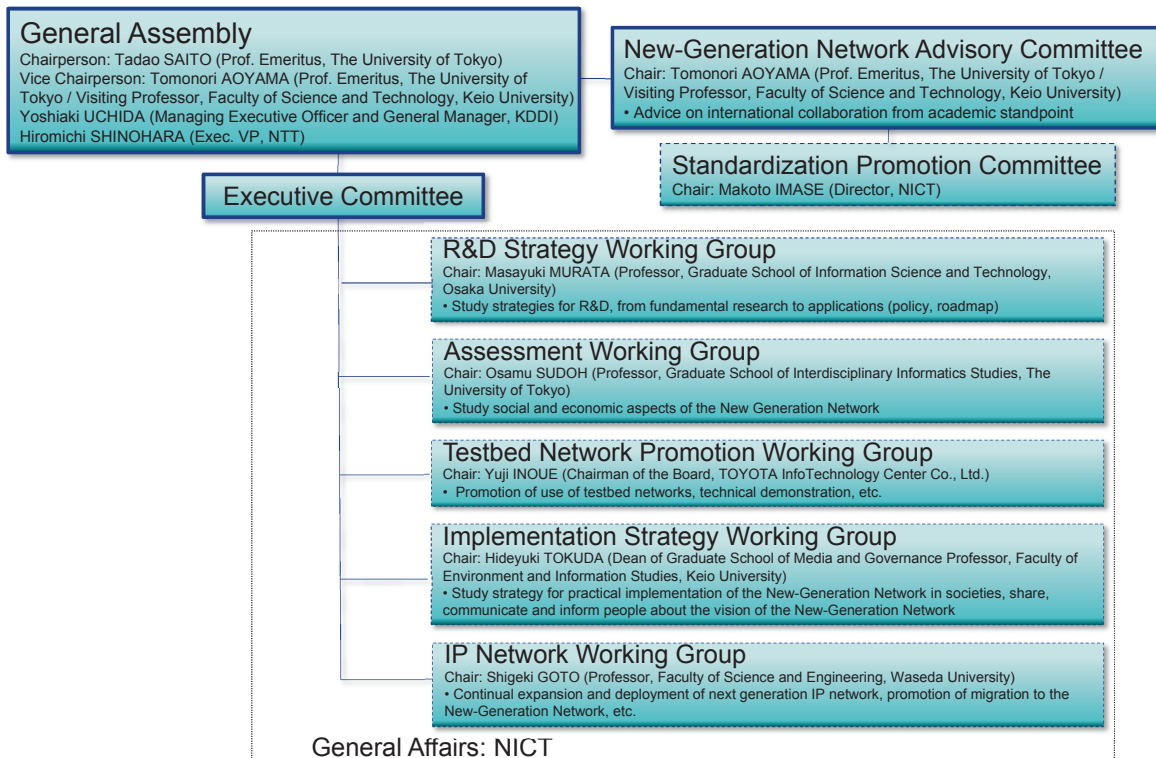
General Affairs: NICT

Fig. 2 Organization chart

of 2014[2].

The increasing interest in the standardization of the network virtualization technologies after the enactment of the Y.3000 series led to the establishment of the specialist working groups under the promotion subcommittee in August 2012, which focuses discussions on the standardization of network virtualization and also Software Defined Networking (SDN).

- The committee members survey cutting edge activities of such foreign organizations as GENI, FIND, US-Ignite, GEC and ONF in the U.S.; EU, FP7, FIRE, FI-PPP and NFV in Europe; and Asia FI and APAN etc. in Asia.

3.2 R&D Strategy WG

This WG is involved in drawing up R&D strategies for the New-Generation Network, as well as promoting research and development ranging from fundamental research to applications, and creating a roadmap. The main activities of this WG are summarized below.

- Based on the advice of experts from industry, academia and government, this WG has helped in developing the "Proposal for priority R&D for the achievement of the New Generation Network, and its implementation strategy," including 31 priority R&D items. As a result of discussions for a total 100 hours,

the WG finally completed the proposal in 2009.

- Based on the above proposal, NICT then proceeded to work on the R&D on network virtualization technologies across Japan and the R&D on information delivery infrastructure from 2010. Consequently, this has led to results such as the creation of many research papers, cited papers and patents (pending).

- The abovementioned priority R&D items were restudied from user and global viewpoints to extract R&D issues. As a result, a demonstration model of the New-Generation Network technologies was developed based on the 3 use case scenarios given below.
  - Predict and prevent network failures based on analysis of information collected from virtual and real spaces
  - Remote collaboration work using ultra-high definition video
  - Emergency traffic and facility control during a disaster or event

Concurrently, as part of its collaboration task with the Assessment WG described below, the R&D Strategy WG studied strategies for paradigm shift-type R&D targeting a new market, with emphasis on use cases of areas where the

core services are not provided by communications businesses, and also studied the exit strategy.

Presently, the WG is also studying issues which need to be identified henceforth based on the technical evaluation activities carried out in relation to the abovementioned 3 models.

3.3　Assessment WG

The Assessment WG is studying the social and economic aspects of the New-Generation Network. It has interviewed experts and related companies, and based on literature surveys, it is also studying predictions of how the socio-economy will be affected by the introduction of the New-Generation Network technologies. Its main activities are summarized below.

- In 2008 and 2009, the 3 issues listed below were identified and studied as issues which were attracting a high level of public interest and considered to be of strategic importance:
  - Health, medical care and public welfare (drug management, health information databases, etc.)
  - Network robots (intelligent buildings, nursing care and nursing support systems, remote medical care, etc.)
  - Lifestyle (green life, remote realistic sensations, etc.)

As a result of the studies, the WG identified the "Important applications," and sorted out an image of the implementation, technology requirements, socio-economic requirements, as well as new issues likely to arise.

- From 2010 to 2014, the focus of the studies was mainly on the network virtualization technologies, which were gaining more and more interest.
- In the first half, the WG started examining the business model to see if the New-Generation Network technologies could be applied. In the latter half, the commercialization of the technologies had already progressed, so it interviewed companies providing actual business, then set various parameters and preconditions from the result, and tried quantifying the economic effects.
- From 2014 onwards, it took applications as the starting point, and studied the image of the society after the introduction of SDN, NFV and other future network technologies. The study included the investigation of trends of foreign organizations such as US Ignite, and is working with a view to contributing to the 2020 Tokyo Olympics and Paralympics.

3.4　Testbed Network Promotion WG

This WG is studying the promotion strategies associated with technical evaluations using the testbed networks as well as strategies for promotion for use of the testbed networks[3]. The main activities of this WG are summarized below.

- NICT first developed a testbed for R&D (JGN: Japan Gigabit Network) when it existed as the Telecommunications Advancement Organization (TAO). Subsequently, in 2004, it started the operation of an upgraded version of this testbed as "JGN2," which was prepared for a large-scale multicast environment and IPv6 testbed, and from 2008, it had operated a further upgraded version as "JGN2plus," a cutting edge testbed incorporating expanded network functions and performances with a view to developing the New-Generation Network. After the Forum was established, the Testbed Network Promotion WG, in cooperation with NICT, promoted a wide range of research activities for technical evaluation of various applications, and R&D of cutting edge network technologies, etc. A total of 122 research projects have been performed using JGN2plus, with 384 participating organizations.
- In 2011, the operation of JGN2plus ended, and JGN Extreme (JGN-X) started operating in its place as the new testbed environment for implementation and deployment of the New-Generation Network. JGN-X features the ability to implement and evaluate in an environment similar to one in which the developed elemental technologies are actually used, and it can be linked to other testbeds such as StarBED[3] which is a large-scale emulator, thereby providing a comprehensive testbed environment that enables experiments ranging from emulation to wide-area network verification.
  As of March 31, 2015, a total of 131 research projects have been performed using JGN-X, with 284 participating organizations.
- Network virtualization testbeds were built on JGN-X, and started being provided for use from 2013. From fiscal 2015, they were opened to the general public, and 908 network slices have been used so far.

3.5　Implementation Strategy WG

This WG was initially named the "Planning WG." Its tasks were to share the vision, communicate information, and carry out activities to inform and educate people. From

2014, while continuing to perform its earlier activities, it is also studying the commercial viability of the New-Generation Network and strategies for the implementation in societies as its major task. The main activities of this WG are summarized below.

- The 2020 Tokyo Olympics and Paralympics are set as the present target of the working group, and it is studying cross sectoral measures and policies considered to be required for future services to be created using the technologies developed through R&D.

- The four pillars of these measures and policies are presumed to be the construction of the business platform, cooperation with local governments, cross-industrial cooperation, and personnel training, which are being studied collectively by 8 members under the Chair. The results of this study will be summarized by pointing out the current issues and problems in the measures, with suggestions for improvements. In the study process, as the output of the activity, the WG submitted the public comments on the content of the interim report of the Ministry of Internal Affairs and Communications.

- Since the time it was named the Planning WG, the working group actively participated in the work for the events hosted by NICT, the Institute of Electronics, Information and Communication Engineers (IEICE) and other institutions as part of its tasks, and is working to inform and spread the New-Generation Network technologies. The major activities in recent years are given below.
  - At the 6th New Generation Network Symposium organized by NICT (July 2014), a panel discussion was held to discuss implementation of the future services in societies with the Tokyo Olympics and Paralympics as targets.
  - The 30th anniversary event of the IEICE Technical Committee on Information Networks (IN Technical Committee) (October 2012).

- Also, the WG has been involved in publicity work using the Forum web site etc., and planning and implementing cooperation between the Forum working groups and events such as lecture meetings at the General Assembly.

3.6 IP Network WG

The "Next Generation IP Network Promotion Forum"[4] established in 2005 was dissolved in 2010 after bearing results in its activities. Some of its activities were then transferred to this Forum, and this WG was launched to focus on these activities[5].

The tasks of the WG are to continually expand and deploy the IP networks which had been developed, and to study how migration to the New-Generation Network from the conventional IP network could be achieved smoothly. The main activities of this WG are summarized below.

- It revised the "Operation Guidelines for smooth provision of mobile phone services using Femtocell Base Stations" which were drafted by the former Next Generation IP Network Promotion Forum in August 2008, and drafted the new "Application Guidelines for smooth provision of BWA service using Femtocell Base Station" and announced them in September 2013[6].

- The working group collaborated with the Telecommunication Technology Committee (TTC) WG3600 (Next Generation Home Network System Working Group) to create the TTC Technical Report TR-1043, "Guidelines for Implementation of Home Network Communications Interface." Thus, the communication standards for home network of control systems such as the smart meter B route and HEMS of Japan were defined.

The international standard ITU-T SG13 Y.2070 "Requirements and architecture of home energy management system and home network services" recommendation was also made through collaboration with TTC WG3600[2].

- It cooperated with TTC, ZigBee Alliance, Wi-SUN Alliance, G3 Alliance, and HD-PLC Alliance to set various standards for home networks[7]. These standards can be quoted in documents of ITU-T etc. as official national standards.

4 Conclusion

This document mainly describes the activities and achievements of the New Generation Network Promotion Forum. The activities of the Forum proceeded with 2015 as the target, and the commercialization of SDN and NFV in recent years shows that the initial goals of R&D on the network elemental technologies have generally been achieved. The focus of the activities in the future should shift to technical evaluation/demonstration of the developed technologies and their implementation in societies, and accordingly, the Forum plans to conduct such activities, including formation of a desirable promotion organization.

5   Acknowledgments

We would like to express our gratitude for the valuable opinions we received from each WG and many other people in putting this paper together.

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