

The ECHONET Lite Specification

Version 1.13



Editorial Staff (Member of System Architecture Working Group)

Version 1.13

- (Chairman) Yoichi Masuda (Panasonic Corporation)
- Takashi Murakami (Panasonic Corporation)
- Keiichi Teramoto (Toshiba Lighting & Technology Corporation)
- Mitsuru Kanda (TOSHIBA CORPORATION)
- Tetsushi Matsuda (Mitsubishi Electric Corporation)
- Kanji Mizuno (Mitsubishi Electric Corporation)
- Ritsuko Kanazawa (Hitachi, Ltd.)
- Ryo Hasegawa (Hitachi Appliances, Inc.)
- Dai Ando (Nippon Telegraph And Telephone Corporation)
- Yasuo Sugawara (Sharp Corporation)
- Yudai Kawasaki (Sharp Corporation)

* Affiliation name is the one at the time this document was published.

The specifications published by the ECHONET Consortium are established without regard to industrial property rights (e.g., patent and utility model rights). In no event will the ECHONET Consortium be responsible for industrial property rights to the contents of its specifications.

In no event will the publisher of this specification be liable for any damages arising out of use of this specification.

The original language of the ECHONET Lite Specifications is Japanese. This English version is a translation of the Japanese version; in case of any queries about the English version, refer to the Japanese version.

General Contents

Part I ECHONET Lite Overview

Chapter 1 Introduction	1-1
1. 1 DEVELOPMENTAL BACKGROUND	1-1
1. 2 ECHONET LITE DEVELOPMENT OBJECTIVES	1-2
1. 3 AIMS OF ECHONET LITE	1-3
1. 4 ENVISIONED APPLICATIONS	1-3
1. 5 ECHONET LITE CHARACTERISTICS	1-4
Chapter 2 Definition of System Configuration	2-1
2. 1 ECHONET LITE SYSTEM ARCHITECTURE	2-1
2. 2 ECHONET LITE NETWORK CONFIGURATION	2-3
2. 3 ECHONET LITE COMPONENT DEVICES	2-3
2. 4 CONNECTIONS TO EXTERNAL NETWORKS AND SYSTEMS	2-4
Chapter 3 ECHONET Lite Communication Layer Configuration	3-1
3. 1 OVERVIEW OF ECHONET LITE COMMUNICATION LAYER CONFIGURATION	3-1
3. 2 ECHONET LITE COMMUNICATION MIDDLEWARE COMPONENTS AND PROCESSING OBJECTS	3-2
3. 2. 1 ECHONET Lite Communication Processing Block	3-2
3. 2. 2 ECHONET Objects	3-3
Chapter 4 Connection of Devices to ECHONET Lite Networks	4-1
4. 1 IMPLEMENTATION OF ECHONET LITE SPECIFICATION IN DEVICES	4-1
4. 2 ECHONET LITE DEVICE TYPES	4-1
4. 3 ECHONET LITE MIDDLEWARE ADAPTERS FOR CONNECTION TO ECHONET LITE	4-2
4. 4 FORMATS OF DEVICE CONNECTION TO ECHONET LITE NETWORK	4-3
Chapter 5 Structure of ECHONET Specifications and Intended Readership	5-1
5. 1 STRUCTURE OF SPECIFICATIONS	5-1
5. 2 INTENDED READERS	5-1
5. 3 VERSION NUMBER OF THE SPECIFICATION	5-2

Part II ECHONET Lite Communication Middleware Specifications

CHAPTER 1 OVERVIEW.....	1-1
1. 1 BASIC CONCEPT.....	1-1
1. 2 POSITIONING ON COMMUNICATIONS LAYERS.....	1-1
1. 3 REFERENCES.....	1-2
CHAPTER 2 ECHONET OBJECTS	2-1
2. 1 BASIC CONCEPT.....	2-1
2. 2 DEVICE OBJECTS	2-1
2. 3 PROFILE OBJECTS.....	2-2
2. 4 ECHONET OBJECTS AS VIEWED FROM APPLICATION SOFTWARE	2-3
CHAPTER 3 MESSAGE STRUCTURE (FRAME FORMAT).....	3-1
3. 1 BASIC CONCEPT.....	3-1
3. 2 FRAME FORMAT.....	3-1
3. 2. 1 ECHONET LITE HEADER (EHD).....	3-2
3. 2. 2 TRANSACTION ID (TID).....	3-3
3. 2. 3 ECHONET LITE DATA (EDATA)	3-4
3. 2. 4 ECHONET OBJECT (EOJ).....	3-4
3. 2. 5 ECHONET LITE SERVICE (ESV).....	3-5
3. 2. 6 PROCESSING TARGET PROPERTY COUNTERS (OPC, OPCSET, AND OPCGET).....	3-8
3. 2. 7 ECHONET PROPERTY (EPC).....	3-8
3. 2. 8 PROPERTY DATA COUNTER (PDC).....	3-10
3. 2. 9 ECHONET PROPERTY VALUE DATA (EDT).....	3-10
CHAPTER 4 BASIC SEQUENCES	4-1
4. 1 BASIC CONCEPT.....	4-1
4. 2 BASIC SEQUENCES FOR OBJECT CONTROL.....	4-1
4. 2. 1 BASIC SEQUENCES FOR OBJECT CONTROL IN GENERAL	4-1
4. 2. 2 BASIC SEQUENCES FOR SERVICE CONTENT.....	4-4
4. 2. 3 DETAILED SEQUENCES CONCERNING SERVICE CONTENT	4-6
4. 3 BASIC SEQUENCE FOR ECHONET LITE NODE STARTUP	4-13
4. 3. 1 BASIC SEQUENCE FOR ECHONET LITE NODE START.....	4-13
CHAPTER 5 ECHONET LITE COMMUNICATIONS PROCESSING BLOCK PROCESSING SPECIFICATIONS	5-1
5. 1 BASIC CONCEPT.....	5-1
5. 2 OBJECT PROCESSING SPECIFICATIONS	5-1
5. 3 SEND MESSAGE CREATION/MANAGEMENT PROCESSING.....	5-2
5. 4 STARTUP PROCESSING.....	5-2
CHAPTER 6 ECHONET OBJECTS: DETAILED SPECIFICATIONS.....	6-1

6. 1 BASIC CONCEPT	6-1
6. 2 ECHONET PROPERTIES: BASIC SPECIFICATIONS.....	6-1
6. 2. 1 ECHONET PROPERTY VALUE DATA TYPES	6-1
6. 2. 2 ECHONET PROPERTY VALUE RANGE.....	6-2
6. 2. 3 CLASS-SPECIFIC MANDATORY PROPERTIES	6-3
6. 2. 4 PROPERTIES THAT MUST HAVE A STATUS CHANGE ANNOUNCEMENT FUNCTION.....	6-3
6. 2. 5 ACCESS RULES	6-3
6. 3 DEVICE OBJECT SUPER CLASS SPECIFICATIONS	6-3
6. 3. 1 OVERVIEW OF DEVICE OBJECT SUPER CLASS SPECIFICATIONS	6-4
6. 4 SENSOR-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS	6-4
6. 5 AIR CONDITIONING-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS	6-4
6. 6 HOUSING/EQUIPMENT-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS.....	6-4
6. 7 COOKING/HOUSEWORK-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS.....	6-4
6. 8 HEALTH-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS.....	6-4
6. 9 MANAGEMENT/CONTROL-RELATED DEVICE CLASS GROUP OBJECTS: DETAILED SPECIFICATIONS	6-4
6. 10 PROFILE OBJECT CLASS GROUP SPECIFICATIONS	6-4
6. 10. 1 OVERVIEW OF PROFILE OBJECT SUPER CLASS SPECIFICATIONS.....	6-5
6. 10. 2 PROPERTY MAP	6-5
6. 11 PROFILE CLASS GROUP: DETAILED SPECIFICATIONS	6-6
6. 11. 1 NODE PROFILE CLASS: DETAILED SPECIFICATIONS.....	6-6
APPENDIX 1 ERROR PROCESSING AT MESSAGE RECEPTION	I

Part III ECHONET Lite Communications Equipment

Specifications

Chapter 1 Overview of ECHONET Lite Communications Equipment Specifications	1-1
1.1 CONCEPT	1-1
1.2 OVERVIEW OF COMMUNICATIONS EQUIPMENT SPECIFICATIONS FOR ECHONET LITE NODES	1-1
1.3 OVERVIEW OF COMMUNICATIONS EQUIPMENT SPECIFICATIONS FOR ECHONET LITE GATEWAYS	1-1
1.4 OVERVIEW OF COMMUNICATIONS EQUIPMENT SPECIFICATIONS FOR ECHONET LITE MIDDLEWARE ADAPTERS	1-2
Chapter 2 ECHONET Lite Gateway.....	2-1

2.1 CONCEPT	2-1
Chapter 3 ECHONET Lite Middleware Adapters	3-1
3.1 CONCEPT	3-1
3.1.1 Anticipated configurations for ECHONET Lite middleware adapters (commentary)	3-3
3.2 DEFINITIONS OF FUNCTIONS	3-7
3.3 MECHANICAL AND PHYSICAL CHARACTERISTICS	3-8
3.3.1 Shape	3-8
3.3.2 Display section	3-8
3.4 ELECTRICAL CHARACTERISTICS	3-9
3.5 LOGICAL REQUIREMENTS	3-9
3.6 ECHONET LITE MIDDLEWARE ADAPTER COMMUNICATION SOFTWARE SPECIFICATIONS	3-9
3.6.1 ECHONET Lite middleware adapter communication interfaces – overview	3-10
3.6.2 Mechanical and physical characteristics of ECHONET Lite middleware adapter communication interfaces	3-10
3.6.3 Electrical characteristics	3-20
3.6.4 Logical requirements	3-21
3.6.5 ECHONET Lite middleware adapter communication software protocols	3-25
3.7 EQUIPMENT INTERFACE DATA RECOGNITION SERVICE	3-25
3.7.1 Frame composition for the equipment interface data recognition service	3-25
3.7.2 Commands for the equipment interface data recognition service	3-27
3.7.3 Equipment interface data recognition service sequence	3-31
3.7.4 Status change diagram for all types	3-33
3.7.5 Error processing	3-35
3.8 COMMUNICATION PROTOCOLS FOR OBJECT GENERATION TYPE	3-36
3.8.1 Frame composition for object generation type interfaces	3-37
3.8.2 Internal services of adapters	3-40
3.8.3 ECHONET Lite middleware adapter status changes for object generation type interfaces	3-44
3.8.4 Commands for object generation type interfaces	3-47
3.8.5 Communication sequences (Object generation type)	3-75
3.8.6 Mechanical and physical characteristics – Object generation method	3-84
3.9 COMMUNICATION PROTOCOLS FOR THE “PEER-TO-PEER TYPE”	3-85
3.9.1 Program Selection Method	3-85
3.9.2 Program Download Method	3-85
3.9.3 Protocols to download the program from ECHONET Lite-ready equipment	3-86
3.10 (RECOMMENDED) SPECIFICATIONS FOR INTERPRETER METHOD-BASED PROGRAM EXECUTION ENVIRONMENTS FOR THE “PROGRAM DOWNLOAD METHOD” FOR THE “PEER-TO-PEER TYPE”	3-94
3.10.1 Scope of the Recommended Specifications	3-95
3.10.2 Overview of Interpreter Method-based program execution environments	3-95

3.10.3 Program format specifications	3-103
3.10.4 Specifications for the language of the download program	3-104
3.10.5 Interpreter Basic API specifications	3-105
3.10.6 Interpreter ECHONET Lite API specifications	3-115
3.10.7 Program compression and uncompression specifications.....	3-132
APPENDIX 1 REFERENCE DOCUMENT	I
APPENDIX 2 EXAMPLES OF INTERPRETER METHOD PROGRAMS	II

Part IV ECHONET Lite Gateway Specifications

Chapter 1 Outline of ECHONET Lite Gateway Specification	1-1
1.1 CONCEPT	1-1
1.2 CONCEPT OF ECHONET LITE CONNECTIONS WITH EXTERNAL SYSTEMS	1-1
1.3 ECHONET LITE GATEWAY TYPES	1-1
1.4 ECHONET LITE GATEWAYS COVERED	1-2
Part 1. Specifications for ECHONET Lite-UPnP Gateways	Part1-1
Chapter 1 Overview	Part1-1-1
1.1 CONCEPT	Part1-1-1
1.1.1 Background of the development	Part1-1-1
1.1.2 Purpose of the Specifications for ECHONET Lite-UPnP Gateways.....	Part1-1-1
1.2 RELATIONSHIP BETWEEN THE ECHONET LITE DCP/ECHONET LITE-UPNP GATEWAY SOFTWARE AND OTHER COMMUNICATION LAYERS	Part1-1-1
1.3 SYSTEM STRUCTURE AND THE RELATIONSHIP BETWEEN THE ECHONET LITE-UPNP GATEWAY AND OTHER SYSTEM COMPONENTS	Part1-1-2
1.3.1 Design principles.....	Part1-1-2
1.3.2 System structure	Part1-1-2
1.4 SUBJECT MATTERS AND SCOPE OF THE SPECIFICATIONS	Part1-1-3
1.4.1 Subject Matters of the Specifications.....	Part1-1-4
1.4.2 Scope of the ECHONET Lite Specifications	Part1-1-5
Chapter 2 Definitions of Terms	Part1-2-1
Chapter 3 UPnP Device-based Method	Part1-3-1
3.1 CONCEPT	Part1-3-1
3.2 CLASSIFICATION OF ECHONET LITE PROPERTIES	Part1-3-2
3.2.1 ECHONET property type-based classification	Part1-3-3

3.2.2 Data type-based classification.....	Part1-3-8
3.3 NAMING RULES.....	Part1-3-11
3.3.1 Naming rules necessary for XML Device Descriptions	Part1-3-11
3.3.2 Naming rules based on ECHONET property type-based classification	Part1-3-11
3.3.3 Definition of the dataType based on data type-based classification.....	Part1-3-12
3.3.4 Argument naming rules.....	Part1-3-13
3.4 SUMMARY OF THE RELATIONSHIPS BETWEEN PROPERTY TYPES, DATA TYPES, OBJECTS, ACTION PREFIXES AND DATATYPES.....	Part1-3-13
Chapter 4 Processing for ECHONET Lite-UPnP Gateways for the UPnP Device-based Method.....	Part1-4-1
4.1 PLUG AND PLAY PROCESSING.....	Part1-4-1
4.1.1 Plug and play processing to be performed when an ECHONET Lite-UPnP gateway connects to a network.....	Part1-4-1
4.1.2 Plug and play processing to be performed when an ECHONET Lite device connects to a network.....	Part1-4-2
4.2 CONTROL OF ECHONET LITE DEVICES FROM UPNP CONTROL POINTS	Part1-4-3
4.2.1 Control of ECHONET Lite devices	Part1-4-3
4.2.2 Referencing the statuses of ECHONET Lite devices	Part1-4-5
4.3 NOTIFYING THE STATUSES OF ECHONET LITE DEVICES TO UPNP CONTROL POINTS	Part1-4-7
Chapter 5 Device Template.....	Part1-5-1
5.1 DEFINITION OF DEVICE	Part1-5-1
5.1.1 Device Type	Part1-5-1
5.1.2 Device requirements	Part1-5-1
5.2 XML DEVICE DESCRIPTIONS	Part1-5-2
5.3 EXAMPLE XML DEVICE DESCRIPTION (AIR CONDITIONER)	Part1-5-3
Chapter 6 Service Template.....	Part1-6-1
6.1 DEFINITION OF SERVICE MODEL	Part1-6-1
6.1.1 Service Type	Part1-6-1
6.1.2 Service Type requirements.....	Part1-6-1
6.1.3 Action.....	Part1-6-2
6.2 XML SERVICE DESCRIPTIONS	Part1-6-4
6.3 EXAMPLE XML SERVICE DESCRIPTION (AIR CONDITIONER)	Part1-6-6
Chapter 7 ECHONET Object-based Method.....	Part1-7-1
7.1 CONCEPT	Part1-7-1
Chapter 8 Processing for ECHONET Lite-UPnP Gateways for the ECHONET Object-based Method	Part1-8-1

8.1 PLUG AND PLAY PROCESSING.....	Part1-8-1
8.1.1 Processing to be performed when an ECHONET Lite-UPnP gateway connects to a network.....	Part1-8-1
8.1.2 Processing to be performed when a UPnP device connects to a network.....	Part1-8-2
8.2 CONTROL OF UPNP DEVICES FROM ECHONET OBJECTS.....	Part1-8-3
8.2.1 Control of UPnP Devices.....	Part1-8-3
8.2.2 Referencing the statuses of UPnP devices	Part1-8-4

Part V ECHONET Lite System Design Guidelines

Chapter 1 About This Document	1-1
-------------------------------------	-----

Definitions of Terms

ECHONET

ECHONET is an abbreviation for Energy Conservation & Homecare Network. The term also means an answer to a call or a response, from the word “echo”.

ECHONET Object (EOJ)

A model of information to be disclosed to the network from information owned by the ECHONET Lite Communication Processing Block, or an access procedure model. The information or control target owned by each device is specified as a property, and the operating method (setting, browsing) for this is specified as a service. An ECHONET object is used when class or instance is not considered.

Objects can be classified broadly into two types of objects: equipment object and profile object.

ECHONET Lite

A kind of ECHONET protocol standardized by the ECHONET Consortium. This is a light version of the conventional ECHONET reduced in protocol stack configuration and protocol.

ECHONET Lite Device

An ECHOET Lite node that has communication interfaces and system support functions compliant with the ECHONET Lite Standards for home devices, home electric products, or building/store devices, such as lighting, air conditioning, refrigeration, power equipment, ordinary home appliances, sensors, actuators, etc. This node is also equipped with a centralized system for monitoring, controlling, and operating facilities and equipment, and also such controller functions as operating units (remote controller, etc.).

ECHONET Lite Gateway

An ECHONET Lite node that has a function to connect an ECHONET Lite domains and an external system (including other ECHONET Lite domains). Multiple ECHONET Lite gateways may exist in the domain depending on differences in the external system(s) to be connected.

ECHONET Lite Service (ESV)

A function of the ECHONET Lite Object. The services for property values are specified. There are three such services: “Request”, “Response” (processing response/”process not possible” response), and “Notice”.

ECHONET Lite Communication Processing Block

One processing block for the ECHONET Lite Communication Middleware. This block performs communication protocol processing to facilitate remote device control/monitoring processing for application software, stores information for the above, and controls various information on the self-device as well as other device statuses.

ECHONET Lite Communication Middleware

This middleware is arranged at a position between application software and Lower-Layer Communication Software and performs communication processing according to the ECHONET Lite communication protocol. The major features of ECHONET Lite are implemented by ECHONET Lite Communication Middleware.

ECHONET Lite Domain

A range on the network within which information transmission is logically guaranteed by ECHONET Lite. Generally, it is thought that property and security control, including homes and stores, use the same range as a domain, but the domain is not limited by any standard.

ECHONET Lite Node

A communication node conforming to the ECHONET Lite Specifications.

ECHONET Property (EPC)

An attribute of an ECHONET Lite Object. Attributes such as set values and statuses are defined as properties. For reading or writing, the ECHONET Lite Service is used.

ECHONET Lite Middleware adapter

An adapter used to connect to the ECHONET a device that has neither a communication interface for the transmission medium specified by the ECHONET Lite Specifications nor an ECHONET Lite lower-layer communication software program, protocol difference absorption processing section and ECHONET communication processing block. The interface for communication between the equipment and ECHONET Lite device adapter shall be as specified in the ECHONET Lite Middleware adapter Communication Interface Specifications.

ECHONET Lite Middleware adapter Communication Interface

The interface for communication between an ECHONET Lite middleware adapter and an ECHONET Lite-ready device

ECHONET Lite Middleware adapter Communication Software

A software program that converts and executes services which are exchanged between the ECHONET Lite communication processing block and ECHONET Lite-ready device

application software. There are two types of communication: object generation and peer-to-peer. Switching between the two types is achieved by the equipment interface data recognition service. This software program must be implemented in both the ECHONET Lite middleware adapter and ECHONET Lite-ready device.

ECHONET Lite-Ready Device / ECHONET Lite-Ready Equipment (Ready_Device / Ready Equipment)

A piece of equipment that has an application software program which is higher than the ECHONET Lite communication middleware (ECHONET Lite communication processing block). This device performs communication processing below the ECHONET Lite communication middleware (ECHONET Lite communication processing block). This device connected to an ECHONET Lite middleware adapter can connect to the ECHONET Lite network.

EMS (Energy Management Service / Energy Management System)

This service, designed to enable the efficient use of energy, efficiently operates and controls devices while maintaining a safe, comfortable living environment. It can also refer to a system using it as an application.

JEM-1439

A home networking standard (dealing with equipment systems in particular) published by The Japan Electrical Manufacturers' Association in August 1988.

Access Rule (AR)

A group of ECHONET Services executable for ECHONET properties.

Application Software

Software that remotely controls devices connected to the system in the controller, or software that implements device functions themselves in individual devices such as air conditioners or refrigerators.

Instance

An entity when ECHONET Objects exist. When multiple objects of the same class exist in a single node, multiple instances should exist. In ECHONET, Instance Codes are used for instance identification.

Instance Code

A code that represents an instance. However, code 0x00 is used to signify a simultaneous broadcast to all instances.

Device Object

A logical model of the information held by equipment devices or home electrical appliances such as sensors, air conditioners and refrigerators, or of control items that can be remotely controlled. The interface form for remote control is standardized. The information and control target of each device is specified as a property, and the operating method (setting and browsing) is specified as a service.

Device Object super Class

A specified property configuration common to all Device Object classes (class group code 0x00 to 0x05).

Class

A definition of an ECHONET object. In ECHONET, each class is uniquely identified by a combination of Class Group Code and Class Code.

Class Group

A group of classes. In ECHONET, each group is uniquely identified by a combination of Class Group Code and Class Code.

Class Group Code

A code that represents a Class Group. In ECHONET, each class is uniquely identified by a combination of Class Group Code and Class Code.

Class Code

A code that represents a class. This is specified in units of Class Group. In ECHONET, each class is uniquely identified by a combination of Class Group Code and Class Code.

Gateway

→ECHONET Lite Gateway

Individual Identification Information

Unique information for an application to identify each device. This information does not change depending on the network connection position.

Subnet

A group of nodes that can communicate.

Participation

A status in which ECHONET Lite Nodes are connected to the ECHONET Lite network, enabling communication. In other words, this status permits access to a Node Profile Object.

Self-device

A general term for a group of Self-device Objects.

Self-device Object

An ECHONET Object for disclosing self-node functions to others or receiving control from others.

Self-node

A node in which the self is mounted, as viewed from application software and middleware.

System

An application with a specific objective; consists of two or more devices or controllers that are organically operated in a linked form by information exchange.

System Architecture

A configuration of various controllers or devices and a structure for function/role sharing between them in a system consisting of multiple devices or controllers.

Other-device

A general term for a group of Other-device Objects.

Other-device Object

An ECHONET Object that controls other node functions or obtains their status.

Other-node

A node other than the Self-node. This node is accessed through the network.

Communication Middleware

→ECHONET Lite Communication Middleware

Topology

A physical multi-point network configuration. Connection of different transmission media is included.

Full ECHONET Lite Device (Full_Device)

A device that has a communications interface standardized by ECHONET Lite and can be connected to the ECHONET Lite system by itself.

Property

→ECHONET Property

Property Map

The contents of property support for each instance. This is intended to identify mounted functions.

Profile Object

A model of profile information and controls and setting items as an ECHONET Lite Node, such as ECHONET Lite Node operation status, manufacturer information, and Device Object list.

Middleware adapter

→ECHONET Lite middleware adapter

Definitions of Abbreviations

AR

Access Rule

DEOJ

Destination ECHONET Object

EDATA

ECHONET Lite Data

EDT

ECHONET Property Value Data

EHD

ECHONET Lite Header

EOJ

ECHONET Object

EPC

ECHONET Property

ESV

ECHONET Lite Service

Full_Device

Full ECHONET Lite Device

Ready_Device

ECHONET Lite-Ready Device

SEOJ

Source ECHONET Object

TID

Transaction ID