Attachment

Study Group on Intelligent Home Appliance Networking

Interim Report

July 20, 2005

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Reference 1: For Concretizing the Plan for Intelligent Home Appliance Networking

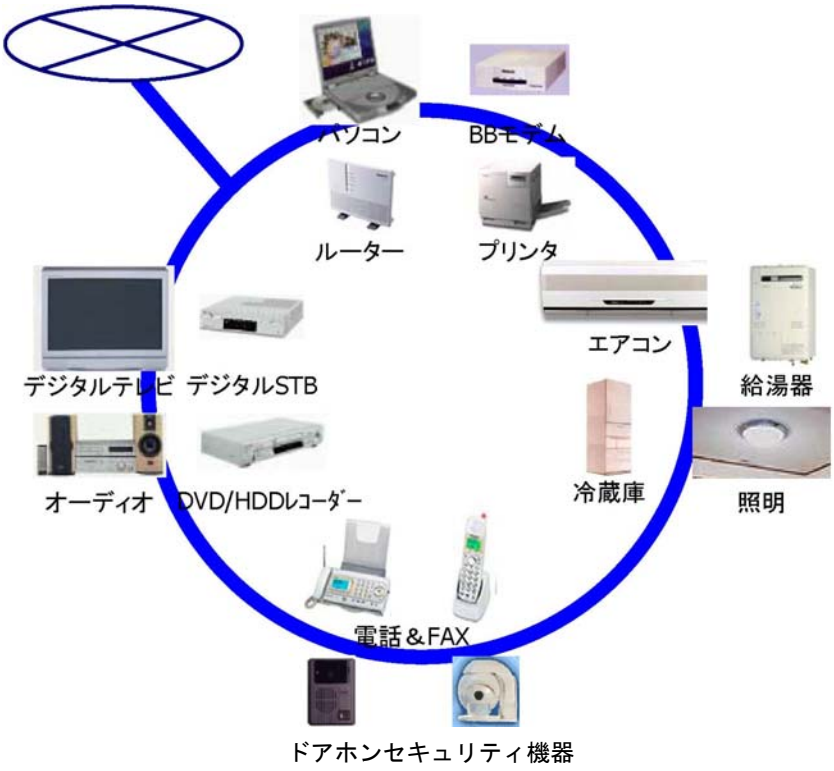
Reference 2: Digital Technology Roadmap

1. Current Status of Intelligent Home Appliance Networking

1) Definition of Intelligent Home Appliance Network

An intelligent home appliance network consists of digital home appliances, which can be networked primarily in the house, and various networks that connect these appliances to each other and to outside networks. The intelligent home appliance network thus connects and optimizes various home appliances beyond their intended use so that diverse new services can be provided.

Diagram of Intelligent Home Appliance Network



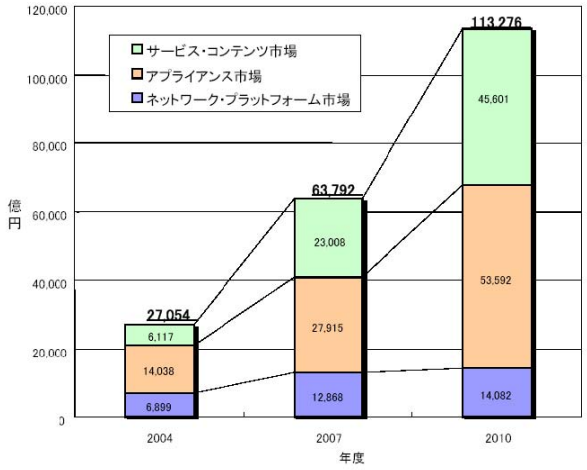
1/ Computer
2/ Router
3/ BB modem
4/ Printer
5/ Air conditioner
6/ Water heater
7/ Refrigerator
8/ Lighting
9/ Telephone & Fax
10/
Door phone
Security device
11/
Audio device

DVD/HDD recorder
12/
Digital TV
Digital STB

2) Market for Intelligent Home Appliance Networks

The market for intelligent home appliances can be divided into digital home appliances (appliances), network platforms, and service content that is created by the appliances and the platforms. The Study Group for Networking Intelligent Digital Home Appliances (Ministry of Internal Affairs and Communications, August 2004) forecast that the market would grow to approximately 11 trillion yen in total by 2010.

Market Forecast for Intelligent Home Appliance Network



1/
Service/Content market
Appliance market
Network/Platform market
2/ 100 million yen
3/ Year

3) Moves to standardize Intelligent Home Appliance Networks

Standardization efforts are actively being made concerning Intelligent Home Appliance Networks in order to secure connectivity. These moves can be roughly divided into creation of overall standards by international bodies such as the ITU, and attempts to establish forum standards or de facto standards for each industry, technology, or product.

Standardization Organizations for Intelligent Home Appliance Networks

1/ Forum/De Facto

2/ Specific technologies/products
3/ DLNA (former DHWG)
4/ DHF (Digital Home-Network Forum)
5/ UPnP Forum
6/
Ipv6 Forum
OIF
7/ PLC Forum
8/ CE Linux Forum
9/ Extensive technologies
10/
Ubiquitous ID Center
EPCglobal
11/ Overall
12/ Global
13/ Regional
14/ Domestic
15/ etc.

4) Initiatives for networking Intelligent Home Appliances in Japan

(1) Governmental initiatives

[1] Initiatives by MIC

The Ministry of Internal Affairs and Communications (MIC) has been committed to various initiatives for networking Intelligent Home Appliances from the viewpoint of promoting use of telecommunications and broadcasting services.

In 1998, the now defunct Committee on Intelligent Homes of the Telecommunication Technology Council suggested that open standardization effort should be promoted under the initiative of the private sector regarding future vision and research and development of intelligent homes. Accordingly, research into basic and application technologies for the next generation home intelligence began. In 2000, the Digital Home-Network Forum, which consisted of telecommunications carriers/broadcasting organizations and manufacturers, was established. The forum submitted Japan's proposal on in-home network architecture to the ITU, the international standardization organization, and it appeared as the ITU recommendation in 2002. Also in 2002, the Promotion Council on Internet for Intelligent Home Appliances was formed under the initiative of consumer electronics manufacturers and telecommunication carriers. Based on the recommendations from this council, MIC implemented initiatives for research and development into intelligent appliance Internet and international standardization of the various related technologies. After 2001, MIC further carried out comprehensive research and development on IPv6 for Intelligent Home Appliances, especially on address space expansion, which is a major characteristic of IPv6, and provisions for increasingly sophisticated applications that use new functions, such as its security function, which is a standard feature of IPv6. In 2004, against a backdrop of expanding market of digital home appliances, especially audio-visual devices, MIC hosted the Study Group for Networking Intelligent Digital Home Appliances, and initiated a study on trends of technological development and standardization regarding networking of digital Intelligent Home Appliances.

In December 2004, MIC compiled the "u-Japan Policy" with the aim of realizing an ubiquitous network society by 2010, setting out the policy to use ubiquitous networks in order to solve various social issues related to the declining birthrate and the aging society. As this policy identifies that "the networking of Intelligent Home Appliances" and "the development of ubiquitous platforms" are key elements in establishing ubiquitous networks, MIC has continually promoted various measures to facilitate the diffusion of Intelligent Home Appliances.

[2] Initiatives by METI

In the "New Industry Creation Strategies" set out by the Ministry of Economy, Trade and Industry (METI) in May 2004, the intelligent home appliance industry is positioned as an advanced industry, because the market is highly likely to expand in response to increasingly sophisticated and diversified needs of the people and because the advanced technologies used for the industry will generate synergy and create following new markets. Meanwhile, the "Information Economy/Industry Vision" compiled in April 2005 by the Information Economy Subcommittee of the Industrial

Structure Council points out the importance of Intelligent Home Appliances in leading upstream/middle-stream raw material/material industry and in creating new goods and services. This vision suggests that it is indispensable to drive forward initiatives that aim to create new services through the networking of Intelligent Home Appliances and to improve convenience for consumers.

Specifically, METI has implemented the Project for Infrastructure Development for Utilization of Information Appliances since 2005. Based on the action program of the New Industry Creation Strategies (for the information appliance area), METI has worked on research for scenario sharing to encourage diffusion of Intelligent Home Appliances, promoted global standardization of intelligent home appliance specifications, promoted standardization of component information distribution between downstream and upstream, and developed an infrastructure to provide people with accurate information (consumer report on Intelligent Home Appliances).

As for technological development, METI has committed to R&D on system LSI, which could realize lower power consumption, higher reliability, and lower costs by achieving sophisticated functions of Intelligent Home Appliances with one or multiple LSI chips, in the "Semiconductor Application Chip Project" started in 2003, while optimizing the innovative ideas of universities and venture companies. In the "Digital Information Equipment Interoperability Foundation Project" that was also started in 2003, METI has conducted R&D into an infrastructure system for Intelligent Home Appliances that allows a user to easily transmit information between various intelligent and high reliability devices, including Intelligent Home Appliances and information terminals in the house or public spaces. Further, in 2005, METI launched the development of an integrated management system for the remote monitoring and management of incident information (outages/malfunctions) concerning digital information devices. Also in 2005, METI promoted R&D to realize an interface technology that removes the barriers between human beings and machines based on "spoken language computing" through its "Leading Research and Development on Voice Technology" project.

(2) Initiatives by the Private Sector

The services provided by networked Intelligent Home Appliances can be classified into the following 12 areas depending on the situation in daily life.

Classification of Services Provided by Networked Intelligent Home Appliances

	Service Area	Outline	Examples of Life Solution Service
[1]	Security	Service, information provision and community for home security, self-defense/security, and disaster prevention	Home security, community safety service, location information provision for self-defense/security, entrance/exit monitoring system
[2]	Community / Local government	Administrative services provided by local governments, services related to local community/PTA, other related information and community	Reservation and fee collection for sporting facilities, simultaneous communication service for PTA

[3]	Home / Housekeeping	Service, information provision and community for life infrastructure (e.g. electricity, gas and water), house renovation, and housekeeping (e.g. cooking, washing and cleaning)	Remote control of consumer electronics and electric/gas devices, e-Billing for utilities, simulations for renovation work
[4]	Marriage / Childbirth / Child raising / Childcare	Service, information provision and community for matchmaking, marriage, childbirth, child raising and childcare	Service for parents to watch their children in kindergarten/day care center, Internet community for childbirth/child raising, marriage information services
[5]	Medicare / Nursing care	Service, information provision and community for Medicare, nursing care or watching elderly	Remote Medicare, service to watch elderly, provision of assessment information on medical institutions
[6]	Work / Employment	Service, information provision and community for finding/changing/applying for jobs or career advancement, and home office management	Service to support home office, e-learning for career advancement, information provision for job hunting
[7]	Education / Learning	Service, information provision and community for preschool education, preparatory schools, study for entrance examination, foreign language learning, qualifications, and study abroad	Various e-learning services, qualification examinations, school information provision for study abroad
[8]	Money / Insurance	Service, information provision and community for banking, securities, insurance, and real estate	Internet banking, on-line trading, estimate and application for insurance, housing information service
[9]	Health / Beauty	Service, information provision and community for health, beauty and diet	A toilet health-check system for in-home health monitoring, health/beauty advice
[10]	Shopping	Service, information provision and community for shopping (including reward and coupon services)	Internet shopping, new products/bargain information, product comparison/evaluation
[11]	Entertainment	Service, information provision and community for music, video, fortunetelling and games	Movie/music download, database management, e-Tickets
[12]	Leisure / Hobby	Service, information provision and community for travel, sports, pets, fashion, gourmet activities, cars, and courses	Travel reservation, sporting facility reservation, information provision via car navigator, gourmet information
[13]	Information Platform	Platform services to provide diverse information/services	Mobile phone, T-Navi.net, Goopas (electronic commuting pass)

(Source: reference provided by IPSe Marketing, Inc.)

Many enterprises have launched services in the security area, as represented by the service to locate a person or object anytime and anywhere, or the home security service that enable a user to monitor the status of his or her home while away. For example, “COCO-SECOM,” provided by SECOM Co., Ltd., provides location information on a car, bicycle, person, pet, package, or freight, using dedicated small terminals, GPS, and mobile phone networks. Tokyu Security Co., Ltd. provides a home security service that uses the infrastructure of the Tokyu Group’s CATV communications company. The service allows a user to check the status of a room from outside the home using a computer or mobile phone to watch video images taken by a camera that can send them over the Internet. Other services currently available are as follows:

Elementary school commuting management service	Fujitsu Ltd.	A security system for schools to check if students passed through the school gate by using RF IC tags attached to students’ backpacks
Mobile TV Door Phone	Aiphone Co., Ltd.	A system that enables a user to answer to the door phone in real-time with a mobile phone while away from the home. The visitor can then be monitored on the screen of the phone.

At the same time, life support services that optimize home appliances in this field have also been launched. Matsushita Electric Industrial Co., Ltd. offers the “Kurashi Net,” an in-home network appliance system to support daily life, which uses a mobile phone to control home appliances or set off an alarm when the sensor detects an emergency. Matsushita has also developed a robot that can clean the house at its own discretion by avoiding obstacles such as furniture using an infrared monitor and built-in gyro sensor to check its position. Toshiba Corporation has released an Internet appliance series “Feminity,” offering washing machine, air conditioner, refrigerator and microwave that can be controlled using radio communications or mobile phones. Dedicated servers on the Internet and in-home access points are connected so that a user can control home appliances using a dedicated terminal, TV set with browser functionality, computer, or mobile phone. This service is implemented in all-electric apartment complexes provided by Toshiba Building Co., Ltd. Other services related to houses/housekeeping are as follows:

Horaso Network Service	Hitachi, Ltd.	A life support service that enables a user to monitor the status of his rooms and home appliances and operate them anytime and anywhere using a remote controller and low-power radio when in the room, or a mobile phone and the Internet when away.
Internet microwave	Sharp Corporation	A system that enables a user to cook a dish with a microwave by retrieving a recipe posted on the Web site.

In the Medicare/nursing care area, various enterprises offer services to monitor elderly people by using home appliances, computer, mobile phone, or network. Zojirushi Corporation’s “Mimamori Hot Line” service e-mails the status of an elderly person’s use of an electric water heating pot to their family living apart, allowing the family to check on how the elderly family member is doing. Matsushita Electric Works, Ltd.’s “Mimamori Net” tracks an elderly person’s position in their house using infrared sensors installed in each room and e-mails the tracking record to a registered mobile phone. As the e-mail indicates the types of rooms that the person moved in and out per time zone, the family can easily check their daily activities.

In the health/beauty area, OMRON Corporation has released a “PC-linkable pedometer for walking record management on a networked computer” and offers a service that allows a user to upload his walking record on a computer from the pedometer so that he can have his data analyzed or get specialist advice over the network for his health management. Matsushita Electric Industrial Co., Ltd. sells a “Health Toilet System” that automatically detects a user’s weight, body fat, occult blood and protein levels (in feces). The automatically monitored data is sent to a medical institution so that the user can receive specialist advice based on the information.

In the entertainment field, services to distribute music content to mobile terminals, as represented by

"i-Pod" and "i-Tunes Music Store" of Apple Computer, Inc., have been launched. A user can select and download music from over 10,000 tracks to his mobile MP3 player with its built-in memory or hard disk. Any Music Inc., jointly established by eight audio appliance manufacturers, including Sony, is launching services for music downloads, online CD shops, and provision of FM on-air information by connecting in-home stereo components via the Internet.

In the leisure/hobby area, the following services related to pets and automobiles are available:

iSeePet	AOS Technologies, Inc.	An auto-feeding service for pets, providing video images taken with a web camera. A user can see their pet over the Internet with a computer or mobile phone and then feed the pet as necessary.
CARWINGS	Nissan Motor Co., Ltd.	A telematics service that enables a user to easily set up destination information by providing destination requirements to an operator over a mobile phone. The operator then searches for information on restaurants or parking lots, for example.

Various services have been started for other areas as well. Some of the leading cases in each field are as follows:

Community / Local government	Sagamihara City's road information reporting system 〈Shirasete Mappun〉	Sagamihara City, Kanagawa Prefecture	A system that enables a citizen to take a picture of damaged road or road sign with his mobile phone and report it to the city office. The picture makes it easier to grasp the situation on-site as well as to locate the reported site with GPS location information or by selecting the site from an address list, enabling the city to take prompt action.
Marriage / Childbirth / Child raising	Live Kids System	Il Garage Co., Ltd.	A system that enables parents to check how their children are doing in a day care center or kindergarten at any time from their home, office, or any place where they can connect to the Internet. They can watch the video image taken with a web camera fixed at the door of the childcare facility.
Work / Employment	TV interview system	Intelligence, Ltd.	A service that makes it possible to conduct a job interview even when the interviewer and the interviewee are far apart by using a TV conference system.
Education / Learning	e-Exam Study Service	Benesse Corporation	An e-learning service for an elementary school child that is going to take an entrance examination for junior high school. The student can take courses and talk with their teacher in a remote location by connecting a headset microphone, a web camera, and a pen tablet to their computer.
Shopping	e-Ticket PIA – Ticket pick up at a digital security pocket (electronic PO box)	PIA Corporation	A service that enables a user to search and pay for a ticket over the Internet and download the ticket data onto an IC card or his mobile phone, which can then be used to gain admittance to the venue.

5) Status of Intelligent Home Appliance Networks in other countries

(1) USA

Currently, we need to pay attention to the moves of the computer industry and

communication device manufacturers regarding home digitization. TiVo offers services such as auto recording, which takes advantage of program information distribution and an HDD recorder, and content playback on a computer via an in-home LAN. Apple Computer's iPod looks almost like an intelligent home appliance as well as a music reproduction device. Furthermore, Microsoft's "Seamless Computing" and Intel's "Digital Home Fund" are intended for the market of intelligent home appliance networks.

(2) Europe

The characteristic in Europe is that research and development and demonstration experiments for Intelligent Home Appliances have been conducted under the European Commission's R&D programs on communication technology.

Meanwhile, the global consumer electronics maker Koninklijke Phillips Electronics N.V. is building an environment that enables users to see each other's digital content by connecting computers, TV sets, and audio devices under the concept of "Connected Planet."

(3) South Korea

One of the characteristics of South Korea's initiatives is the government's "Digital Home Plan" policy, for which concerted efforts of the public and private sectors have been made to convert 10 million households to digital homes by 2007. Under this plan, South Korea aims at achieving a convenient life (remote meter reading, remote learning, remote Medicare, remote control of home appliances), safe life (safety/security, information management), and affordable life (home banking, home shopping, energy control).

Additionally, Samsung commercialized Korea's first digital home—Tower Palace, a luxurious apartment complex of 3000 households, in Dogok-dong, Gangnam-gu, Seoul.

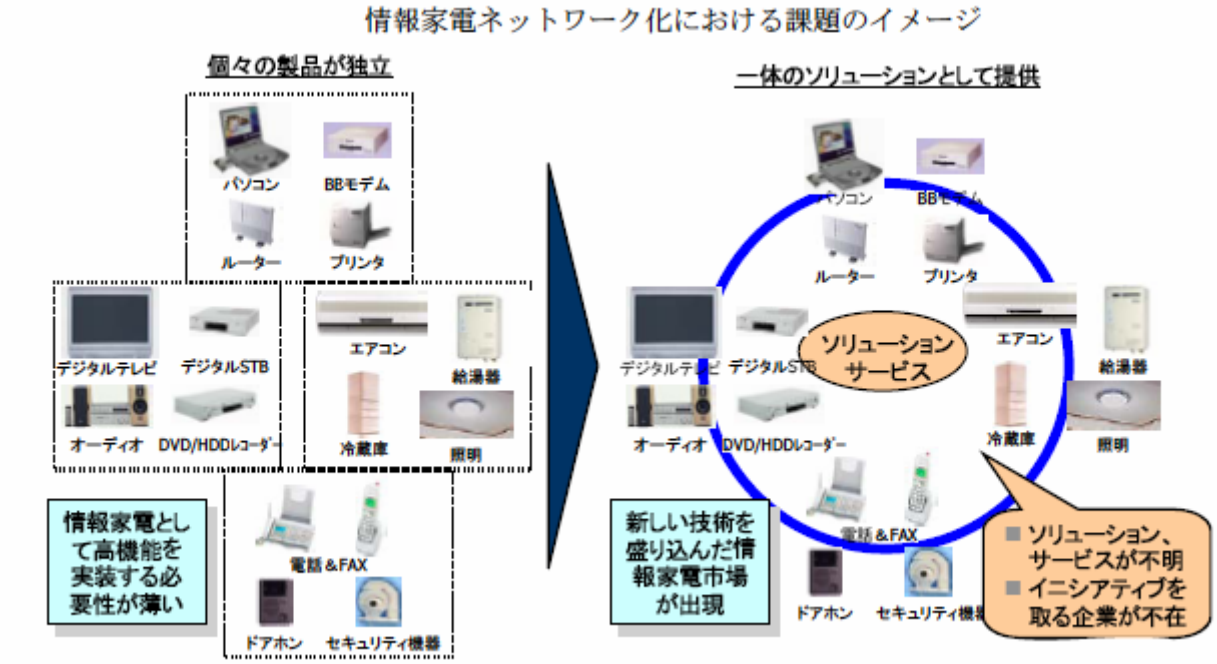
2. Issues in Networking Intelligent Home Appliances

1) Overall picture of the issues in networking Intelligent Home Appliances

The product area of Intelligent Home Appliances is strong only when the products are offered as a single solution service, rather than when they are sold separately. As an additional value, “information” complements conventional consumer electronics, but consumers would not accept Intelligent Home Appliances nor could this market really start up unless the environment for providing such an integrated solution service is established.

Currently, however, various specifications of devices and communication methods coexist, making it difficult to secure connectivity between devices or between makers. Although makers are taking actions individually, an integrated solution service across the entire intelligent home appliance network has yet to be clarified. In addition, an enterprises that can take a leadership role in standardizing specifications or providing solution services has not been identified. These initiatives therefore are not able to advance due to such factors.

The fundamental issue could be that a player or movement able to take the initiative to drive the networking of Intelligent Home Appliances has yet to emerge.



1/ Figure showing the issues in networking Intelligent Home Appliances
2/ Each product stands alone
3/ Computer
4/ BB modem
5/ Router
6/ Printer

7/ Digital TV
8/ Digital STB
9/ Audio device
10/ DVD/HDD recorder
11/ Air conditioner
12/ Water heater
13/ Refrigerator
14/ Lighting
15/ Little need to implement advanced functionality in Intelligent Home Appliances
16/ Telephone & Fax
17/ Door phone
18/ Security device
19/ Provided as an integrated solution
20/ Solution service
21/ Market for Intelligent Home Appliances with new technologies emerges
22/
Solutions/services not identified
Enterprises taking initiative do not exist

2) Technical issues

Technical issues for intelligent home appliance networks to effectively function are summarized into "compatibility," "scalability," and "connectivity."

Firstly, compatibility means that operations of devices and systems that comprise an entire network of Intelligent Home Appliances is ensured even when one of them is replaced upon upgrade by the same provider or by a different provider. This situation can be easily described using the following example:

"Mr. A was using Company X's digital TV set on an intelligent home appliance network, but thinking of buying a new one as he had been using it for five years. Around that time, Company Y had just released a new product and his friends talked a lot about it. Mr. A was about to replace his old TV with Y's TV. However, he found out that Y's digital TV could not be connected to the intelligent home appliance network he was using. Mr. A could do nothing but abandon the idea of changing his old digital TV to Y's..."

As mentioned above, consumers find it very inconvenient if a different company's product that replaces one of their networked devices cannot be connected to an existing network. Under such circumstances, intelligent home appliance networks will not spread smoothly. To avoid such a case, that is, to ensure that any device of any manufacturer can replace a device currently in use on the network, compatibility is essential, and thus it is an extremely important issue.

Secondly, scalability means that it is ensured that already implemented devices or systems can be enhanced through the improved functionality of their components, or by being combined with a new device or system in order to improve overall functionality. In a word, it is necessary to ensure some freedom for successive future upgrades.

Lastly, connectivity means that it is ensured that different devices, systems, or networks can be connected to each other so that they can be used in an integrated manner. As mentioned in the overall

picture of the issues, in order to provide services or content on an intelligent home appliance network, various Intelligent Home Appliances need to be connected to the network as a whole. Therefore, it is crucial that connectivity between devices, systems, and networks, regardless of differences in manufacturers or types of models, is always secured in a stable manner.

As discussed in "1.3 Moves to standardize intelligent home appliance networks," various specifications of devices and communication methods coexist at the moment. In most cases, compatibility and connectivity are not ensured at all, while scalability is secured only within an extremely limited scope, such as among the same product lineup of one manufacturer. Accordingly, it will be indispensable to solve these technical issues for the effective networking of Intelligent Home Appliances.

3) Issues from the users' perspective

In order for intelligent home appliance networks to widely spread throughout society, they must represent what users want to use or what users can safely use. To that end, users' burden of costs, information security, and usability of devices are important points.

When we consider the cost burden, initial costs and running costs should be separated. As for initial costs, including initial investment needed to purchase Intelligent Home Appliances or to establish the network, it is difficult to ask users to shoulder considerably greater burden than the burden they have assumed in the past. In light of this, the unit price of Intelligent Home Appliances should be restricted within a range that is not so much higher than the unit prices of existing consumer electronics. Meanwhile, the initial investment needed to establish a network would be an issue, especially at the household level. It is likely that the infrastructure outside the home could be established without directly asking users to assume the burden, but as for inside the home, users may be required to assume the cost directly. In the case of a newly built building, a network can be built in as a standard feature, which contributes to restraining the cost, and the percentage of the networking cost would not be so great within the total house purchase costs. In the case of existing building, however, the networking costs would be a new spending for users. Therefore the cost burden should be reduced by using existing in-home wiring or a wireless LAN.

Meanwhile, the issue of imposing running costs on users is likely to be more difficult. Currently, users are shouldering running costs only for some safety/security-related services and their types are quite limited. Therefore, it may be necessary to implement various measures to reduce this burden on users, such as enhancing the appeal to users by providing services in a package or considering alternative methods to recoup the costs, e.g. through advertising or through the initial cost.

As for information security, some measures should be taken to prevent damages of unlawful access or phishing that have become an issue in the world of computers and the Internet. In intelligent home appliance networks that connect diverse devices, storing numerous kinds of personal information, the weakest point in terms of information security measures could be attacked to obtain various kinds of personal information on other devices through that point. It is also possible that personal information

could be stolen from Intelligent Home Appliances that are disposed of upon replacement.

On the other hand, since it is likely that many users of intelligent home appliance networks would have little preventive knowledge of such unlawful acts, self-protection on the user side can hardly be expected. Under these circumstances, all possible measures should be taken as general users' awareness of information security has considerably increased in recent years due to such accidents as unlawful use of cash cards.

Lastly, ease-of-use is another important factor. Consumer electronics currently on offer do not offer much operational connectivity between devices. As operations become more complicated on the intelligent home appliance networks, it is strongly required to secure ease-of-use. Since users of Intelligent Home Appliances are not necessarily accustomed to operating devices, it is undoubtedly essential to provide easy-to-use Intelligent Home Appliances. At the same time, it is necessary to study usability that allows users to control various products with the devices that they are accustomed to use.

4) Issues from the business operators' perspective

It is also very important to resolve issues for business operators who provide the intelligent home appliance networks, as well as issues for the users of such networks. The biggest challenge for business operators is how to build business models for intelligent home appliance networks. Business operators may cover enterprises and organizations in various industries, including home electronics makers, telecommunication carriers, content/service providers, and energy suppliers. Business models should differ between business operators and allow free competition, but it will be indispensable to establish a ground where everyone can compete in a fair environment. Meanwhile, methods to recoup costs, as referred to in the section of issues from the users' perspective, need to be studied separately. Since only a few enterprises have an infrastructure for collecting charges from users, how to collect and re-distribute the costs is a very important perspective in developing business models. One critical issue for content/service providers is the procedure to get consent and protection for copyrights or other rights that are related to the content and services they own. While the provision of high-quality content and services is essential to expand intelligent home appliance networks, such content and services are related to an array of rights, so that procedures to obtain consent for these rights could be extremely difficult and cumbersome. It is very important, therefore, to clarify the concept of authorization procedures and the protection of copyrights and discuss and study technical measures carefully.

5) Issues on systems and rules

In order for intelligent home appliance networks to penetrate throughout society, social systems and rules, e.g. information literacy or code of conduct on the part of users and business operators, and deregulation to allow the entry of enterprises of various business categories and industries, should also be established. Information literacy and codes of conduct relate to both users and business operators. As has already been seen in the world of computers, mobile phones, and the Internet, individual users will also provide services or contents for intelligent home appliance networks. It is not difficult to anticipate

that there may be many persons with malicious intentions among users. Measures for information security against malicious acts are definitely important. It is also required for proactive use of intelligent home appliance networks to clearly indicate the code of conduct for usage and educate users while also improving the literacy of both users and business operators. Meanwhile, as the environment where anyone can easily obtain contents will be developed, it is also necessary to bring about an environment where accesses to harmful content can be flexibly controlled according to the types of users, such as minors.

As new technologies that can be used for intelligent home appliance networks are highly likely to emerge in the future, it is important that various devices using these technologies can be seamlessly connected to intelligent home appliance networks. As implementations of new technologies sometimes requires new systems to be established, it is desirable that system establishment be facilitated according to the specific needs of each system, using wireless technologies, especially mobile technologies, in which Japan has a particular strength, for the further diffusion and sophistication of intelligent home appliance networks.

3. Actions for Networking Intelligent Home Appliances

1) Prospects for networking Intelligent Home Appliances

What is most hoped for in networking Intelligent Home Appliances is that standardization and connectivity, i.e. the environment where everyone can connect devices easily, would be brought about through demonstrations and experiments, so that various Intelligent Home Appliances can be connected. Some also point out that it is indispensable to lay the groundwork for the "next essential technologies," and to initiate research and development for future leading technologies besides the demonstration experiments. Many claim that such studies should take into account future product launches in Asia and throughout the world. However, as for the promotion of standardization, some say that due consideration must be paid as to how far the standardization should be carried out in order to secure a healthy competitive environment for enterprise to provide services or sell devices.

While it is anticipated that standardization and connectivity for Intelligent Home Appliances can be realized, some claim the overriding importance of the contents and services to be provided to users. Content or services can be roughly classified into two areas: content, such as music or video; and monitoring, such as security and device control, and both these areas can benefit from demonstration experiments. As for content, some say that cases where DRM is used and cases where DRM is not used should be considered separately, while some say that retaining compatibility with both cases could be an option. It has also been pointed out that building an overall picture for seamless connection between indoor and outdoor usage is essential in promoting the networking of Intelligent Home Appliances.

Besides these expectations, there is a strong need for demonstration experiments on user acceptance and charging systems regarding the contents, services, and devices for future commercialization. Furthermore, studies are expected to be conducted on specifications for user-friendly devices and control and remote operation using mobile phones.

2) Direction of solutions for networking Intelligent Home Appliances

In light of the above expectations, the direction for resolving the major issues to facilitate networking of Intelligent Home Appliances should be as follows:

- Building connectivity models that are fitted to the speed and needs of the market;
- Coordinating service-related business operators based on the assumption that Intelligent Home Appliances will be connected to each other;
- Strategies that takes into account schemes that can be globally launched, not specifically for Japan;
- Research and development in order to respond to new needs;
- Optimizing existing specifications and supplementing them where needed, rather than creating new specifications.

3) Specific future actions

[1] Establishing promotion systems through public-private collaborations

Japanese consumer electronics manufacturers that have led the world have fallen behind overseas companies in the fields of computers and software, while maintaining their competitiveness in the field of consumer electronics—including white goods and audio-visual equipment. In reality, however, even within this strong area, they are calling for improved added values as Korean and Chinese companies are catching up quickly.

The key to improving added value is "networking," especially the networking of Intelligent Home Appliances, for which there is a strong user requirement. However, as this cannot be realized only through the efforts of individual companies or industries, a collaborative system that transcends business categories and individual industries must be developed. It is necessary to establish a platform that enables the participation and cooperation of wide-ranging players, including not only the makers of Intelligent Home Appliances, but also the operators of the networks that connect the devices, and the providers of contents and services through such devices and networks, such as broadcasting, advertising, education, Medicare, and security. The premise is that interoperability between Intelligent Home Appliances must be realized so that related Intelligent Home Appliances can be seamlessly connected and cooperation between business operators can be carried out efficiently.

However, the move toward networking Intelligent Home Appliances has not advanced far—even within Japan. At this point, networking efforts are bound by respective business categories or industries, and closed networks have been developed by some companies. Advancement in building platforms beyond business categories and industries, and creating specifications to secure interoperability between Intelligent Home Appliances is not yet sufficient.

The private sector should take the initiative in starting up the market of intelligent home appliance networks. The development of compelling services by the private sector would open up the market. In this light, the government needs to provide support to accelerate the private sector's efforts and establish an environment that will facilitate the efforts of the private sector so that Japanese companies can demonstrate their competitiveness in the face of business launches by overseas enterprises, such as Korean companies.

Therefore, a system for public-private collaboration through which consumer electronics manufacturers, network operators, and service providers can join forces to establish an environment for networking Intelligent Home Appliances needs to be established. On that basis, a scheme that promotes the development of platforms for securing the interoperability of Intelligent Home Appliances and that enables participation of business operators from various business categories and industries can be created.

[2] Conducting R&D and demonstration experiments

In order to start up the market for Intelligent Home Appliances, the participation and collaboration of wide-ranging companies, beyond basic business categories or industries, is required. Currently, however, there are no players that take the initiative in driving forward such efforts. Therefore, it is desirable that research and development—and demonstration experiments—in which wide-ranging

players of the government, industry, and academia can take part, are conducted in order to promote public-private collaboration that takes into account business operator's expectations. In this way, the R&D needed for starting up the market of intelligent home appliance networks, verification of business models, and promotion of related measures by the government can be realized.

Firstly, specific R&D and demonstration experiments should be conducted on various themes that conform to the direction of the aforementioned solution of issues. An immediate priority issue for networking Intelligent Home Appliances is development of the home gateway function[1] to secure interoperability between Intelligent Home Appliances. Ideally, all Intelligent Home Appliances in a house should be able to be freely connected to each other under unified specifications. In the present circumstances, where multiple specifications coexist, unifying specifications that cover everything is not feasible. For the time being, it may be effective to develop a home gateway function to realize connectivity between different existing specifications.

At the same time, in-home networks of Intelligent Home Appliances certainly require connection to outside networks, as well as connectivity between the devices on the network. Both in-home connectivity and external connections can be effectively managed via a so-called information hub. Furthermore, establishing a platform that enables safe and secure connection between Intelligent Home Appliances and outside networks is also important.

To that end, development of the home gateway function is likely to play a vital role in promoting wide use of Intelligent Home Appliances. At the same time, utilization of mobile terminals on Intelligent Home Appliance Networks should be considered in order to provide user-friendly operations, convenience of portability, and optimization of a widely-used charging/authentication platform. Additionally, in order to promote penetration of Intelligent Home Appliances, it seems important to establish an environment where users can enjoy various services beyond differences between device specifications.

Secondly, what is important in conducting R&D and demonstration experiments is target contents and services. Ultimately, various contents and services will be provided to users through the home gateway function, but, in the start-up phase of these services, the target should be examined by taking into account marketability and commercialization. Additionally, in order to study business models in R&D or demonstration experiments, the participation of a wide range of business operators is essential so that they can make efforts to promote the development of new business models. For example, distribution of video content may require participation of the advertising industry, as well as a study of charge models, such as VOD. Remote control of white goods may require participation of the real-estate industry, as well as studies on the collection of monthly fees.

At the same time, it is important to study measures to ensure safe and secure operations for both business operators and users through R&D and demonstration experiments. In order to promote the private sector's efforts, the government needs to study and promote related measures required to

[1] Possible ways to provide home gateway function are providing the function as part of a network service or mounting it on a device such as TV set, computer, STB, DVD recorder or controller.

facilitate the start up of the Intelligent Home Appliances market, including collaboration of MIC and METI. Some specific themes for R&D or demonstration experiments could be as follows:

- Development of the home gateway function that realizes connections between different specifications according to the degree of diffusion of elemental technology development / Verification according to purpose
- Development of platform management technology that absorbs differences in performance and capacity for diversifying devices
- Development of configuration technology that reduces the burden on users (e.g. automatic authentication, and automatic protocol selection)
- Verification of connectivity of respective Intelligent Home Appliances and terminals
- Balancing copyright protection and convenience in conjunction with interoperation of content between Intelligent Home Appliances
- Establishment of infrastructure and business models to provide services, including authentication and charging

When R&D and demonstration experiments are conducted, it must be ascertained that they would immediately lead to start up of the intelligent home appliance networks market once they are completed, rather than remaining at the experimental or R&D level. To that end, they should be conducted in view of commercialization under the private sector's initiative. It is also necessary to employ a scheme that enables end-users to provide their feedback to business operators and end-users, and for business operators to cooperate in developing new services and devices for intelligent home appliance networks. It is further expected that, when R&D and demonstration experiments are completed, the market of Intelligent Home Appliances will smoothly start up under free competition among participating enterprises, beyond particular business categories and industries.

Members of the Study Group on Intelligent Home Appliance Networking

(as of July 20, 2005; honorifics omitted; in order of Japanese syllabary)

Chair: ISHII Takemochi: Professor Emeritus of the University of Tokyo
OKINAKA Hideo: Vice President and General Manager, Technology Planning & Development Division, Corporate Technology Sector, KDDI Corporation
KORIYAMA Ryu: CEO and Chairman, Aplix Corporation
KOKURYO Jiro Professor, Keio University
SEKI Yoshiyuki: Executive Technical Director, Technical Department, Fuji Television Network, Inc.
TAKEBAYASHI Hajime: General Manager, Engineering Department, Security Solution Business Development Division, OMRON Corporation
CHIBA Toru:Group General Manager, Corporate Research and Development Group, Sharp Corporation
TSUGA Kazuhiro:Executive Officer in charge of Digital Network and Software Technologies, Matsushita Electric Industrial Co., Ltd.
TOKUDA Hideyuki: Professor, Keio University
TOKORO Mario: Senior Vice President, Sony Corporation
NOHARA Sawako:President, IPSe Marketing, Inc.
HASHIMOTO Shin: Senior Vice President, Director of Department II, Nippon Telegraph and Telephone Corporation
FUJIMOTO Takashi: Managing Director, The Tokyo Electric Power Company, Incorporated
FURUKAWA Kazuo: Executive Vice President and Executive Officer, Information & Telecommunication Systems, CEO, Hitachi, Ltd.
FUWA Hisayoshi: Executive Officer, Corporate Vice President, Management Planning Division, Toshiba Corporation
Vice-Chair: MURAKAMI Teruyasu Chief Counselor Nomura Research Institute, Ltd.
MURAKI Shigeru Senior Executive Officer, Chief Executive of R&D Division, Tokyo Gas Co., Ltd.

Record of Meetings of the Study Group on Intelligent Home Appliance Networking

First Meeting

• Date and Time: May 18, 2005 (Wed)
• Agenda: Current Status and Issues of Intelligent Home Appliance Network

Second Meeting
• Date and Time: June 2, 2005 (Thur)
• Agenda: Issues and Initiatives for Promoting Diffusion of Intelligent Home Appliance Network

Third Meeting
• Date and Time: June 24, 2005 (Fri)
• Agenda: Future Vision for Intelligent Home Appliance Network

Fourth Meeting
• Date and Time: July 15, 2005 (Fri)
• Agenda: Interim Report by the Study Group on Intelligent Home Appliance Networking