Research and Development to support NEC's growth strategy toward NGN era

June 29, 2006

NEC Associate Senior VP & Central Research Laboratories Executive GM
Takemitsu Kunio
NEC Solutions Development Laboratories Executive GM
Yutaka Kasahara

Topics

1. Overview of Intellectual Asset R&D Unit

2. R&D to support NEC growth strategy toward NGN era

Today's Theme

May 29, 2006
Strategic Direction Material
By K. Yano

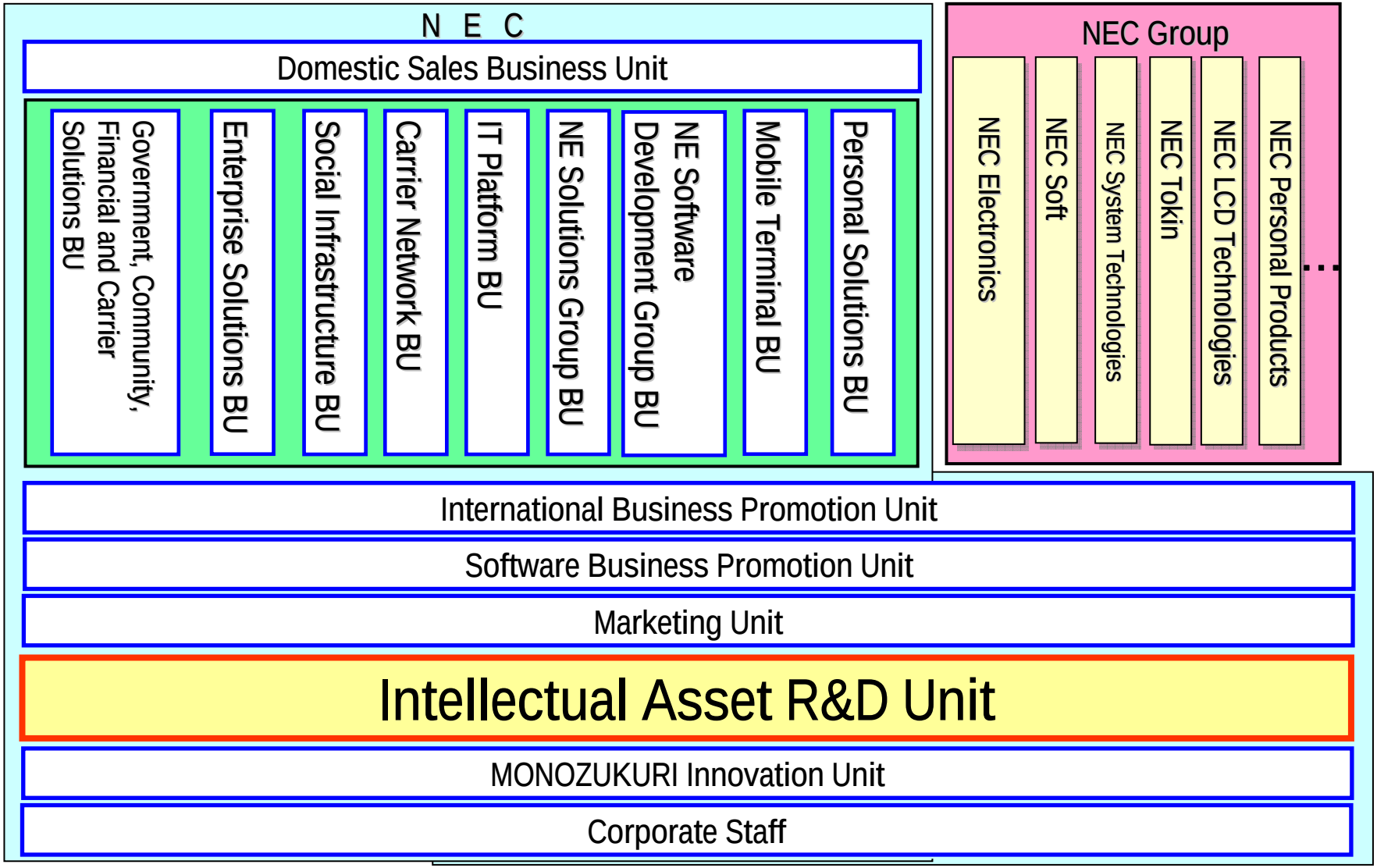
A Global "Innovation Company"

- Fuel growth with NEC's Technology Competence
  - Creating globally competitive products
  - Converging NEC strengths
    Hardware + Software, IT + Network + Device
- Innovation for the customer
  - New solution, business model ・・・
- Re-expand Global business

Introduce technology and solution that contribute to NEC growth strategy

Positioning of Intellectual Asset R&D Unit

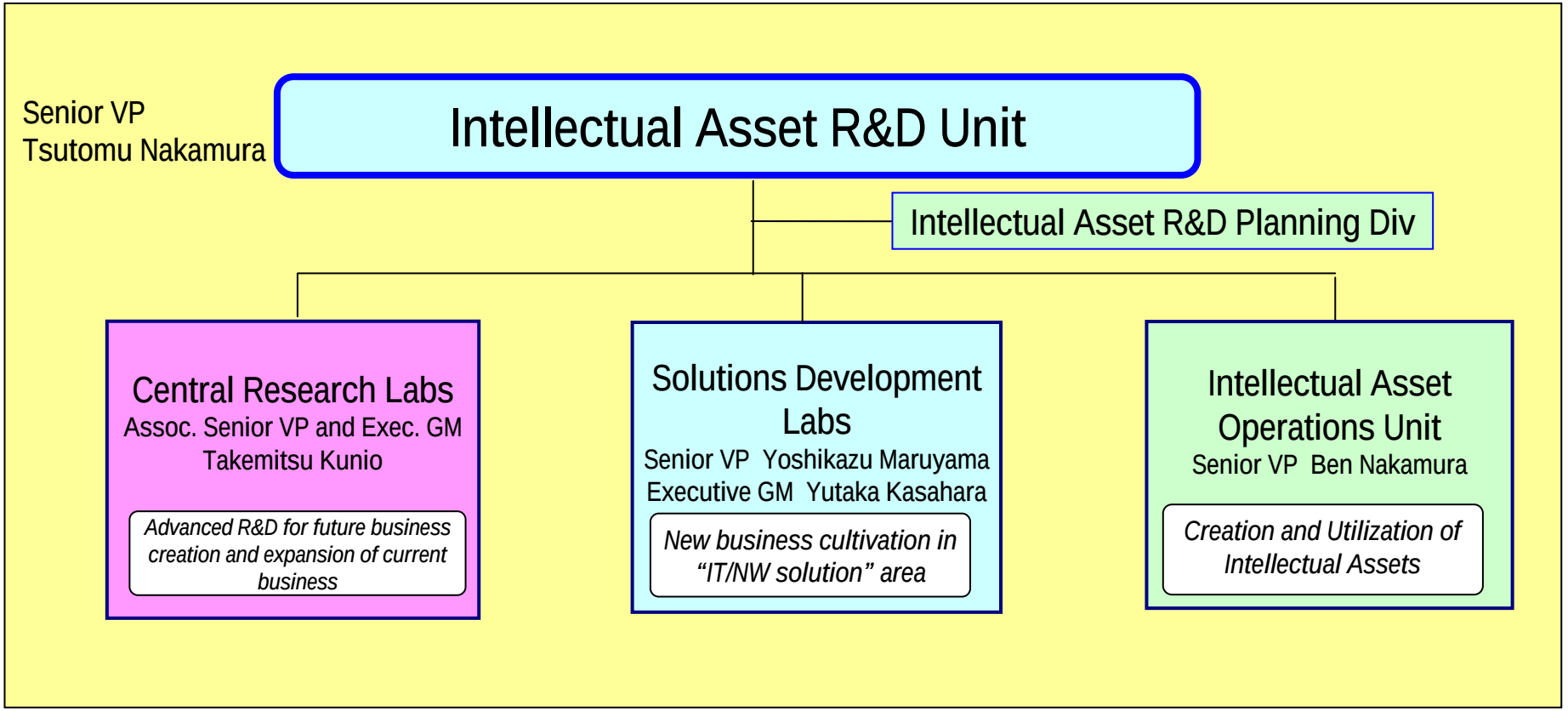
(As of April 2006)



BU:ビジネスユニット

Mission and Organization of Intellectual Asset R&D Unit

Mission : Continuous creation of innovation to support “Technology driven NEC”, and contribute to growth of NEC group



Reference

Central Research Laboratories

Central Research Labs

T. Kunio Exec GM (and System Device area)

H. Katayama VP (IT/SL area, Personal area, Future Core Tech Research)

S. Suyama VP (NW-SL area)

K. Nakanishi ASVP (Production/Environment related technology)

Research Planning Div K. Emura (Mid/long term strategy, IPR rights)

R&D Support Center S. Wada (Technology support, prototype equipment and parts)

Internet Systems Research Labs — T. Yamanouchi

Grid, security, web service, sophisticated communication, ubiquitous system, mining, network service

System Platform Research Labs — T. Kanoh

Computer architecture, storage system, NW architecture, broadband system, mobile system/terminal, high speed optical device,

Media & Information Research Labs — K. Yamada

AV coding, image/voice recognition, automatic translation, DVD, robot-ware, conversation interface

System Device Research Labs — N. Sumihiro

Advanced CMOS, volatile RAM, high-speed interface LSI, low power processor, system CAD, optical communication device / wireless device module, optical disk device

Jisso & Production Technology Research Labs — Y. Shimada

System module packaging, mobile equipment packaging, packaging design, new product production technology/equipment, high-speed high-density LSI packaging

Fundamental and Environmental Research Labs — J. Sone

Bio IT, quantum IT, nano technologies, ECO design material, energy device

NEC Laboratories America

Network Laboratories, NEC Europe

C&C Research Laboratories, NEC Europe

NEC Laboratories China

Reference

Solutions Development Laboratories

Solutions Development Labs

Y. Kasahara Executive GM

Y. Maruyama Senior VP

Bio IT Business Promotion Center

New market cultivation in Bio IT (Research support solution/clinical support solution/ drug discovery support solution)

ITS Business Promotion Center

New market cultivation in ITS market (Vehicle equipment, probe information system, telematics)

Ubiquitous Platform Development Labs T. Fujita

IMS / NGN service
Mobile service platform
Mobile solution
RFID technical center
Context application

System Platform SW Development Labs Y. Takashima

Real time communication
Office collaboration
Grid / Web service
Security
Software engineering
Human interface

Reference

Intellectual Asset Operations Unit

Intellectual Asset Operations Unit

T. Nakamura Executive GM

Intellectual Asset Planning Div — K. Yamada

- IA strategic planning
- Budget, personnel, general affairs
- IA related management and policy setting
- Corporate wide training, human development

Intellectual Asset Licensing Div — H. Ogata

- Licensing strategies and execution (including license in, out, cross)
- IA litigations, patent related appeals
- PPF competitive analysis, PPF enhancement measures

Intellectual Asset Bus. Dev. & Licensing Div — K. Ushijima

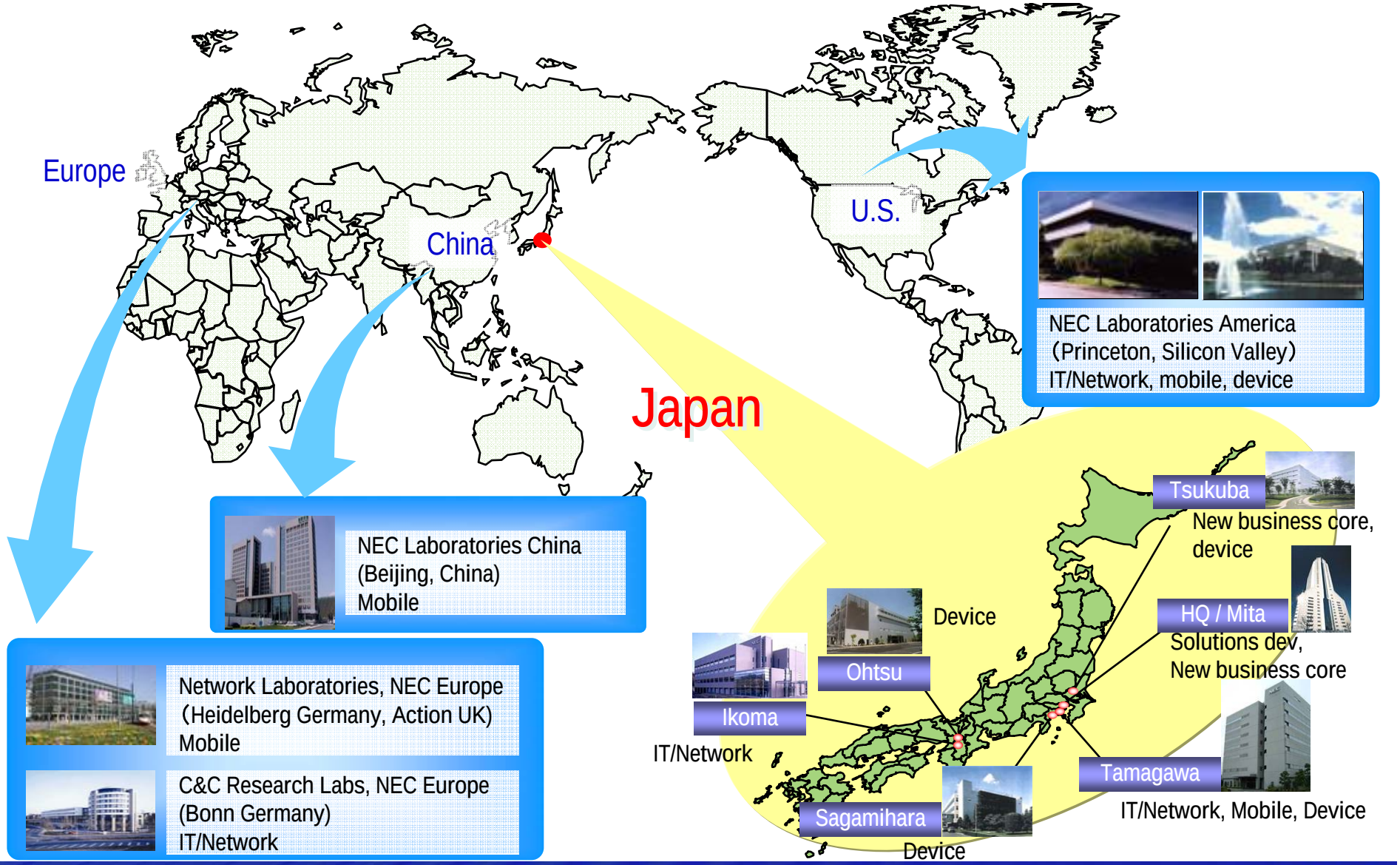
- Sales activities on licensing, asset transfer
- Business strategies for technology transfer projects, know-how contract

Creation Group — H. Murata

- Patent creation support
- Claiming rights and process management of patents
- Promote corporate wide CPO structure

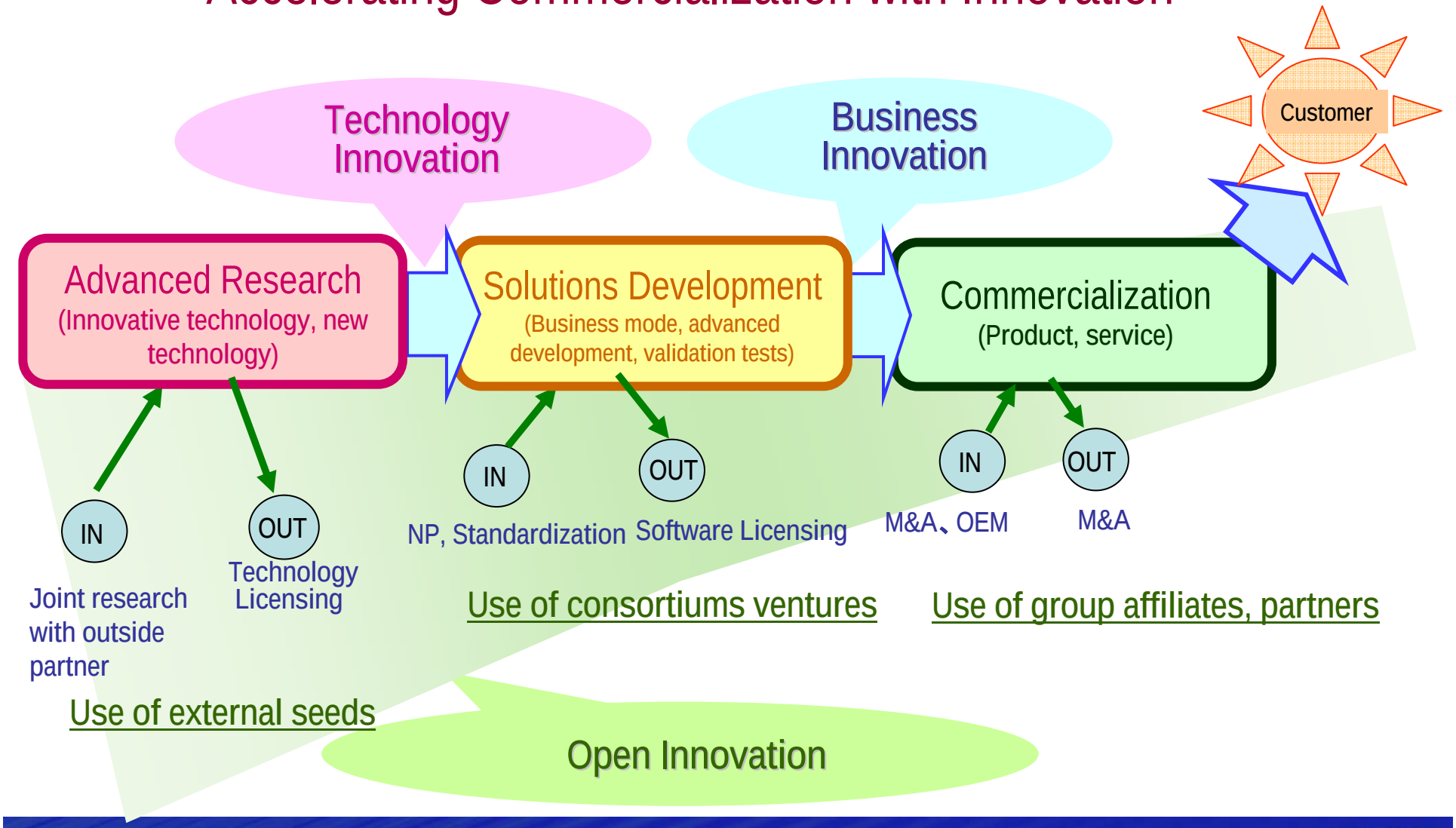
PPF: Patent Portfolio
CPO: Chief Patent Officer

R&D Sites

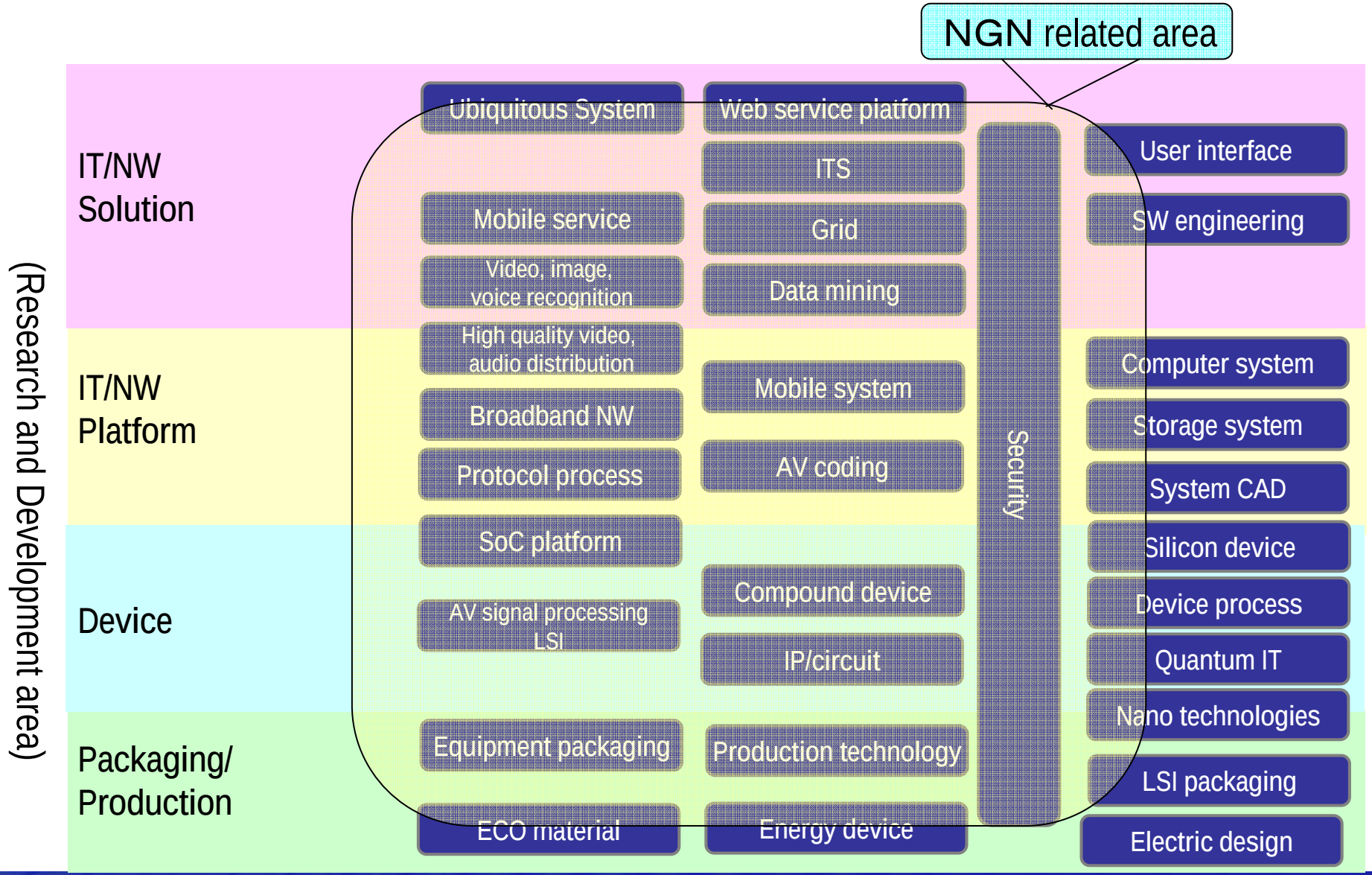

Europe
China
U.S.
Japan
NEC Laboratories America
(Princeton, Silicon Valley)
IT/Network, mobile, device
NEC Laboratories China
(Beijing, China)
Mobile
Network Laboratories, NEC Europe
(Heidelberg Germany, Action UK)
Mobile
C&C Research Labs, NEC Europe
(Bonn Germany)
IT/Network
Tsukuba
New business core,
device
HQ / Mita
Solutions dev,
New business core
Device
Ohtsu
Ikoma
IT/Network
Tamagawa
IT/Network, Mobile, Device
Sagamihara
Device

R&D Process at Intellectual Asset R&D Unit

Accelerating Commercialization with Innovation

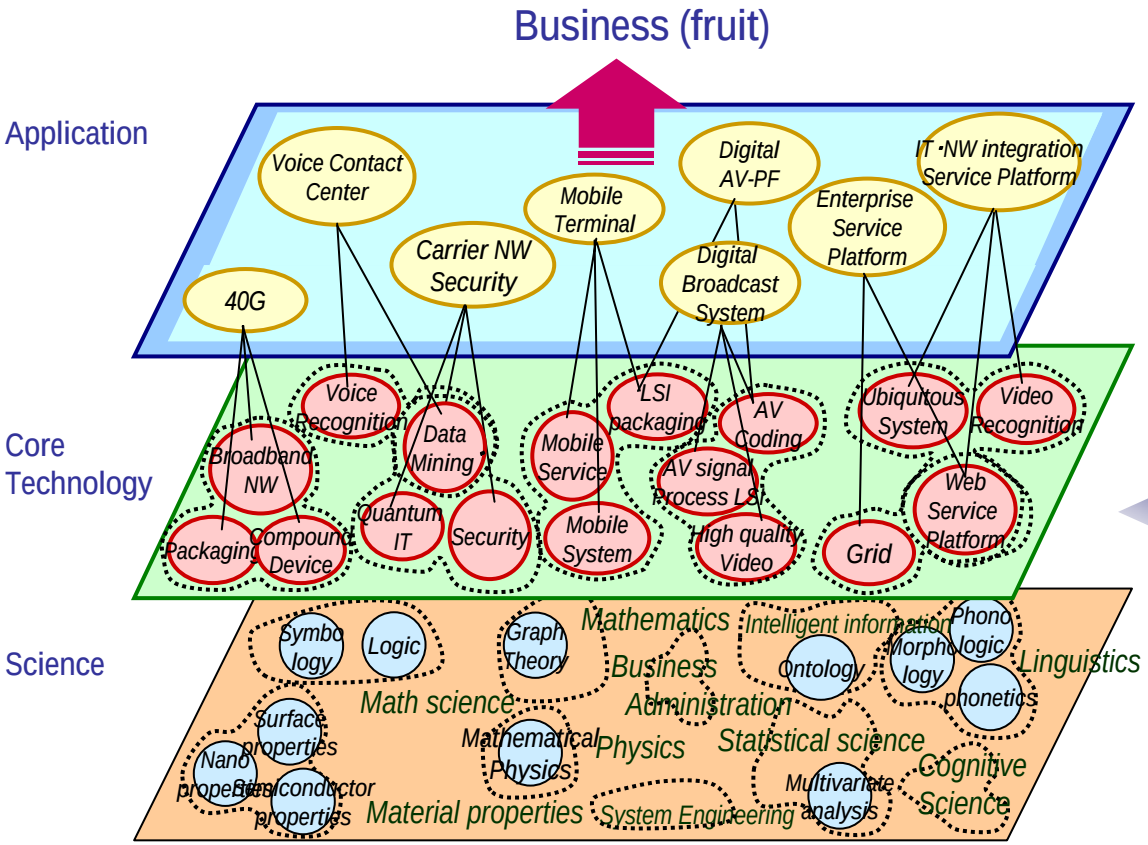


Research & Development area of Intellectual Asset R&D Unit



Activities toward creating Technology Innovation

Nurture strong core technology based on science through collaborative efforts with external parties and deploy to business



approach

intake

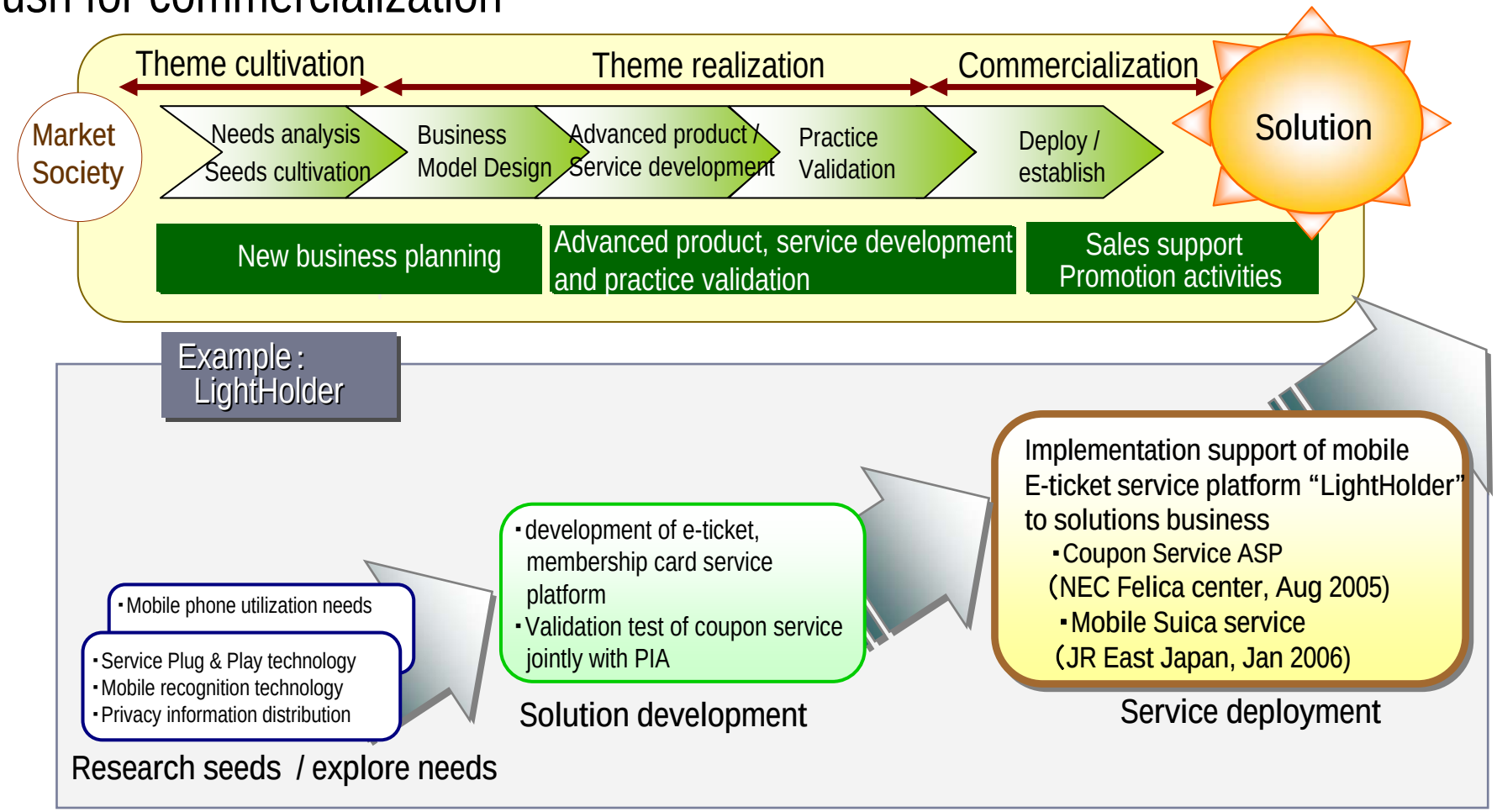
Companies, Universities, National Institutes

(Objective of external collaboration)

- Complimenting technology
  (Intake of new seeds, strong technology)
- Partner building (standardization)
- Diversify risks in development
- Shorten Time To Market

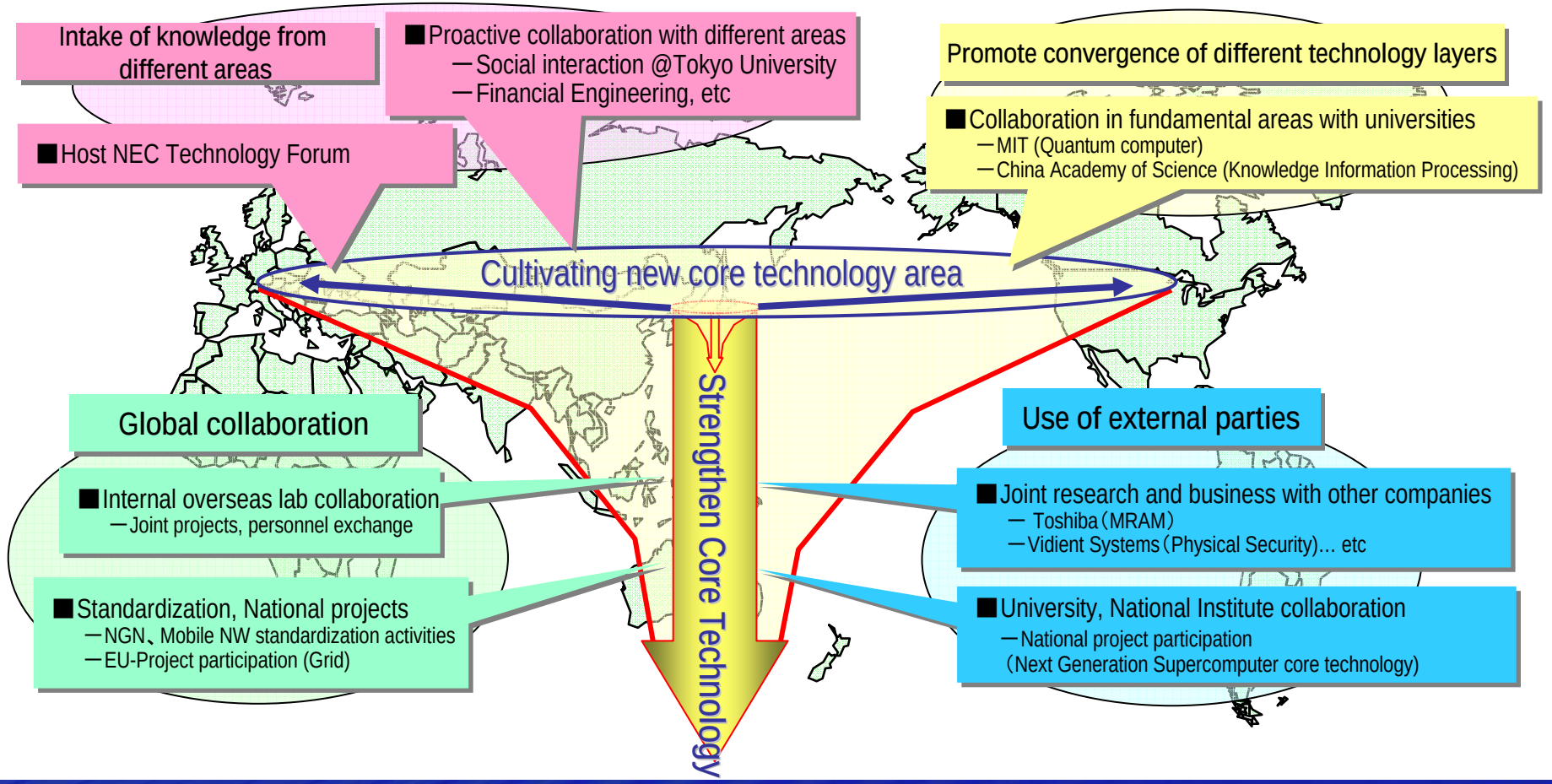
Activities toward creating Business Innovation

Analyze market, utilize internal & external seeds, go through business development, product/service development, best practice validation, and push for commercialization



Promoting Open Innovation

- Cultivate new core technology through intake from different areas of knowledge and by promoting convergence in different technology layers.
- Strengthen core technology through proactive use of external parties and global collaboration.



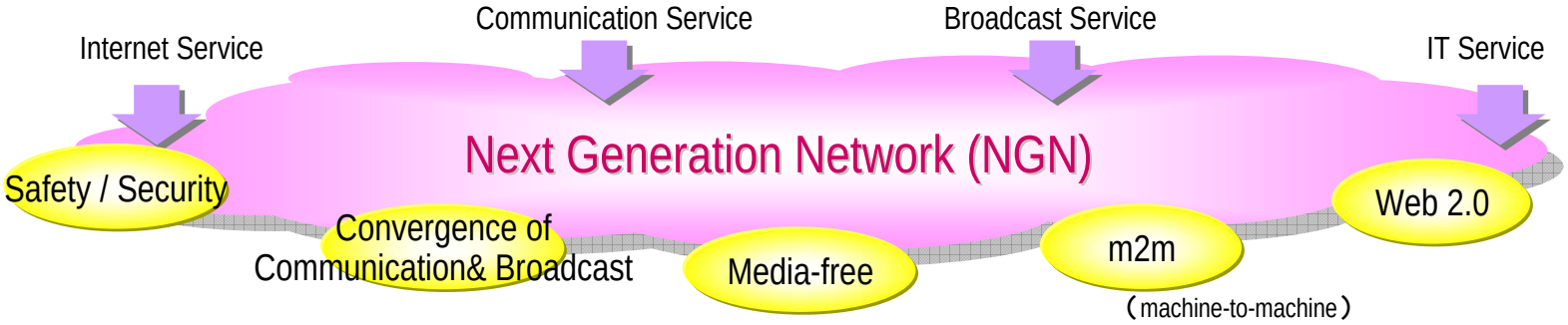
Topics

1. Overview of Intellectual Asset R&D Unit

2. R&D to support NEC growth strategy toward NGN era

What is Next Generation Network (NGN)

- IP based Network : Major revolution to the communication network of 100 year history
- Separation in Transport (Transmission) and service : Flexible service offering
- QoS (Guarantee in transmission speed / quality), security
- High compatibility with IT



What becomes possible with NGN

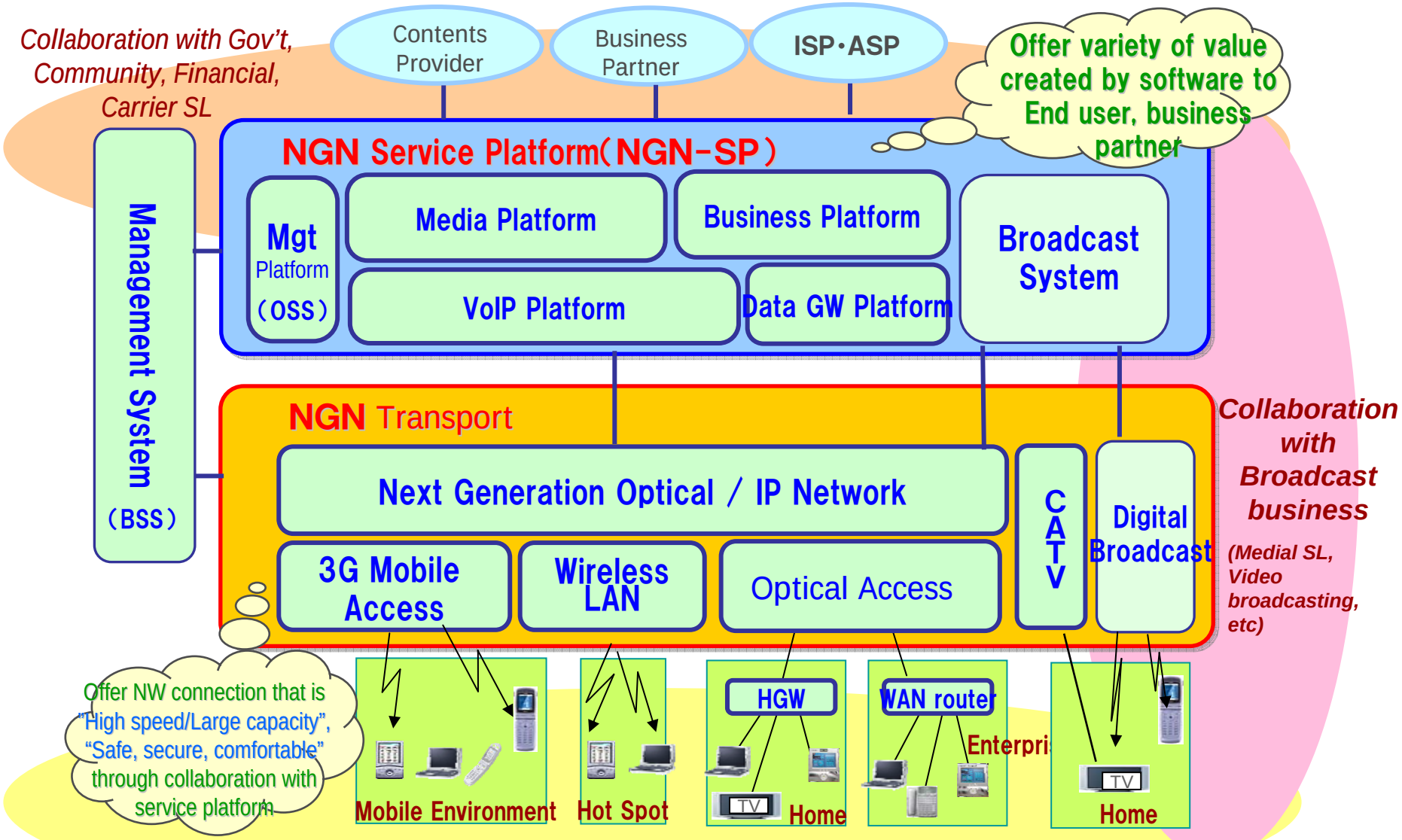
- Provide safe, secure, high quality, highly reliable service at low costs
- Provide various services in an unified fashion through common communication method called IP
  - ① FMC (Fixed and Mobile phone convergence :One Phone、One Bill、One Number)
  - ② Triple play (provide voice, video, data communication through single line)
- Provide a variety of services with ease (wallet phone, home security)
- Allows creation of new service platform such as next generation enterprise information system

Active Investment at a wide range

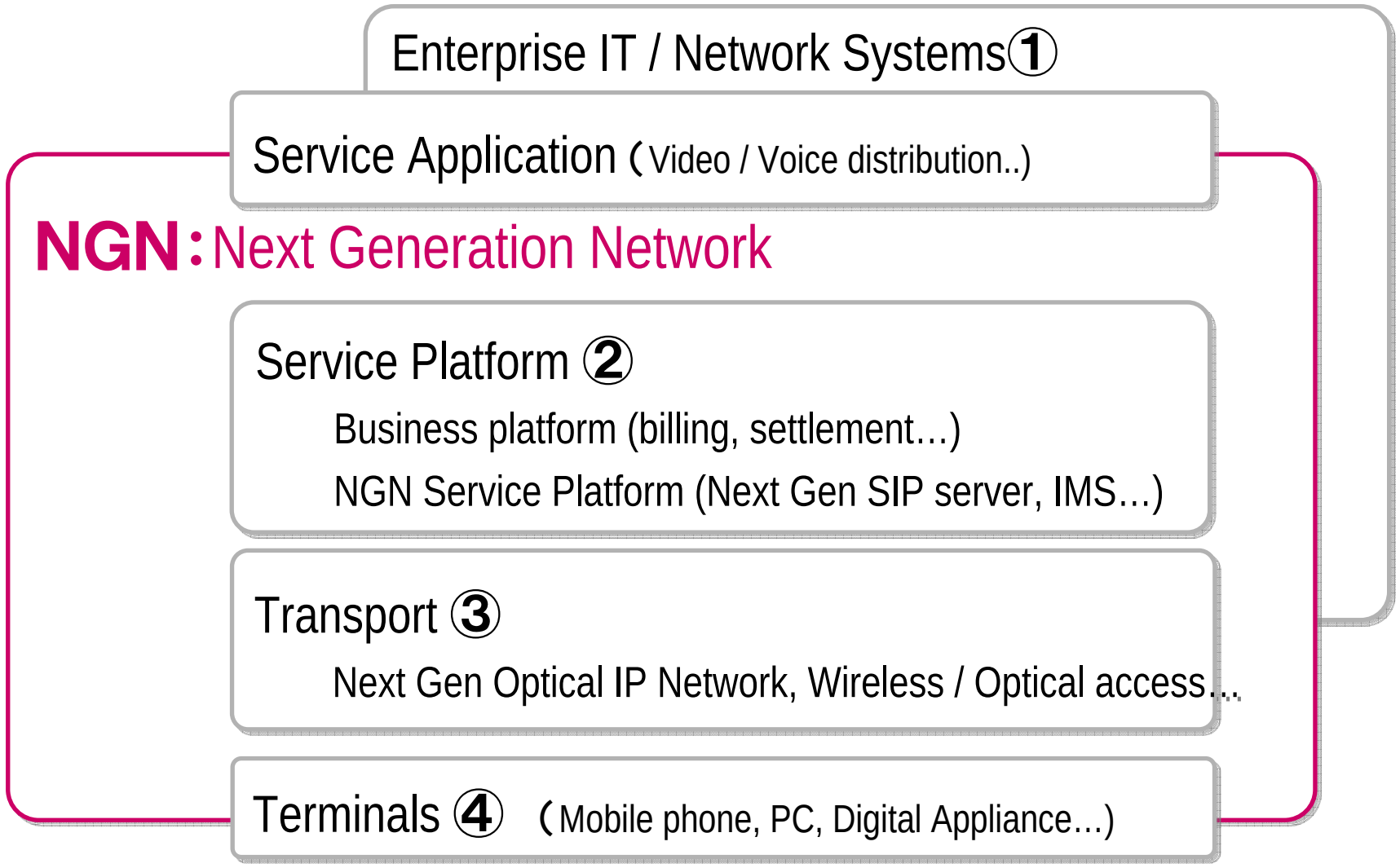
QoS: Quality of Services FMC：Fixed-Mobile Convergence

Next Generation Network（NGN）Business Area

Covering Full Line, Full Layer of NGN through Collaboration between BU's

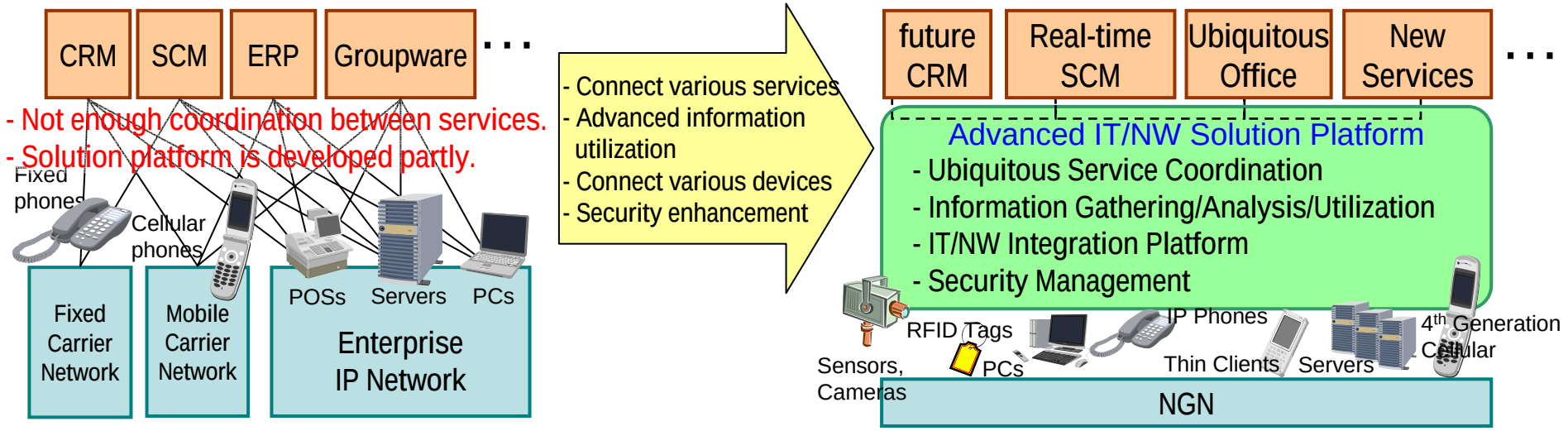


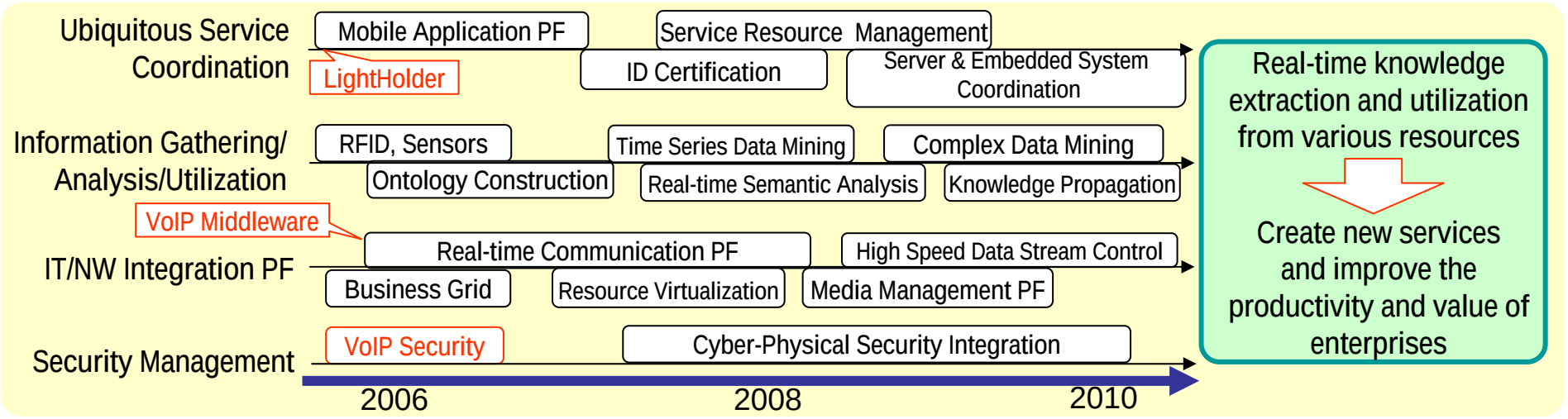
Business Opportunity with Next Generation Network (NGN)



(1)Enterprise IT/Network Systems

- Develop new solutions on NGN with the advanced IT/NW solution platform.
- Improve the productivity of enterprises using extracted knowledge from various sources.



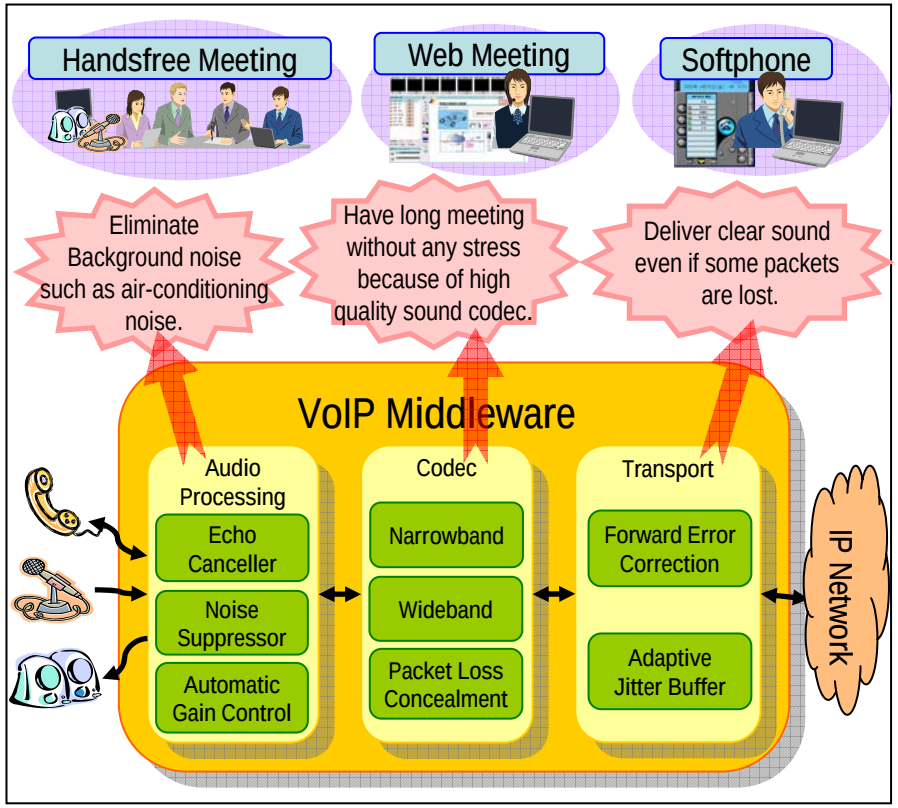


PF: Platform

Achievements for Enterprises IT/Network Systems (1)

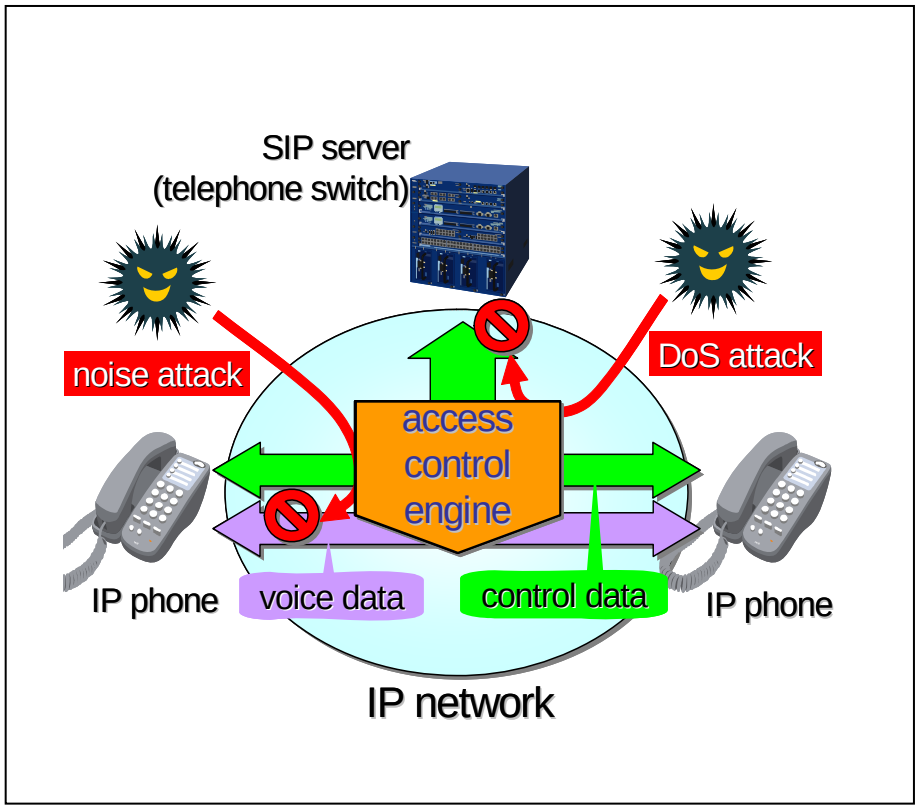
VoIP Middleware

- Enable highest quality VoIP communication



VoIP security

- Protects IP-phone environment from cyber attacks

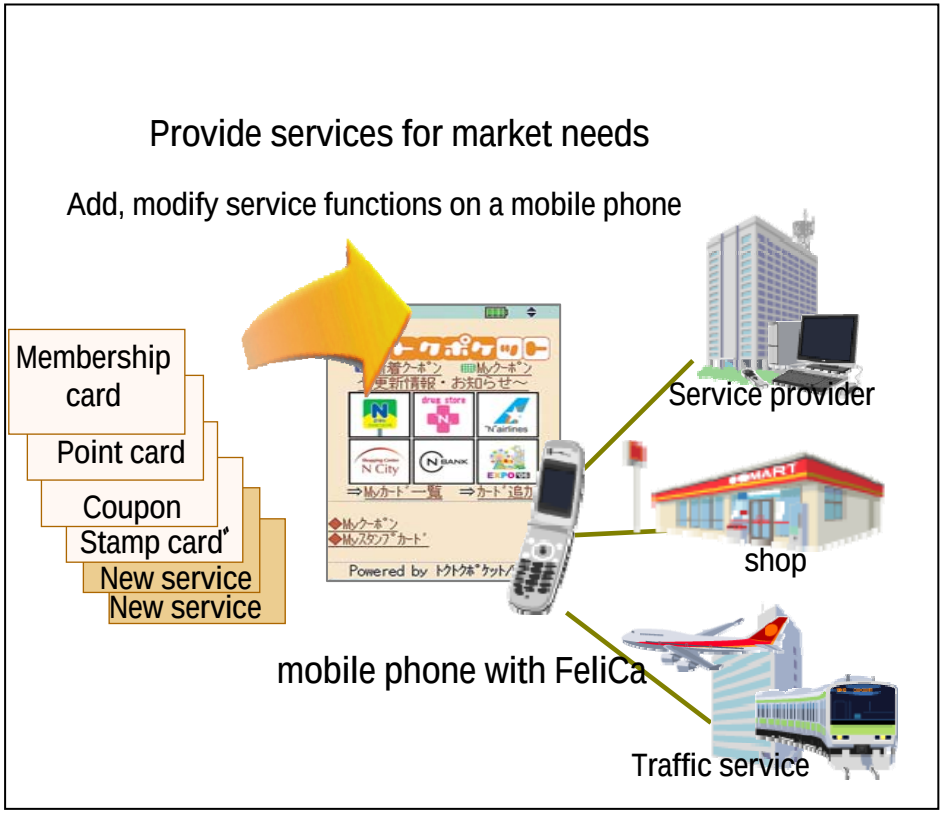


Achievements for Enterprises IT/Network Systems (2)

Mobile e-ticket service platform LightHolder for FeliCa

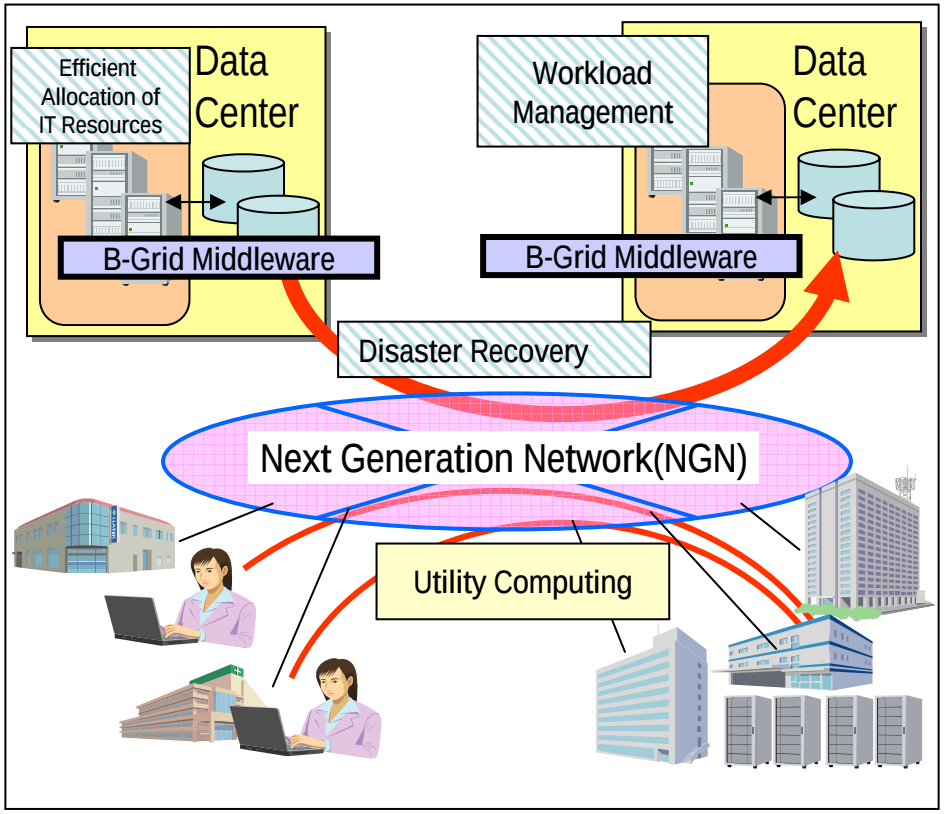
- Adopted as the service platform software for JR-East mobile Suica service
- For TokuToku Pocket, the mobile FeliCa service ASP by NEC

*"SuiCa" is a registered trademark of East Japan Railway Company
*"FeliCa" a a registered trademark of Sony Corporation



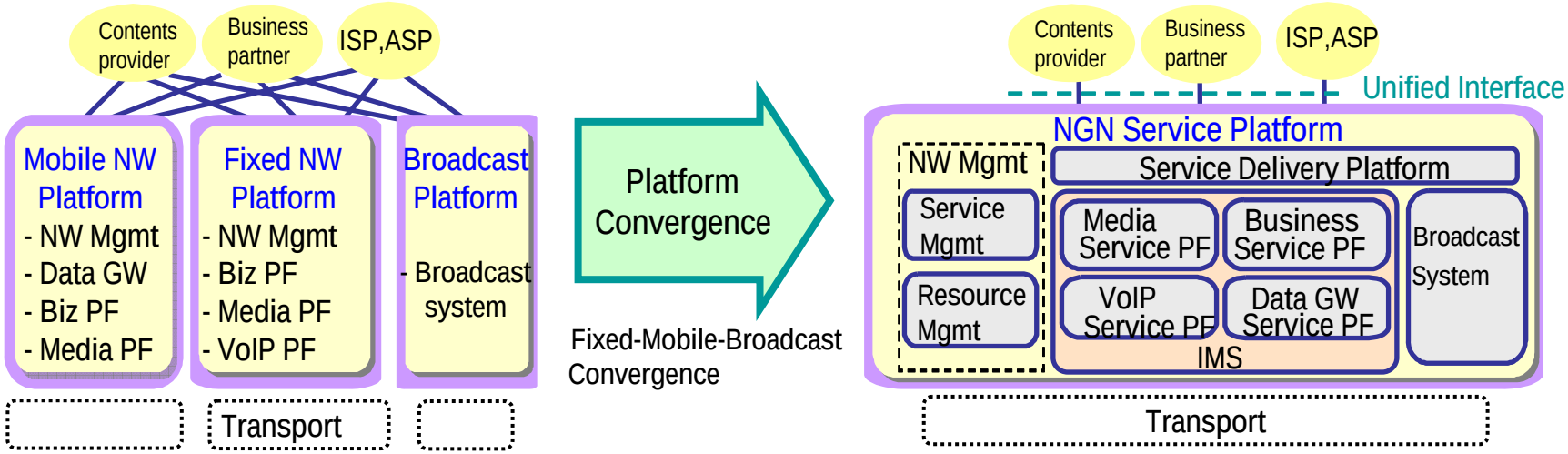
IT Resource Optimization by Business Grid

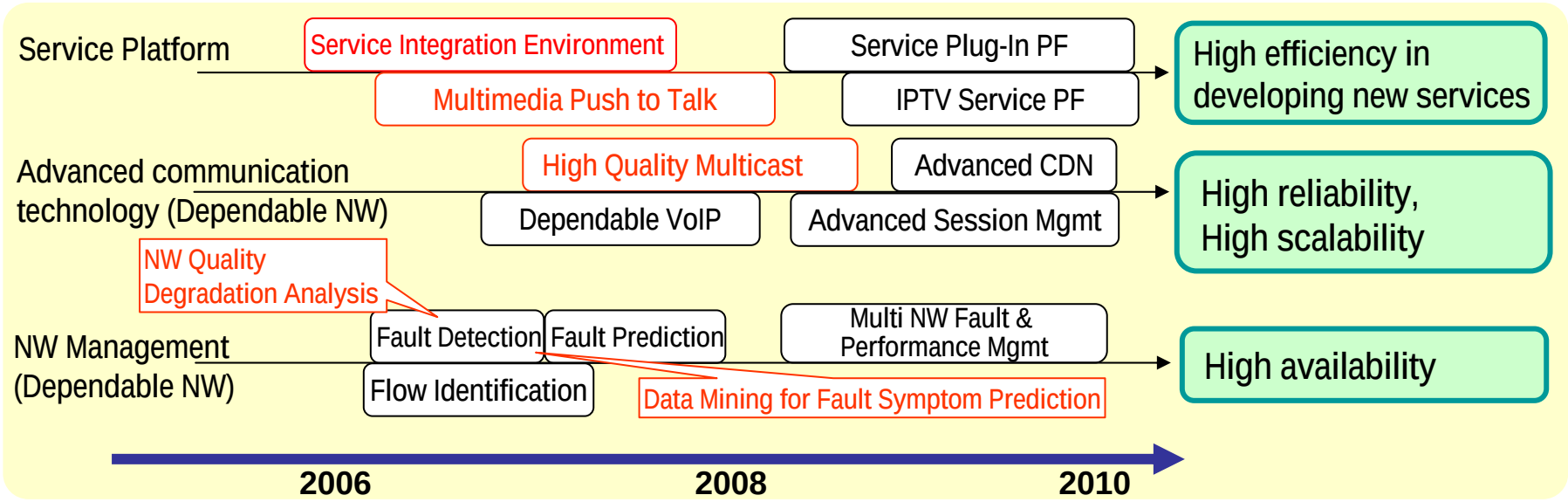
- Reduces TCO by automatically controlling resources on the event of failure and/or workload fluctuation
- Realizes disaster recovery with the least dedicated backup resources



(2)Service Platform

Enable rapid development of high quality and secure new services by NGN Service Platform.



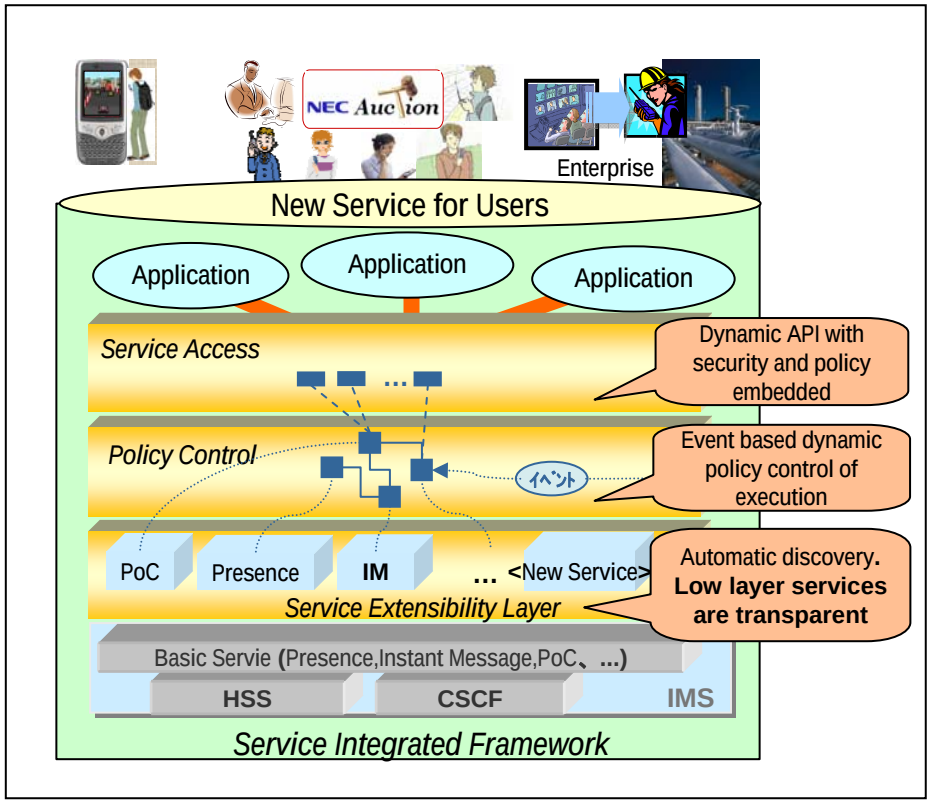


IMS: IP Multimedia Subsystems

Achievements for Service Platform (1)

Service Integration Environment

■Service integration framework based on the OMA service environment standard



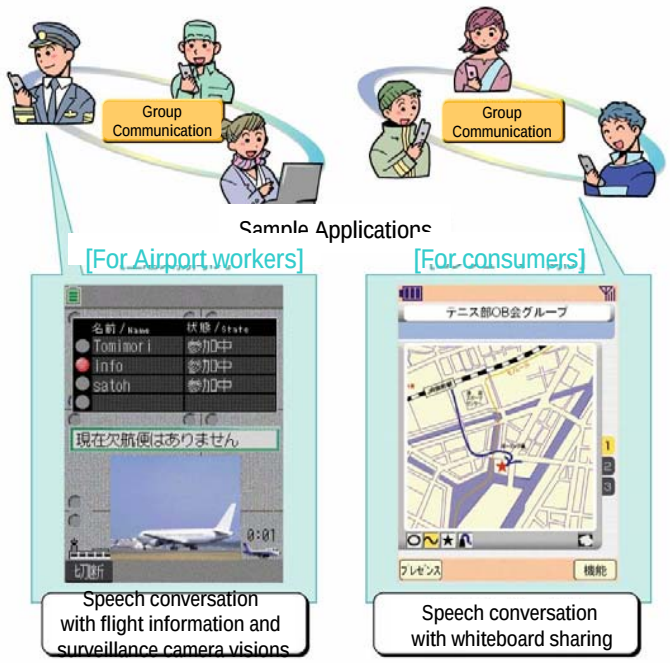
Legend:

CSCF	**Call Session Control Functions**
HSS	**Home Subscriber Server**
IMS	**IP Multimedia Subsystem**
IM	**Instant Messaging**
OMA	**Open Mobile Alliance**
PoC	**Push-to-Talk-over-Cellular**

Achievements for Service Platform (2)

Multi-media Push-To-Talk

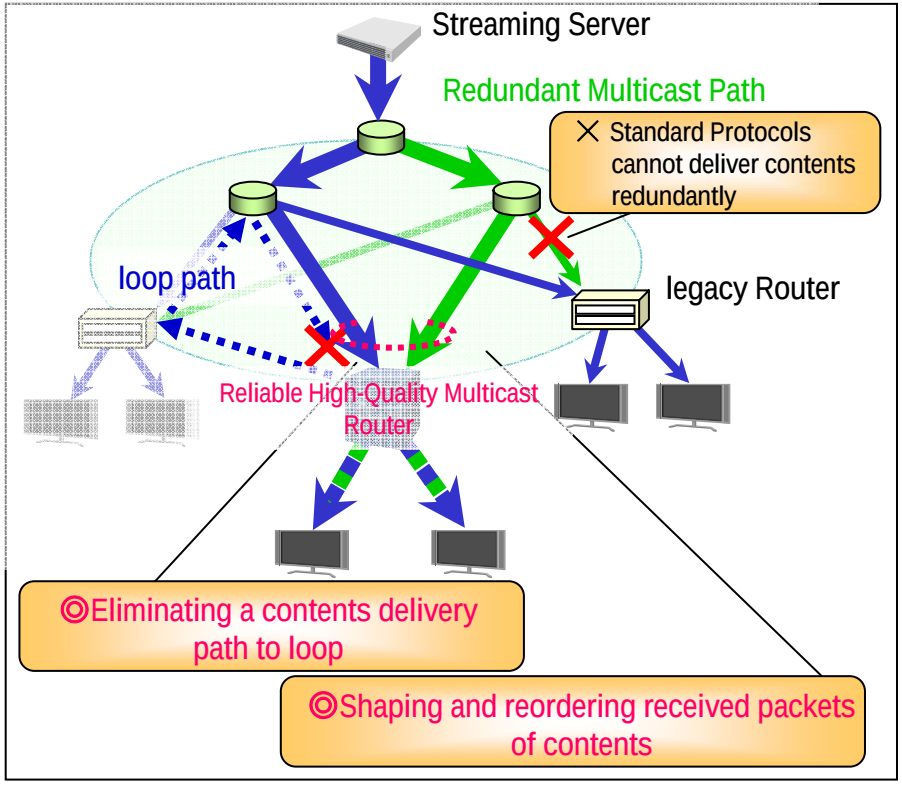
■Multi-media sharing (Whiteboard, Web, and movies) group communication



This research has received some support from NEDO(P05024) and NICT(170-014-2).

High-Quality Multicast Broadcasting System

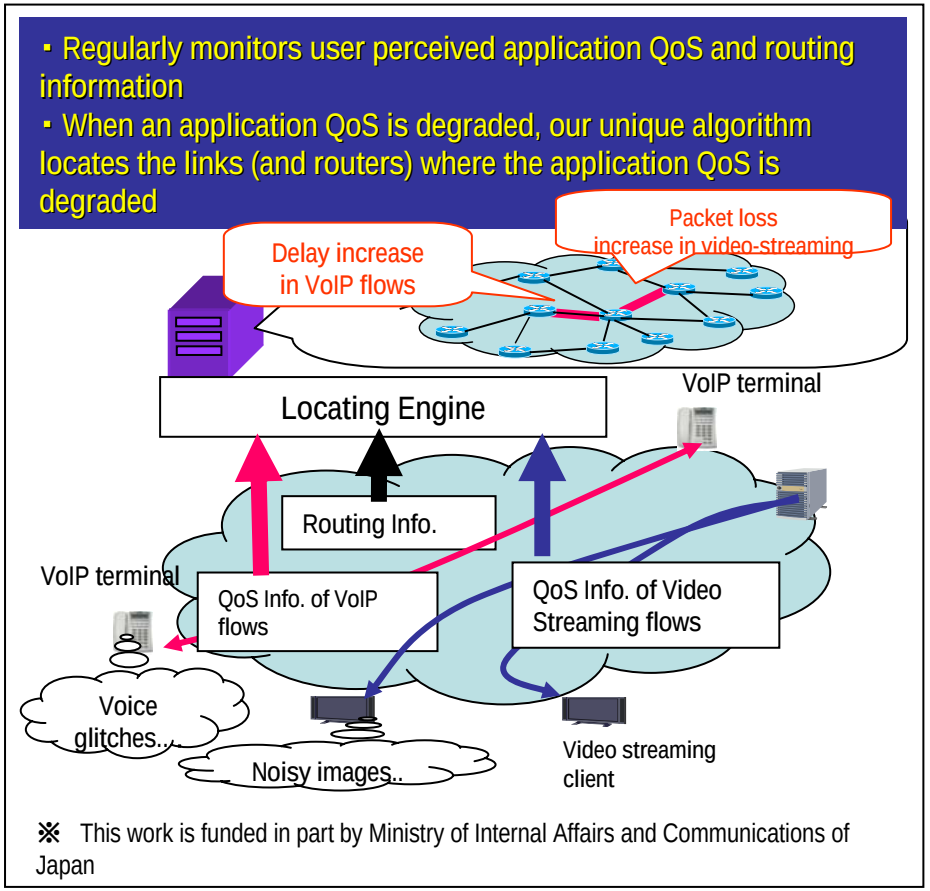
■Enables IPTV services to improve communication quality and reliability



Achievements for Service Platform (3)

Quality Degradation Analysis for Large-scale Networks

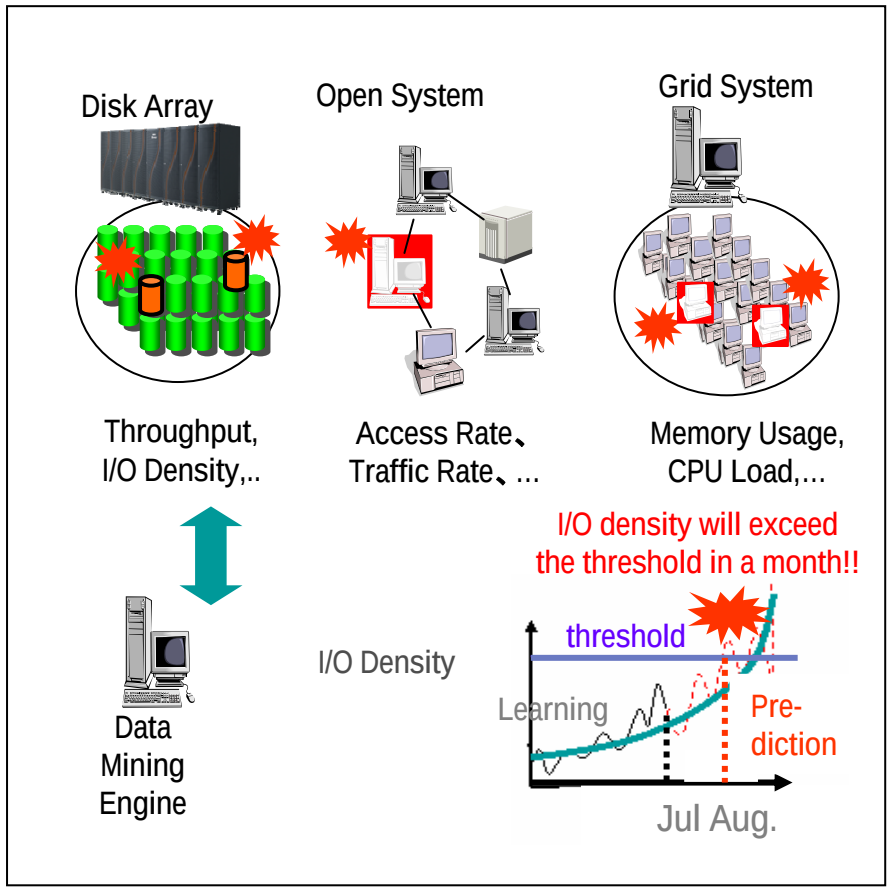
■ Real-time locating of quality degradation in large-scale carrier/ISP networks



※ This work is funded in part by Ministry of Internal Affairs and Communications of Japan

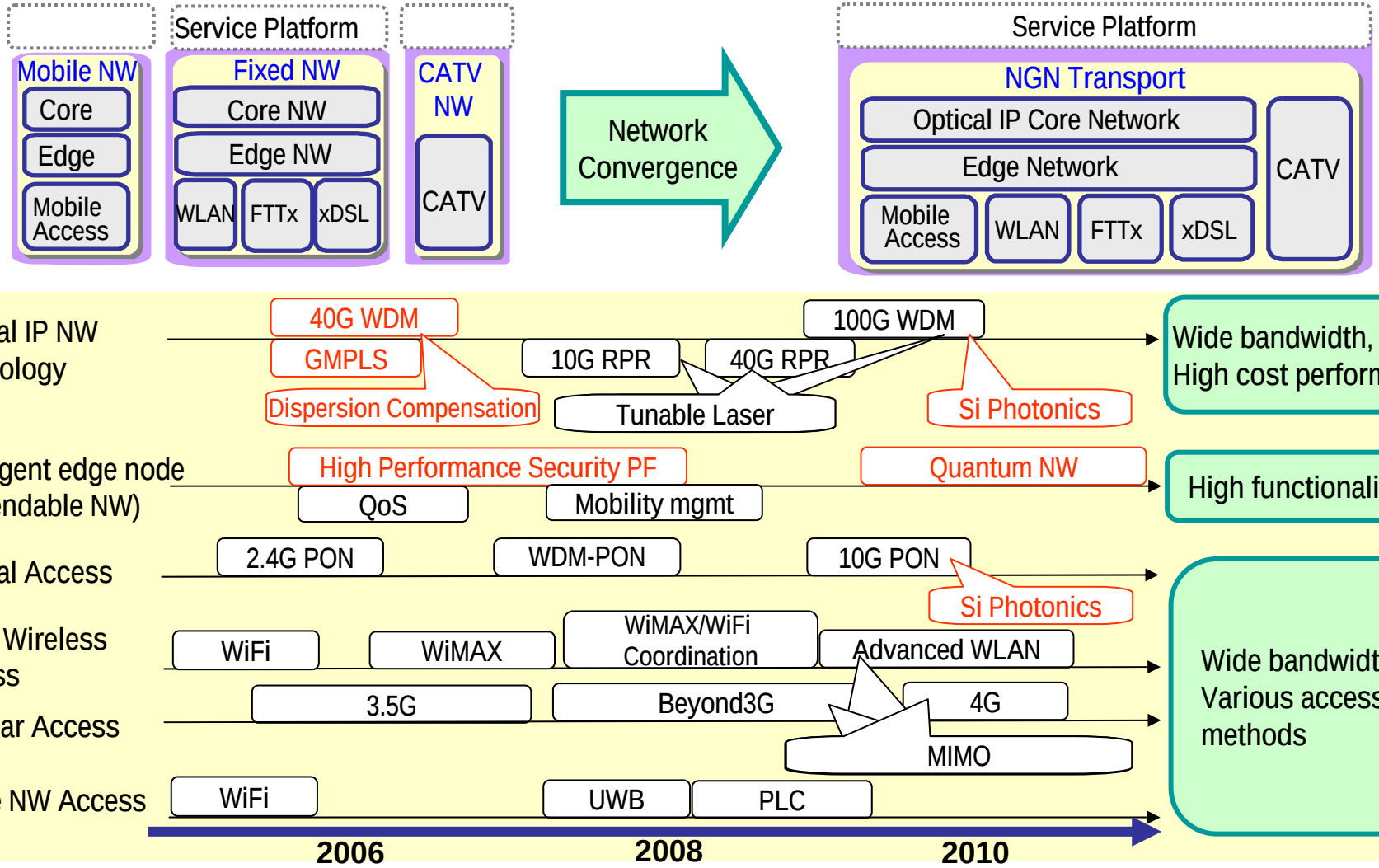
Data Mining for Fault Symptom Prediction

■ Predict behaviors of a large scaled complex system precisely and quickly



(3)Transport

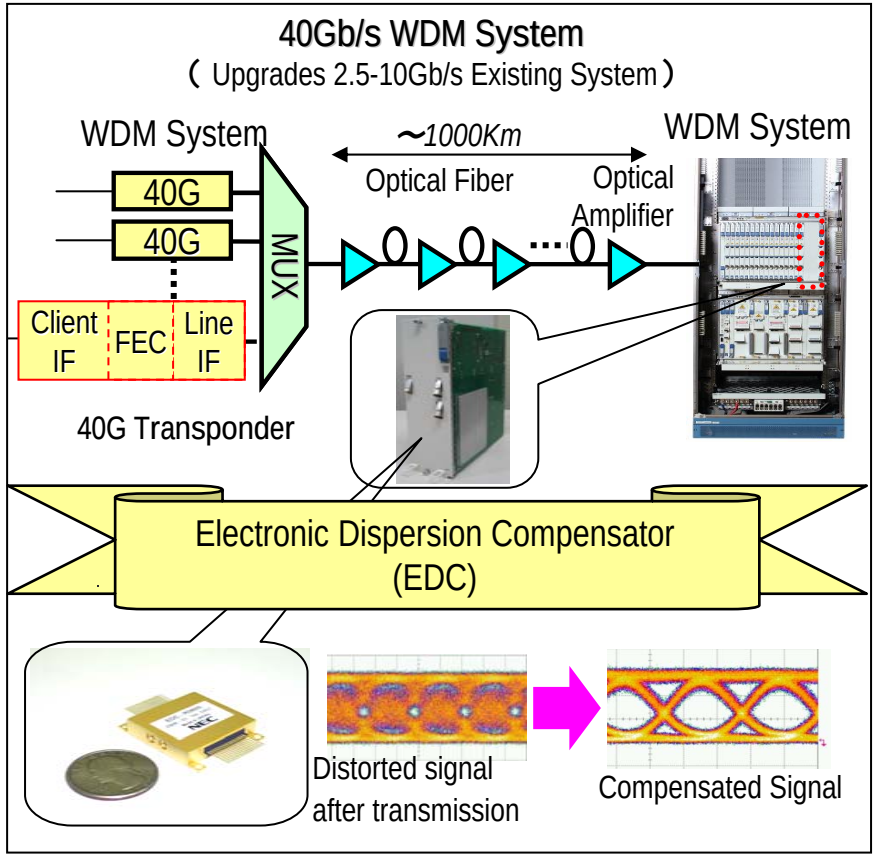
Develop dependable network infrastructure for FMC (Fixed Mobile Convergence).



Achievements for Transport (1)

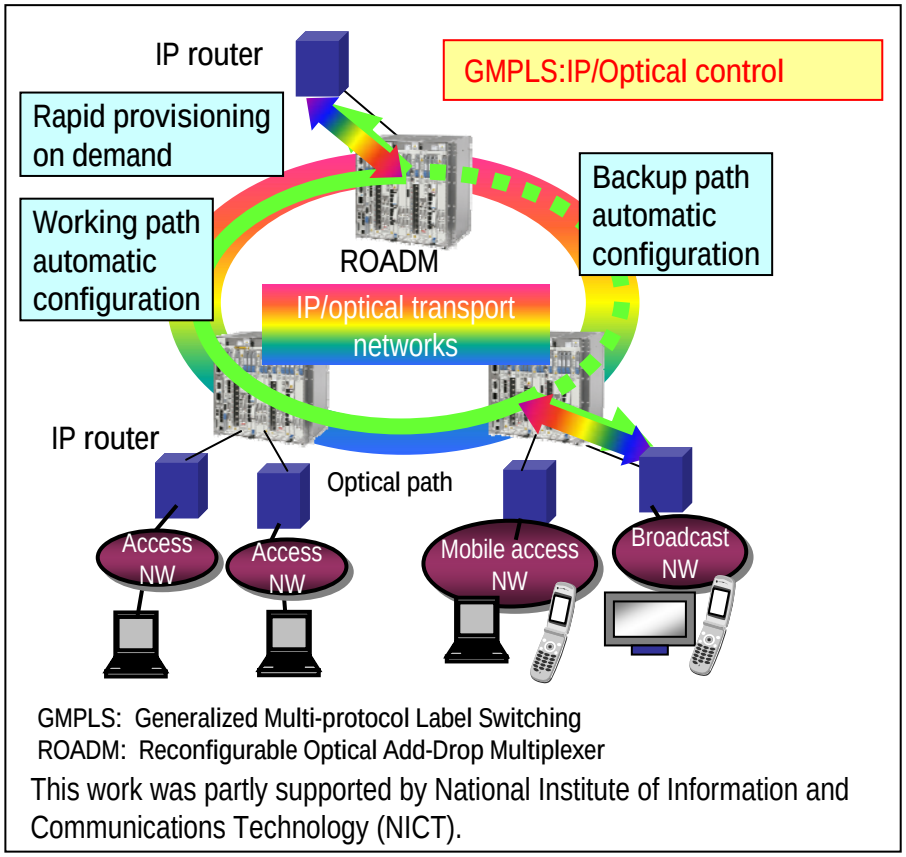
40Gb/s DWDM Long-Haul Transport System

■ Achieves reliable 40Gb/s long-haul transport over optical fiber network



IP/Optical Network Control System

■ World's first demonstration of GMPLS-equipped optical nodes (ROADMs) with IP routers under practical network operation



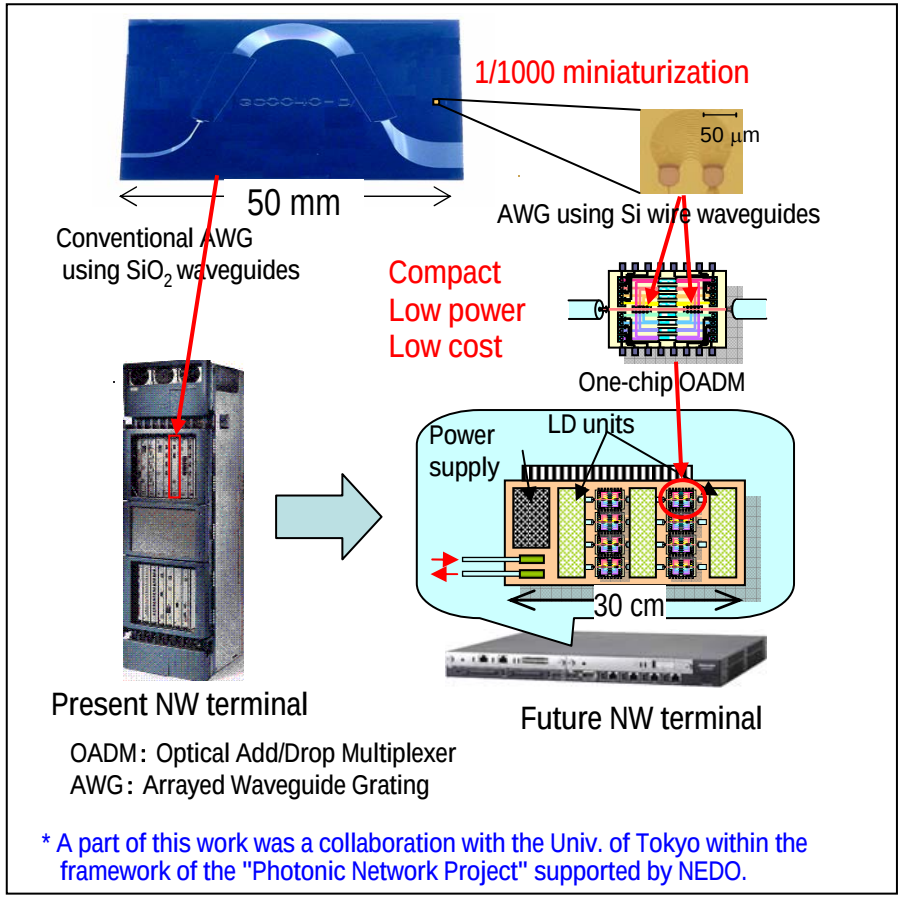
GMPLS: Generalized Multi-protocol Label Switching
ROADM: Reconfigurable Optical Add-Drop Multiplexer

This work was partly supported by National Institute of Information and Communications Technology (NICT).

Achievements for Transport (2)

Photonic integrated Circuits with Si Photonics

■ Miniaturizing and integrating optical devices by combining micro-photonics and Si nanofabrication technology

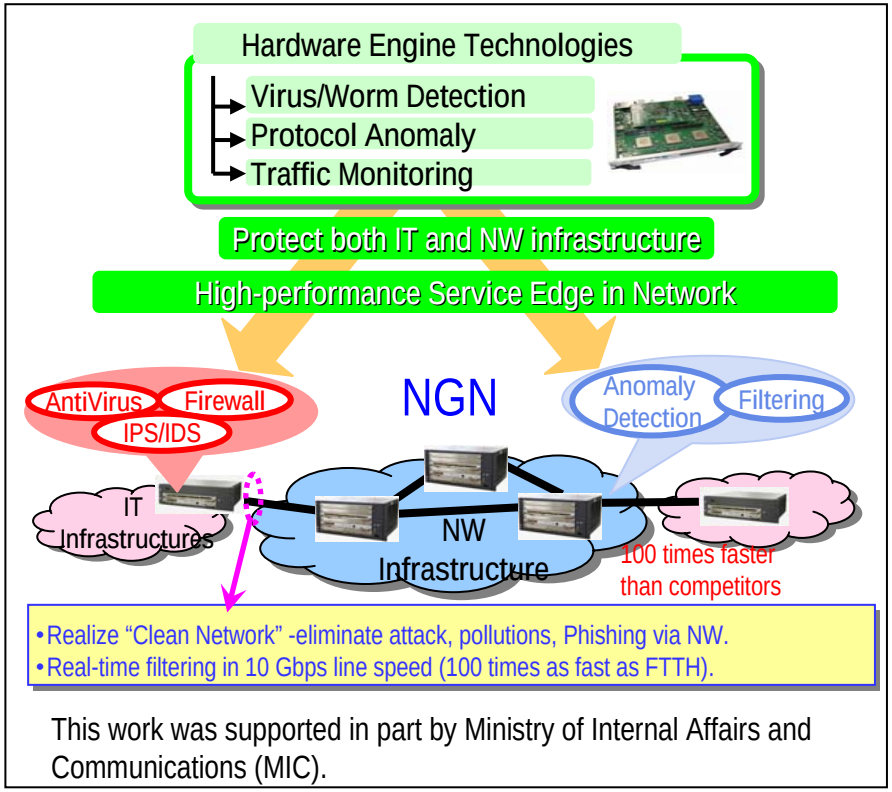


* A part of this work was a collaboration with the Univ. of Tokyo within the framework of the "Photonic Network Project" supported by NEDO.

Achievements for Transport (3)

10 Gbps High-Performance Security Platform

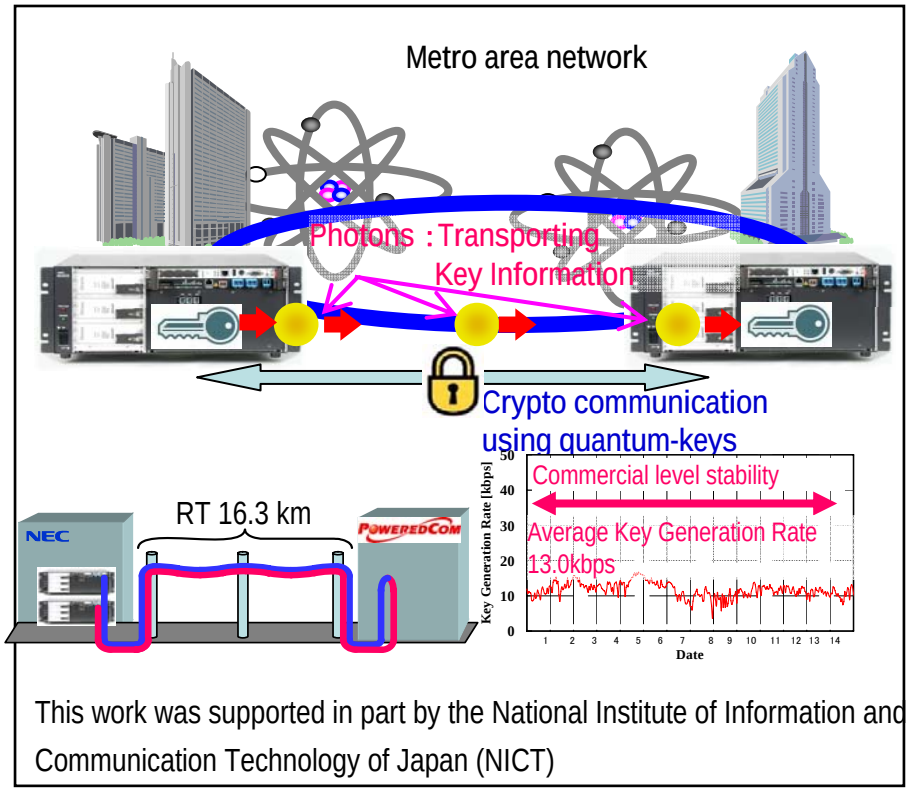
■ The NEC's hardware engine technologies realize high-performance security processing



This work was supported in part by Ministry of Internal Affairs and Communications (MIC).

Quantum Cryptography Network

■ World's first demonstration of stable and continuous operation under general environment condition

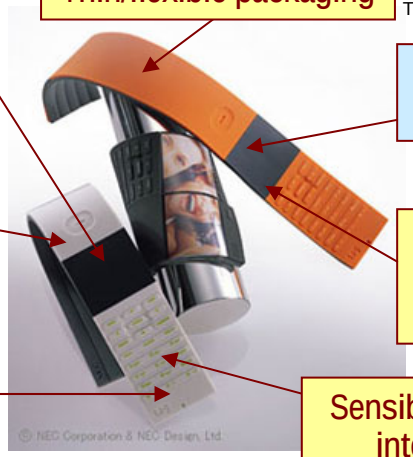


This work was supported in part by the National Institute of Information and Communication Technology of Japan (NICT)

(4)Terminals: environmentally-friendly and energy-saving

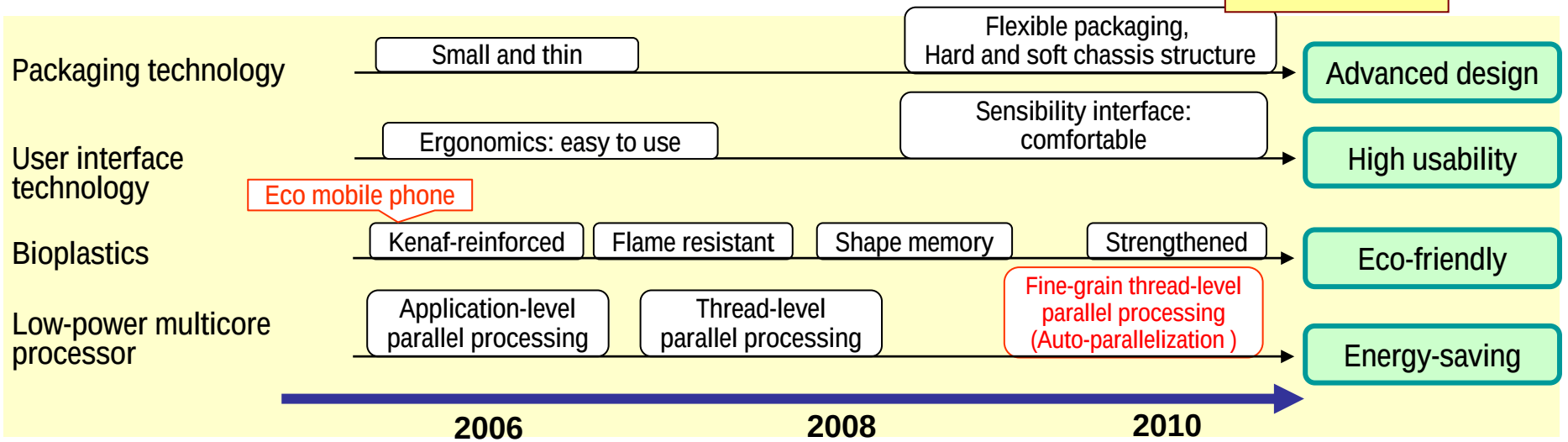
Develop ubiquitous terminals for a sustainable society, with superior energy-saving and environmentally-friendliness, as well as advanced design and usability.

Thin fold-type
camera-equipped mobile phone



This picture shows a concept model.

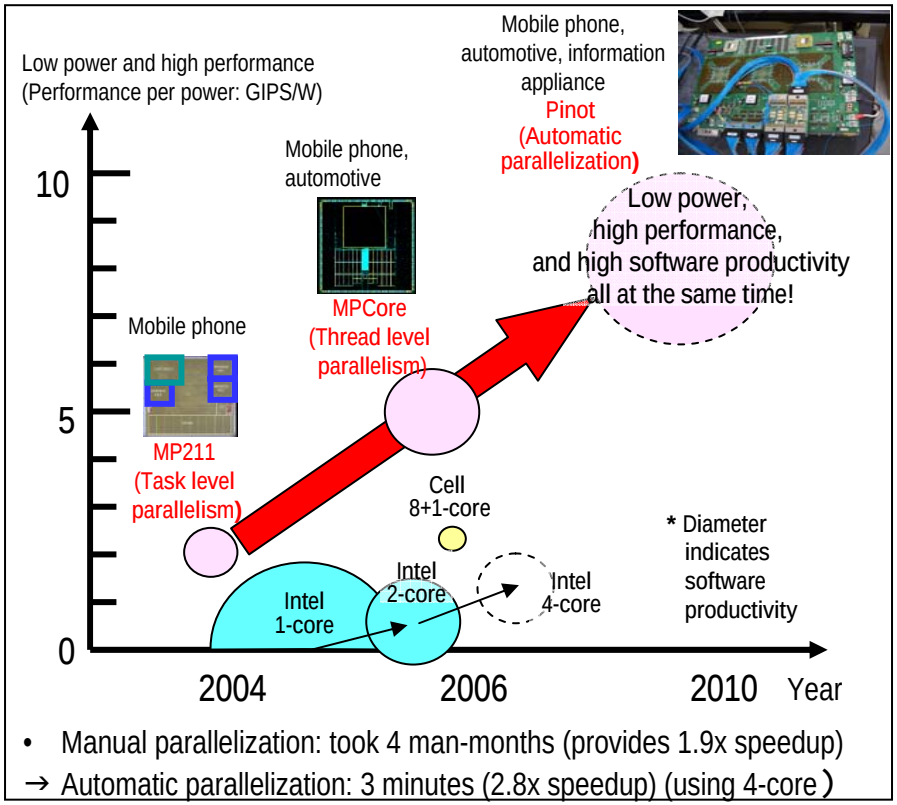
Thin/flexible packaging
Personal authentication
Personal concierge service
Bioplastics
Low-power multicore processor
Flexible battery
Sensibility user interface



Achievements for Terminals: environmentally-friendly and energy-saving

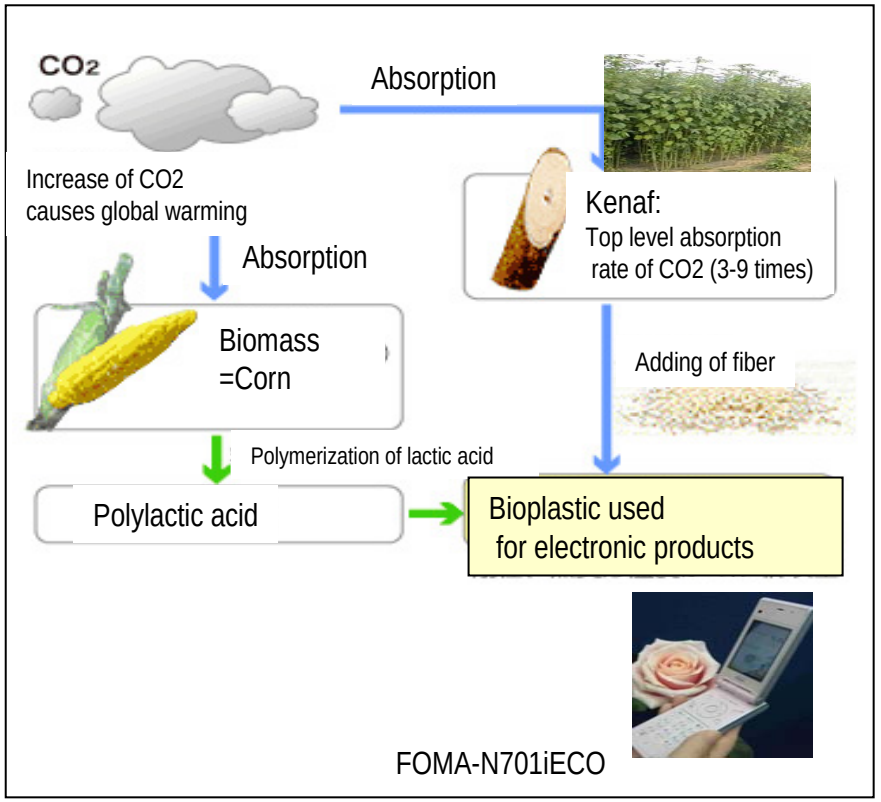
Low Power Multicore Processor

■Apply parallel processing technologies developed for super computers and parallel servers to information appliances



Highly Functional Bioplastics

■ High environmental friendliness (top-level biomass ratio) and good performance



Empowered by Innovation

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The management targets included in this material are not projections, and do not represent management's current estimates of future performance. Rather, they represent targets that management will strive to achieve through the successful implementation of NEC's business strategies.