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INTERNATIONAL
STANDARD

**Information technology – Home electronic system (HES) architecture –
Part 5-5: Intelligent grouping and resource sharing for Class 2 and Class 3 –
Device type**

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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FOREWORD

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International Standard ISO/IEC 14543-5-5 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 14543 series, under the general title *Information technology – Home electronic system (HES) architecture*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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

INTRODUCTION

ISO/IEC 14543-5, *Information technology – Home electronic system (HES) architecture – Part 5: Intelligent grouping and resource sharing for HES (IGRS)*, consists of the following parts:

➢ **IGRS Part 5-1: Core protocol**

- Specifies the TCP/IP protocol stack as the basis and the HTTP protocol as the message-exchanging framework among devices.
- Specifies a series of device and service interaction/invocation standards, including device and service discovery protocol, device and service description, service invocation, security mechanisms, etc.
- Specifies core protocols for a type of home network that supports streaming media and other high-speed data transport within a home.

➢ **IGRS Parts 5-2#: Application profile**

- Based on the IGRS Core Protocol.
- Specifies a device and service interaction mechanism, as well as application interfaces used in IGRS Basic Applications.
- Multiple application profiles are specified, including:
  - Part 5-21: AV profile
  - Part 5-22: File profile
- Additional application profiles are planned (part numbers to be assigned)
  - Part 5-2w: DVD profile
  - Part 5-2x: QoS profile
  - Part 5-2y: DMCP profile
  - Part 5-2z: Universal control profile

➢ **IGRS Part 5-3: Basic application**

- Includes an IGRS basic application list.
- Specifies a basic application framework.
- Specifies operation details (device grouping, service description template, etc.), function definitions and service invocation interfaces.

➢ **IGRS Part 5-4: Device validation**

- Specifies a standard method to validate an IGRS-compliant device.

➢ **IGRS Part 5-5: Device type**

- Specifies IGRS Device types used in IGRS applications.

➢ **IGRS Part 5-6: Service type**

- Specifies basic service types used in IGRS applications.

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

Part 5-5: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Device type

1 Scope

This part of the ISO/IEC 14543 specifies the device type of all devices that conform to ISO/IEC 14543-5-1: Core Protocol, and ISO/IEC 14543-5-2#: Application Profile.

This part of the ISO/IEC 14543 is applicable to all devices that are operating in an IGRS network.

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.

ISO/IEC 14543-5-1, *Information technology – Home electronic system (HES) architecture – Part 5-1: Intelligent grouping and resource sharing for Class 2 and Class 3 – Core protocol*

ISO/IEC 14543-5-6, *Information technology – Home electronic system (HES) architecture – Part 5-6: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Service type*[1]

ISO/IEC 14543-5-21, *Information technology – Home electronic system (HES) architecture – Part 5-21: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Application profile – AV profile*

ISO/IEC 14543-5-22, *Information technology – Home electronic system (HES) architecture – Part 5-22: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Application profile – File profile*

ISO/IEC 29341-3-1:2008, *Information technology – UPnP Device Architecture – Part 3-1: Audio Video Device Control Protocol – Audio Video Architecture*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply. These terms are commonly used in other industry publications.

3.1.1
centralised device group
set of IGRS devices with one IGRS device acting as the master

NOTE The master is responsible for managing the setup, for dismissing a Device Group and for processing a join request from other devices. The master device and other IGRS devices in such a Device Group form a centralised or master-slave relationship.

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3.1.2
client identifier
unique identifier associated with a client on an IGRS device to which that client belongs

3.1.3
device group
multiple IGRS devices that are organised in a logical group through the device group management mechanism in the IGRS specification

NOTE   Each IGRS device that joins in a Device Group follows common interaction rules. Two types of Device Groups are defined: peer-to-peer Device Group and centralised (master-slave) Device Group.

3.1.4
device identifier
globally unique device identifier associated with one IGRS device

3.1.5
device pipe
channel used to transfer device interaction messages

NOTE   This channel is set up through the pipe setup mechanism in the IGRS specification.

3.1.6
device type
identifier that indicates the physical and functional characteristic shown by an IGRS device

3.1.7
entity device type
identifier that indicates the physical form of a device

3.1.8
functional device type
identifier that indicates the functional characteristic of a device

3.1.9
IGRS client
application that draws upon the services of one or more connected IGRS devices

NOTE   Multiple client instances can exist on a network at the same time.

3.1.10
IGRS device
information device that conforms to the IGRS specification

3.1.11
IGRS dynamic service invocation module
part of the AV application logic to orchestrate the interaction of application services with respect to the capability of the device or device group involved and to coordinate the service invocation sequence between the media server and media client

NOTE   The IGRS dynamic service invocation module should be implemented on a media server, a media client or a separate other device.

3.1.12
IGRS service
shareable resource encapsulated in an IGRS device by implementing application interfaces and providing services for other IGRS devices

NOTE   An IGRS service has an invocation interface that meets the requirements of the IGRS specification. These invocation interfaces are described and announced on the network through the IGRS service description specification.

3.1.13
IGRS user
owner of an IGRS device and client

3.1.14
mandatory interface
service interface that is implemented by an IGRS device of some functional device type

3.1.15
peer-to-peer device group
set of IGRS devices where each IGRS device within a set has a peer-to-peer relationship to one another

3.1.16
service identifier
unique identifier assigned to a service provided by a specific IGRS device

NOTE   The same type of service may be provided by multiple IGRS devices within the same network. Each instance of a service has a unique service identifier on the IGRS device providing that service.

3.1.17
service type
category of IGRS service defined according to the set of encapsulated resources

NOTE   The service type enables service applications in the same category to have common invocation interfaces.

3.1.18
subservice
specific set of services that is a part of some functional device type

3.1.19
user identifier
identifier of an IGRS user

3.2   Abbreviations

BCM	Back Channel Message
CIS	Content Index Service
CMS	Connection Management Service
FAMS	File Access Management Service
FC	File Client
FCMS	File Connection Management Service
FS	File Server
IGRS	Intelligent Grouping and Resource Sharing
MC	Media Client
MCTMS	Media Client Transport Management Service
MP	Media Player
MR	Media Recorder
MS	Media Server
MSTMS	Media Server Transport Management Service
RMS	Rendering Management Service

4   Conformance

For IGRS devices to claim conformance to this International Standard the following applies.

- The IGRS device type classification identifier definitions shall meet the specification described in Clause 5.

- An entity device type shall meet the basic device type specifications described in Clause 6.

- A functional device type including subservice and mandatory interface definitions shall meet the specification defined in Clause 7.

5   Device type overview

IGRS device type can be divided into two conceptual types. One type is the Entity Device Type; the other is Functional Device Type. The Entity Device Type is used to indicate the physical form of a device, such as a PC, TV, etc. The Functional Device Type is used to indicate the common functional characteristic of devices, for example, Media Server, Media Player, etc.

The identifiers of the Entity Device Type and Functional Device Type of IGRS devices shall conform to the definition of the device type identifier in 8.1.4 of ISO/IEC 14543-5-1.

The device type identifier shall meet the following syntactic definition:

<IGRSDeviceTypeURN>::=urn:<IGRSNS>:<IGRSSingleType>|<IGRSTypeList>

<IGRSNS>::=IGRS:Device:DeviceType

When describing a single device type, the syntactic definition is:

<IGRSDeviceTypeURN>::=urn:<IGRSNS>:<IGRSSingleType>

<IGRSSingleType>::= <NAME>

When describing a multi-device type, the syntax shall be:

<IGRSDeviceTypeURN>::=urn:<IGRSNS>:<IGRSTypeList>

<IGRSTypeList>::=<IGRSSingleType>*<IGRSTypeVal>

<IGRSTypeVal>::=<ConnectionSign><IGRSSingleType>

<NAME>::=1*16<URN chars>

<URN chars>::=<trans>

<trans>::=<upper>|<lower>|<number>|<other>

<upper>::= "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" |"I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" |"Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" |"Y" | "Z"

<lower>::= "a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" |"i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" |"q" | "r" | "s" | "t" |"u" | "v" | "w" | "x" |"y" | "z"

<number>::= "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" |"8" | "9"

<other>::= - | . | _

<ConnectionSign>::=;

<URN chars> is case insensitive.

Every IGRS device shall have one Entity Device Type and at least one Functional Device Type.

All device types related to the IGRS device shall be listed in the device type field of the device online advertisement message. However, only relevant types shall be listed in the device type field of device search and subscription messages.

When both types are listed at the same time, the Entity Device Type shall be listed in front of the Functional Device Type.

6   Entity device type

The Entity Device Type is used to indicate the physical form of IGRS devices. Every IGRS device shall have a unique Entity Device Type. To identify the common Entity Device Types, the corresponding device type identifiers specified in Table 1 shall be used.

Table 1 – Basic entity device type list

Entity Device Type Identifier	Field Explanation
urn:IGRS:Device:DeviceType:PC	IGRS PC
urn:IGRS:Device:DeviceType:NoteBook	IGRS Notebook
urn:IGRS:Device:DeviceType:PDA	IGRS PDA
urn:IGRS:Device:DeviceType:DC	IGRS Digital Camera
urn:IGRS:Device:DeviceType:DV	IGRS Digital Video Camera
urn:IGRS:Device:DeviceType:MP3	IGRS MP3 Player
urn:IGRS:Device:DeviceType:MP4	IGRS MP4 Player
urn:IGRS:Device:DeviceType:Mobilephone	IGRS Mobile Phone
urn:IGRS:Device:DeviceType:SetTopBox	IGRS Set-Top-Box
urn:IGRS:Device:DeviceType:TV	IGRS TV
urn:IGRS:Device:DeviceType:VCR	IGRS VCR
urn:IGRS:Device:DeviceType:DVDPlayer	IGRS CD/DVD Player
urn:IGRS:Device:DeviceType:DMA	IGRS Digital Media Adaptor
urn:IGRS:Device:DeviceType:NAS	IGRS Network Attached Storage (NAS)
urn:IGRS:Device:DeviceType:UnknownType	IGRS unknown device type

7   Functional device type

7.1   Summary on functional device type

The Functional Device Type identifies the functional form of IGRS devices. Every device can have multiple Functional Device Types at the same time.

The Functional Device Type is defined by the subservices and the mandatory interface set of each subservice.

This standard details a series of basic Functional Device Types in the following subclauses. The descriptions include the related device type identifier, the subservice set, the mandatory interface set of each subservice and the commonly used service invocation procedure of the device type.

Table 2 defines a series of basic Functional Device Types.

Table 2 – Basic functional device type list

Device type name	Functional device type identifier	Field explanation
Media Server	urn:IGRS:Device:DeviceType:MediaServer	Device that provides media content. See 7.2.2 for details.
Media Player	urn:IGRS:Device:DeviceType:MediaPlayer	Device that plays media content. See 7.2.3 for details.
Media Recorder	urn:IGRS:Device:DeviceType:MediaRecorder	Device that records media content. See 7.2.4 for details.
File Server	urn:IGRS:Device:DeviceType:FileServer	Device that provides file content. See 7.2.5 for details.

7.2   Basic functional device type

7.2.1   General

This subclause specifies all of the basic functional devices listed above.

7.2.2   Media server

7.2.2.1   Overview

A Media Server provides media content. It includes CIS, CMS, BCM TCP Service and optional MSTMS (refer also to ISO/IEC 29341-3-1:2008).

The functions of a MS include:

a) the Media content of an MS provided to a network can be browsed and searched by the IGRS dynamic service invocation module, including content format, supported transport protocol and transport control mechanism, etc.;

b) the preparation to connect MS and MC;

c) the Media transport control (such as play, stop etc.);

d) the copying or moving of the media resource onto other devices;

e) the distribution collaboration with another MS and the MS provides personalised content recommendations.

7.2.2.2   Device type

The device type definition of the Media Server is as follows:

   urn:IGRS:Device:DeviceType:MediaServer.

7.2.2.3   Subservice and the mandatory interface definitions

This subclause lists the subservices of the Media Server (see Table 3), including required and optional services and its interface list (see Table 4).

Table 3 – Subservice list of media server

Service name	Required/ Optional	Service type	Field explanation
Content Index Service	Required	urn:IGRS:Service:ServiceType:ContentIndex:1	CIS allows an IGRS dynamic service invocation module to discover and list the media content on an MS so that IGRS dynamic service invocation module can retrieve the content information, including the name, creation date, size, format etc. of media content. This information can be used by IGRS dynamic service invocation module to determine whether these contents can be played on an MC. The content directory structure supports nesting of subdirectory. See 8.1 in ISO/IEC 14543-5-6 for details.
Connection Management Service	Required	urn:IGRS:Service:ServiceType:ConnectionManagement:1	CMS is used to create and manage the connection between an MS and MC. An MS can support and manage several active connections at any one time by a CMS. See 8.2 in ISO/IEC 14543-5-6 for details.
Back Channel Message TCP Service	Required		Back Channel Message TCP service is a type of connection management and transport control mechanism used for AV playback specified in the IGRS AV system. It is essentially a command token control protocol over TCP protocol, including the BCM server and BCM client. See Clause 9 of ISO/IEC 14543-5-6 for details.
Media Server Transport Management Service	Optional	urn:IGRS:Service:ServiceType:MediaServerTransportManagement:1	The optional MSTMS enables an IGRS dynamic service invocation module to adjust and control the media stream transport on an MS, such as play, pause, stop, seek, etc. If this service exists, it means that the media server initiated transport mode is supported. Otherwise, it is not supported. See 8.3 in ISO/IEC 14543-5-6 for details.

Table 4 – Mandatory interface list of media server service

Service name	Mandatory interface	Field explanation
Content Index Service	GetSortCapabilityList	Retrieve the sorting list supported by a CIS on an MS.
	GetContentUpdateId	Retrieve the value of content update ID of a CIS on an MS.
	Browse	Return the browsed content directory object.
Connection Management Service	GetProtocolInfo	Get the protocol information supported by current device, including transport protocol, transport control mechanism, network port, media format and available IP address list on an MS.
Media Server Transport Management Service	SetTransportURIList	Set TransportURIList variable. Specify the URI list of media content object to be transported by MSTMS instance.
	GetTransportInfo	Return the current transport state information of transport service instance.
	Next	Set the next media object in the media list to be played. The selection mode is decided by the current media playing mode.
	Previous	Set the current media object as the previous played media object.
	Stop	Stop the current media object played by MSTMS. The current position should be reset in some devices.
	Play	Play media object in media list in sequence with specified playing speed. The starting point is decided by Offset. Playing is continued until the URI list has been completely played or other interfaces have been invoked, such as stop, etc. In addition, DRM transport should be established before playing copyrighted media content. The available content should include license and encrypted media content corresponding to the playing device. The encrypted media stream should be decrypted by DRM system functionality on an MS.
	Seek	Find the target position specified by input parameter in accordance to the input parameter Unit.
	GetPlayURIList	Get an MS URI list transported by specified transport service instance.
	GetAllMediaInfo	Get the detailed content information of media URI list transported by specified transport service instance.
	GetCurrentMediaInfo	Get media information transported by specified transport service instance.

7.2.3   Media player

7.2.3.1   Overview

An IGRS Media Player is used to transport and play media. It includes CMS, RMS, BCM TCP Service (see ISO/IEC 14543-5-6) and an optional MCTMS (also refer to ISO/IEC 29341-3-1:2008). CMS allows the IGRS dynamic service invocation module to get media format, transport protocol and the transport control mechanism supported by the MP (refer to ISO/IEC 14543-5-21). Similarly with an MS, an MP can support multiple connections simultaneously and enable an IGRS dynamic service invocation module to discover the active connection instances and attributes. The BCM TCP Service is used to adjust and to control the transport of the media stream on an MP. An RMS is used to control the media rendering, such as volume, contrast, brightness, etc.

7.2.3.2   Device type

The device type definition of the Media Player is as follows:

urn:IGRS:Device:DeviceType:MediaPlayer.

7.2.3.3   Subservice and the mandatory interface definitions

This subclause lists the subservices of a Media Player (see Table 5), including required and optional services and its interface list (see Table 6).

Table 5 – Subservice list of media player

Service name	Required /Optional	Service type	Field explanation
Connection Management Service	Required	urn:IGRS:Service:ServiceType:ConnectionManagement:1	The CMS is used to create and manage the connection between an MS and MP. An MS can support and manage several active connections at any one time by CMS. See 8.2 in ISO/IEC 14543-5-6 for details.
Back Channel Message TCP Service	Required		The Back Channel Message TCP service is a type of connection management and transport control mechanism used for AV playback specified in the IGRS AV system. It is essentially a command token control protocol over TCP protocol, including the BCM server and BCM client. See Clause 9 in ISO/IEC 14543-5-6 for details.
Media Client Transport Management Service	Optional	urn:IGRS:Service:ServiceType:MediaClientrTransportManagement:1	The MCTMS service enables IGRS dynamic service invocation module to adjust and control the transport of media stream on an MP, such as play, pause, stop, seek, etc. See 8.4 in ISO/IEC 14543-5-6 for details.
Rendering Management Service	Optional	urn:IGRS:Service:ServiceType:RenderingManagement:1	The Rendering Management Service allows IGRS dynamic service invocation module to control media playing, such as volume, contrast, brightness, etc. Multiple active instances of rendering control can be supported, such as the "picture-in-picture" function in TV. A new RMS instance is created by PrepareForConnection() of CMS on MP. This service is only provided by MP. See 8.5 in ISO/IEC 14543-5-6 for details.

Table 6 – Mandatory interface list of media player

Service name	Mandatory interface	Field description
Connection Management Service	GetProtocolInfo	Get the transport protocol supported by the current device, including the transport control mechanism, network port, content format, other protocol information and available IP address list on an MP.
Media Client Transport Management Service	SetTransportURIList	Set TransportURIList variable. Specify the URI list of media content object to be transported by MCTMS instance.
	GetTransportInfo	Get current transport state information of transport service instance.
	Play	Play media object in media list in sequence with playing speed. The starting point is decided by the Offset. Playing is continued until the URI list has been completely played or other interfaces have been invoked, such as stop, etc. In addition, DRM transport should be established before playing copyrighted media content. The available content should include license and encrypted media content corresponding to the playing device. The encrypted media stream should be decrypted by a DRM tool on an MS or MP.
	Next	Set the next media object in the media list to be played. The selection mode is decided by the current media playing mode.
	Previous	Set the current media object as the previous played media object.
	Stop	Stop the current media object played by an MPTMS. The current position should be reset in some devices.
	Seek	Find the target position specified by the input parameter in accordance with the input parameter Unit.
	GetPlayURIList	Get MS URI list transported by appointed transport service instance.
	GetAllMediaInfo	Get the detailed content information of media URI list transported by specified transport service instance.
	GetCurrentMediaInfo	Get media information transported by specified transport service instance.
Rendering Management Service	ListPresets	Get current rendering control state variable list.
	SelectPresets	Recover rendering control state variable to preset value.

7.2.4   Media recorder

7.2.4.1   Overview

The MR records the media stream from MS. Its configuration is similar to that of MP in that Connection Management Service, Media Client Transport Management Service and BCM TCP service are provided.

7.2.4.2   Device type

The device type definition of the Media Recorder is as follows:

urn:IGRS:Device:DeviceType:MediaRecorder.

7.2.4.3   Subservice and the mandatory interface definitions

This subclause lists the subservices of a Media Recorder (see Table 7), including required and optional services and its interface list (see Table 8).

Table 7 – Subservice list of media recorder

Service name	Required /Optional	Service type	Field explanation
Connection Management Service	Required	urn:IGRS:Service:ServiceType: ConnectionManagement: 1	The CMS is used to create and manage the connection between an MS and MR. An MS can support and manage several active connections at any one time by CMS. See 8.2 in ISO/IEC 14543-5-6 for details.
Back Channel Message TCP Service	Required		The Back Channel Message TCP service is a type of connection management and transport control mechanism used for AV playback specified in the IGRS AV system. It is essentially a command token control protocol over TCP protocol, including the BCM server and BCM client. See Clause 9 in ISO/IEC 14543-5-6 for details.
Media Client Transport Management Service	Optional	urn:IGRS:Service:ServiceType:MediaClientTransportManagement:1	The optional MCTMS service enables the IGRS dynamic service invocation module to adjust and control the transport of media stream on an MR, such as record, pause, stop, seek, etc. See 8.4 in ISO/IEC 14543-5-6 for details.

Table 8 – Mandatory interface list of media recorder

Service name	Mandatory interface	Field explanation
Connection Management Service	GetProtocolInfo	Get the transport protocol supported by current device, including transport control mechanism, network port, content format, other protocol information and available IP address list on MR.
Media Client Transport Management Service	SetTransportURIList	Set TransportURIList variable. Specify the URI list of media content object to be transport by an MCTMS instance.
	GetTransportInfo	Get current transport state information of transport service instance.
	GetCurrentMediaInfo	Get media information transported by the specified transport service instance.
	Record	Record in real-time the media stream on the specified media transport instance between an MR and MS and save the recording in a newly created media object on an MS uploaded from an MR.
	PauseRecord	Pause media content that is being recorded by an MCTMS instance.
	ResumeRecord	Continue to record media content managed by an MCTMS instance.
	StopRecord	Stop recording the media content by an MCTMS instance.

7.2.5   File server

7.2.5.1   Overview

A File Server is the device that provides file content. It includes File Access Management Service (FAMS) and File Connection Management Service (FCMS).

The functions of the File Server include the following.

a) Based on the authentication information provided by File Client, the File Server assigns a corresponding authentication key to the File Client (recommended validity only during the session). This key is matched with the File Client access right such that the key can be used as the identifier for subsequent file access by the File Client.

b) The File Server provides the network with the file/directory that can be browsed or searched by the File Client.

c) It supports simple management of the file/directory in a shared directory on the File Server.

d) It manages the uploading/downloading of a file/directory.

e) It supports the File Server file/directory update event subscription.

f) It supports the service update event subscription.

7.2.5.2   Device type

The device type definition of the File Server is as follows:

    urn:IGRS:Device:DeviceType:FileServer.

7.2.5.3   Subservice and the mandatory interface definitions

This subclause lists the subservices of File Server (see Table 9), including required and optional services and interface list (see Table 10).