TTC技術レポート
Technical Report

TR-1062

Customer support use cases for home network services

Edition 1.1

Established on November 21, 2016

THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

Telecommunication Technology Committee

Table of Contents

<Reference>

1. Relations with international recommendations and others

The international recommendations related to this technical report are described in this document.

2. Revision history

Edition	Establishment date	Description
1.0	September 14, 2016	Initial edition established.
1.1	November 21, 2016	Application of some technical terms are modified. Text expressions in section 3.1.3 are modified.

3. Referenced documents

The documents mentioned herein were mainly referenced.

4. Working group in charge of the creation of this technical report

Edition 1.0: TTC Next-generation Home Network Systems Working Group (SWG3603)

Edition 1.1: TTC Next-generation Home Network Systems Working Group (SWG3603)

5. Organizations involved in the creation of this technical report "Customer support use cases for home network services"

The draft of this technical report was prepared by the Residential ICT Sub-working Group (led by Yasuo Tan of JAIST/NICT) in the IP Network Working Group of the New Generation Network Promotion Forum. The draft was then reviewed by the TTC Next-generation Home Network Systems Working Group (chaired by Kazuo Kitamura of NTT) and published as a TTC technical report.

For the discussions in the Residential ICT Sub-working Group, an ad hoc group was formed under the Strategy Vision Taskforce (led by Ryuichi Matsukura of Fujitsu).

1 Introduction

1.1 Background

As well as power supply, network connection has been indispensable to home use electrical appliances. Some of the applications operating on electrical appliances do not work without a home network and/or the Internet. Network connection has been essential for home use electrical appliances.

As soon as connected to a home network, an electrical appliance is provided with an appropriate network service. Applications sometimes need a configuration change to another electrical appliance, a gateway, etc. Since such configuration changes to electrical appliances are difficult to achieve correctly by hand, home networks need to have a function for automatically changing configuration.

TTC has studied an architecture for utilizing the cloud to access and control electrical appliances connected to a home network, and thereby contributed to ITU-T Recommendation Y.2070. From the viewpoint of customer services, TTC has established guidelines for the maintenance, failure detection, and other matters related to information appliances connected to a home network as TTC TR-1053 and TR-1057. TTC also has established ITU-T Recommendation G.9973 (TTC JJ-300.00) for acquiring topology information on the information appliances and network devices connected to a home network. Functional enhancement for notification of device internal information necessary for maintenance has already been revised as JJ-300.00v2.

1.2 IEC 62608

IEC 62608 specifies reference models for setting up an appropriate configuration for correctly operating devices connected to a home network. The objective of IEC 62608 is to specify a framework for setting up an appropriate configuration of network applications that will be executed on devices.

IEC 62608 consists of four parts. Part 1 specifies basic reference models. Part 2 specifies protocols between components. Part 3 specifies the models of the metadata and data that will be exchanged by the protocols. Part 4 specifies guidelines for security for the reference models.

This technical report details use cases of the multimedia-compatible home network configuration methods described in Part 2 of IEC 62608.

1.3 Definitions of terms

This document uses terms defined as follows.

1.3.1 Home network

Network to which a device configured by a method specified in this document will be connected, and that generally refers to a network installed in the home

1.3.2 Home gateway

Relay device from a device subject to configuration to the outside of the home network

1.3.3 Configurator

Device or software for setting up the configuration of a device such as an electrical appliance

1.3.4 Configuration agent

Device or software for transmitting configuration information to the configurator

1.3.5 Cloud server

Server or server group that executes functions requested from the outside of the home network in cooperation with the configurator; cloud servers include Service Servers, Quality Check Servers, Service Failure Information Servers, and Diagnosis Servers.

2 Information Registered in Configurators

The following four types of information are registered in configurators: initial registration information, additional registration information, existence confirmation information, and static entry information.

2.1 Initial registration information

Initial registration information is necessary for identifying information appliances and other entities. The following types of information are included.

Device information
- Classification
- Manufacturer code
- Model name
- Model number

MAC address

IP address

2.2 Additional registration information

Additional registration information as well as initial registration information provides device information that is referred to in the process of maintenance of the relevant device. The following types of information are included.

Date of manufacture

Serial number

Version number

Connection topology information (topology and media)

Installation location

List of operating services

Period of use (date of installation)

Operating time

2.3 Existence confirmation (presence confirmation) information

Existence confirmation information is obtained or registered from the relevant device when it is in a state in which it is accessible from the corresponding home network. The following types of information are included.

Information obtained from the cloud server by polling

Information notified from the device
- Information obtained from L2 Agents (broadcasting an LLDPDU at constant intervals)

Timer information
- Intervals of existence confirmation and those of confirmation for deregistration

2.4 Static entry information

Static entry information, if changed, may cause a malfunction, such as inappropriate operation of a network application on a device, or a problem with matters, such as availability leading to theft or a security problem.

Monitoring needs to be performed on an as-needed basis so that it will not be changed. The following types of information are included.

Device information
MAC address
IP address
Connection topology information (topology and media)
Installation location

3 Use Cases

3.1 Common matters

Before detailing use cases, this section overviews them and organizes information on their composition elements and sequence diagrams.

3.1.1 Use case categories

Use cases are roughly classified into three categories.

(1) Installation or transfer of a device

Sequence 1-1. Connecting a new information appliance (consumer electronics (CE)) to a home network/changing connection of an information appliance (CE)

Sequence 1-2. Setting up a configuration for a new service

(2) Activating a service

Sequence 2-1. Accessing an information appliance (CE) on a home network from a mobile device

Sequence 2-2. Access between home networks

Sequence 2-3. Device configuration

(3) Troubleshooting

Sequence 3-1. Checking the status of a device

Sequence 3-2. Reachability of a network (network layer)

Sequence 3-3. Reachability of a network (application layer)

Sequence 3-4. Quality of a network (network layer)

Sequence 3-5. Quality of a network (application layer)

Sequence 3-6. Service interference

Sequence 3-7. Failure of terminal equipment

3.1.2 Cloud servers and their functions

Service Server

Quality Check Server

Service Failure Information Server

Diagnosis Server

3.1.3 Notation for sequence diagrams

Each sequence diagram is represented with vertically extending actors and the messages and processing exchanged between the actors.

Messages represented with a solid line are essential for the sequence, and those represented with a broken line are necessary in some situations. Multiple messages surrounded by a broken line form a subsequence that is executed on an as-needed basis. Messages represented with a chain line are transmitted to the entire home network and therefore can be regarded as broadcast messages.

A beltlike representation extending across multiple actors means a series of processes. For example, if the test refers to a test for checking quality, it is composed of one or more procedures to do among the actors. The detail of the processing depends on its implementation. The whole sequence can be defined with a message setting up the beltlike and a message describing the processing result at the end of the beltlike.

The direction of an arrow indicates the direction in which the relevant message is transmitted. Some arrows are double-headed arrows. In such cases, either side can trigger message transmission.

3.2 Installation or transfer of a device

3.2.1 Connecting a new information appliance (consumer electronics (CE)) to a home network/changing connection of an information appliance (CE)

(1) New device connection with cloud, pull-type (Sequence 1-1.A)

When an information appliance is to be newly connected to a home network, this sequence registers information on the relevant appliance in the corresponding configurator, acquires configuration information on the relevant appliance from the corresponding Service Server, and then applies the acquired information to the inside of the relevant appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that manages the devices connected to the home network

Sequence

・The configuration agent on the information appliance transmits a "configurator search request" to the inside of the home network and thereby finds the configurator.

・The configurator sends back its own address to the configuration agent as a "configurator search reply."

・The configuration agent performs "registration" of information on the information appliance in the configurator.

・The configurator performs "registration" of this information in the Service Server.

・The following sequence is performed, whenever necessary.

The configurator requests configuration information from the Service Server.

The Service Server transmits the configuration information to the configurator as a response.

The configurator applies this configuration information to the configuration agent.

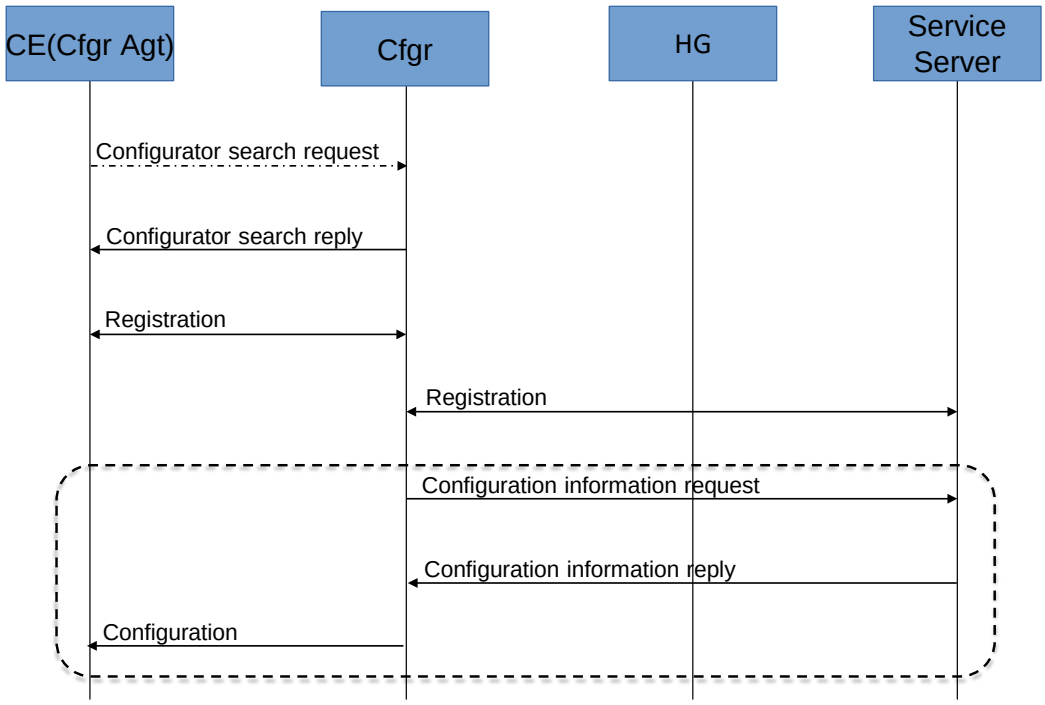

Figure 1 New device connection with cloud, pull-type (Sequence 1-1.A)

(2) New device connection with cloud, push-type (Sequence 1-1.B)

In a case where a configurator has been notified of configuration information on an information appliance by the corresponding Service Server in advance, when the relevant appliance is to be newly connected to the corresponding home network, the configurator applies the acquired information to the inside of the relevant appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Service Server: Server that manages the devices connected to the home network

Sequence

・The Service Server transmits a "configuration information registration" to the configurator.
・The configuration agent on the information appliance transmits a "configurator search request" to the inside of the home network and thereby finds the configurator.
・The configurator sends back its own address to the configuration agent as a "configurator search reply."
・The configuration agent performs "registration" of information on the information appliance in the configurator.
・The configurator performs "registration" of this information in the Service Server.
・The following sequence is performed, whenever necessary.
The configurator applies the registered configuration information to the configuration agent.

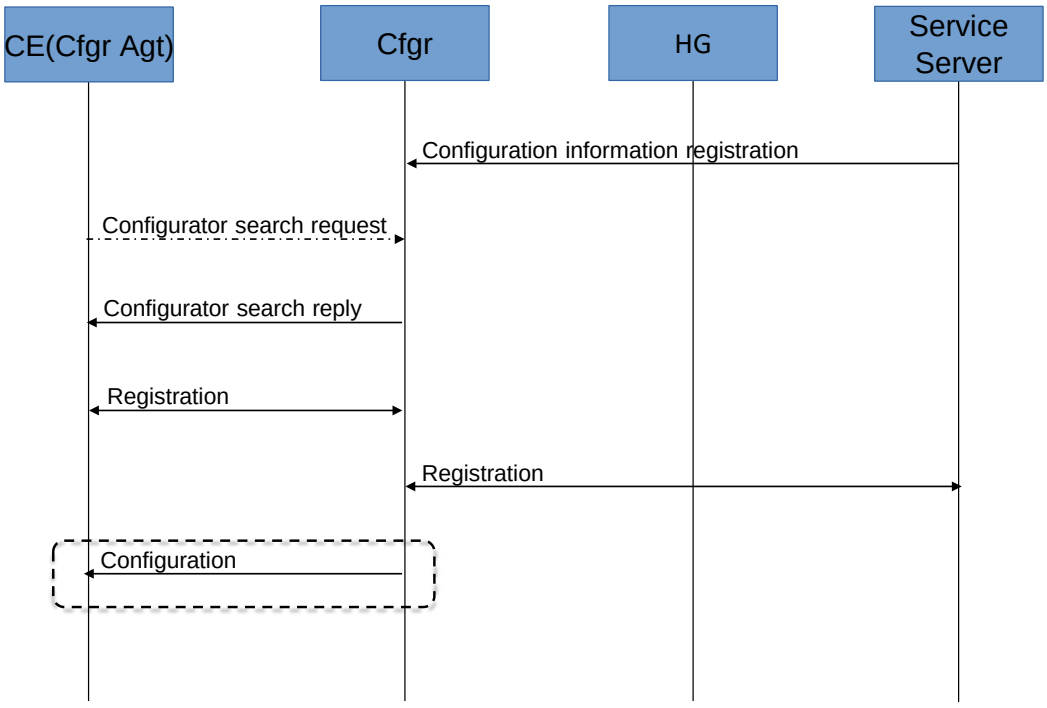

Figure 2 New device connection with cloud, push-type (Sequence 1-1.B)

(3) Device connection change with cloud, pull-type (Sequence 1-1.C)

When an information appliance is to be transferred and then reconnected to a home network, this sequence registers information on the relevant appliance in the corresponding configurator, reacquires configuration information on the relevant appliance from the corresponding Service Server, and then reapplies the reacquired information to the inside of the relevant appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Service Server: Server that manages the devices connected to the home network

Sequence

・The configuration agent on the information appliance transmits a "configurator search request" to the inside of the home network and thereby finds the configurator.
・The configurator sends back its own address to the configuration agent as a "configurator search reply."
・The configuration agent performs "re-registration" of information on the information appliance in the configurator.
・The configurator performs "re-registration" of this information in the Service Server.
・The following sequence is performed, whenever necessary.
The configurator re-requests configuration information from the Service Server.
The Service Server transmits the configuration information to the configurator as a response.
The configurator reapplies this configuration information to the configuration agent.

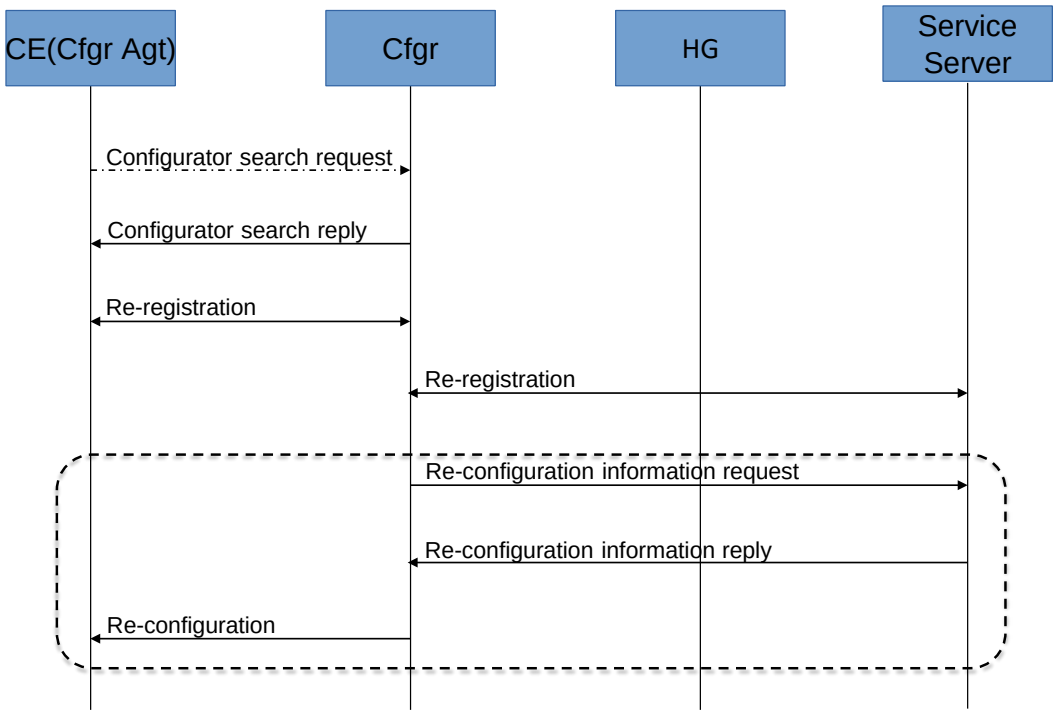

Figure 3 Device connection change with cloud, pull-type (Sequence 1-1.C)

(4) Device connection change with cloud, push-type (Sequence 1-1.D)

In a case where a configurator has been notified of configuration information on an information appliance by the corresponding Service Server in advance, when the relevant appliance is to be transferred and then reconnected to the corresponding home network, the configurator reapplies the acquired information to the inside of the relevant appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Service Server: Server that manages the devices connected to the home network

Sequence

・The Service Server transmits a "configuration information registration" to the configurator.
・The configuration agent on the information appliance terminal transmits a "configurator search request" to the inside of the home network and thereby finds the configurator.
・The configurator sends back its own address to the configuration agent as a "configurator search reply."
・The configuration agent performs "re-registration" of information on the information appliance in the configurator.
・The configurator performs "re-registration" of this information in the Service Server.
・The following sequence is performed, whenever necessary.

The configurator reapplies the registered configuration information to the configuration agent.

Sequence

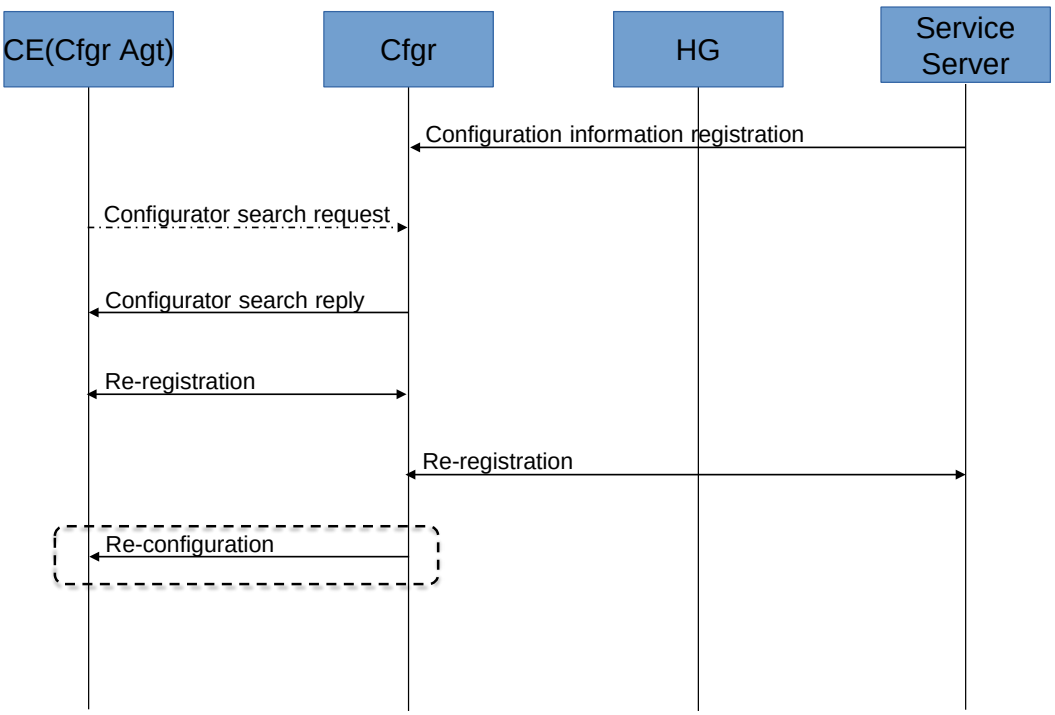

Figure 4 Device connection change with cloud, push-type (Sequence 1-1.D)

(5) Deregistration (Sequence 1-1.E)

An information appliance that has been connected requests the corresponding configurator to delete registration information from the corresponding Service Server. The configurator performs processing for the deletion and then transmits its result to the information appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that manages the devices connected to the home network

Sequence

・The configuration agent transmits a "delete request" to the configurator.

・Whenever necessary, "delete" is performed to delete information on the relevant information appliance from the configurator and the Service Server.

・The configurator transmits a "delete reply" to the configuration agent.

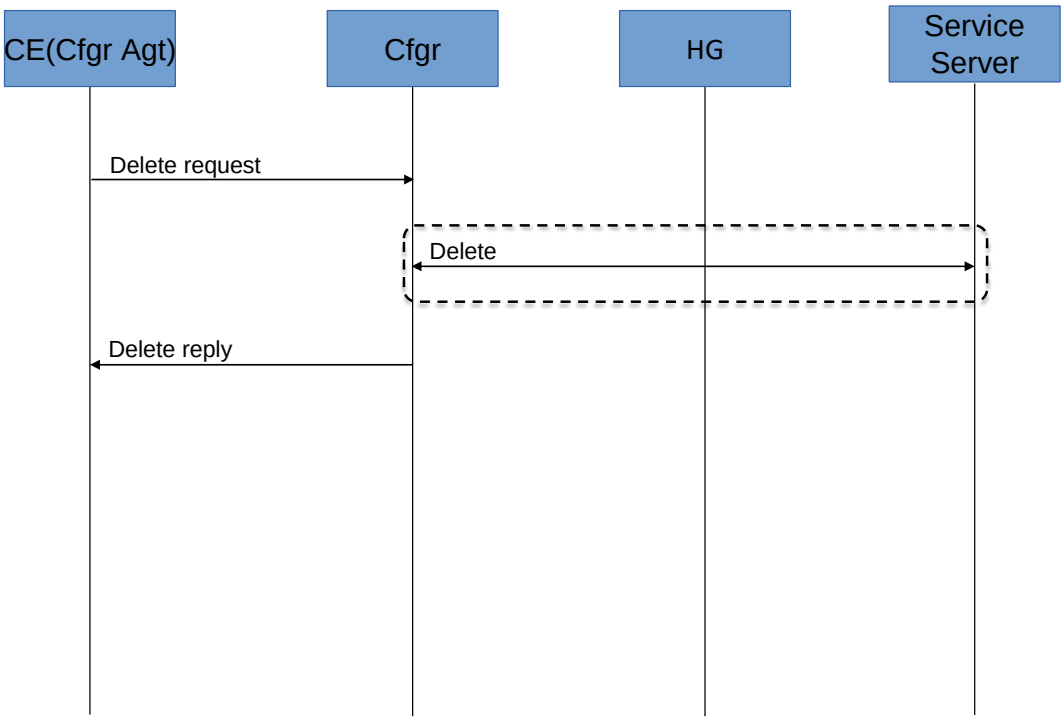

Figure 5 Deregistration (Sequence 1-1.E)

3.2.2 Setting up a configuration for a new service

(1) Device status check and communication quality check (Sequence 1-2.A)

This sequence acquires the status of service operation of an information appliance connected to a home network and information on its communication quality from the corresponding Service Server. On the basis of the result, the sequence enables the operation of a service supported by the information appliance.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that manages the devices connected to the home network

Sequence

・The Service Server transmits a "status request" to the configurator.

・The configurator transmits a "status request" to the configuration agent on the relevant information appliance.

・The configuration agent sends back the current status of the information appliance to the configurator as a "status reply."

・The configurator transmits the information to the Service Server as a "status reply."

・The following sequence is performed, whenever necessary.

The Service Server transmits a "communication quality status request" to the configurator.

The configurator transmits a "communication quality status request" to the configuration agent on the relevant information appliance.

A "communication test" is performed between the configuration agent and the Service Server.

On the completion of the test, the configuration agent transmits a "communication quality status reply" to the configurator.

The configurator transmits the result to the Service Server as a "communication quality status reply."

・The following sequence is performed, whenever necessary.

The Service Server transmits a service start configuration to the configurator.

The configurator sets up the "configuration" of the relevant information appliance.

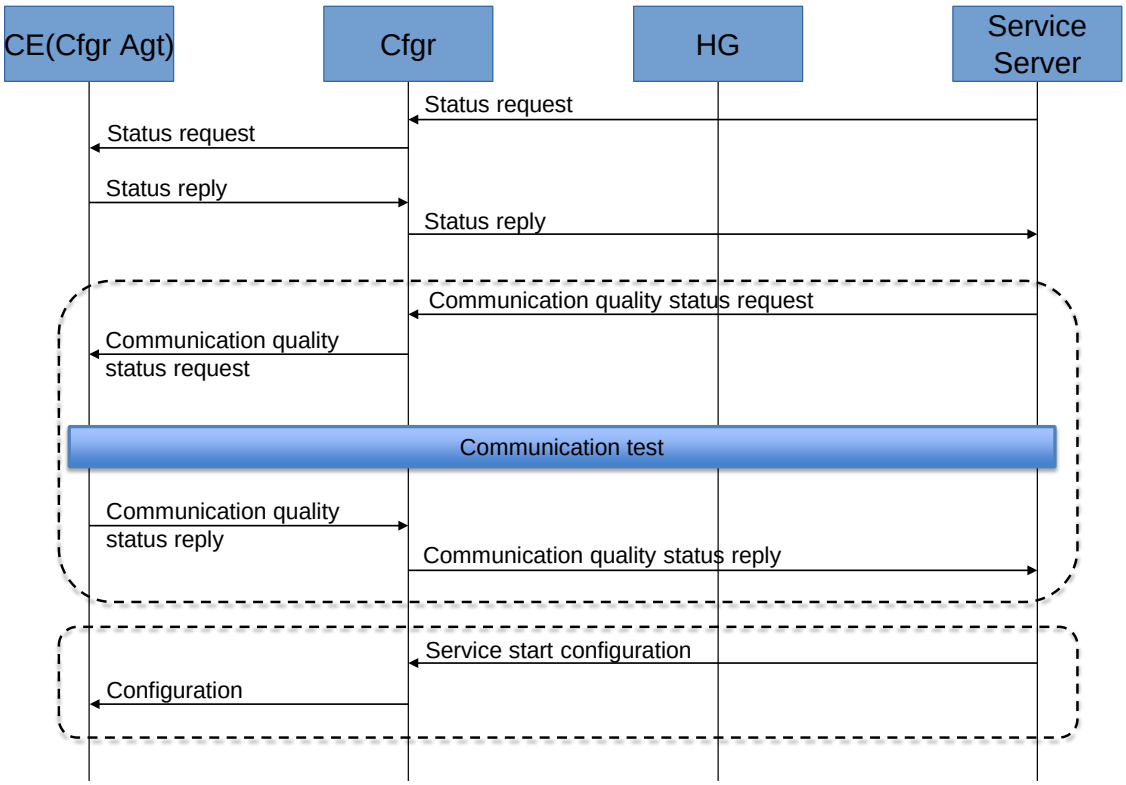

Figure 6 Device status check and communication quality check (Sequence 1-2.A)

(2) Service interference check (Sequence 1-2.B)

This sequence confirms that a service of an information appliance in operation does not interfere with another service on the same home network. The Service Failure Information Server holds a list of combinations of the services that interfere with each other, notifies a list of the services registered in information appliances, and notifies the presence or absence of the services that interfere in the current environment.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Failure Information Server: Server in which a list of services that interfere with each other has been registered

・Service Server: Server that manages the devices connected to the home network

Sequence

・The Service Server transmits a "service interference test request" to the configurator.

・The configurator transmits a "service status list request" to the configuration agent on the relevant information appliance.

・The configuration agent transmits a list of the services operating on the information appliance to the configurator as a "service status list reply."

・The configurator transmits this list to the Service Failure Information Server as a "service interference information request."

・The Service Failure Information Server checks against the transmitted list and sends back the result to the configurator as a "service interference information reply."
・The configurator transmits this result to the Service Server as a "service interference test reply."

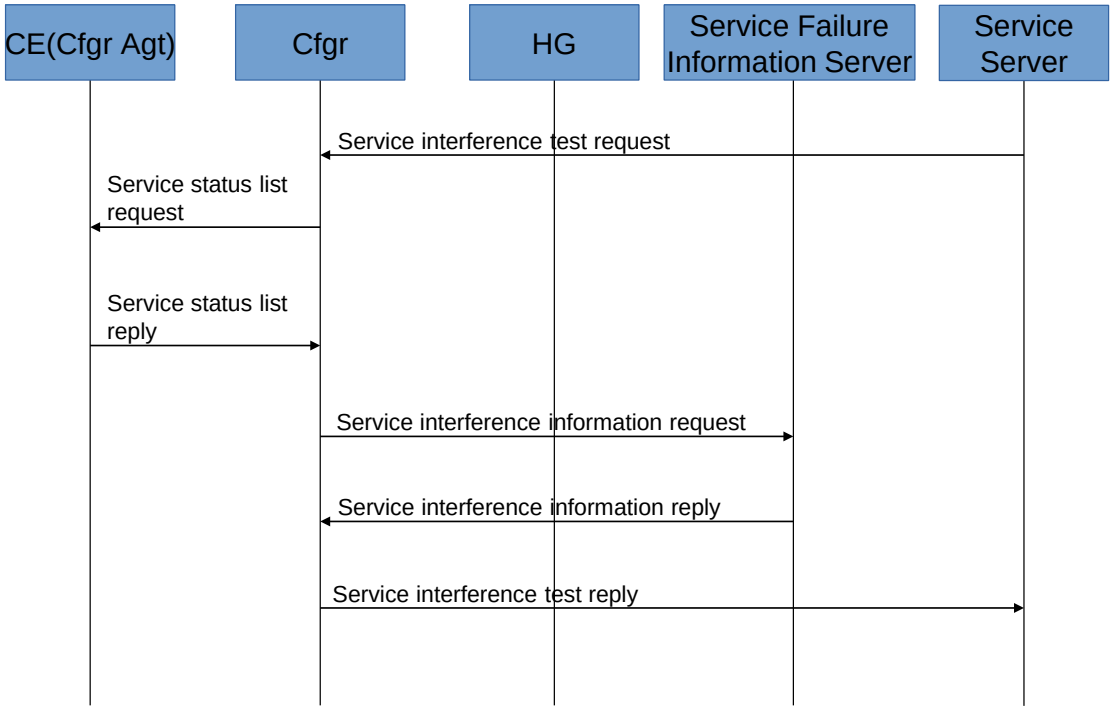

Figure 7 Service interference check (Sequence 1-2.B)

3.3 Activating a service

3.3.1 Accessing an information appliance (CE) on a home network from a mobile device

(1) Accessing an information appliance (CE) on a home network from a mobile device without using a cloud server (Sequence 2-1.A)

To execute a service for performing a remote operation of an information appliance from a mobile device, the mobile device transmits a message to the information appliance via the corresponding configurator. When it is necessary to allow access of mobile devices from the outside, a gateway is provided for their communication.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Service Server: Server that manages the devices connected to the home network
・Mobile device: Application on a smart phone or some other similar device (e.g. remote video recording)

Sequence

・The mobile device transmits a "remote control request" to the configurator.
・The configurator transmits a "remote control request" to the configuration agent on the relevant information appliance.
・The configuration agent transmits a "remote control reply" to the configurator.

・Whenever necessary, the configurator sets up the "configuration" of the home gateway that is necessary for service establishment.

・The configurator transmits a "remote control reply" to the mobile device.

・"Service establishment" is performed between the mobile device and the information appliance.

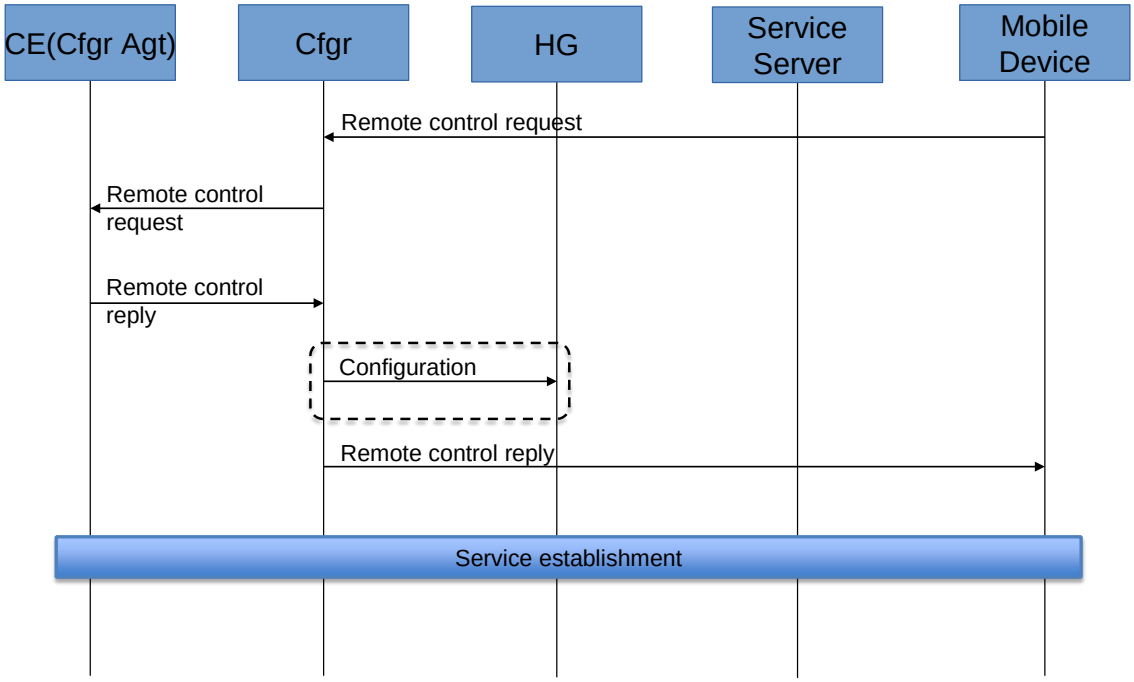

Figure 8 Accessing an information appliance (CE) on a home network from a mobile device without using a cloud server (Sequence 2-1.A)

(2) Accessing an information appliance (CE) on a home network from a mobile device via a cloud server (Sequence 2-1.B)

To execute a service for performing a remote operation of an information appliance from a mobile device, the mobile device transmits a message to the information appliance via the corresponding Service Server, a type of cloud server. When it is necessary to allow access of mobile devices from the outside, a gateway is provided for their communication.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that manages the devices connected to the home network

・Mobile device: Application on a smart phone or some other similar device (e.g. remote video recording)

Sequence

・The mobile device transmits a "remote control request" to the Service Server.

・The Service Server transfers the "remote control request" to the configurator corresponding to the relevant information appliance.

・The configurator transfers the "remote control request" to the configuration agent on the relevant information appliance.

・The configuration agent transmits a "remote control reply" to the configurator.

・Whenever necessary, the configurator sets up the "configuration" of the home gateway that is necessary for service establishment.

・The configurator transmits the information received from the information appliance to the Service Server as a "remote control reply."

・The Service Server transmits the information received from the information appliance to the mobile device as a "remote control reply."

・The service is established between the mobile device and the information appliance.

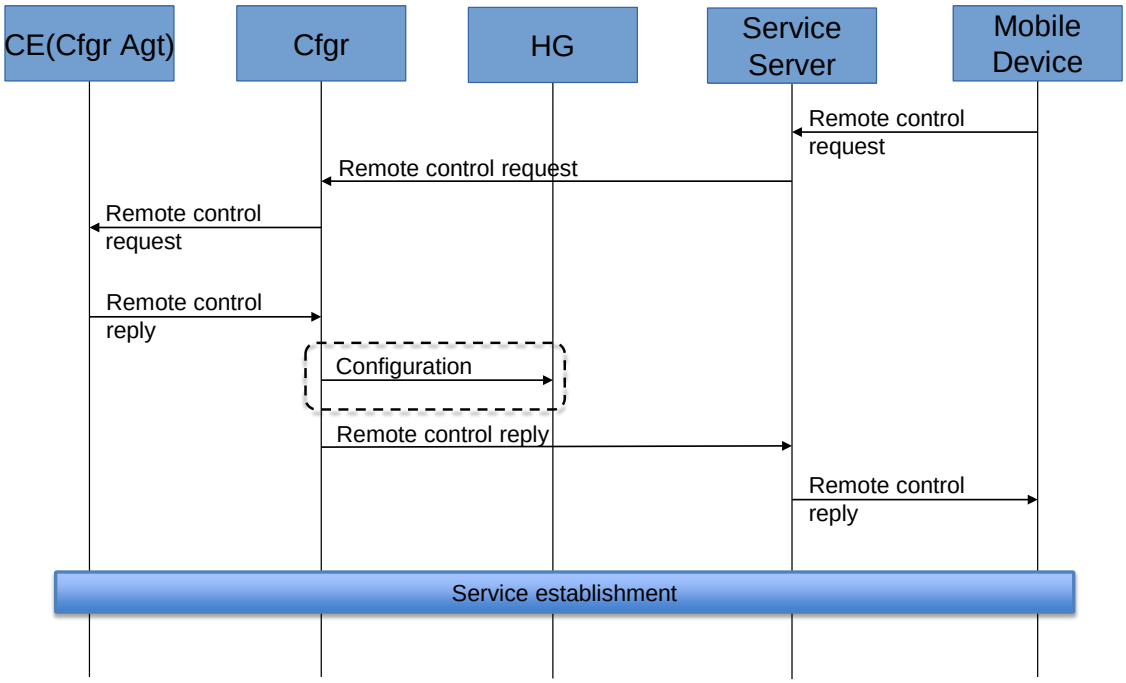

Figure 9 Accessing an information appliance (CE) on a home network from a mobile device via a cloud server (Sequence 2-1.B)

3.3.2 Access between home networks

(1) HN-HN connection without using a cloud server (Sequence 2-2.A)

This sequence establishes the mutual connection between two information appliances connected to different home networks. They are directly connected without using a cloud server.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

Sequence

・Configuration Agent A transmits a "connection request" of Configuration Agent B to Configurator A.

・Configurator A transfers the "connection request" to Configurator B.
・Configurator B transfers the "connection request" to Configuration Agent B.
・Configuration Agent B transmits a "connection reply" to Configurator B.
・Whenever necessary, Configurator B sets up the "configuration" of Home Gateway B.
・Configurator B transfers the "connection reply" received from Information Appliance B to Configurator A.
・Whenever necessary, Configurator A sets up the "configuration" of Home Gateway A.
・Configurator A transfers the "connection reply" received from Configurator B to Configuration Agent A.
・The service is established between Information Appliance A and Information Appliance B.

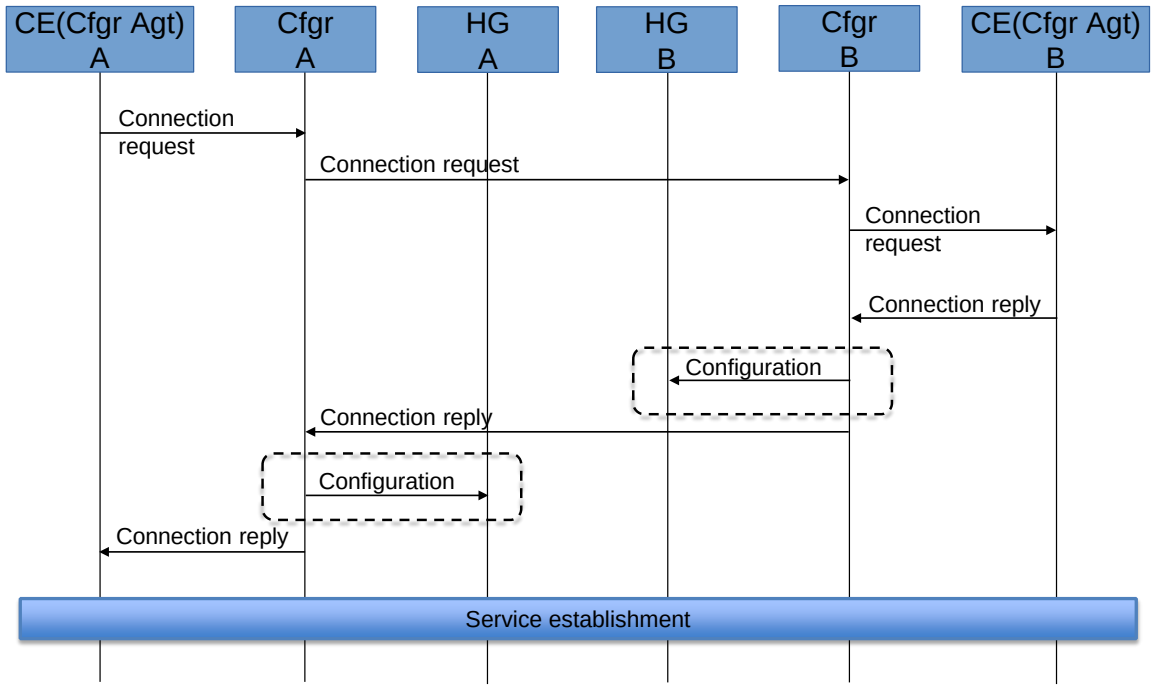

Figure 10 HN-HN connection without using a cloud server (Sequence 2-2.A)

(2) HN-HN connection via a cloud server (Sequence 2-2.B)

This sequence establishes the mutual connection between two information appliances connected to different home networks. They are connected via a Service Server on a cloud.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Service Server: Server that remotely controls the information appliances

Sequence

・Configuration Agent A transmits a "registration request" to Configurator A.
・Configurator A performs "registration" of Information Appliance A in the Service Server.
・Configurator A transmits a "registration reply" to Configuration Agent A.
・Configuration Agent B transmits a "registration request" to Configurator B.

・Configurator B performs "registration" of Information Appliance B in the Service Server.
・Configurator B transmits a "registration reply" to Configuration Agent B.
・Configuration Agent A transmits a "connection request" to the Service Server.
・The following sequence is performed, whenever necessary.

Configuration Agent A transmits a "configuration request" to Configurator A.

Configurator A transmits a "configuration" to Home Gateway A to set up a configuration necessary for service operation.

・The Service Server transfers the "connection request" from Configuration Agent A to Configuration Agent B.
・The following sequence is performed, whenever necessary.

Configuration Agent B transmits a "configuration request" to Configurator B.

Configurator B transmits a "configuration" to Home Gateway B to set up a configuration necessary for service operation.

・Configuration Agent B sends back a "connection reply" to the Service Server.
・The Service Server transfers the "connection reply" from Configuration Agent B to Configuration Agent A.

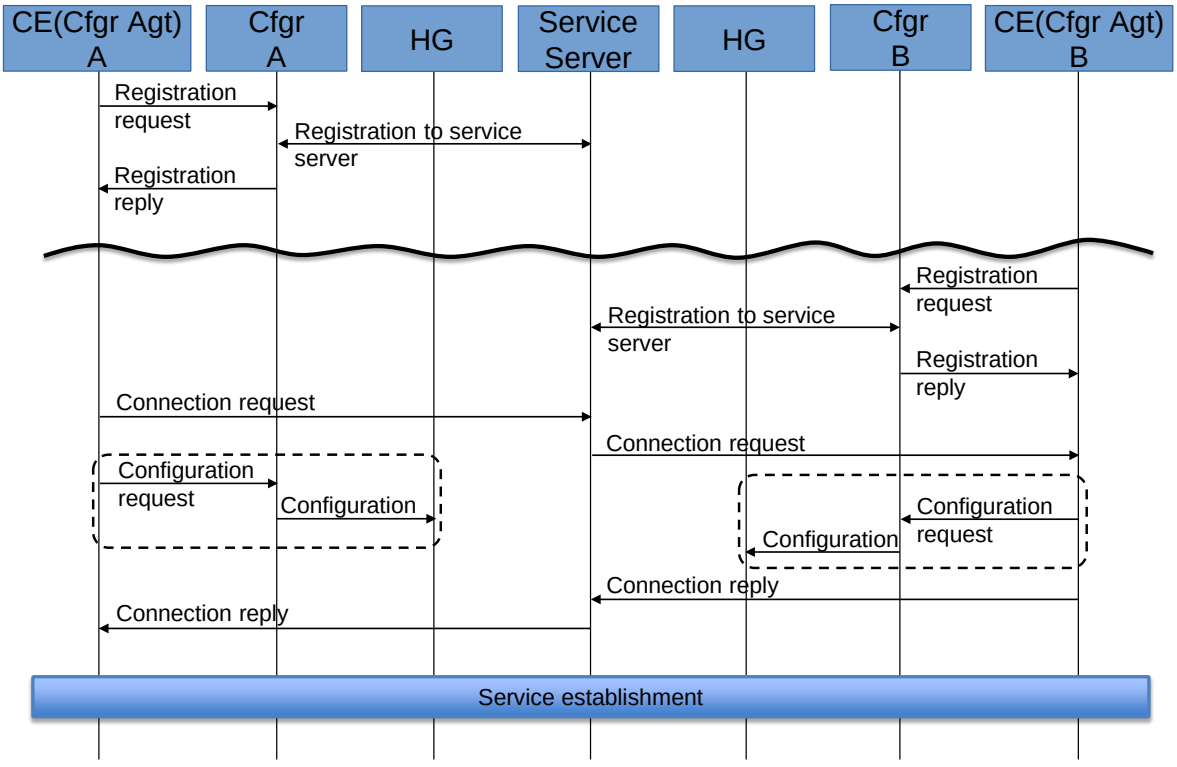

Figure 11 HN-HN connection via a cloud server (Sequence 2-2.B)

3.3.3 Device configuration

(1) Configuring an information appliance via a configurator from a service company (Sequence 2-3.A)

The configuration of an information appliance connected to a home network is set up via a configurator from a Service Server.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that remotely changes the configuration of the information appliance

Sequence

・The Service Server transmits a "remote configuration request" to the configurator.

・The configurator transfers the "remote configuration request" to the configuration agent.

・The configuration agent transmits a "remote configuration reply" to the configurator.

・The configurator transfers the "remote configuration reply" received from the information appliance to the Service Server.

・The Service Server transmits a "configuration information registration" to the configurator.

・The configurator transmits a "configuration" to the configuration agent to set up a necessary configuration of the information appliance.

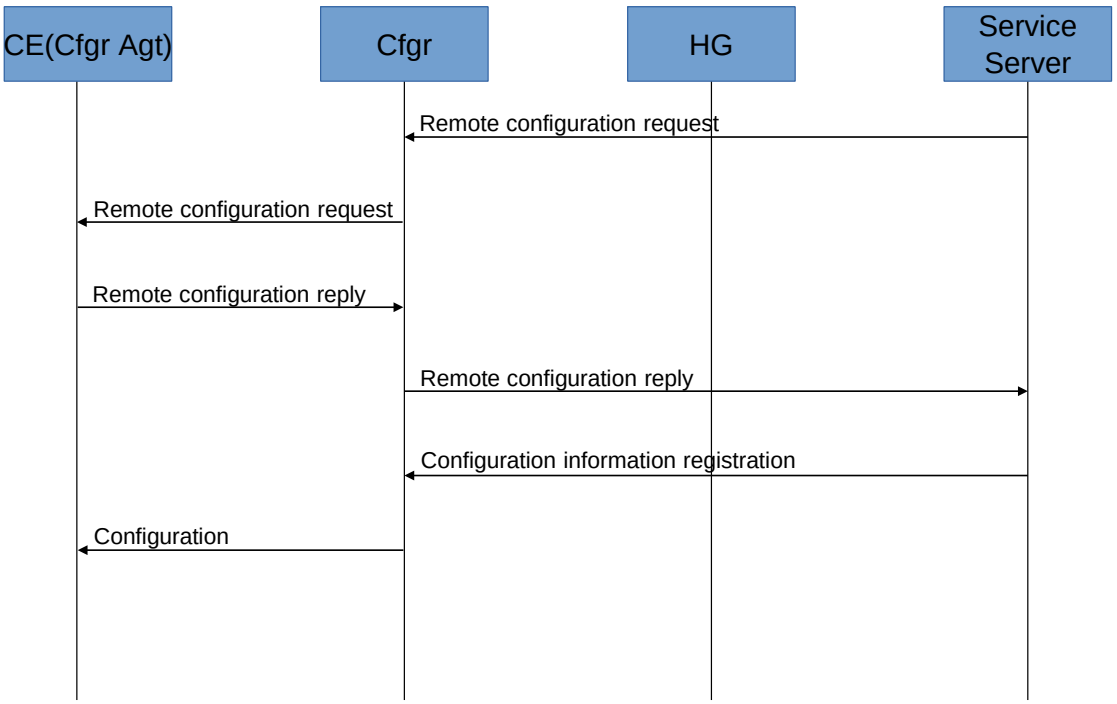

Figure 12 Configuring an information appliance via a configurator from a service company (Sequence 2-3.A)

(2) Configuring an information appliance directly from a service company (Sequence 2-3.B)

The configuration of an information appliance connected to a home network is set up directly from a Service Server.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that remotely changes the configuration of the information appliance

Sequence

・The Service Server transmits a "remote configuration request" to the configurator.

・The configurator transfers the "remote configuration request" to the configuration agent.

・The configuration agent transmits a "remote configuration reply" to the configurator.

・Whenever necessary, the configurator transmits a "configuration" to the home gateway to set up a necessary configuration.

・The configurator transfers the "remote configuration reply" received from the information appliance to the Service Server.

・The Service Server transmits a "configuration" to the configuration agent to set up a necessary configuration of the information appliance.

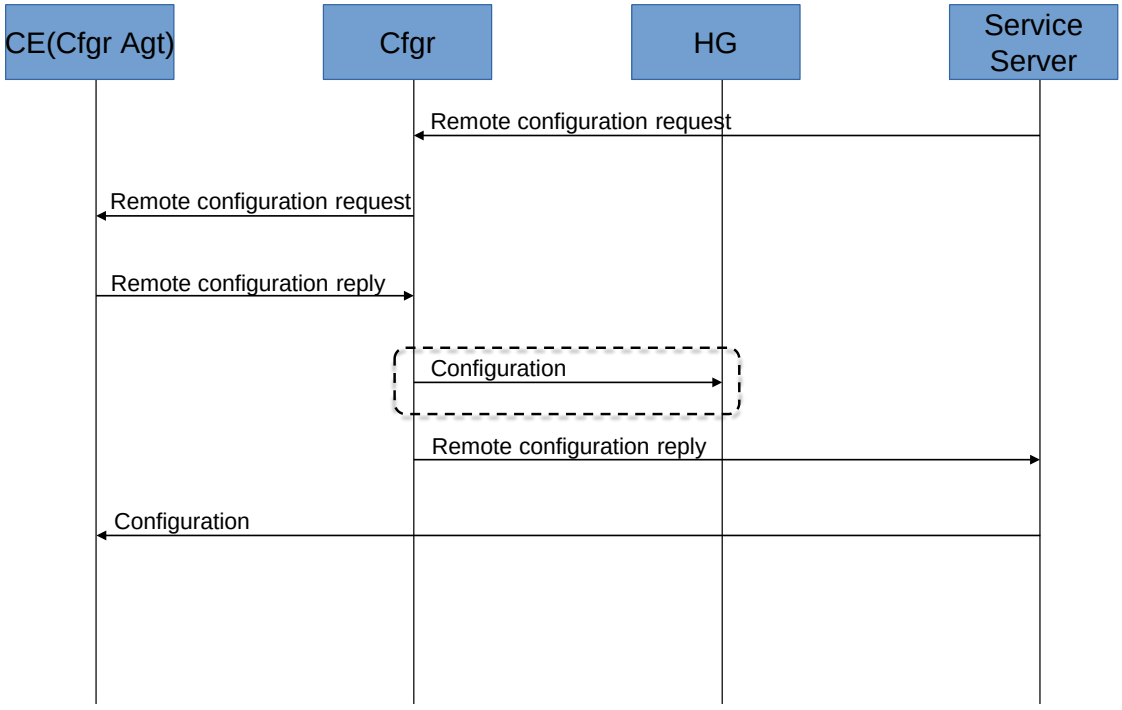

Figure 13 Configuring an information appliance directly from a service company (Sequence 2-3.B)

3.4 Troubleshooting

3.4.1 Checking the status of a device

(1) Existence confirmation of a recalled product (Sequence 3-1.A)

A Service Server acquires information, such as a manufacturing number, from an information appliance connected to a home network and confirms that the appliance is a product subject to recall.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that confirms the status of the information appliance

Sequence

・The Service Server transmits a "status request" to the configurator.

・The configurator transmits a "status request" to the configuration agent connected to the configurator.

・The configuration agent transmits device information on the information appliance to the configurator as a "status reply."

・The configurator transmits a list of information on all the information appliances to the Service Server as a "status reply."

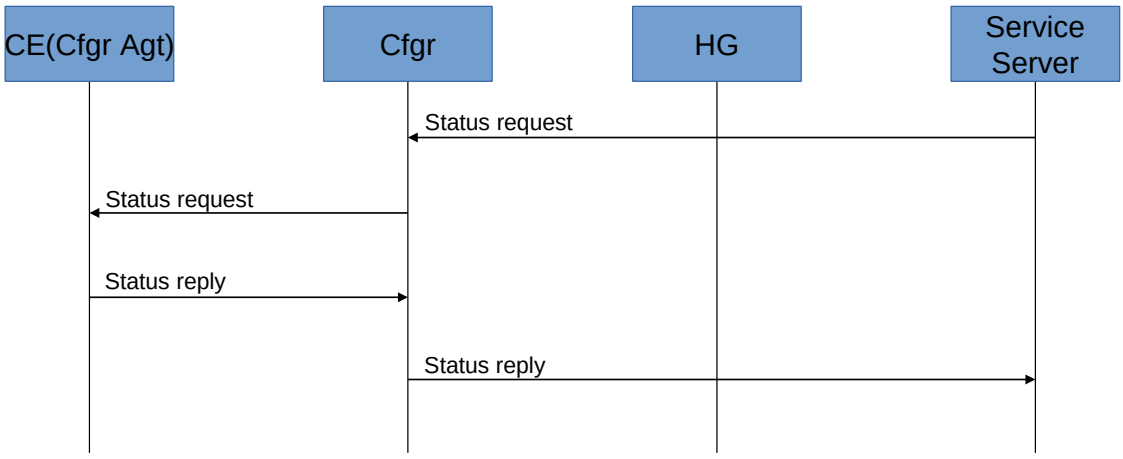

Figure 14 Existence confirmation of a recalled product (Sequence 3-1.A)

(2) Confirming static configuration (Sequence 3-1.B)

Static configuration information is not ordinarily changed. A change to this information will cause, for example, a malfunction of a device that has been operating or cancellation of security that has been retained. Whenever necessary, a Service Server transmits a "static information configuration" of an information appliance to the configurator. The configurator uses this information to periodically confirm that the configuration of the information appliance has not been changed. The configurator will notify the Service Server of any change to the configuration.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that confirms the status of the information appliance

Sequence

・Whenever necessary, the Service Server transmits a "static information configuration" of the information appliance to the configurator.

・The configurator performs "periodic monitoring" on the configuration agent to confirm that the static information configuration has not been changed.

・Whenever necessary, the configurator transmits the confirmation result to the Service Server as a "notification."

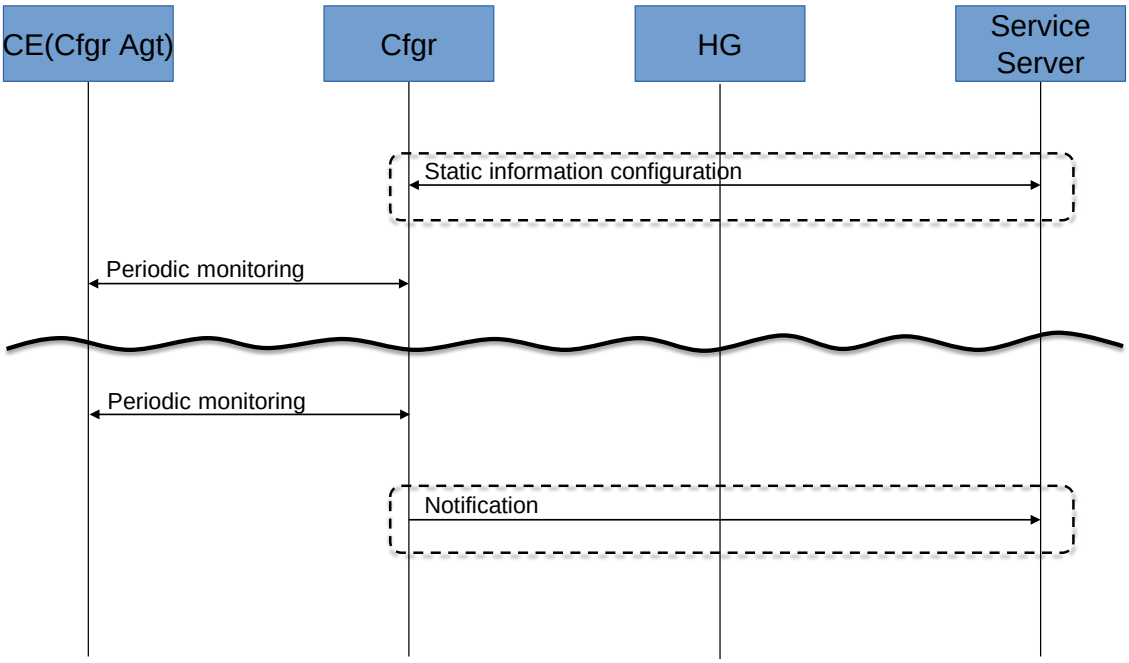

Figure 15 Confirming static configuration (Sequence 3-1.B)

3.4.2 Reachability of a network (network layer)

(1) Communication reachability test (Sequence 3-2.A)

When connection of an information appliance to a network cannot be established, this sequence checks communication reachability along the route from the corresponding Service Server to the information appliance to the corresponding configurator to the corresponding home gateway to the Service Server and acquires the check result.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that checks the communication reachability to the information appliance and other entities

Sequence

・The Service Server transmits a "communication reachability test request" to the configurator.

・The configurator performs a "communication reachability test" on the communication with each of the configuration agent, home gateway, and Service Server to check the communication reachability between the configurator and the other entities.

・The configurator transmits a "communication reachability test request" to the configuration agent.

・The configuration agent performs a "communication reachability test" on the communication with each of the home gateway and Service Server to check the communication reachability between the configuration agent and the other entities.

・The configuration agent transmits a "communication reachability test reply" to the configurator.

・The configurator transmits a "communication reachability test reply" to the Service Server.

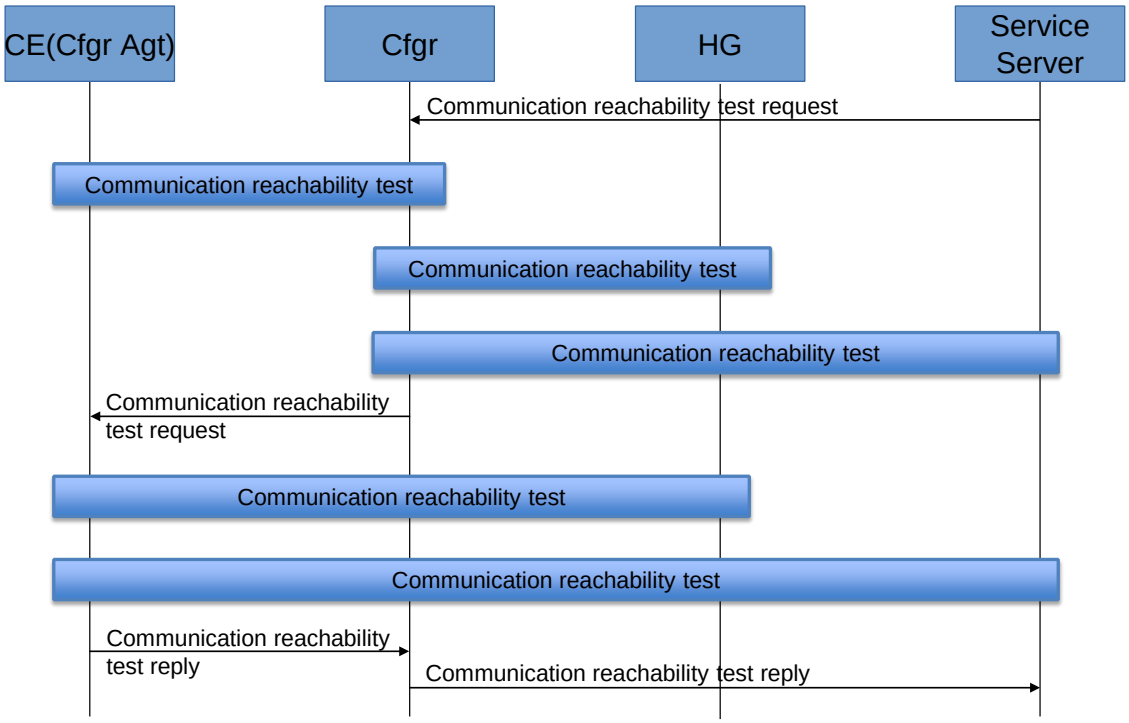

Figure 16 Communication reachability test (Sequence 3-2.A)

3.4.3 Reachability of a network (application layer)

(1) Application reachability test (Sequence 3-3.A)

When connection of an information appliance cannot be established on the application level while its connection to a network has been established, this sequence checks reachability on the application level along the route from the Service Server to the information appliance and acquires the check result.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Server: Server that checks the communication reachability to the information appliance and other entities

Sequence

・The Service Server transmits an "application reachability test request" to the configurator.

・The configurator transfers the "application reachability test request" to the specified configuration agent.

・An "application reachability test" is performed between the configuration agent and the Service Server.

・The configuration agent transmits an "application reachability test reply" to the configurator.

・The configurator transmits an "application reachability test reply" to the Service Server.

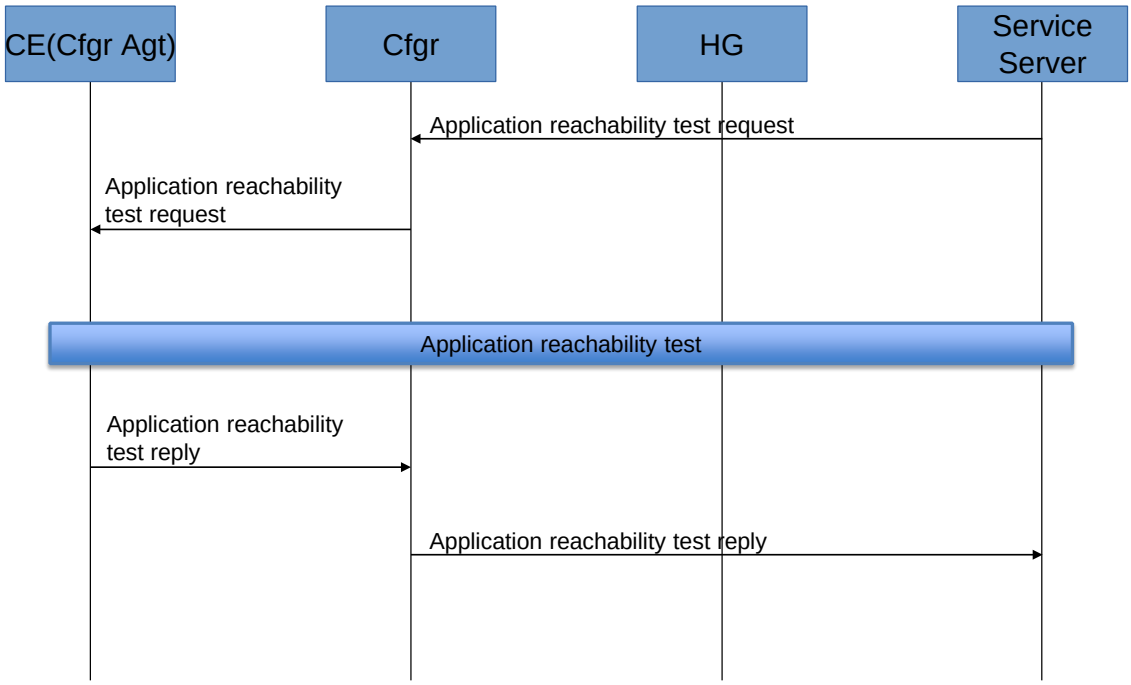

Figure 17 Application reachability test (Sequence 3-3.A)

3.4.4 Quality of a network (network layer)

(1) Communication quality test (Sequence 3-4.A)

When the quality of service is affected by deficiency in band or other insufficient communication quality while connection of the corresponding information appliance to a network has been established, this sequence checks communication quality along the route from the Service Server to the information appliance and acquires the check result.

Actors

- Information appliance (CE): Electrical appliance supporting the configurator
- Home gateway (HG): Network device that acts as a bridge between the home network and a public line
- Configurator (Cfgr): Device or software for performing configuration management of the information appliance
- Quality Check Server: Server that checks the communication quality of the network

Sequence

- The Quality Check Server transmits a "communication test request" to the configurator.
- The configurator transfers the "communication test request" to the configuration agent.
- The configurator transfers the "communication test request" to the home gateway.
- A "communication test" is performed between the configuration agent and the home gateway.
- The home gateway transmits a "communication test reply" to the configurator.
- The configurator transmits a "communication test request" to the configuration agent.
- The configurator transmits the "communication test request" to the Quality Check Server.
- A "communication test" is performed between the configuration agent and the Quality Check Server.
- The Quality Check Server transmits a "communication test reply" to the configurator.
- The configurator transmits a "communication test reply" to the Quality Check Server.

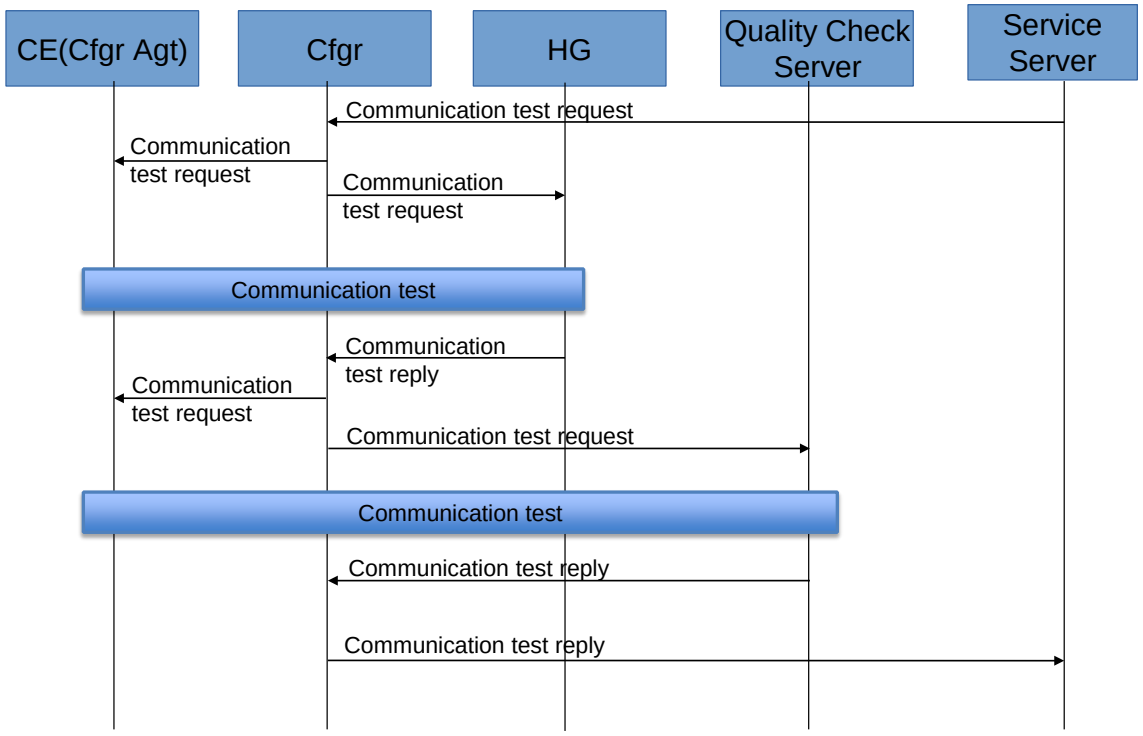

Figure 18 Communication quality test (Sequence 3-4.A)

3.4.5 Quality of a network (application layer)

(1) Application layer quality test (Sequence 3-5.A)

When quality cannot be ensured on the application level while connection of the corresponding information appliance to a network has been established, this sequence checks communication quality on the application level along the route from the Service Server to the information appliance and acquires the check result.

Actors

- Information appliance (CE): Electrical appliance supporting the configurator
- Home gateway (HG): Network device that acts as a bridge between the home network and a public line
- Configurator (Cfgr): Device or software for performing configuration management of the information appliance
- Quality Check Server: Server that executes a quality test program

Sequence

- The Quality Check Server transmits an "application layer quality test request" to the configurator.
- The configurator transfers the "application layer quality test request" to the configuration agent.
- An "application layer quality test" is performed between the configuration agent and the Quality Check Server.
- The configuration agent transmits an "application layer quality test reply" to the configurator.
- The configurator transmits an "application layer quality test reply" to the Quality Check Server.

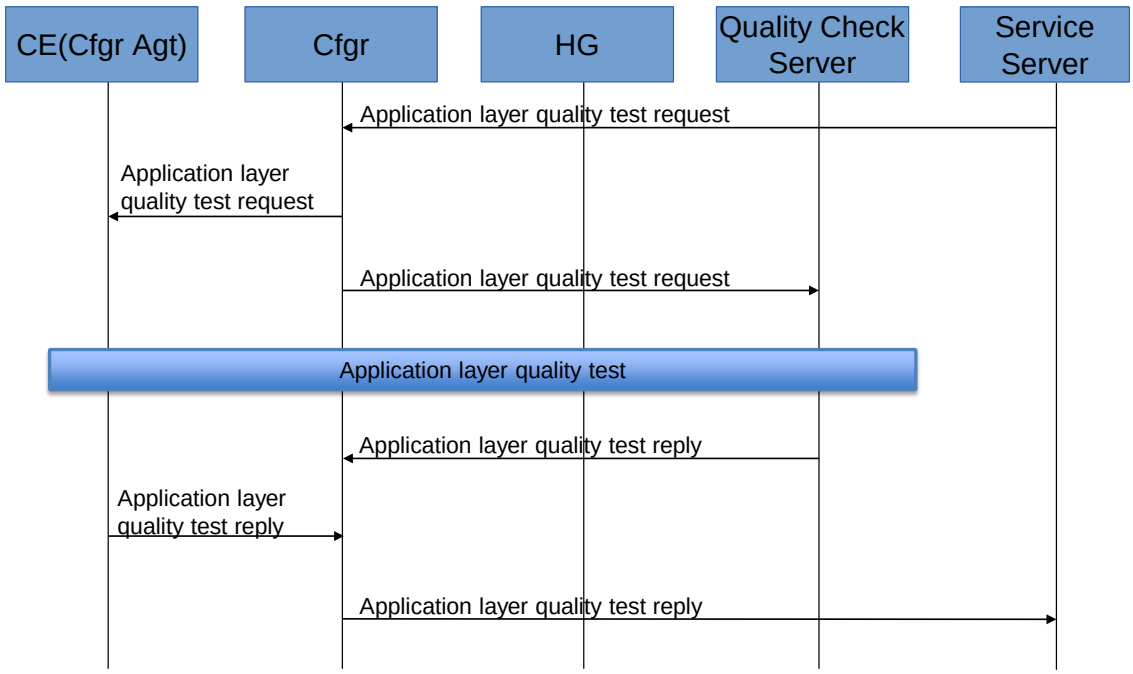

Figure 19 Application layer quality test (Sequence 3-5.A)

3.4.6 Service interference

(1) Interference between services (when the interference list contains the relevant information) (Sequence 3-6.A)

When connection of an information appliance cannot be established on the application level while its connection to a network has been established, this sequence checks whether each service operating on the information appliance and a service operating on another information appliance interfere with each other, and acquires the check result.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Failure Information Server: Server in which a list of combinations of the services that interfere with each other is registered

・Service Server: Server that checks for interference between services

Sequence

・The Service Server transmits a "service interference test request" to the configurator.

・The configurator transmits a "service status list request" to the configuration agent.

・The configuration agent transmits a list of the services operating on the information appliance to the configurator as a "service status list reply."

・The configurator transmits the list of the operating services to the Service Failure Information Server as a "service interference information request."

・The Service Failure Information Server transmits the presence or absence of service interference to the configurator as a "service interference information reply."

・The configurator transmits the presence or absence of service interference to the Service Server as a "service interference test reply."

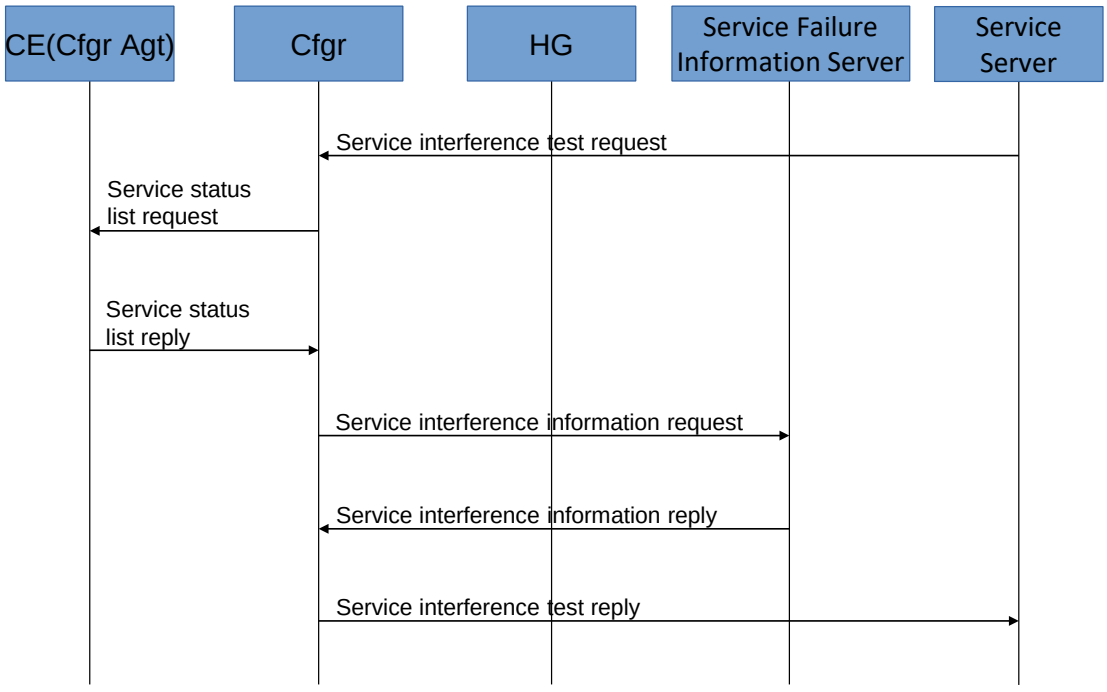

Figure 20 Interference between services (when the interference list contains the relevant information) (Sequence 3-6.A)

(2) Interference between services (when the interference list does not contain the relevant information) (Sequence 3-6.B)

When connection of an information appliance cannot be established on the application level while its connection to a network has been established, this sequence checks whether each service operating on the information appliance and a service operating on another information appliance interfere with each other, and acquires the check result. In contrast to Sequence 3-6.A, no service interference list is present for this sequence.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Service Failure Information Server: Server in which a list of combinations of the services that interfere with each other is registered

・Service Server: Server that checks for interference between services

Sequence

・The Service Server transmits a "service interference test request" to the configurator.

・The configurator transmits a "service status list request" to the configuration agent.

・The configuration agent transmits a list of the services operating on the information appliance to the configurator as a "service status list reply."

・The configurator transmits the list of the operating services to the Service Failure Information Server as a "service interference information request."

・The Service Failure Information Server transmits a notification stating that no interference list information is available, to the configurator as a "service interference information reply."

・The configurator activates services on the information appliance and those on the Service Server and checks whether the services normally operate in each of their combinations.

・The configurator transmits the result of the service interference test (combinations of the services that interfere with each other) to the Service Failure Information Server as a "service interference information registration request."

・The Service Failure Information Server registers the combinations in the service interference list.

・The Service Failure Information Server transmits a "service interference information registration reply" to the configurator.

・The configurator transmits a "service interference test reply" to the Service Server.

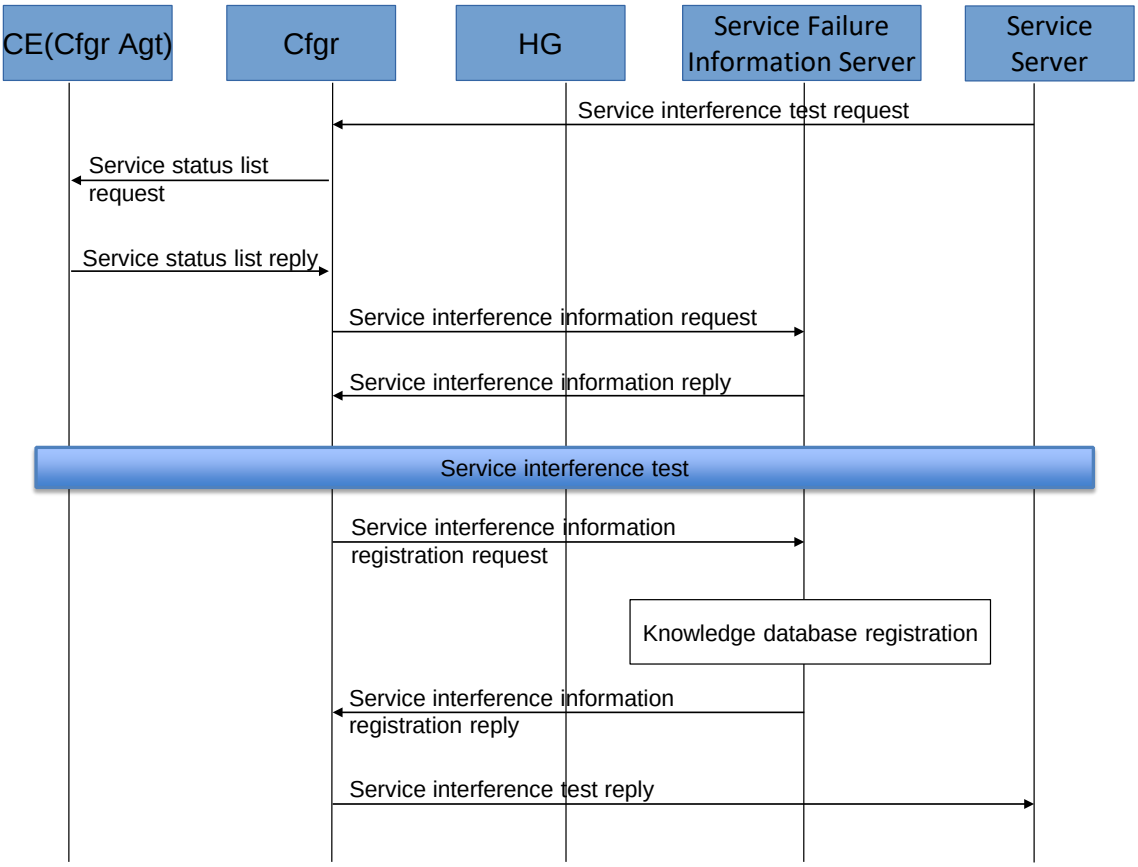

Figure 21 Interference between services (when the interference list does not contain the relevant information) (Sequence 3-6.B)

3.4.7 Failure of terminal equipment

(1) Device failure test via a cloud server (Sequence 3-7.A)

When connection of an information appliance to a network has been established but is unstable, this sequence acquires the internal status of the information appliance and the status of the connected network, thereby detecting the failure of the information appliance and making a diagnosis of the failure with the aid of a Diagnosis Server.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator
・Home gateway (HG): Network device that acts as a bridge between the home network and a public line
・Configurator (Cfgr): Device or software for performing configuration management of the information appliance
・Diagnosis Server: Server that identifies failures from years of operation and the time of introduction
・Service Server: Server that checks on the information appliance and other entities for a failure

Sequence

・The Service Server transmits a "device failure test request" to the configurator.
・The configurator transmits a "device status request" to the configuration agent.
・The configuration agent sends back current information on the information appliance to the configurator as a "device status reply."
・The configurator transmits the current information on the information appliance to the Diagnosis Server as a "device diagnosis request."
・The Diagnosis Server transmits the result of the presence or absence of a failure determined from the current information on the information appliance to the configurator as a "device diagnosis reply."
・The configurator transmits the result of the diagnosis to the Service Server as a "device failure test reply."

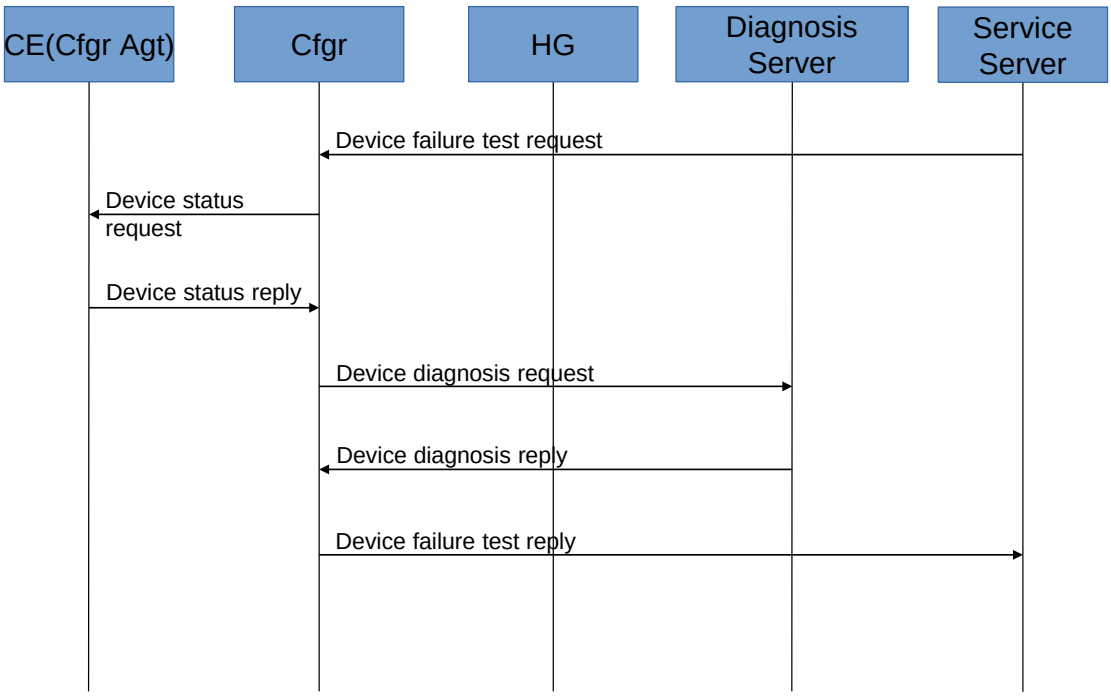

Figure 22 Device failure test via a cloud server (Sequence 3-7.A)

(2) Device failure test without using a cloud server (Sequence 3-7.B)

When connection of an information appliance to a network has been established but is unstable, another information appliance requests the corresponding configurator to check on the relevant unstable information appliance for a failure. The configurator acquires the internal status of the relevant unstable information appliance and the status of the connected network, thereby detecting the failure.

Actors

・Information appliance (CE): Electrical appliance supporting the configurator

・Home gateway (HG): Network device that acts as a bridge between the home network and a public line

・Configurator (Cfgr): Device or software for performing configuration management of the information appliance

・Diagnosis Server: Server that identifies failures from years of operation and the time of introduction

・Service Server: Server that checks on the information appliance and other entities for a failure

Sequence

・Configuration Agent 1 transmits a "device failure test request" to the configurator.

・The configurator transmits a "device status request" to Configuration Agent 2.

・Configuration Agent 2 sends back current information on the corresponding information appliance to the configurator as a "device status reply."

・The configurator makes a device diagnosis.

・The configurator transmits the result of the diagnosis to Configuration Agent 1 as a "device failure test reply."

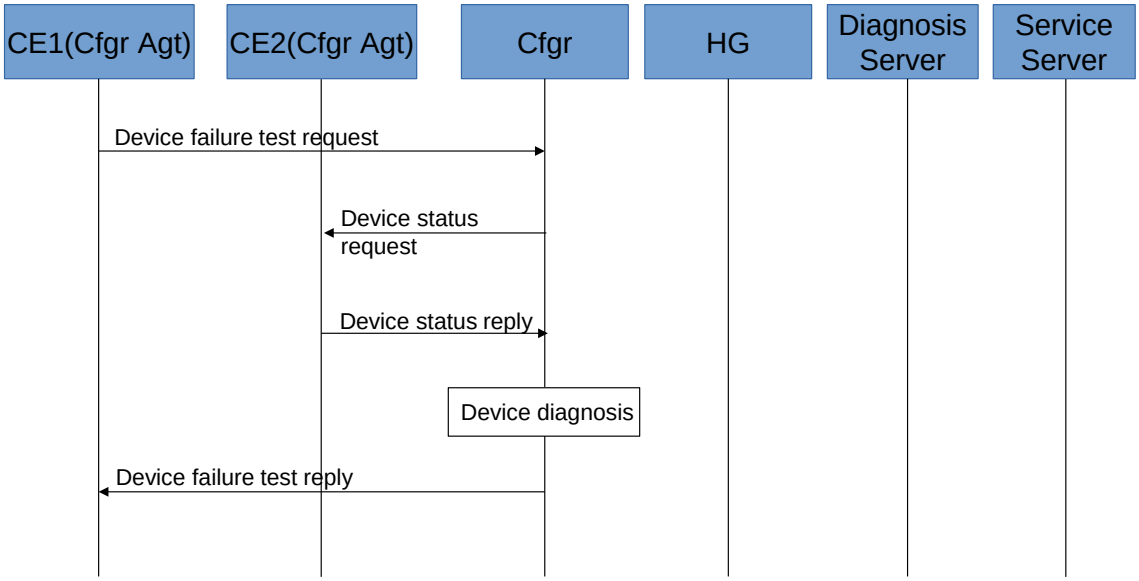

Figure 23 Device failure test without using a cloud server (Sequence 3-7.B)

4 Reference Documents

[IEC 62608] IEC 62608-1 (2013), Multimedia home network configuration – Basic reference model – Part 1: System model

[TTC TR-1053] TTC TR-1053, Customer support functions for home network service platform

[TTC TR-1057] TTC TR-1057, Customer support guideline for home network service

[ITU-T Y.2070] ITU-T Y.2070, Requirements and architecture of the home energy management system and home network services

[TTC JJ-300.00] TTC JJ-300.00, Home-network Topology Identifying Protocol (HTIP)