Introduction of IPv6 in Japan

2005.5.31
Takashi Arano
Intec Netcore, Inc.
Board member, the IPv6 Forum

Who are We? Intec NetCore, Inc.

- R&D and Consulting company for advanced network technologies
  - IPv6, MPLS, Reliable network technologies, Routing, etc.
- IPv6 Activities
  - Research Results
    - Multi-Prefix Control Technology
    - P2P VPN tools and IPv6 Security
    - IPv6 Deployment and Transition Methodologies/Guidelines
    - IPv6 Solution development
    - IPv6 Metrics
  - Proposed IPv6 Address Policy to APNIC/RIPE/ARIN which has been adopted as the global standard (2002)
  - Published "IPv6 Deployment Guideline" which has been licensed all over the world (2003-2004)
  - Served an coordinator/advisor for "IPv6 Deployment Field Trial" project (5BYen for 3years of 2003-2005) by Japanese government
  - Succeeded in implementation of new IPv6 Security Model in the joint research with NeuSoft, Inc, a Chinese SI company, which may be the first case in the world to our knowledge(2004.12)
  - A lot of outsourced researches and techno-strategic consulting
  - Has served many public roles
    - board member of the global IPv6 Forum, Vice Chair of ICANN Address Council, APNIC address policy SIG chair, Steering committee member of Asia Pacific IPv6 Task Force, Trustee of JPNIC, Chair of IPv6 Deployment Committee of Internet Association of Japan, Chairs of IPv6 Deployment WG of IPv6 Promotion Council Japan, Director of WIDE Security Area, etc

6 Questions about IPv6

- WHAT?
- WHY?
- WHEN?
- COST?
- HOW?
- BARRIER?

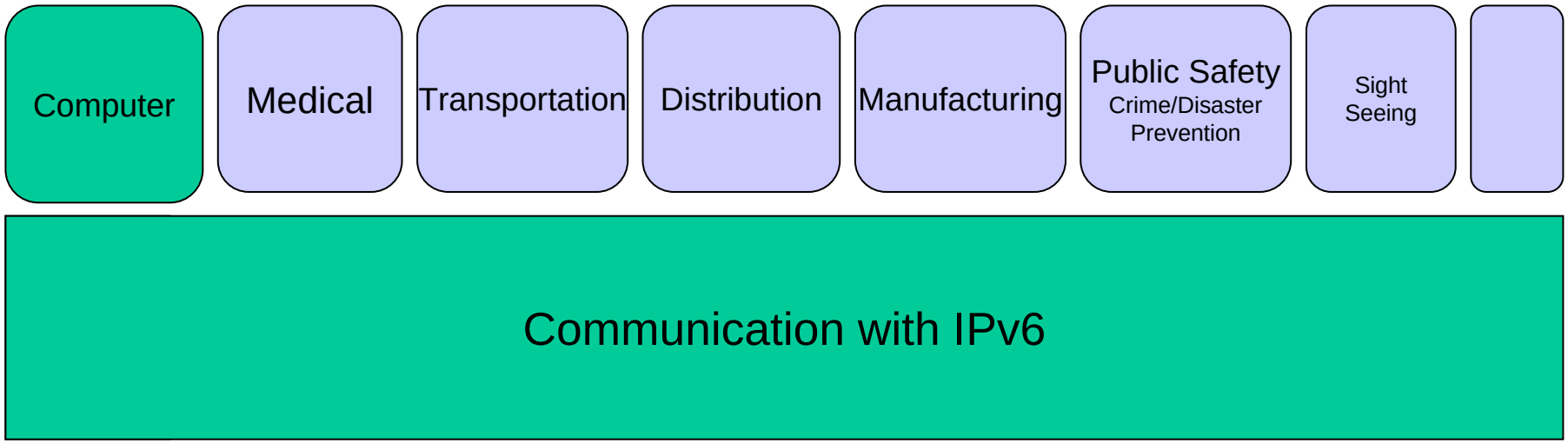
WHAT IS IPv6 ?

What is IPv6?

- IP version 6
  - Current version is v4
  - Version 6 = next generation IP protocol
  - Basic features were standardized in IETF in early 90's.
- Features
  - Huge address space
    - From 32bit to 128bit
    - Huge difference (astronomically!)
  - Review pros/cons of IPv4 and redesign it
    - All IPv6 equipments must implement IPSec, an end-to-end security technique, by default.
    - Plug and Play
    - Flow label for QoS flow identification

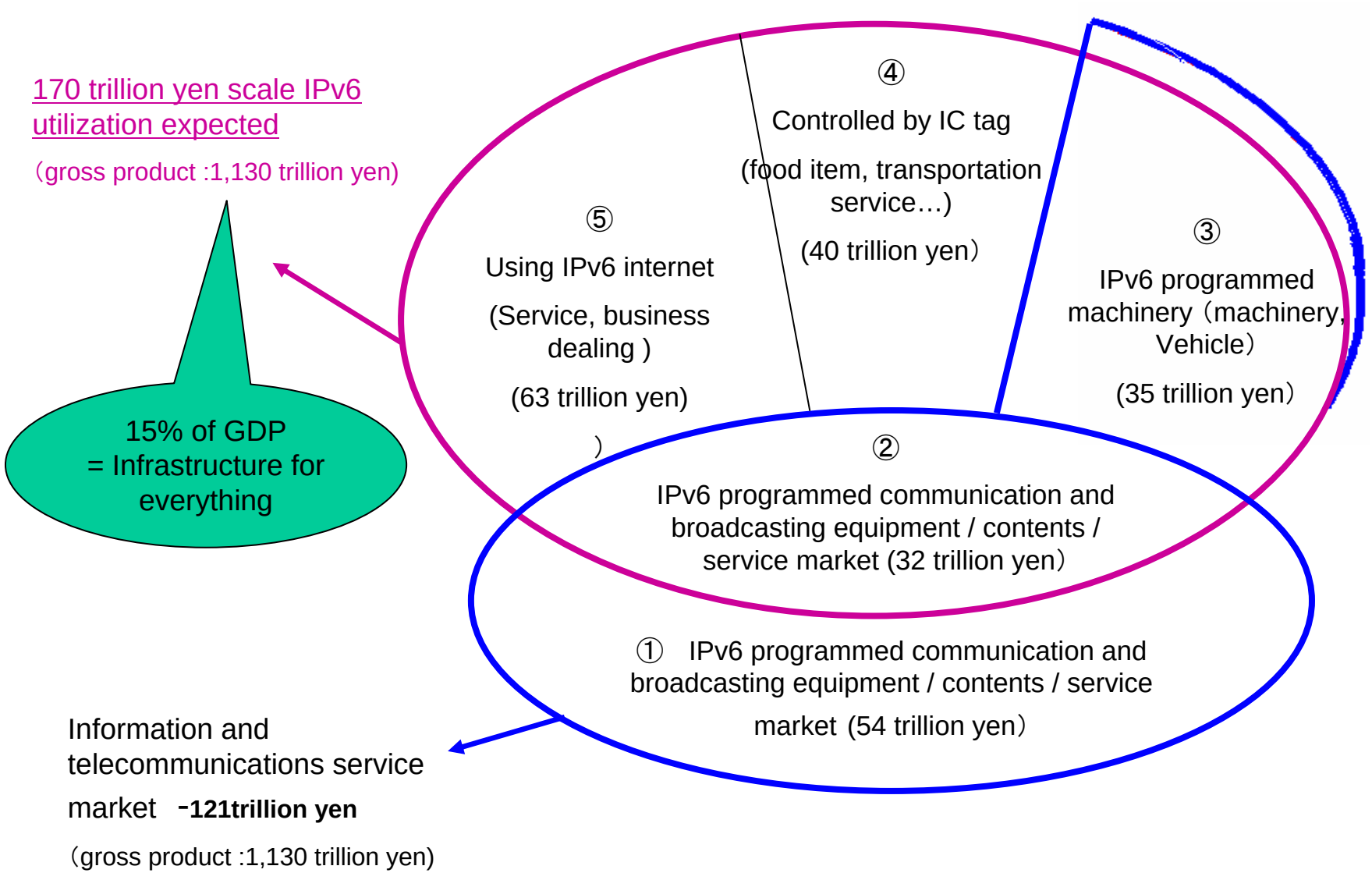
Goal of IPv6

As an Enovation Enabler



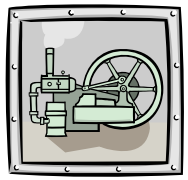
Scale of IT Market in 2010

"Whole concept of Internet policy in the 21st century –the 2nd interim report" / Home Affairs



Learn from the history

- Watt's stream engines triggered a lot of innovations and changed the worlds.
- How?



- Horses could do the same things as stream engines did.
- There were many other engines what could do the same things. In a sense, Watt's was an improved technology.
- But, Watt's could do the same things much better.

- Tens of years later, big innovation happened with invention of locomotive as an application of steam engines.

- Then IPv6?

WHY ?

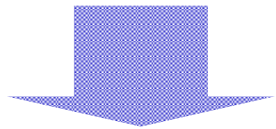
Why IPv6?（Ｉ）

- Limit of IPv4 Operation
- New Business Applications and Needs of IPv6

Why IPv6?（Ⅱ）

What's the limit of IPv4？

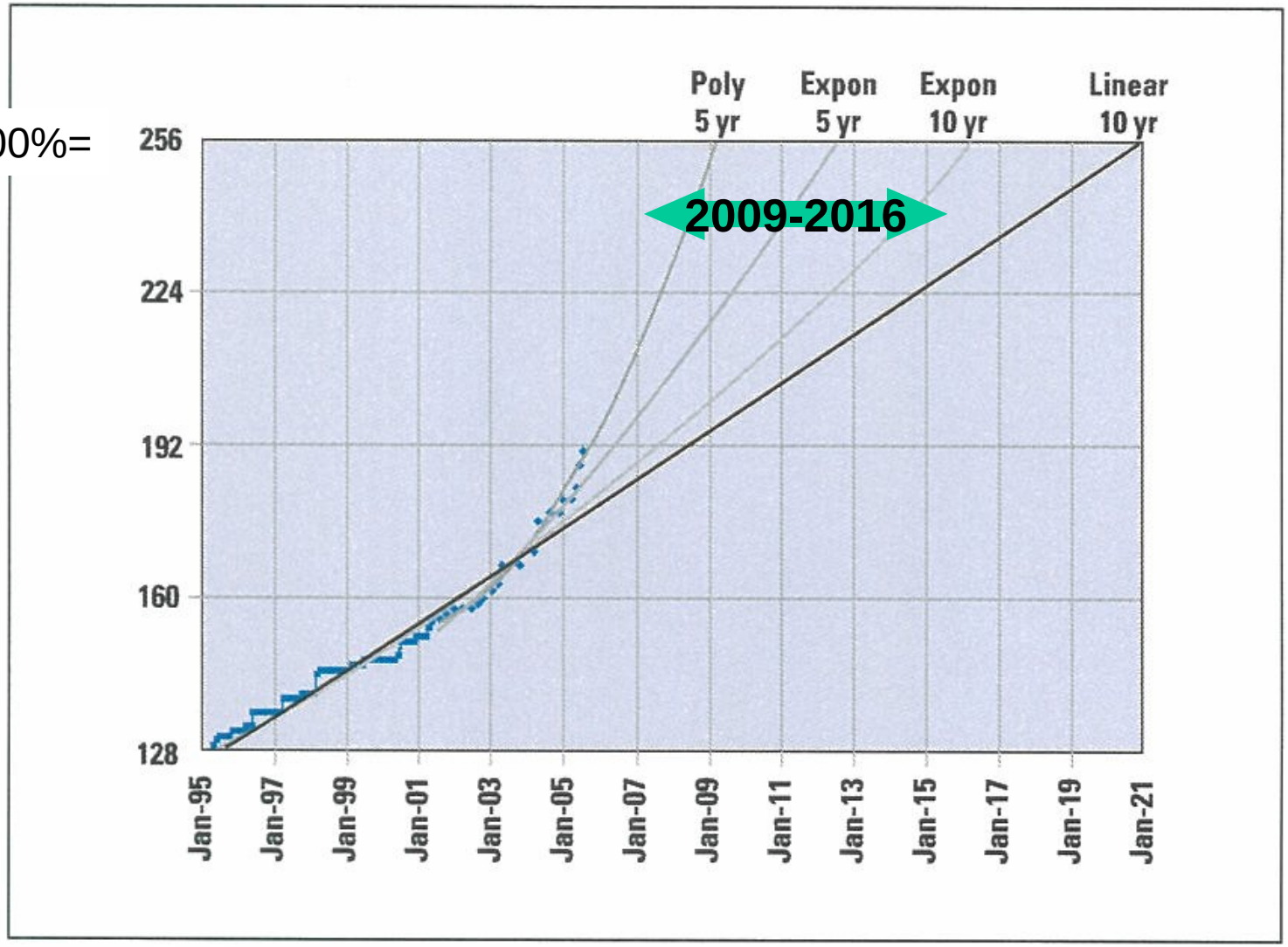
- Unexpected Expansion of Scale



- Address Depletion
- Loss of Seamless

Address Consumption and its Prediction chart

100%=



Tony Hain『The Internet Protocol Journal』
September 2005 (Volume8, Number3)

“Change in the Quality”

- IPv6 brings not only “change in the quantity”, but also “change in the quality”

- More Flexible Way of Address Usage
- More Security
- Range of the Internet will be expanded
  - from Computer to Non-Computer
    - Office / Telephone、Fax、Desk、Watch、Camera、Meeting room・・・
    - Home/ Internet Appliance、Vehicle、Mobile、POS、Game machine・・・
  - from Private Address＋NAT to Global Address

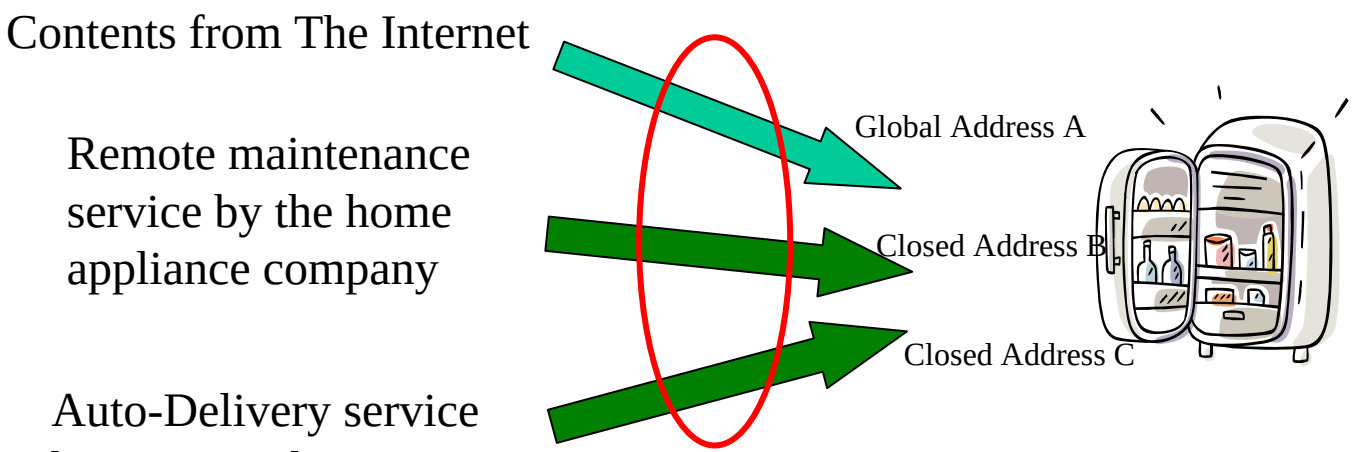
NAT：Network Address Translation

Address Usages

- Two ways in IPv4
  - ISP gets addresses from APNIC and assigns them to sites for the Internet connectivity
  - Private address which is shared, for closed nets
- Other usage in IPv6?
  - Service providers (xSP) gets address from APNIC and assigns them for their services including the Internet connectivity services or private services
    - Addresses are globally unique

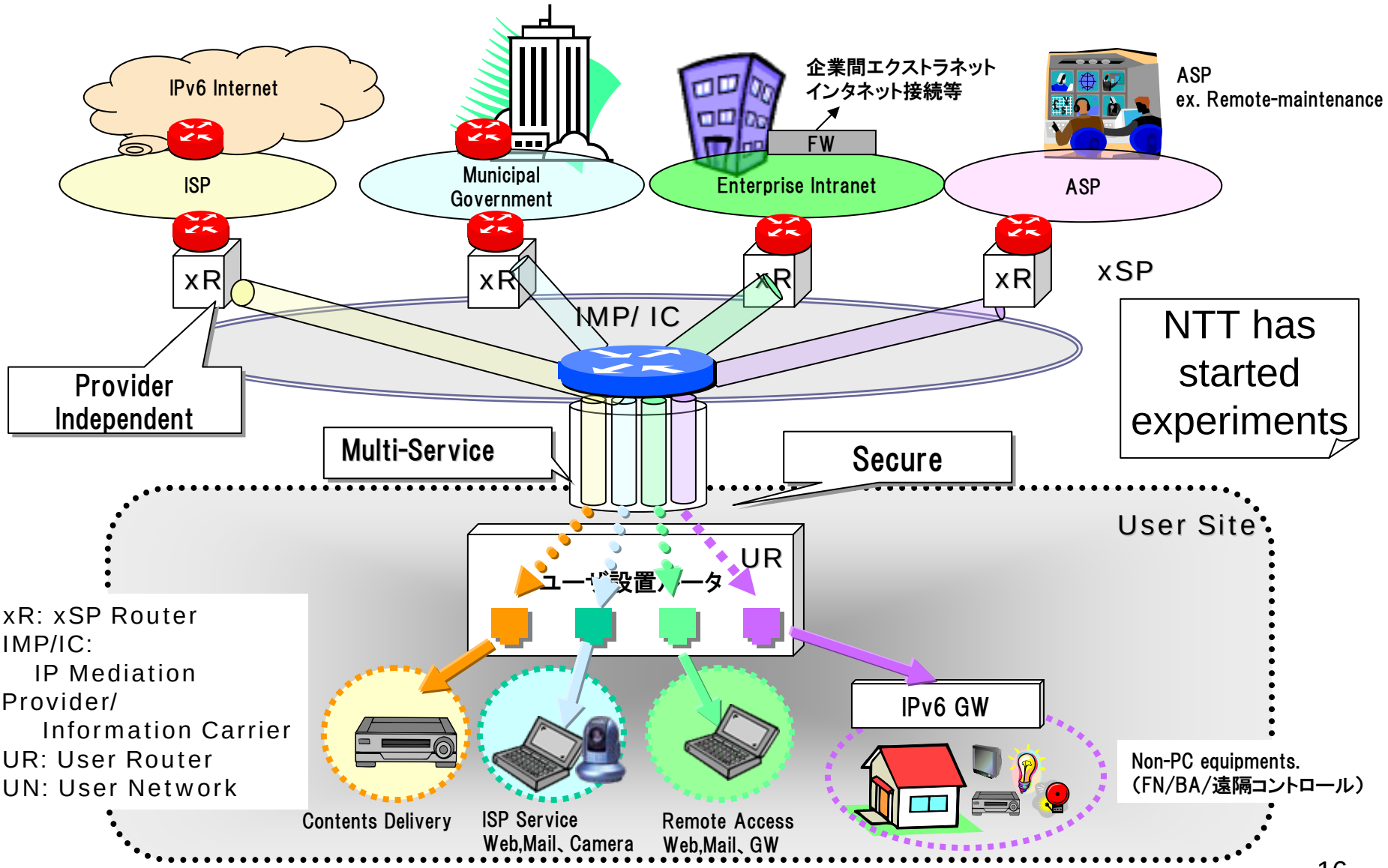
Closed Network and Multi-Prefix services

- Closed network with “Global Unique Address” is one of IPv6 killer applications.
  - No more secure than closed networks
  - Applications
    - Various industrial applications
    - Closed network to home
- Multi prefix services by carriers are expected



Multi-Prefix Services by Telecom Carriers

MP/MH Service(MultiPrefix/MultiHome)

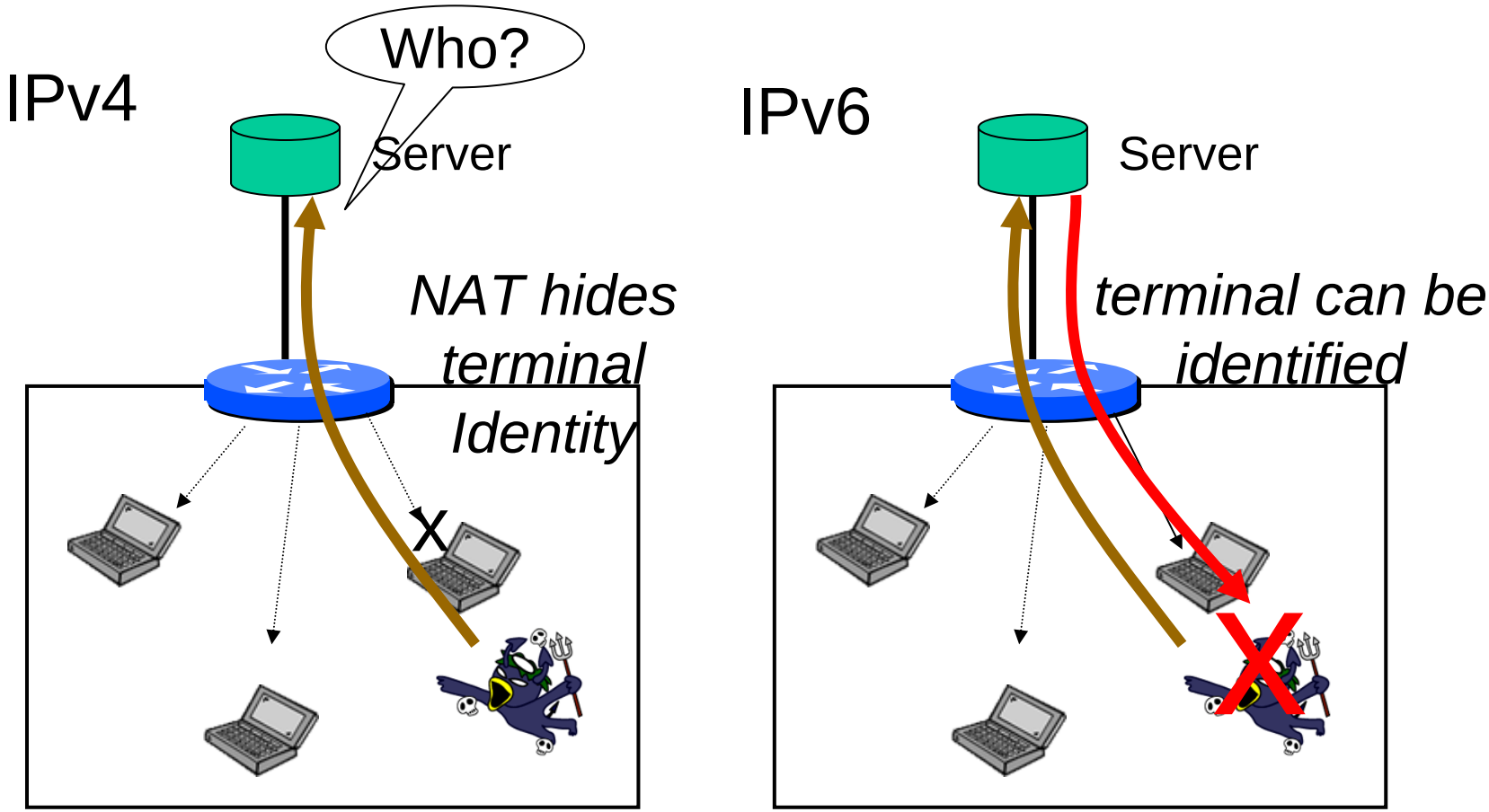


IPv6 Security

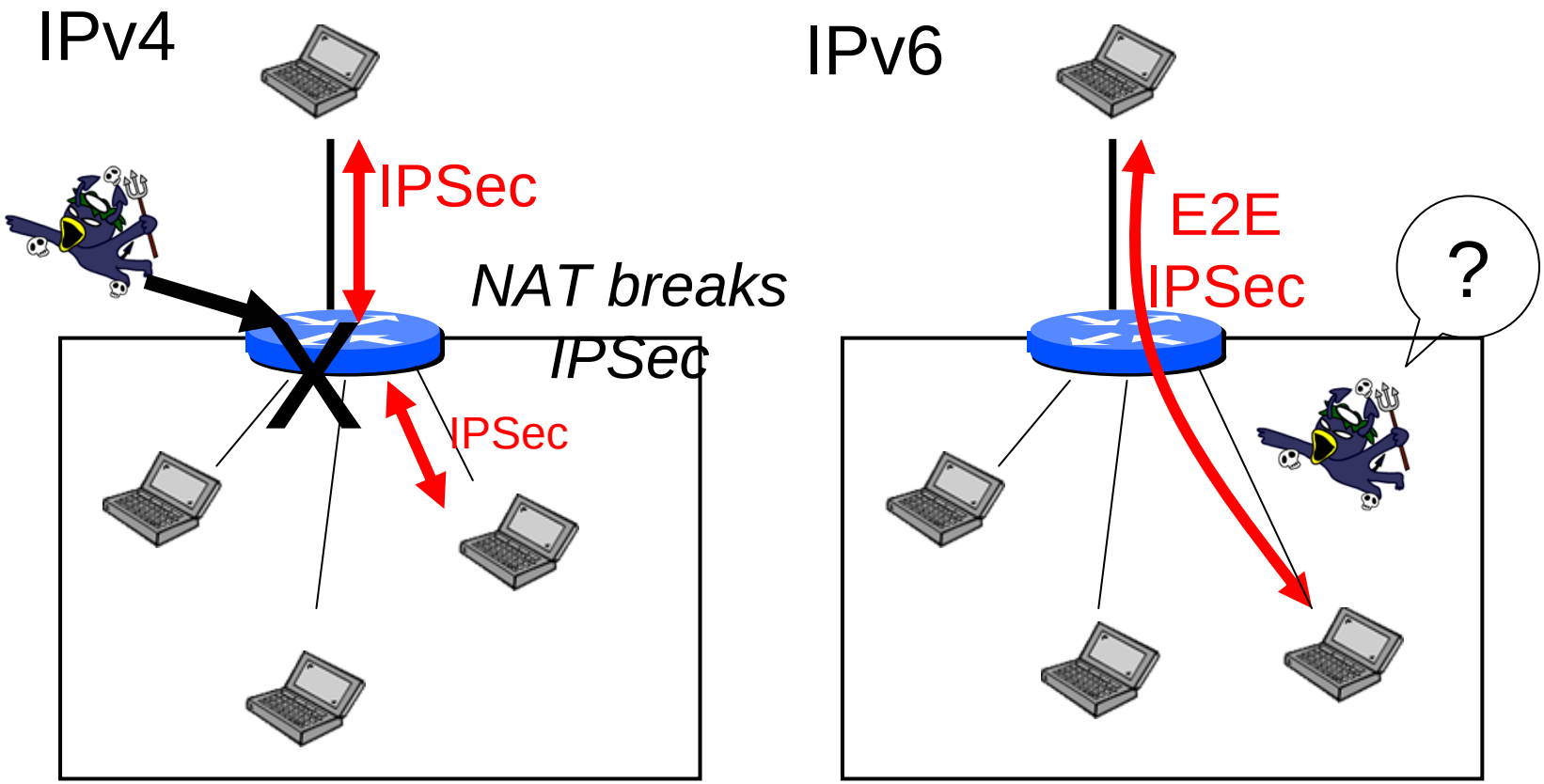
- No essential changes with IPv6 security in specification
- But significant effect in some operational and practical cases

- Terminal Identification with IP addresses
- IPSec standardized in IPv6 specification with IPv6's End-to-End concept
  - A new security model combining IPv6 Firewall and IPSec P2P VPN
- Private/Closed network with Global Unique address

Terminal Identification with IP addresses



IPSec with End-to-End



IPv6 Application?

Example of Home Appliances Applications

- utilize INFORMATION which would be otherwise discarded

Business Model / Process Change

Info

Money back(?)

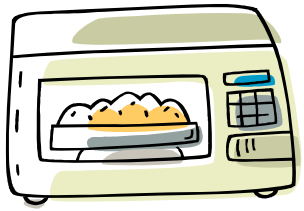
HA vendors
Market research
Remote maintenance

・frequency/time of door opened
・contents inside

IPv6 Network

Food Industry
Market research

third parties

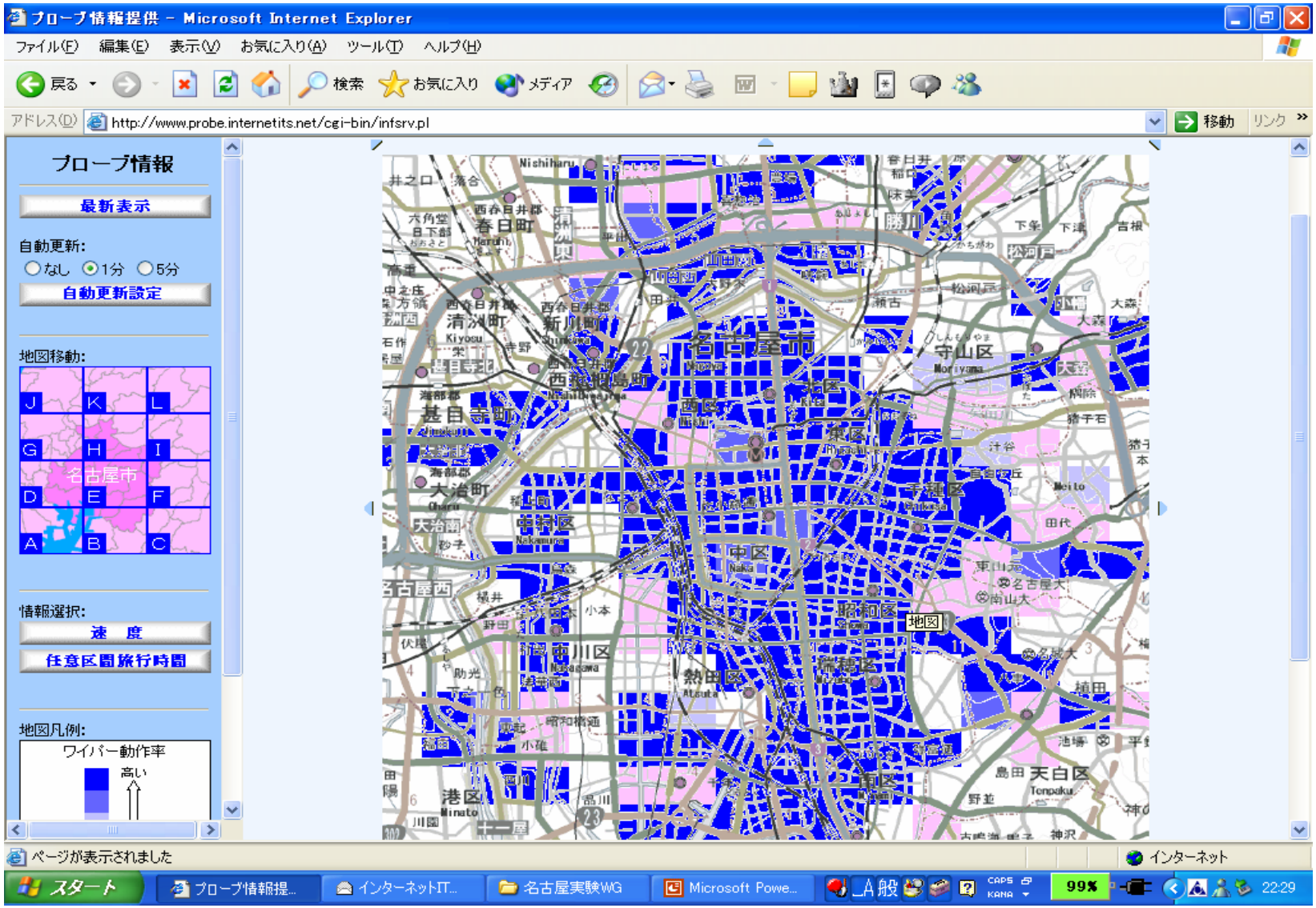


・frequency/time the oven function is used
・healthiness of power unit

Neighborhood Community
(Grocery store, etc.)
One-to-one marketing & sales

(ex.) Vehicles with the Internet

(ex.) Probe Information System (Rain condition)



(Provided by WIDE project)

IPv6 = Information Exchange Platform

- IPv6 will grow to be a platform for Information Exchange
  - No Zero-Sum game any more. Can be a Win-Win game
    - Information from various devices newly connected is NEW VALUE
  - Information exchanges occur not only between home electronic vendors and their users, but among heterogeneous industry sectors, home users and equipments, various sensors in public, etc.
  - Authentication & authorization and privacy protection mechanism should be included in the platform.
- A lot of opportunities for new applications and your business!

Future IPv6 carriers will provide Info Exchange platform which includes security, QoS, AAA and various services.

How?

Deployment Principles

Observation from several deployment cases

IPv6 is being deployed and will be deployed where its deployment is effective

- All the past field trials until 2003 have not successfully lead to real deployment
  - Technically interesting, but
  - Not cost efficient
  - Not operationally feasible
- In 2004-5 more real and practical deployment cases have appeared.
  - Recognizes that IPv6 is almost same as IPv4 but has a small difference
  - Focuses on the difference
  - Tries to deploy in applications where the difference is effective

Deployment Models

- Smooth Transition
- Forced Deployment
- Solution-Oriented Deployment

Smooth Transition

- To enable IPv6 at system renovation time
  - No extra cost needed
  - Will take 5-7 years to transit to IPv6 gradually
  - Some enterprise networks, especially IPv6 companies, do this.

Forced Deployment

- Japanese government mandates IPv6 for governmental networks by the end of FY2008.

Solution-Oriented Deployment

- System is introduced as a solution which solves a problem users have, regardless of the version of IP.
- There, IPv6 is chosen because IPv6 implementation has some advantage over IPv4.
  - Cheap
  - Easy
  - Fast
  - Extensible and flexible
  - Especially so In the long run
- Deploy IPv6 as better protocol in a new system.

Real Examples of Solution-Oriented Deployment

- Building Facility Management System
  - 30% energy consumption reduced by managing air-conditioners, lightings, elevators etc.
  - IPv4 is not a good choice, considering long lifetime of buildings
  - Matsushita's Shiodome Building, NTT's Saitama Building
- VoIP systems in Dormitories
  - needs to construct 20,000 nodes in a short term
  - IPv6 reduces time and cost of design, installation and maintenance
  - Kyoritsu maintenance/Freebit
- Carrier's Infrastructure
  - NTT West have deployed IPv6 for their new "Premium" service because of manageability and future extensibility.
  - KDDI, too.

Real Examples of Solution-Oriented Deployment(II)

- Live Lesson Services to remote sites in prep-schools
  - High quality streaming with low cost.
  - Just by using NTT's multicast service, they can reduce cost compared to using satellite.
- International VPN
  - P2P applications such as TV conference and web cam can facilitate collaborations between remote offices
  - IPv6's end-to-end security adds more features
- Public solutions
  - 15 cases in different area are now being examined in real fields in a governmental project
  - Crime prevention, disaster recovery, medical and welfare, sightseeing, education, environmental monitoring, tele-metering, etc.

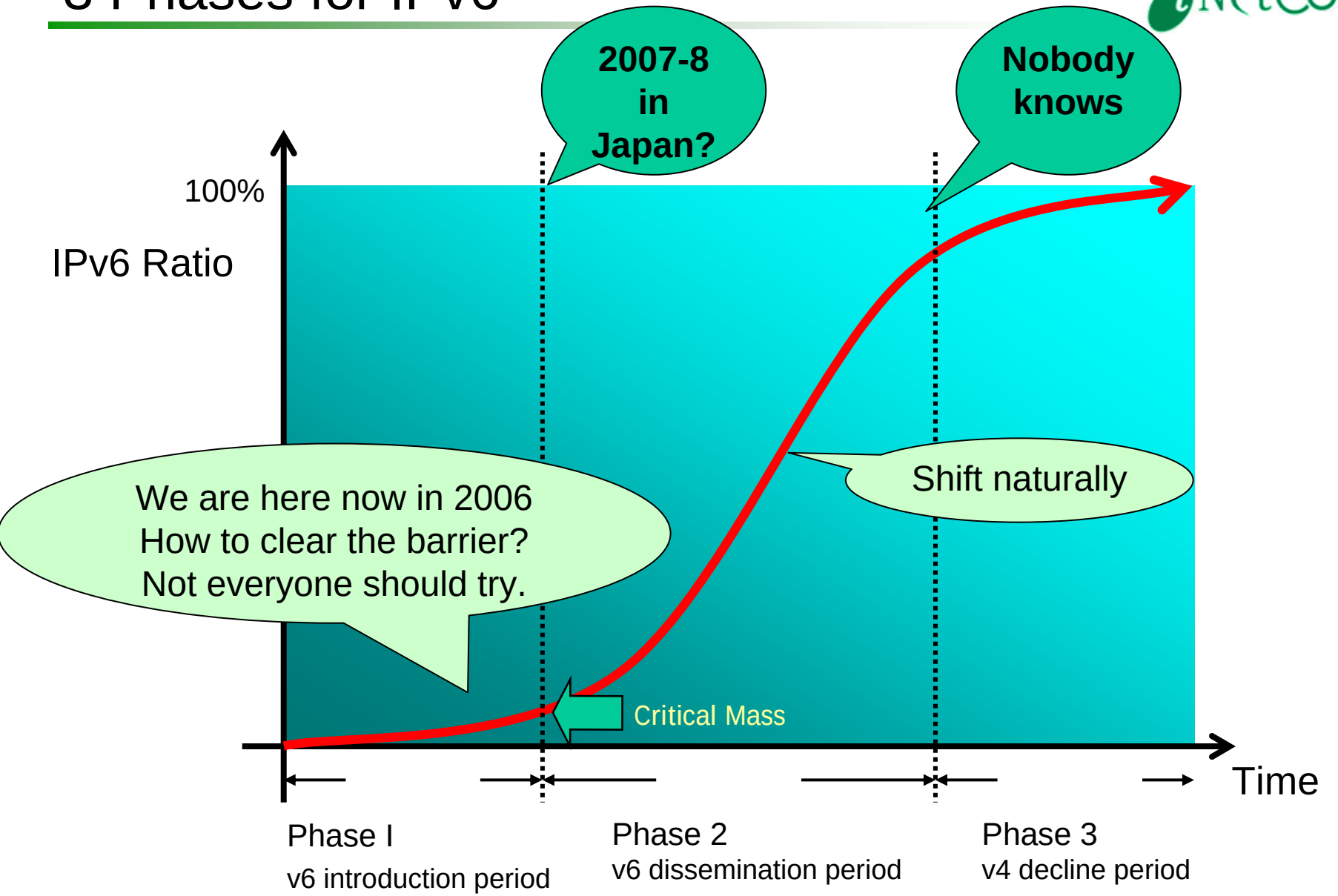
Implication of 3 models

- Who gets merits from IPv6?
  - End users don’t care about IPv6.
  - Implementers can get advantages of IPv6 in some situations.

- Stop looking for what IPv6 only can do.
- Stop commenting “this can be done by IPv4”
- Look for where IPv6 can do better, instead.

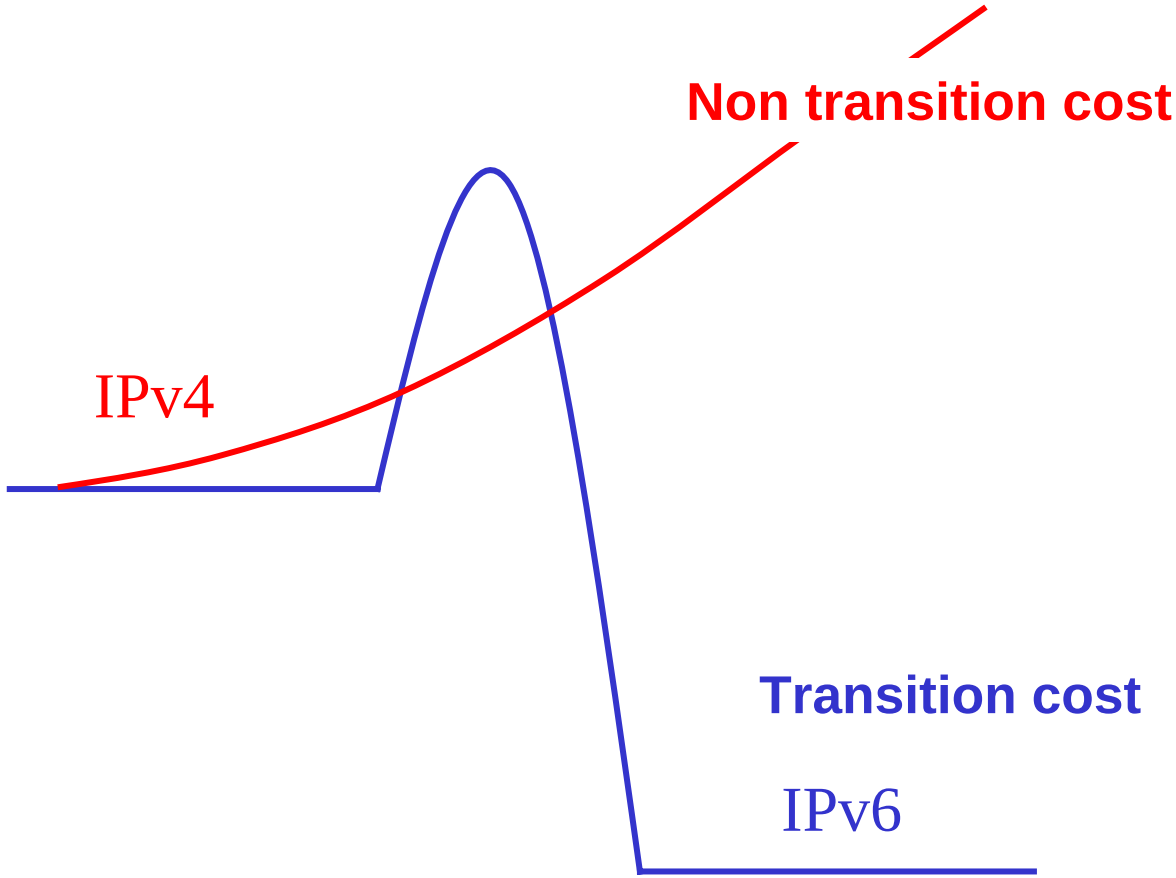
WHEN？

3 Phases for IPv6



COST ?

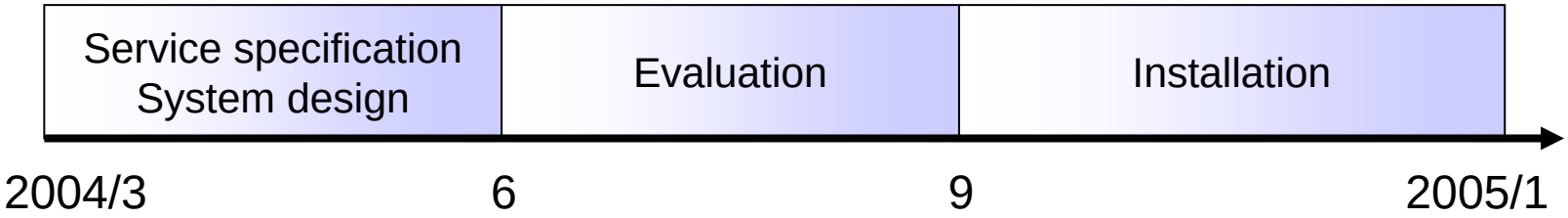
General Model of Cost Comparison



Free Bit's Case – IPv6 VoIP System in Dormitories

FreeBit Co., Ltd.

Launch of 20,000 nodes in a very short term

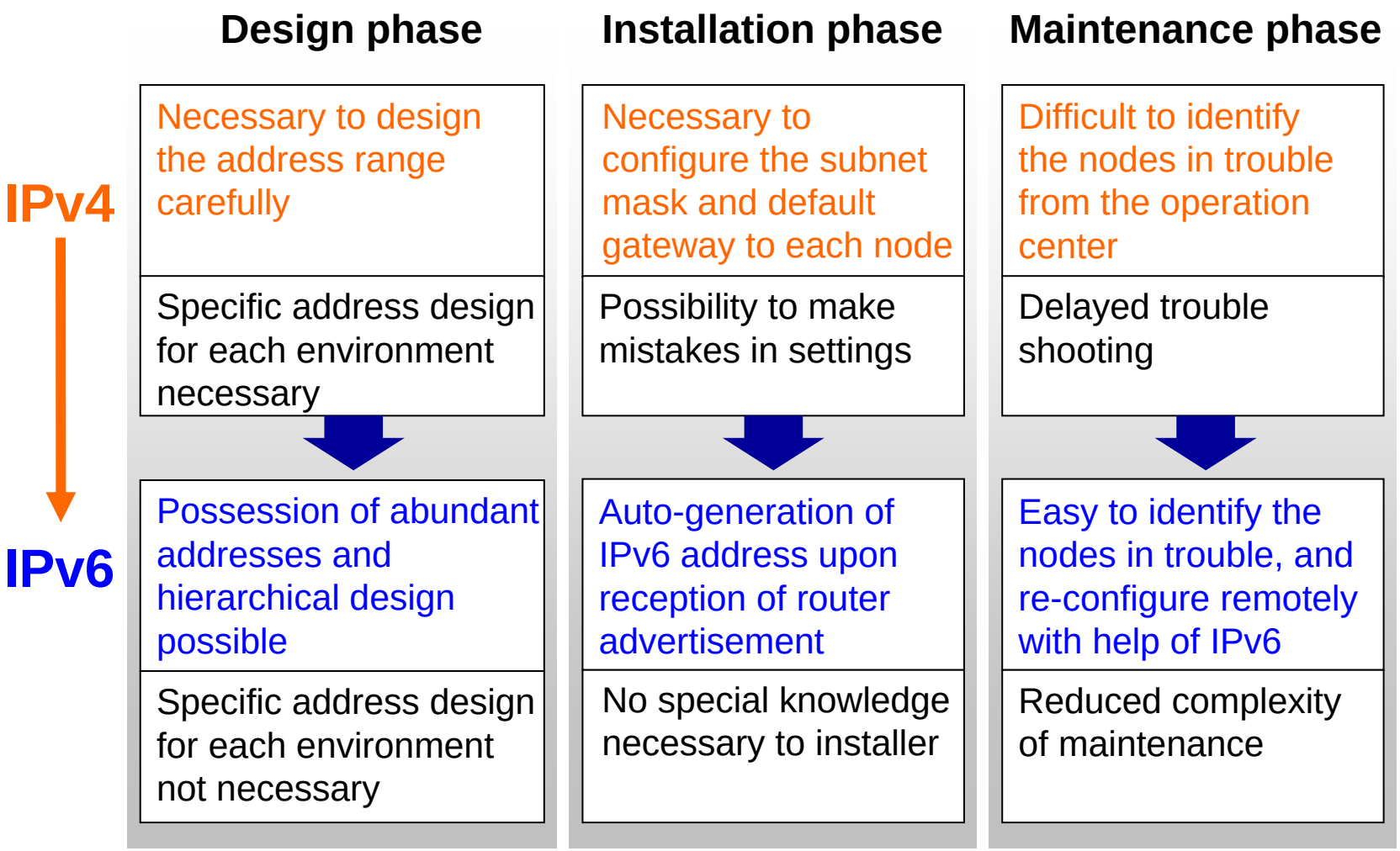


Abstraction of installation procedure into 3 patterns depending on the number of rooms, made possible by the easiness in IPv6 address design

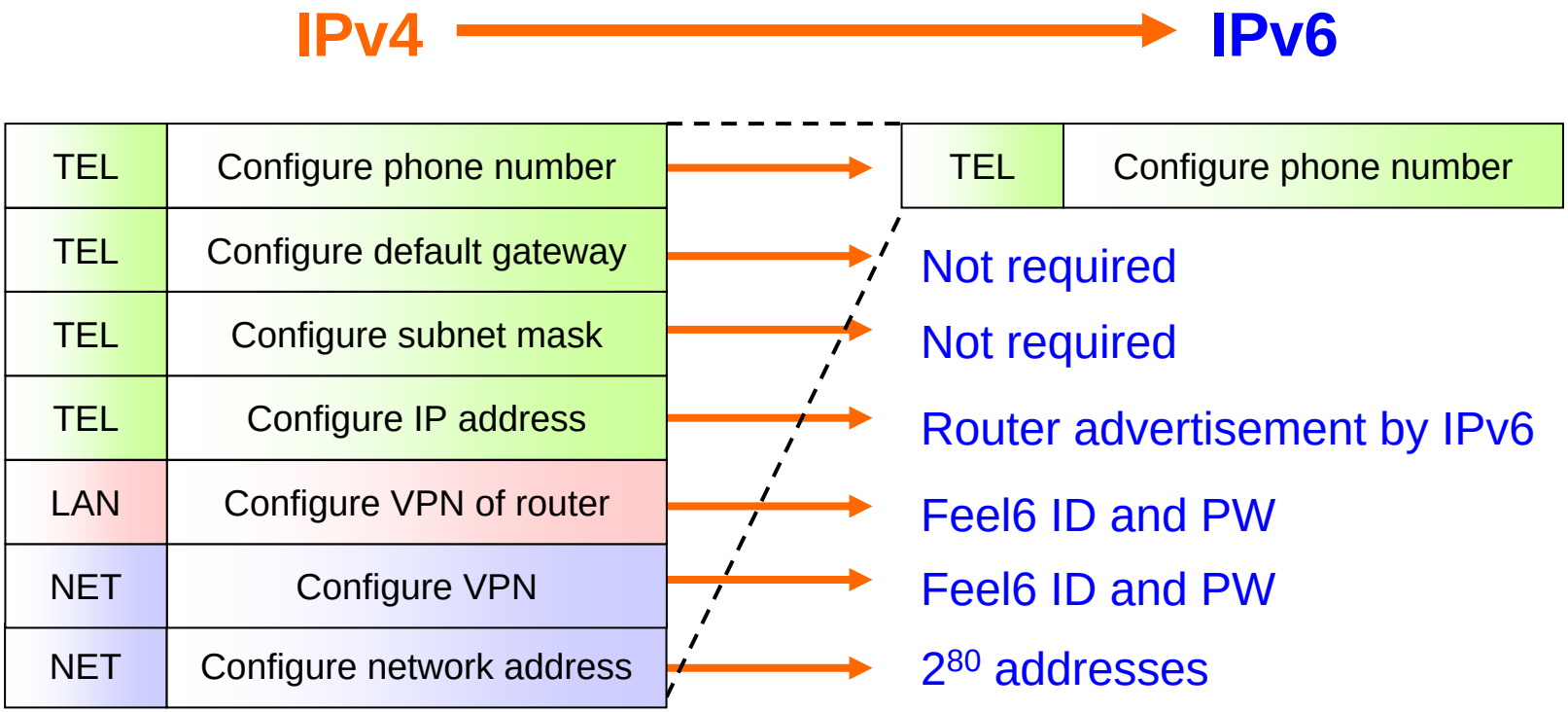
Easy installation due to the auto-generation of IPv6 address

Realization of remote monitoring and quick maintenance of the nodes, made possible by fixed IPv6 addresses

Cost reduction made possible by IPv6



Significant reduction of network design steps



Initiatives for IPv6 Transition in Japan

Barrier of Transition to IPv6

1. Unclear benefit at hand
   - Proof of concepts by demonstration experiment
     - Show the potential
     - Demonstrate the low cost
2. Not convinced of stability and reliability
   - Verification of reliability
     - Inspect and solve bugs by demonstration experimer
     - Connectivity verification, tool, logo program
3. Not sure how to do
   - Deploy IPv6 not to sacrifice IPv4 operation
   - Improvement of transition manual for each entity
     - Security model, Phase & Process, Metric for transition
     - Transition package

IPv6 Deployment Field Trials

IPv6 Promotion Council, CERT-WG, TAHI

V6 Promotion Council Deployment Guide line

IPv6 Deployment Field Trials

IA Japan Deployment Metric

Deployment WG, IPv6 Promotion Council

- Draft a deployment guideline

- Segments
  - Home network
  - Small firm intranet
  - Big firm intranet, Municipality service net
  - ISP

- Target …depends on the segment
  - Home network : service provider, equipment vendor
  - Office network : office network operator, SIer

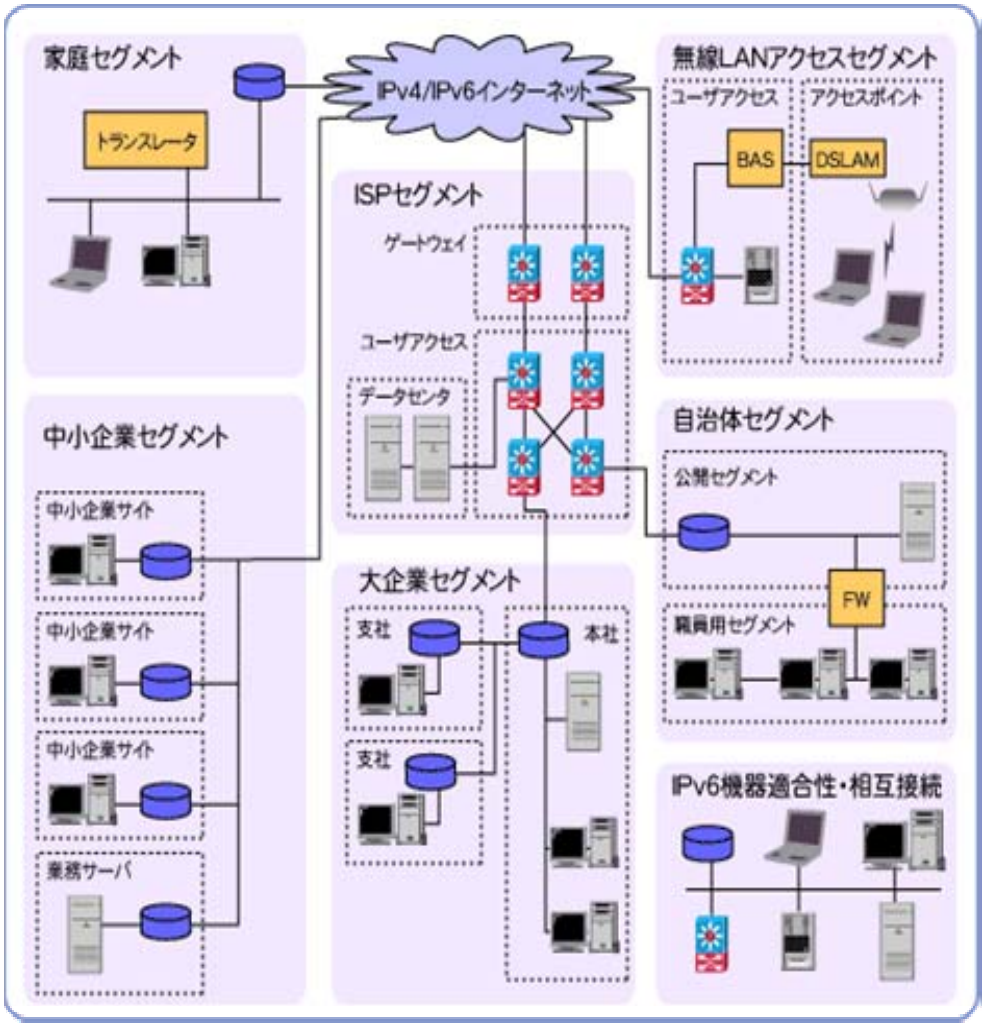
- Range
  - Cover (v4:v6=5:5)
  - Revise every year for the next year

Framing of Guide line

- Definitions and Distinctions of the each segment
- BCP
- Analyzing and Modeling
  - Solution option, adaptable situation, negative profit
- Targeted NW＆System＋Application on v4:v6=5:5
  - Typical equipment configuration and service pattern
  - Advantage
- Assignment for v4:v6=5:5
  - Problem to be solved
  - Requirements to other segments (ISP)
- Security Model
  - Policy
  - Implementation
- Tips
  - Practical know-how for transition
    - Addressing, routing
    - Server design
    - Network system administration
    - Security
    - Application
    - v4-v6 translator
    - Multicast

2004 Guideline
http://www.v6pc.jp/jp/wg/transWG/index.html

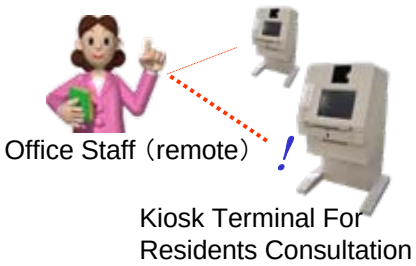
IPv6 Deployment Field Trial



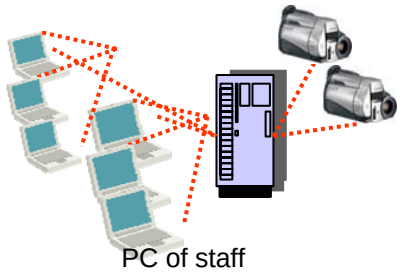
- One of MPHPT IPv6 Initiatives
- Give Solutions
  - Transition procedure
  - Technical Issues
  - Merit/Cost evaluation
- IPv6 Guideline & IPv6 Solution Guideline, published
- 5 billion yen / 3Year
  - 2003.9-2006.3
- http://www.v6trans.jp/en/

FY2005 IPv6 Deployment Field Trial Overview (No.1)

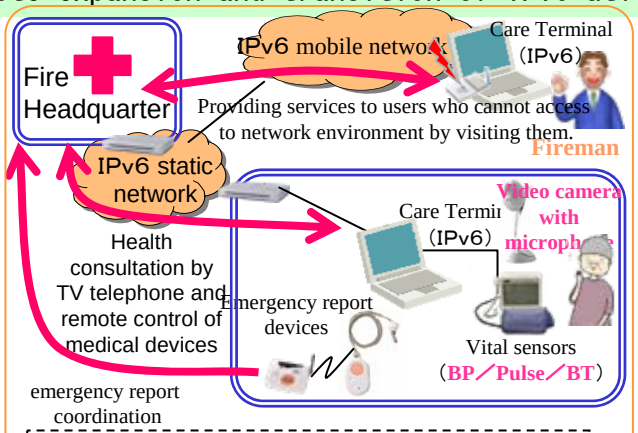
Various experiments for practical use of IPv6 will be widely carried out and evaluated for the benefit in addition to the implementation of technical verifications related to IPv6. The result of the experiments will be publicly announced through something like a guideline to promote expansion and transition of IPv6 utilization.



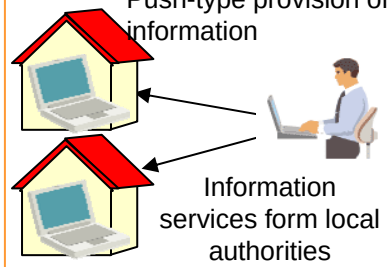
■Consultation services for residents (Taito, Tokyo)
Constructing a remote consultation service system for residents by utilizing IPv6's security system.



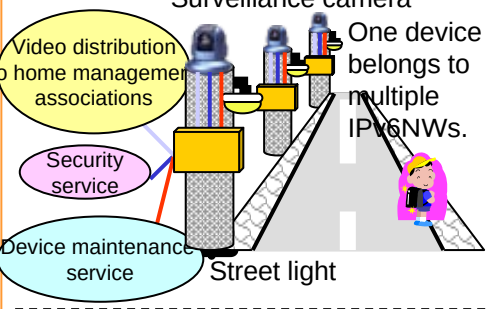
■Taito City Assembly streaming live video relay services (Taito, Tokyo)
Implementing a high-definition City Assembly video relay distribution system by multicast distribution functions of IPv6



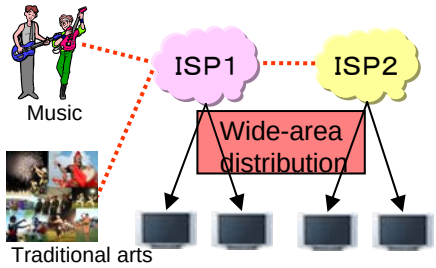
■Health care at home support services (Asahikawa, Hokkaido)
Realizing a health-care-at-home support service by means of IPv6-ready mobile terminals by the "push functions" of IPv6.



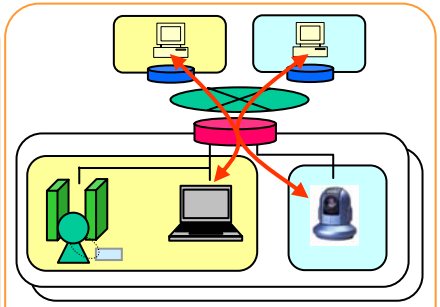
■Push-type information provision services for residents (Osaka)
Constructing information provision services by the information push function of IPv6.



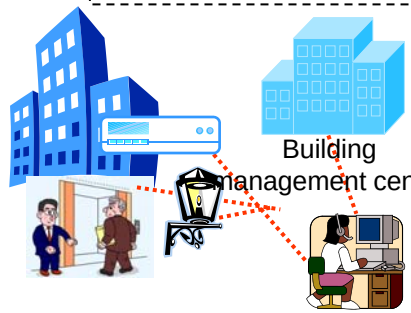
■IPv6 multi-services in Security-Town (Kawasaki, Kanagawa)
Implementing a security town service system by simultaneous control functions of multiple connections and automatic setting functions of IPv6.



■Music Town services (Okinawa)
Realizing a video multicasting system via multiple ISPs by using IPv6.



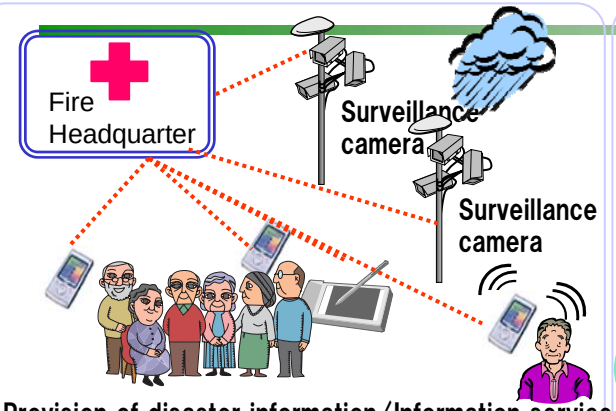
■IPv6 multi-service in school security solutions (Tokyo)
Implementing a security service system for schools by using the functions that control the multiple connections of IPv6 at the same time.



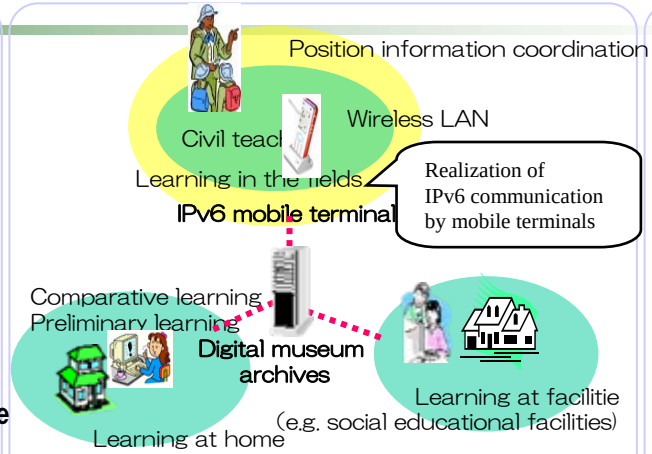
■Office building automation services (Tokyo)
Implementing a total building management system by using abundant IPv6 addresses in some cultural facilities.

※The place-names in the figure above are not responsible organizations but the places where the experiments are planed.

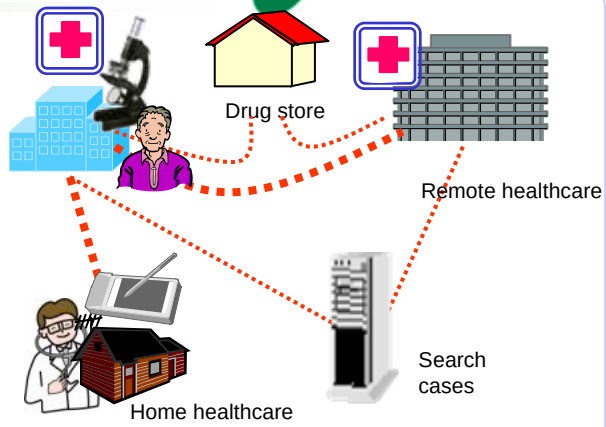
FY2005 IPv6 Deployment Field Trial Overview（No.2）



■Information gathering service for disaster prevention（Niikappu, Hokkaido)
Constructing an image processing stationary measurement system, the mobile terminal information service and the telephony service system by IPv6's connectivity and manageability.

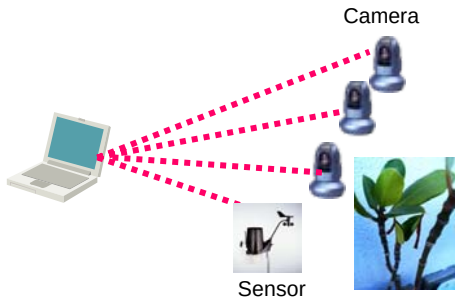


■Local digital museum（Tateyama, Toyama)
Constructing a learning-aided system which archives the learning materials from many wireless LAN spots and provides to cellular phone type mobile terminal of IPv6.

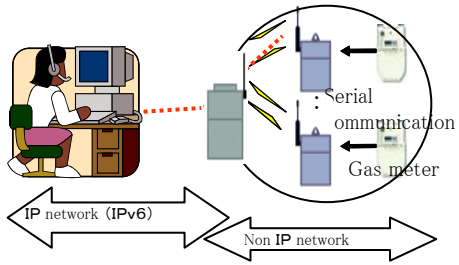


■Local medical network service（Wakayama）
Constructing a medical collaboration service system with high quality protection for personal data by end-to-end communication function of IPv6.

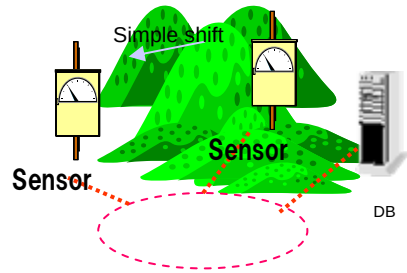
■Video distribution service between educational facilities（Hiroshima）
Constructing an educational network system which delivers educational contents to multiple places and supports remote schooling by using direct connectivity of IPv6.



■Nature regeneration monitoring service（Taira）
Constructing a continuous monitoring system for nature regeneration process by using abundant addresses and the plug & play function of IPv6.



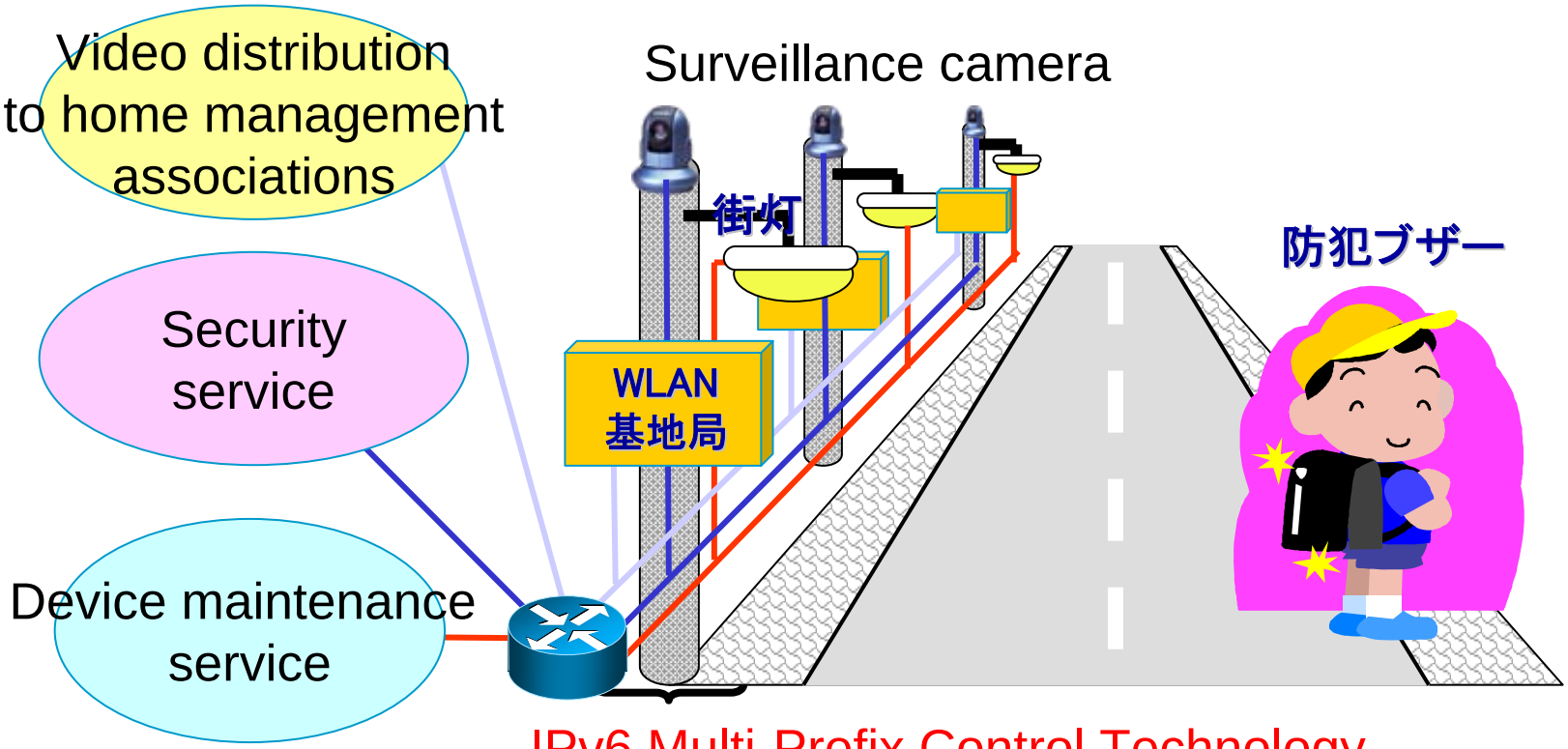
■LP gas tele-metering（Kochi）
Constructing a remote gas meter surveillance system by using the plug & play function and unchanging terminal IP address of IPv6.



■Environment monitoring（Tottori）
Realizing an environment monitoring system for effective usage of limited sensors by using the plug & play function of IPv6.

※The place-names in the figure above are not responsible organizations but the places where the experiments are planed.

IPv6 Security Town



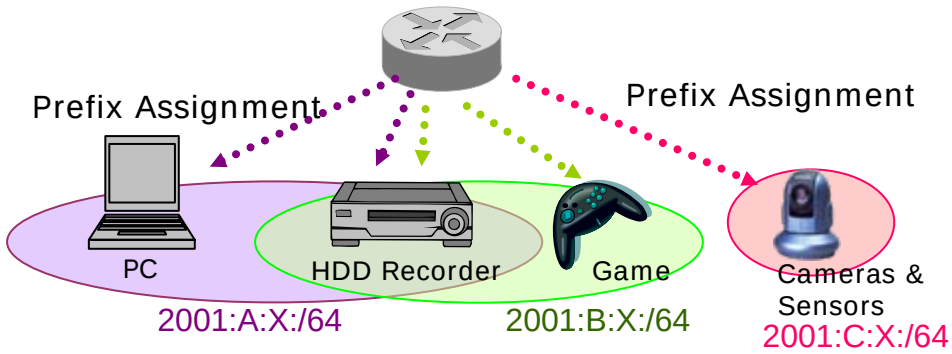
IPv6 Multi-Prefix Control Technology

One device belongs to multiple IPv6 networks.

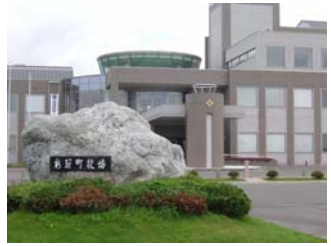
- Implementing a security town service system by simultaneous control functions of multiple connections and automatic setting functions of IPv6.

Multi-Prefix Control Technology

- Controls multi address prefixes and provides multi logical networks in a single LAN
  - Address Prefix per a service and/or per a security level
    - Terminal with an address prefix can't access another with different one unless prefixes are routed
  - No implementation necessary in terminals
  - Assumes IPv6 because the way to use IPv4 address is limited
  - IPv6 global unique address brings various advantages such as
    - Plenty of addresses for plenty of terminals/devices
    - Address-based service management/terminal management
    - Multi-address/services for a single terminal



IPv6 Information gathering system in Disaster recovery



City Hall

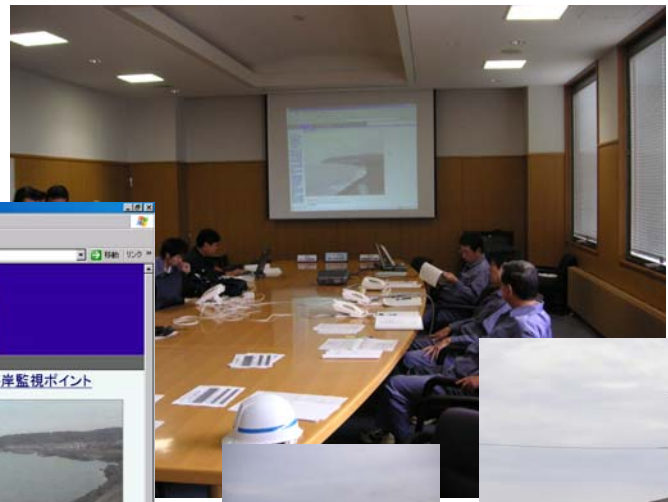
In the past, many tsunami and floods attacked the city.

Before the system

Sending persons to disaster (dangerous) spots with special wireless equipments

IPv6 Information system

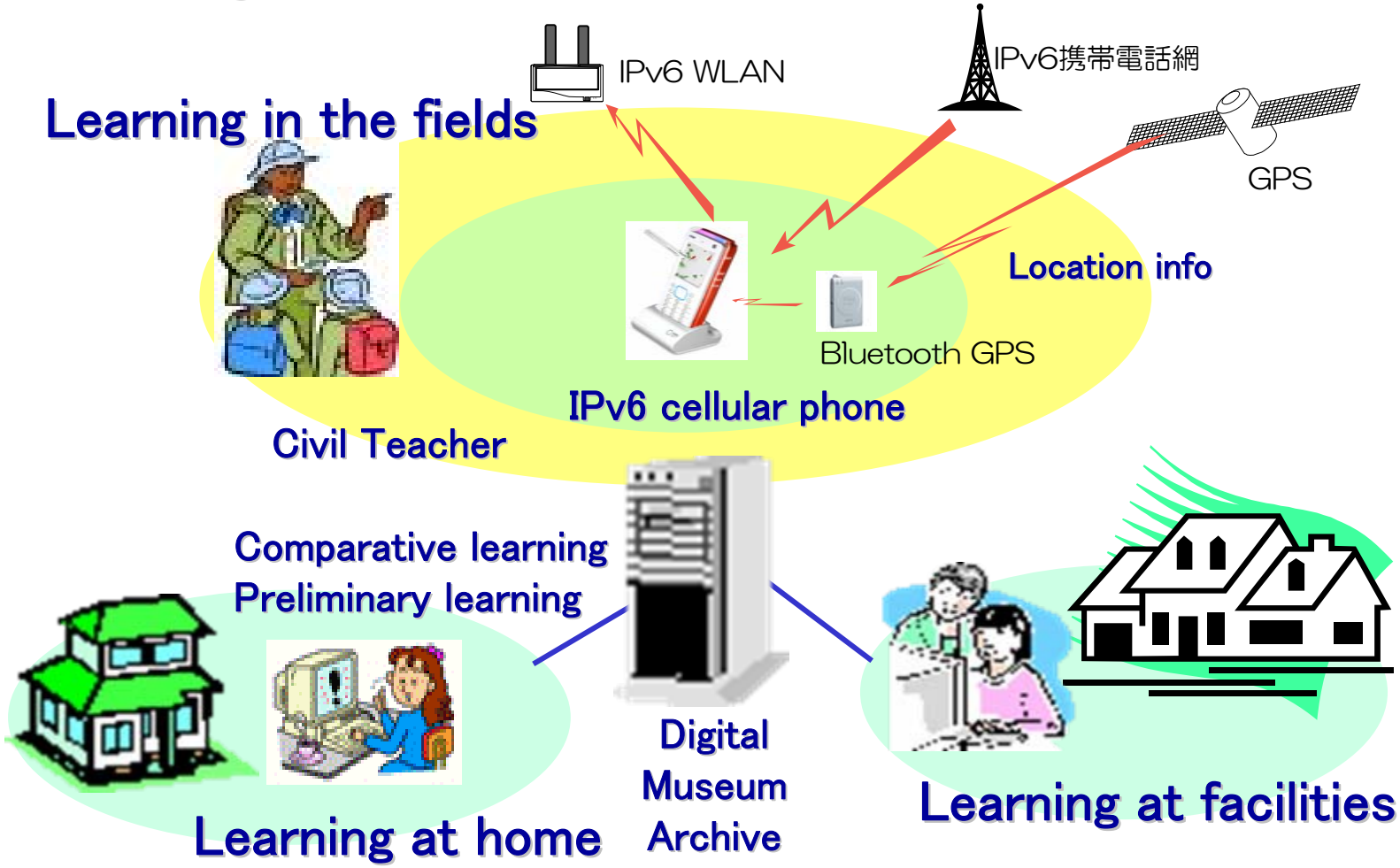
Headquarter can directly view what's happening from surveillance cameras and PDAs given to residents



Surveillance camera

右のカメラ／電柱は海岸脇に設置

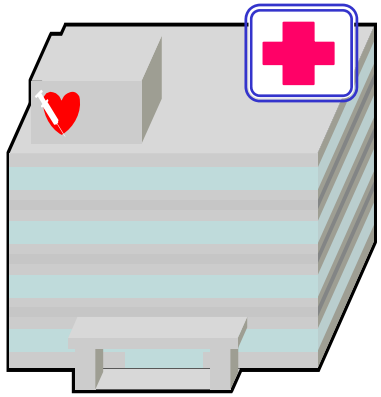
IPv6 Digital Museum



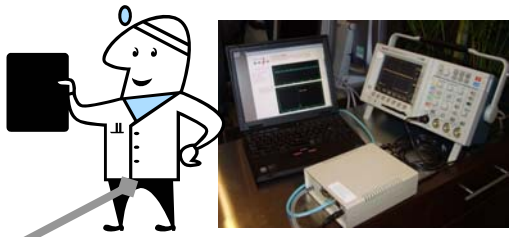
Preserving local cultural resources and heritage

Constructing a learning-aided system which archives the learning materials from many wireless LAN spots and provides to cellular phone type mobile terminal of IPv6.

IPv6 Medical Platform

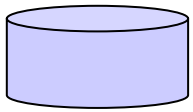


Municipal Hospital



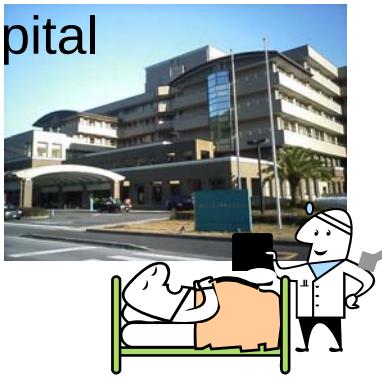
Medical receipt handling

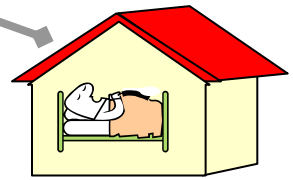
Data Center



IPv6 Medical Platform

small-to-medium hospital





Treatment at home

Remote surgery support

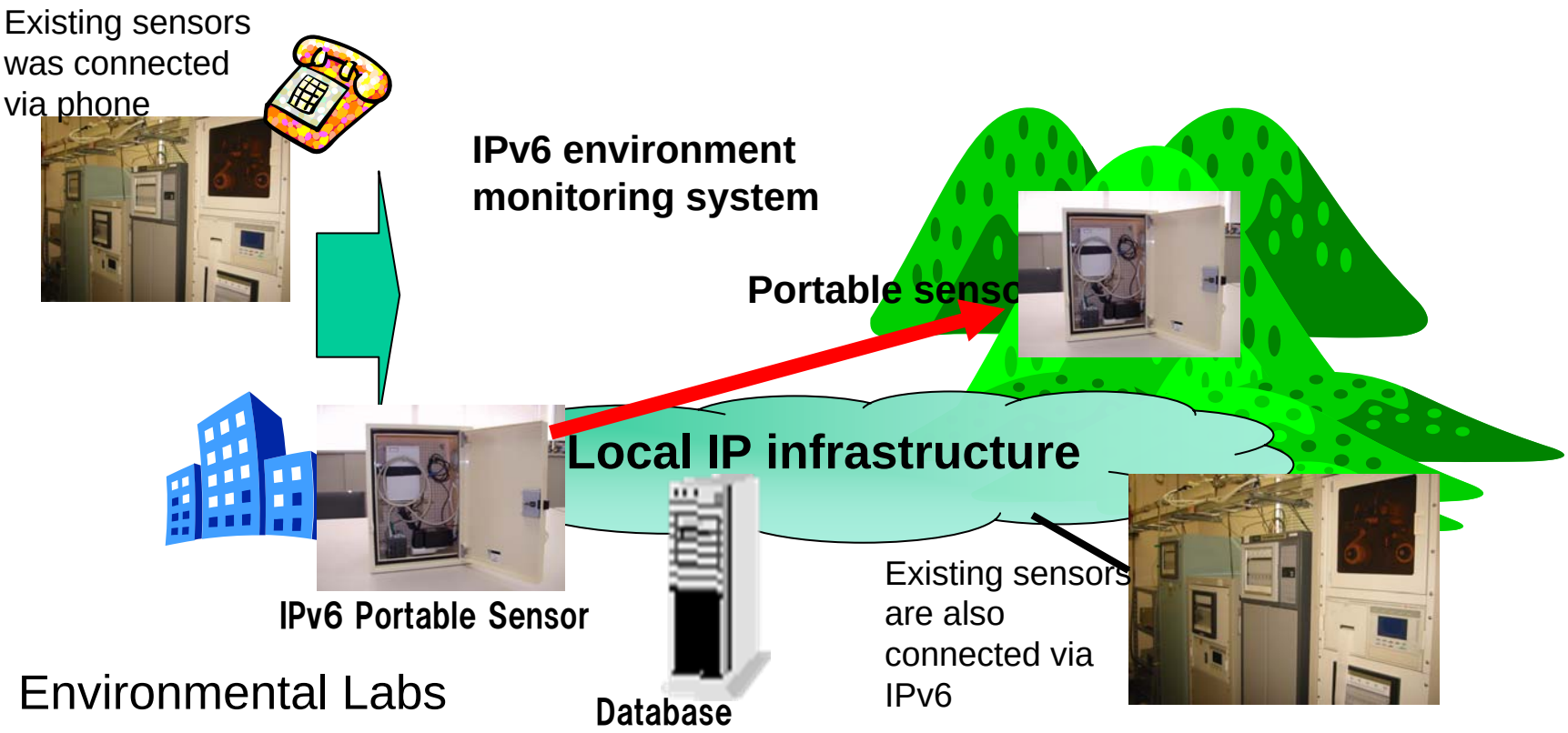
existing ISDN → more efficient / real-time support by broadband and IP communication

IPv6 Environmental Monitoring

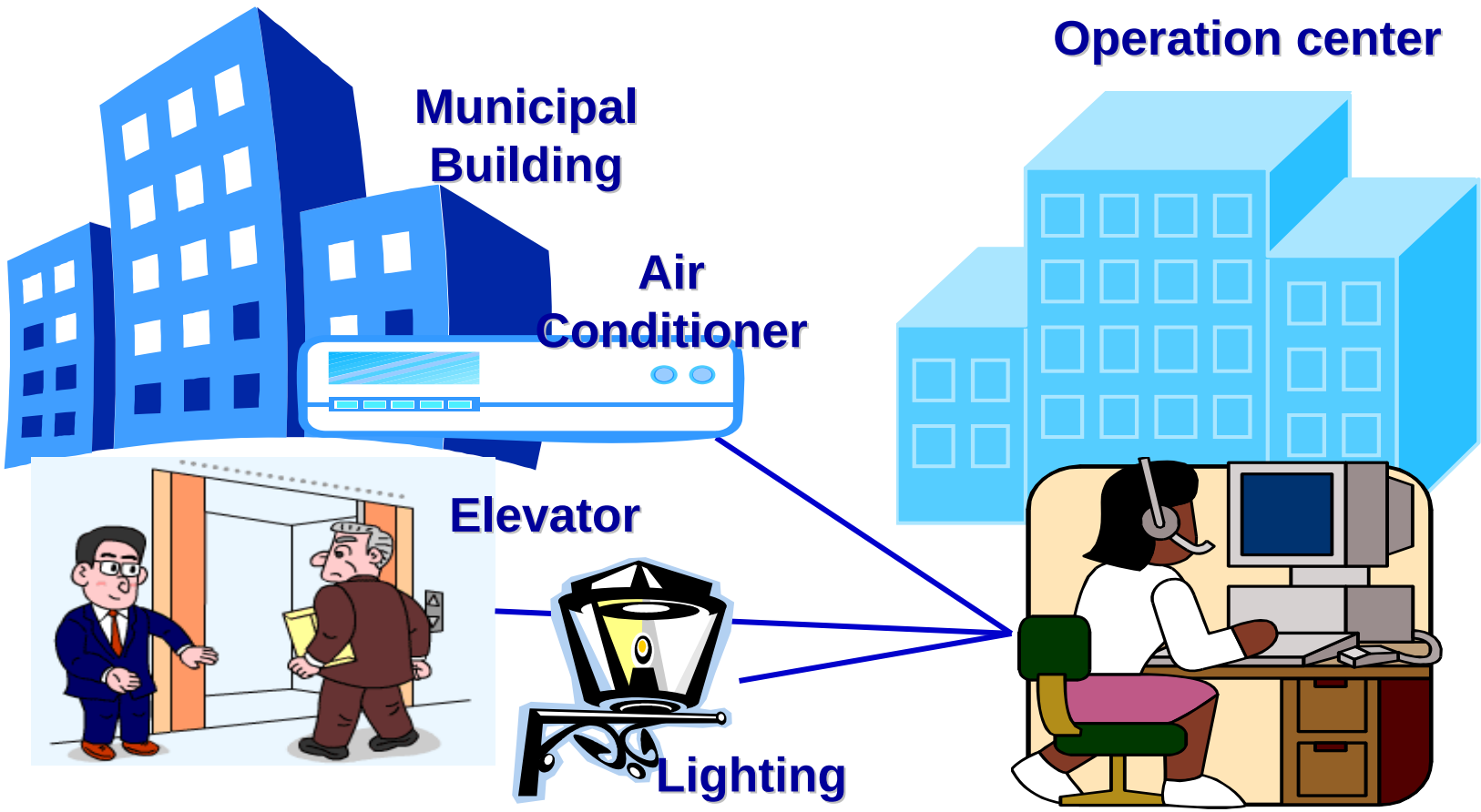
- Sensors for professionals cost more than US$20,000-30,000, which a city can buy just a few of them.
- A lot of needs for measuring data everywhere in the city

  →

- Realizing a portable environment monitoring system for effective usage of limited sensors by using the plug & play function of IPv6.
- Connecting existing sensors via IP

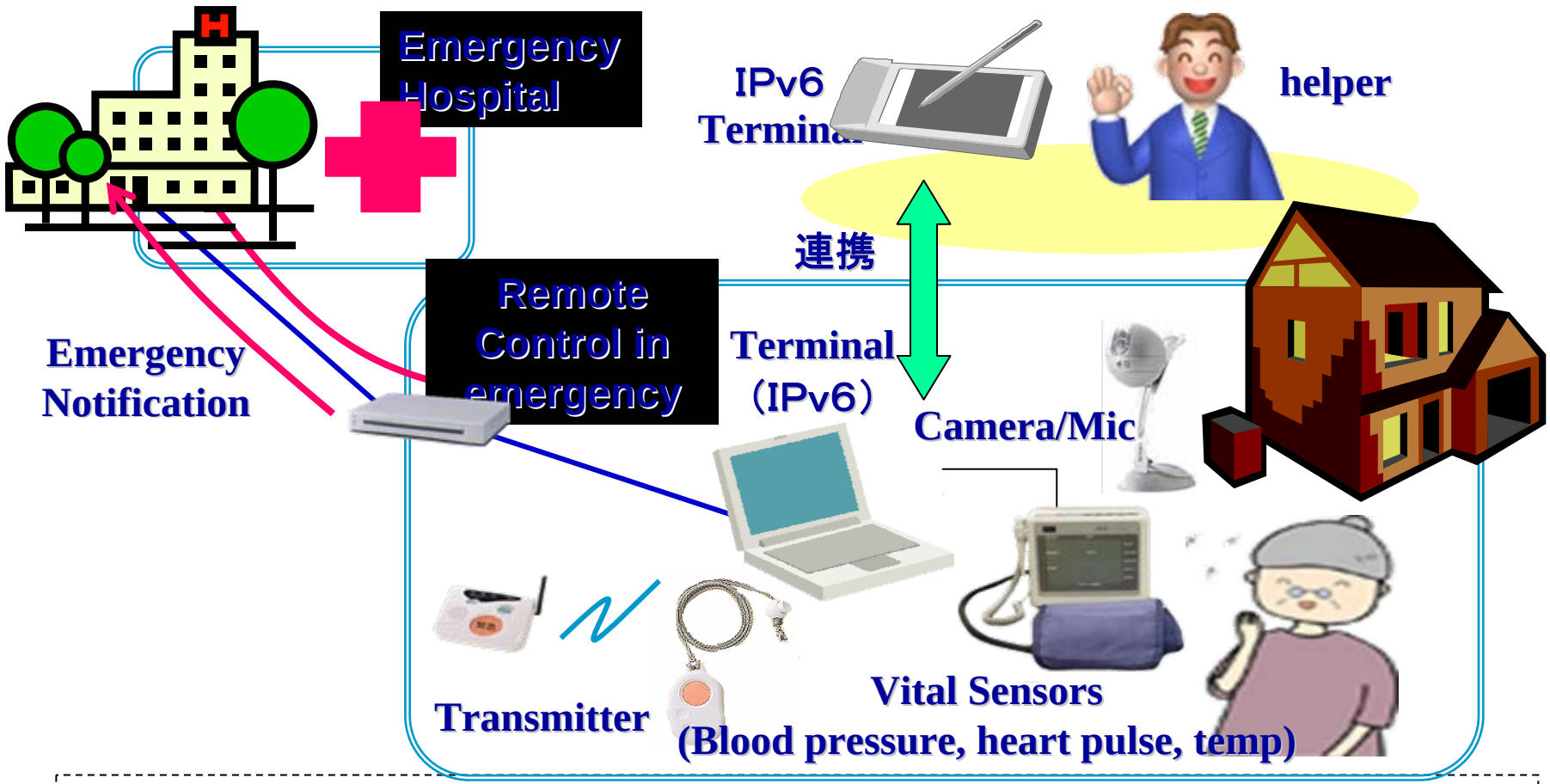


IPv6 Building Facility Management



- **Implementing a total building management system by using abundant IPv6 addresses in some cultural facilities.**

IPv6 Healthcare Support System

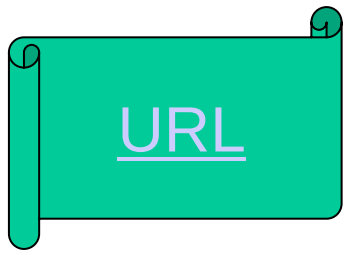


Realizing a health-care-at-home support service by means of IPv6-ready mobile terminals by the "push functions" of IPv6.

IPv6 Deployment Metric Measurement

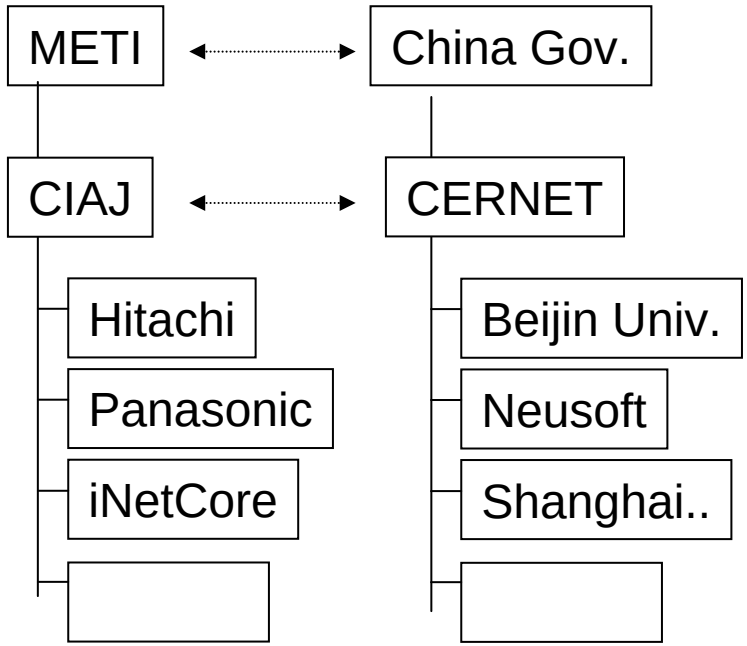
(Internet Association of Japan)

- Indicates how many percentage IPv6 is deployed
  - Collecting data of transition level since the early planning stages and examining in various angles
  - Principal purpose
    - Basic data for marketing
    - Basic numeric value for verification of hypotheses
    - Stand on another side of real operation metric
    - Cooperation with international projects



IPv6 JC Project

- Collaboration Project between Japan and China in 2003-2005
- Activities
  - Test-Bed Network in China
  - Applications and platform technology experiments
    - Telematics
    - E-Home
    - Area Management System
    - P2P Security System etc.
  - Standards
  - Promotion/Seminar



Thank you very much!

Any questions and comments to
arano@inetcore.com