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Multimedia gateway in home networks – Guidelines

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International Standard IEC 62514 has been prepared by technical area 9: Audio, video and multimedia applications for end-user network, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/1672/FDIS	100/1705/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

In a digital home, in order to meet the various requirements of digital living, all kinds of communication devices (computers, consumer-electrical products etc) are integrated into a home network. Such a network (comprising home information, entertainment, control services, etc.) thus forms a system of information exchange with outside networks.

A home network system is a Local Area Network (LAN) connecting such terminal devices as information devices, communication devices, entertainment devices, household appliances, meters of gas, water and electricity, health-care equipment, lighting and security systems, etc. to implement the network management and services and share the resources and services in the network.

The multimedia services and the management for devices mentioned above can be performed through a home multimedia gateway.

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MULTIMEDIA GATEWAY IN HOME NETWORKS – GUIDELINES

1 Scope

This International Standard describes the general guidelines for typical applications of the home multimedia gateway in home networks supporting IP networking.

This standard specifies recommended functions and services to be supported by the home multimedia gateway and, where appropriate, refers to existing standards supported in the market. For general requirements, it is expected that widely adopted standards and technologies will be considered by implementers.

This standard gives supplementary application to IEC 62481, which specifies a central management model in home network supporting various interfaces in LAN side and WAN side (optional).

This standard is applicable to home multimedia gateways in the home network or networks of similar environment.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62481 (all parts), *Digital living network alliance (DLNA) home networked device interoperability guidelines*

IEC 62481-1:2007, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 1: Architecture and protocols*

IEC 62481-2, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 2: Media formats*

ISO/IEC 14762, *Information technology – Functional safety requirements for home and building electronic systems (HBES)*

ISO/IEC 29341 (all parts), *Information technology – UPnP Device Architecture*

ISO/IEC 29341-1, *Information technology – UpnP Device Architecture – Part 1: UpnP Device Architecture Version 1.0*

ISO/IEC 29341-3 (all Parts 3), *Information technology – UpnP Device Architecture – Part 3: Audio Visual Device Control Protocol*

ISO/IEC 15045-1, *Information technology – Home electronic system (HES) gateway – Part 1: A residential gateway model for HES*

ITU-T G.9960 /9961/G.hn   *Next generation home networking transceivers*

UPnP Forum: *Quality of Service:3 (all parts), http://www.upnp.org/specs/qos/qos3.asp*

RFC 2663, *IP Network Address Translator (NAT) Terminology and Considerations*

RFC 3022, *Traditional IP Network Address Translator (Traditional NAT)*

IEEE 802.16, *IEEE Standard for Local and metropolitan area networks Media Access Control (MAC) Bridges*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1
home multimedia network
high speed network system to transport multimedia information within the home network

3.1.2
home multimedia gateway
HMG
logical device in the home network, which provides such functions as multimedia processing and home automations, interconnection, QoS and security, etc; it can also connect LAN with outside networks (for example internet), implementing protocol translation and offer various network services

3.1.3
home control network
network that transports control information in the home network

3.1.4
home control gateway
provides protocol translation, device management, network management and control services in a home control network which can be combined with HMG in the form of a physical device

3.1.5
control point
retrieves device and service descriptions, sends actions to services, polls for service state variables and receives events from Services

NOTE 'Service' is a term that is also defined in the ISO/IEC 29341 series.

3.1.6
terminal device
devices in the home network that can be controlled and managed by HMG and control point

3.1.7
media receiver
MR
device that receives media contents

NOTE It normally refers to the media content player.

3.1.8
home media receiver
HMRec
device that receives media contents in the home network

NOTE   HMRec should fully support the function of DMR and DMP which are DLNA device classes defined by IEC 62481-1.

3.1.9
media source
MS
device that owns media resources and sends media contents

3.1.10
home media source
HMSou
device that provides media contents in the home network; it can be a media server

NOTE   HMSou should fully support the function of DMS and +PU+, which are defined by IEC 62481-1 and IEC 62481-2.

3.1.11
WAN media source
device that provides media contents in the Wide Area Network (WAN)

3.2   Abbreviations

+DN+	Download Controller
+PR+	Printing Controller
+PU+	Push Uploader
+UP+	Upload Controller
AAC	Advanced Audio Coding
ADSL	Asymmetric Digital Subscriber Line
ANSI	American National Standards Institute
ARP	Address Resolution Protocol
ATA	Analog Telephone Adapter
ATRAC	Adaptive Transform Acoustic Coding
AV	Audio and Video
AVC	Advanced Video Codec
CDS	Content Distribution Service
CPU	Central Processing Unit
DHCP	Dynamic Host Configuration Protocol
DLNA	Digital Living Network Alliance
DMC	Digital Media Controller
DMR	Digital Media Renderer
DMP	Digital Media Player
DMPr	Digital Media Printer
DNS	Domain Name System
DRM	Digital Rights Management
DSCP	Differentiated Service Code Point
DSL	Digital Subscriber Line
DTV	Digital Television
EPG	Electronic Program Guide
ETH	Ethernet
FTP	File Transfer Protocol

GENA	General Event Notification Architecture
HMRec	Home Media Receiver
HMG	Home Multimedia Gateway
HMSou	Home Media Source
HTTP	Hyper Text Transfer Protocol
ICMP	Internet Control Message Protocol
ID	Identification
IGD	Internet Gateway Device
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPTV	Internet Protocol Television
ITU	International Telecommunication Union
JEPG	Joint Photographic Experts Group
LAN	Local Area Network
LPCM	Linear Pulse Code Modulation
MAC	Media Access Control
MIU	Media Interoperability Unit
MPEG	Moving Picture Experts Group
MR	Media Receiver
MRCP	MediaRenderer:1 Control Point
MS	Media Source
MSCP	MediaServer:1 Control Point
NAT	Network Address Translation
NAPT	Port-Level NAT
NID	Network Infrastructure Device
PAN	Personal Area Network
PC	Personal Computer
QoS	Quality of Service
RID	Request Identity
RIP	Routing Information Protocol
SOAP	Simple Object Access Protocol
STB	Set Top Box
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UpnP	Univeral Plug and Play
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
VDSL	Very-high-bit-rate Digital Subscriber Line
VOD	Video on Demand
VOIP	Voice over Internet Protocol
WAN	Wide Area Network
WMS	WAN Media Source
WMM	Wireless Multimedia

4   HMG architecture

4.1   Architecture of a home multimedia network

A home multimedia network adopts a multiple levels network topology consisting of two network segments, i.e. a home multimedia network and a home control sub-network. The home control sub-network is optional, where appropriate.

The home multimedia network   supports the central management mode which can be functioned by HMG, as well as supporting peer-to-peer mechanism as specified in the IEC 62481 series. The home multimedia network can access the outside network through an HMG while the home control sub-network can be connected to the home multimedia network through a home control sub-network gateway. The devices in a home control sub-network can intercommunicate and further access outside networks by sub-gateways and HMG.

The typical architecture of a home multimedia system is shown in Figure 1 as follows.
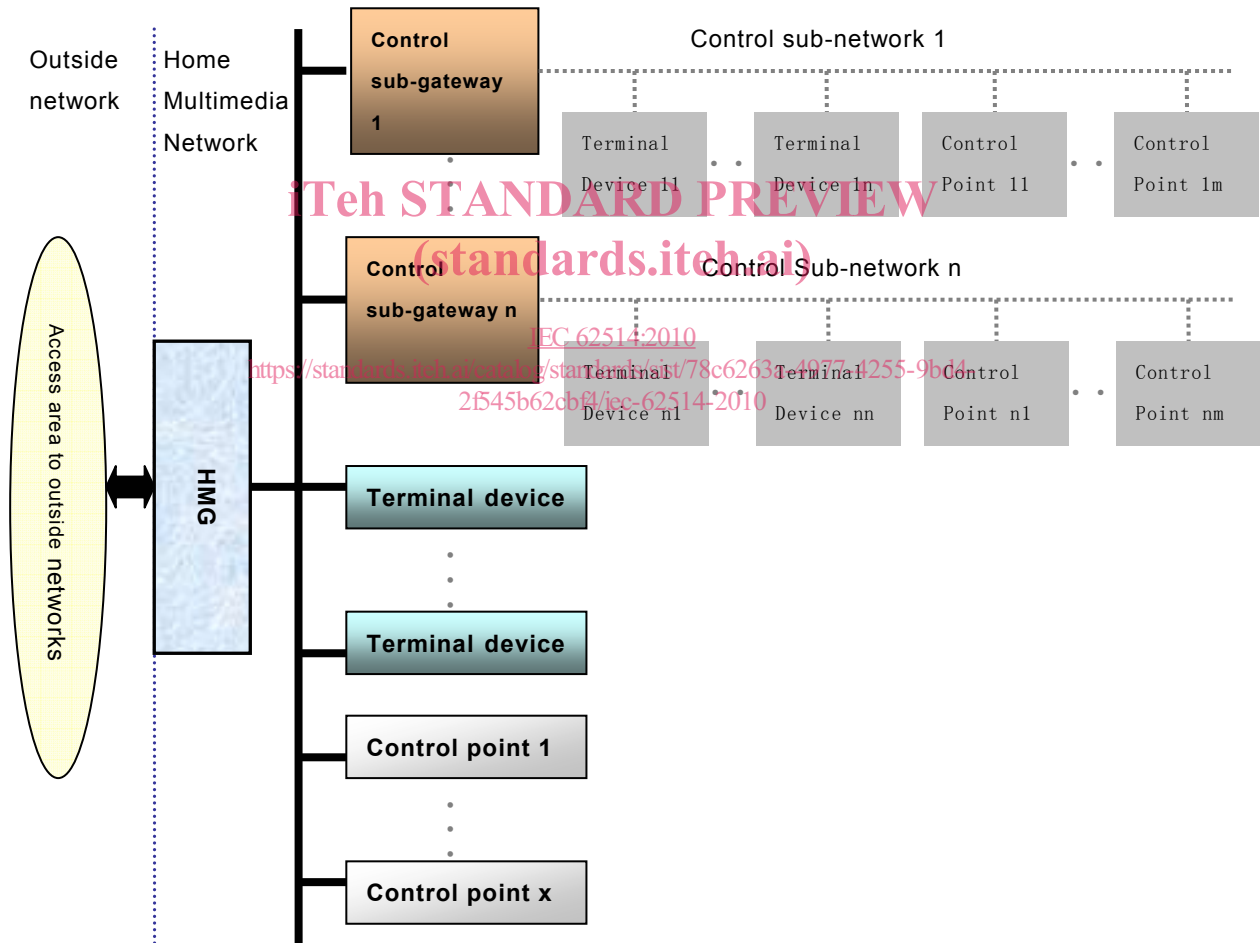

Figure 1 – Architecture for a home multimedia network

4.2 HMG architecture

4.2.1 General

From the aspect of functional structure, the HMG provides such functions as multimedia processing and applications, interconnection, QoS and security, etc. The architecture of the HMG is shown in Figure 2 below.
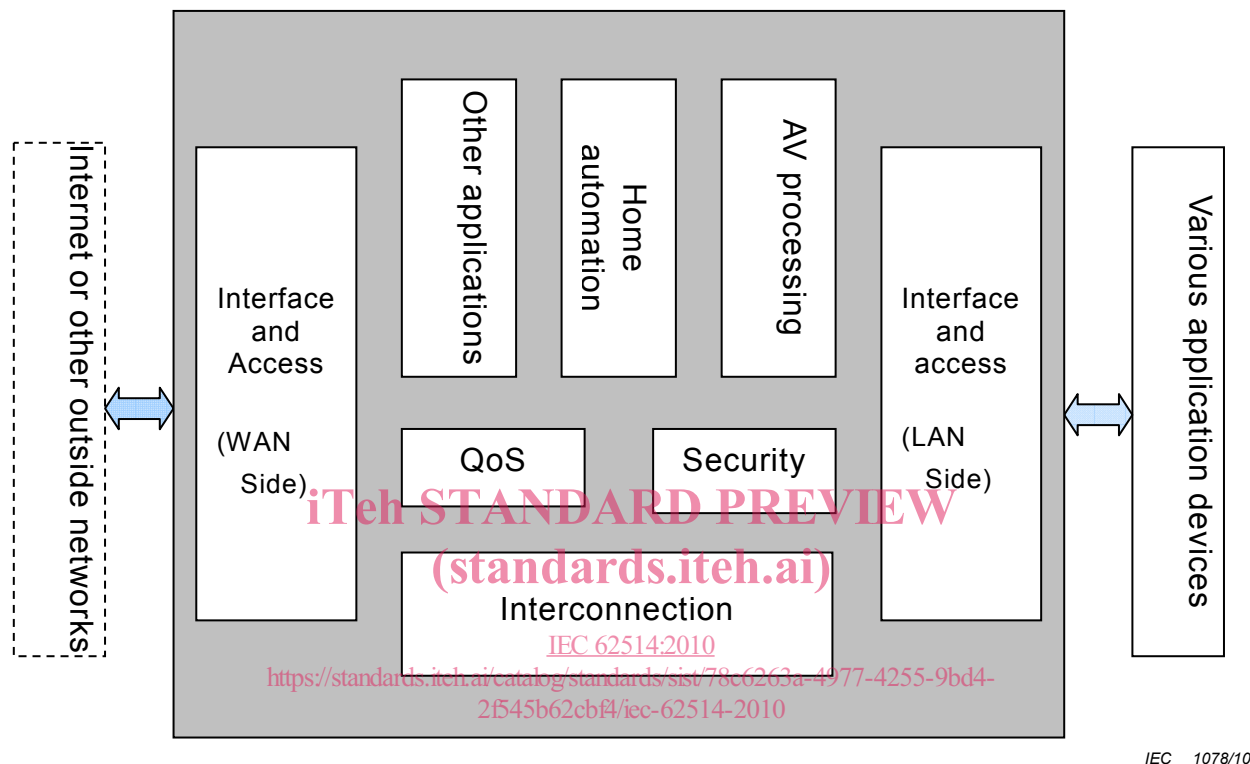

IEC   1078/10

Figure 2 – HMG architecture

4.2.2 AV processing

The HMG shall provide various application services of video and audio in the home multimedia network. It shall fully support all the functions of MIU (includes MSCP, MRCP), DMPr and +UP+/+DN+/+PR+, which are defined in IEC 62481-1 and IEC 62481-2.

4.2.3 Home automation

The HMG can offer local management and remote management as well as various control services to the devices in the home network.

4.2.4 QoS

HMG should support QoS features in order to transport multimedia contents effectively in the home network where the HMG is involved.

If HMG supports QoS features, then HMG shall use priority tag of QoS in order to transfer the multimedia contents that have IEEE 802.1Q User Priority, WMM Access Category or DSCP.

The detailed requirements of QoS shall be compliant with Networking and Connectivity: QoS requirements in IEC 62481-1.