ISO/IEC 10192-4-2

Edition 1.0 2024-08

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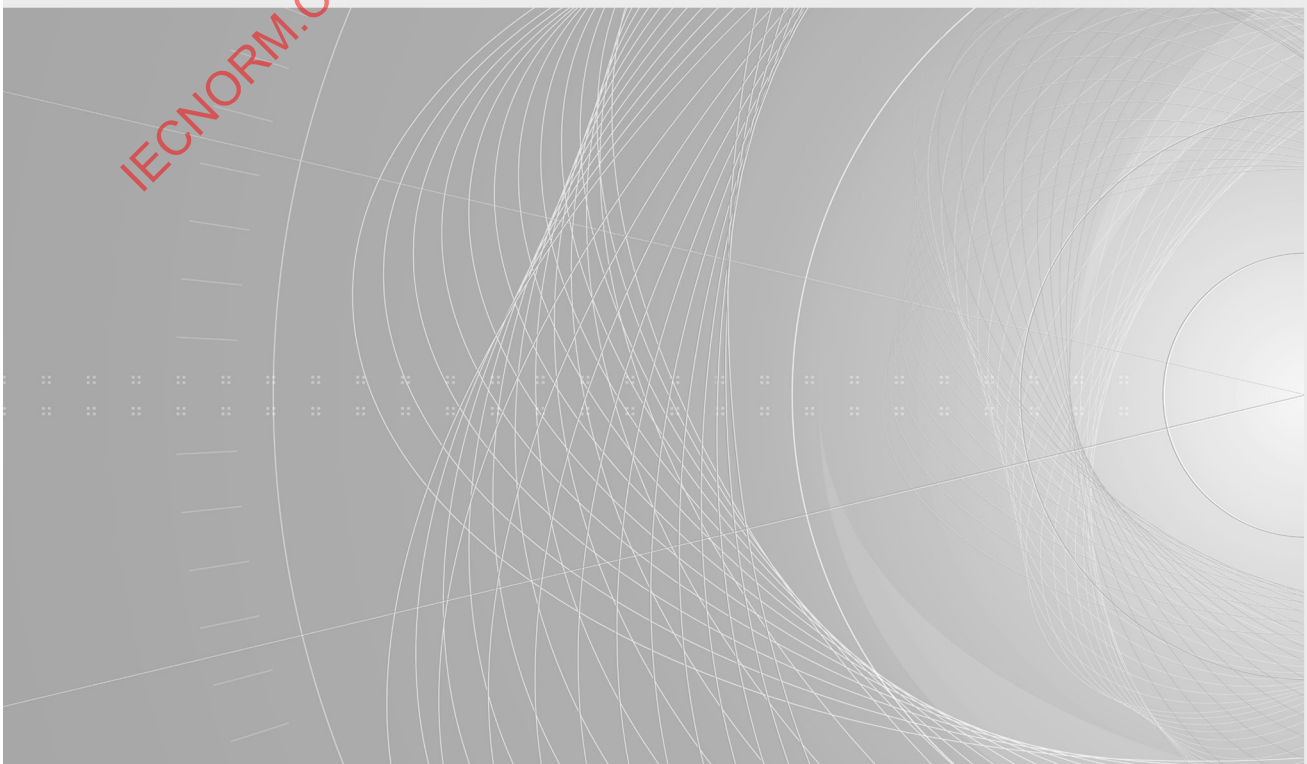
Information technology – Home Electronic System (HES) interfaces – Part 4-2: Common user interface and cluster-to-cluster interface to support interworking among home cluster systems – Interfaces, services and objects



ISO/IEC 10192-4-2:2024-09(en)

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) INTERFACES –

Part 4-2: Common user interface and cluster-to-cluster interface to support interworking among home cluster systems – Interfaces, services and objects

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The text of this International Standard is based on the following documents:

Draft	Report on voting
JTC1-SC25/3221/CDV	JTC1-SC25/3263/RVC

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

The language used for the development of this International Standard is English.

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This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

A list of all parts in the ISO/IEC 10192 series, published under the general title *Information technology – Home Electronic System (HES) interfaces*, can be found on the IEC website.

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INTRODUCTION

A home cluster system is implemented by interconnecting several devices to deliver one or more applications. A cluster can function independently of other clusters. Cluster devices include sensors, actuators, a controller, and user interfaces. Multiple home cluster systems can be installed and operated in a single home for the following reasons.

- There are various types of application domains in the home such as lighting, safety, air conditioning, telecommunications, audio and video, etc. One or more applications are implemented by the constituents of a cluster. Therefore, if a user purchases several applications, they will be implemented by one or more home cluster systems.
- Home application vendors usually provide systems implemented in clusters of required devices. Depending on the user's needs, several application systems, possibly from different manufacturers, can be installed in a home as separate clusters.

A customer can access the functions provided by a cluster via a user interface associated with that cluster. With multiple clusters it is important for a user to learn how to operate a range of different interfaces. This document provides the cluster-to-cluster interworking foundation necessary for a single common user interface to manage applications in multiple clusters.

Application-to-application and the resulting device-to-device collaboration are essential for providing integrated services in a multi-device Home Electronic System (HES) environment. For example, if a fire monitoring system detects a fire, it is important that the indoor lights are turned on and the fire announcement is broadcast through available speakers in the house for prompt evacuation of the residents, the ventilation blowers are stopped to avoid spreading the fire, and the public fire service is contacted. This needs collaboration among fire detectors, indoor lights, speakers, HVAC and telecommunication devices. If the devices are located in different clusters, cluster-to-cluster interworking is essential for collaboration among them.

In practice, a safety monitoring cluster can send out a fire-detected message and a lighting cluster can be ready to activate a lighting scene that alerts the occupant by turning on or flashing the appropriate lights. However, these two clusters usually do not have a way to communicate with each other especially if supplied by different manufacturers possibly using different protocols and messages. This document solves that problem by providing the necessary interworking and interoperability functionality to ensure that the clusters can work together.

When the cluster systems are in different HANs or use different protocols, interworking is accomplished using the HES gateway (ISO/IEC 15045 series) and related interoperability standards (ISO/IEC 18012 series). For interworking between cluster systems using the same protocols and belonging to the same HAN, HES gateway services can optionally be used if the cybersecurity, privacy and safety features of the HES gateway are desired. The functions specified in this document do not require the Internet to operate but can connect to the Internet if the application requires.

This document specifies the architecture for interworking home cluster systems where

– the home cluster systems use different HANs or protocols, or
– the home cluster systems use the same HANs and protocols plus the services of the HES gateway.

Figure 1 shows the core interoperability and HES gateway standards. Figure 2 shows the common user interface series of standards designated ISO/IEC 10192-4, *Information technology – Home Electronic System (HES) interfaces – Common user interface and cluster-to-cluster interface to support interworking among home cluster systems*. ISO/IEC 10192-4 consists of three parts:

Part 4-1: Architecture

Part 4-2: Interfaces, services and objects

Part 4-3: Messaging

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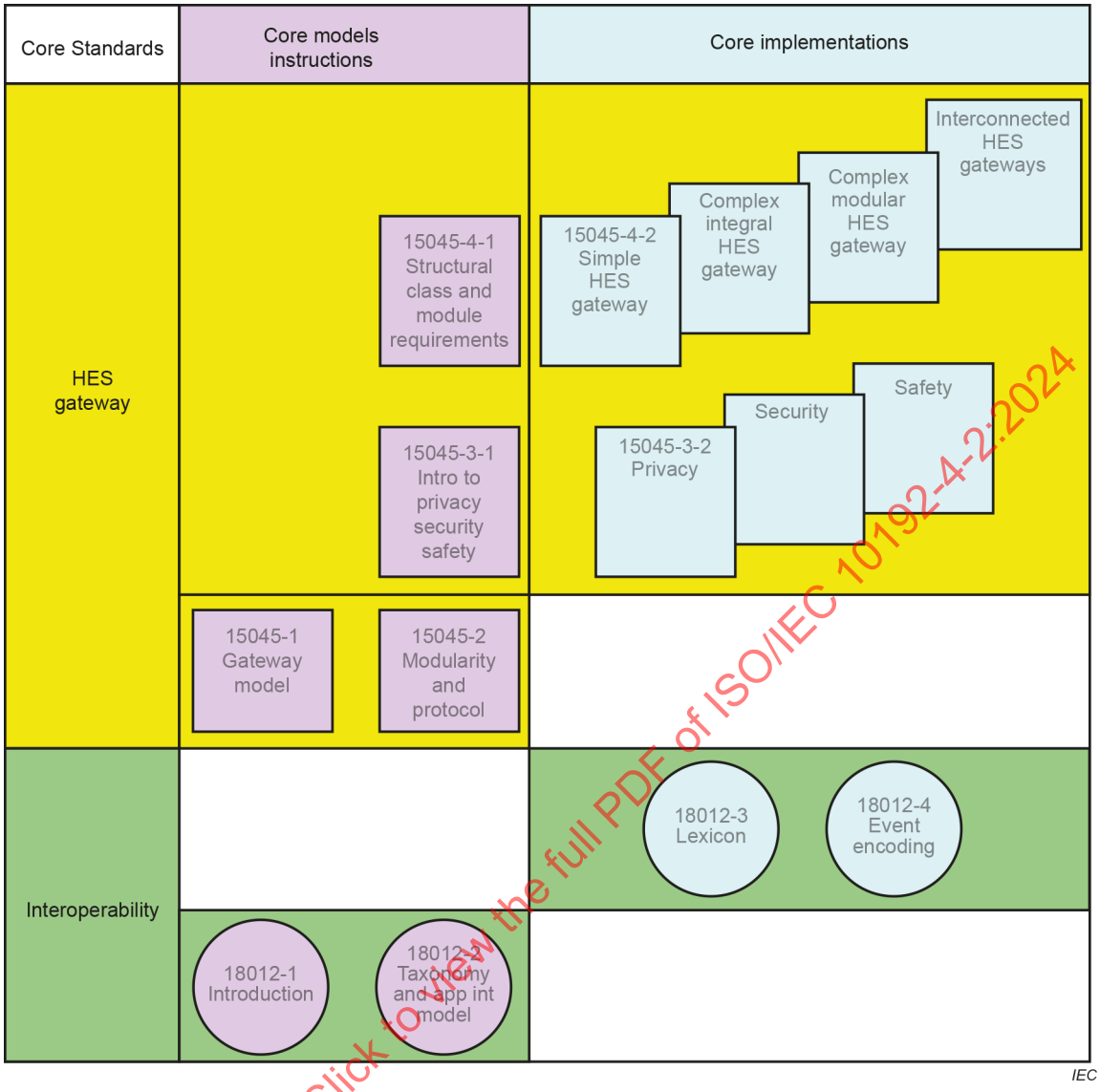

Figure 1 – Core interoperability and HES standards

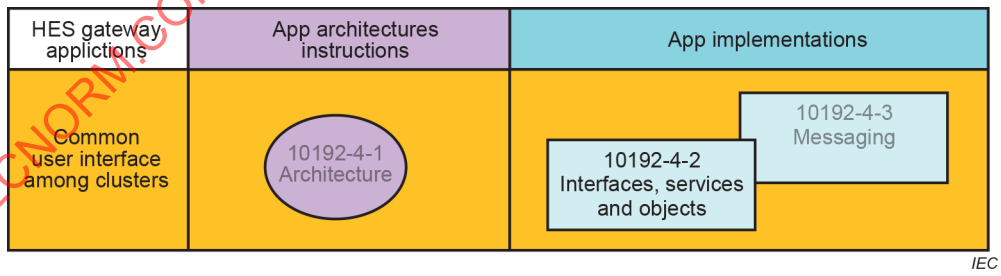

Figure 2 – HES gateway applications standards

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) INTERFACES –

Part 4-2: Common user interface and cluster-to-cluster interface to support interworking among home cluster systems – Interfaces, services and objects

1 Scope

This part of ISO/IEC 10192 specifies a control architecture, user interface, and service objects in the HES gateway to enable interworking among home cluster systems and interoperability among the applications supported by these cluster systems. The ISO/IEC 10192 series specifies a common user interface to these cluster-system applications. This common user interface provides input and output methods for user information exchange to access, monitor, control and coordinate applications running on home cluster systems.

This document specifies the application object, service and interface modules from the interoperability standard (ISO/IEC 18012 series) necessary for interworking and incorporation of these modules in the HES gateway (ISO/IEC 15045 series).

2 Normative references

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 10192-4-1, *Information technology – Home Electronic System (HES) interfaces – Part 4-1: Common user interface and cluster-to-cluster interface to support interworking among home cluster systems – Architecture*

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

ISO/IEC 15045-2, *Information technology – Home Electronic System (HES) gateway – Part 2: Modularity and protocol*

ISO/IEC 15045-3-1, *Information technology – Home Electronic System (HES) gateway – Part 3-1: Privacy, security, and safety – Introduction*

ISO/IEC 15045-3-2, *Information technology – Home Electronic System (HES) gateway – Part 3-2: Privacy, security, and safety – Privacy framework*

ISO/IEC 15045-4-1, *Information technology – Home Electronic System (HES) gateway – Part 4-1: Structure – Structural class and module requirements*

ISO/IEC 15045-4-2, *Information technology – Home Electronic System (HES) gateway – Part 4-2: Structure – Simple gateway*

ISO/IEC 18012-1, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 1: Introduction*

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ISO/IEC 18012-2, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 2: Taxonomy and application interoperability model*

ISO/IEC 18012-3, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 3: Lexicon*[1]

ISO/IEC 18012-4, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 4: Event encoding*[2]

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
access token
trusted object encapsulating the authority for a subject to access a resource

[SOURCE: ISO/IEC 29146:2016]

3.1.2
cluster controller
functional unit that manages the operation of a home cluster system

3.1.3
C2C interface
interface in a cluster that supports HAN communication for C2C interworking with an HES gateway by a cluster controller in a home cluster system

[SOURCE: ISO/IEC 10192-4-1:2022, 3.1.1]

3.1.4
C2C interworking
communications among home cluster systems to support coordination among them

3.1.5
common user interface
interface that provides input and output methods for user information exchange to access, monitor and control applications running on home cluster systems

3.1.6
CUI operational information
local user object and service that enable users to access, monitor, and control applications running on their home cluster system and to schedule coordination among them

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1 First edition under preparation. Stage at the time of publication: ISO/IEC CDV 18012-3:2024.

2 First edition under preparation. Stage at the time of publication: ISO/IEC CDV 18012-4:2024.

3.1.7
federation
group of entities that have agreed to form a union based on common properties that the entities can share

3.1.8
home cluster system
set of functional units under common control in a home environment that includes sensors, actuators, user interfaces, and a cluster controller

[SOURCE: ISO/IEC 10192-4-1:2022, 3.1.3]

3.1.9
ISEE group
group of interface modules, service modules and HES-CLME event encoding to support a particular application or operation

3.1.10
master CUI C2C interface
C2C interface of a home cluster system that includes CUI user objects that initiate actions on remote systems

[SOURCE: ISO/IEC 10192-4-1:2022, 3.1.4]

3.1.11
receptive CUI C2C interface
C2C interface of a home cluster system that manipulates the local cluster based upon receipt of CUI user objects from a remote master CUI

[SOURCE: ISO/IEC 10192-4-1:2022, 3.1.6]

3.1.12
user interface
functional system used specifically to interface the computer-based control system to the operator, maintenance personnel, or engineer

[SOURCE: IEC 62270:2013, 2.51, modified – In the definition, "engineer, etc." has been replaced with "or engineer".]

3.2 Abbreviated terms

API	application programming interface
C2C	cluster to cluster
CUI	common user interface
HAN	home area network
HES	home electronic system
HES-CLME	home electronic system – common language messaging exchange
HVAC	heating, ventilation, and air conditioning
ID	identifier
ISEE	interface (e.g. HAN and WAN interface modules), service (e.g. service modules), and event encoding (e.g. HES-CLME)
SSO	single sign-on
TLS	transport layer security

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4 Conformance

Home cluster systems that claim conformance to this document shall support the common user interface as specified in this document.

5 HES components for common user interface

The architecture for the common user interface (CUI) shall be one of the three alternatives specified in ISO/IEC 10192-4-1. The common user interface can be located in a cluster (alternative #1), a separate device (alternative #2), or a service module (alternative #3) in the HES gateway. Figure 3 (alternative #1), Figure 4 (alternative #2) and Figure 5 (alternative #3) show the architecture required to support the common user interface in each alternative. On the left side of the HES gateway in Figure 3 to Figure 5, there can be multiple home area networks (HANs) and multiple clusters on one HAN. The architectural models of the HES gateway shall be as specified in ISO/IEC 15045-1 and ISO/IEC 15045-2, structural classes shall be as specified in ISO/IEC 15045-4-1 and ISO/IEC 15045-4-2, and product interoperability shall be as specified in ISO/IEC 18012-1, ISO/IEC 18012-2, ISO/IEC 18012-3 and ISO/IEC 18012-4.

The parts marked with red in Figure 3 to Figure 5 indicate components added to support the common user interface.

The common user interface enables one local user interface to be used for multiple clusters in order to access objects and services in the clusters connected with the HES gateway and to allow collaboration and co-ordination among cluster applications, regardless of cluster type or manufacturer.

The cluster to cluster (C2C) interface in a cluster or a separate device specifies the transfer of information and procedures necessary over the HAN to operate other clusters. The C2C interface is supported by the C2C interworking application ISEE group in the HES gateway.

A cluster (alternative #1) or separate device (alternative #2) having the common user interface includes a master CUI C2C interface or a master CUI interface, respectively, that initiates CUI operational information. When the common user interface is implemented in the HES gateway (alternative #3), the HES gateway includes a service module containing common user interface service that emits CUI operational information.

A cluster that receives and reacts to CUI operational information includes a receptive CUI C2C interface. The master CUI C2C interface or the service module of the HES gateway containing common user interface service initiates the actions to the receptive CUI C2C interface.

The HES gateway includes HAN interface modules, service modules and HES-CLME event encoding to support the common user interface and collaboration among the clusters. To support C2C interworking, cooperation among events from different clusters is required. This cooperation is supported by the binding map service in the HES gateway that is specified in ISO/IEC 18012-3.

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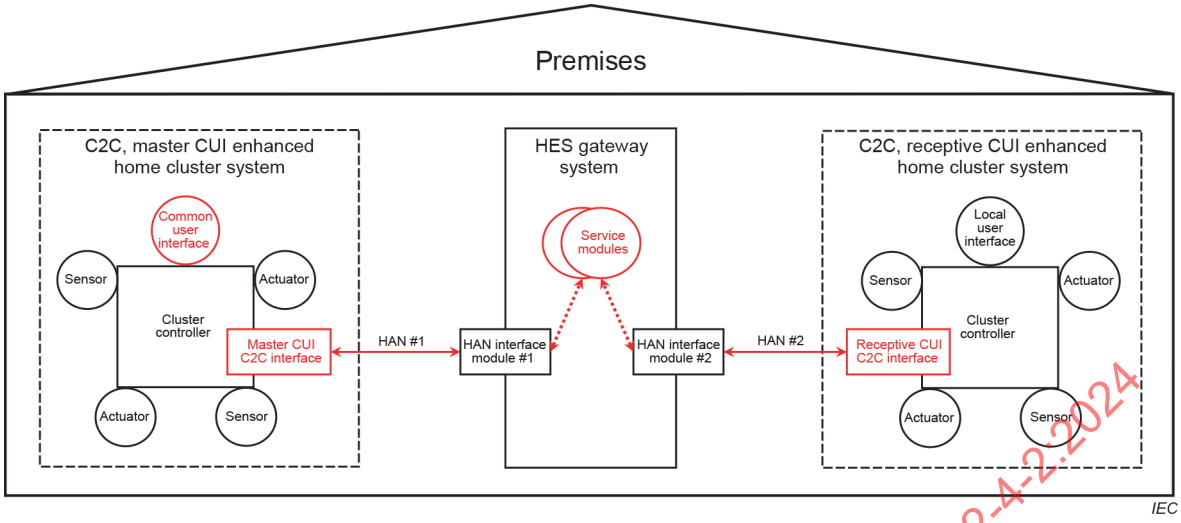

Figure 3 – CUI components of alternative #1: common user interface in a cluster

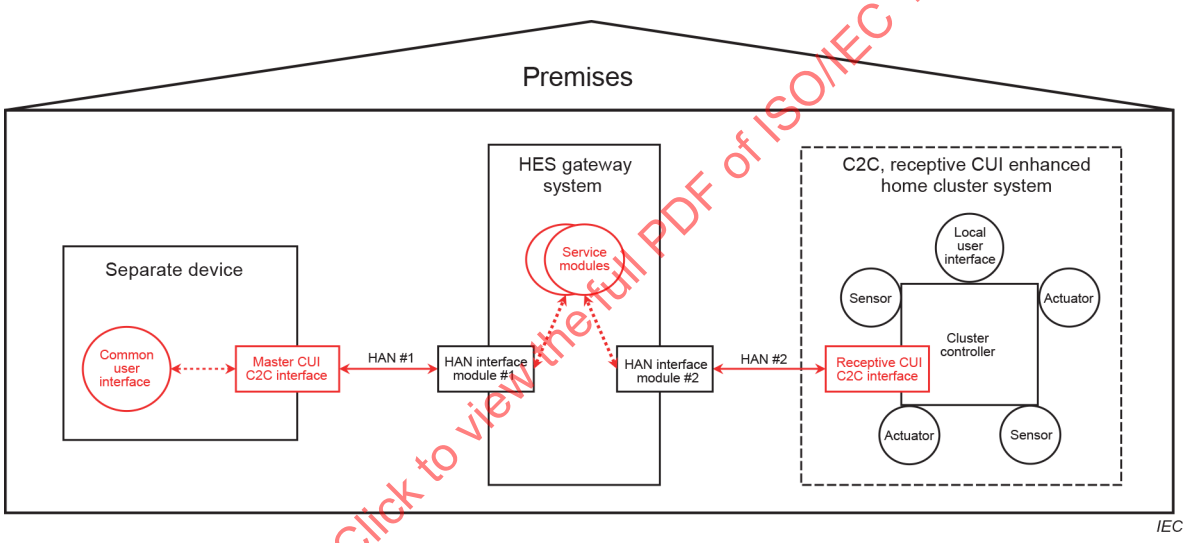

Figure 4 – CUI components of alternative #2: common user interface as a separate device

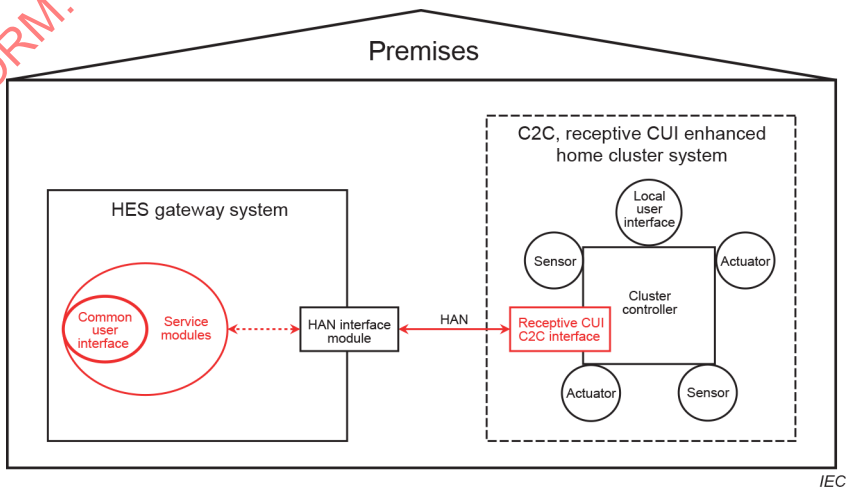

Figure 5 – CUI components of alternative #3: common user interface in a service module

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6 Common user interface

As shown in Figure 6, the common user interface interacts with CUI users via interactive media (e.g. audio, visual, gesture, touch and API) for input of the user's option selection and presentation of the results.

The common user interface exchanges CUI operational information about the selection and resulting actions with the receptive CUI cluster using internal cluster communications and C2C protocol messages over the HAN.

The CUI operational information, as shown in Figure 6, contains the equivalent information as the interactive media with the CUI users. This CUI operational information does not necessarily use standard HES lexicon when transported within the cluster or the connected HAN but uses internal cluster or native HAN protocol lexicons.

The common user interface performs translation between the interactive media and the CUI operational information for transport within the cluster. The C2C interface performs translation between the internal cluster and the connected HAN.

Standard HES lexicon of CUI operational information for use within the HES gateway is specified in ISO/IEC 18012-3.

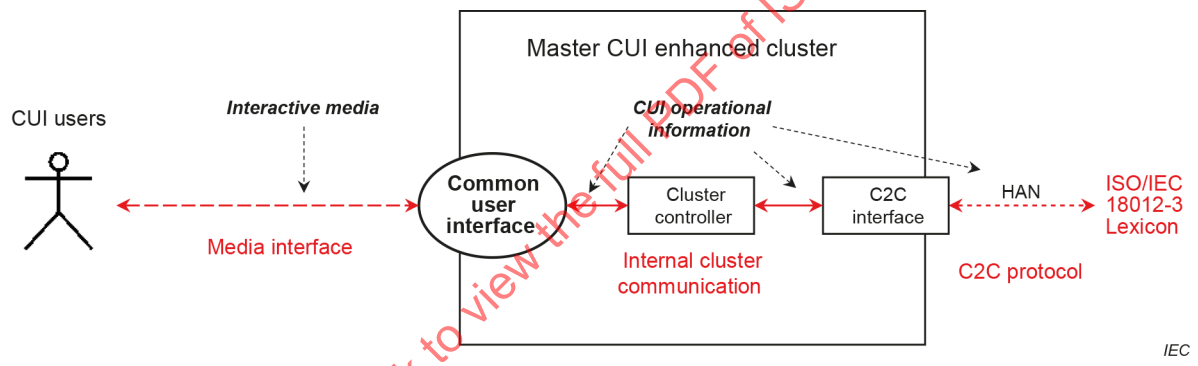

Figure 6 – Translation between CUI operational information and interactive media

7 CUI operational information

7.1 Usage

A typical home cluster system (before being upgraded to a "CUI enhanced" cluster) is shown in Figure 3 of ISO/IEC 10192-4-1:2022. It has a "local user interface" to access the local cluster functions. A key element of the user interface is the interaction with a person, "the user."

As shown in Figure 3 of this document, the "local user interface" has been upgraded to a "common user interface" in the CUI enhanced cluster ("C2C, master CUI enhanced"). The same underlying functionality for the user interface is provided (e.g. buttons, voice commands) but the targets of the functions would be other remote clusters. This document specifies user interface operations that can be transported to the remote clusters.

Similar operations occur for alternative #2 in Figure 4 and alternative #3 in Figure 5.

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There are some challenges to overcome in order to specify the common user interface. To standardize every button push, word uttered, and gesture would be unwieldy and overwhelming. With the wide variety of interactive media (audio, visual, gestures, etc.) that can be utilized, it can be a challenge and too restrictive to require the same interactive media for both the common user interface and the local user interface (in the remote location). In addition, user interfaces, even when using same the interactive media (e.g. visual display), have a wide range of resolutions and capabilities. To require the common user interface to match the local user interface (in the remote location) would unnecessarily restrict the usage of this document.

This document overcomes these challenges by specifying an HES lexicon for the presentation and the selection actions as they related to cluster communications, called common user interface (CUI) operational information.

Typically, a user is presented with a number of options for actions or for retrieving useful information. Visually this can be presented by a menu or a display of buttons. With audio, voice directions can direct the user to speak "yes" or "no", or coach the user to utter a name.

The selection of a user to activate actions can be touch, audio or hand gesture. There can be cases where the original local user interface for a cluster was one type of user interface, such as a touch screen, but the remote common user interface controlling the cluster is a very different type, such as voice control.

The CUI operational information is configured with two linked aspects consisting of the presentation to the user and the selection by the user. The presentation aspect provides information to the user about the options that are available and linked to control and information communication messages presented through the CUI operational information. The selection aspect accepts feedback from the user to activate the control and information messages through the CUI operational information.

Figure 7 shows an example of a user being presented with a visual display and the user responding with instructions entered on a touch screen.

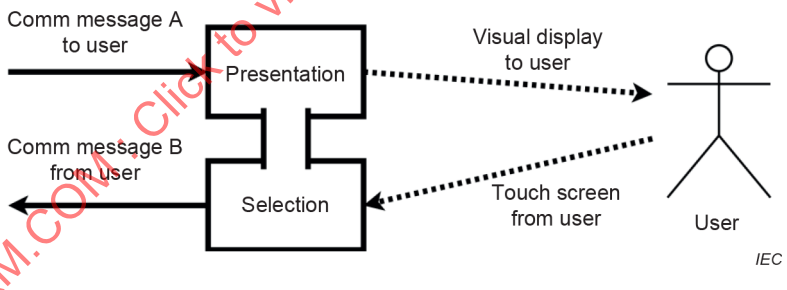

Figure 7 – Interactive visual and touch media

Figure 8 shows another example in which the user is presented with audio information and the user responds by providing instructions.

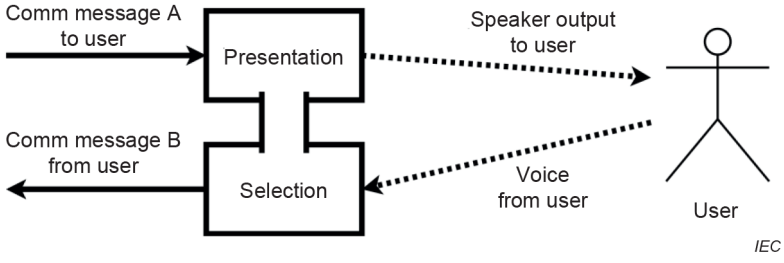

Figure 8 – Interactive speaker and voice media

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A key feature of these examples is that the same communication messages (A and B) are used for both cases, even though the users have completely different user experiences. This means that the common user interface is not required to be the same type of interface as the local user interface. This document can be used for a wide range of applications. The common user interface is not required to match the local user interface (at the remote location).

7.2 CUI operational information composition

As shown in Figure 7 and Figure 8, "Comm message A" is a configuration message to the User that utilizes the CUI operational information. The CUI operational information provides the presentation information to inform the User and also provides expectations for the selection that the User will ultimately perform.

The CUI operational information includes the choice of items to be presented using the standardized application domain as specified in ISO/IEC 18012-3. The CUI operational information also provides selection information for such things as the type of selector (e.g. radio) as specified in the "user interface" application domain in ISO/IEC 18012-3. The CUI operational information includes the ability to provide pre-selection of values (initial values). For more complex interactions, the CUI operational information can include a tree-type structure for main items and secondary items.

Rendering (e.g. how to display, fonts, audio, how it is to appear to the user, etc.) is a separate aspect that should be defined within each product.

The CUI operational information also indicates how the selection reply via the "Comm message B" is to be formulated (e.g. indication of status, command initiation) when the user selects a choice or inputs data (selection option), and how the resultant action is to be handled.

Static CUI operational information has predetermined functionality with real-time operations. For example, a three-position physical selector can have "light off", "mid-level light" and "light full" operations predetermined. Complex user interface operations can also be accomplished with static CUI operational information. HES-CLME messaging transfers the status of the CUI operational information among modules. No new CUI operational information is created in real time, so the HES-CLME messaging requirements are lower.

Dynamic CUI operational information allows for functionality to change as required. For example, the functions displayed on a screen (e.g. text on a button) can change depending on the operations performed in real time. In such cases, HES-CLME messaging would require the creation of new CUI operational information "on the fly". Such objects would need appropriate security protection techniques to ensure safe and interoperable operations and would need higher requirements for HES-CLME messaging. The present versions of the HES gateway and interoperability standards do not allow for dynamic creation of user objects, but such capability is anticipated to be added in future versions.

7.3 Delivery of CUI operational information

The CUI operational information about the selection option chosen by the user at the common user interface (see "Comm message B from user" in Figure 7 and Figure 8) is transported from the master CUI system (i.e. the cluster, the separate device or the HES gateway) via the HES gateway to the receptive CUI enhanced cluster. The CUI operational information about the resultant action (such as success or failure) in the receptive CUI enhanced cluster is transported via the HES gateway back to the master CUI system to be presented to the user.

The CUI operational information is delivered by CUI messaging. The CUI messaging will be specified in ISO/IEC 10192-4-3.

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7.4 Interoperability of heterogeneous CUI operational information

Figure 9 shows the interoperability architecture of the HES gateway that enables interworking between CUI systems (e.g. cluster, separate device) that can use their own lexicons for CUI operational information. The interoperability architecture is based on the ISO/IEC 18012 series. The HES gateway enables interworking between the heterogeneous CUI systems. This architecture enables the common user interface by combining cluster products from different vendors.

CUI messages including CUI operational information for selection option and resultant actions are delivered between the CUI systems and the HES gateway using the C2C protocol.

The HAN interface module #1 translates CUI operational information #1 in a C2C protocol message from the master CUI system into the standard HES gateway CUI operational information. The HES gateway CUI operational information is then included in the HES-CLME message and converted via the service modules into a new HES-CLME message to the HAN interface module #2. The HAN interface module #2 translates the standard HES CUI operational information into the CUI operational information #2 that is included in the C2C protocol message and finally transported to the receptive CUI cluster.

CUI operational information #2 in a C2C protocol message from the receptive CUI cluster is translated in the same way into CUI operational information #1 in a C2C protocol message back to the master CUI system.

The HES CUI operational information lexicon is specified in ISO/IEC 18012-3, and its use is described in this document. The detailed internal messaging in the HES gateway for the common user interface will be specified in ISO/IEC 10192-4-3.

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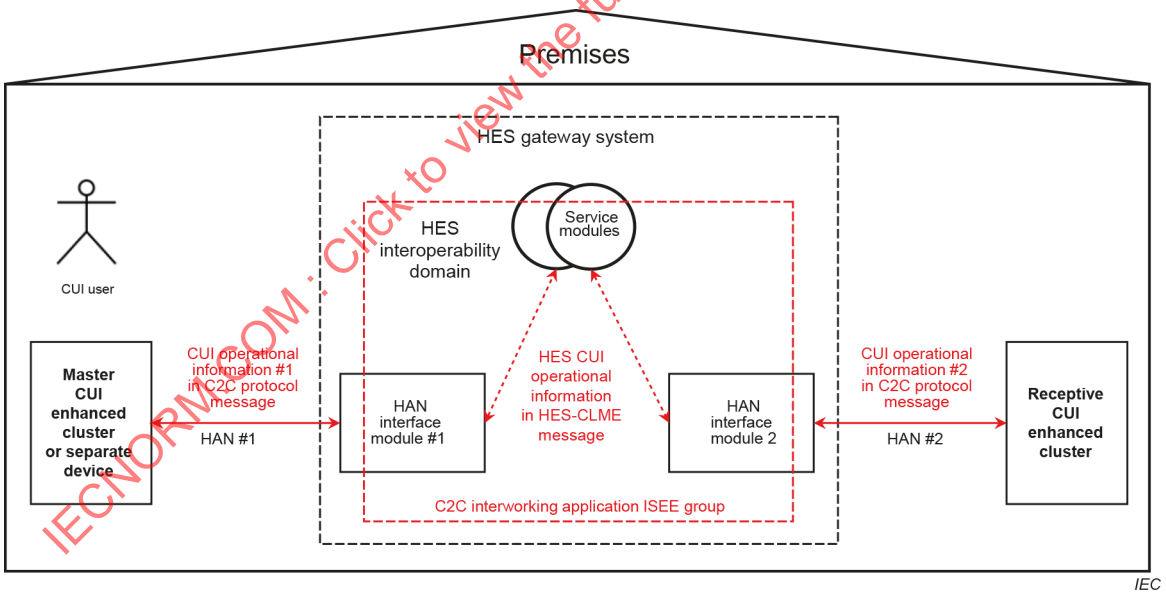

Figure 9 – Interoperability of heterogenous CUI systems

7.5 CUI selection and resultant actions for handling devices

7.5.1 General

The users select an option of CUI operational information and receive the results through the common user interface for retrieval and update of information, and notification of event on cluster devices related to the users. These selection and resultant actions can support the cases described in 7.5.2 to 7.5.4.

The selection and resultant actions may be combined to form high-level tasks or functionalities for one or more applications that utilize the common user interface. This combination is decided by the application developers and is outside the scope of this document.

7.5.2 Acquisition of user's set of devices

The user obtains a complete list (e.g. device identification) of cluster devices that are related to the user and which the user can access.

7.5.3 Synchronization of user devices

After obtaining the complete list of cluster devices related to the user, the user can subscribe to an event in the complete set of devices or in units of devices in this set.

Subscribing to an event of the complete set of devices enables the user to be notified whenever a new device in the cluster is added or an existing device is removed. When a new device is added, the event includes identification of the added device. The user can retrieve information about this device by using this device identification.

Subscription to an event of a device enables notification to the user whenever there is a change in the state of the device in clusters (e.g. when the device becomes "in service" or "out of service").

7.5.4 Handling of request and response for user devices

The user can retrieve and update information about cluster devices related to the user.

8 Secure C2C connection

A cluster may use secure connections with external peers such as clusters, the HES gateway or other devices to allow transmitting information without risk of eavesdropping, data theft and message forgery. If the secure connection is required, the C2C protocol shall support the transport layer security (TLS) protocol specified in IETF RFC 8446. In this case, clusters and HES gateways need authentication and encryption keys to encrypt the passing information. The authentication and encryption keys are contained in server certificates. There are several optional modes and extensions in TLS 1.3 specification – such as the use of pre-shared keys (PSKs), and client authentication through client certificates – that include the possibility of additional objects. This document covers only the basic operation of TLS. Such optional and extension operations are outside the scope of this document.

TLS-based secure connection is used between the C2C interface and the HAN interface module. Figure 10 illustrates the TLS configuration for C2C interworking.

The TLS connection request is initiated from a cluster to the HES gateway. Therefore, the HAN interface module connected to the cluster plays the role of the TLS server. The C2C interface of the cluster plays the role of the TLS client.

The TLS server obtains a server certificate from the certificate authority related to the HES gateway system and stores it in a secure data storage. The certificate authority service is provided by the authorization and authentication service of the HES gateway system, as specified in ISO/IEC 18012-3. The post-market credentials configuration data table provided by the authorization and authentication service is used as the secure data storage.

The C2C authorization controller service and C2C authorization processor service are responsible for TLS processing and server certificate management in the HES gateway.

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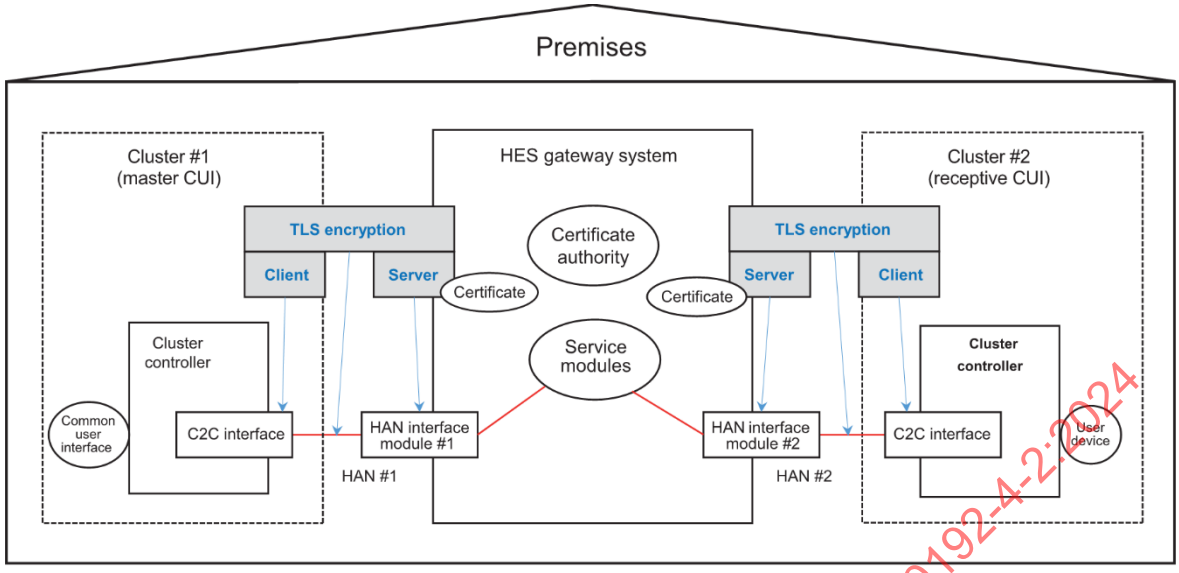

Figure 10 – TLS based C2C secure connection

9 C2C authorization

9.1 General

The C2C authorization enables the master CUI system to obtain access to resources in the receptive CUI clusters, on behalf of a resource owner (i.e. CUI user) by orchestrating an approval interaction between the resource owner and the receptive CUI cluster. The C2C protocol shall support the approval interaction for C2C authorization.

The approval interaction includes user identity federation and the OAuth 2.0 authorization framework with the use of access tokens. Access tokens are credentials used for the master CUI system to access resources in the receptive CUI clusters. Access tokens represent specific scopes and durations of access, granted by the resource owner. Access token attributes and the methods used to access the resources are beyond the scope of this document and are specified in IETF RFC 6750.

User identity federation is the process of linking a user's electronic identity stored across multiple systems, such as clusters, the HES gateway, and a separate device in a home. This federation process is included in the process of single sign-on (SSO), in which a user's single authentication is trusted across other systems in a home.

User identity federation utilizes the authorization and authentication service specified in ISO/IEC 18012-3. Subclause 9.2 describes the structure of the tables necessary for user identity federation in the HES gateway.

The OAuth 2.0 authorization framework, specified in IETF RFC 6497, enables a third-party application to obtain limited access to a resource server.

9.2 User identity federation

This subclause 9.2 describes the table structure for user identity federation in the HES gateway. These tables are provided by the authorization and authentication service specified in ISO/IEC 18012-3.

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A user may have their own account and user objects in a cluster. The user objects in the cluster are associated with the user account in the cluster. When a user at the master CUI system tries to access his or her user object in the receptive clusters, the receptive cluster identifies the user to check if the user has proper access rights to the user object. To support this, the user identity on the master CUI system shall be provided and converted to the user identity on the receptive cluster. For this conversion, all user accounts of a user shall be federated to be linked together in advance. Messaging flow for this user identity federation will be specified in ISO/IEC 10192-4-3.

Figure 11 illustrates the configuration of the user identities and the devices registered to the user in the clusters. The HES gateway manages the user identity federation table to link these user identities. Figure 12 shows configuration of the user identity federation table.

In this configuration, the user has the user identities of "user1" (uniqueClassID #4 from Figure 12) in cluster #1 and "user2" (uniqueClassID #5) in cluster #2. Device #5 in cluster #1 is registered to the user and identified as netRefIndex #3 in the HES gateway. Device #3 in cluster #2 is registered to the user and identified as netRefIndex #4 in the HES gateway.

The arrangement and enhancement of the authorization and authentication service allows reference to:

– user1 alone (i.e. uniqueClassID: #4),
– user2 alone (i.e. uniqueClassID: #5), and
– the federation of user1 and user2 together (i.e. uniqueClassID: #6).

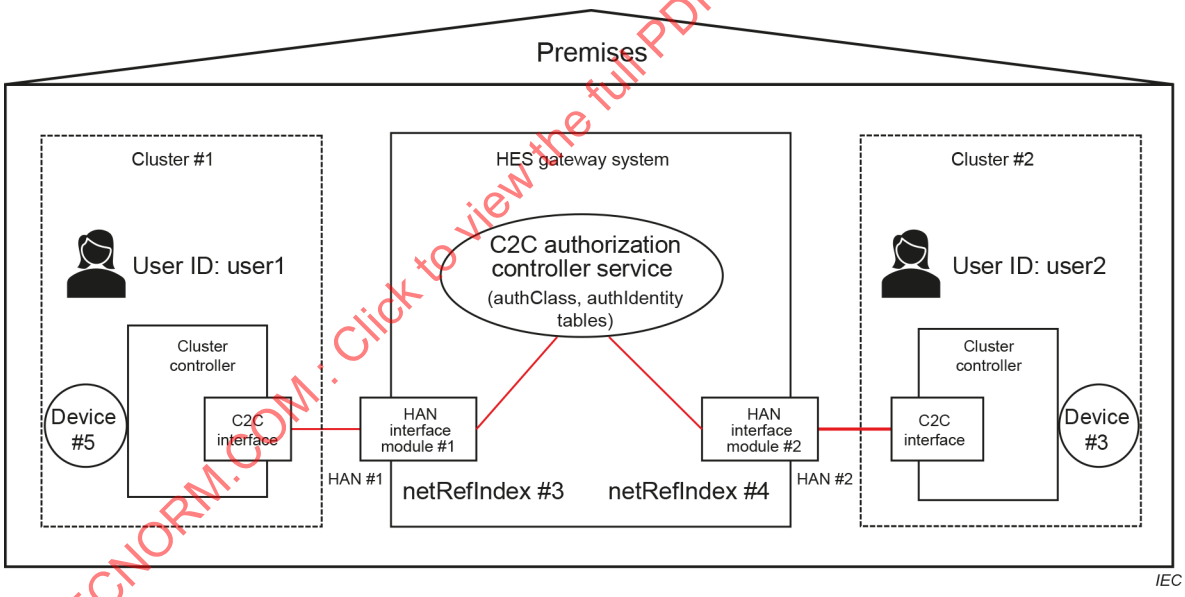

Figure 11 – Configuration of user identities and devices

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authClass table

unique ClassID 'ci'	userFriendly ClassName 'fn'	status Auth 'st'	auth Identity 'ti'	permission GroupID 'pi'	credentialID 'cr'
4	user1	'au' (authorized)	1 (linked to authIdentity)	tba	tba

authIdentity

auth Identity 'id'	auth Type 'ta'	module Type 'mt'	module RefIndex 'mi'	net RefIndex 'ni'
1	'dv' (device)	'hi' (HAN interface)	1 (HAN module #1)	3 (device #5)

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a) "user1" user

authClass table

unique ClassID 'ci'	userFriendly ClassName 'fn'	status Auth 'st'	auth Identity 'ti'	permission GroupID 'pi'	credentialID 'cr'
5	user2	'au' (authorized)	2 (linked to authIdentity)	tba	tba

authIdentity

auth Identity 'id'	auth Type 'ta'	module Type 'mt'	module RefIndex 'mi'	net RefIndex 'ni'
2	'dv' (device)	'hi' (HAN interface)	2 (HAN module #2)	4 (device #3)

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b) "user2" user

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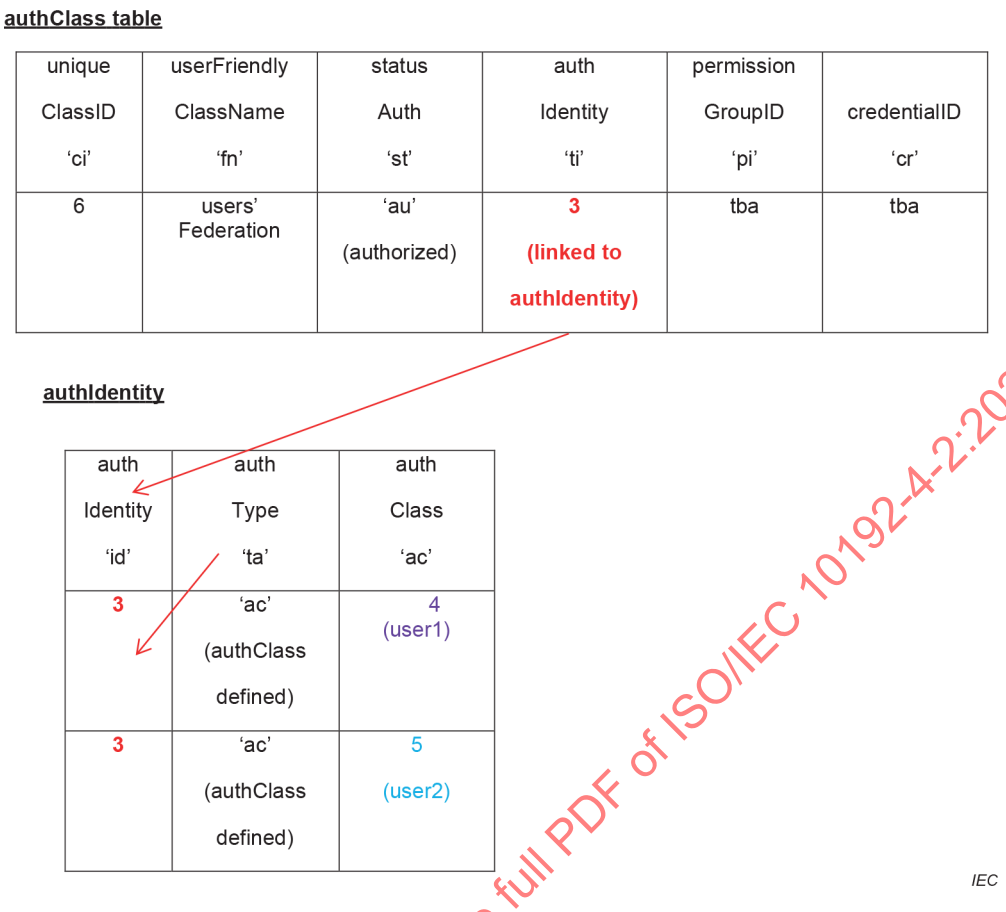

c) Federation of users

Figure 12 – Configuration of user identity federation table

9.3 C2C authorization procedure

This subclause 9.3 describes the C2C authorization procedure using OAuth 2.0 that allows the master CUI system to gain access to resources (i.e. devices) in the receptive CUI clusters, acting as a resource owner (i.e. CUI user). The configuration of user identities in the clusters is illustrated in Figure 11.

Table 1 illustrates the correlation between the roles defined in OAuth 2.0 and the components in a CUI application.

Figure 13 briefly shows the C2C authorization procedure including issuing, using and verifying an access token among the related CUI components. Detailed messaging flow for the C2C authorization procedure will be specified in ISO/IEC 10192-4-3.

Table 1 – Correlation between roles in OAuth 2.0 and CUI components

Roles in OAuth 2.0	CUI component
Resource	Device registered to a CUI user
Resource owner	CUI user
Resource server	Receptive CUI cluster
Client	Master CUI system (cluster or separate device with CUI)
Authorization server	C2C authorization processor service of the HES gateway

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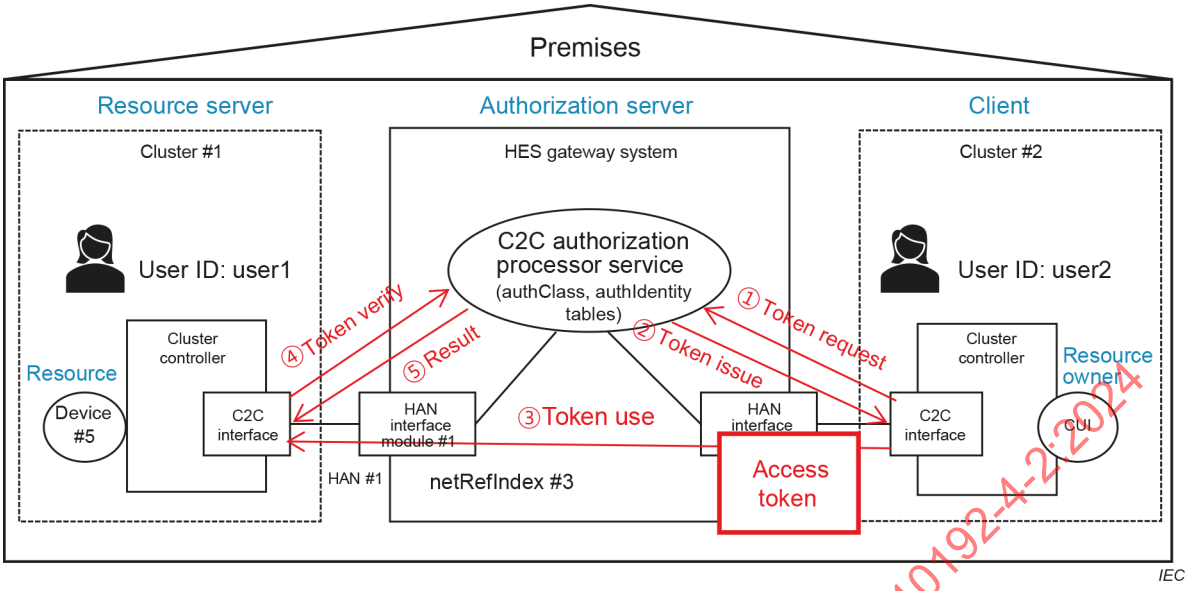

Figure 13 – C2C authorization procedure

10 C2C interface

As shown in Figure 3 to Figure 5, the C2C interface supports communications for the common user interface by exchanging CUI messages with the internal components of the CUI system and the HES gateway via a HAN. The CUI messages include CUI operational information about the selection or presentation actions described in Clause 7. For a master CUI cluster, the internal component refers to the common user interface and the cluster controller. For a receptive CUI cluster, the internal components refer to the cluster controller.

The C2C interface shall support the secure C2C connection described in Clause 8 to establish a secure connection with the HES gateway. It also shall support the C2C authorization described in Clause 9 to enable the master CUI system to obtain access to resources in the receptive CUI clusters on behalf of a resource owner (i.e. CUI user).

11 CUI service

The common user interface service resides in a service module of the HES gateway. When the common user interface is implemented in the HES gateway, the common user interface service includes the common user interface, as shown in Figure 5.

The common user interface service performs interaction with the clusters to establish the user object relationship that enables CUI operational information to be processed in a cluster or a separate device that receives the CUI operational information. Messaging to establish the user object relationship will be specified in ISO/IEC 10192-4-3.

12 C2C interworking application ISEE group

12.1 General

The C2C interworking application ISEE group in the HES gateway supports interworking among the clusters for common user interface services. Figure 14 shows the structure of the C2C interworking application ISEE group that includes the C2C services, the HAN interface module, and the HES-CLME. To support this interworking, the C2C interworking application ISEE group uses the core services of the HES gateway specified in ISO/IEC 18012-3.

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