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## Information technology – Home electronic system (HES) architecture – Part 5-8: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Remote access core protocol

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# INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

## Part 5-8: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Remote access core protocol

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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 and ISO websites.

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.

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# INTRODUCTION

The ISO/IEC 14543-5 series of standards specifies the services and protocol of the application layer for Intelligent Grouping and Resource Sharing (IGRS) devices and services in the Home Electronic System. Some parts reference Classes 1, 2 and 3, which are HES designations specified in the HES architecture standard, ISO/IEC 14543-2-1.

The ISO/IEC 14543-5 series includes the following parts.

– Part 5-1: Core protocol
  - Specifies the TCP/IP protocol stack as the basis and the HTTP protocol as the message-exchange 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 transports within a home.
– 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
– 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.
– Part 5-4: Device validation
  - Defines a standard method to validate an IGRS-compliant device.
– Part 5-5: Device type
  - Specifies IGRS device types used in IGRS applications.
– Part 5-6: Service type
  - Specifies basic service types used in IGRS applications.
– Part 5-7: Remote access system architecture
  - Specifies the architecture and framework for the remote access of IGRS devices and services in the Home Electronic System. The remote access communications protocol and application profiles are specified in the following parts of ISO/IEC 14543-5:
    – ISO/IEC 14543-5-8: Remote access core protocol
    – ISO/IEC 14543-5-9: Remote access service platform
    – ISO/IEC 14543-5-101: Remote AV access profile
    – ISO/IEC 14543-5-102: Remote universal management profile
    – ISO/IEC 14543-5-11: Remote user interface
    – ISO/IEC 14543-5-12: Remote access test and verification
  - The relationships among these parts are specified in Part 5-7.

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– Part 5-8: Remote access core protocol
  - Provides detailed system components, system function modules, basic concepts of IGRS remote access elements and their relationships, message exchange mechanisms and security related specifications.
  - Specifies interfaces between IGRS Remote Access (RA) client and service platforms. Defines co-operative procedures among IGRS RA clients.
– Part 5-9: Remote access service platform
  - Specifies the IGRS RA service platform (IRSP) architectures and interfaces among servers in the service platforms.
  - Based on Part 5-8: Remote access core protocol.
– Parts 5-10#: Remote access application profiles
  - Defines a device and service interaction mechanism for various applications.
  - Based on Part 5-8: Remote access core protocol.
  - Two profiles are under development:
    – Part 5-101: Remote AV access profile.[1] This part defines the common requirements for IGRS RA AV users and devices in IGRS networks.
    – Part 5-102: Remote universal management profile.[2] This part specifies a mechanism for integrating devices with both relatively high and low processing capabilities into IGRS networks. It also specifies universal remote device discovery and a management framework.
  - Additional application profiles will be specified in the future.
– Part 5-11: Remote user interface[3]
  - Specifies adaptive user interface generation and remote device control mechanisms suitable for different remote access applications and devices.
– Part 5-12: Remote access test and verification[4]
  - Defines a standard method to test and verify IGRS-RA compliant device and service interfaces.

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1 Under preparation. Stage at the time of publication: ISO/IEC DIS 14543-5-101:2017.

2 Under preparation. Stage at the time of publication: ISO/IEC CD 14543-5-102:2016.

3 Under preparation. Stage at the time of publication: ISO/IEC DIS 14543-5-11:2017.

4 Under preparation. Stage at the time of publication: ISO/IEC DIS 14543-5-12:2017.

# INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) ARCHITECTURE –

# Part 5-8: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Remote access core protocol

## 1 Scope

This part of ISO/IEC 14543-5 specifies the core protocol of IGRS user and device remote access, including intelligent grouping and resource sharing. The protocol features are:

a) IGRS RA user and IGRS RA device concepts and relationship management mechanisms,

b) user and device remote discovery and online and offline status management mechanisms,

c) user and device remote access message formats and message exchanging flows, and

d) remote data and service distribution and sharing mechanisms.

This document is applicable to remote access of an IGRS sub-network (called an IGRS subnet) for resource sharing and service collaboration among home and/or remote computers, consumer electronics and communication devices.

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## 2 Normative references

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The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14543-5-9, *Information technology – Home electronic system (HES) architecture – Part 5-9: Intelligent grouping and resource sharing for HES Class 2 and Class 3 – Remote access service platform*

ISO/IEC 9594-8|Recommendation ITU-T X.509, *Information technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks*

IETF RFC 2616, *Hypertext Transfer Protocol – HTTP/1.1*

IETF RFC 2818, *HTTP over TLS*

IETF RFC 4422, *Simple Authentication and Security Layer (SASL)*

IETF RFC 5246, *The Transport Layer Security (TLS) Protocol – Version 1.2*

IETF RFC 6120, *Extensible Messaging and Presence Protocol (XMPP): Core*

IETF RFC 6121, *Extensible Messaging and Presence Protocol (XMPP): Instant Messaging and Presence*

IETF RFC 7622, *Extensible Messaging and Presence Protocol (XMPP): Address Format*

# 3 Terms, definitions and abbreviated terms

## 3.1 Terms and definitions

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

**3.1.1**
**binding**
relationship established between a user and a device, which represents an own/owned relationship between the user and the device

Note 1 to entry: The user and device with binding relationship are shown in each other's roster. One user can bind multiple devices, and one device can be bound by multiple users.

**3.1.2**
**buddy**
relationship established between two users, which represents that the two users trust each other

Note 1 to entry: Two users with buddy relationship are shown in each other's roster.

**3.1.3**
**connection ID**
instance identification that identifies the connection between "user and IRSP" and "device and IRSP"

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**3.1.4**
**contact group**
set of multiple contacts where each has the same attribute

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**3.1.5**
**device connection**
network connection established between an IGRS RA device and the IRSP

Note 1 to entry: Only one device connection can be maintained at any time. Multiple devices of one user can connect to the IRSP simultaneously.

**3.1.6**
**device connection ID**
identification that represents an instance of a connection between an IGRS RA device and the IRSP

EXAMPLE If the device ID is"#igrsdevice@igrs.com" and the connection ID is "home", the device connection ID is "#igrsdevice@igrs.com/home".

Note 1 to entry: A device connection ID is unique. The IRSP tests and guarantees the uniqueness of the device connection ID.

Note 2 to entry: A device connection ID consists of a device ID and a connection ID. A "/" is used to separate these two IDs.

**3.1.7**
**device ID**
unique identification of an IGRS RA device

EXAMPLE If the local part of a device ID is "#igrsdevice" and the domain name part of the user ID is "igrs.com", the device ID is "#igrsdevice@igrs.com".

Note 1 to entry: A device ID consists of a local part and a domain name part. A "@" is used to separate the two parts. Each device ID starts with a "#".

**3.1.8**
**device verification code**
string used to examine if the user has the authority to bind a device

Note 1 to entry: For a device without a user interface, the device verification code is used to bind a device to a user. The device owner guarantees the safety of the device verification code.

**3.1.9**
**IGRS RA device**
physical device that is accessible to the IGRS RA user in the IGRS RA system

Note 1 to entry: A binding relationship can be established between an IGRS RA device and an IGRS RA user. A sibling relationship can be established between two IGRS RA devices.

**3.1.10**
**IGRS RA server**
instantiation of a service provider that may be included in an IRSP

Note 1 to entry: An IGRS RA server is deployed on the Internet. It maintains relationships among IGRS RA user and IGRS devices. It also provides re-transmission of collaborative messages. The IGRS RA user and IGRS device can start a data connection to the IRSP and supports interconnections using the data connection and re-transmission functions of the IRSP.

**3.1.11**
**IGRS RA service platform**
**IRSP**
collection of multiple IGRS RA servers that are deployed on the Internet to maintain the relationships among IGRS RA user and IGRS RA device and to exchange collaborative messages

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Note 1 to entry: IGRS RA user and device can establish connections to the IRSP, can send collaborative messages over these connections and can exchange messages in the servers of the IRSP.

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**3.1.12**
**IGRS RA user**
entity that uses the IGRS RA devices and application services

Note 1 to entry: Generally, an IGRS RA user is a human being. Each IGRS RA user should have a unique user ID (identification). A bundle relationship can be established between one IGRS RA user and another. A binding relationship can be established between one IGRS RA user and one IGRS device.

**3.1.13**
**interested connection**
connection that logged onto the IRSP using a user ID and requested the roster of that user

**3.1.14**
**roster**
list that stores all users and devices by which this specific user or device is permitted access

Note 1 to entry: A roster is managed by the IRSP. Each user or device has one and only one roster on the IRSP.

**3.1.15**
**roster item**
item in the roster

**3.1.16**
**service ID**
identification of a service

**3.1.17**
**sibling**
relationship established between two or more devices, which represents that these devices have a binding relationship with the same user, or these devices belong to the same user

Note 1 to entry: Devices with sibling relationship are shown in each other's roster.

**3.1.18**
**user connection**
network connection established between an IGRS RA user and the IRSP

Note 1 to entry: Multiple user connections can be maintained simultaneously for one user.

**3.1.19**
**user connection ID**
identification that represents an instance of a connection between an IGRS RA user and the IRSP

EXAMPLE If the user ID is "igrsuser@igrs.com" and the connection ID is "office", the user connection ID is "igrsuser@igrs.com/office".

Note 1 to entry: A user connection ID is unique. The IRSP tests and guarantees the uniqueness of a user connection ID.

Note 2 to entry: A user connection ID consists of a user ID and a connection ID. A "/" is used to separate the two IDs.

Note 3 to entry: The connection ID is set by the user when logging in.

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**3.1.20**
**user ID**
unique identification of an IGRS RA user

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EXAMPLE If the local part of a user ID is "igrsuser" and the domain name part of the user ID is "igrs.com", the user ID is "igrsuser@igrs.com".

Note 1 to entry: A user ID consists of a local part and a domain name part. A "@" is used to separate the two parts.

## 3.2 Abbreviated terms

| | |
|---|---|
| AS | autonomous system |
| HTTP | hypertext transfer protocol |
| ID | identification |
| IGRS | intelligent grouping and resource sharing |
| IRSP | IGRS RA service platform |
| NAT | network address translation |
| RA | remote access |
| SASL | simple authentication and security layer |
| TLS | transport layer security |
| TCP/IP | transmission control protocol/Internet protocol |
| UI | user interface |
| XMPP | extensible messaging and presence protocol |

## 4 Conformance

A system that conforms to this document shall be implemented according to Clauses 5 through 14, where the service flow and message exchange mechanism in each functional block shall conform to Clauses 6 through 12. The user and device discovery and online status management shall conform to Clause 13 and the security mechanism in IGRS RA system shall conform to Clause 14.

## 5 IGRS RA overview

The IGRS RA core protocol extends the IGRS application scenarios from the home and office to the mobile and remote access situations. The applications scope is extended from the LAN area to the Internet for both fixed and mobile devices.

Each IGRS RA user or device shall have a unique user ID or device ID. One user or device can establish relationships with other users or devices. Based on these relationships, one user or device can obtain and exchange the online/offline status, changing messages, etc. from the other relevant users or devices.

This document is based on the concepts of IGRS RA user and IGRS RA device. The contents include:

a) IGRS RA user and IGRS RA device concepts and relationship management mechanisms;

b) user and device remote discovery and online and offline status management mechanisms;

c) user and device remote access message formats and message exchanging flows, and

d) remote data and service distribution and sharing mechanisms.

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This document is the core protocol of IGRS RA based on IETF RFC 6120 and IETF RFC 6121.

Three types of interactive relationships can be established and maintained:

1) Binding: relationship between user and device. Binding shows the user ownership of the devices.

2) Sibling: relationship between device and device. When two devices are bound with the same user, these two devices are in a sibling relationship with each other.

3) Buddy: relationship between user and user. Buddy means a trusting relationship.

The detailed relationship definitions and management mechanisms are specified in Clause 10.

## 6 IGRS RA service functional flow

The IGRS RA request/response messages shall conform to the request/response model of HTTP/1.1 (see IETF RFC 2616). A typical service flow of IGRS RA service is shown in Figure 1.