

**International Electrotechnical Commission
President's Advisory Committee on Future Technology (PACT)**

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Final report of the project on:

Human interfaces in Multimedia network Era

The members of the WG are:

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Summary

The PACT Network HI WG was established at the PACT meeting in Tokyo (September 1998) to identify standardization issues concerning "Human interfaces in Multimedia network Era". The WG was formed under the leadership of Mr. Hideki Hirakawa to assess the present standards in this field, and to recommend and prioritize appropriate actions.

The WG found that:

- (a) Development of services that are closer to each local community.
- (b) Popularization of multimedia contents used for various services came out as the trend. In other words, what we need is a technology to fuse the real world and the cyber world. Also, network services in the following two domains are important in considering standardization items in the future Network HI area:
 - (i) Network services at home and outside (while walking, traveling)
 - (ii) Environmental and mobile Human Interface

In addition, eight technical and standardization candidates were extracted.

The WG recommends that the IEC should:

- 1) Discuss the eight standardization items discussed later in this report at TC100 AGS.
- 2) Include especially the following two standardization items in its scope.
 - a) Standardization of ontology technologies
 - b) Standardization of media converting technologies

1. Introduction

Nowadays the Information technology has been developed so far as to be considered as the main support of industries, and it is assumed that the networked society will develop more rapidly from now on. In the past, access to the network was available only within special environments for experts and limited to particular devices connected to the network. However, in Japan for example, the environment for internet access from mobile phones like i-mode made rapid progress, and various kinds of network services for general users are now emerging.

The network, which now exists everywhere as a social infrastructure as mentioned above, is establishing a new age in which anyone can access the so-called cyber world from

everywhere. In other words, it can be said that the cyber world is expanding fast and getting closer to the real world, and the real world is becoming inseparable from the cyber world.

The more the networked society develops rapidly and the real world becomes dependent on the cyber world, the more our life in the real world would be inconvenient and restricted without the cyber world. This is already a problem called “digital divide” or “accessibility” that comes from disparity between those people who can use the internet and those who cannot, the elderly for example.

As a result of the internet, people are now able to communicate with each other all over the world without concerning themselves with time and space. However, not everyone has benefited from the internet yet. Web devices, for example, enabled us to easily access the internet but we are not supported enough to make use of it. It is still only a restricted number of users who can really make full use of the internet.

This means it is not enough if only net appliances are provided to users so that they can access the network from everywhere. In order for everyone to receive the benefits from the cyber world, it is necessary to establish technologies that enable them to easily and safely use the network without feeling any stress, that is, human interface technologies.

We believe that the concept of “Network Human Interface”, which is to simplify the usage of the network, is the key to the future networked society, although network technologies or human interface for improving operability of devices are also important.

We studied the concept of “Network Human Interface (Network HI)” and the following points came out as the main trend:

- (a) Development of services that are closer to each local community.
- (b) Popularization of multimedia contents used for various services

This implies that what is required now is to enable users to get multimedia information that is appropriate in a location or situation of each user, anytime and at anywhere they want. In short, what we need is a technology to fuse the real world and the cyber world.

2. Plan

In the interim report of our WG that was presented at the PACT meeting in September 1999, we focussed on the importance of interoperability, and suggested metadata interoperability as one of the most valuable standardization items in the Network HI area. At the same time, we suggested that we should not confine our attention only to the metadata operability but also investigate other possible standardization items. Our suggestion was agreed on by the other members at the meeting.

Thus we decided to consider other standardization areas that the IEC should tackle from a different point of view and expand the area which the Network HI is targeting. In considering standardization areas, we found it necessary to investigate actual services from the viewpoint of users' needs without abstract considerations.

As the result, the following items were defined as essential outputs from the investigation:

- 1) A map with standardization technologies that covers the whole area of the Network HI domain
- 2) A list of possible standardization areas based on the above map

- 3) Priority of the above standardization areas
- 4) Investigation of the current situation in the standardization areas that have high priority.

3. Process

Since the Network HI that our WG is targeting is quite a large area, we decided to draw technological maps that comprehensively cover the Network HI. Each map consists of two types of axis; one with elements from the Network Service group and the other from the Human Interface (HI) group, so that each map includes essentially two features of the Network HI without bias.

Moreover, an idea came from one of our members that we should start from users' needs and the investigation should be based on what kind of services users would need. Thus we considered actual network services and extracted necessary standardization items for those services.

3.1 Axes extraction

Possible axes to draw a map that covers the Network HI domain were listed. For proper analysis of the Network HI domain, we classified the listed axes into two groups of Network Service and Human Interface (HI), and chose two axes from both the groups to draw a map.

In the HI group, the axes are related to media, environment, or input/output. For example, IF device, Manipulation method, Modality, Flexibility Fuzziness, Input/output media, Device, User, Location, etc. (See figure1).

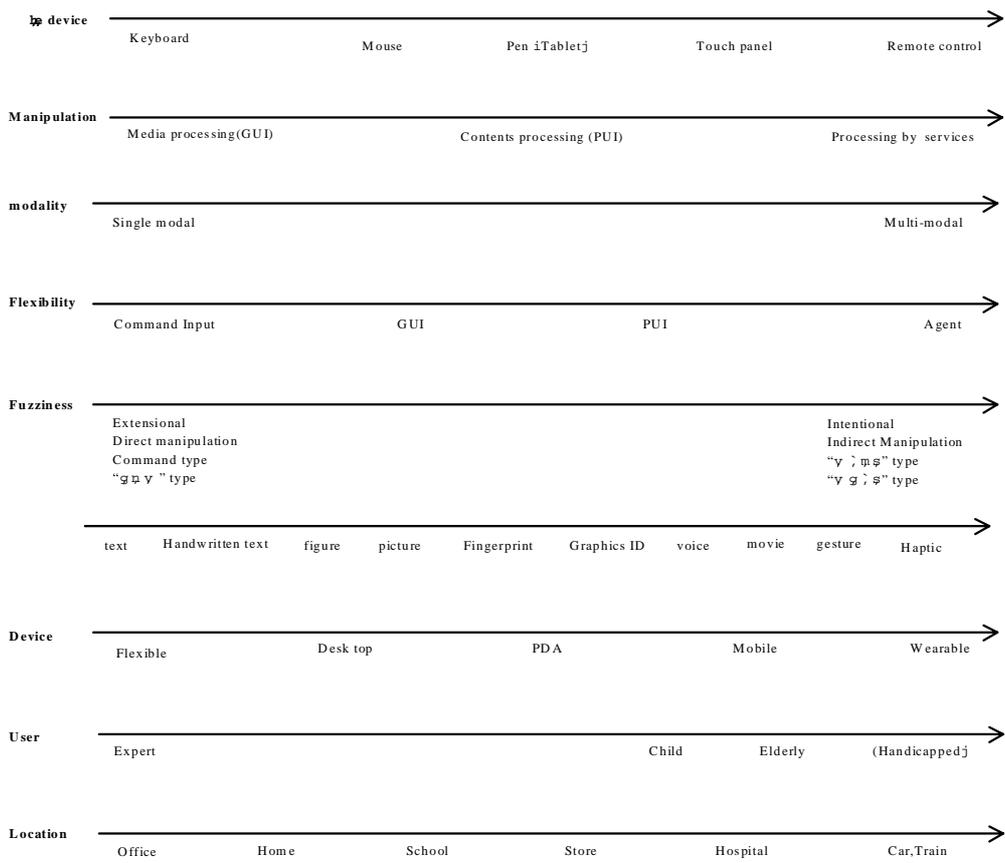


Figure1 Axes in HI group

In the Network Service group, there are axes related to services, systems for realizing such services, application, contents, and distribution method, etc. For example, Contents, Industry, Bandwidth, Service area, Communication, Service category, Network type, etc. (See figure 2).

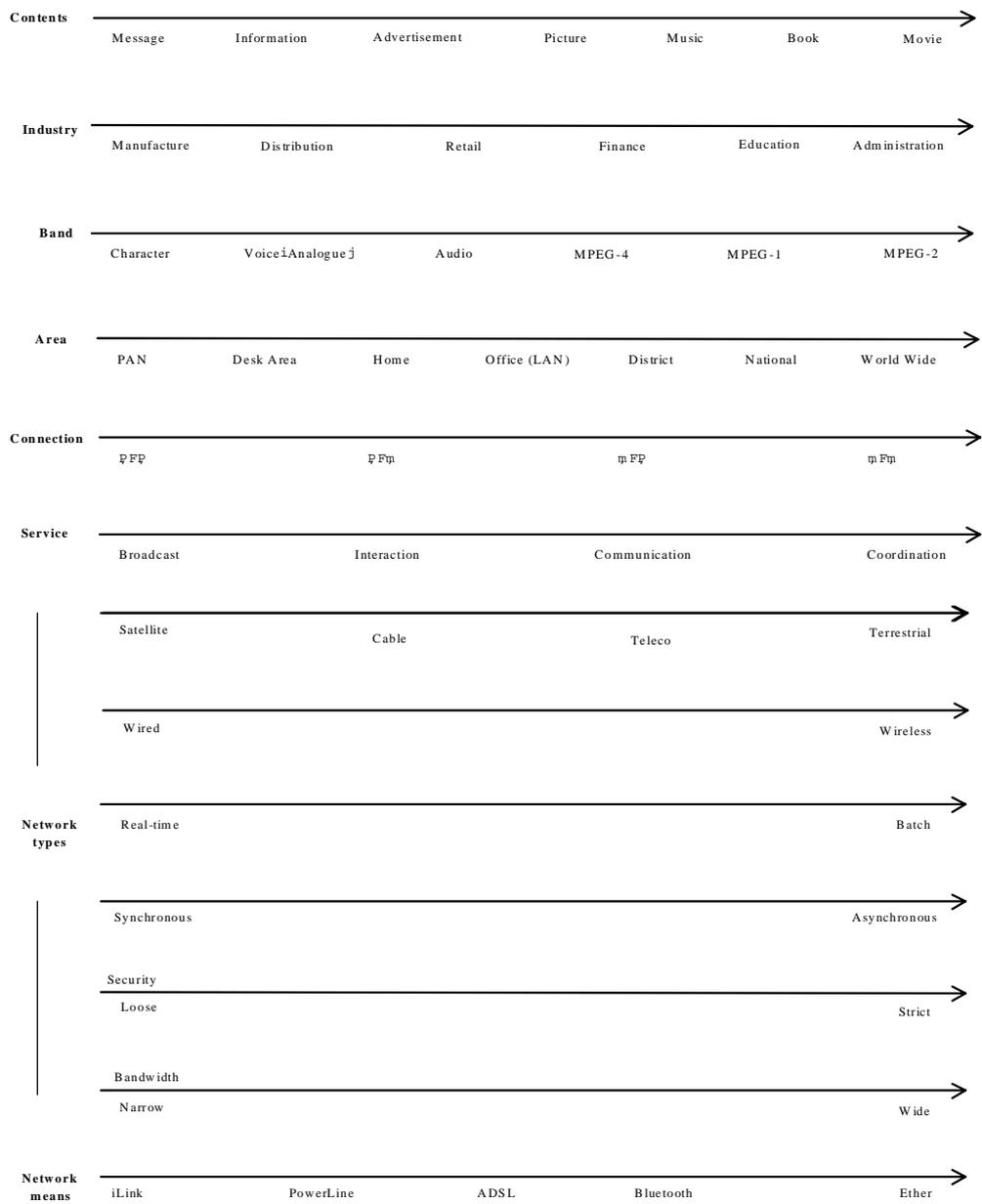


Figure 2 Axes in Network Service group

3.2 Map

Appropriate combinations of axes were selected to draw maps and the maps filled with areas of current technology, services or standardization. From each map, areas were found that have not been standardized yet and areas were picked out that seem to be valuable standardization items.

On the other hand, the selected axes can be categorized into two groups; a group with elements that show some kind of trend, and the other group without any trend. If both axes are chosen from the former group of trend-type to draw a map, the map tends to be useful for explaining the entire technological trend of the Network HI. If both axes are chosen from the latter group of no-trend, the map is useful for analyzing technical areas with a matrix.

On the map below, for example, both axes were chosen from the trend-type group. The HI axis suggests a trend from command line interface to agent interface, and the Network Service axis suggests a trend from character based messages to movie data. It clearly shows that Front-end interoperability that we proposed in the previous interim report, and TV-anytime that started at the same time with PACT, are in the right direction of the future trend. It also shows that the TV anytime reflects only the trend of the Network Service while the Front-end interoperability reflects both the trends of the Network Service and the HI.

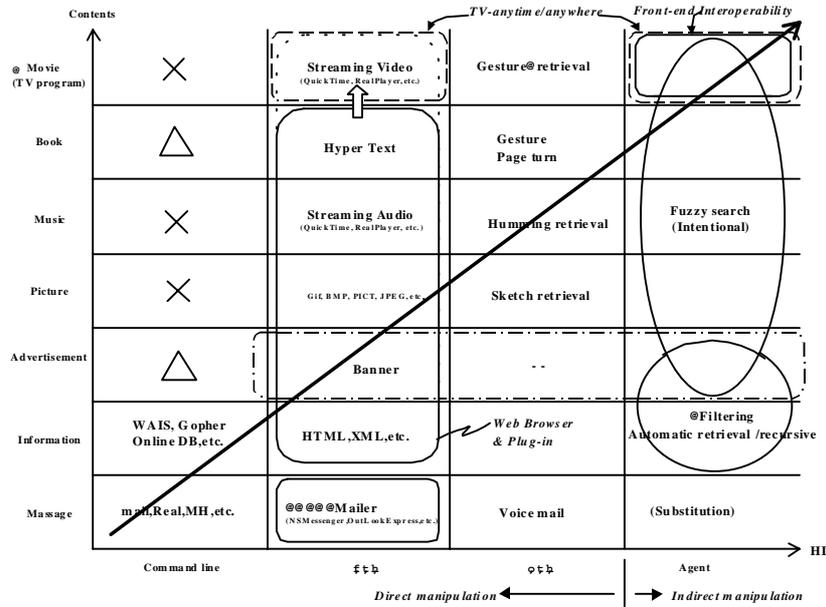


Figure 3 A map consist of trend-typed axis group

The map shown in figure 3 proved that the investigation based on combinations of possible axes was effective. However, the domain of the Network HI has many varied aspects and it is almost impossible to cover all the aspects only by one combination of axes. Thus we chose and studied several aspects that seem most characteristic of the Network HI. Figure 4 (a) (b) are the maps, which we think show most directly the characteristics of the Network HI.

(a)

Contents		Devices				
Movie (TV program)		Unknown area		Streaming video MP3	Home theater	
Book		e-Book	H H	On-line magazine		
Music	Unknown area	MP3 Memory-stick walkman		Streaming audio Net distribution		
Picture			Already-known area		Unknown area	
Information		mopera	i-mode	Net news News site		
Message		Mail oriented terminal	Mail service	e-mail		
		Wearable	PDA	Mobile phone	@Desktop	Environmental

(b)

Service Area		Situation			
World wide		Internet		Mobil Internet	
National					
District	Goods service Regional information service	Community service	Car navigation Map distribution Regional/sight seeing info	Route guide Shop guide	
Building	LAN	Home network	Place information Connection information	Floor guide	
Room	Conference support	Remote controller	Information service in a train/car	Information service in shops	
Desk	Cooperated Desktop devices	Augmented Reality	Network game	Automatic interaction Guidance of goods/counters	
PAN	Information exchange (ex. Business cards)	H H	H H	Personal information exchange	
		Office	Home	On the train/car	On walking

Figure 4 The maps shows the characteristics of the Network HI

In the upper map (figure 4a), the HI axis is classified into various forms of Human Interface, and it shows how the Human Interface is used depending on each device. The Network Service axis in the same map is categorized by the size of data transfer rate of user content, from smaller to larger rate.

In the lower map (figure 4b), the HI axis is classified into various situations of users, and the Network axis shows areas where network services are used.

As a result of the investigation of the above two maps, we found that the network services in the following two domains are important in considering standardization items in the future Network HI area.

- (a) Network services at home and outside (while walking, traveling)
- (b) Environmental and mobile Human Interface.

3.3 Enumeration of services and essential standardization items

We have extracted standardization items based on new network services that would meet users' needs in the future. The reason why we considered them on this basis is that it is content of services on the network that determines what is necessary for the network or for HI; and the point is we should not extract standardization items from the network or HI independently, but we should extract them from possible new network services. Thus we assumed what users would need in the future, and also considered the validity and technological possibility of realizing those needs.

In the areas of (a) and (b) described above, there are many technical points common to both the combinations of 1) the use of network services at home, and environmental human interfaces, and 2) the use of network services while walking or travelling, and mobile human interfaces. It seems they are related to each other. Thus we combined them and enumerated actual network services, and extracted important standardization items.

Figure 5 shows the areas defined by Service area and Situation.

Figure 6 shows the areas defined by Network Service and HI.

Figure 7 (a) and (b) show enumerated actual network services in the area defined by Network Service and HI area. More services and standardization items are listed in the appendix.

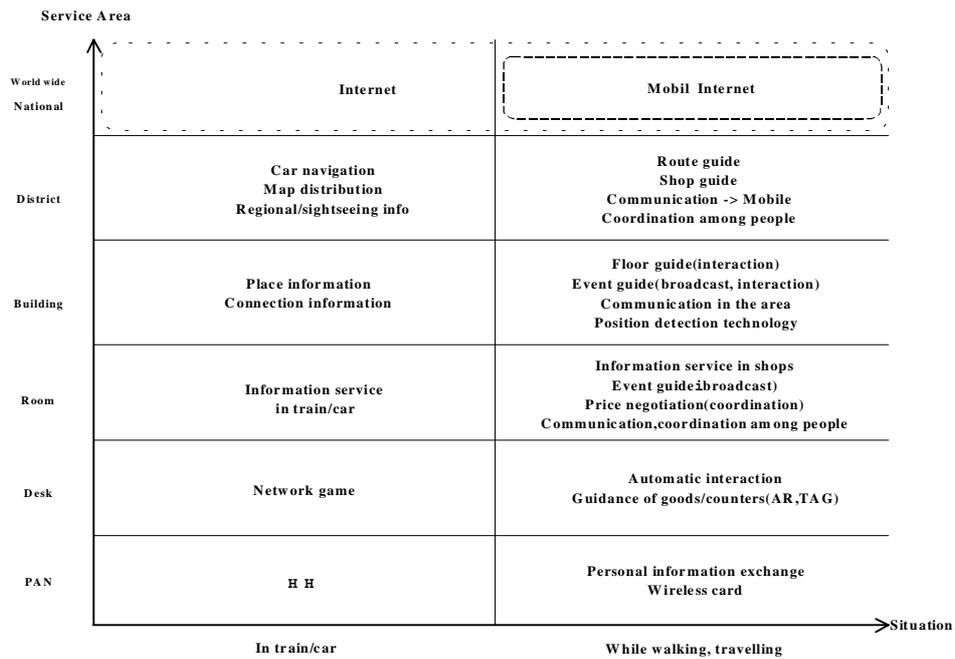


Figure 5 Areas defined by Service area and Situation

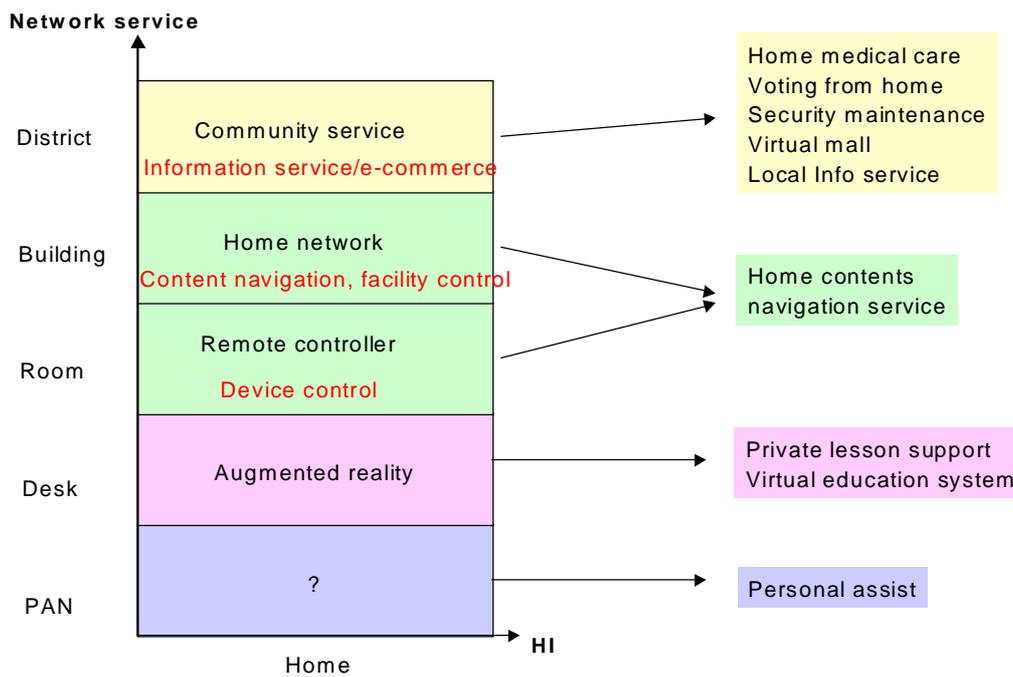


Figure 6 Areas defined by Network Service and HI

(a)

District/Community

Virtual Mall Service	Users are able to do shopping at local markets from one's home. Virtual malls and real malls are correspondent. Agents located in each shop offer products information based on each user's taste. They also know what are kept in stock in each user's refrigerator. Easy settlement without troublesome certification. Automatic product delivery.
Necessary Standardization Items	¶ Method of constructing malls. Q 3D image communication protocols for realizing virtual malls. R 3D image compression method. S Necessary API for managing malls. (Shop-API) T Maintenance of product information and user information, and a bridge between them U Maintenance and communication protocols for home stock information V Easy certification and settlement (in bulk, alibi based) W Information maintenance that links product info with delivery info (For example, search the best route for delivery based on product information such as the best period to be consumed)
Existing Standardization Activities	

(b)

District/Community

Local Information Service	Each local information such as garbage collection or water supply suspension etc. is provided to certain households. The system gives advice like garbage segregation. Other local Information of transportation, weather, event, shop etc. is available too.
Necessary Standardization Items	¶ Certification for administration usage Q Privacy protection R Protocols for transmitting/receiving local information S Method that is available for any receiving devices (from TV to mobile)
Existing Standardization Activities	

Figure 7 enumeration of actual services and necessary standardization items

3.4 Investigation of technologies to be standardized

We investigated each enumerated service and found that it is necessary to fuse the real world and the cyber world for realizing the Network HI, and each service can be investigated from another viewpoint of the fused real-cyber world. For instance, network services “while walking or travelling” (such as portable devices) can be regarded as the services that are realized by fusing the real world and the cyber world.

The following four technical areas should be the key standardizations for harmonizing the real world and the cyber world.

- (a) Technologies for fusing the real world with the cyber world.
- (b) Technologies for comprehensively managing information in the cyber world.
- (c) Technologies for extracting necessary information from the cyber world based on each user’s request
- (d) Technologies for selecting and converting Media input/output between the real world and the cyber world

Figure 8 below explains the relationship of the four areas above.

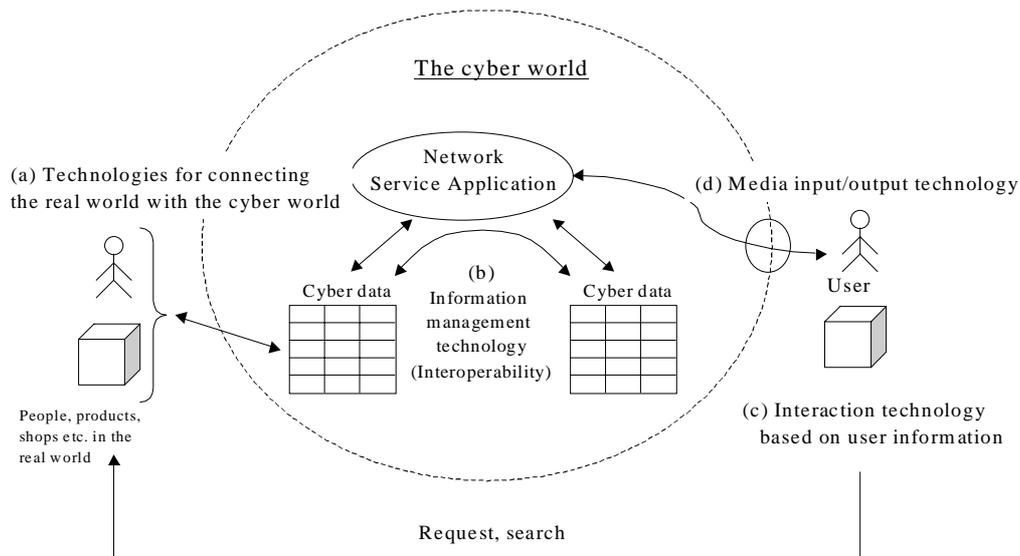


Figure 8 Standardization technologies for the Network HI to fuse the real world and the cyber world

We extracted standardization items that seem necessary for the listed network services and classified them into four technical areas from a) to d) given below. As the areas that are already on a table as standardization candidates were deleted, there are now four areas from a) to d) and eight technical and standardization items from (i) to (viii).

- (a) Technologies for connecting the real world with the cyber world.

- (i) ID providing technology

- Technology to distinguish information corresponding to the real world with other information that only exists in the cyber world.

- (ii) Position detection technology

- Indoor position detection technology

- (b) Technology for comprehensively managing information in the cyber world.
- (iii) Framework of describing attribute information to keep interoperability in the real world
 - Multi-lingual, Ontology
- (iv) Framework to reflect information in the real world
 - Technology to guarantee that the cyber world reflects the information in the real world
- (c) Technology for interacting with the cyber world based on user information
- (v) Privacy protection technology
 - Remaining anonymous
- (vi) Searching, filtering, and matching methods
 - Route search (optimum in various conditions)
- (d) Media input/output technology between the real world and the cyber world
- (vii) Media converting technology
 - Codec 3D image compression method
 - Interoperability among devices (Device independent display method)
- (viii) Interaction technology
 - Easy settlement In balk, Alibi based cf. by location IDs
 - Automatic interaction with devices cf. maintenance of personal information, protocols

3.5 Existing related standardization activities

Privacy protection technology

P3P: (W3C)

The Platform for Privacy Preferences Project (P3P), developed by the World Wide Web Consortium, is emerging as an industry standard providing a simple, automated way for users to gain more control over the use of personal information on Web sites they visit.

GBDe:

The Global Business Dialogue for electronic commerce (GBDe) is an industry-lead initiative to facilitate development of the Internet and electronic commerce. GBD should set up guidelines for self-regulation by the private sector, and demonstrate their effectiveness to governments of both developed and developing countries.

Media converting technology

Voice Browsers: (W3C)

W3C is working to expand access to the Web to support interaction by spoken commands, prerecorded speech, music and synthetic speech.

Speech Synthesis Markup Language: (W3C)

This specification defines an XML markup language for generating synthetic speech via a speech synthesizer. The role of the markup language is to give authors a standard way to control aspects such as volume, pitch, rate and other properties.

CC/PP: (W3C)

A Composite Capability/Preference Profile (CC/PP) is a collection of the capabilities and

preferences associated with user and the agents used by the user to access the World Wide Web. These user agents include the hardware platform, system software and applications used by the user.

Interaction technology

MPEG21: (ISO/IEC JTC1/SC29/WG11)

Its goal is to develop new specifications which allow:

- Access, (re)use of and interaction with multimedia objects across networks and/or capable devices
- The implementation of multiple business models including those requiring the management of automated rights and payments transactions throughout the value chain
- The privacy of content users to be respected.

4. Suggestion

After extracting essential technologies and standardization items from the listed services in the Network HI area, the above eight technical areas in four main network HI related technologies came up as the key items which we should consider standardizing.

From the above eight areas, the following two standardization items were picked up as the ones that should be included in the scope of IEC.

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- 1) Standardization of ontology technologies
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- 2) Standardization of media converting technologies

We would like to recommend to the IEC that all the standardization items (including items above) should be discussed at TC 100 AGS and we propose handing over those items over to TC 100 for the further investigation. This is because TC 100 deals with multimedia equipment and human interface related sections.

Appendix

District/Community

Home medical service	At home, patients are able to have medical examination (interview), and get instructions from a doctor. If necessary, able to send information by using a home diagnostic sensor and call an ambulance.
Necessary standardization items	<ul style="list-style-type: none"> ¶)Medical interview interface (Multi-lingual,fuzzy j Q jDiagnostic sensor iCommunication protocols, sensing functionality/performance, Error prevention functionality) ⌘ jEffective transfer using Map & route search, hospital information, patient information etc.
Existing standardization activities	Medical records, X-ray photographs

District/Community

Security Maintenance Service	<p>Surveillance system for safety and disaster prevention. In case of emergency, the system gives a warning and advice of emergency measures or evacuation routes. Those warnings or advice will be given from all of possible communication measures, not only from home devices but also from mobile ones. Those warnings or advice are all linked with local fire or police stations.</p>
Necessary Standardization Items	<ul style="list-style-type: none"> ¶ jStandards on surveillance and warning issue. Q jCommunication protocols for warning ⌘ jAdvice on emergency measures or evacuation routes suitable for individual §)Emergency instruction method available for any devices. ‡ jIntegration method of instruction system
Existing Standardization Activities	

District/Community

Administration	Users are able to vote from home, and even from abroad. Also able to renew driving license or passport etc. at home.
Necessary Standardization Items	<ul style="list-style-type: none"> ⌘ Certification for administration usage ⌘ Privacy protection
Existing Standardization Activities	

Building/Home Network

Home Contents Navigation Service	Devices and contents at home are all managed by the system. No complicated software work is necessary for connecting/detaching devices to/from the network. Information of each device is provided based upon user's request.
Necessary Standardization Items	<ul style="list-style-type: none"> 1)Communication protocols 2)Interoperability method 3)Contents description method 4)Method of extracting contents data 5)User preference method 6)Bridge for various communication methods
Existing Standardization Activities	All the items except the 4th are already in the scopes of IEEE 1394, HAVi, MPEG-7, or TV Anytime.

PAN

Personal Assist Service	Users are supported by personal assist service at anywhere, and anytime. The system recommends TV programs, sports events, movies etc. based on each user's taste. Schedule maintenance and other advice such as for health care etc. are also possible.
Necessary Standardization Items	EReal time collection and renewal of personal taste information EInformation collection that fits each user's taste EHealth care sensor EGeneral advice from various aspects such as health, personal taste, the society, etc.
Existing Standardization Activities	