

IP version 6 (IPv6) R&D and Deployment



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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

IPv6 R&D Activities in WIDE (1/3)

- 1992
 - Started IPv6 Activity
- 1994
 - Established IPv6 WG
- 1997
 - First IPv6 Shownet at NetWorld+Interop Tokyo
- 1998
 - Started operation of WIDE IPv6 network
 - Established KAME Project (for *BSD*) and TAHI Project (for conformance testing)
- 2000
 - Established USAGI Project (for Linux)
 - Started GS(General Service) of JGN IPv6



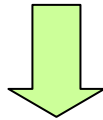
Special projects on IPv6 in WIDE

- **KAME IPv6 for BSD since 1998**
 - Keio Univ., Univ. of Tokyo, Fujitsu, Foretune, Hitachi, IJ, NEC, Toshiba, Yokogawa, Sony, Panasonic
 - <http://www.kame.net>
- **USAGI IPv6 for LINUX since 2000**
 - IJ, Keio Univ, Univ of Tokyo, Yokogawa, CRL(NICT), Toshiba, NTT-Soft, Panasonic, IBM (Japan and USA)
 - <http://www.linux-ipv6.org>
- **TAHI IPv6 Test & Evaluation Software**
 - Yokogawa, Univ.of Tokyo, NTT, NTT-AT, Yasukawa
 - <http://www.tahi.org>
- **DNS and BIND since 2002**
 - USC-ISI, ISC



IPv6 Ready Logo Program for Global Interoperability

- **TAHI Project since 1998**
 - IPv6 test and evaluation specification and software



- **IPv6 Ready Logo Program run by IPv6 Forum**
 - <http://www.ipv6ready.org>
 - Certification WG at IPv6 Promotion Council
 - Technical coverage
 - IPv6 basic function
 - IPSec
 - Mobile IP



IPv6 R&D Activities in WIDE (2/3)

- 2001
 - Established IPv6 Promotion Council
- 2002
 - Started collaboration on BIND with ISC
 - Started collaboration on measurement with CAIDA
 - e! project (two year program)
 - IETF Yokohama
- 2003
 - IPv6 transition trials (three year program)
 - Nautilus6 (MIP/NEMO/MANET) for mobile reality
 - AI3 (Satellite Internet service for Asian countries)
 - Established secure6 WG
- 2004
 - Launched JGN2



V6 Promotion Council

- Four Working Groups
 - Application WG
 - Next generation Internet applications based on IPv6
 - Facility Networking SWG
 - Testbed WG
 - Design, establish and operation of IPv6 testbed
 - IPv6 middleware
 - Router development
 - V6 core technology WG
 - Basic and platform technology development
 - Strategy WG
 - Security SWG
 - Certificate SWG

IPv6 R&D Activities (3/3)

- 2005
 - IPv6-fix task force
 - Digital TV with IP

Enabling IP (i.e.,IPv6) at digital TV system



A lot of IP digital appliances
are going to be connected



**IPv6 Keyboard
By YAMAHA**



Internet into the 4th Wave

First Wave : Closed → Global Open Network

- not only for closed system
- TCP/IP as common language

Computing while sharing computers

Second Wave : IP for Everyone/Billions

- not only for researchers
- Scalability, Reliability & Robustness

Sell/Buy contents with WEB

Third Wave : IP for E-Business

- not only for hobby/research

Fourth Wave Broadband/Ubiquitous/Mobile

- not only for computers
- Small Nodes
- Heterogeneous (Quality and Quantity)

Computing, interacting with Real-Space

How use the (digital) information ?

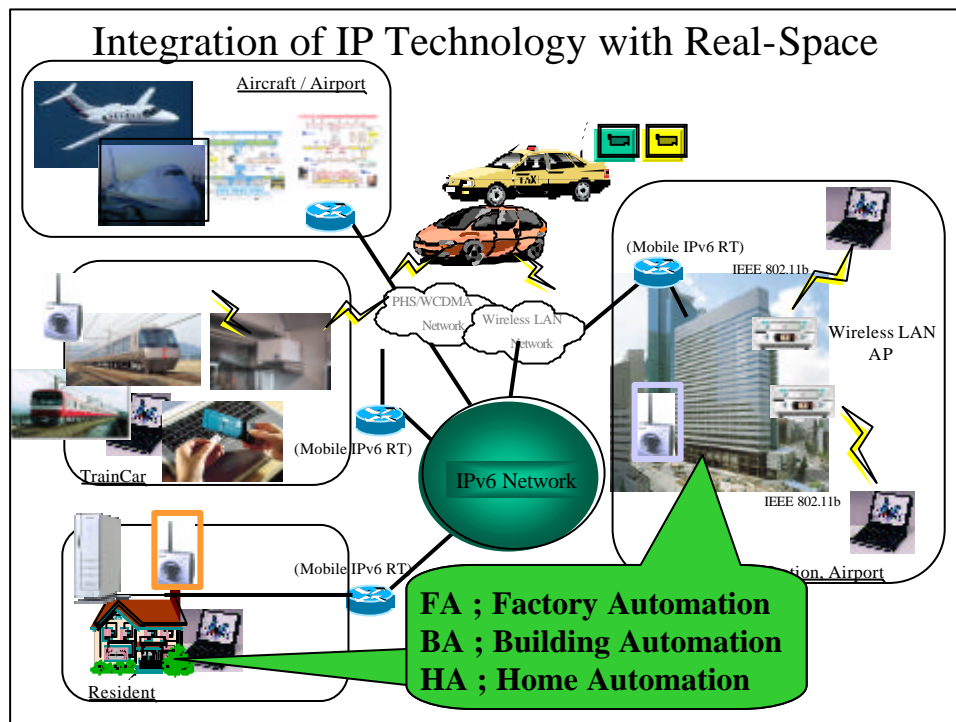
- Generate
- Collection
- Distribution
- Analyze
- Process
- Share

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

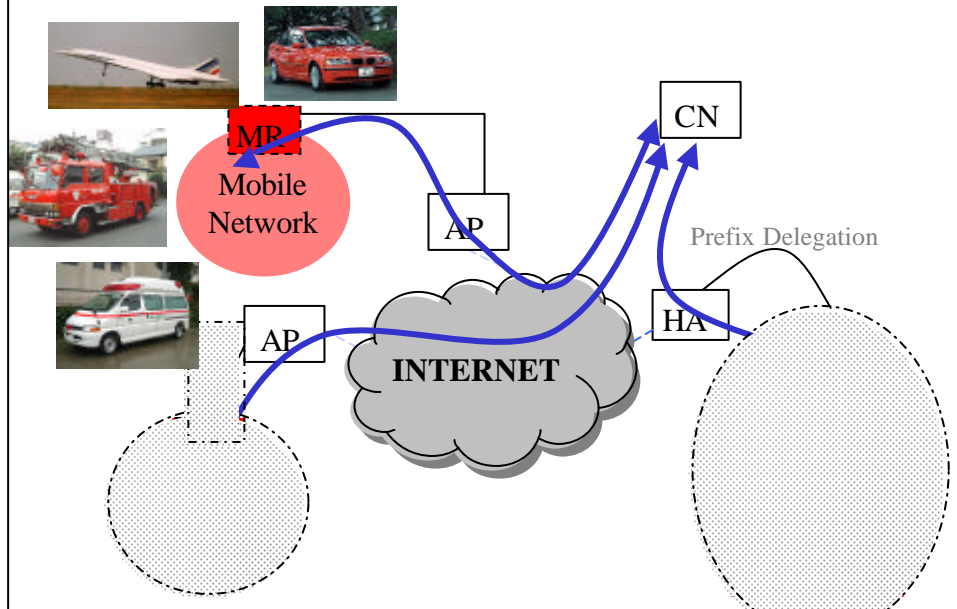
Toward SAVE money !!



Some Examples of IPv6 Applications

- Toward the Real-Space Internet
 - Transportation System
 - InternetCAR
 - InternetTrain
 - Facility Networking
 - Building Automation
 - Live E!, i.e., Sensor Networking
 - Real-time Interactive Communication
 - Digital Video Transmission
 - VoIP over MIPv6 on Linux by USAGI+Nautilus6
 - IP Telephony (i.e., PBX)
 - Uncompressed HDTV

Toward the Network Mobility

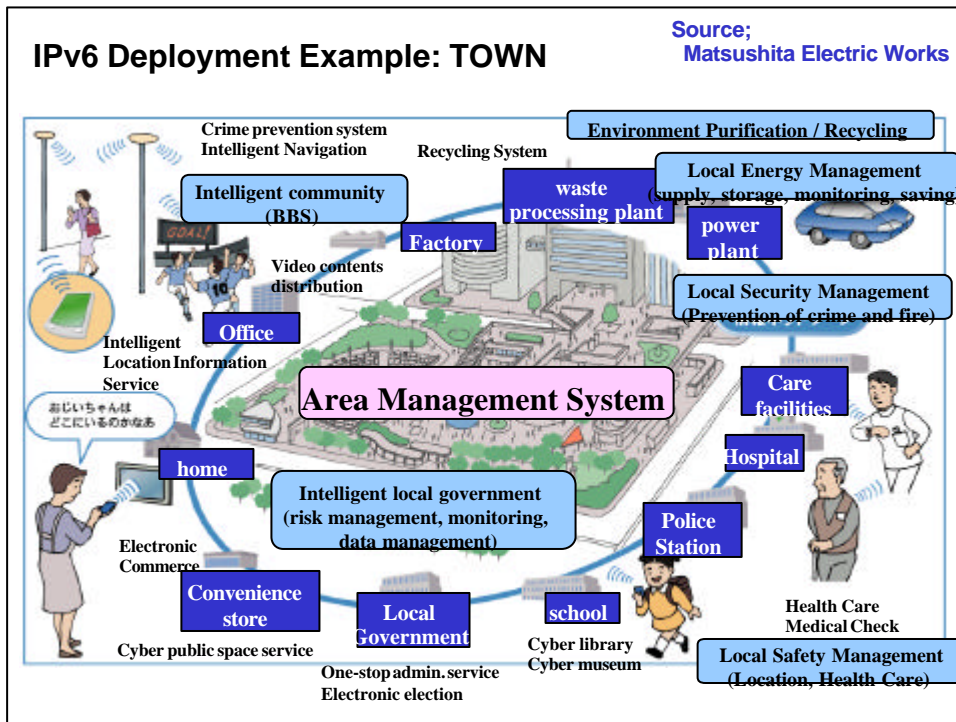


Lesson from NEMO/MIP

- Applicable not only for wireless networks, but also for wired networks
 - Do not need re-configuration at nodes
 - Providing “Portable” address space is a key.
 - Even when we need configuration, Re-configuration contribute cost reduction for network operation
 - Full auto-configuration is not easy, but is difficult
- (*) Reflecting to operational cost

IPv6 Deployment Example: TOWN

Source;
Matsushita Electric Works

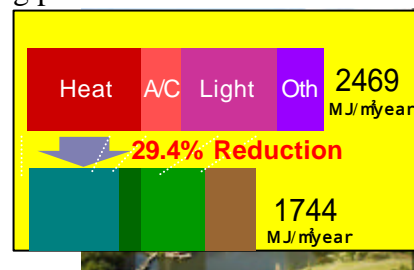


Example ; Building Automation

- Huge operational cost
 - Large energy (e.g., gas, electricity) cost
 - About 30% energy saving has achieved !
- Proprietary technologies
 - Let it be open technology
 - Each systems use proprietary technology
 - About 200K control and monitoring points in Roppongi Hills
- COP3 by UN
 - 10%-30% energy saving



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



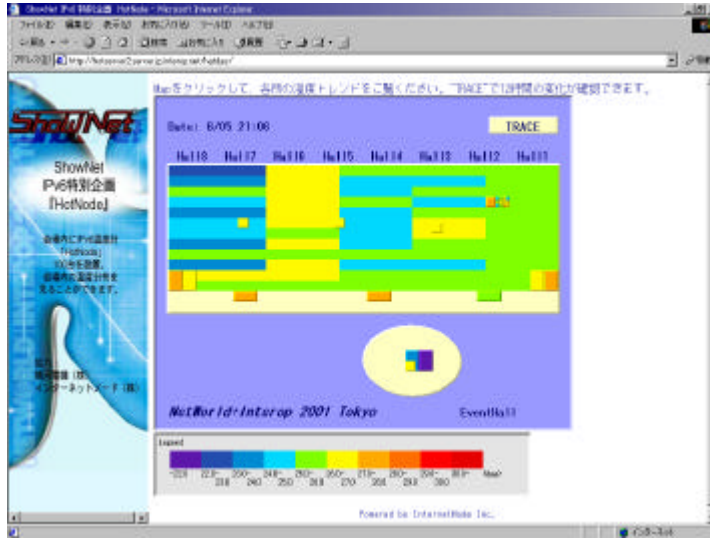
Example; Navigation in Facility

- Navigation of Human-being with RF-ID
 - (*) Originally for technical conference
 - Location management, e.g., zone control
 - Walking path control
 - Customer/visitor
 - Tenant
 - Landlord
 - Evacuation path

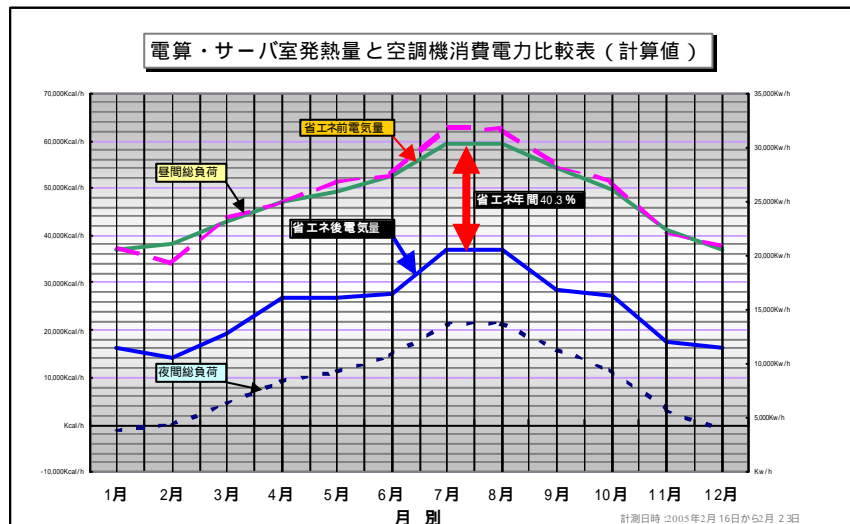
Initiated “Live E!” project.

- install “weather sensor” units
- let information available for anyone
- targeting sub-mile-mesh network
- three applications
 1. Educational material
 2. Public service
 3. Business use

Temperature at ShowFloor



資料提供 : (株)大崎コンピュータエンジニアリング
<http://www.oce.co.jp/>



電算・サーバ室設備設置状況 部屋の大きさ 18,000(W)×15,000(D)×2,700(H)
 室内空調負荷設備 : Host Computer System 2式, サーバ機器類 200ヶ
 空調設備 : 水冷式床下送風型空調機 15ps, 6台
 電源設備 : 三相UPS 200KVA 2台 (並列冗長) 単相UPS 1.4KVA 約25台

**20,000 IP-Phones
At 280 sites !
within 9 months**

IPv6style
Freebit to Deploy IPv6 Centrix Service of 20,000 nodes
(2004.6.7)

Freebit collaborates with Kyoritsu Maintenance Co., Ltd. to offer the Internet connection service and IPv6 Centrix service for approximately 300 sites. Kyoritsu Maintenance manages and operates dormitories for students and corporate employees. More than 20,000 phone sets will be deployed for this service. With the success of a trial deployment at a site, all implementation at 300 sites will be finished by the end 2004.

This offering from Freebit is a customized version of its IPv6 IP Centrix service "Freebit OfficeOne IP Business Phone" which has already been offered to enterprise users since the end 2003. Each dormitory will be given B FLET'S optical access to accommodate the Internet connection service. In addition, IPv6 compatible telephone sets are used for voice communication under direct control by the Freebit IP Centrix server. Kyoritsu Maintenance charges 1,890 yen for the phone service alone and 3,780 yen for both phone and the Internet connection services on a monthly basis. Voice communication between the dormitory residents under Kyoritsu's management is free, and external voice communication is offered at a low price comparable to the generic IP telephony service.

Hiroki Ishida, CEO of Freebit Co., Ltd., said "IPv6 simplified the network design dramatically and enabled deployment at so many sites in such a short period at a low cost".

Large-scale introduction of IPv6 system

- **280** sites all over Japan
- IPv6 Node as many as **20,000**

The IP Centrex service, "IP Business Phone", developed by FreeBit, has got a major contract with Kyoritsu Maintenance, a nation-wide dormitory supplier. The IPv6 phones will be installed into all of their rooms, that is as many as 20,000.

Utilize a technology called, "Feel6", which enables secured IPv6 network over existing IPv4 network

- Easiness to design the address management scheme regardless the tremendous number of nodes
- Management of terminal versions by achieving the reachability to each terminal over Internet

"Realized the cost reduction by IPv6"

20,000 IPv6 Nodes
280 addresses

Note) Information as of 2004/Nov



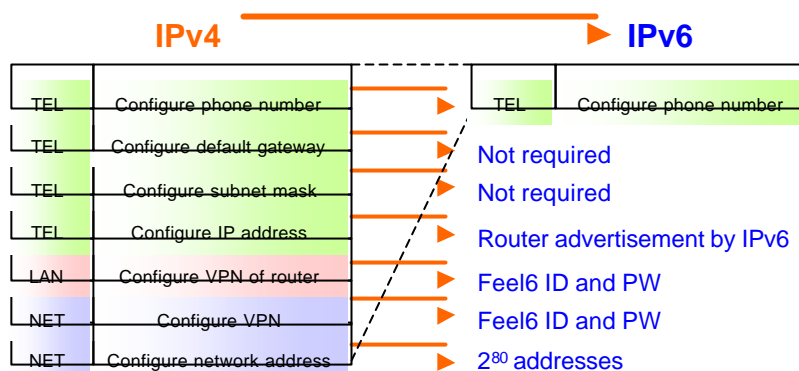
Cost reduction made possible by IPv6

	Design phase	Installation phase	Maintenance phase
IPv4 ↓ IPv6	<p>Necessary to design the address range carefully</p> <p>Specific address design for each environment necessary</p>	<p>Necessary to configure the subnet mask and default gateway to each node</p> <p>Possibility to make mistakes in settings</p>	<p>Difficult to identify the nodes in trouble from the operation center</p> <p>Delayed trouble shooting</p>
	<p>Possession of abundant addresses and hierarchical design possible</p> <p>Specific address design for each environment not necessary</p>	<p>Auto-generation of IPv6 address upon reception of router advertisement</p> <p>No special knowledge necessary to installer</p>	<p>Easy to identify the nodes in trouble, and re-configure remotely with help of IPv6</p> <p>Reduced complexity of maintenance</p>

FreeBit Co., Ltd.



Significant reduction of network design steps

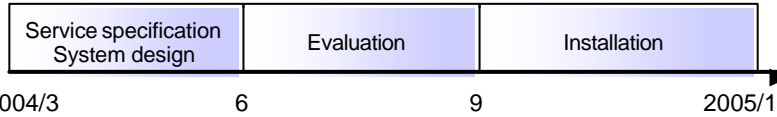


FreeBit Co., Ltd.

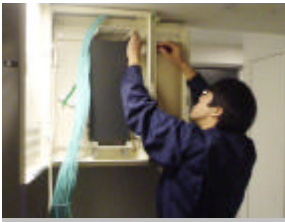


Launch of 20,000 nodes in a very short term

FreeBit Co., Ltd.



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

FACTs and Lessons from this IP-Centric Migration

- Simple and small number of installation types. i.e, only three in this case
 - Less design cost and easier installation manuals
- Small number of mis-configurations
 - Reduce expensive engineers' technical supports, i.e., from 300 to single number.
- Easier trouble-shooting
 - Identify the trouble, easier

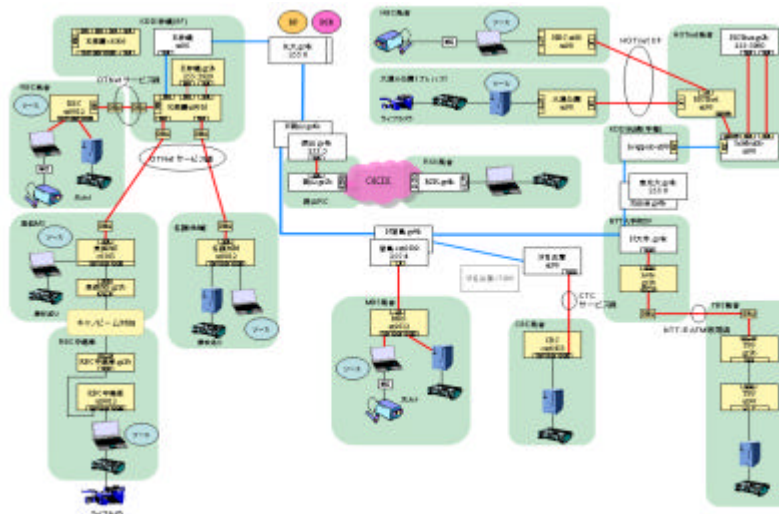


All are contributed cost reduction caused by human resource

DVTS & Multicasting

- DV(Digital Video) Multicasting over JGN2
- DV over IPv6 for TV productions
 - Portable DVTS gear
 - DV switcher
 - ➔ direction of digital appliances networking

Network Configuration at Sapporo Snow Festival in 2005 - DVTS multicasting -



Some network equipments



DVTS : Digital Video Transmission System
 (*) runs all platforms, BSD/Linux/Windows

Smart Location System - Light Weight Digital Video Communication System -

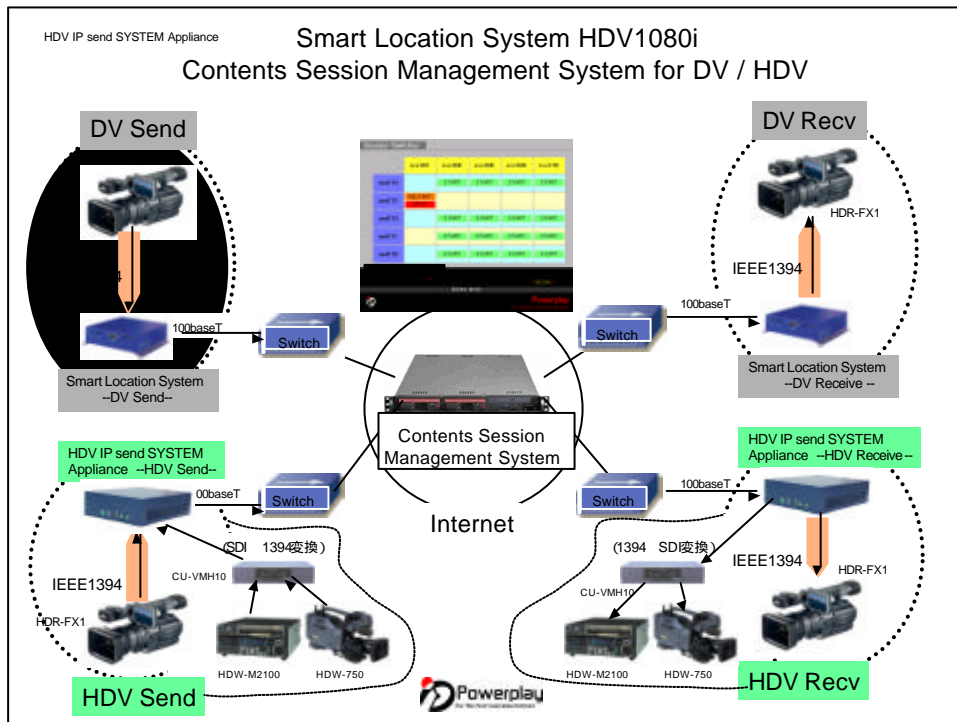


Operating System : Linux
Booting period : 30 seconds
Main Features
 On-board VIA C3 800MHz+ processor
 One internal 2.5" HDD bay
 Built-in speaker-out, MIC-in and TV-out ports
 Optional Compact Flash or DOM module
 On-board DOC socket up to 288MB
Construction
 Heavy-duty steel
 Device
 Support internal 2.5" HDD x1
Dimension
 146(W) x 41 (H) x 160 (D) mm 5.75"(W) x 1.6"(H) x 6.3"(D)
Cooling system
 3 cm fan for system cooling x1
LED indicators
 Power-on/off LED x1
I/O ports
 IEEE1394 port x1 PS/2 Keyboard/
 Mouse x1 Serial port x1 Audio-out x1
 MIC-in x1 TV-out x1 USB port x1

Power Module (Internal DC to DC power converter)
 EBK DC512 Power input: 16V~24Vdc Power output: 12V & 5V
 Power output: 24Vdc / 2.5A 60W max Power input: 100~240Vac
 2A 50/60HZ
Environment
 Operating temperatures : 0 ° C to 45 ° C Storage temperatures
 : -20 ° C to 80 ° C Relative humidity : 10% to 90%
 (Non-condensing)
Certification
 CE FCC

Battery
 Operation





IPv6-Fix task force

- 1% of technical issues on IPv6 system and operation
 - Specification, implementation, operation
 - Professional operators hesitate/step-back
 - “We wanted use the IPv6”, however we are afraid of service outage....

How use the (digital) information ?

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



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Toward SAVE money !!

THANK YOU

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