

# **Examining the Economic Challenges and Opportunities of IPv6**



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IPv6

Starting the smell of “money”.

# Recent Big News around IPv6

- USA
  - DoD will be IPv6-able until 2008.
  - DoC will transit to IPv6
  - USA gets larger number of IPv6 address prefixes
- EU
  - Defense Departments of NATO (e.g.,UK,GE) countries will be IPv6-able

# Recent Big News around IPv6 (cont')

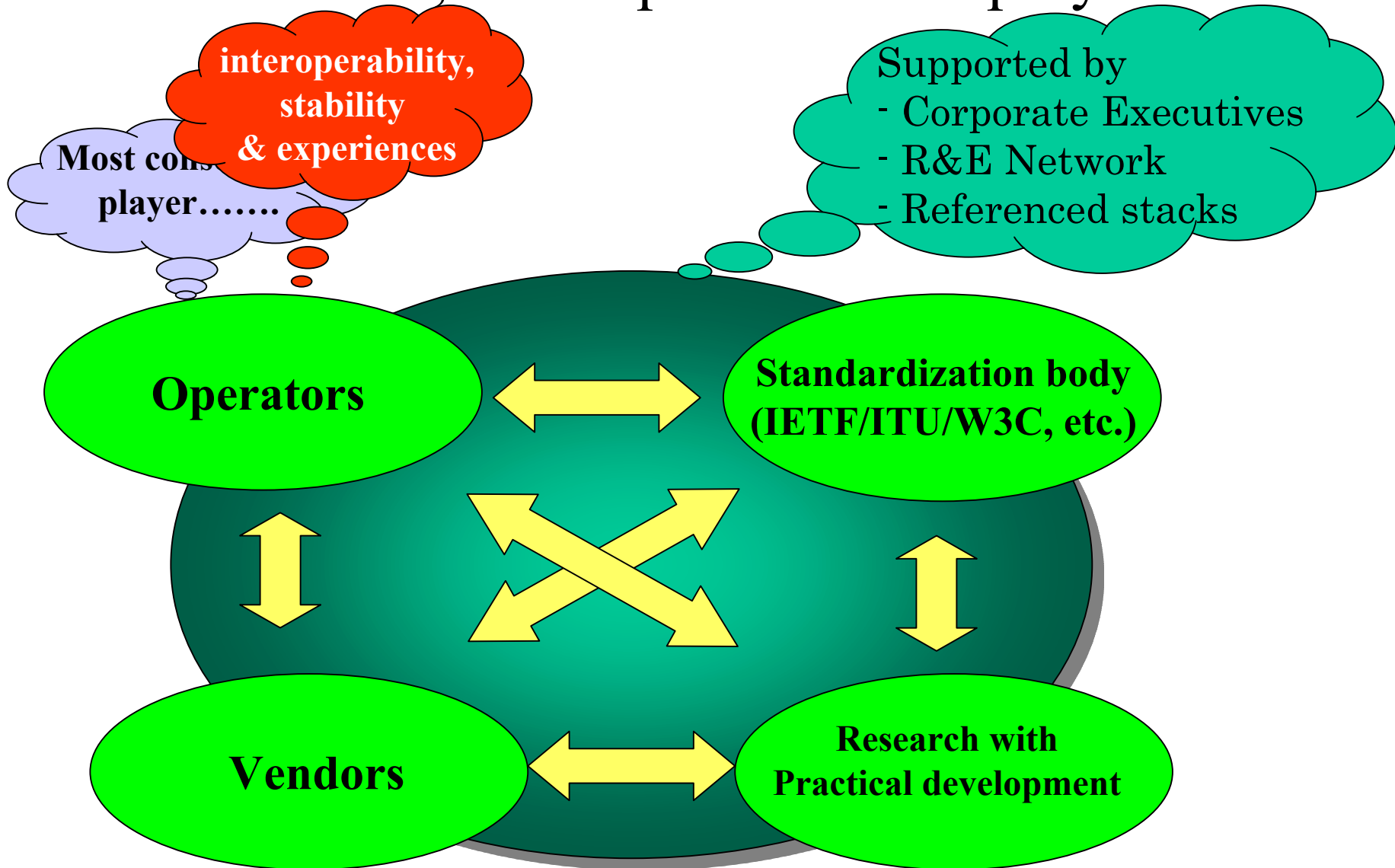
- China
  - Kicked off the CNGI (China Next Generation Internet) by Chinese government
  - Major manufactures in China have already worked on IPv6.
  - VoIP over wireless with IPv6 is their serious consideration
- Korea
  - Government announces they aim the 50-100 times larger bandwidth network/infrastructure using IPv6
  - Samsung is quiet serious on IPv6
  - NCA and TTA is serious on IPv6
- Taiwan
  - IPv6 Task Force has been established.



# Japanese Market

- Commercial networks (ISPes and IXes) and R&D networks requires IPv6 capability in procurement.
  - e.g., Japan Gigabit Network
  - e.g., NTT Communications / VERIO
- Every industrial area has started to consider the new service, while the availability of IPv6.
  - Internet Car/Train, Medical, On-line Games, etc
- A lot of consumer electronics, e.g., digital camera, with IPv6 has been started to be shipped to the commercial market.
  - e.g., SONY ; all products will be IPv6 ready until 2005.

# Community interaction in the Internet industry for research, development and deployment



# Key Components for Deployment

- Research → toward the “next” stage
- Standardization → into advanced functions
- Development → Big trigger by US-DoD
  - Equipment → Into production/commercial
  - Network (Application) → Booth-strapping
- Operational experiences
  - Experimental → Done
  - Production Quality → Nearly done
  - Commercial Quality → On-going for integration

# Steps to Explore the “Reality”

- Technical Standardization
  - IETF since 1990 (for 15 years)
- Referenced Implementation
  - e.g., ISC(bind), KAME(BSD), USAGI(Linux)
- Conformance and Interoperability testing
  - e.g., Moonv6/ UNH-IOL, PLUGTEST, Connectathon, TAHI
- Testbed operation
  - e.g., Abilene, 6NET/EURO6IX/GEANT, JGN/WIDE, APAN

# **- Toward the “Reality” of IPv6 -**

- **Let Platform Ready to be “Reality”**
  - **Who is the Show-Stopper ?**
- **Let Application Ready**
  - **Toward the Real-Space Internet**
  - **IPv6 introduction to the “real” network**
- **Recognize, again**
  - **Internet is “Datalink-Free”**

We have to realize “Broken down of”

- User/Host is stupid
- Fixed >> Portable
  - Mobility and plug-and-play
- Client Server System
  - Return to peer-to-peer system, but different scale
- Monopoly
  - Layer 1/2 → Layer 3(IP) → Service Aggregation
- Firewall Operation
  - End-to-end security
  - Collaborating with network

# TIPS for Global Deployment

- Avoid the locality for larger market scale
  - Readiness for global connectivity, though local deployment is important for business bootstrap/startup
    - Global connectivity is not mandatory at the beginning.
    - Global-ID vs. Local-ID
- Every object, including human-being will move around over the globe
- Global business from multi-national business
- We need security, but there is no perfect security
- Heterogeneity is important for robust operation

People starts think about “Reality”.  
Lets “Killer” Applications Ready !

toward  
“Real-Space” and “Mobile”

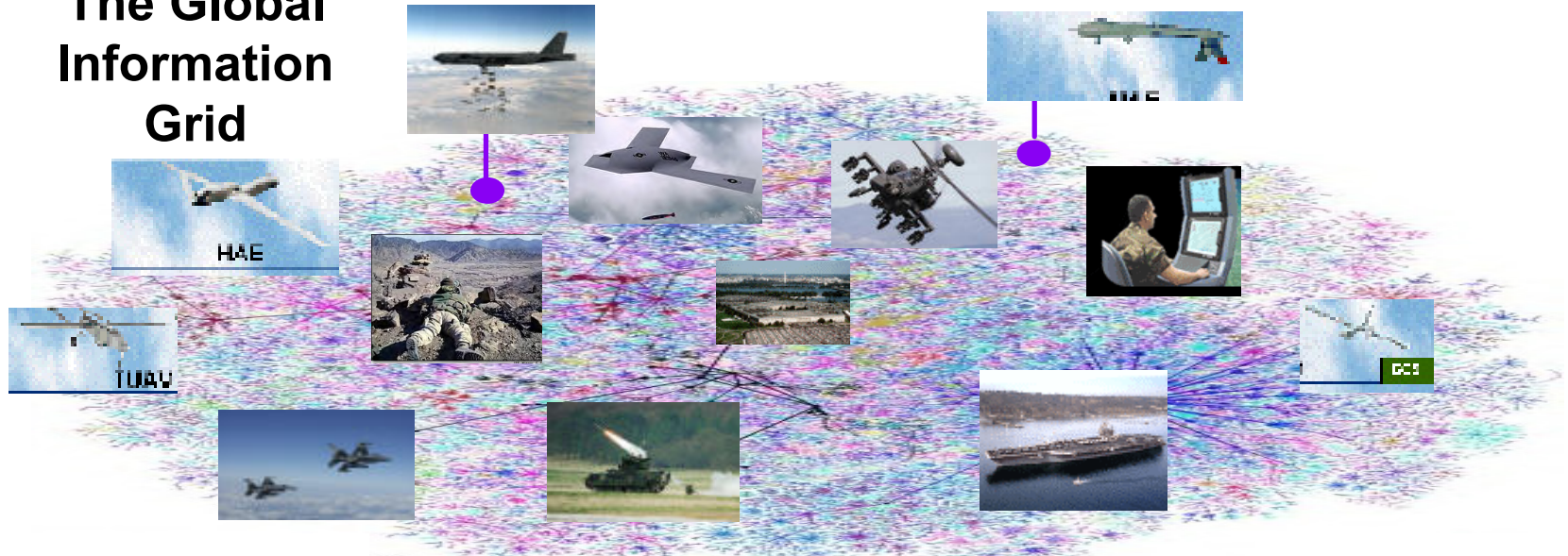
DoD looks “serious”.....



# Force Transformation

## *Net-Centric Operations*

### The Global Information Grid



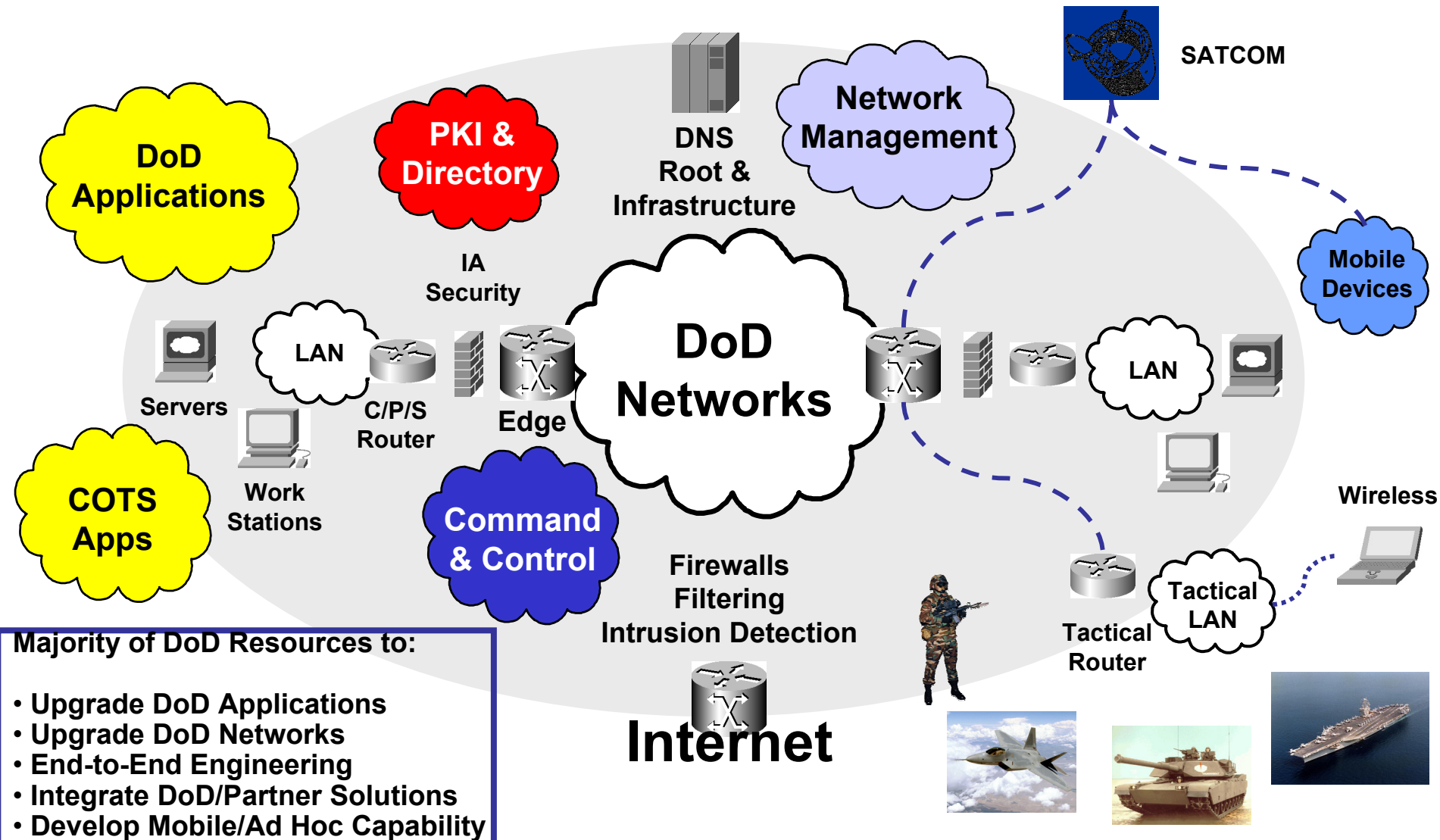
“... adopt ‘post before process’ intelligence and information concepts, achieve data level Interoperability; and **deployment of “net-ready” nodes of platforms, weapons and forces.**”

- IP convergence layer
- Exploding sources of data

- A New Generation of Applications
- Increased Use of Reach back and Virtual Presence

# Transition Implications

## IPv6 Will Touch EVERYTHING

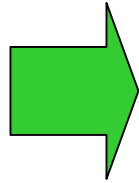


# What is “Real-Space” Internet ?

- Internet
  - Infrastructure to handle digital information
    - Generate, Collect, Distribute, Share, Analyze, Process
- Real-Space Network
  - Every object has
    - Global identifier
    - Internet connectivity
    - Linkage with own digital info and other object info
- Grasp and represent the Real-Space
  - Objects(e.g., id, location, topology)
  - Atmosphere (e.g., temperature, wind, humidity)

# How use the (digital) information ?

- Generate
- Collection
- Distribution
- Analyze
- Process
- Share

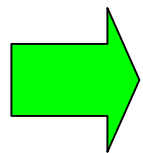


## Value/Worth

1. Direct income (i.e., GET money)  
sell some information  
(e.g., contents)
2. In-direct income (i.e., SAVE money)  
Cost-reduction  
Improve efficiency

# Example ; Building Automation

- Huge operational cost
  - Large energy (e.g., gas, electricity) cost
- Proprietary technology
  - Let it be open technology
  - Each systems use different technology
- COP3 by UN
  - 10%-30% Energy saving



1. Improve portfolio
2. Increase value



# Integration of IP Technology with Real-Space

Aircraft / Airport



**Murai Award Winner !!!**



(Mobile IPv6 RT)







**FA ; Factory Automation  
BA ; Building Automation  
HA ; Home Automation**

Cell Station, Airport

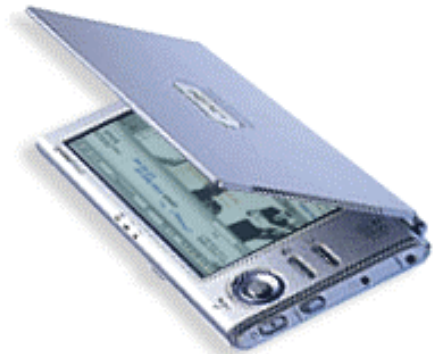
ss LAN  
IP

# Integration with the “Real-Space” Activity - examples -

- Private Contents
  - Personal & Corporate Contents
- Public Safety Service
  - e.g., police, fire fighter, ambulance  
- Public Service
  - e.g., Transporting system  
- {Building/Home/Factory} Automation
- Healthcare Service
- SCM with RF-ID

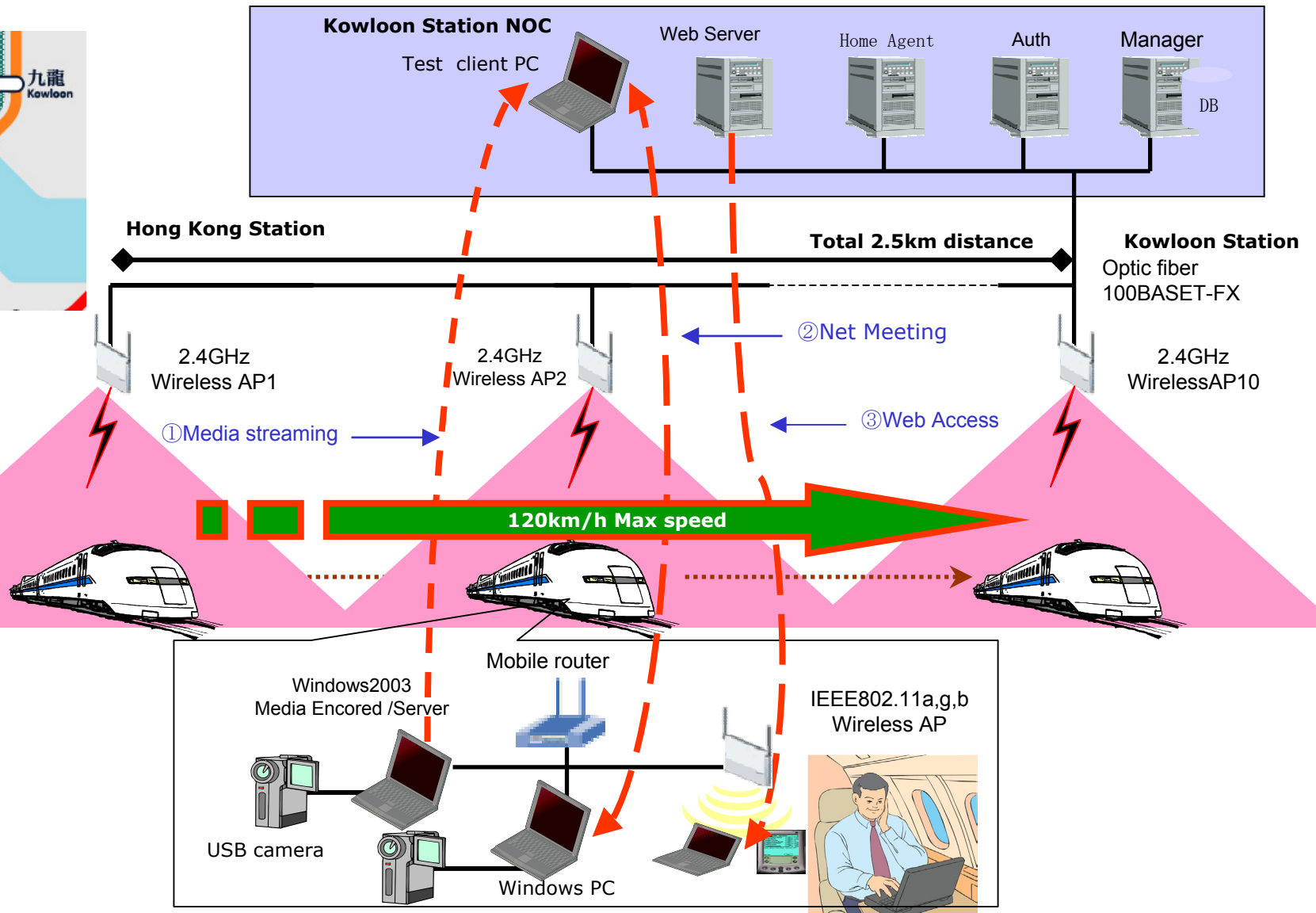
# Mobile IP Gadgets

- IEEE802.11 + VoIP
  - Also, IEEE802.20, 15, 16
  - Aggregator business
  - (\*) cost-reduction and robustness
- Cellarer Phone;
  - Portable telephone number
  - Separation of signaling (i.e., rendezvous ) and Data transmission





# Mobile System at HongKong



# Vertical Market Applications



## Public Services

- Emergency services
- Police
- Fire Fighter



## Armed Services

- Military: Army, Navy, Marines, NATO, UK DoD, etc.



## Commercial Markets

- Package delivery fleets
- Trucking
- Rental fleets



## Consumer Automotive

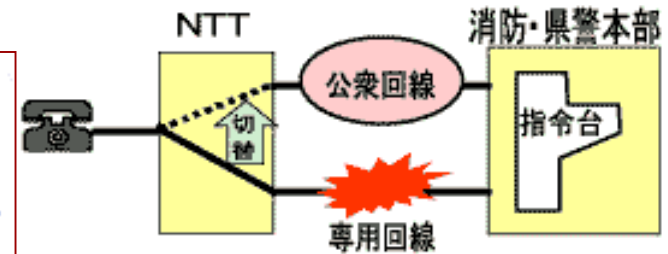
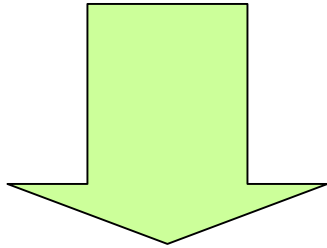
- Telematics
- Infotainment
- Railroads



# Changing the Emergency Call

- Very expensive “emergency” call system

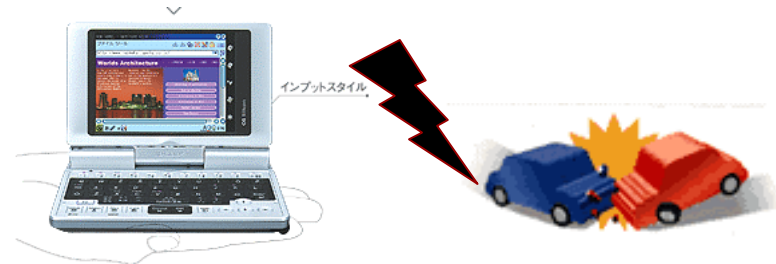
(\*) main player is “voice”



- Robust “shared” emergency information system

(\*) main player is digital information

(e.g., location from GPS, Auto-ID)



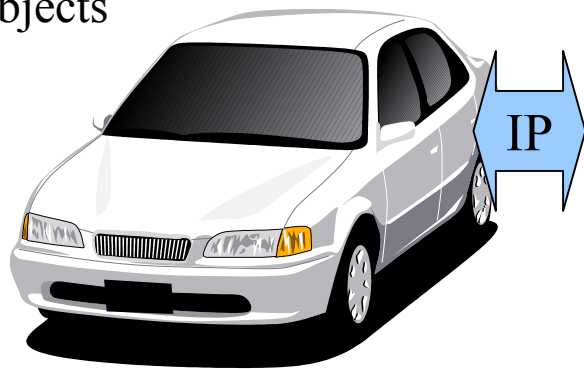
# VI – Vehicles with the Internet





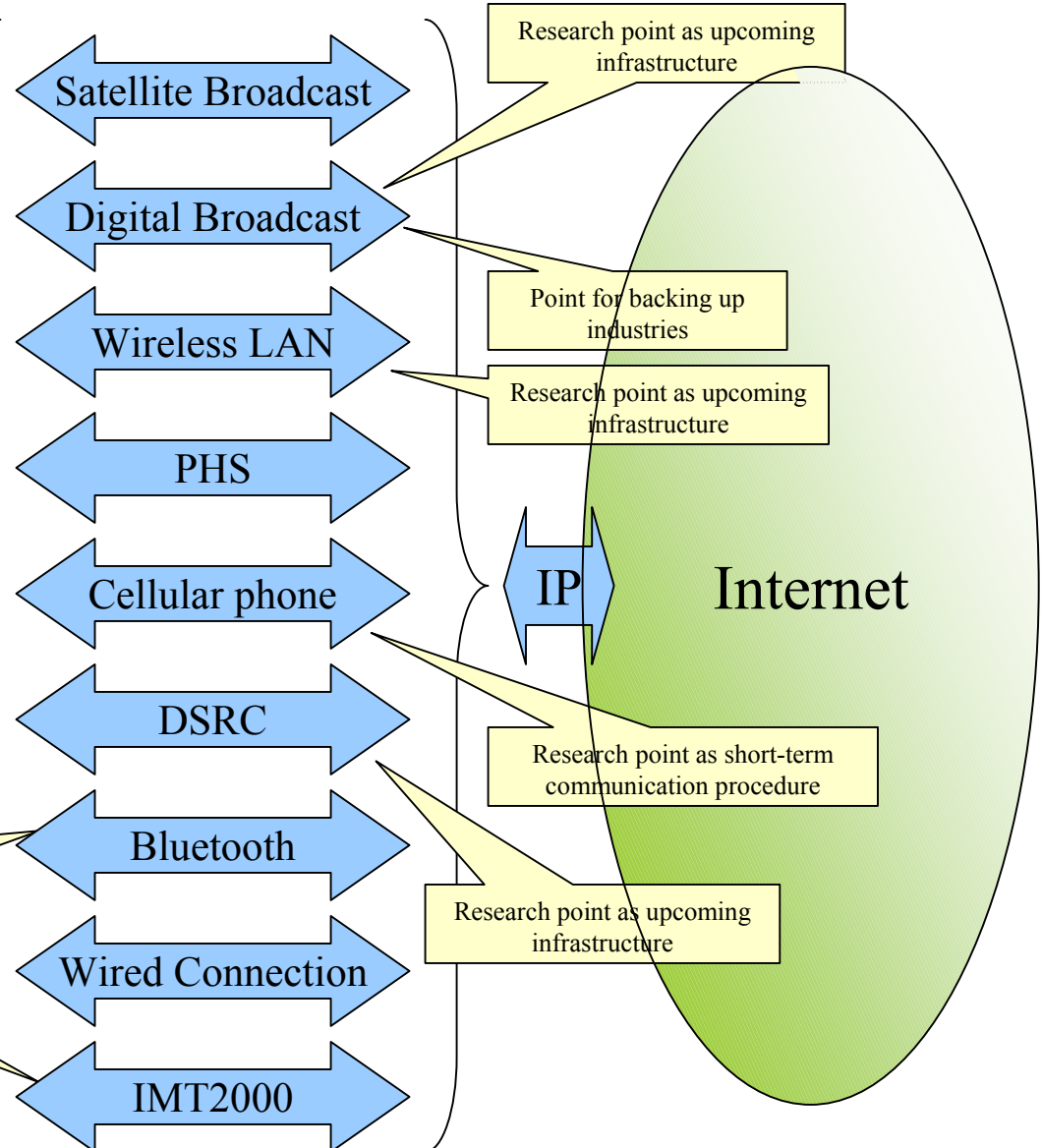
# Technology of connecting vehicles to the Internet

- Use of multiple communication device
- Implementation of the stable connection through the Internet
  - Technologies for vehicle to vehicle communication.
  - UDLR Technology
- Application to other moving objects




Research point for cooperation with other area application

Research point as upcoming infrastructure





リンク

アドレス(D)  [http://www.ipcar.org/web/cgi-bin/ipc\\_www\\_infoview.pl](http://www.ipcar.org/web/cgi-bin/ipc_www_infoview.pl)

移動

**情報種別**

速度

## 事故

特定所要時間

任意所要時間

雨量

凍結

地区・情報

## 速度 地図情報

文字情報



更新

擴大

縮小

地図サイズ: 400×400 ▼

縮尺: 1/20万

**中心位置情報:**

地名: 港南区大久保二丁目

緯度: N35.24.14.52

經度: E139.35.30.76

凡例：

-  10Km/h 未満
-  10Km/h 以上 20Km/h 未満
-  20Km/h 以上 30Km/h 未満
-  30Km/h 以上 40Km/h 未満
-  40Km/h 以上

事故情報表示

ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る

進む

中止

更新

ホーム

検索

お気に入り

履歴

メール

印刷

Real.com

リンク

アドレス(D) [http://www.ipcar.org/web/cgi-bin/ipc\\_www\\_infoview.pl](http://www.ipcar.org/web/cgi-bin/ipc_www_infoview.pl)

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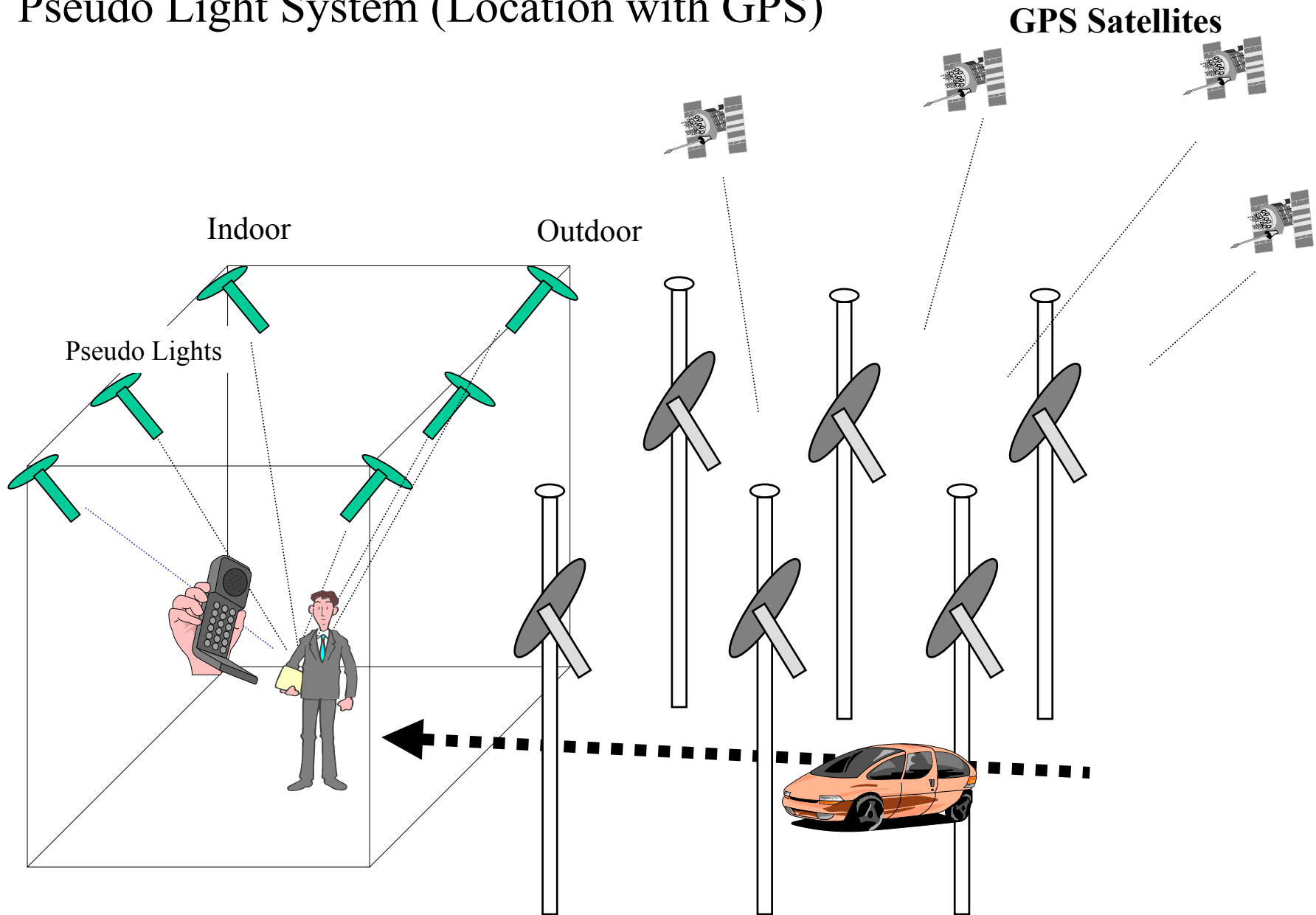
中心位置情報:  
地名: 港南区大久保二丁目  
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凡例:  

不明	降雨なし	雨
	小雨	大雨

ページが表示されました

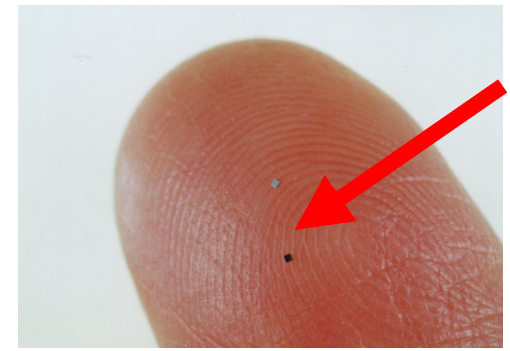
インターネット

# Pseudo Light System (Location with GPS)





# RF-ID/IC card/ $\mu$ -chip

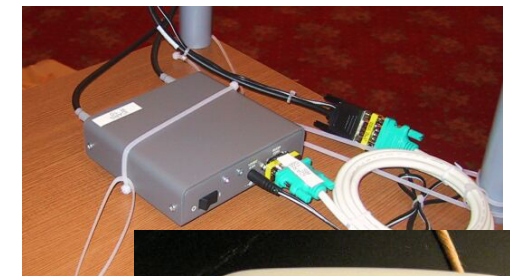


RF-ID  
MYCOM PC WEB

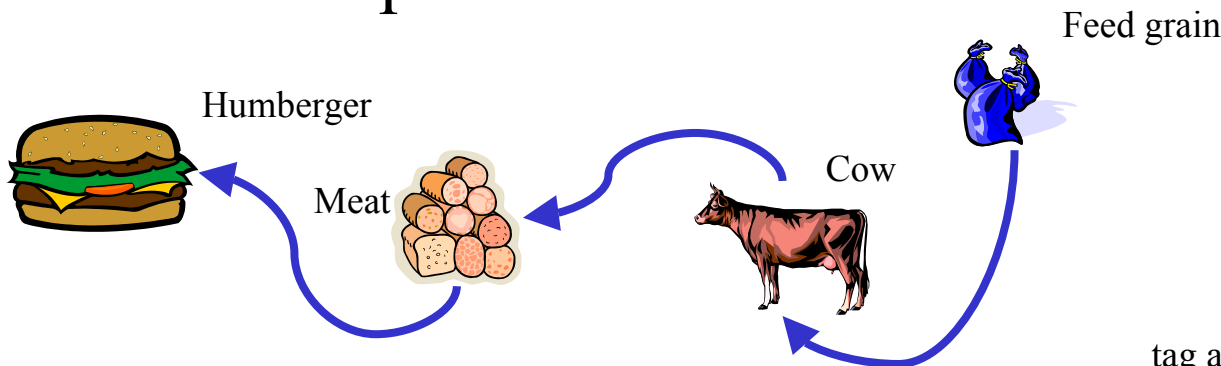
<http://pcweb.mycom.co.jp/news/2001/07/05/22.html>



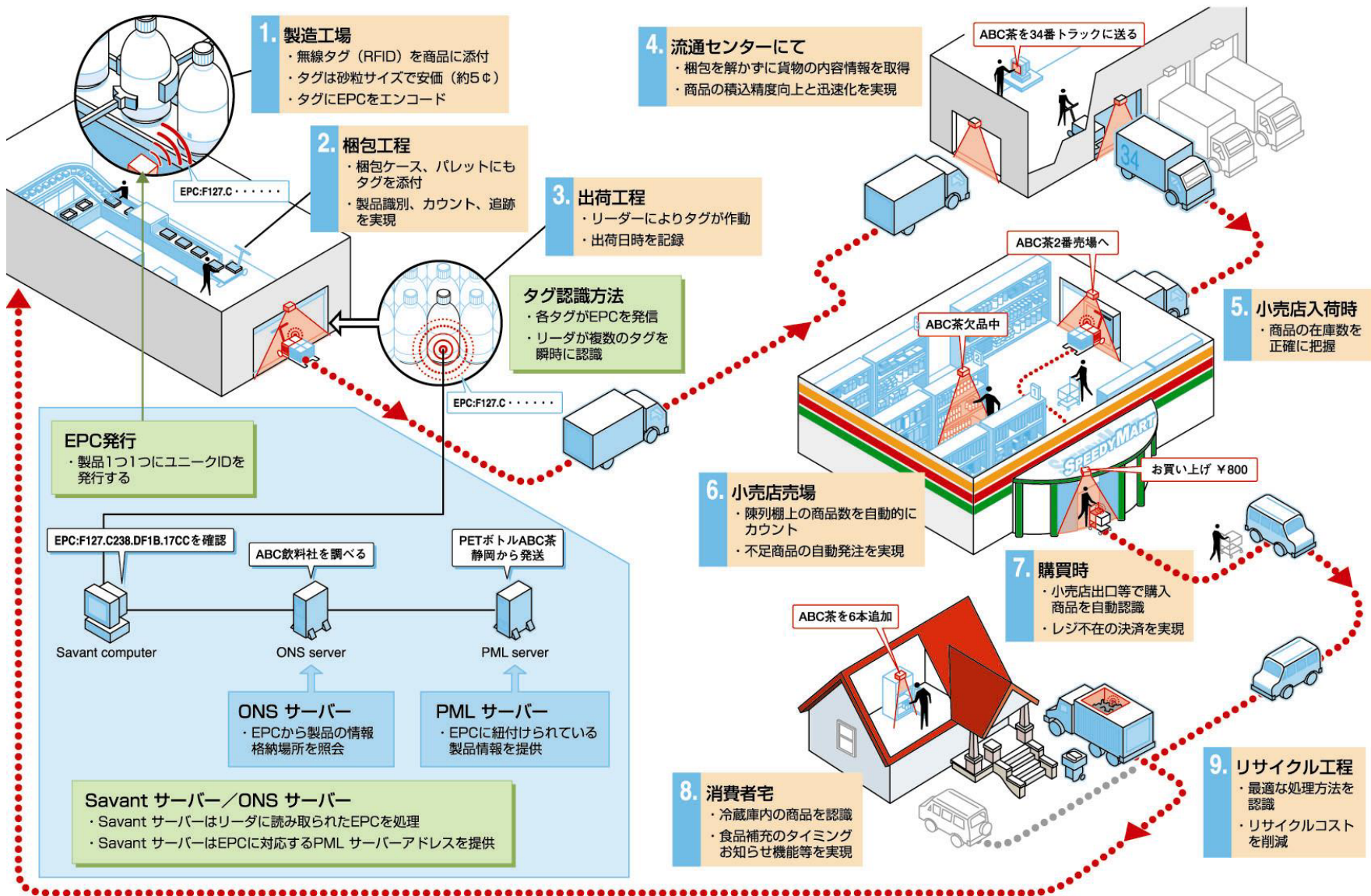
IC card



RF-ID  
tag and reader



# SCM : Supplied Chain Management



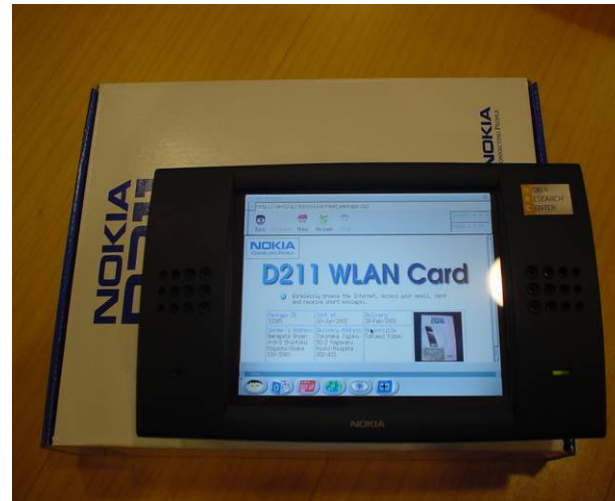
# NOKIA Research Center

PDA with MIPv6+IPSec+RFID+WirelessLAN



Application examples

- School
- Train
- SCM
- Corporate office



SCM,  
Supplied Chain  
Management



# Internet-Node by Yokogawa



MP3 music file download for  
audit by customer at CD Shop



Voice guide using IR bar-code  
reader

# SONY Broadband Solutions

## Video chat system using PS2

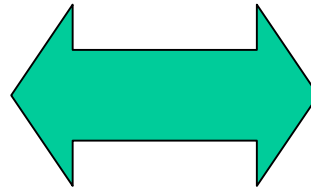


# Ubo Project

## Peer-to-Peer video chat system



Via IPv6 net.





# Sanyo

## Wireless LAN IPv6 Digital Camera



Digital camera works as video  
Communication gadget ☺

# Other products

- prototypes and for commercial -



NEC : Web-camera



360 degree camera



KDDI : Quality Meeting



Panasonic: Web-camera  
**Commercially available**



RuffSystems (DVTS)



KDDI : Home server

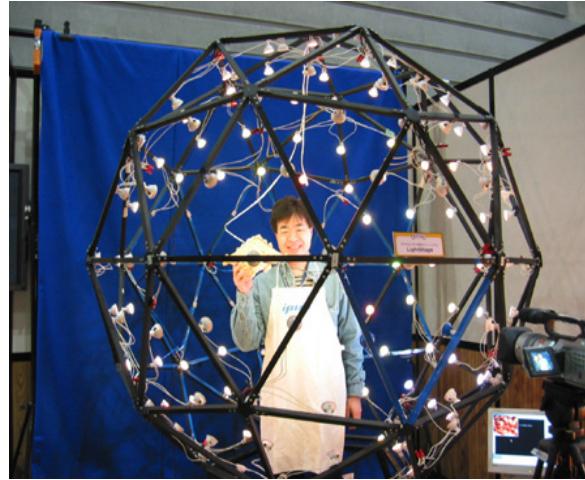


# Other products

## - prototypes and for commercial -



Mitsubishi Information  
Network



Digital Cinema Consortium



KNOPIX

# What we need for Real-Space Internet ?

- Global standard
  - Radio frequency
  - For all industries (e.g., sensor, actuator)
    - (\*) each industry has own standardization, which would not use open standard technology
- Challenging to embedded systems
  - Robust operating system
  - Energy saving technology
  - Robust operational architecture
  - Scalable information retrieval infrastructure
  - Distributed data processing

# Summary

## We need “Global” collaboration

- Not an International Collaboration
- Think and try the new application, at all industry area
- Example of “On-Going” collaboration items
  - R&D/R&E network
    - IPv6 TF
    - IEEAF
    - Moonv6
  - Around DNS (US/FR/KR/JPN)
  - Auto-ID (EU/US/AP)
  - IPv6 Ready Logo (EU/NA/AP)
  - Mobile (FR/KR/JP)

# THANK YOU

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