IPv6 Related Activities in Japan

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Executive Director, IPv6 Promotion Council of Japan

Board member, WIDE Project

Board of Trustee, ISOC

AGENDA

1. Issue of IPv4 Address Depletion

2. Task Force on IPv4 Address Exhaustion

3. Explore the New Business Areas

Important activities by ISOC

1. "IPv6 is critical issue" to resolve, i.e., deployment of IPv6 is very important as OECD and IGF(Internet Governance Forum) topics
2. Officially Identify as the major strategic initiative "Trust and Identifier"

Resolution on December 8, 2007 at Vancouver, Canada

What is our goal ; toward the **"Eco-System"**

- Back-Ground
  - There are many systems/networks with IP
  - Still, there are many non-IP systems/networks
  - Networks and Systems are tend to be **Fragmented**...
- Objective and Goal
  - **Avoiding the fragmentation** of IP systems/networks
  - Encourage the **collaboration among sub-systems**
  - Explore the "Eco-System", that deliver **the cheapest system** deployment , while delivering **innovations**

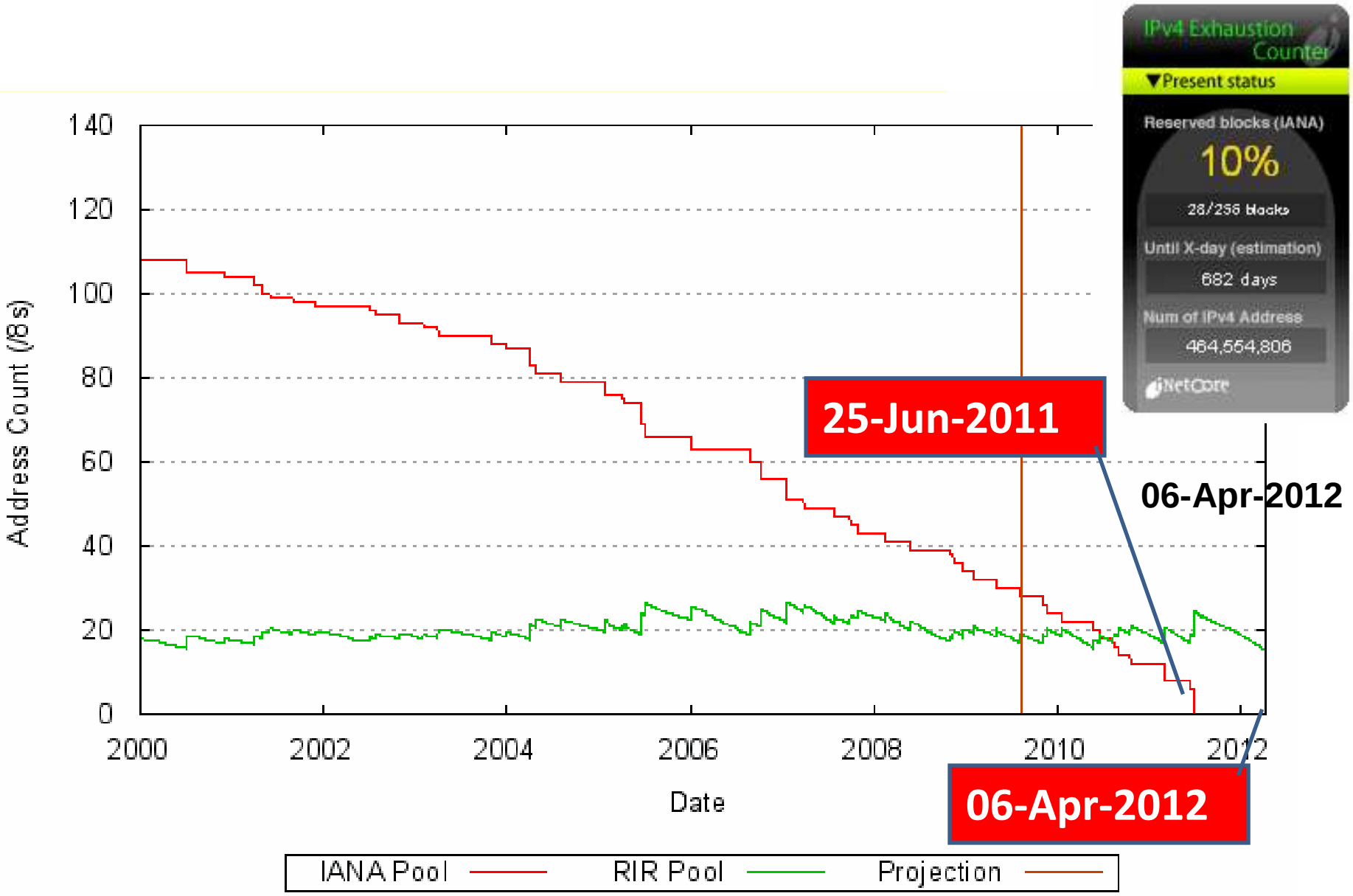


Figure 35 - Projected RIR and IANA Consumption (/8s)

Japanese MIC formed study group

http://www.soumu.go.jp/joho_tsusin/eng/pdf/080617_1.pdf

- Mission: “How to achieve smooth IPv6 introduction”
- Some interesting discussion and analysis
  1. There is no free lunch ! All must pay money on IPv6.
  2. Squeezing out the global IPv4 address from existing network looks so hard…. JPNIC had got less than 2% of address space…..
  3. IPv4 address exchanging market may generate the company accounting issue, since IPv4 address may become as an asset.
  4. Broadband Internet consumes a lot of global IP(v4) addresses
  5. RIPE is large IPv4 address consumption as well as BRICs area.
  6. The largest sacrifice is business/service deployment for new companies and for legacy companies
  7. Contents provider and system integrator should join
  8. Translator between large clouds will not work….. Put it at the

Japanese MIC formed study group

- Mission: “How to achieve smooth IPv6 introduction
-

6. **The largest sacrifice is business/service deployment for “new” companies and for “legacy” companies**

7. **Contents provider and system integrator should/must join**

Translator between large clouds will not work….. Put it at the

Japanese MIC formed study group

- Mission: “How to achieve smooth IPv6 introductio
-

8. We may need carrier-class NAT boxes in the network.
But, serious technical issue will occur, regarding the number of TCP sessions……

Contents provider and system integrator should join

Translator between large clouds will not work….. Put it at the

NTT Communications

Shin Miyakawa, Ph.D

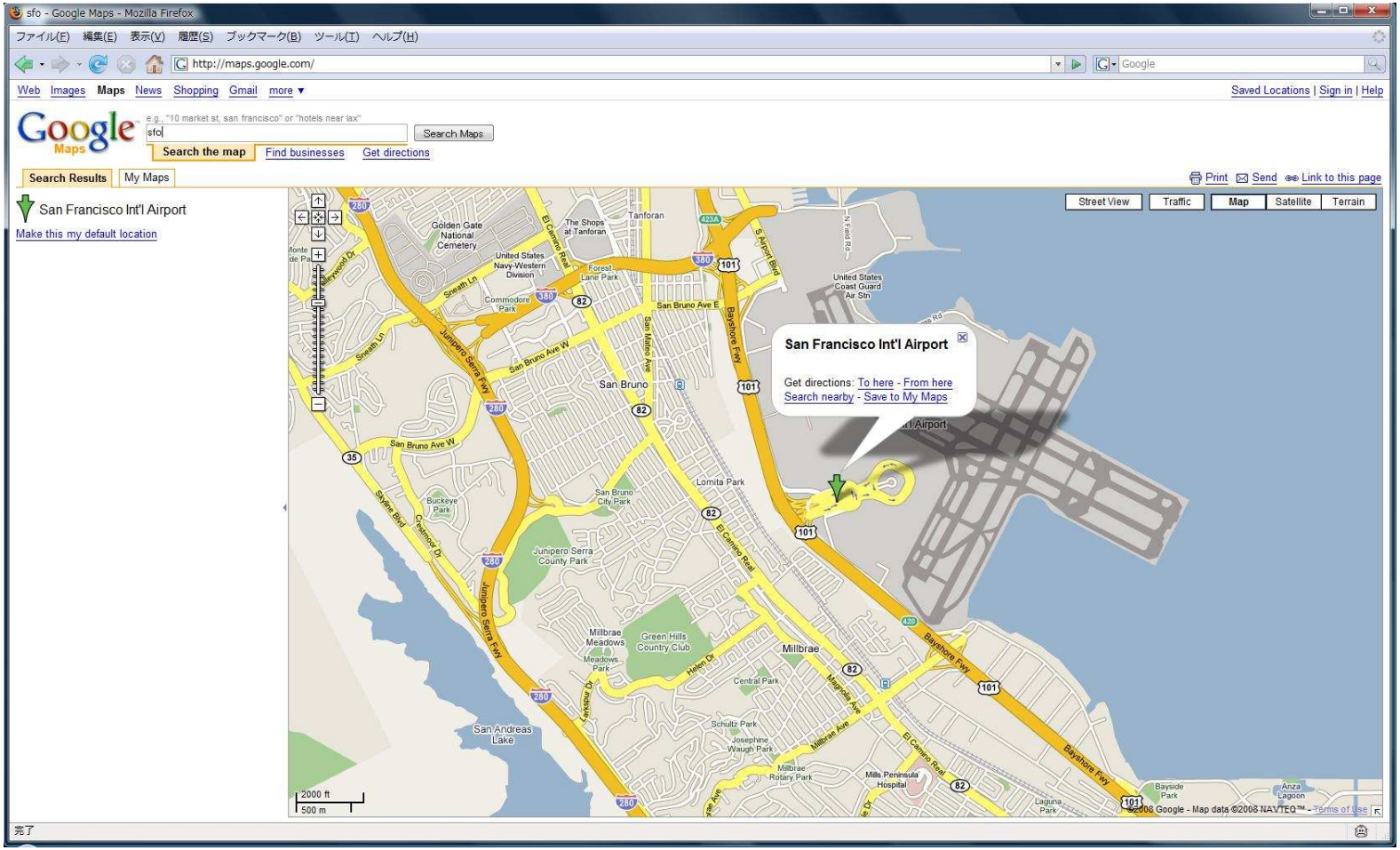
However……

- **Limitation** on the number of session states for NAT operation
- Each user could use certain number of sessions
  - How many sessions ?
  - Even as the best case, **65,536** is the maximum number of sessions, shared by customers accommodated into a single IPv4 address

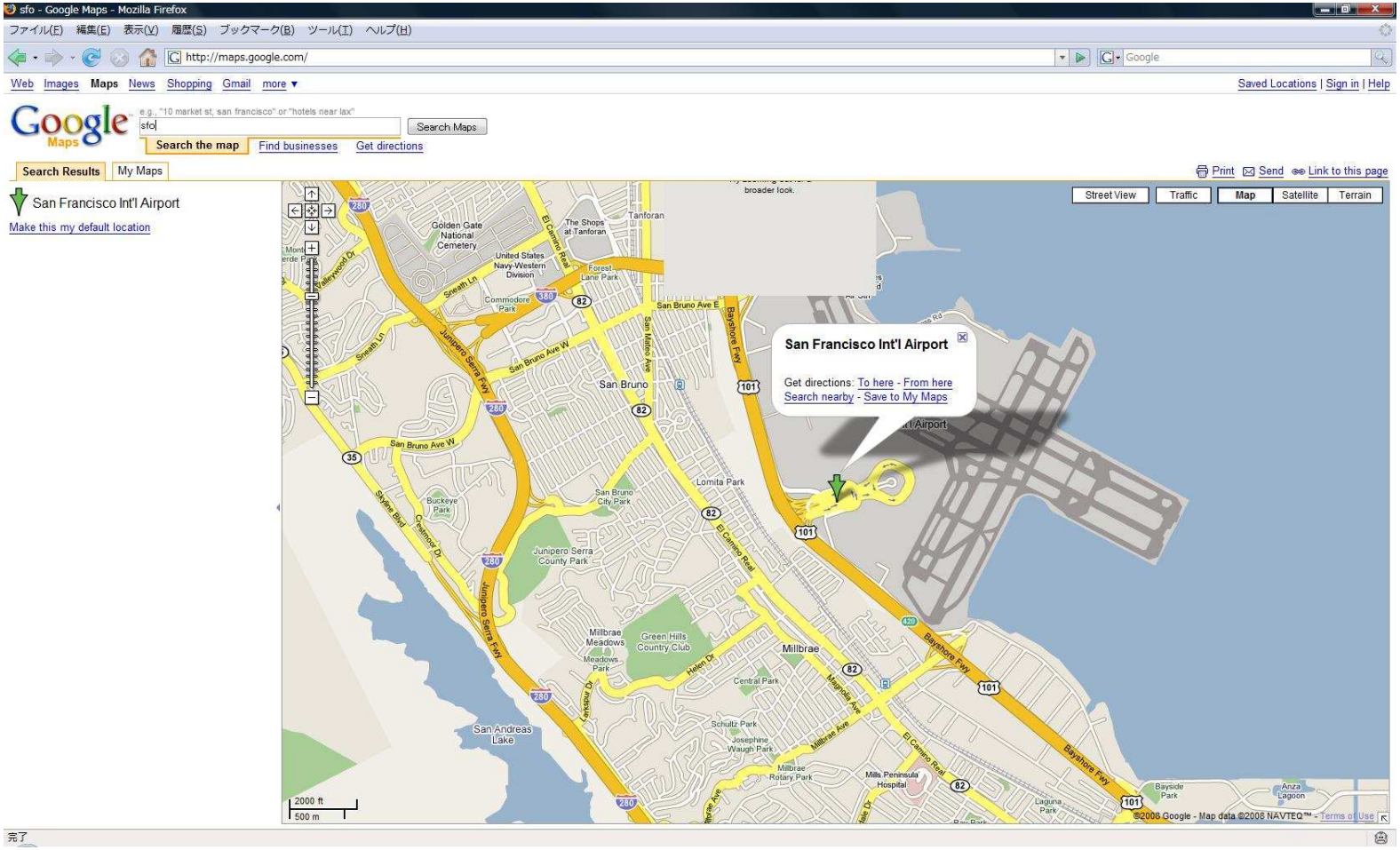
    ➔ When the number of users is **2,000**, it will be **only 30 sessions**

➔ This means……..

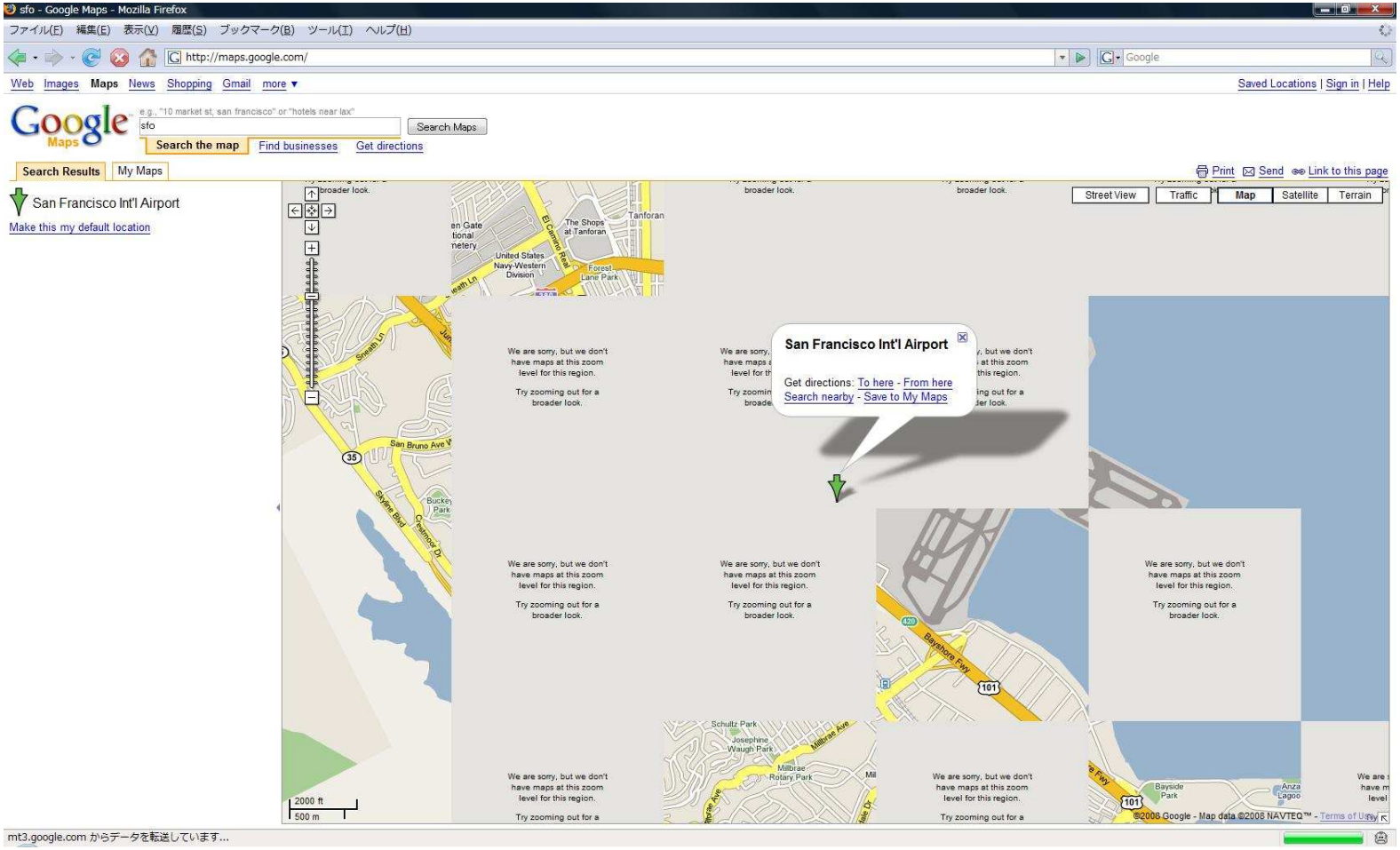
Max 30 Connections



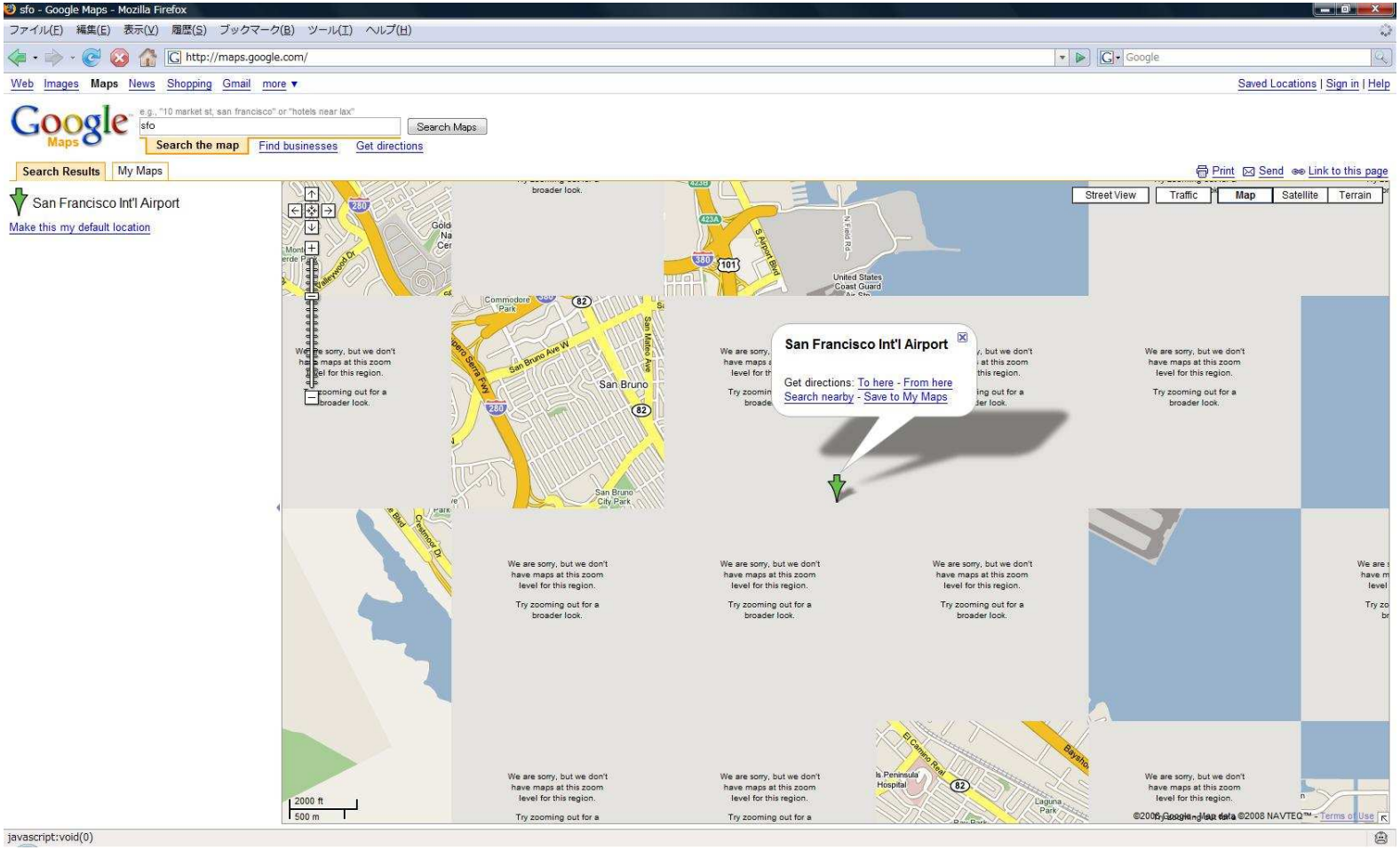
Max 20 Connections



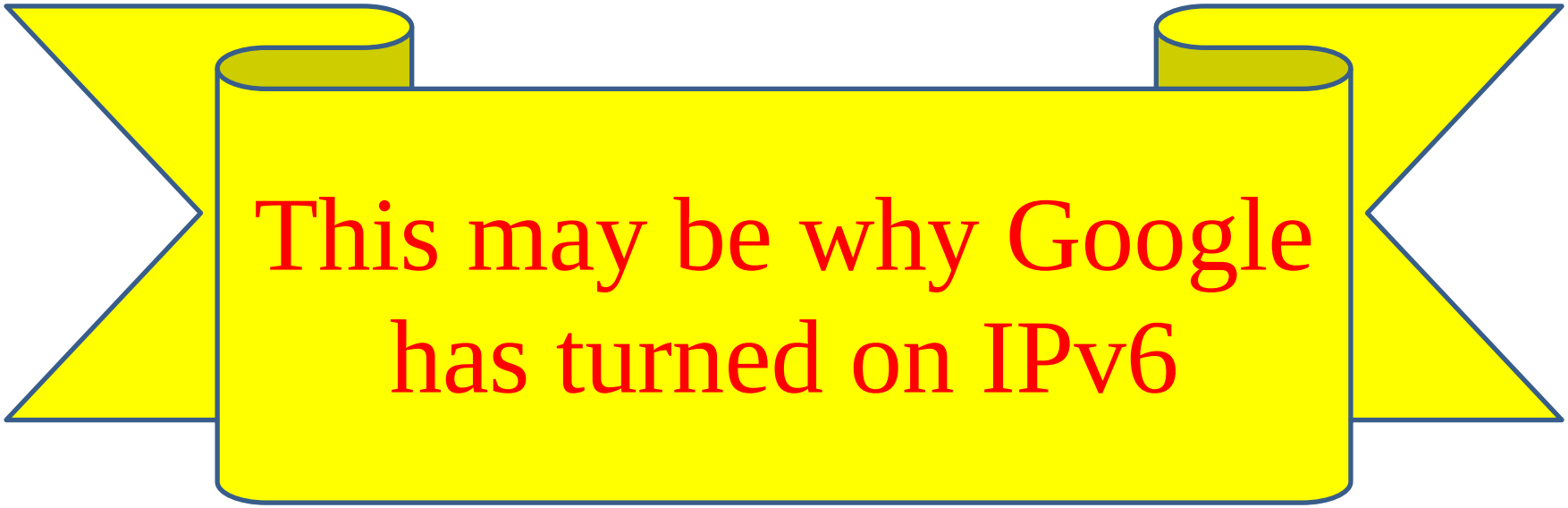
Max 15 Connections



Max 10 Connections



Max 5 Connections

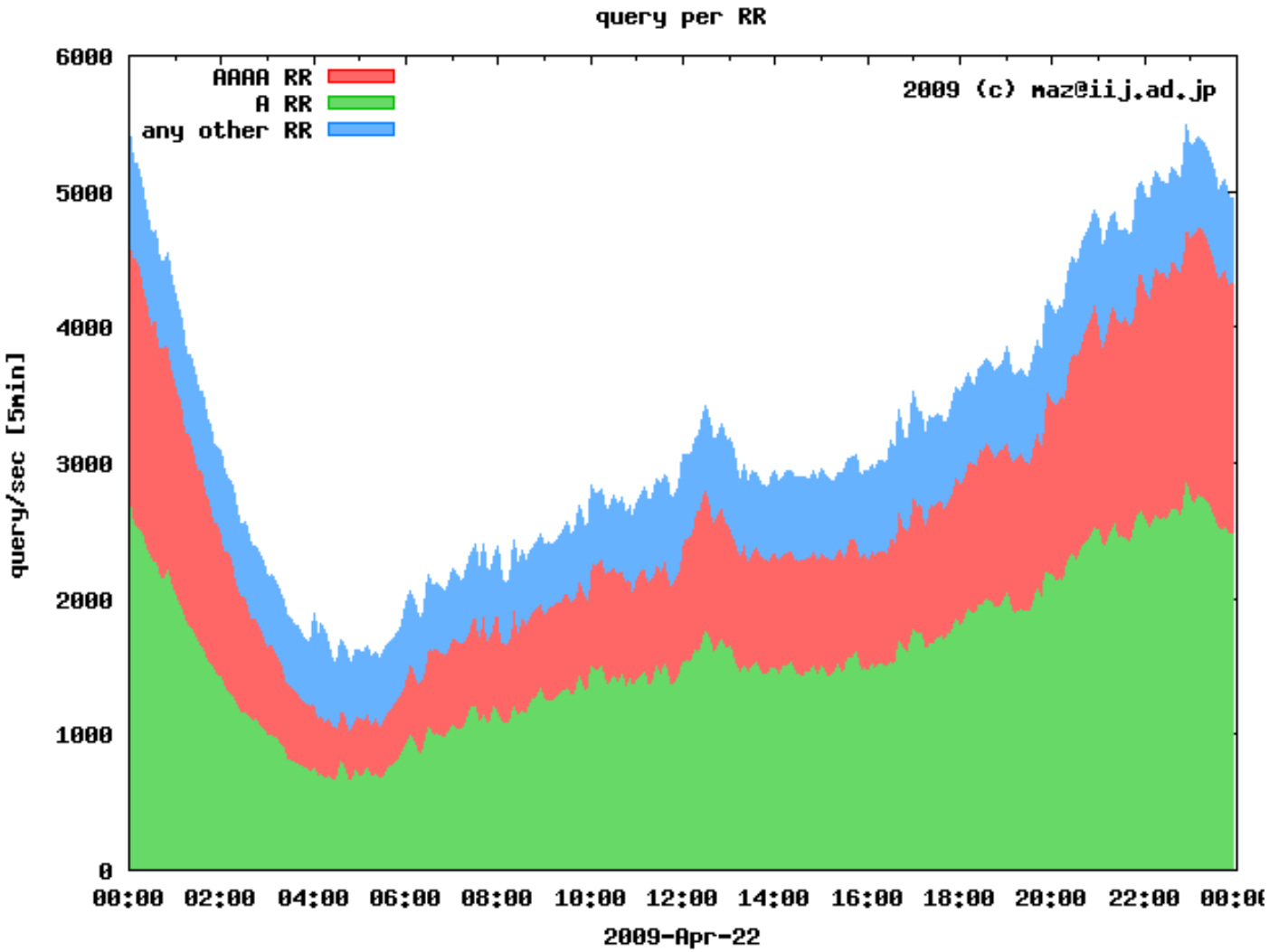

This may be why Google
has turned on IPv6

Some examples of major Web site

Application	# of TCP sessions
No operation	5□10
Yahoo top page	10□30
Google image search	30□60
□□□□□□□	50□80
OCN photo friend	170□200+
iTunes	230□270
iGoogle	80□100
□□(Rakuten)	50□60
Amazon	90
HMV	100
YouTube	90

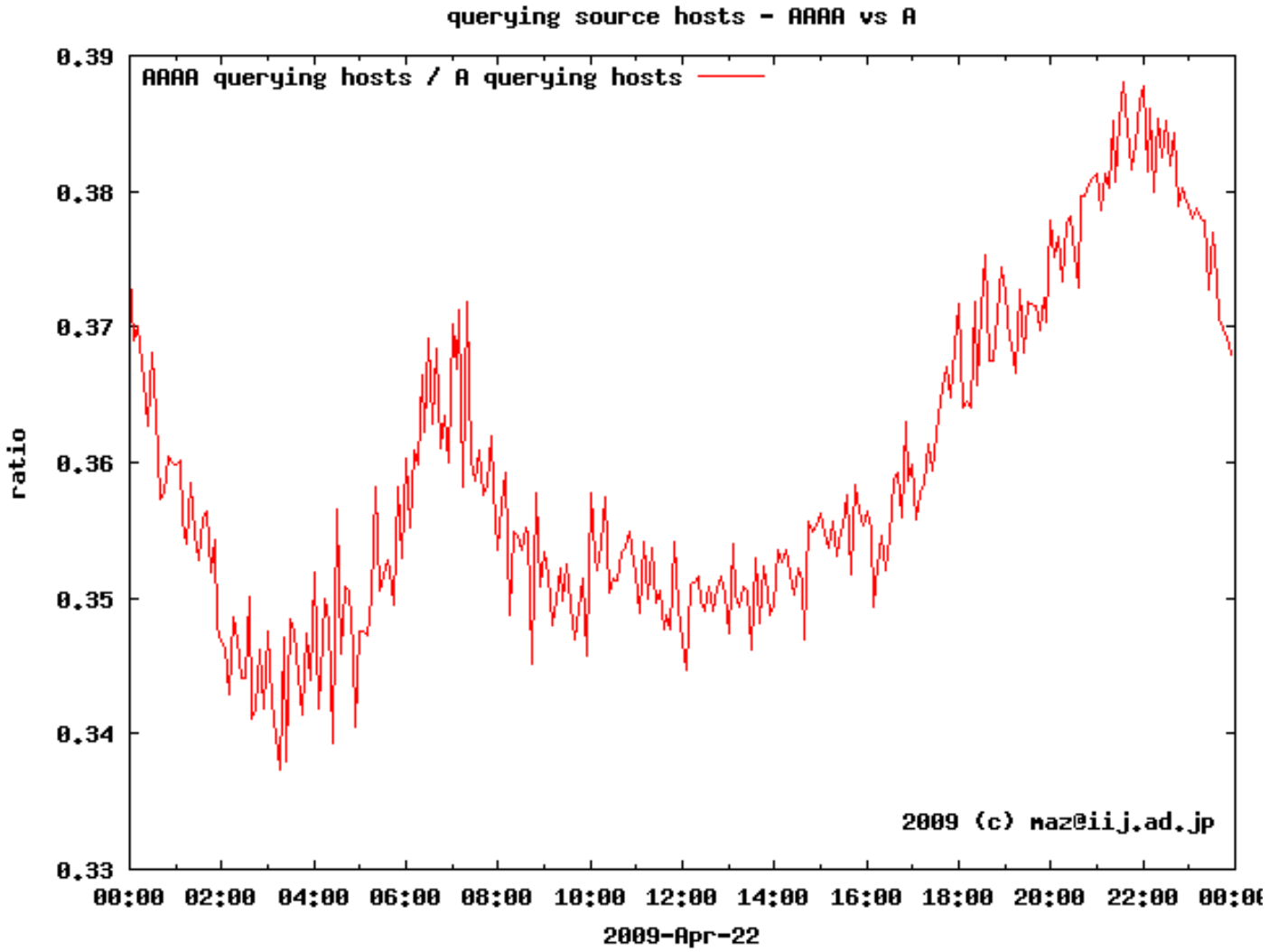
Source; Mr,Y.Matsuzaki of IIJ

A vs AAAA



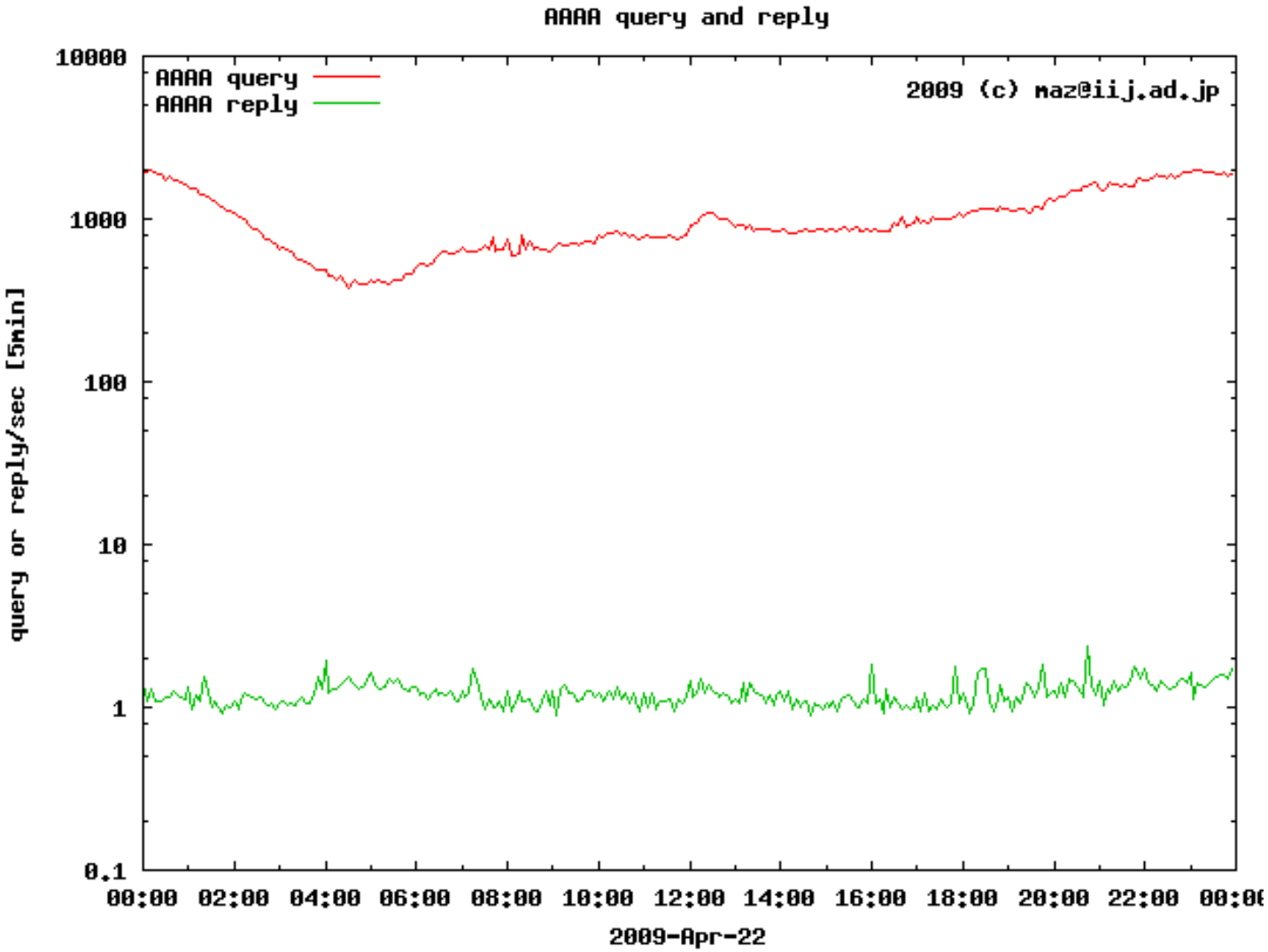
Source; Mr,Y.Matsuzaki of IIJ

Number of source node for Queries



Source; Mr,Y.Matsuzaki of IIJ

A vs AAAA



AGENDA

1. Issue of IPv4 Address Depletion

2. **Task Force on IPv4 Address Exhaustion**

3. Explore the New Business Areas

IPv6 Promotion Council

Task Force on IPv4 Address Exhaustion

Kicked off on September 2008

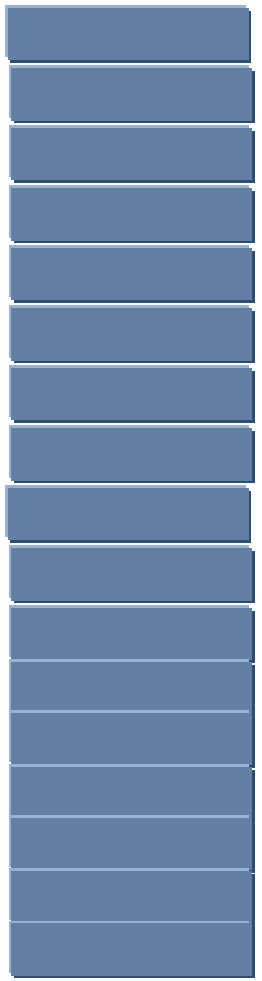
http://kokatsu.jp/index.html

IPv4 EXHAUSTION

Organizations in TF

Chair: Prof. Hiroshi Esaki, University of Tokyo
Vice Chair: Mr.Takashi Arano, Intec NetCore

- Participating organizations
  1. IPv6 Promotion Counsel (v6PC)
  2. Internet Association Japan (Iajapan)
  3. Next Generation IX Consortium (distix)
  4. Communications and Information network Association of Japan (CIAJ)
  5. TELECOM SERVICES ASSOCIATION
  6. Telecommunications Carriers Association (TCA)
  7. Japan Approvals Institute for Telecommunications Equipment (JATE)
  8. Japan Internet Providers Association (JAIPA)
  9. Japan Cable and Telecommunications Association (JCTA)
  10. Japan Data Communications Association (JADAC)
  11. Japan Network Information Center (JPNIC)
  12. JApan Network Operator's Group (JANOG)
  13. Japan Network Security Association (JNSA)
  14. Japan UNIX Society (jus)
  15. Japan Registry Services Co., Ltd. (JPRS)
  16. WIDE Project (WIDE)
  17. Ministry of Internal Affairs and Communications (MIC)



IPv4 EXHAUSTION

Two important messages;

1. Even if you have large IPv4 addresses, you must be suffered

2. There are a lot of IPv6 Ready equipments, thanks VISTA (and Windows7) and Mac OS-X.

Premise and Our Mission

- "Migration to IPv6" is **not** our primary mission.
  But, "Correspondence against the IPv4 address depletion is our mission".
- Premise□
  - ✓In about 2 or 3 years, you will experience the difficulty to obtain the global IPv4 address.
    - ➢The most suffering player and area is for the introduction of **new business** and for the **expansion of business**.
  - ✓**All the stakeholder will be suffered**.
    - ➢We need the collaboration and harmonization among stakeholders.

Recognized Stakeholders

- System owner (Public and Private Sector)
- System Integrator
- Hosting, ASP
- System Operator (out-source, self-operation)
- Network Provider
- ICT Equipment Vendor
- ICT Software developer/vendor
- End-User, e.g., residential customer
- Corporate user
- Analyst, investigator
- Educational Organization (e.g., university)

How you should implicate

- As a Business Opportunity
  - Innovation, revolution and creation of businesses regarding the system and network industry.
- As a Risk Management
  - Preferential treatment for the existing operators will be hard
  - Even existing operators (i.e., ISP, ASP) will experience the difficulties
  - Expectation to “IPv4 address trading market” would be of risk.
  - System, network and service security issue

Message to ISP

1. **In order to provide the network connectivity for IPv6 only servers, ISP must carry IPv6 packets**
2. **Carrier-Grade NAT is just transitional solution.**
3. **The system development/deployment against IPv4 address depletion is against the business risk.**
4. **The cost for system development may be ought to be considered as a risk management..**

Message to iDC, ASP, CSP

IPv4 EXHAUSTION

1. **Server operators will be suffered, first, since the server node needs global (IPv4) address.**
2. **At least, after the IPv4 address pool depletion, the IDC that have available global IPv4 address would have better business superiority than the IDC that does not have.**
3. **Many IDC companies and operators may not have correct technical understanding, and may anticipate the system will be modified overnight…But, it would be of business risk….**

Action Items by the Task Force

1. *List up the issues to solve by each player*
2. *Information sharing among related organizations*
3. *Establish the Q&A center*
4. *Design and operation of testbed*
5. *Design and operation of education package*
6. *Issues and it's solution of security during the transition process*
7. *Out-reach to new stakeholders suffered by IPv4 address depletion*

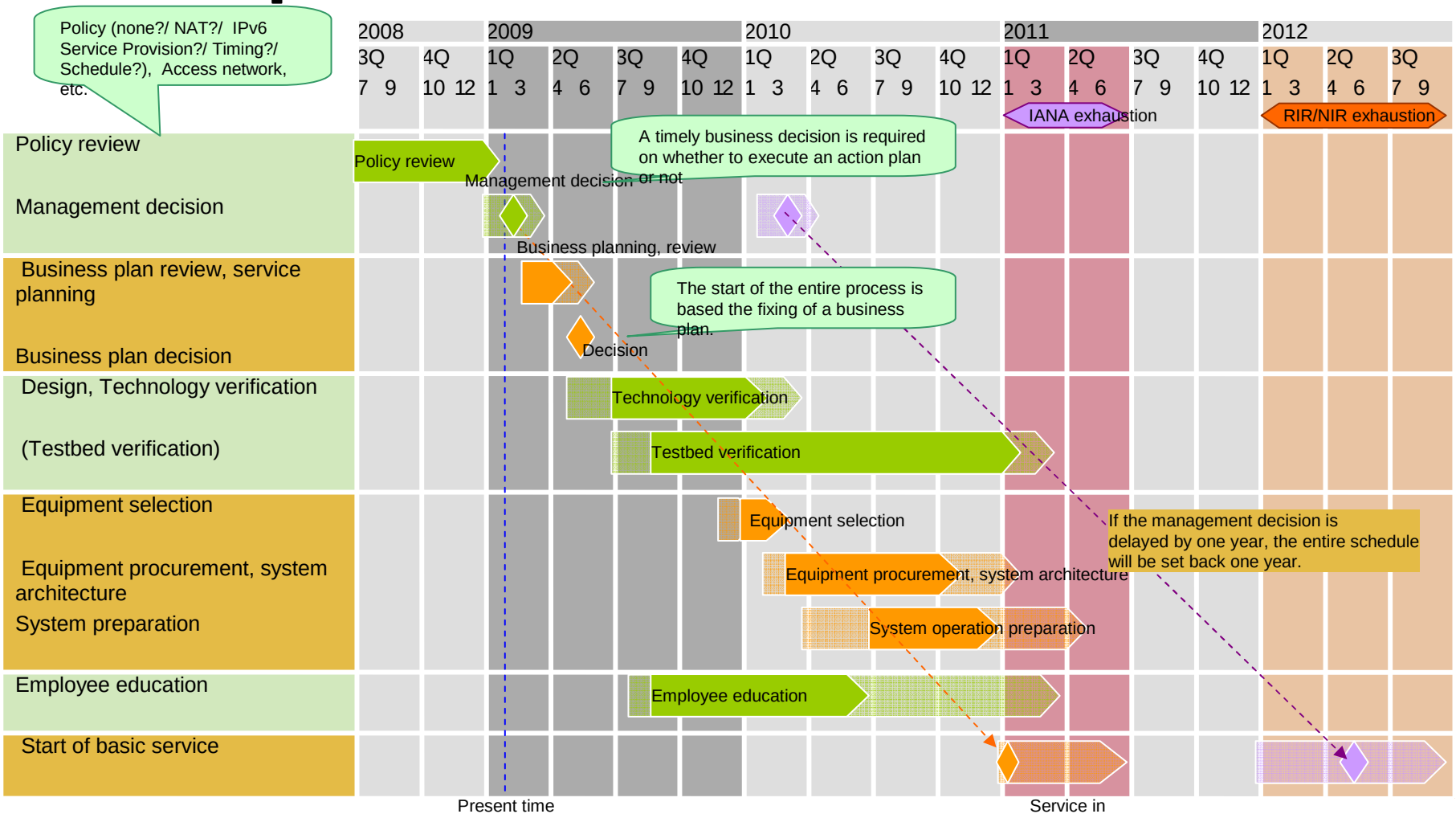
Working Groups within the TF

WG	In charge of	lead	members
Publicity	Assistance for events/conferences of member associations, Regular press conferences Planning of outreach	JPNIC	IAJapan□Telesa, JAIPA□□ 6PC
Education and Testbed	Education programs, negotiation with certification providers, planning the testbed	v6PC	JPNIC□JATE□JAIPA□ JCTA/JCI□JANOG□jus□ WIDE□DISTIX
Action planning support	Supporting the action planning by every stakeholder	v6PC	IAJapan, Telesa, JAIPA□ JPNIC
Applications	Enlightening the SIers,	v6PC	JUS□JISA
Access Network	Negotiation with Access Network providers	JAIPA	TBD
Ready Logo	Planning IPv6 Ready Logo for ISPs and Web sites	JATE	v6PC
Secretariat		v6PC	JPNIC

Activities of Action Planning WG

From http://www.kokatsu.jp/blog/ipv4/en/data/090217_v4exh_actionplan_en.pdf

Network Operators' timeline

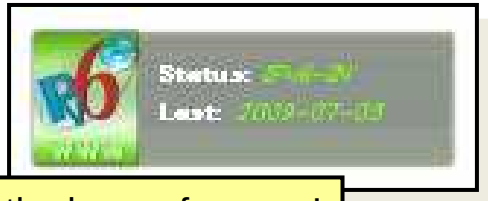


IPv6 transition testbed

- Organized by Education and Testbed WG in the TF
  - Kawasaki Campus , Keio University
  - Osaka Data Center at Broad Band Tower
- Purpose
  - Provide an environment which can simulate the IPv4 exhaustion and the actions towards exhaustion
  - Establish transition scenarios in multiple circumstances
  - Human resource development programs
- Targets
  - ISP, CATV, iDC, ASP, CSP, Hardware Vendor, Software vendor, Security Vendor, Sier, etc.

Activities of Ready Logo WG

- Allow IPv6-ready ISPs and Web sites to *"differentiate from others"*
  - Apply and extend the strategy of "IPv6 Ready Logo" for equipments to services like ISPs and Web sites
- Had domestic and Intra-TF discussion, then synchronize it to *"IPv6 Enable Program"* of *IPv6 Forum* – launched in June 2009
  - Why don't you get the logo at:
    - http://www.ipv6forum.com/ipv6_enabled/ipv6_enable.php !!



Kokatsu.jp has already put on the logo, of course!

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1. Issue of IPv4 Address Depletion

2. Task Force on IPv4 Address Exhaustion

3. **Explore the New Business Areas**

Lessons from IPv6 Operations as a business incentive

- IPv6 is ready to go into professional and business operation
  - Initial cost:
    - New services;

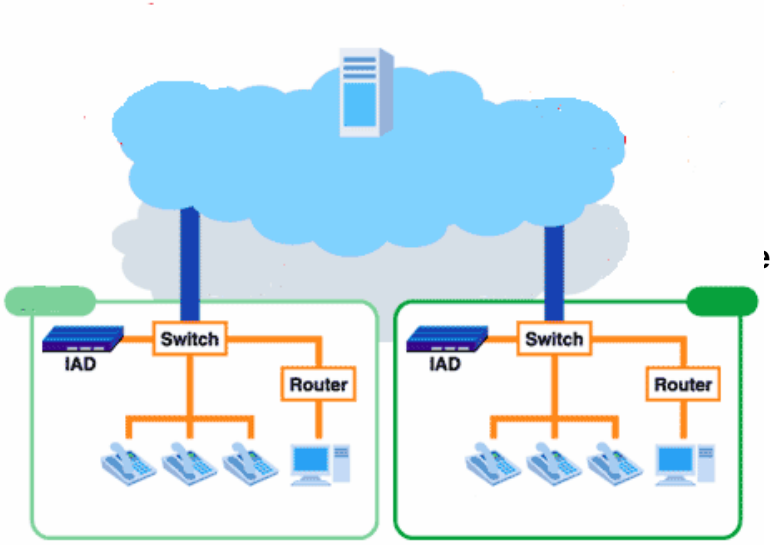
      Especially, when you can start some new services/applications, the cost of IPv6 is almost same as of IPv4. Sometime, cheaper than IPv4, due to simple network design.
  - Running cost / life-time cost
    - How will you come up with merging, restructuring of organization

Nationl-wide IP-Phone Installation

◆IP-Phone (by FreeBit)

✓IP-phone solution based on shared IP Centrex

✓Has already installed 20,000 terminals to 280+ sites of dormitories to manage their distributed facilities within 18 months



System Target

-Reduction of initial and running cost

-Provides the service such as PSTN quality

-Easy Operation for diverse / distributed facilities (e.g. by dormitory operator)

What IPv6 achieves

- Simplifies Network design / re-design
  - ➔ fall into only three install manuals
- Reduce the required human-resources and it's cost
  1. Installation
  2. Mis-configuration (i.e., 300 ➔ single number)
  3. Trouble shooting

Nationl-wide IP-Phone Installation

What IPv6 achieves

- **"*Simplifies*" Network design / re-design**
  - **→ fall into only three install manuals**
- **"*Reduce*" the required human-resource *"cost"***
  1. ***Installation*, auto-configuration at end-nodes**
  2. ***Mis-configuration***
     (i.e., 300 → single number)
  3. ***Trouble shooting***
     (thanks for NAT-free global IP address)

A matter of "Cost Reduction"

Lessons from IPv6 Operations as a business incentive

- IPv6 is ready to go into professional and

For new business,

It is s matter of

“Lifetime Cost”

Running cost / life-time cost

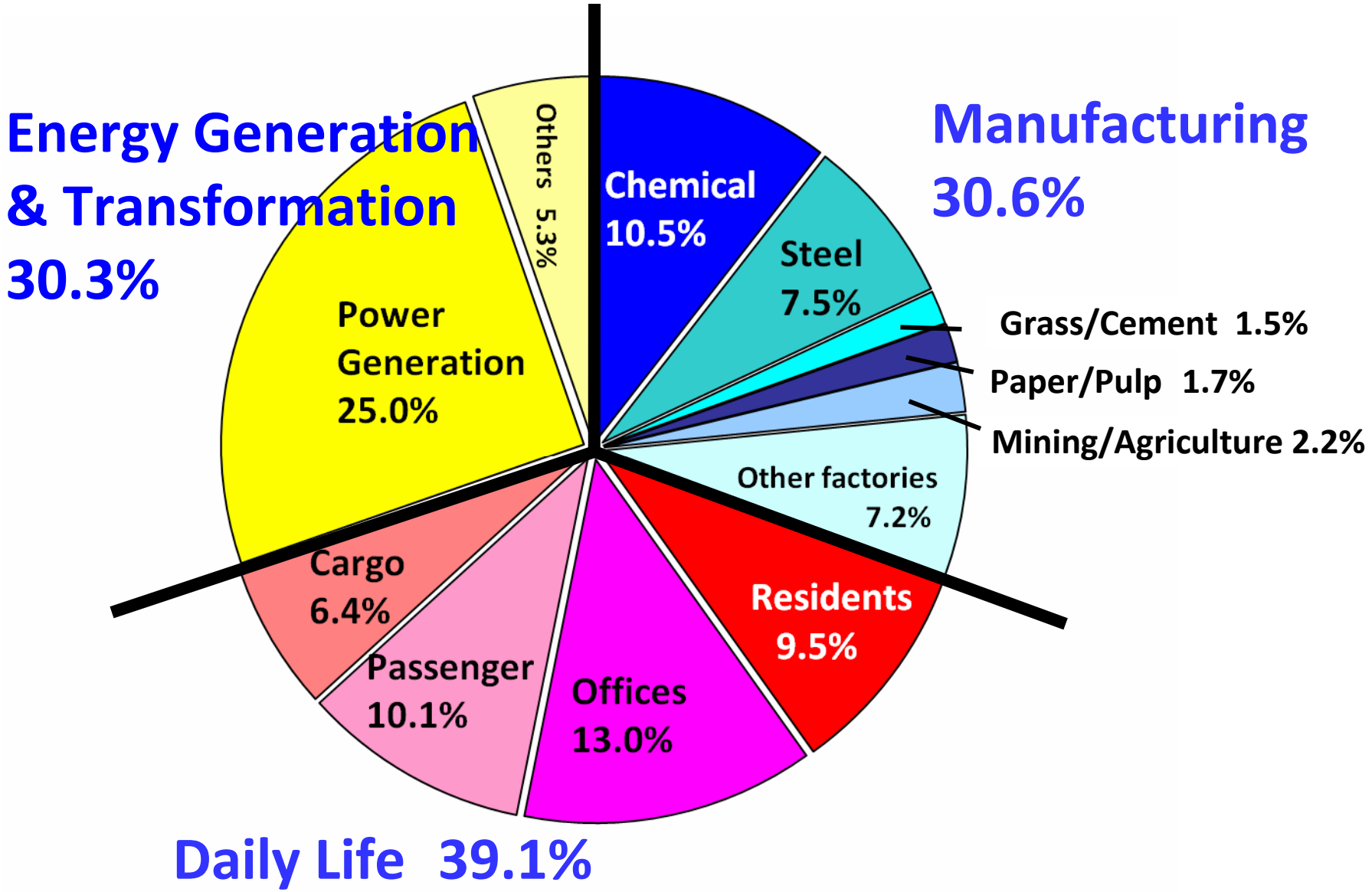
- How will you come up with merging, restructuring of organization

Why we go to new continent ?

- Contribution of revenue by ICT industry in the **GDP is less than 10%.**
- More than **90% revenue** in GDP is come from **non-ICT industries**.
- Almost all the companies, including non-ICT industries, **depend on ICT technology** on their corporate operation.
- How to use the ICT defines the marketing power and operating power of companies.

Source：Hiroshi Komiyama, Ph.D, MRI Ltd.,

Japanese Energy Consumption in 2005



How to use the sensor network e.g., saving energy in building system

- Huge operational cost
  - Large energy (e.g., gas, electricity) cost
  - About 30% energy saving has achieved !
- Proprietary technologies
  - Large complex has more than 200K monitoring and controlling points
  - Each systems use different technology

  ➔ Let it with open TCP/IP technology (i.e., IPv6)
- COP3 by United Nation
  - 10%-30% energy saving

1. **Improve portfolio**
2. **Increase asset value**

How to use the sensor network
e.g., saving energy in building system

1. Energy saving and preserving the Earth is now “Global” agenda, while there is an economical benefit and incentive for private companies.
2. Integration of separated sub-systems, e.g., Air-conditioning, lightening, security, IT.

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    - pen TCP/IP technology (i.e., IPv6)
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  - – 1

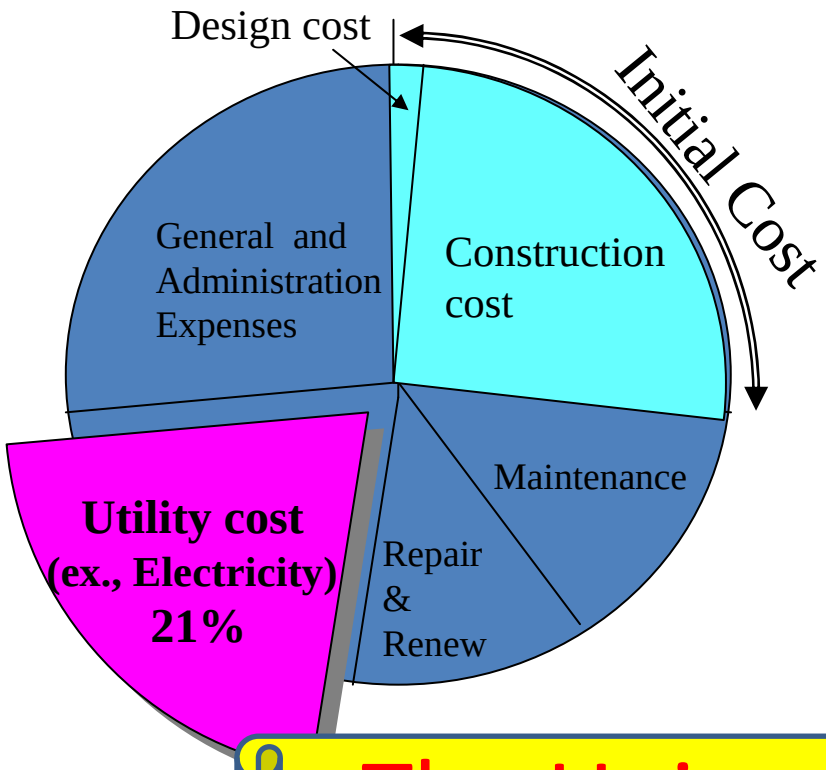
Large number of sensors/actuators; they has NOT/NEVER cooperated…. People start to realize the benefit of open system, i.e., IP.

Interesting Topics at INTEROP Tokyo 2009

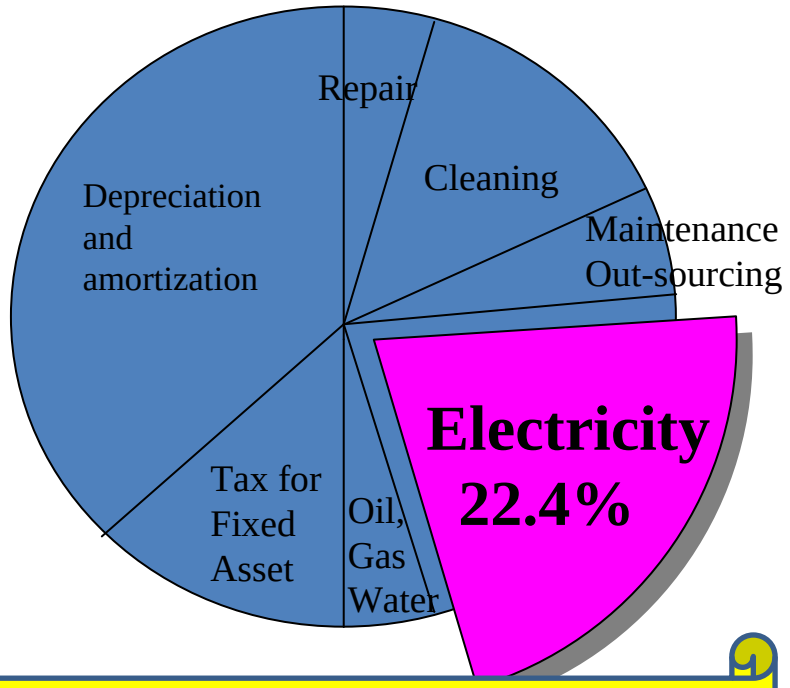
- "Smarter Planet" by IBM Japan
  - Let smarter all the facility and activities
    e.g. , Cloud R&D platform, Rea-time PDCA with real-time data
- Energy Consumption by IT/ICT is only few %
  - Facilities(50%), Transportation(25%), Factory(25%)
    - e.g., factory is not industrialized……..
  - Facility□25% for IT/ICT equipments, 75% for facility management

Life-time cost in Building System

Life time portfolio
(in office building)



Yearly portfolio
(in office building)



The University of Tokyo pays
$50M/year on Electricity !!!

tml

Special Project at the Univ. of Tokyo "Green University of Tokyo Project"

- Building No.2, Hongo Campus
  - Targeted reduction;
    - **15%=$4M USD (in 2012), 50%=$30M USD (in 2030)**
  - 12 floor high, R&D and R&E activities
  - Established October 2005, Start of Operation in March of 2006
  - More than saving energy
  - Forming R&D consortium

東京大学
THE UNIVERSITY OF TOKYO

Mission Statement

1. Contribution to TSCP (Todai Sustainable Campus Project)
   - 15% reduction in 2012, 50% reduction in 2030.
2. Green IT campus
   - Reduce power consumption by ICT equipments
   - New operation and design model of campus
3. Testbed operation for the evaluation and establishment of Green facility networking and controlling.
   - Cooperative facility networking
   - Explore the new business
4. Technical Specification for Interoperability
5. Referenced procurement specification for campus
6. Specification of Benchmarking and RoI for saving energy

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Estb.June 09, 2008

- (WILCOM)
- NT
- Cis
- Ci
- IT
- WIDE
- IPv6

40 Organizations
27 Corporations, 13 NPOs

Participants

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- [redacted](WILCOM)
- [redacted]NTT[redacted]
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Stakeholders on Facility Business;

- Developer, e.g., landlord
- General Contractor/Con”s”tractor
- System Integrator
- System Designer
- ICT Vendor
- Component vendor, e.g., sensor
- Standardization Body
- R&D organization, e.g., University
- Local government, e.g., Tokyo

Integration of legacy systems

Visualization

Analysis

Reaction / control

I/F

Web

Data Center

LON

BX

WEB

CSV

DU

DU

DU

CT

BCRN

BCRN

BCRN

PLC

LAN

AP

AP

AP

AP

ID

ID

ID

Air Condition

Air-Condition

Lightening

Integration with IP

Additional System

Security System

Integration of legacy systems

1. **Sub-systems have never cooperated to each other……**
2. **Enough stupid to deny the cooperation and coordination…..**
3. **Isolated and proprietary sub-systems…..**

➔ **Expensive and Stupid System**

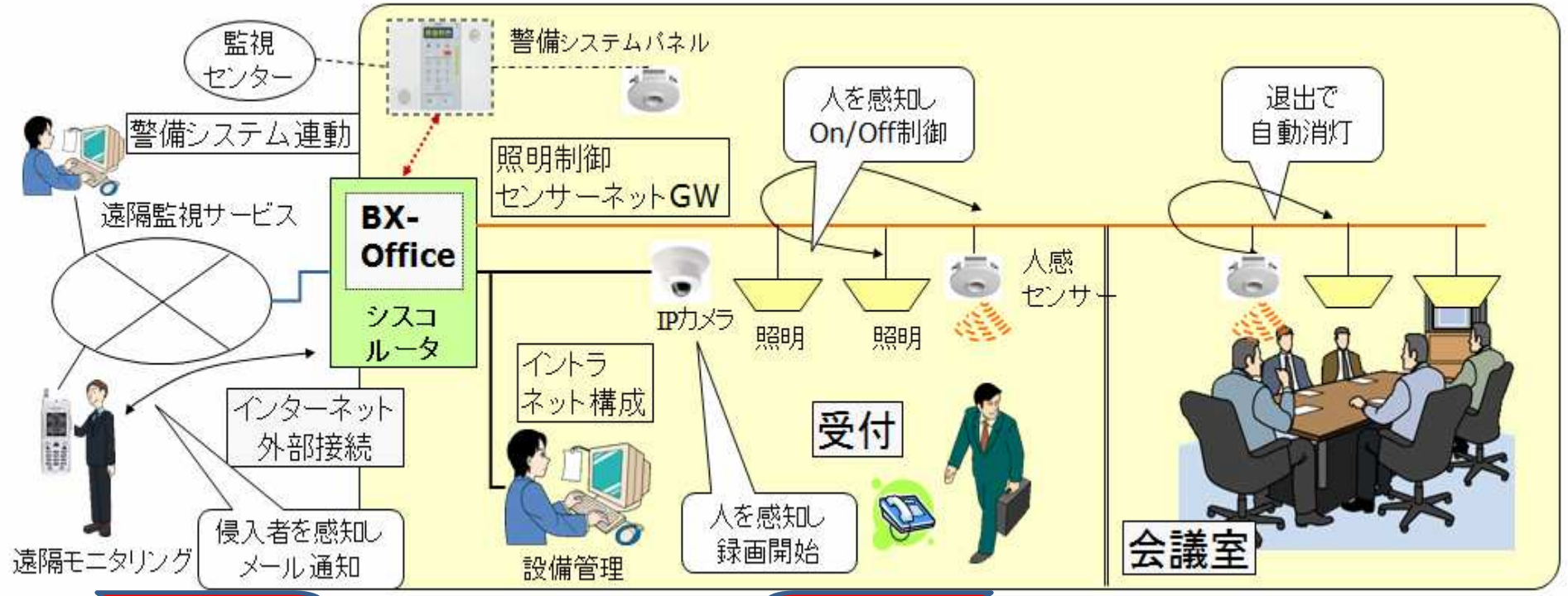
i.e.,

Integration with IP | **Additional System** | **Security System**

Experimental operation

UBITEQ, Panasonic EW, Cisco Systems, {Yamatake}

◆システム構成



In operation since Nov.15,2008

UBITEQ
UBIQUITOUS TECHNOLOGY

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遠隔

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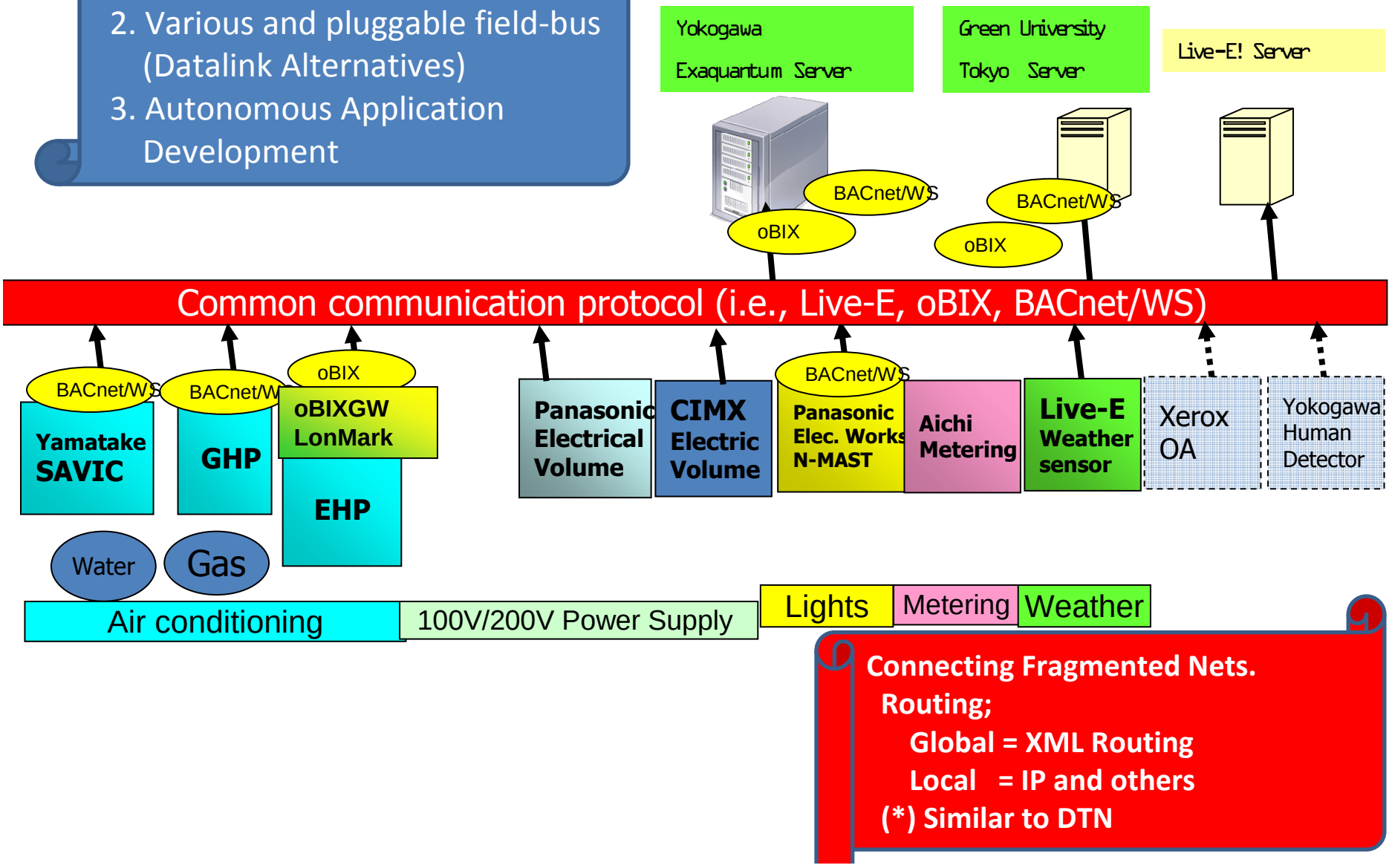
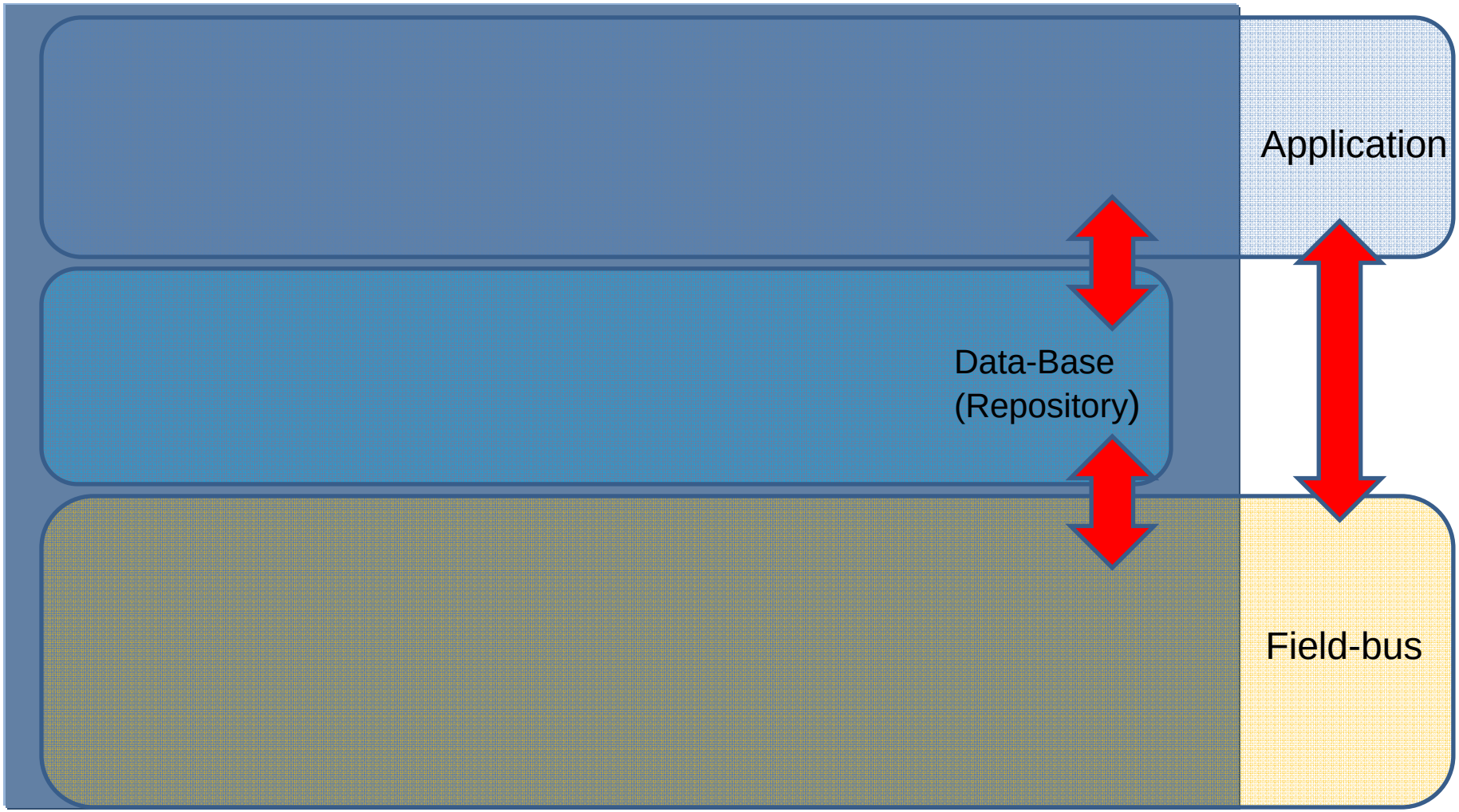
Design Principle

1. Shared database
   (Database centric)
2. Various and pluggable field-bus
   (Datalink Alternatives)
3. Autonomous Application
   Development



Connecting Fragmented Nets.
Routing;
Global = XML Routing
Local = IP and others
(*) Similar to DTN

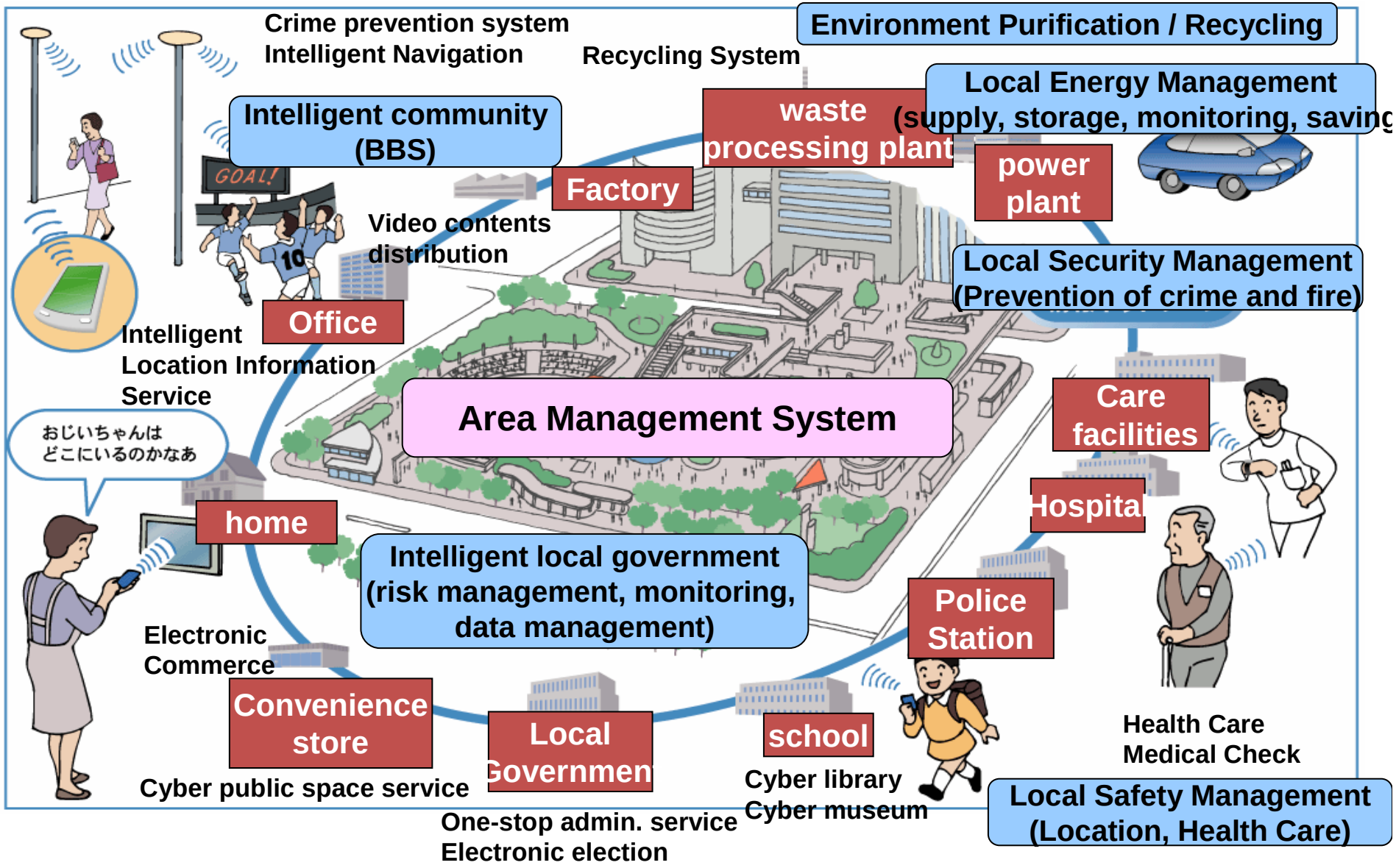
Referenced System Architecture for standardization



Conclusion

Metropolitan design; Real-Space Internet with IPv6

Source: Matsushita Electric Works



Innovation of Metropolitan Design Principle

Past requirements

- **Agriculture (river, canal)**
- **Manufacturing (logistics=train, road)**

Future:

Control of "Energy and information flow" with ubiquitous energy sources

→ SCM of energy flow

What we (really) expected ?

- Win-Win relationship between Environment /Energy-saving and Ubiquitous networking

Step.1 Mandatory components

1. Sensors and actuators network
2. Collaborative operation among individual components
3. Control the energy flow using the information

Step.2 Ubiquitous digital space sharing all the digital information

(*) **Each equipments and components are already paid-off !!**

Step.3 **Invention and innovation for new applications**

This is the ”internet End-to-End Model”

東京大学
THE UNIVERSITY OF TOKYO

WIDE PROJECT

www.wide.ad.jp

Thank you

IPv6 Promotion Council

IPv6 Promotion Council of Japan:
http://www.v6pc.jp/en/index.html
e-mail: info@v6pc.jp

IPv4 EXHAUSTION

Task Force on IPv4 Address Exhaustion:
http://kokatsu.jp/

Green university of Tokyo Project

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