R&D Strategy toward New Generation Network (NWGN)

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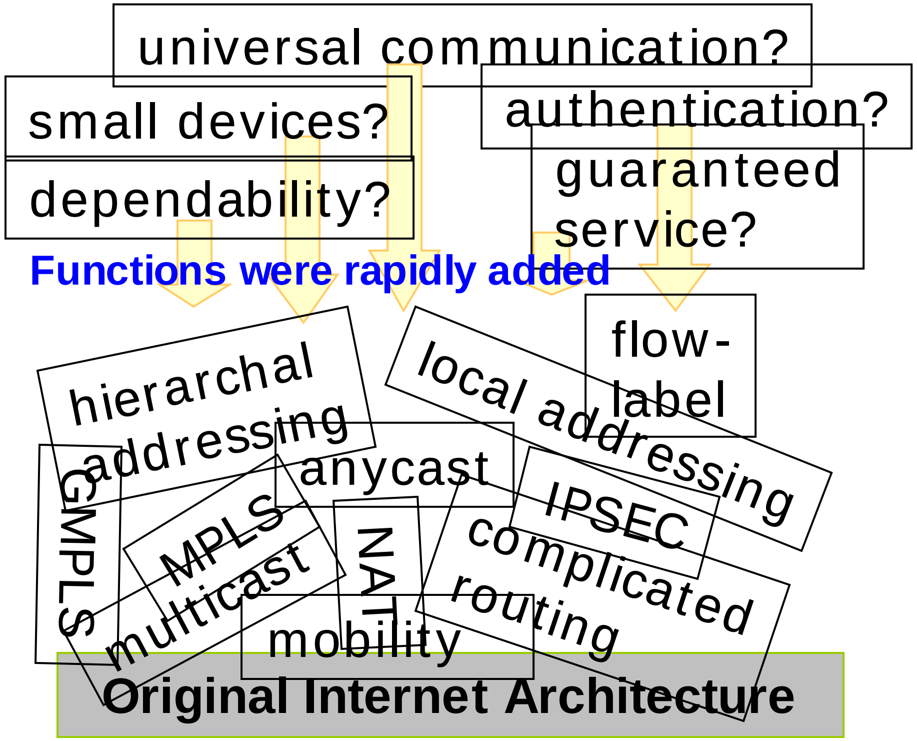
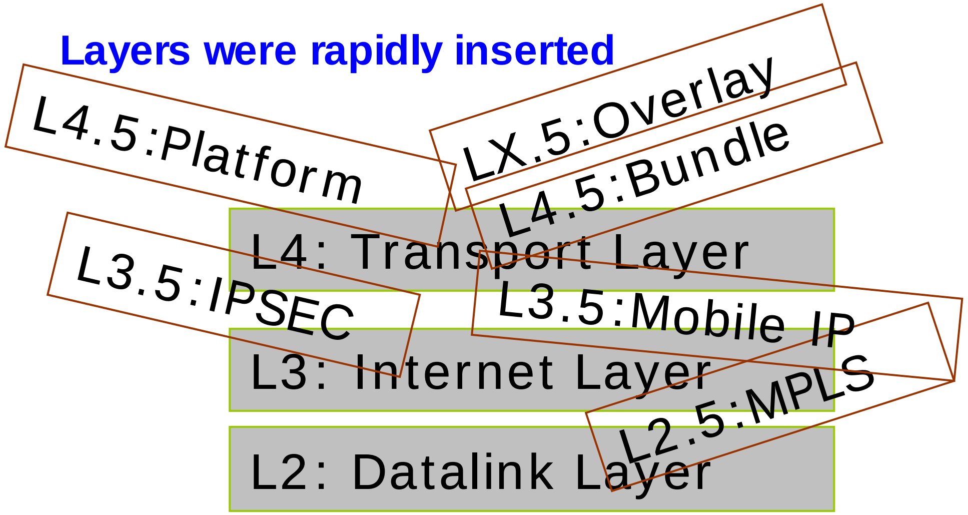
Universal Communications

Whether Internet is sustainable or not ?

1. Too complex ! Become more and more difficult to add new functions


universal communication?
small devices?
authentication?
dependability?
guaranteed service?
Functions were rapidly added
flow-label
hierarchal addressing
local addressing
anycast
GMPLS
MPLS
multicast
NAT
IPSEC
complicated routing
mobility
Original Internet Architecture


Layers were rapidly inserted
L4.5:Platform
LX.5:Overlay
L4.5:Bundle
L4: Transport Layer
L3.5:IPSEC
L3.5:Mobile IP
L3: Internet Layer
L2.5:MPLS
L2: Datalink Layer

2. Capability to meet rapidly growing Information traffic

-Amount of total traffic of broadband subscribers in Japan reached 721.7Gbit/s in May 2007,
-40% growth from previous year and 70% from two years ago. **(From MIC press release of Aug 2007)**

-It will reach 1 terabit/s (1,000Gbit/s) around 2008, and 1 petabit/s (1,000 terabit/s) in the 2020’s.

Whether Internet is sustainable or not ?

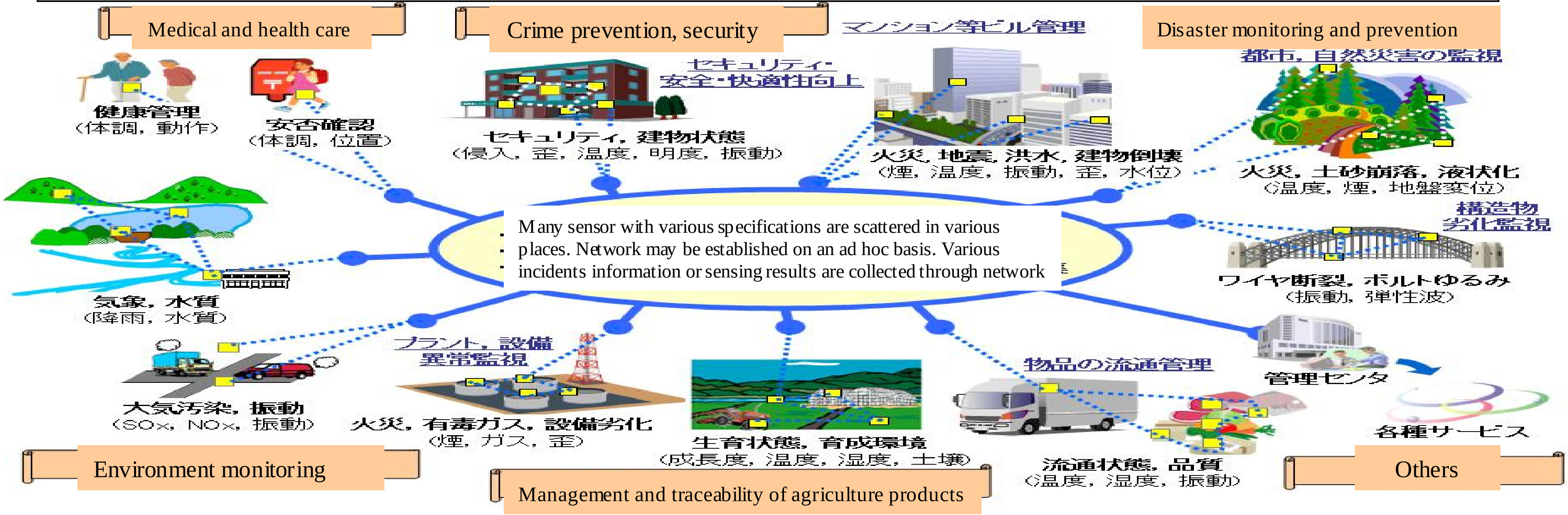
3. Economic damage from security incidents is increasing

Economic loss from spam mail in Japan is estimated 5 billion dollars in 2005. (US Ferris Research) Sufferers from personal information leak are 22 million in 2006 and estimated compensation amounts to 457 billion yen. (Japan Network Security Association) Information security market is growing and will reach 800 billion yen in 2011. (Fuji Chimera Research Institute) Cyber attack to threaten company is increasing.

4. Power consumption of ICT equipments is increasing rapidly

1.2 Tbps (/ shelf) router's power consumption is 15.5 KW. If linear relationship is maintained, estimated power consumption of petabit class router could be about 10,000 KW. 100 petabit class routers may consume all power from one atomic generator.

5. Possibilities to meet the requirements from ubiquitous applications



Many sensor with various specifications are scattered in various places. Network may be established on an ad hoc basis. Various incidents information or sensing results are collected through network

Medical and health care
Crime prevention, security
マンション等ビル管理
Disaster monitoring and prevention
都市，自然災害の監視
健康管理
（体調，動作）
安否確認
（体調，位置）
セキュリティ・
安全・快適性向上
セキュリティ，建物状態
（侵入，歪，温度，明度，振動）
火災，地震，洪水，建物倒壊
（煙，温度，振動，歪，水位）
火災，土砂崩落，液状化
（温度，煙，地盤変位）
構造物
劣化監視
ワイヤ断裂，ボルトゆるみ
（振動，弾性波）
気象，水質
（降雨，水質）
プラント，設備
異常監視
大気汚染，振動
（SOx，NOx，振動）
火災，有毒ガス，設備劣化
（煙，ガス，歪）
生育状態，育成環境
（成長度，温度，湿度，土壌）
物品の流通管理
流通状態，品質
（温度，湿度，振動）
管理センタ
各種サービス
Environment monitoring
Management and traceability of agriculture products
Others

Consideration items to develop NWGN

Possible sustainable solution ⇒ New Generation Network

We started the development of NWGN concepts. Followings are major consideration items (but not exhaustive);

- Safety and reliability of network
- Integration of packet and circuit switches (optical paths) through the introduction of all optical signal processing at switching node and significant power conservation.
- Flexible access systems including wireless and mobile
- Assumption of various terminals ranging from high end servers to sensor devices
- Higher network performance (transmission speed, robustness, sustainability, etc.)
- Virtualization of network resources
- etc.

Strategic approaches for the development of NWGN

- **Promotion of strategic R&D of key technologies**

  ex. New network architecture, virtualization technologies, dynamic network technologies, ubiquitous/sensor network technologies, wireless technologies, information security technologies, etc.

- **Promotion of experiments using the fruit of R&D**

  ex. Development of test bed network and other test beds

- **Consensus building through the consideration of social and economic impacts of new technologies and systems**

  ex. Information security, privacy, environmental impacts, open network conditions, sustainability of network, etc.

- **Strengthening of capability to cope with diversification of global market**
- **Promotion of international collaboration**

Core organizations to promote R&D of NWGN

NICT

Establish "New Generation Network R&D strategic headquarter" in Oct. 2007

Chairperson: President Miyahara

- -Development of mid- and long- term R&D strategies toward NWGN
- -Measures to promote R&D in NICT and organizational framework to realize them
- -Measures to promote international cooperation

◆ In NICT, following activities are promoted; design of network architecture of NWGN, R&D of optical node, overlay network fundamental technologies and etc., experiments using test bed network JGN2.

◆ R&D funding to industry or academy for the development of dynamic network technologies, photonic network technologies, etc.

Develop strategies reflecting ideas from different fields

Contribution to Forum activities

"New Generation Network Promotion Forum" established in Nov. 2007

Chairperson: Dr. Saito, professor emeritus of Tokyo University

-Open forum for everyone (engineers, economists, consumer associations, etc.)

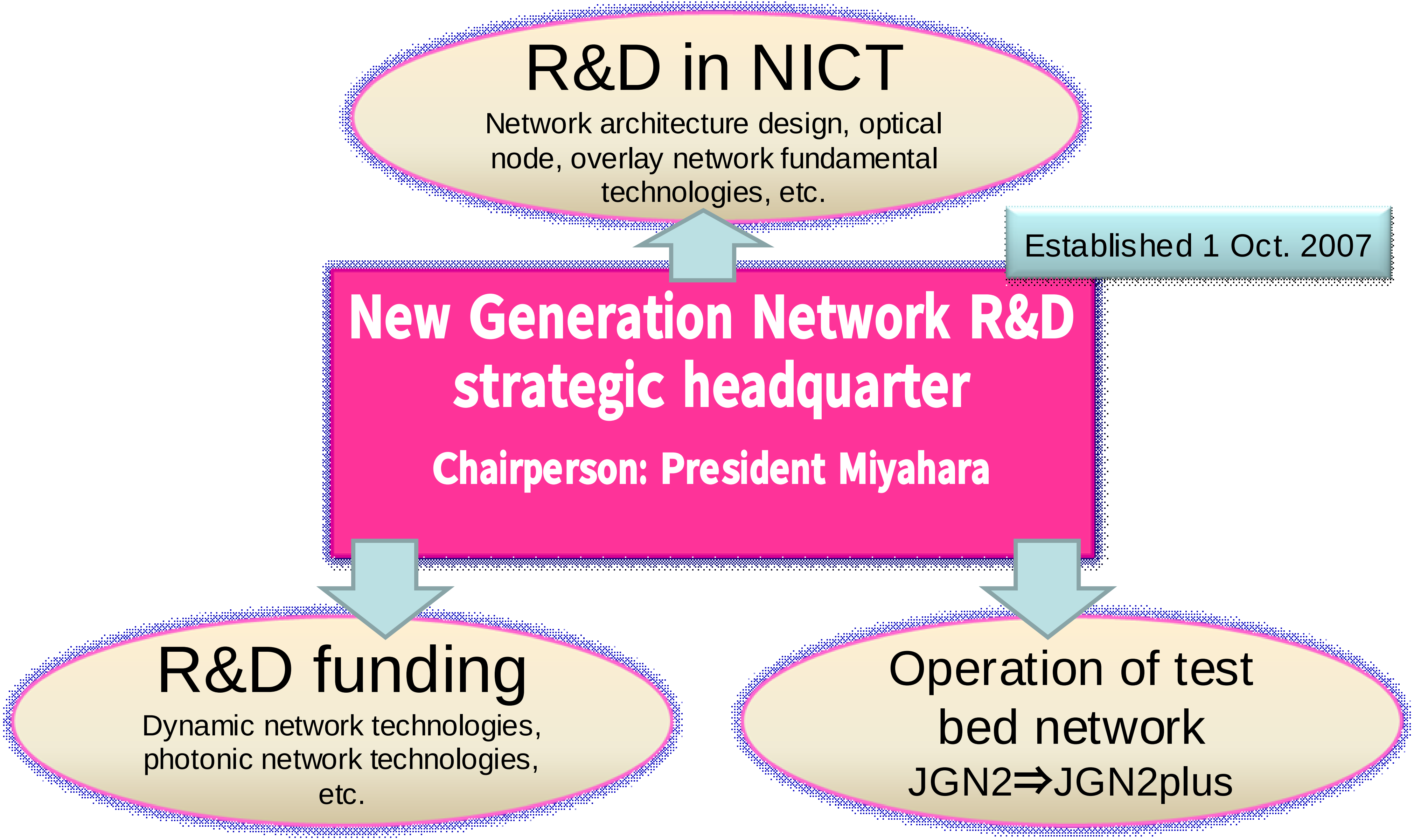
-Promote R&D through the cooperation of industry, academy and government

Activities

- -R&D policies and road maps making for NWGN
- -Consideration of social and economic aspects of NWGN
- -Promotion of international cooperation through international symposium and workshop

Based on R&D strategies developed by NICT, we plan to promote strategic R&D to realize NWGN.

R&D related activities of NICT



R&D in NICT

Network architecture design, optical node, overlay network fundamental technologies, etc.

Established 1 Oct. 2007

New Generation Network R&D strategic headquarter

Chairperson: President Miyahara

R&D funding

Dynamic network technologies, photonic network technologies, etc.

Operation of test bed network

JGN2⇒JGN2plus

Organization of New Generation Network Promotion Forum

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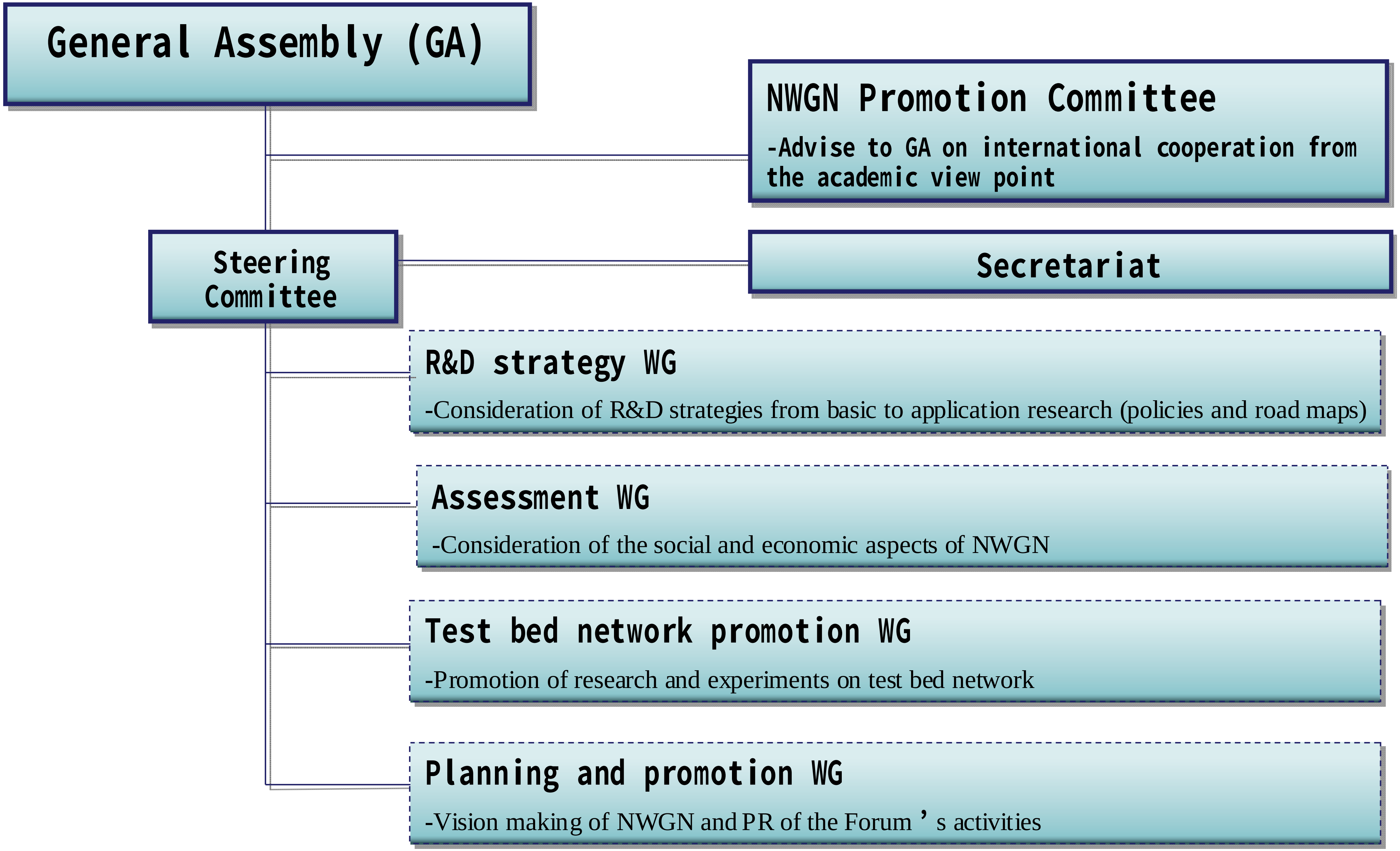

General Assembly (GA)

NWGN Promotion Committee

-Advise to GA on international cooperation from the academic view point

Steering Committee

Secretariat

R&D strategy WG

-Consideration of R&D strategies from basic to application research (policies and road maps)

Assessment WG

-Consideration of the social and economic aspects of NWGN

Test bed network promotion WG

-Promotion of research and experiments on test bed network

Planning and promotion WG

-Vision making of NWGN and PR of the Forum’s activities

http://nwgn-forum.nict.go.jp