

ECHONET Lite in a nutshell:

A 10 minute introduction to ECHOENT Lite

Marios Sioutis

Japan Advanced Institute of Science and Technology

Contents and self-introduction

- Contents
 - Basic concepts in ECHONET Lite
 - The ECHONET CONSORTIUM
- Self-introduction: ECHONET Lite developer
 - First ECHONET Lite framework for PC (Java)
 - ECHONET Lite framework for microcontrollers (C)
 - Middleware Adapter implementation using BeagleBone Black/
Raspberry PI (C)
 - “Ready” device implementation (<1Kbyte RAM, C)
 - Participate in the first ever ECHONET Lite Plug Fest

Q: What is ECHONET Lite?

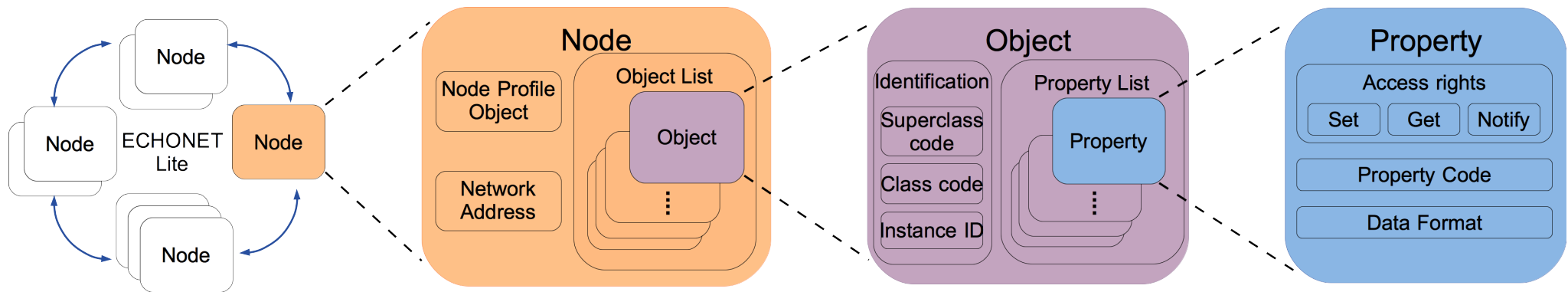
- My answer: Network communication protocol for controlling *mostly* household appliances
 - Applications: Smart homes, HEMS, AAL, Healthcare, smart meters etc.
 - Binary protocol, Layer 7 OSI (Application Layer)
 - Open specification (available in English too!)
 - Released in 2012
 - Backed by the ECHONET CONSORTIUM
 - A “Lite” version of the ECHONET protocol (est. 1997)

Website:

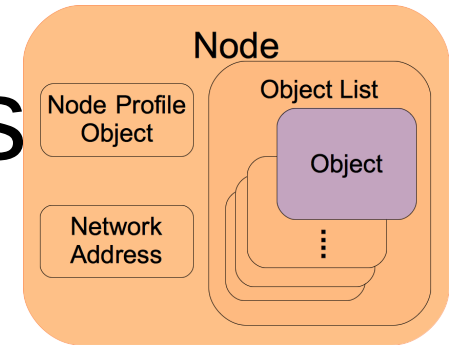
<http://echonet.jp/english/>

Basic Concepts

- Nodes → Objects → Properties
- Similar semantics to other protocols
 - Esp. SNMP: set, get, trap, MIB → set, get, notify, Appendix

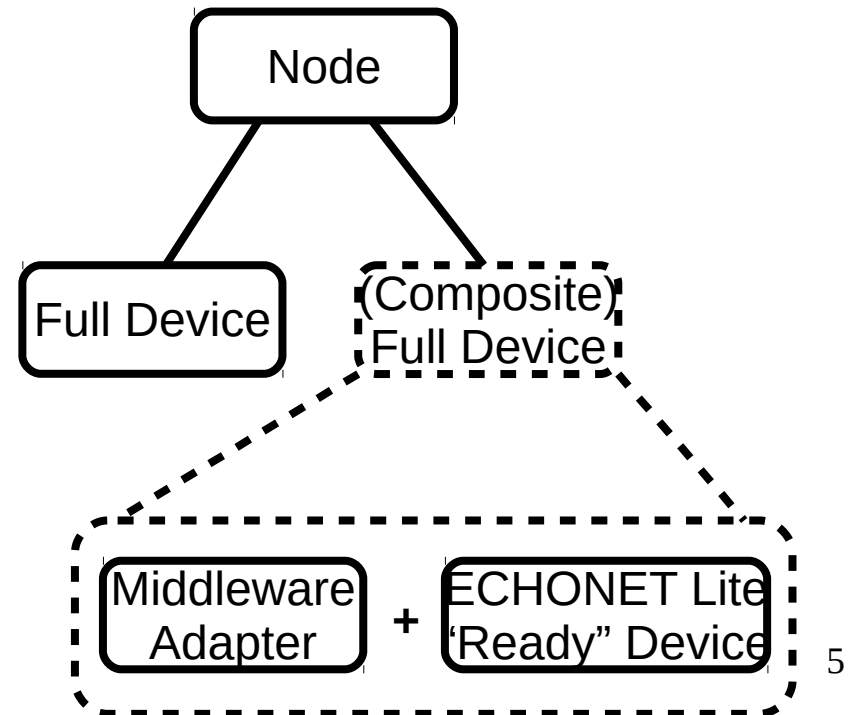
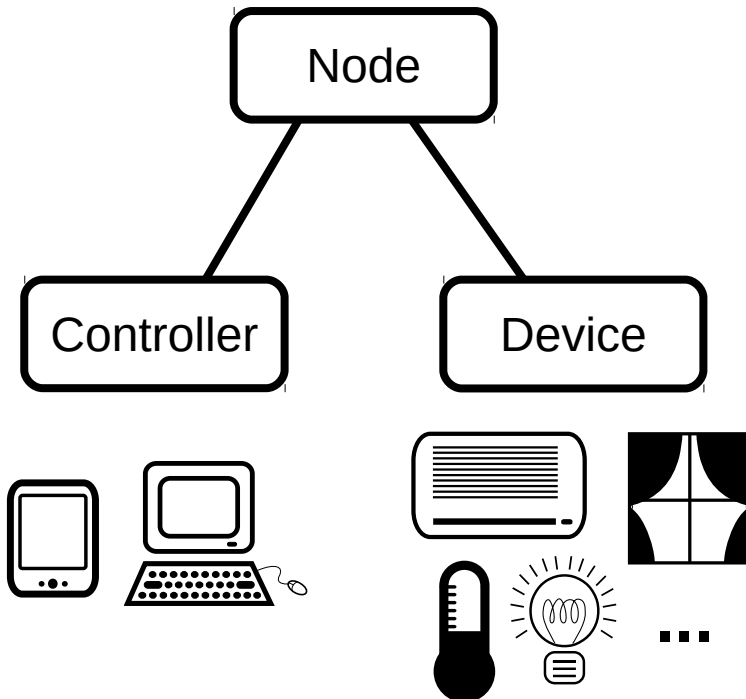


Nodes and their Types

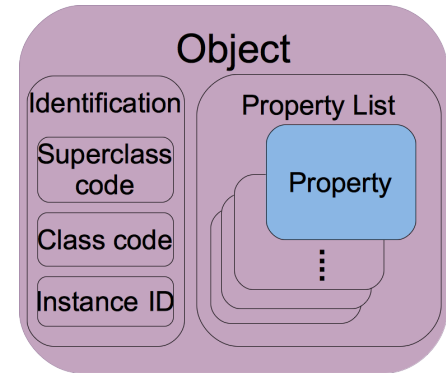


- **Node:** a physical device connected to the network
 - Has its own network interface and address
 - Consists of two or more objects
- **Logical** distinction
 - **Controllers:** application logic (usually software implementation, control device operation)
 - **Devices:** sensors and actuators

- **Physical** distinction
 - **Full device:** a standalone device
 - **Composite:** “Ready” device + Middleware Adapter
 - **Middleware adapter:** provides network interface and communications
 - **“Ready” Device:**
 - Serial communication interface with Middleware Adapter
 - Contains the actual objects

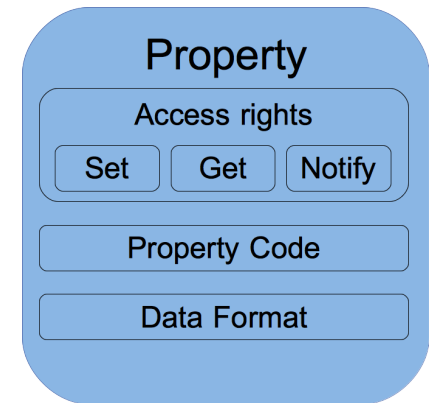


Objects



- Objects represent **logical devices**
 - One node contains two or more objects
 - E.g. An air condition unit: Node profile object, air condition object, temperature sensor object, humidity sensor object
- Objects are **standardized** (see the Appendix)
 - Seven device classes: **Sensors, HVAC, House/Facilities**, Health, Cooking and Housekeeping, Management and Control, AV
 - Comprised by a specific set of **properties**
 - **Identifiable**: [Superclass code, class code, instance code]
- Node profile object
 - Provides information regarding the node
 - **Discoverability** of objects

Properties



- Characteristics of a logical device
 - Specific code, size, format, access rules, etc.
 - E.g. property 0x80:

Property name	EPC	Contents of property		Data type	Data size	Unit	Access rule	Mandatory	Announcement at status change	Remark
		Value range (decimal notation)								
Operation status	0x80	This property indicates the ON/OFF status.		unsigned char	1 byte	—	Set		○	
		ON=0x30, OFF=0x31					Get	○		

- Some common properties across all objects
- Mandatory/optional properties
- Access: Get, Set, Notify

Frame Format



- Network Header: Network/Transportation layer header
 - Most common: UDP/IP port 3610 with multicast, also IPv6 and others
- Header: ECHONET Lite header, including frame ID
- SRC/DST: source/destination ECHONET Lite objects
- Operation: set/get/notify, their variants, and their success/failure indication in responses, plus number of TLVs
- Property “TLV”: property code, length and value
 - Multiple TLVs possible (i.e. set/get a bunch of properties at the same time)
- Common sizes:
 - No maximum frame size, no minimum guaranteed frame size either
 - Max TLV length is 255 bytes

ECHOENT CONSORTIUM: Members

- Established in 1997
- **Membership:**
 - Managing members: 7 (Hitachi, Mitsubishi, NTT, Panasonic, Sharp, TEPCO, Toshiba) – *Voting rights*
 - General members: 164
 - Academic members: 27 (JAIST being one of them)
- A member can:
 - View and comment on drafts, participate in forums, participate in the Plug Fest, etc.

ECHONET CONSORTIUM: Activities

- **Yearly Activities:**

- Plug Fest (interoperation tests)
- Forum
- Symposium
- Request for comments
- Exhibitions etc.

Fiscal Year 2016 Schedule

2016	Apr	Request for additions/modifications for the ECHONET device objects
	May	Exhibition at Wireless Japan 2016
	Jun	Third Regular General Assembly, Fifth ECHONET Forum
	Jul	2016 First Plugfest (Tokyo)
	Aug	
	Sep	
	Oct	Request for additions/modifications for the ECHONET device objects
	Nov	2016 Second Plugfest (Osaka)
	Dec	ECHONET Symposium
2017	Jan	
	Feb	2016 Third Plugfest (Tokyo), Sixth ECHONET Forum
	Mar	

ECHONET CONSORTIUM: Certification

- **Certification of products**
 - Online application for certification
 - Certification process handled by:
 - List of authorized certification bodies
 - List of authorized certification labs
 - Depending on the device type, it can be tested in a certified lab or at the member's premises

Q&A

Any questions?