ECHONET Consortium
Personal Connected Health Alliance
Guidance on Data Linkages

Revision History

DATE	Version	REVISED
April 14,2022	1.00	First edition
November 07,2022	1.01	Corrected clerical errors

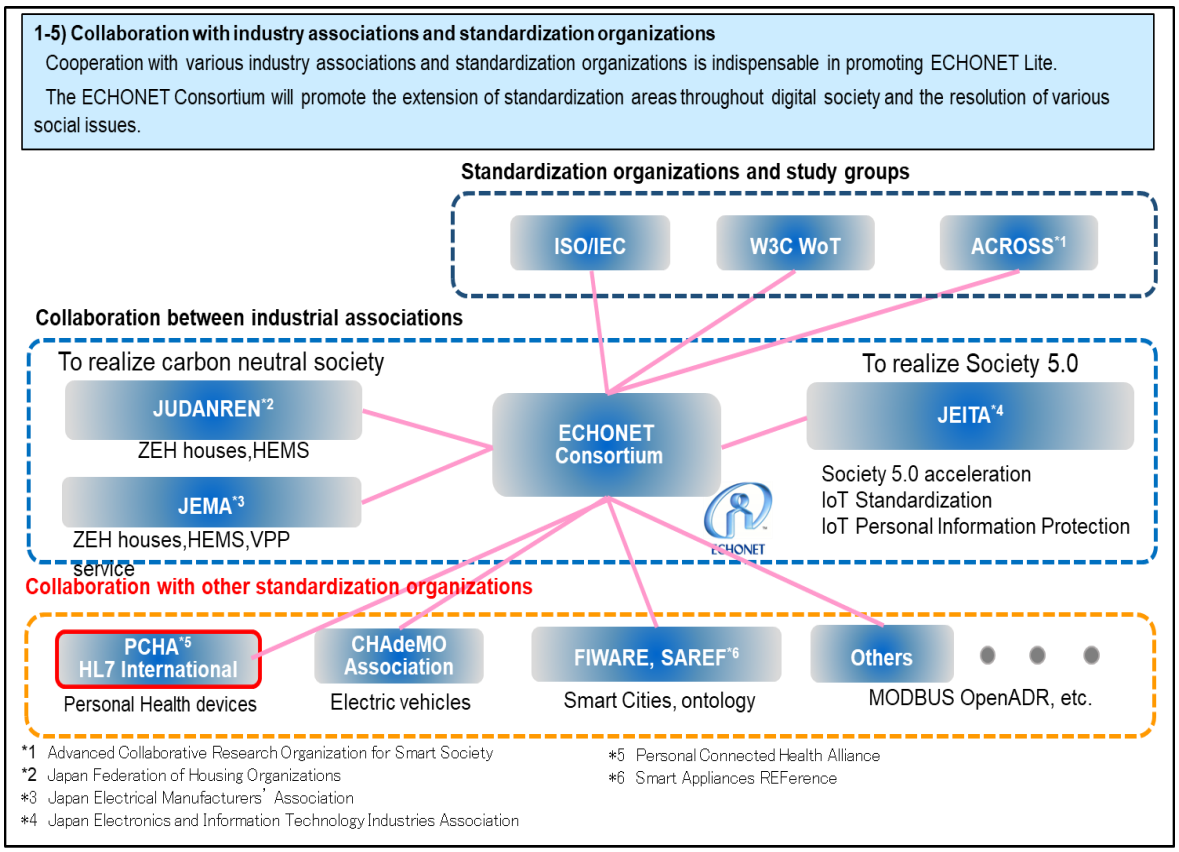
CONTENTS

Chapter 1 Introduction

The ECHONET Consortium is promoting the study of data linkages among standards organizations as a part of the ECHONET 2.0 initiatives. This document summarizes studies on a standard mechanism for establishing online data linkage between ECHONET Lite device data and health data, like body temperature and blood pressure, with the aim of effectively using this kind of data in services such as health-minded housing. Furthermore, it summarizes the direction of the necessary ECHONET Lite Web API specification extensions.

1.1. ECHONET 2.0 initiatives

The ECHONET Consortium is promoting the study of data linkages among standards organizations as a part of the ECHONET 2.0 initiatives. This document summarizes studies on a standard mechanism for establishing online data linkage between ECHONET Lite device data and health data, like body temperature and blood pressure, with the aim of effectively using this kind of data in services such as health-minded housing. Furthermore, it summarizes the direction of the necessary ECHONET Lite Web API specification extensions.



Source: Reference documents reported by the Sixteenth ECHONET Forum Promotion Committee

Figure 1 Study on ECHONET Consortium service linkages

1.2. Direction of Smartlife Services

The Japan Electronics and Information Technology Industries Association (JEITA) is promoting activities to realize a society with various Smartlife Services by collecting and utilizing data related to usage and environment from ever increasingly IoT-oriented home appliances and housing equipment. In line with these activities, JEITA released a standard model “Smartlife Service Delivery Model through Cloud Linkage Ver 1.0”.

In this model, Figure 2 demonstrates the concept of delivering highly flexible services by shifting from the conventional service delivery model based on vertical integration by device manufacturers to a service delivery model based on multi-company collaboration through cloud-based ID connections.

Regarding the collaboration structure between PCHA and the ECHONET Consortium, the Consortium is also considering data linkage at the Web API level based on this concept. For this purpose, the recommended PCHA standard HL7®FHIR® (hereinafter referred to as “FHIR”) Web API (hereinafter referred to as “FHIR REST API”) and the ECHONET Lite Web API will be used.

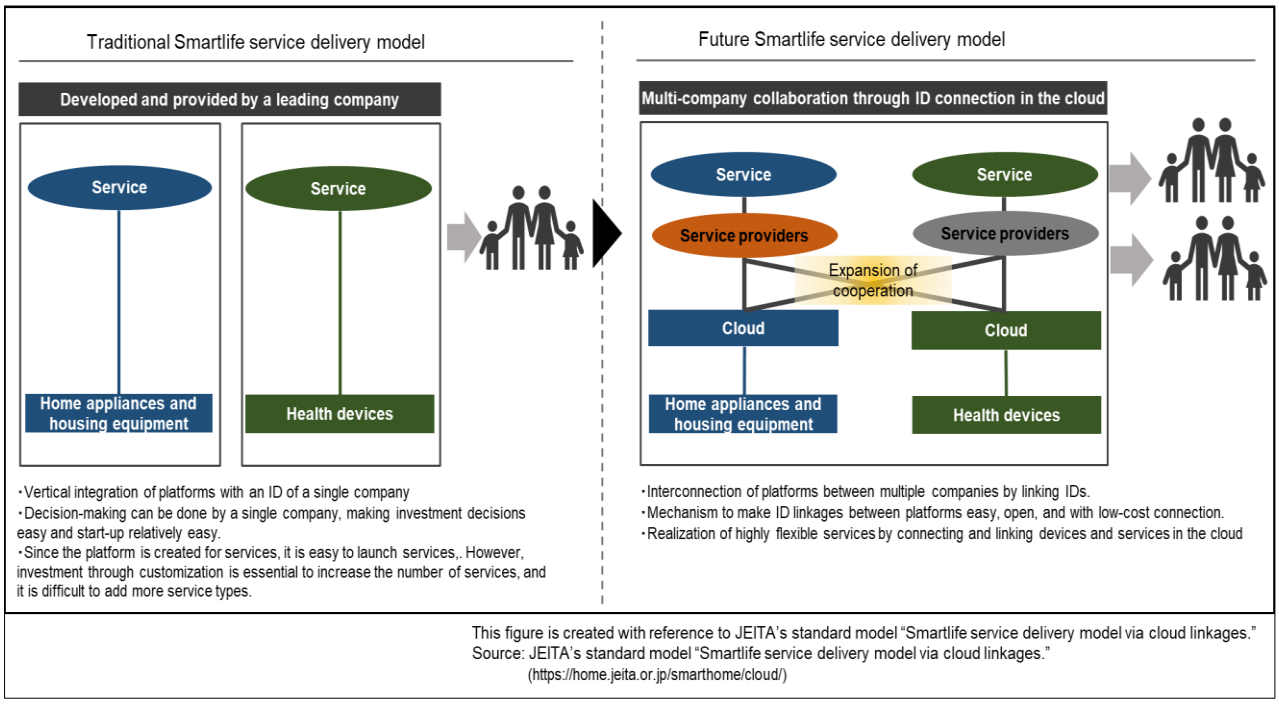


Figure 2 Smartlife Service delivery model

1.3. Purpose of data linkages

In October 2020, PCHA and the ECHONET Consortium signed a “Memorandum of Understanding for Collaboration among Organizations” to link and effectively utilize health data as well as home appliance and housing equipment data, while continuing to hold discussions regarding collaboration.

Through this alliance, the ECHONET Consortium shall realize Smartlife Services directly related to *people*, stretching from services such as home energy conservation management and remote control of equipment using home appliances and housing

equipment to links with health services which attract high social interest. Furthermore, there is room to consider extending the specifications of the ECHONET Lite Web API to appropriately handle health and other types of data, which are closely related to *people*. Therefore, the Consortium shall promote these considerations as a part of its data linkage activities.

While promoting the standardization of healthcare data, the PCHA sees this as an opportunity to advance the use of the FHIR standard in collaboration with Smartlife Services linked to home appliances and housing equipment.

To achieve the common goal of making a social contribution, it is necessary that the linked data is not only utilized by an individual or their family at home, but that this standardized and highly reliable data from both segments is utilized by services such as nursing care and care for potential patients which extend throughout the care network of a region.

The following are the objectives that this collaboration aims towards.

- Realize and distribute comprehensive services which shift from intra-silo data utilization to the inter-silo collaboration model
- Expand the market of collaborative services which are developed by ECHONET Consortium member companies
- Expand the market of health services which make use of the FHIR standard
- Contribute to society in areas such as business support services for caregivers through the use of linked data and comprehensive community care networks
- Extend the ECHONET Lite Web API specifications in order to handle data which is closely related to *people*

Previously, services were often provided within their respective silos. However, as shown in Figure 3, by linking at the Web API level, it is expected that service providers will be able to expand their services to link with other industries while utilizing their knowledge of their existing business fields. As these linked services are recognized in the market, the market for linked services by new service providers is expected to expand.

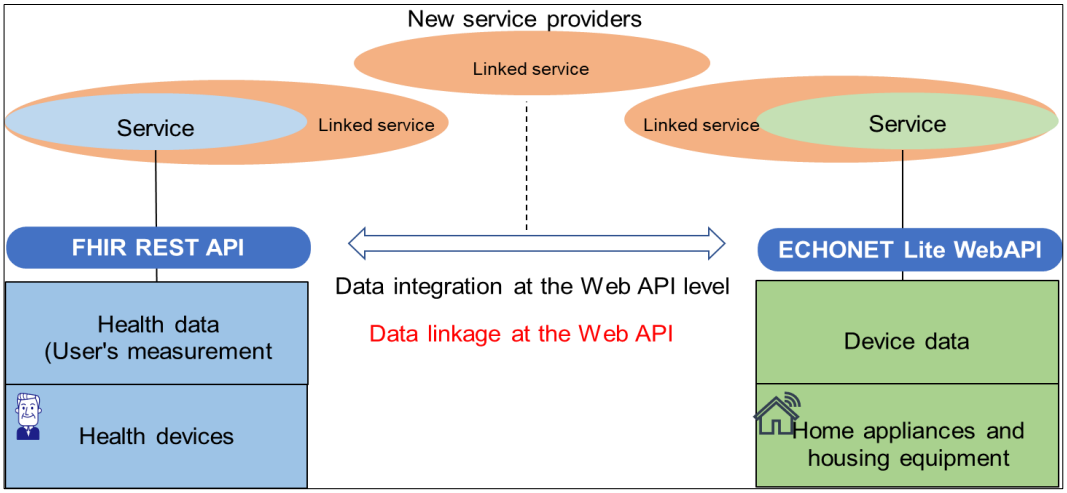


Figure 3 Concept of service utilization through data linkages

1.4. Definitions

Definitions	Description
Management cloud for home appliances and housing equipment devices	In this document, this refers to cloud servers operated by ECHONET Consortium member companies and capable of providing ECHONET Lite device data to service providers via the ECHONET Lite Web API.
Health data management cloud	In this document, this refers to cloud servers that comply with the FHIR standard operated by health service providers and ECHONET Consortium member companies and for the purpose of managing health data such as weight and blood pressure measured at home.
Web service cloud	In this document, this refers to a cloud server consisting of a Web server and an application server to implement services that utilize both ECHONET Lite device data and health data.
Health devices	In this document, this refers to home health equipment intended primarily for personal use, such as thermometers, blood pressure monitors, body weight scales, and body composition analyzers.
Health data	This refers to data such as body temperature, blood pressure, and weight measured by health equipment for individuals to manage their own health. This data does not include data for medical use measured by medical institutions for medical checkups or consultations.
Data linkage	In this document, this refers to data utilization after integrating both data standardized by ECHONET Lite standards accumulated by home appliances and the housing equipment management cloud, and data standardized by FHIR standards that is accumulated in the health data management cloud to be used in services.
Web API	This refers a standard technology which is an intersystem interface using HTTP(S) to send/receive data using a request & response method
ECHONET Lite Web API	This refers to the specifications defined in the “ECHONET Lite Web API Guidelines”, which are standardized for communicating ECHONET Lite device data between systems using Web API technology.
FHIR REST API	In this document, this refers to the Web API defined in FHIR®, a medical data standard developed by HL7®.
LOINC codes	This is the standard for item names and codes for information to be obtained from medical examinations, consultations, etc., and is adopted by FHIR@. For example, when obtaining body temperature data, specify the LOINC code “8310-5”.

1.5. Reference documents

(1) HL7®FHIR® FHIR Specifications (Website)

(2) ECHONET Lite Web API Guidelines

(3) JEITA “Smartlife Service Delivery Model through Cloud Linkage Ver 1.0”

Chapter 2 Effective utilization of cloud data

2.1. Web service utilization for ECHONET Lite device data

In general, the operating status and operation history of ECHONET Lite devices such as home appliances and housing equipment are collected via communication devices in a cloud operated by the device/controller manufacturers.

Figure 4 shows the pattern where data is collected by Company A's GW and HEMS controllers, and data of both Company A (room air conditioners) and Company B (lighting) are collected in Company A's cloud. A service provider can then access data regarding the in-house room air conditioners and lighting through Company A's cloud.

On the other hand, Figure 5 shows the data for Company A's room air conditioners collected into Company A cloud, and the data for Company B's lighting collected in the Company B's cloud. Service providers can access room air conditioning and lighting data through Company A's and Company B's cloud respectively. For real-world houses, there are some additional cases where the HEMS controller is from Company C, and equipment data from Companies A and B are stored in Company C's cloud, or combinations of these cases.

In the case of the configuration shown in Figure 5, it is necessary to access multiple clouds to comprehensively use the in-house equipment data. This is one of the major challenges in promoting Smartlife Service businesses. In order to tackle this challenge, it is necessary to operate a public data linkage infrastructure and open data to the public in the future. The JEITA Data Catalog project is a step towards this direction.

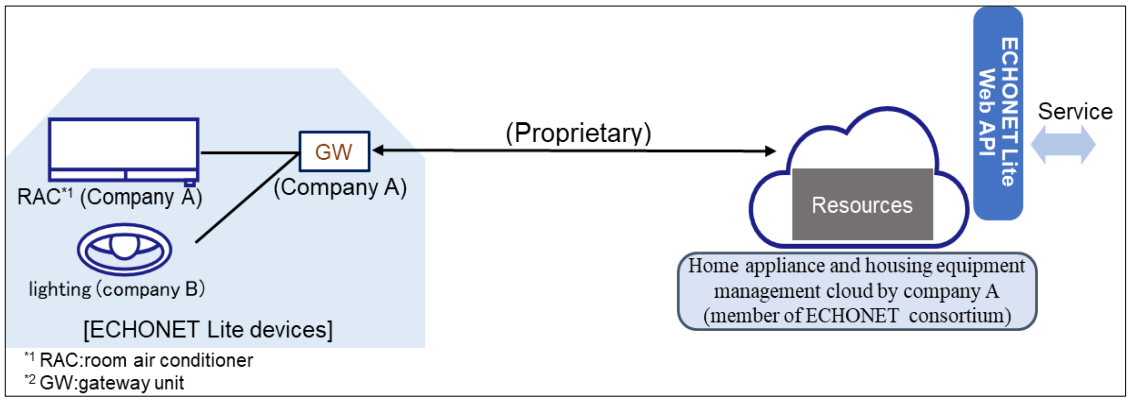


Figure 4 Concept of cloud utilization of ECHONET Lite device data 1

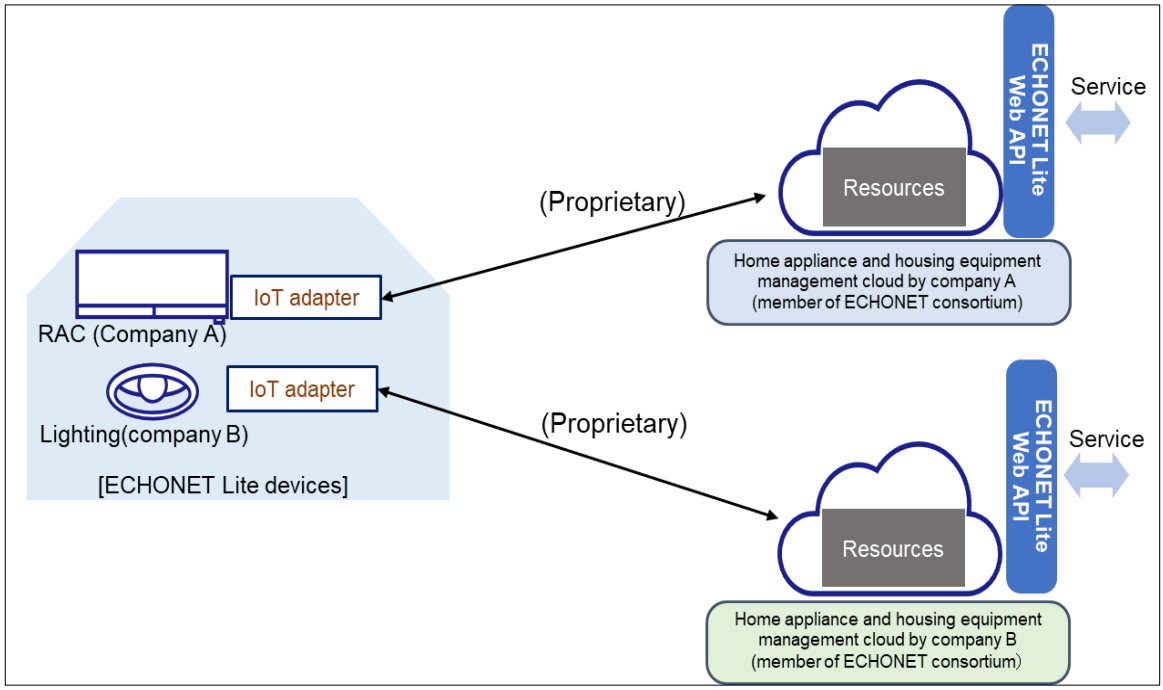


Figure 5 Concept of cloud utilization of ECHONET Lite device data 2

2.2. Utilization of Web services for health data

Health data such as blood pressure and body weight are acquired from smartphones or other devices owned by the persons being measured and are accumulated as FHIR conforming data, linked to a person, in the health data management cloud operated by the health service provider. Smartphone applications can acquire health data from various devices to store in a server.

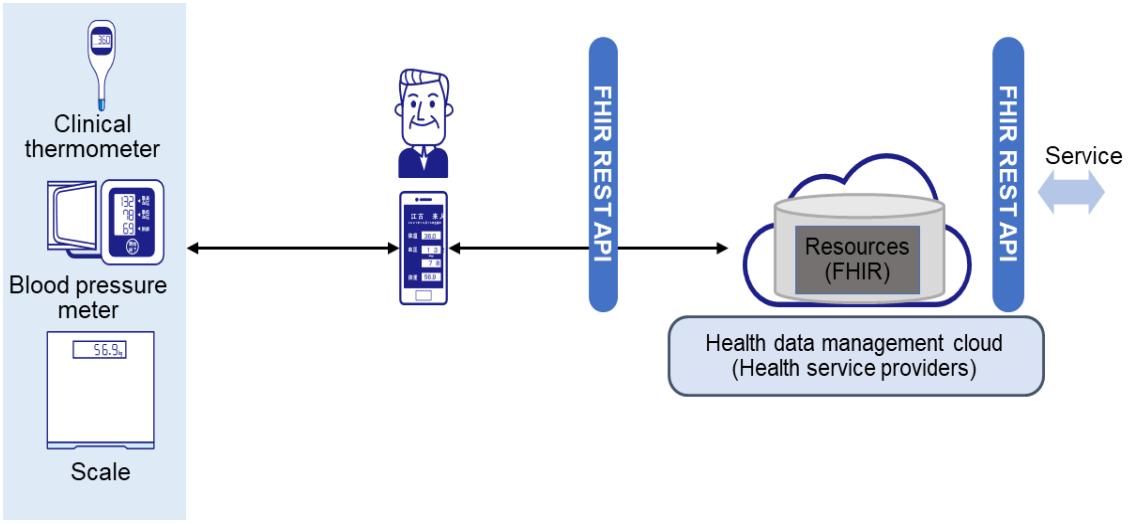


Figure 6 Concept of health data cloud utilization

2.3. Difference between ECHONET Lite WebAPI and FHIR REST API

The ECHONET Lite Web API and the FHIR REST API have some common elements, including the use of a REST API that operates on resources using Web standard technologies such as URI and HTTP, and recommending standard technologies such as OAUTH 2.0 as an authorization method for cloud-to-cloud access.

Many of the home appliances and housing equipment operate constantly 24-7, resulting in a large amount of periodically collected data. Furthermore, the ECHONET Lite standard does not specify “who” is operating the equipment.

In contrast, health data is data regarding a *person* being measured by a device, and is the result of somebody actively performing a measurement. Therefore, the possibly irregular data updates as well as who this data is associated with are very important aspects of health data.

The FHIR® standard mainly targets medical data, and is not only intended for health data. Because of this, resources related to a broad range of medical operations are defined, and it is not easy to understand the resources unless the person is familiar with medical operations. These challenges may make the handling of such data difficult for the ECHONET Consortium members. However, since the data linkage addressed in this guidance does not include the medical field, we believe that this data can be utilized in services as long as the resources that refer to measurements of simple health data are understood.

The ECHONET Lite Web API specifications are not designed to handle data linked to *people* appropriately. However, assuming that in the future effective service utilization will be expanded to various business areas, this collaboration study will consider the handling of such data.

Table 1 Differences between health data and home appliances and housing equipment data

	Data updates and collection cycle	Data linkage
Health data	**・Data is updated as people take measurements.** **・Update cycle is typically several times a day.**	**・Link the “person to be measured” with the “measurement data”.** **・Link the “person to be measured” with the “measurement data” and the “measurement device”.**
Home appliances and housing equipment	**・Data is periodically updated inside the device.** **・The update cycle is typically once every few seconds or minutes.**	**・Link “equipment” and “operation data”.** **・Link “equipment”, “installed room”, and “operation data”.**

2.4. Data linkage concept

The following three methods can be considered for linking health data with home appliances and housing equipment data, as a method to provide them to service providers:

(1) ECHONET-related business operators combine both health data and home

appliances and housing equipment data, and subsequently provide this data to service providers. (Figure 7)

(2) Service providers access and acquire data from both the health data management cloud and the home appliance and home equipment management cloud respectively (Figure 8)

(3) Service providers acquiring the necessary data via data collaboration platforms. (Figure 9)

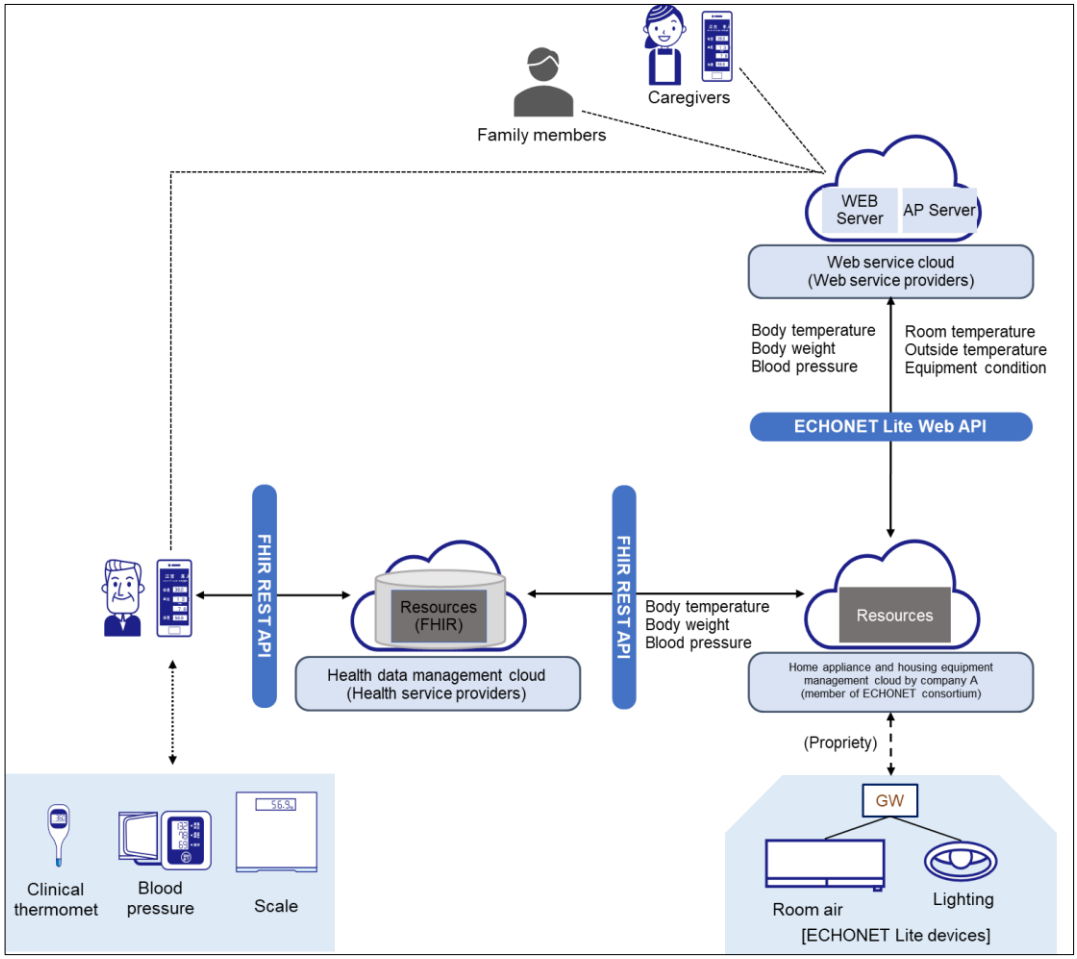


Figure 7 Data linkage concept (1)

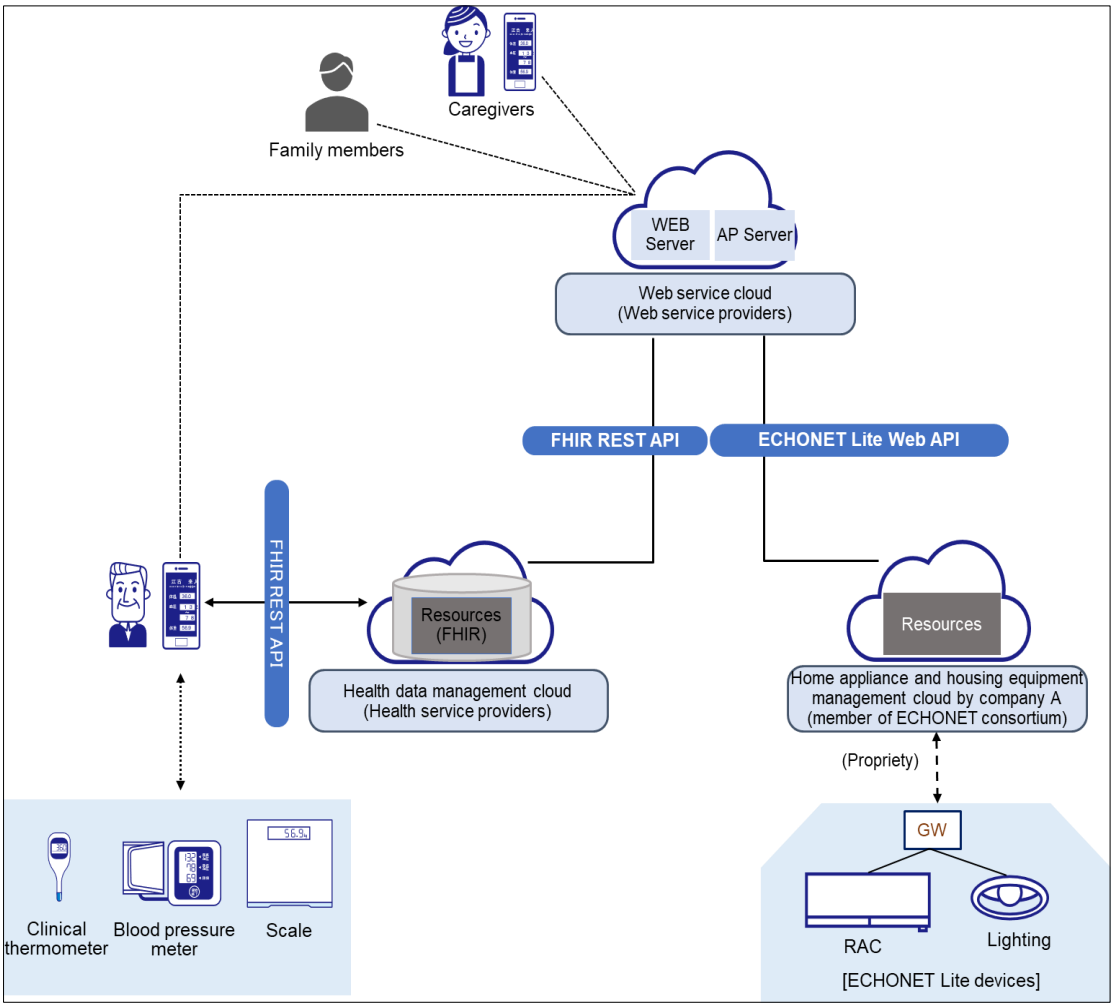


Figure 8 Data linkage concept (2)

The second data linkage concept shall be excluded from the scope of the discussion because this type of data linkage is something to be discussed between two parties: a service provider and an ECHONET-related business operator. This model shows a structure for accessing FHIR (health data) and ECHONET Lite Web API (home appliances and housing equipment data) from the Web service cloud, built by the service providers to obtain data. In this case, the main consideration points are a data linkage model, the data sets suitable for applications to be realized on the Web service cloud side, or the data analysis mechanism to be utilized for the service.

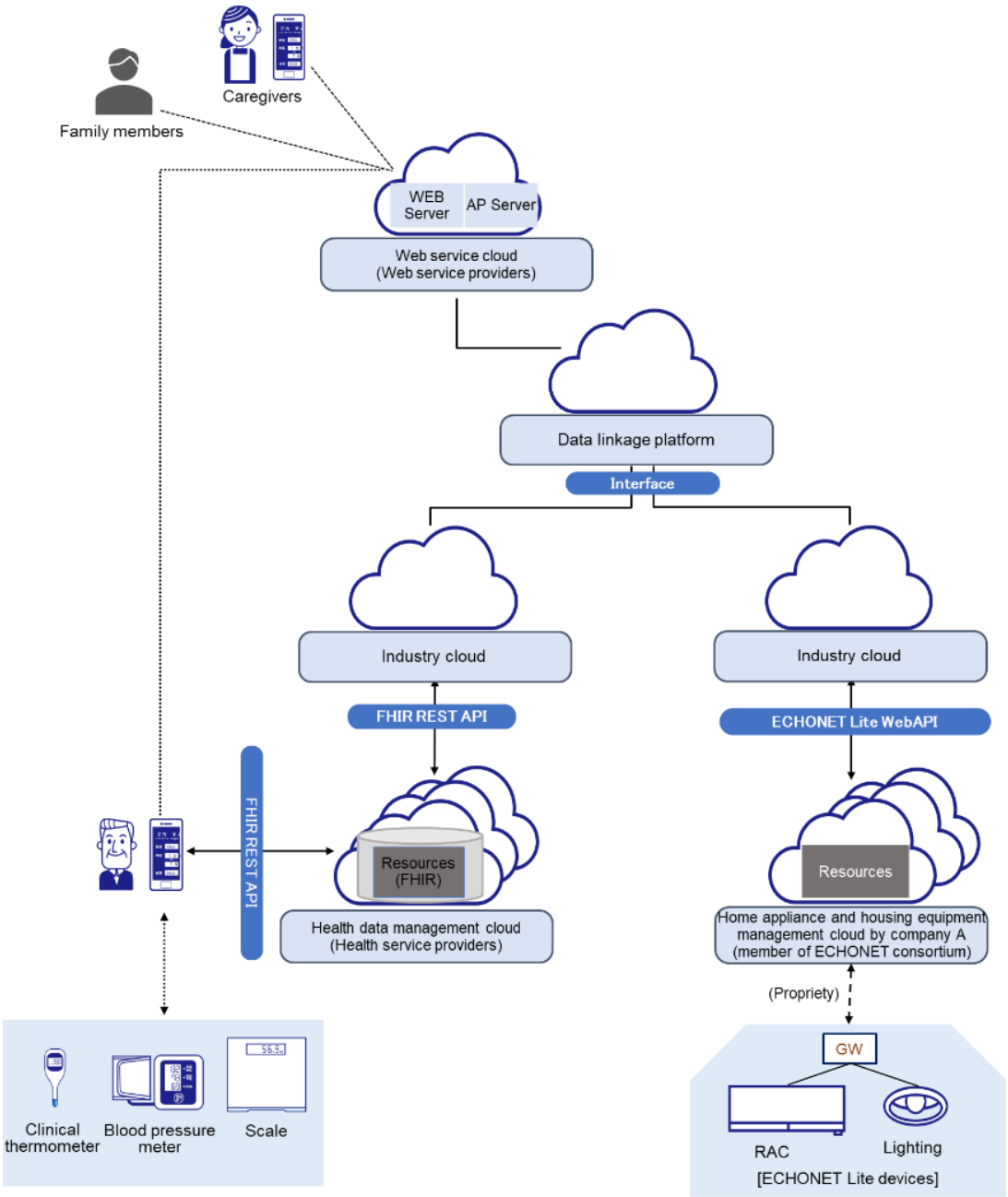


Figure 9 Data linkage concept (3)

Similarly, the third data linkage concept is also excluded, as it necessitates a mechanism for open data utilization, which is a topic to be discussed broadly between many organizations and not something to be discussed just between two organizations. Therefore, this study is being conducted with a focus on the first data linkage concept.

Chapter 3 Data linkage structure

3.1 Data linkage structure

Figure 10 shows the structure of the first data linkage concept. This linkage method is a good example of how ECHONET Consortium member companies can realize services that utilize home appliances and housing equipment data as well as health data. By unifying the cloud-to-cloud interface with the service provider cloud to the ECHONET Lite Web API, service providers can handle health data via the ECHONET Lite Web API, which is familiar to them.

This structure assumes collaboration among business operators that obtain health data via the FHIR REST API, from health data management cloud operated by business operators that handle health data. Also, the FHIR server of the health data management cloud is provided as an OSS or cloud service SAAS, and its structure is suitable for the ECHONET Consortium member companies to build and operate a health data management cloud to realize services that utilize health data and home appliances and housing equipment data. As stated above, allowing health data to be obtained from the ECHONET Lite Web API is a feature of the PCHA-ECHONET Consortium data linkage. In order to achieve this, we plan to extend the ECHONET Lite Web API specification appropriately.

Through this structure, it is possible to build a system linking health data management cloud and a home appliances and housing equipment management cloud to provide data that integrates home appliance and housing equipment data as well as health data, without relying on the development of data linkage platforms or other open social infrastructure. The home appliances and housing equipment management cloud service providers understand what kind of data they can offer and, by offering this data to the service providers, the ECHONET Consortium expects further progress on service development by the service providers.

Similarly, it is assumed that this will be unified into the FHIR REST API, but since there are no plans at this time to extend the specifications of the FHIR standard, no examples are provided in this document.

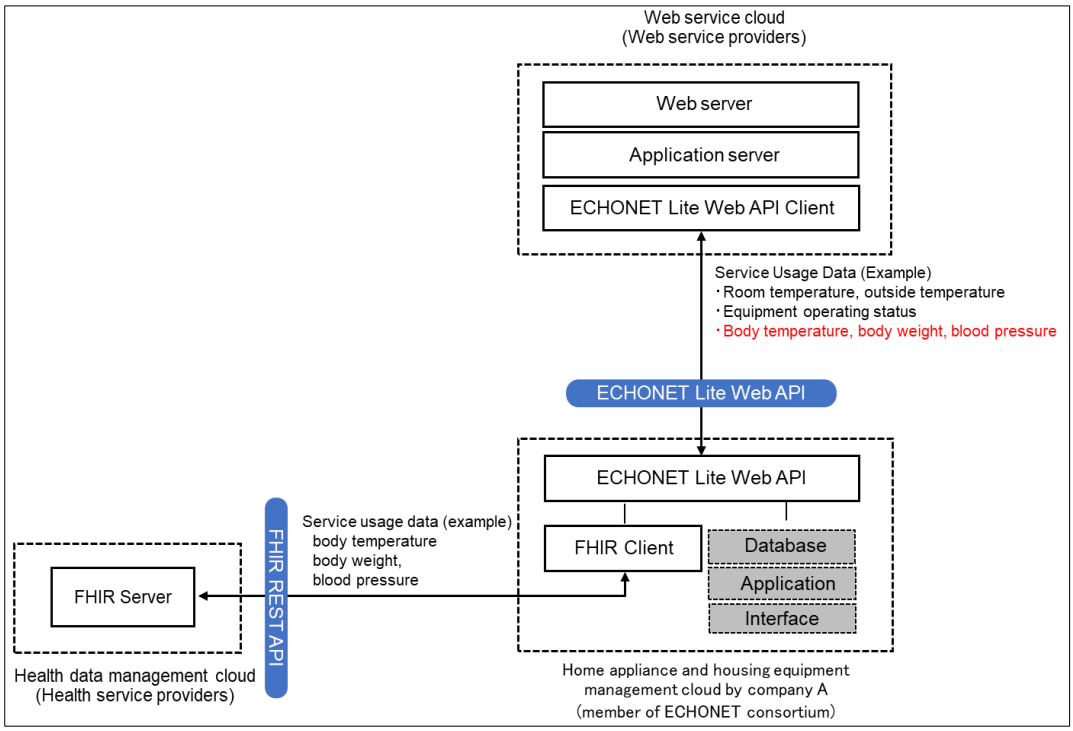


Figure 10 PCHA－Structure on ECHONET Consortium data linkage

The following provides an overview of how health data is obtained from service providers (Figure 11/Figure 12). The ECHONET Lite Web API Client on the Web service cloud of the service providers accesses the health data on the home appliances and housing equipment management cloud through its ECHONET Lite Web API Server. This ECHONET Lite Web API Server implements the planned ECHONET Lite Web API extensions for accessing health data.

The steps of the health data acquisition process are the following. First, the health data acquisition request (1) is converted to FHIR REST API by the FHIR Client functional unit in the home appliances and housing equipment cloud. Then, the request (2) to obtain data health data against FHIR server is sent, and the data is obtained in response (3). Finally, the data is provided to the Web Service cloud by the ECHONET Lite Web API response (4). Although the FHIR Client unit here includes FHIR REST API processing as well as ECHONET Lite Web API⇔ FHIR REST API conversion functionality, considering the partitioning of functions in actual systems other implementations are also possible.

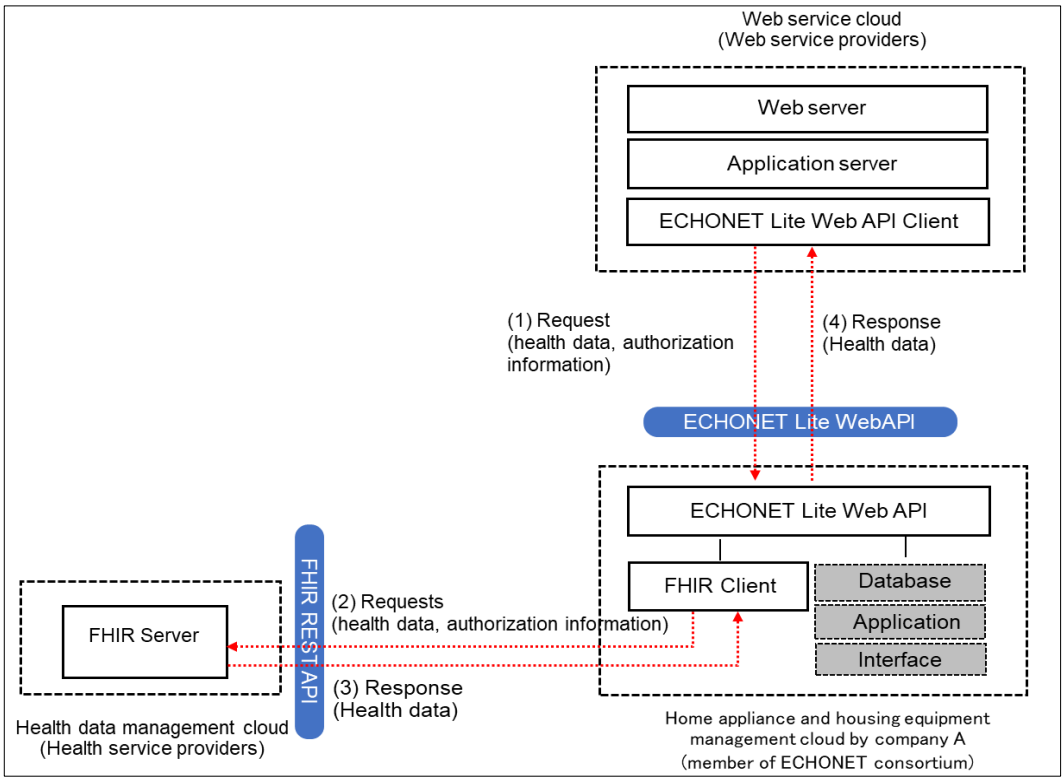


Figure 11 Overview of health data acquisition process

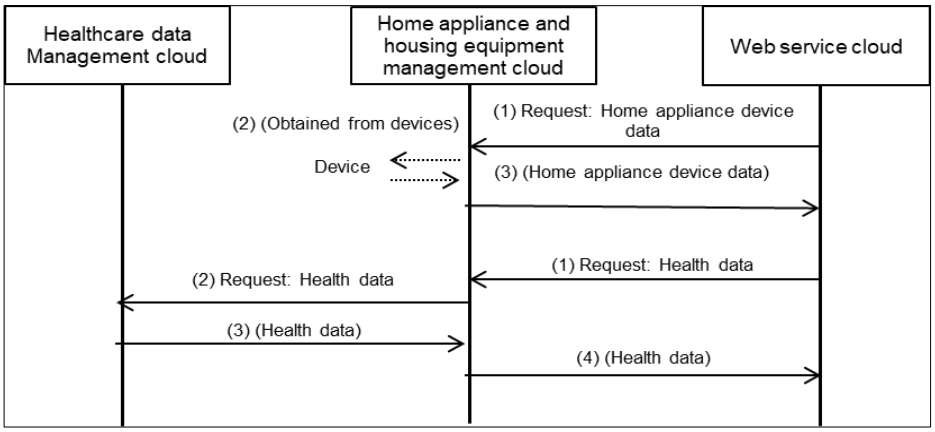


Figure 12 Health and home appliance device data acquisition from Web service cloud

3.2 Authentication and authorization for cloud-to-cloud access

Information such as user accounts and account authentication information are managed in each cloud: the health data management cloud, the home appliances and housing equipment management cloud, and the Web service cloud. However, when data is linked, transferring such information may pose another problem.

In particular, personal information protection and privacy policies have a significant

impact on companies in the event of incidents. Because every company operates under different premises, at this time it is not realistic to standardize the handling of such information. Technically, OpenID connect and OAUTH 2.0 are commonly known among Web services to realize ID integration, therefore it should be acceptable to use these technologies.

Figure 13 shows an example of account linkage utilizing account authentication and authorization servers. When a user (himself, a family member, or a caregiver) logs into a service provided by the Web service cloud, they go through an identity verification process on the authentication and authorized server first. Next, an ID token and access tokens for user access authorization are issued by the authentication and authorization server. Finally, this access token is handed over to the participating clouds, and each cloud verifies the received tokens. This enables the sharing of data, among these clouds, subject to the extent of the authorization.

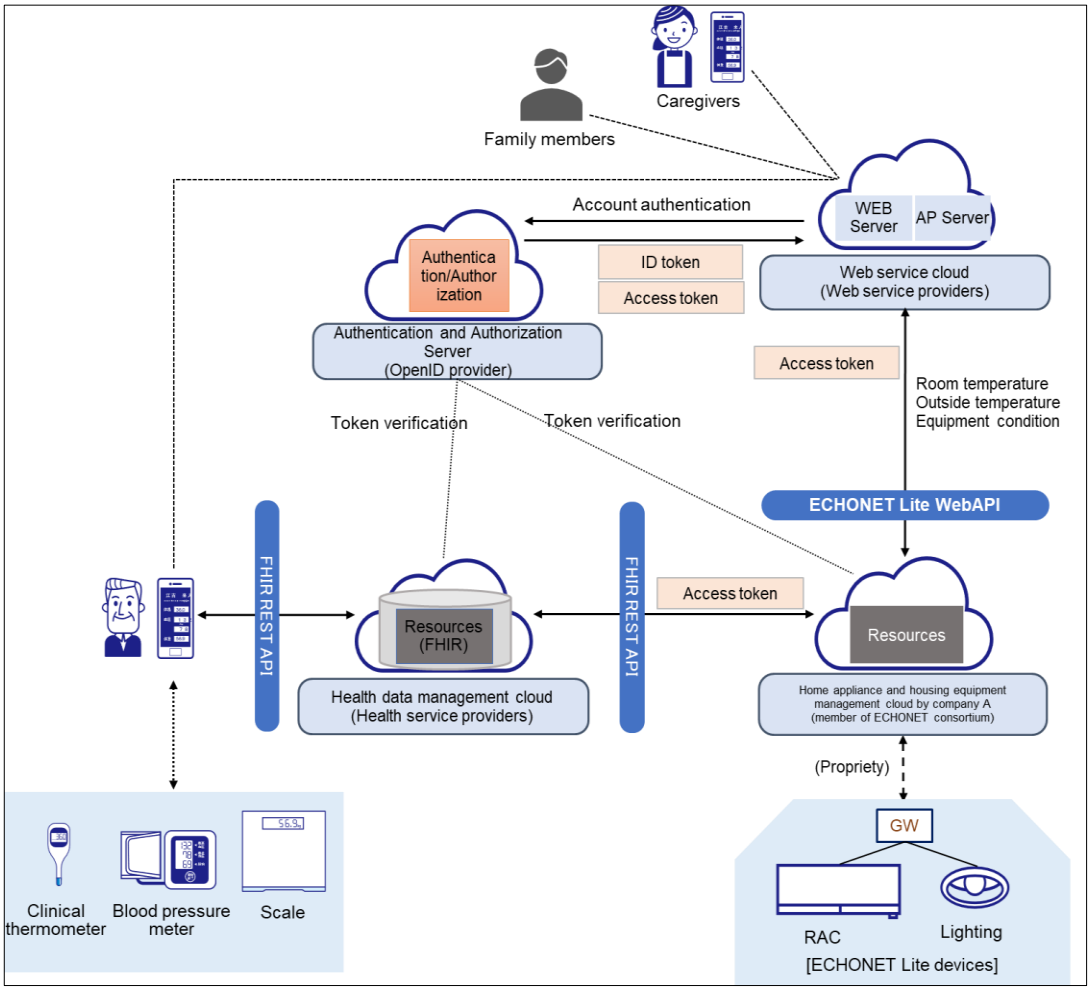


Figure 13 Account linkage using account authentication/authorization server 1

In the case the study shown in Figure 14, data-sharing between the health data management cloud and the home appliance and housing equipment management cloud is achieved through cloud-to-cloud access using OAUTH 2.0 or similar, and health data is periodically collected in the home appliance and housing equipment management cloud.

Therefore, data between the Web service cloud and the home appliance and housing equipment management cloud is same as shown in Figure 13. For example, in cases where ECHONET-related business operators manage both the health data management cloud and the home appliances and housing equipment management cloud, this kind of operation may be more suitable.

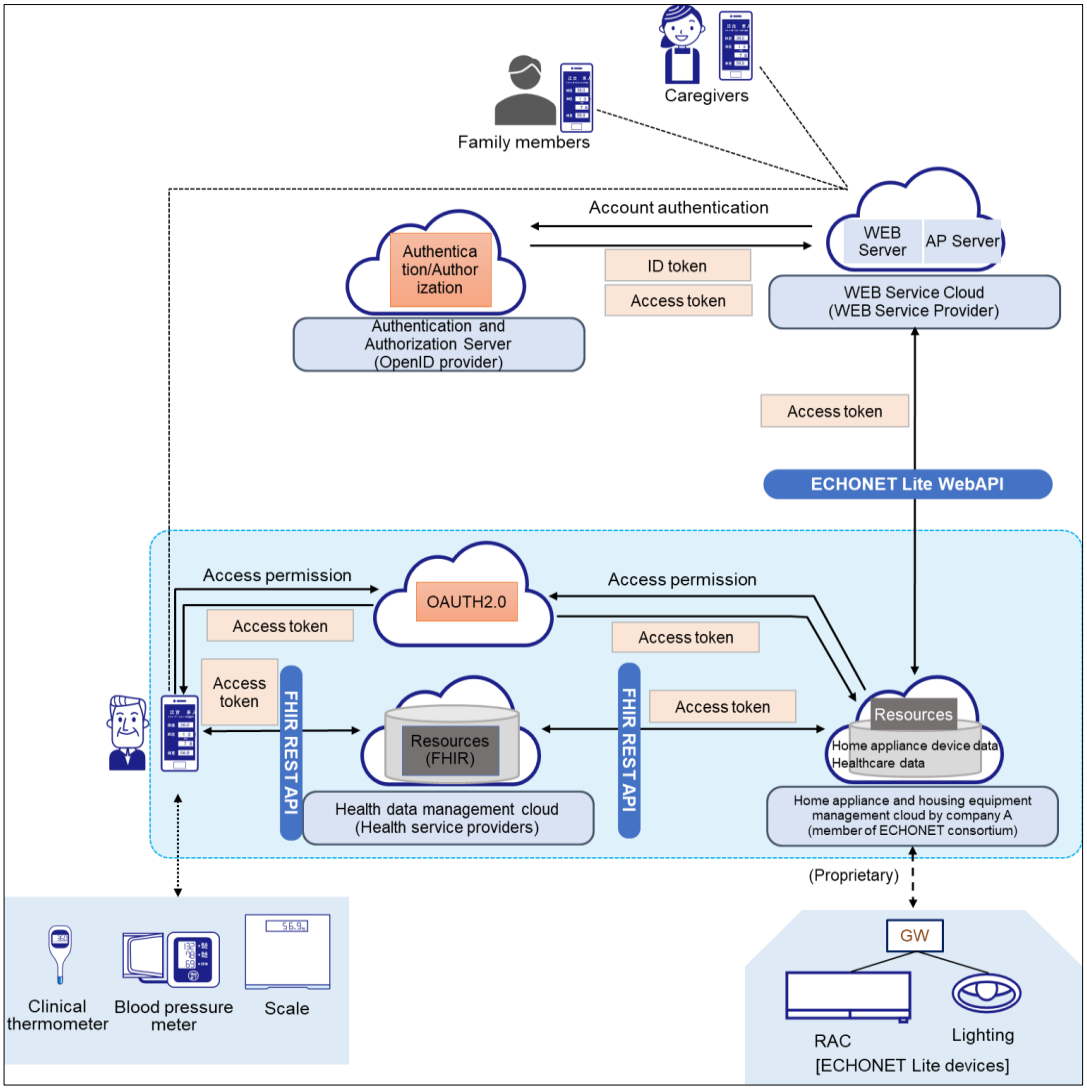


Figure 14 Account linkage using account authentication/authorization server 2

3.3 Direction of extension of ECHONET Lite Web API specifications

The major difference between home appliances and housing equipment data and health data is that home appliances and housing equipment data is data related to the device from which the data originated, as it represents the performance and operating status of that device. As such, the ECHONET Lite Web API has a structure in which data properties are defined for each device as the Device class. On the other hand, personal health data is data that quantifies a person's condition, such as blood pressure, weight, and body temperature. Therefore, in addition to the device from which the data comes from, it is also important which person the data belongs to, and this is the major difference. The realization of the first data linkage concept (Figure 7) requires the extension of ECHONET Lite Web API specifications to accommodate this difference. Specifically, the Personal Information class is being defined to handle information closely related to people.

In order to promote effective data utilization proposed as ECHONET 2.0, it is essential to directly handle data related to people such as health data. Thus, the ECHONET Consortium has decided to proceed with the definition of a personal information class using the data linkage between PCHA and the ECHONET Consortium as an example.

To access to ECHONET Lite device data, use the Device class as previously, while using the Personal Information class to acquire health data.

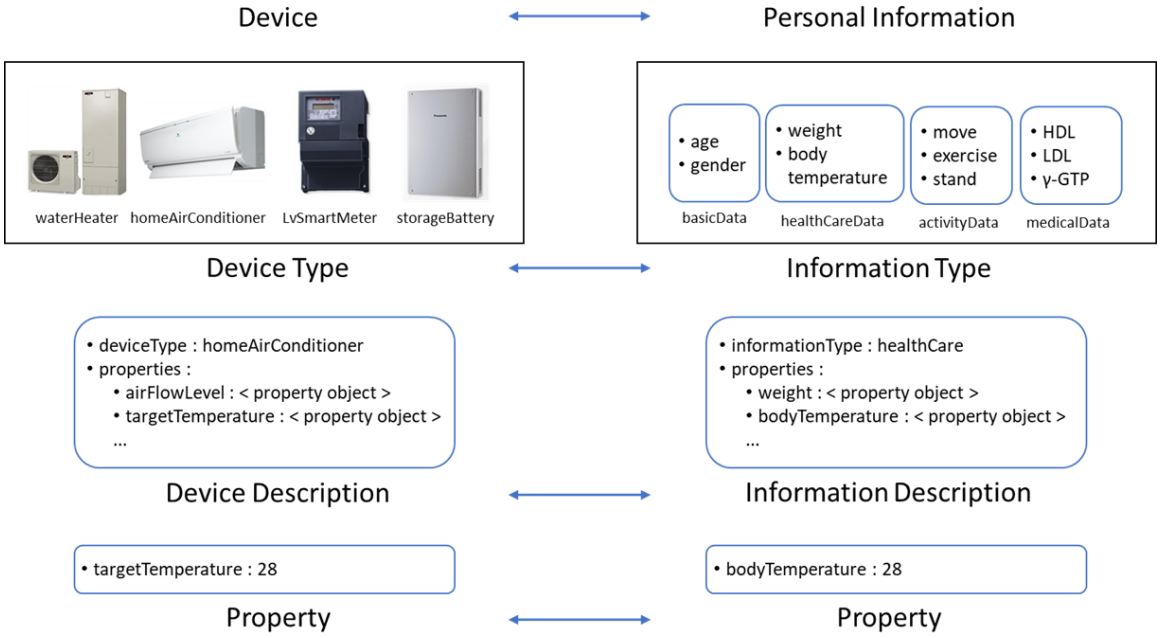


Figure 15 Device class and Personal Information class concept

3.4 ECHONET Lite devices

For reference purposes, the following devices are introduced, assuming use cases linked to health data such as understanding the living environment and improving the environment. Data linking should not be limited to the listed devices, but can be applied to any device for which the ECHONET Lite Web API is defined.

(Device data (example) for ECHONET Lite Web API)

Common resource

【Property Resource】(example)

Resource name	discription	unit
operationStatus	indicates the ON/OFF status.	-
installationLocation	indicates the installation location	-
currentDataAndTime	Current date and time	-

DeviceType：homeAirConditioner

【Property Resource】(example)

Resource name	description	unit
operationMode	Used to specify the operation mode	-
targetTemparature	temperature setting value	℃
humidity	indoor relative humidity	%
roomTempareture	Measured room temperature	℃
outdoorTemperature	Measured outdoor temperature	℃

DeviceType : generalLighting

【Property Resource】(example)

Resource name	description	unit
brightness	brightness level	%
operationMode	Used to specify the operation mode	-
brightnessLevelForMainLighting	brightness level setting for main lighting	-
brightnessLevelStepForMainLighting	brightness level step setting for main lighting	-
autoMode	Used to acquire the current lighting mode in auto mode.	-

3.5 Health devices

The following is a list of relevant devices for reference purposes, assuming use cases linked to home appliances and housing equipment such as monitoring the health conditions of residents. Data linking should not be limited to the given data, but data intended to be used for medical purposes shall be excluded from data linking. The reason for excluding medical data is that the data is indispensable for meeting the relevant legal requirements when used for medical purposes and does not meet the purpose of being broadly utilized for services.

FHIR health data (example)

	Code (Loinc)	Unit
BMI	39156-5	kg/m2
Blood pressure	85354-9	mm [Hg]
Systolic blood pressure	8480-6	mm [Hg]
Diastolic blood pressure	8462-4	mm [Hg]
Body temperature	8310-5	°C, °F
Heart rate	8867-4	Pulse/minute

See specifications to be found in:

10.1.10 Resource Observation – Extensions & Profiles
(https://www.hl7.org/fhir/observation-profiles.html)

3.6 FHIR specifications (Reference)

FHIR is published on the following website as a standard. The FHIR Resource is as shown in Table 2, and health data (e.g. weight and blood pressure) are included in Observation N. For details, refer to the following.

(Specifications found at:)

HL7FHR Release 4 homepage (https://www.hl7.org/fhir/)

10.1 Resource Observation - Content (https://www.hl7.org/fhir/observation.html)

Table 2 FHIR Resource list

A-D:	D-L:	M-P:	P-Z:
Account 2	DeviceMetric 1	Measure 2	PractitionerRole 2
ActivityDefinition 2	DeviceRequest 1	MeasureReport 2	Procedure 3
AdverseEvent 0	DeviceUseStatement 0	Media 1	Provenance 3
AllergyIntolerance 3	DiagnosticReport 3	Medication 3	Questionnaire 3
Appointment 3	DocumentManifest 2	MedicationAdministration 2	QuestionnaireResponse 3
AppointmentResponse 3	DocumentReference 3	MedicationDispense 2	RelatedPerson 2
AuditEvent 3	EffectEvidenceSynthesis 0	MedicationKnowledge 0	RequestGroup 2
Basic 1	Encounter 2	MedicationRequest 3	ResearchDefinition 0
Binary N	Endpoint 2	MedicationStatement 3	ResearchElementDefinition 0
BiologicallyDerivedProduct 0	EnrollmentRequest 0	MedicinalProduct 0	ResearchStudy 1
BodyStructure 1	EnrollmentResponse 0	MedicinalProductAuthorization 0	ResearchSubject 1
Bundle N	EpisodeOfCare 2	MedicinalProductContraindication 0	RiskAssessment 1
CapabilityStatement N	EventDefinition 0	MedicinalProductIndication 0	RiskEvidenceSynthesis 0
CarePlan 2	Evidence 0	MedicinalProductIngredient 0	Schedule 3
CareTeam 2	EvidenceVariable 0	MedicinalProductInteraction 0	SearchParameter 3
CatalogEntry 0	ExampleScenario 0	MedicinalProductManufactured 0	ServiceRequest 2
ChargeItem 0	ExplanationOfBenefit 2	MedicinalProductPackaged 0	Slot 3
ChargeItemDefinition 0	FamilyMemberHistory 2	MedicinalProductPharmaceutical 0	Specimen 2
Claim 2	Flag 1	MedicinalProductUndesirableEffect 0	SpecimenDefinition 0
ClaimResponse 2	Goal 2	MessageDefinition 1	StructureDefinition N
ClinicalImpression 0	GraphDefinition 1	MessageHeader 4	StructureMap 2
CodeSystem N	Group 1	MolecularSequence 1	Subscription 3
Communication 2	GuidanceResponse 2	NamingSystem 1	Substance 2
CommunicationRequest 2	HealthcareService 2	NutritionOrder 2	SubstancePolymer 0
CompartmentDefinition 1	ImagingStudy 3	Observation N	SubstanceProtein 0
Composition 2	Immunization 3	ObservationDefinition 0	SubstanceReferenceInformation 0
ConceptMap 3	ImmunizationEvaluation 0	OperationDefinition N	SubstanceSpecification 0
Condition (aka Problem) 3	ImmunizationRecommendation 1	OperationOutcome N	SubstanceSourceMaterial 0
Consent 2	ImplementationGuide 1	Organization 3	SupplyDelivery 1
Contract 1	InsurancePlan 0	OrganizationAffiliation 0	SupplyRequest 1
Coverage 2	Invoice 0	Parameters N	Task 2
CoverageEligibilityRequest 2	Library 2	Patient N	TerminologyCapabilities 0
CoverageEligibilityResponse 2	Linkage 0	PaymentNotice 2	TestReport 0
DetectedIssue 1	List 1	PaymentReconciliation 2	TestScript 2
Device 2	Location 3	Person 2	ValueSet N
DeviceDefinition 0		PlanDefinition 2	VerificationResult 0
		Practitioner 3	VisionPrescription 2

3.7 FHIR REST API

For more information on the FHIR REST API, refer to the following.

(See specifications to be found in:)

3.1.0 RESTful API (https://www.hl7.org/fhir/http.html)

3.8 Example of health data acquisition

Two operations are defined to retrieve health data: $lastn and $stats. For details, refer to the following.

(See specifications to be found in:)

10.1.11 Resource Observation - Operations

(https://www.hl7.org/fhir/observation-operations.html)

3.1.1 Acquisition of measurement data ($lastn)

Request: The case for obtaining patient readings is shown in the FHIR specifications.

(1) Example of obtaining the three measurement results taken at the end of all vital data
GET [base]/Observation/$lastn?max=3&patient=Patient/123&category=vital-signs

(2) Example of obtaining the three measurement results taken at the end of all vital data
GET [base]/Observation/$lastn?patient=Patient/123&category=laboratory

(3) Example of obtaining the last test result
GET[base]/Observation/$lastn?max=3&patient=Patient/123&category=vital-signs&code=9279-1,8867-4,85354-9

3.1.2 Obtaining statistical data ($Stats)

Request: Example of obtaining the average, minimum, maximum, and count of a series of blood pressure readings for a patient

GET [base]/Observation/$stats?subject=Patient/123&code=85354-9&system=http://loinc.org&duration=1&statistic=average&statistic=min&statistic=max&statistic=count

3.9 FHIR Server formulation

The two organizations developed a concept prototype and exhibited it at CEATEC2021 to promote the value of services through data linkage. As a FHIR server, the HAPI FHIR server (OSS) was used, and the ECHONET Consortium verified that the data (body temperature, blood pressure, and weight) measured by home health devices is stored in the FHIR Server as FHIR data, and the data can be handled in a similar way as lighting and air conditioning data in the home appliances and housing equipment cloud.

In the future, it is expected that service activities such as adjusting room temperature and ventilation according to the relationship between blood pressure/body temperature readings and the room temperature in a room where the measurements took place would be more advanced, by making it possible to provide health data to service providers via the ECHONET Lite Web API. Note that the Japan Advanced Institute of Science and Technology (JAIST) studied the relevant technologies, implemented this FHIR Server configuration and designed the demonstration functionality.

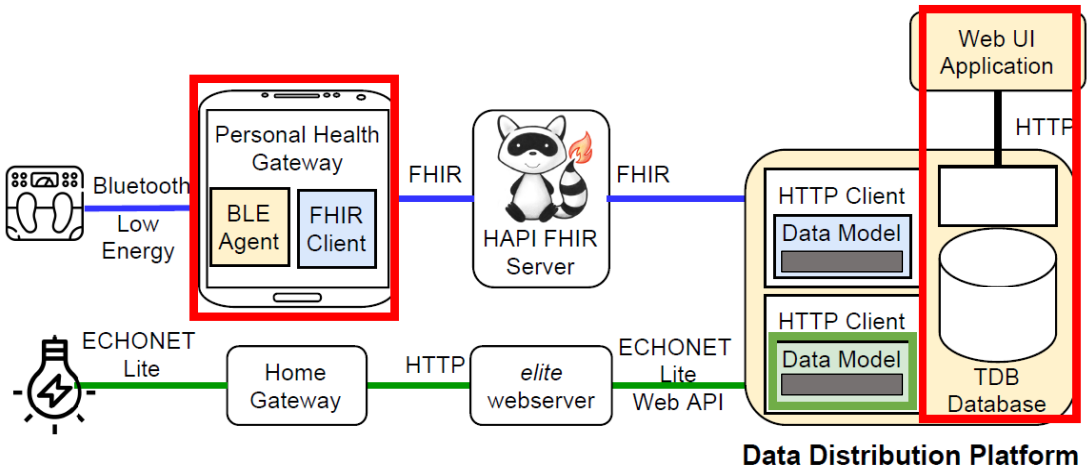
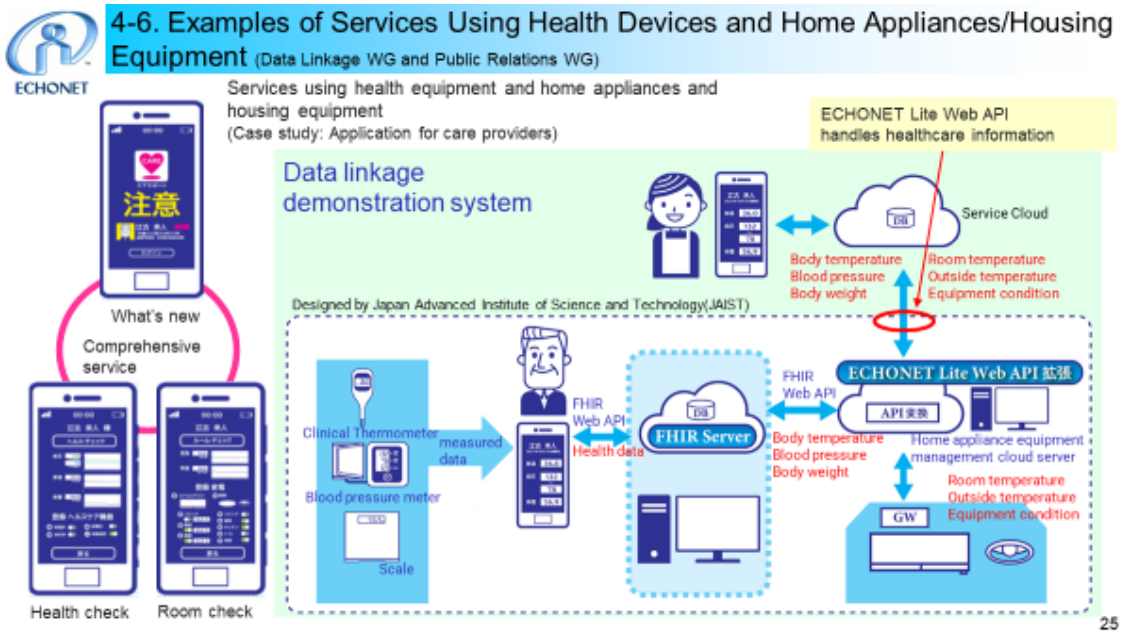


Figure 16 FHIR data linkage verification by Japan Advanced Institute of Science and Technology (JAIST)



Source: Excerpt from the reference documents reported by the Sixteenth

Figure. 17 Examples of services using health equipment and home appliances and housing equipment

Chapter 4 Conclusion

As the lifestyle-supporting services such as home energy management and remote control using ECHONET Lite devices have already been realized, it is expected that Smartlife services will be enhanced by collecting, storing, and using data obtained from ECHONET Lite devices in the cloud.

The ECHONET Consortium and PCHA have been studying ways to further enhance, through data linkage, Smartlife services related to energy, living environment, health etc., and have summarized their work in this document. In the future, the Consortium plans to standardize more detailed linkage specifications and study extensions to the ECHONET Lite Web API specifications.