

INTERNATIONAL STANDARD



**Information technology – Home network resource management –
Part 3: Management application**

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**Information technology – Home network resource management –
Part 3: Management application**

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INFORMATION TECHNOLOGY – HOME NETWORK RESOURCE MANAGEMENT –

Part 3: Management application

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International Standard ISO/IEC 30100-3 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 30100 series, under the general title *Information technology – Home network resource management*, can be found on the IEC website.

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 30100 series of standards specifies an abstract model for remote management of home networks conforming to the Home Electronic System (HES) architecture specified in ISO/IEC 14543-2-1. An HES consists of a collection of devices that are able to interwork via a common internal network. In a home environment several HES networks may operate concurrently each with separate control and management methods. This part of ISO/IEC 30100 specifies the architecture and the base methodology to support applications that may span multiple different HES networks. Home resource management allows uniform fault processing, diagnostics and configuration management of HES elements in home environment.

This standard specifies an architecture for the home network resource management, a home resource model for transparent system configuration and a diagnostic processing in the home network.

Currently, ISO/IEC 30100, *Information technology – Interconnection of information technology equipment – Home Network Resource Management*, consists of the following parts:

Part 1: Requirements

Part 2: Architecture

Part 3: Management application

ISO/IEC 30100 is applicable to

- a management server located at a home network service provider,
- an apartment complex server, located in an office at the of apartment complex office,
- a home residential gateway or set top box (STB).

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INFORMATION TECHNOLOGY – HOME NETWORK RESOURCE MANAGEMENT –

Part 3: Management application

1 Scope

This part of ISO/IEC 30100 specifies a control and management interface for the integrated home network resources at the top of the interoperability framework specified by ISO/IEC 18012-1. Methods are specified for controlling and managing home network resources through a consistent interface regardless of the underlying home network middleware technologies. Based on the home resource management interface, a management application specifies HES device control services and fault management services. This part of ISO/IEC 30100 specifies the communications data formats and functions for messages sent between the objects of a resource management process and the objects of one or more management applications.

2 Normative references

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

ISO/IEC 14543-2-1, *Information technology – Home electronic system (HES) architecture – Part 2-1: Introduction and device modularity*

ISO/IEC 18012-1:2004, *Information technology – Home electronic system – Guidelines for product interoperability – Part 1: Introduction*

ISO/IEC 30100-2, *Information technology – Home network resource management – Part 2: Architecture*¹

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

apartment complex server

computer remotely managing services for residents in a multiunit dwelling

apartment complex office

management facility that provides services for residents in a multiunit dwelling

3.1.2

application

field of use of home resource management process

¹ To be published.

3.1.3

class

set of instances of home resource

3.1.4

device

distinct physical unit on a network that performs a specific function (a set of functions) in a particular context

Note 1 to entry: A device can either be an end node on the network, or an intermediate node (as in the case of a network gateway device connecting two distinct physical networks).

3.1.5

domain

range of validity of a resource object

3.1.6

HES entity

logical component that has a specified functionality in the HES architecture

Note 1 to entry: The HES architecture is specified in ISO/IEC 14543-2-1.

3.1.7

HES interoperability framework

collection of standards defining device and network interoperability for homes as specified in the ISO/IEC 14543 series

3.1.8

home residential gateway

interface between external networks and home networks

3.1.9

home resource

managed object that can be used for home network services

3.1.10

home resource management interface

logical connection point between management application and home resource management process

3.1.11

home resource management process

element that performs information processing for a particular management application

3.1.12

home resource model

abstract, formal representation of resource objects in a home environment

Note 1 to entry: Resource objects include resource properties, relationships and the operations that can be performed on them.

3.1.13

home resource provider interface

data transfer between resource information provider and home resource management process

3.1.14

instance

example

Note 1 to entry: This term is used in object-oriented programming.

3.1.15

management information

set of components used either in a management application or in a resource management process

3.1.16

network

interconnected devices sharing a common communications protocol

3.1.17

network middleware

software that links an operating system to a communications protocol

3.1.18

object

abstract element representing device functions and data stored within the device

Note 1 to entry: The functions and data contained within an object (referred to as "properties") can be executed, read or modified as appropriate for the property by "messages" sent from other objects. A message causes a "method" within the object to be invoked. This may result in access to an internal data structure or the execution of a subroutine or both. A value may be returned by the recipient object.

3.1.19

physical space

some arbitrary set of reference co-ordinates of a home resource in the real world

3.1.20

resource information provider

functions for home resource management process to control HES entities

Note 1 to entry: Collects data from HES entities and transfers the collected data to a home resource management process.

3.1.21

resource object

managed unit located within the resource management process specified by the home resource model

Note 1 to entry: The resource object includes methods for accessing the properties of the management process and/or interacting with other objects. A resource object can contain one or more HES entities.

3.1.22

resource relation object

managing unit located within the resource management process by the home resource model

3.1.23

service

field of use of an HES

3.1.24

set top box

interface between the external service and home equipment

3.2 Abbreviations

AFM	Automatic Fault Management
BNF	Backus-Naur Form
DM	Device Management
HAN	Home Area Network

HES	Home Electronic System
HNRM	Home Network Resource Management
HRMI	Home Resource Management Interface
HRPI	Home Resource Provider Interface
FMA	Fault Management Application
HMAI	Home Management Application Interface
RM	Remote Management
OSI	Open System Interconnection

4 Conformance

In order to claim conformance to this International Standard, the network application and management software written for managing the home network resources specified in Clause 4 of ISO/IEC 14543-2-1:2006 shall be implemented as follows.

- A home network management application shall be implemented according to the model specified in Clause 5.
- A home network management application shall implement the interface specified in Clause 6.
- A home network management process shall implement the interface specified in Clause 6.

5 Management application

5.1 Overview

The home resource management architecture consists of three parts as described in ISO/IEC 30100-2.

- Resource information provider
- Resource management process
- Management application

A management application is a user process that communicates with a resource management process via an HRMI. The HRMI provides an interface not only for information retrieval for the resources and relationships among resources, but also for the control and management of the resources regardless of the underlying home network middleware technologies.

This standard specifies basic interfaces for the essential home applications such as home resource auto-configuration, fault management and HES device control service.

5.2 Management application model

Figure 1 illustrates a reference model for the HNRM (home network resource management) application model with an HRMI.

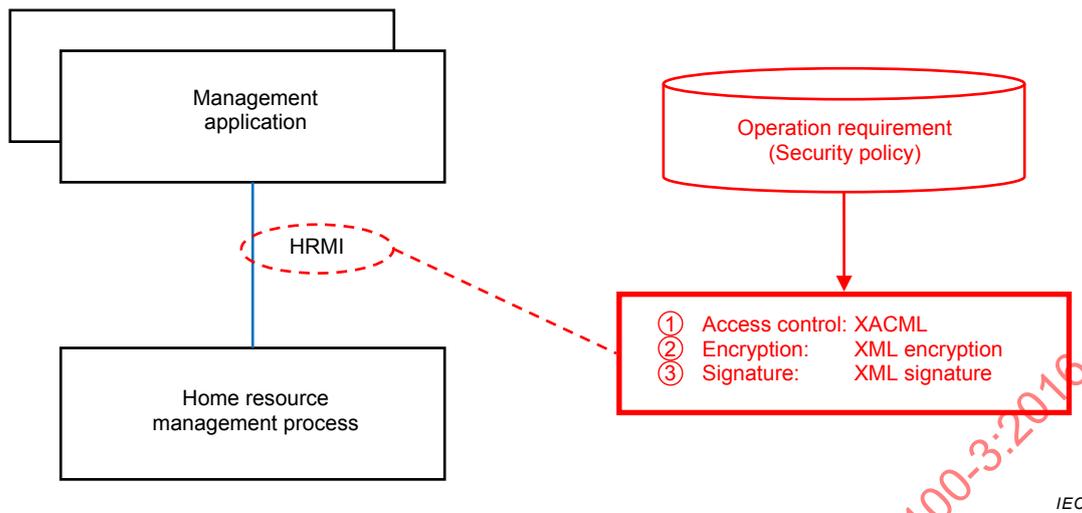


Figure 1 – Management application model

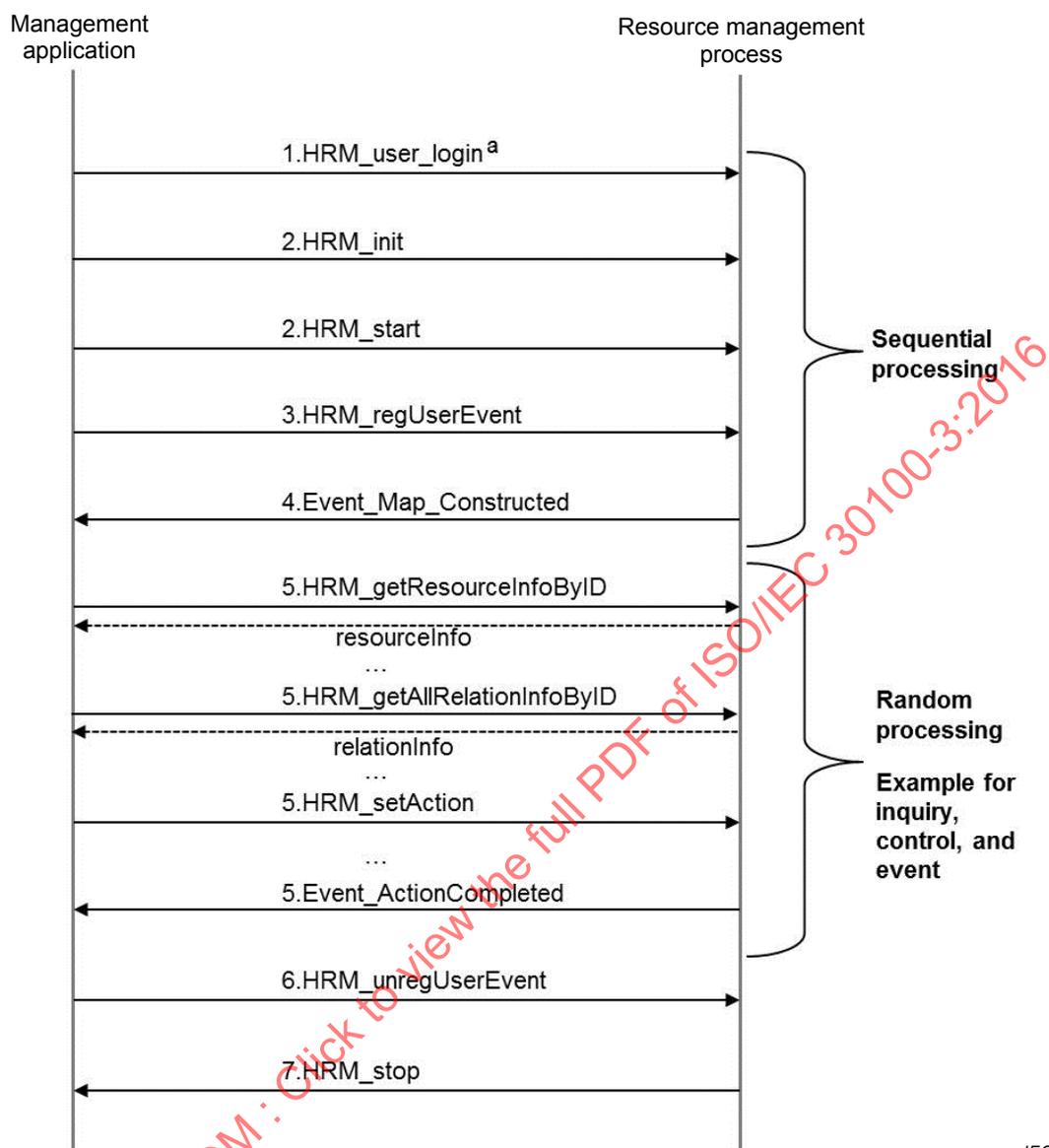
As shown in Figure 1, the HRMI provides a common interface for all home network resource management applications. Therefore, the home network resource management application can be developed to fulfil a requirement to be a stand-alone application or a client-server application. When the home network management application is designed with a client-server model, an interface for the server and client shall be specified. The interface is not specified in this standard. The HRMI interface shall include a resource management process for access control, encryption and signature as a means for security and privacy protection, as specified in 5.5 of ISO/IEC 30100-22.

5.3 Home resource management process

The home resource management process collects all information about a resource entity from at least one resource information provider through pre-defined interfaces. When two or more dissimilar home area networks are installed and interoperate, the network devices providing this information shall comply with Clause 6 of ISO/IEC 18012-1:2004. The interface example for other resources such as network, service and physical space is explained in Annex A. An implementation example is presented in Annex B.

5.4 Simple interaction flow using HRMI

Figure 2 shows the simple interaction flow between a management application and a resource management process using the HRMI function. In Figure 2 messages in brackets “[]” are optional messages. For example, event registration messages are used for registration in order to receive events of interest. However, when there are no events of interest, this message is not used.



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^a Authentication is required.

Figure 2 – Example of simple interaction flow

While Figure 2 is not suitable for describing all use cases, it illustrates an example of a procedure for a home network resource management application to handle home network resources. In Figure 2, the solid line signifies a message for resource management interface service, and the dashed line signifies output parameters of the requested message. Step 1 to Step 4 should be performed sequentially, and the others are not. The procedure using the services listed in 6.2 and specified in 6.3 is as follows.

- First, a user shall be authenticated in order to determine if he/she has a right to access the target resources using HRM_user_login". This step fulfills the security requirements specified in 5.2 by using methods such as SSL/TLS or SSH.
- After the user authentication process, the setup process with the home network resource management process starts using "HRM_init" and "HRM_start" sequentially. In the initial setup process, functions and modules for the resource management process are initialised.
- When management applications want to receive some specific events, they subscribe to a list of events related to home network resource management applications using

“HRM_reqUserEvent”. Only subscribed events are notified to the applications when they occur. The unsubscribed events are ignored.

- d) When a resource management process collects home network information, it converts the information as a resource and creates a resource map that generates and analyses the relationship among resources. When it is generated, the resource management process notifies to the management application as an event “Event_Map_Constructed”. The procedures from Step 1 to Step 4 should be carried out sequentially.
- e) After a resource management application gets an event of “Event_Map_Constructed”, it is possible to retrieve and to control all resources and associated relationship information. The resource information can be retrieved by the domain name, resource name, ID and relation information (see 6.2) using “HRM_getResourceInfoByID”, “HRTM_getAllRelationInfoByID”, and “HRM_setAction”. When requested control is completed, it notifies the applications using “Event_ActionCompleted”.
- f) Before a management application ends a session with the resource management process, it first unregisters all events registered to it using “HRM_unreqUserEvent”.
- g) When a management application needs to end, it sends a “HRM_stop” message.

6 Home resource management interface (HRMI)

6.1 Overview

The HRMI (home resource management interface) is used for delivering home resource information, including resource objects and resource relation objects created and maintained by the resource management process, to management applications. In addition, it delivers events or responses from user requests to applications that occurred during the resource management process.

Through HRMI, a management application obtains information about resource objects and resource relation objects and requests commands for resource control.

This clause specifies the interface service procedures to be used for management applications and the detailed descriptions of data types, structures and interface functions for each procedure.

6.2 List of resource management interface services

No	Service name	Function description	Usage
1	HRM_user_login	This service shall be used to authenticate a user.	Required
2	HRM_init	This service shall be used to initialise the home resource management process.	Required
3	HRM_start	This service shall be used to start the home resource management process.	Required
4	HRM_stop	This service shall be used to stop the home resource management process.	Required
5	HRM_restart	This service shall be used to restart the home resource management process.	Optional
6	HRM_getDomainInfo	This service shall be used to get resource domain information from the home resource management process.	Required
7	HRM_getAllResourceInfoByDomain	This service shall be used to get all resource information from the home resource management process.	Required
8	HRM_getResourceInfoByName	This service shall be used to get resource information from the home resource management process by using resource name.	Required
9	HRM_getResourceInfoByType	This service shall be used to get resource information from the home resource management process by using resource type.	Required
10	HRM_getResourceInfoByID	This service shall be used to get resource information from the home resource management process by using resource identifier.	Required
11	HRM_getAllRelationInfo	This service shall be used to get all relation information from the home resource management process.	Required
12	HRM_getAllRelationInfoByDomain	This service shall be used to get relation information from the home resource management process by using domain.	Required
13	HRM_getRelationInfoByRelationID	This service shall be used to get relation information from the home resource management process by using relation identifier.	Required
14	HRM_getRelationInfoBySourceID	This service shall be used to get relation information from the home resource management process by using source ID.	Required
15	HRM_regUserEvent	This service shall be used to register interesting events to the home resource management process.	Required
16	HRM_unregUserEvent	This service shall be used to cancel registered events to the home resource management process.	Optional
17	HRM_getAllEventInfo	This service shall be used to get registered event information from the home resource management process.	Required
18	HRM_setAction	This service shall be used to control resources through the home resource management process.	Required
19	HRM_resourceProbing	This service shall be used to check whether the resource is alive through the home resource management process.	Optional
20	HRM_getResourceMap	This service shall be used to get log data about relation information in specific time from the home resource management process.	Required

6.3 Home resource management interface services

6.3.1 Request for user authentication

6.3.1.1 Description

This service shall be used to authenticate the user. For this service the user sends an ID and password for the login process. The Resource Management Process returns a True or False result to authenticate the user.

6.3.1.2 Sequence



6.3.1.3 Input parameters

Data type	Name	Description
String	UserID	User identifier consisting of character sets or integer number 0-9.
String	password	Password for user authentication

6.3.1.4 Output parameters

None.

6.3.1.5 Prerequisite service

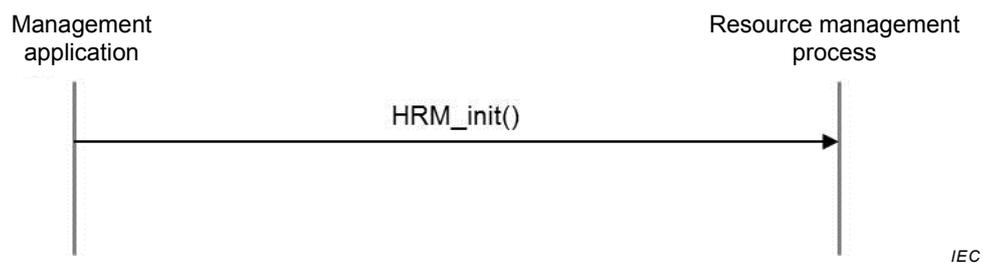
None.

6.3.2 Request for initial setup

6.3.2.1 Description

This service shall be used to initialise the home resource management process. If it succeeds, the Resource Management Process returns True; if not, it returns False.

6.3.2.2 Sequence



6.3.2.3 Input parameters

None.

6.3.2.4 Output parameters

None.

6.3.2.5 Prerequisite service

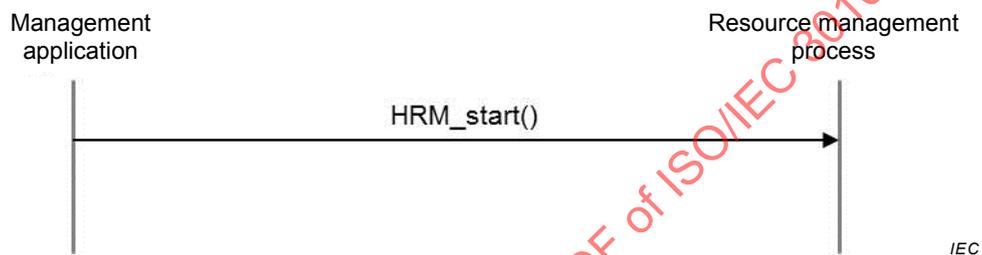
HRM_user_login()

6.3.3 Request for operation start

6.3.3.1 Description

This service shall be used to start the home resource management process. If it succeeds, the Resource Management Process returns True; if not, it returns False.

6.3.3.2 Sequence



6.3.3.3 Input parameters

None.

6.3.3.4 Output parameters

None.

6.3.3.5 Prerequisite service

HRM_user_login(), HRM_init()

6.3.4 Request for operation stop

6.3.4.1 Description

This service shall be used to stop the home resource management process.

6.3.4.2 Sequence



6.3.4.3 Input parameters

None.

6.3.4.4 Output parameters

None.

6.3.4.5 Prerequisite service

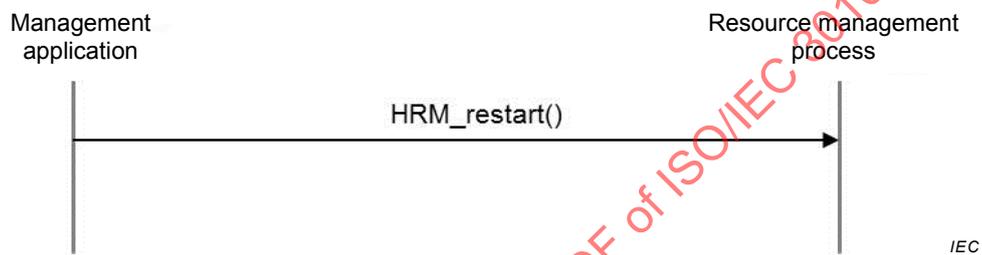
HRM_user_login(), HRM_init(), HRM_start()

6.3.5 Request for operation restart

6.3.5.1 Description

This service shall be used to restart the home resource management process. If it succeeds, the Resource Management Process returns True; if not, it returns False.

6.3.5.2 Sequence



6.3.5.3 Input parameters

None.

6.3.5.4 Output parameters

None.

6.3.5.5 Prerequisite service

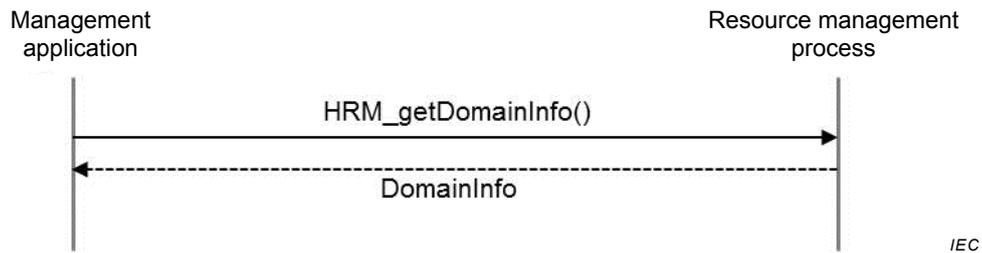
HRM_user_login(), HRM_init(), HRM_start(), HRM_stop()

6.3.6 Request for the inquiry of home resource domain

6.3.6.1 Description

This service shall be used to get resource domain information from the home resource management process. The domain information consists of a domain identifier and a name. The results are usually a number of resource domain data.

6.3.6.2 Sequence



6.3.6.3 Input parameters

None.

6.3.6.4 Output parameters

Data type	Name	Description
Int	DomainNum	Number of resource domain managed by home resource management process
DomainInfoType	DomainInfo[MAX_DOMAIN]	DomainInfoType is the structure type of domain ID and domain name. See also 6.4.1.

6.3.6.5 Prerequisite service

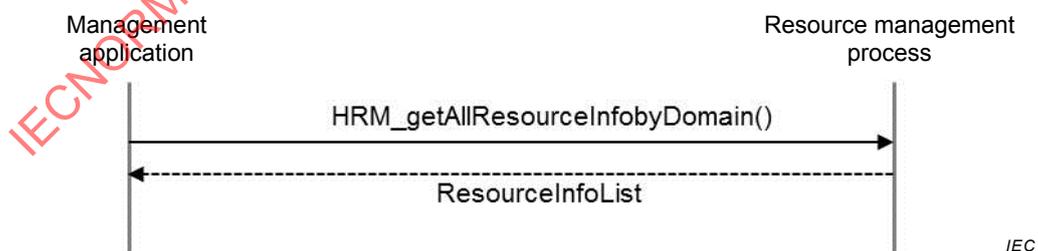
HRM_user_login(), HRM_init(), HRM_start()

6.3.7 Request for the inquiry of home resource information

6.3.7.1 Description

This service shall be used to get all resource information per domain from the home resource management process. The resource management process provides several different user interfaces by using name, ID and type so that the users can get suitable resource information according to the user requirements. The results are usually a number of resource information lists specified in 6.3.7.4.

6.3.7.2 Sequence



6.3.7.3 Input parameters

Data type	Name	Description
Char	DomainID	1 //Device domain 2 //Network domain 3 //Physical domain

6.3.7.4 Output parameters

Data type	Name	Description
Int	ResourceInfoNum	Number of resource object information
ResourceInfoList	ResourceInfo[NUM_INFO]	The list of resource information. ResourceInfoList consists of resource ID, resource type and resource name. See also 6.4.1.

Return value is TRUE when the output parameter has one more resource information; otherwise the return value is FALSE.

6.3.7.5 Prerequisite service

HRM_user_login(), HRM_init(), HRM_start()

6.3.8 Request for the inquiry of home resource information by Name

6.3.8.1 Description

This service shall be used to get resource information using the name from the home resource management process. The results are usually a number of resource information lists specified in 6.3.8.4.

6.3.8.2 Sequence



6.3.8.3 Input parameters

Data type	Name	Description
String	resourceName	Resource Name

6.3.8.4 Output parameters

Data type	Name	Description
Int	ResourceInfoNum	Number of resource object information
ResourceInfoType	ResourceInfo[NUM_INFO]	The list of resource information. ResourceInfoType consists of resource ID, resource type and resource name. See also 6.4.1.

6.3.8.5 Prerequisite service

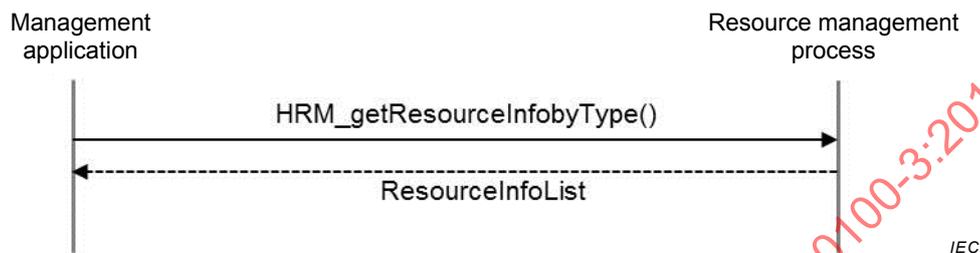
HRM_user_login(), HRM_init(), HRM_start()

6.3.9 Request for the inquiry of home resource information by type

6.3.9.1 Description

This service shall be used to get resource information using type from the home resource management process. The results are usually a number of resource information lists specified in 6.3.9.4.

6.3.9.2 Sequence



6.3.9.3 Input parameters

Data type	Name	Description
String	resourceType	Resource Type

6.3.9.4 Output parameters

Data type	Name	Description
Int	ResourceInfoNum	Number of resource object information
ResourceInfoType	ResourceInfo[NUM_INFO]	The list of resource information. ResourceInfoType consists of resource ID, resource type and resource name. See also 6.4.1.

6.3.9.5 Prerequisite service

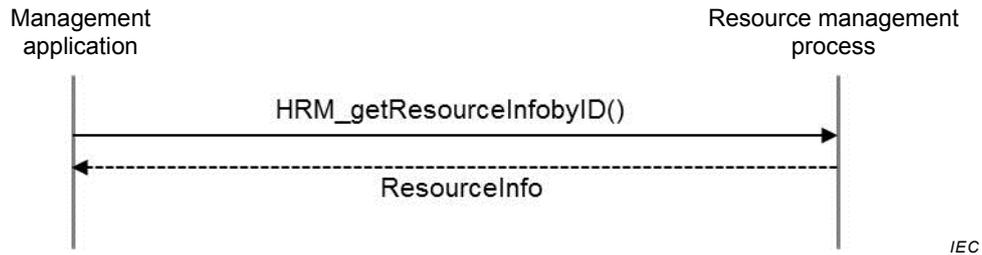
HRM_user_login(), HRM_init(), HRM_start()

6.3.10 Request for the inquiry of home resource information by ID

6.3.10.1 Description

This service shall be used to get resource information using the ID from the home resource management process. The result is specific resource information that has the user requested ID.

6.3.10.2 Sequence



6.3.10.3 Input parameters

Data type	Name	Description
ResourceID	resourceID	Resource identifier

6.3.10.4 Output parameters

Data type	Name	Description
ResourceInfoType	ResourceInfo	ResourceInfoType consists of resource ID, resource type and resource name. See also 6.4.1.

Return value is TRUE when output parameter succeeds, otherwise the return value is FALSE.

6.3.10.5 Prerequisite service

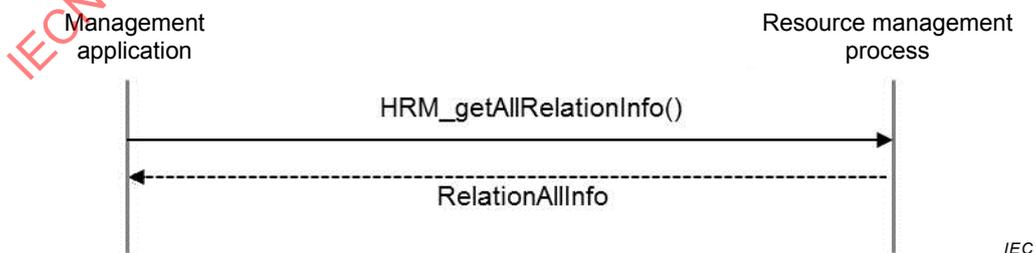
HRM_user_login(), HRM_init(), HRM_start()

6.3.11 Request for the inquiry of home relation information

6.3.11.1 Description

This service shall be used to get relation information from the home resource management process. The resource management process provides several different user interfaces by using domain resourceID and sourceID so that the user can get suitable relation information according to the user requirements. The results are usually a number of relation information lists specified in 6.3.11.4.

6.3.11.2 Sequence



6.3.11.3 Input parameters

None.

6.3.11.4 Output parameters

Data type	Name	Description
Int	RelationInfoNum	Number of relation object information
RelationAllInfoType	relationAllInfo[NUM_INFO]	All relation object information. It consists of domain identifier and the list of relation object information.

6.3.11.5 Prerequisite service

HRM_user_login(), HRM_init(), HRM_start()

6.3.12 Request for the inquiry of home relation information by domain

6.3.12.1 Description

This service shall be used to get relation information per domain from the home resource management process. The results are usually a number of relation information lists specified in 6.3.12.4.

6.3.12.2 Sequence



6.3.12.3 Input parameters

Data type	Name	Description
char	domainID	1 //Device domain 2 //Network domain 3 //Physical domain

6.3.12.4 Output parameters

Data type	Name	Description
Int	RelationInfoNum	Number of relation object information
RelationInfoType	RelationInfo[NUM_INFO]	The list of relation object information. RelationInfo consists of relation identifier, source resource object information and the list of target resource objects by domain. See also 6.4.1.

6.3.12.5 Prerequisite service

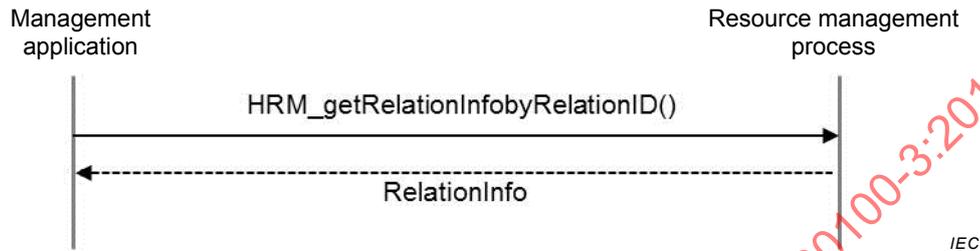
HRM_user_login(), HRM_init(), HRM_start()

6.3.13 Request for the inquiry of home relation information by relation ID

6.3.13.1 Description

This service shall be used to get relation information using the relation ID from the home resource management process. The result is specific relation information that has the user requested relation ID.

6.3.13.2 Sequence



6.3.13.3 Input parameters

Data type	Name	Description
string	relation ID	Relation identifier

6.3.13.4 Output parameters

Data type	Name	Description
RelationInfoType	RelationInfo	RelationInfo consists of relation identifier, source resource object information and the list of target resource objects by domain. See also 6.4.1.

6.3.13.5 Prerequisite service

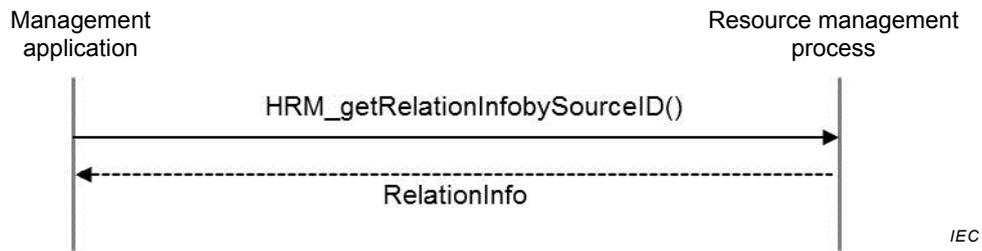
HRM_user_login(), HRM_init(), HRM_start()

6.3.14 Request for the inquiry of home relation information by source ID

6.3.14.1 Description

This service shall be used to get relation information using the source ID from the home resource management process. The result is specific relation information that has the user requested source ID.

6.3.14.2 Sequence



6.3.14.3 Input parameters

Data type	Name	Description
ResourceID	Source resource ID	Source resource Identifier

6.3.14.4 Output parameters

Data type	Name	Description
RelationInfoType	RelationInfo	RelationInfo consists of relation identifier, source resource object information and the list of target resource objects by domain. See also 6.4.1.

6.3.14.5 Prerequisite service

HRM_user_login(), HRM_init(), HRM_start()

6.3.15 Request for registration of event condition

6.3.15.1 Description

This service shall be used to register notable events to the home resource management process. To register events the user sends resourceID, objectID, event condition and value name of user interesting resource. The user can also register a number of user events.

6.3.15.2 Sequence



6.3.15.3 Input parameters

Data type	Name	Description
ResourceID	resourceID	A resource ID is a unique identifier to identify an object in a resource management process. It consists of a couple <domain id, object id>. See also 6.4.1.
String	objectID	Specific object identifier in the resource
String	condDesc	Event condition
String	valueName	Specific value name in the object

6.3.15.4 Output parameters

None.

6.3.15.5 Prerequisite service

HRM_user_login(), HRM_init(), HRM_start()

6.3.16 Request for cancellation of event condition

6.3.16.1 Description

This service shall be used to cancel registered events from the home resource management process. To cancel the event the user sends resourceID and objectID because the resource management can find the registered event using just two parameters without a condition description.

6.3.16.2 Sequence



6.3.16.3 Input parameters

Data type	Name	Description
ResourceID	resourceID	A resource ID is a unique identifier to identify an object in a resource management process. It consists of a couple <domain id, object id>. See also 6.4.1.
String	objectID	Specific object identifier in the resource.

6.3.16.4 Output parameters

None.

6.3.16.5 Prerequisite service

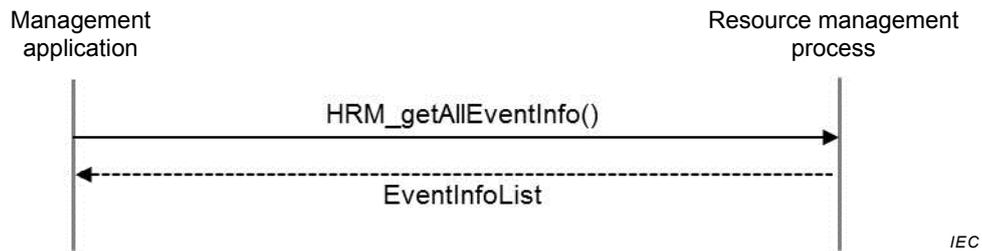
HRM_user_login(), HRM_init(), HRM_start(), HRM_regUserEvent()

6.3.17 Request for inquiry of event

6.3.17.1 Description

This service shall be used to get registered event information from the home resource management process. The results are usually a number of lists of registered event information.

6.3.17.2 Sequence



6.3.17.3 Input parameters

None.

6.3.17.4 Output parameters

Data type	Name	Description
Int	EventInfoNum	Number of event information
EventInfoType	eventInfo[NUM_EVENT]	The list of event information. EventInfoList consists of resource identifier, object identifier, value name, condition, the list of event conditions. See 6.4.1.

6.3.17.5 Prerequisite service

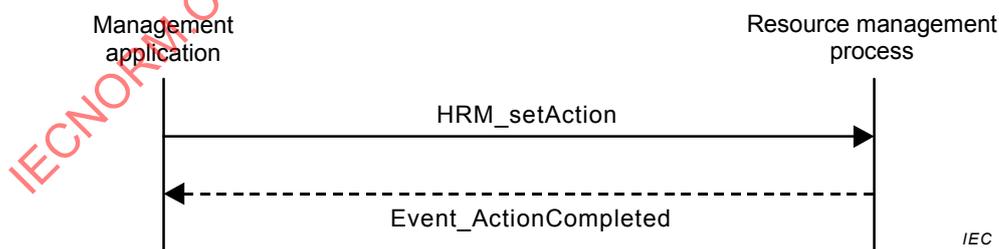
HRM_user_login(), HRM_init(), HRM_start()

6.3.18 Request for resource control

6.3.18.1 Description

This service shall be used to control resources through the home resource management process. For example, when the user would like to turn on the light, the user makes a request using setAction() API with resourceID, objectID and valuelist that consists of valuenam and value parameters. The result is that the setAction() is issued by the Event_ActionCompleted.

6.3.18.2 Sequence



6.3.18.3 Input parameters

Data type	Name	Description
ResourceID	ResourceID	A resource ID is a unique identifier to identify an object in a resource management process. It consists of a couple <domain id, object id>. See also 6.4.1.
String	ObjectID	Specific object identifier in the resource
ValueList	Valuelist	See also 6.4.1.

6.3.18.4 Output parameters

None.

6.3.18.5 Prerequisite service

HRM_user_login(), HRM_init(), HRM_start()

6.3.18.6 Event

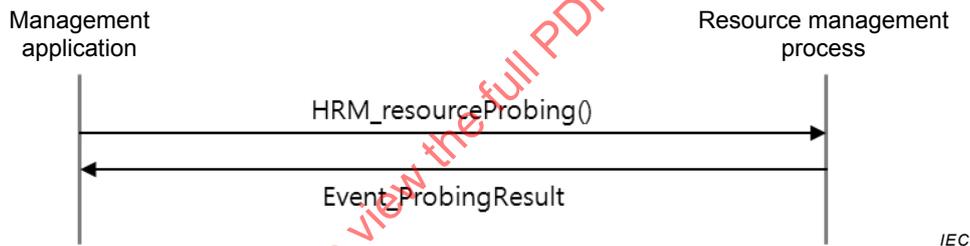
Event_ActionCompleted: See 6.4.2.

6.3.19 Request for resource probing

6.3.19.1 Description

This service shall be used to check whether the resource is alive through the home resource management process. The assignment of identifiers for the apartment complex shall be unique for that complex and may be provided by the complex manager. For example, if the user would like to check whether a specific light is alive, the user makes a request using resourceProbing() API with resourceID, objectID and processID parameters. The result of resourceProbing() comes from theEvent_ProbingResult.

6.3.19.2 Sequence



6.3.19.3 Input parameters

Data type	Name	Description
ResourceID	ResourceID	A resource ID is a unique identifier to identify an object in a resource management process. It consists of a couple <domain id, object id>. See also 6.4.1.
String	ObjectID	Specific object identifier in the resource.
Int	ProcessID	Specific process identifier.

6.3.19.4 Output parameters

None.

6.3.19.5 Prerequisite service

6.3.19.6 HRM_user_login(), HRM_init(), HRM_start()Event

Event_ProbingResult: See 6.3.2.

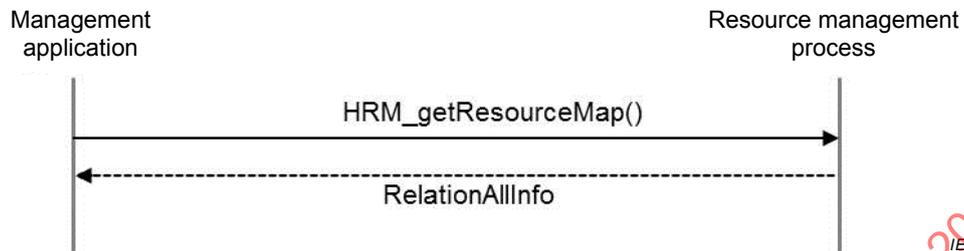
6.3.20 Request for log data about relation information

6.3.20.1 Description

This service shall be used to get log data about relationship information within a specific time from the home resource management process. The resource management process

periodically saves relation information into storage so that the user can get stored relation information using `getResourceMap()` API with specific time information. The results are usually a number of relation information lists specified in 6.3.20.4.

6.3.20.2 Sequence



6.3.20.3 Input parameters

Data type	Name	Description
String	Timestamp	Specific time for stored relation map

6.3.20.4 Output parameters

Data type	Name	Description
Int	relationAllInfoNum	Number of all relation object information
RelationAllInfoType	relationAllInfo[<code>NUM_INFO</code>]	RelationAllInfoType consists of domain identifier and the list of relation object information. See also 6.4.1.

6.3.20.5 Prerequisite service

`HRM_user_login()`, `HRM_init()`, `HRM_start()`

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6.4 Management interface services

6.4.1 Data structure of management interface

Data structure name	Data fields	Description
ResourceID	char domainID char objectID[24]	Management interface service uses ResourceID structure to get resource identifier information.
ResourceInfo	char domainID char objectID[24] ResourceType resourceType String objectNam int rFlag void* objectInfo void* nextResourceInfo	Management interface service uses ResourceInfo structure to get detailed resource information.
DominInfo	char domainID string domainName	Management interface service uses DomainInfo map to get domain information.
RelationInfo	unsigned int relationID ResourceInfo* srcResource TargetDomain targetDomain	Management interface service uses RelationInfo structure to get detailed relation information.
RelationAllInfo	Char domainID RelationInfoList* relationInfoList	Management interface service uses RelationAllInfo map to get all relation information.
EventConditionList	EConditionType conditionType EconditionOpType conditionOpType Double value	Management interface service uses EventConditionList structure to get event condition information in detail.
EventInfo	String ResourceID String ObjectID String ValueName String CondDesc EventConditionList EventConditionList	Management interface service uses EventInfo structure to get event information in detail.
ValueList	string name string value	Management interface service uses ValueList structure to get value information.
Event	Event_Map_Constructed Event_State_Changed Event_Add_Resource Event_Del_Resource Event_Add_Relation Event_Del_Relation Event_GetStatus Event_Error Event_ActionCompleted Event_ProbingResult	See also 6.4.2.

6.4.2 Event Name of management interface

Event name	Input parameters	Description
int Event_Map_Constructed	string timestamp	Management application registers MapConstructed event to receive a ready signal for the operation start of the resource management process.
int Event_State_Changed	string resourceID, string objectID, char* status, string timestamp	Management application registers StateChanged event to receive resource status when the status of resource is changed.
int Event_Add_Resource	string resourceID, string timestamp	Management application registers AddResource event to receive changed information when resources are added.
int Event_Del_Resource	string resourceID, string timestamp	Management application registers DelResource event to receive changed information when resources are deleted.
int Event_Add_Relation	RelationIDList reIIDList, string timestamp	Management application registers AddRelation event to receive changed information when relations are added.
int Event_Del_Relation	RelationIDList reIIDList, string timestamp	Management application registers DelRelation event to receive changed information when relations are deleted.
int Event_GetStatus	int status	Management application registers GetStatus event to receive resource's status.
Int Event_Error	string resourceID, int errorType, string timestamp	Management application registers Error event to receive error information.
int Event_ActionCompleted	string resourceID, string objectID, ValueList valuelist	Management application registers ActionCompleted event to receive results about resource control function.
int Event_ProbingResult	string resourceID, int processID, int probingResult	Management application registers ProbingResult event to receive results about resource probing function.

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Annex A (informative)

Interface schema for physical space information provider (example)

Annex A contains an example of a resource provider interface (HRPI) schema organised by resource domain types.

```

<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xsd:simpleType name="PhysicalSpaceObjectType">
    <xsd:restriction base="xsd:string">
      <xsd:enumeration value="APT"/>
      <xsd:enumeration value="Dong"/>
      <xsd:enumeration value="Ho"/>
      <xsd:enumeration value="Room"/>
      <xsd:enumeration value="Entrance"/>
      <xsd:enumeration value="Veranda"/>
      <xsd:enumeration value="Outdoor"/>
      <xsd:enumeration value="Balcony"/>
      <xsd:enumeration value="Wall"/>
      <xsd:enumeration value="Floor"/>
      <xsd:enumeration value="Ceiling"/>
      <xsd:enumeration value="Room"/>
      <xsd:enumeration value="Safe Guard"/>
      <xsd:enumeration value="Curtain Wall"/>
      <xsd:enumeration value="Pillar"/>
      <xsd:enumeration value="Stair"/>
      <xsd:enumeration value="Door"/>
      <xsd:enumeration value="Handrail"/>
      <xsd:enumeration value="Window"/>
      <xsd:enumeration value="TVport"/>
      <xsd:enumeration value="LANport"/>
      <xsd:enumeration value="Powerport"/>
      <xsd:enumeration value="NetworkCable"/>
      <xsd:enumeration value="Pipe"/>
      <xsd:enumeration value="Furniture"/>
      <xsd:enumeration value="BuiltinDevice"/>
      <xsd:enumeration value="Elevator"/>
      <xsd:enumeration value="Unknown"/>
    </xsd:restriction>
  </xsd:simpleType>
  <xsd:complexType name="CoordinateType">
    <xsd:attribute name="X" type="xsd:float"/>
    <xsd:attribute name="Y" type="xsd:float"/>
    <xsd:attribute name="Z" type="xsd:float"/>
  </xsd:complexType>
  <xsd:complexType name="RenderingInfoType">
    <xsd:sequence>
      <xsd:element name="MeshObjectID" type="xsd:string"/>
      <xsd:element name="Position" type="CoordinateType"
minOccurs="0"/>
      <xsd:element name="Scale" type="CoordinateType" minOccurs="0"/>
      <xsd:element name="Rotation" type="CoordinateType"
minOccurs="0"/>
      <xsd:element name="Min" type="CoordinateType" minOccurs="0"/>
    </xsd:sequence>
  </xsd:complexType>

```

```

        <xsd:element name="Max" type="CoordinateType" minOccurs="0"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="ObjectPropertyType">
    <xsd:sequence>
        <xsd:element name="PropertyNo" type="xsd:integer"/>
        <xsd:element name="PropertyName" type="xsd:string"/>
        <xsd:element name="PropertyValue" type="xsd:string"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="ObjectPropertyListType">
    <xsd:sequence maxOccurs="unbounded">
        <xsd:element name="ObjectProperty" type="ObjectPropertyType"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="AddressType">
    <xsd:sequence>
        <xsd:element name="AptName" type="xsd:string"/>
        <xsd:element name="BuildingName" type="xsd:string"/>
        <xsd:element name="RoomName" type="xsd:string"/>
        <xsd:element name="street" type="xsd:string" minOccurs="0"/>
        <xsd:element name="city" type="xsd:string" minOccurs="0"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="SpaceRelationType">
    <xsd:complexContent>
        <xsd:extension base="AddressType">
            <xsd:sequence>
                <xsd:element name="RoomName" type="xsd:string"/>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="ArchitectureRelationType">
    <xsd:complexContent>
        <xsd:extension base="AddressType">
            <xsd:sequence>
                <xsd:element name="RoomName" type="xsd:string"/>
                <xsd:element name="WallName" type="xsd:string"/>
                <xsd:element name="OtherWallName1"
type="xsd:string"/>
                <xsd:element name="OtherWallName2"
type="xsd:string"/>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="NetworkCableRelationType">
    <xsd:sequence>
        <xsd:element name="ParentNetworkName" type="xsd:string"/>
        <xsd:element name="ChildNetworkName" type="xsd:string"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="Facility2RelationType">
    <xsd:complexContent>
        <xsd:extension base="AddressType">
            <xsd:sequence>
                <xsd:element name="RoomName" type="xsd:string"/>
                <xsd:element name="WallName" type="xsd:string"/>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>

```

```

                <xsd:element name="FaciltyName" type="xsd:string"/>
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="FacilityRelationType">
    <xsd:choice>
        <xsd:element name="NetworkCableRelation"
type="NetworkCableRelationType"/>
        <xsd:element name="Facility2Relation" type="Facility2RelationType"/>
    </xsd:choice>
</xsd:complexType>
<xsd:complexType name="ObjectRelationInfoType">
    <xsd:choice>
        <xsd:element name="SpaceRelation" type="SpaceRelationType"/>
        <xsd:element name="ArchitectureRelation"
type="ArchitectureRelationType"/>
        <xsd:element name="FacilityRelation" type="FacilityRelationType"/>
    </xsd:choice>
</xsd:complexType>
<xsd:complexType name="DrawingFileInfoType">
    <xsd:sequence>
        <xsd:element name="FileName" type="xsd:string"/>
        <xsd:element name="LocationURI" type="xsd:string"/>
        <xsd:element name="FileSize" type="xsd:integer"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="PhysicalSpaceObjectType">
    <xsd:sequence>
        <xsd:element name="ObjectName" type="xsd:string"/>
        <xsd:element name="ObjectType"
type="PhysicalSpaceObjecttypeType"/>
        <xsd:element name="ObjectID" type="xsd:string"/>
        <xsd:element name="MeshObjectID" type="xsd:string"/>
        <xsd:element name="ObjectHandle" type="xsd:string"/>
        <xsd:element name="Rederinfo" type="RenderingInfoType"
minOccurs="0"/>
        <xsd:element name="ObjectPropertyList" minOccurs="0">
            <xsd:complexType>
                <xsd:complexContent>
                    <xsd:extension base="ObjectPropertyListType">
                        <xsd:attribute name="NumOfProperty"
type="xsd:integer" use="required"/>
                    </xsd:extension>
                </xsd:complexContent>
            </xsd:complexType>
        </xsd:element>
        <xsd:element name="ObjectRelationInfo"
type="ObjectRelationInfoType" minOccurs="0"/>
        <xsd:element name="DrawingFileInfo" type="DrawingFileInfoType"
minOccurs="0"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="PhysicalSpaceObjectListType">
    <xsd:sequence maxOccurs="unbounded">
        <xsd:element name="PhysicalSpaceObject"
type="PhysicalSpaceObjectType"/>
    </xsd:sequence>
</xsd:complexType>

```

```

<xsd:complexType name="MeshObjectType">
  <xsd:sequence>
    <xsd:element name="MeshObjectID" type="xsd:string"/>
    <xsd:element name="MaterialName" type="xsd:string"/>
    <xsd:element name="MeshFileName" type="xsd:string"/>
    <xsd:element name="MeshUnit" type="xsd:string"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="MeshObjectListType">
  <xsd:sequence maxOccurs="unbounded">
    <xsd:element name="MeshObject" type="MeshObjectType"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="PhysicalSpaceDescriptionType">
  <xsd:sequence>
    <xsd:element name="PhysicalSpaceObjectList">
      <xsd:complexType>
        <xsd:complexContent>
          <xsd:extension
base="PhysicalSpaceObjectListType">
            <xsd:attribute
name="NumOfPhysicalSpaceObject" type="xsd:integer" use="required"/>
          </xsd:extension>
        </xsd:complexContent>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="MeshObjectList">
      <xsd:complexType>
        <xsd:complexContent>
          <xsd:extension base="MeshObjectListType">
            <xsd:attribute name="NumOfMeshObject"
type="xsd:integer" use="required"/>
          </xsd:extension>
        </xsd:complexContent>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>
<xsd:element name="HomeResource">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element name="PhysicalSpaceDescription"
type="PhysicalSpaceDescriptionType"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
</xsd:schema>

```