

W3C Workshop on the Web of Things

Service platform with Web based interface to control devices

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Background

■ Many devices connect to Network

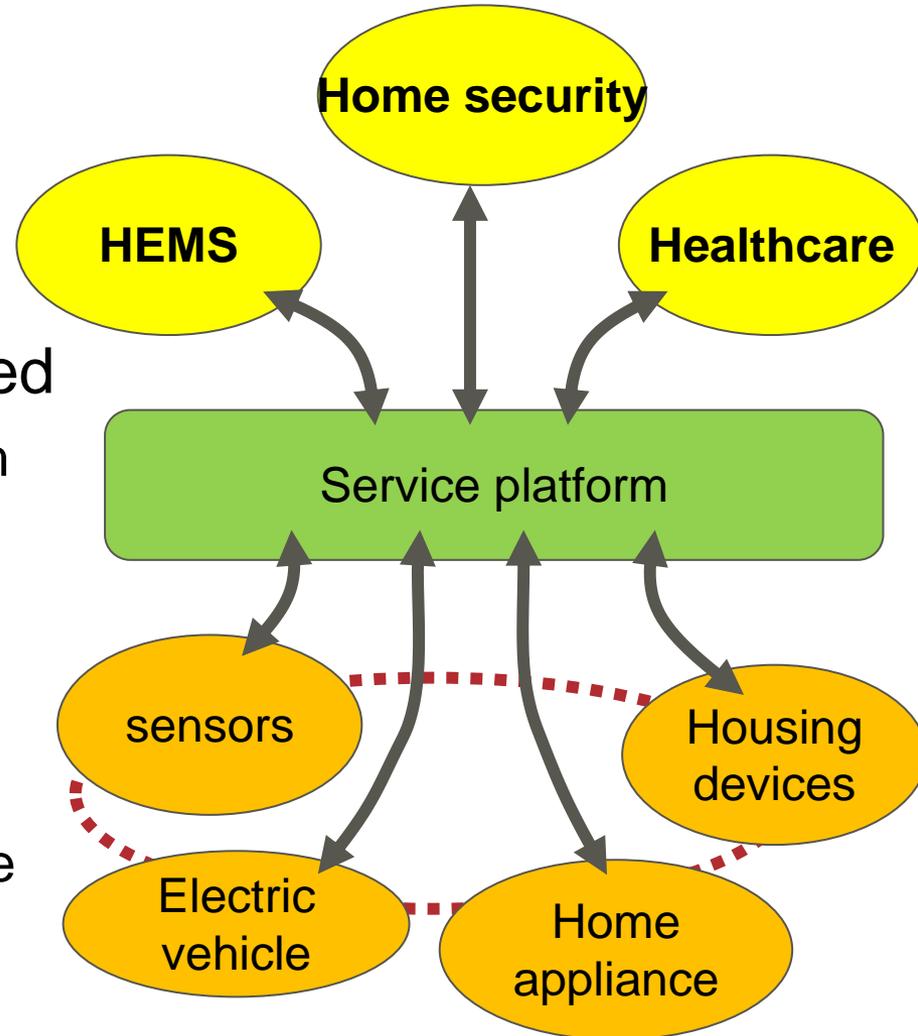
- Home appliances
- Housing devices
- Sensors
- Electric vehicle

■ M2M services are newly released

- Home Energy Management System
- Home Security
- Healthcare

■ Service platform is required for multi devices and multi service

- Our work is applied for mainly home devices and some shop facilities



What is service platform?

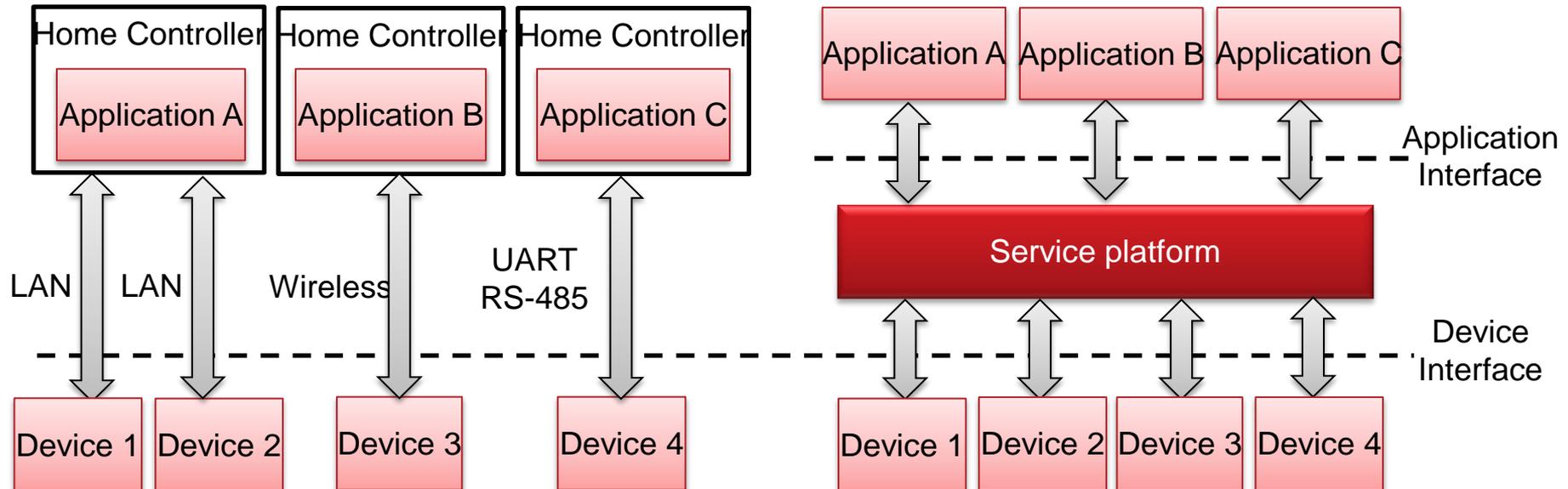
■ Advantage of Service Platform

■ If service platform dose not exit, (LEFT)

different applications depend on different device interfaces.

■ Service platform (RIGHT)

- provides common interfaces for developers.
- makes developing application easier.



Deployment of service platform

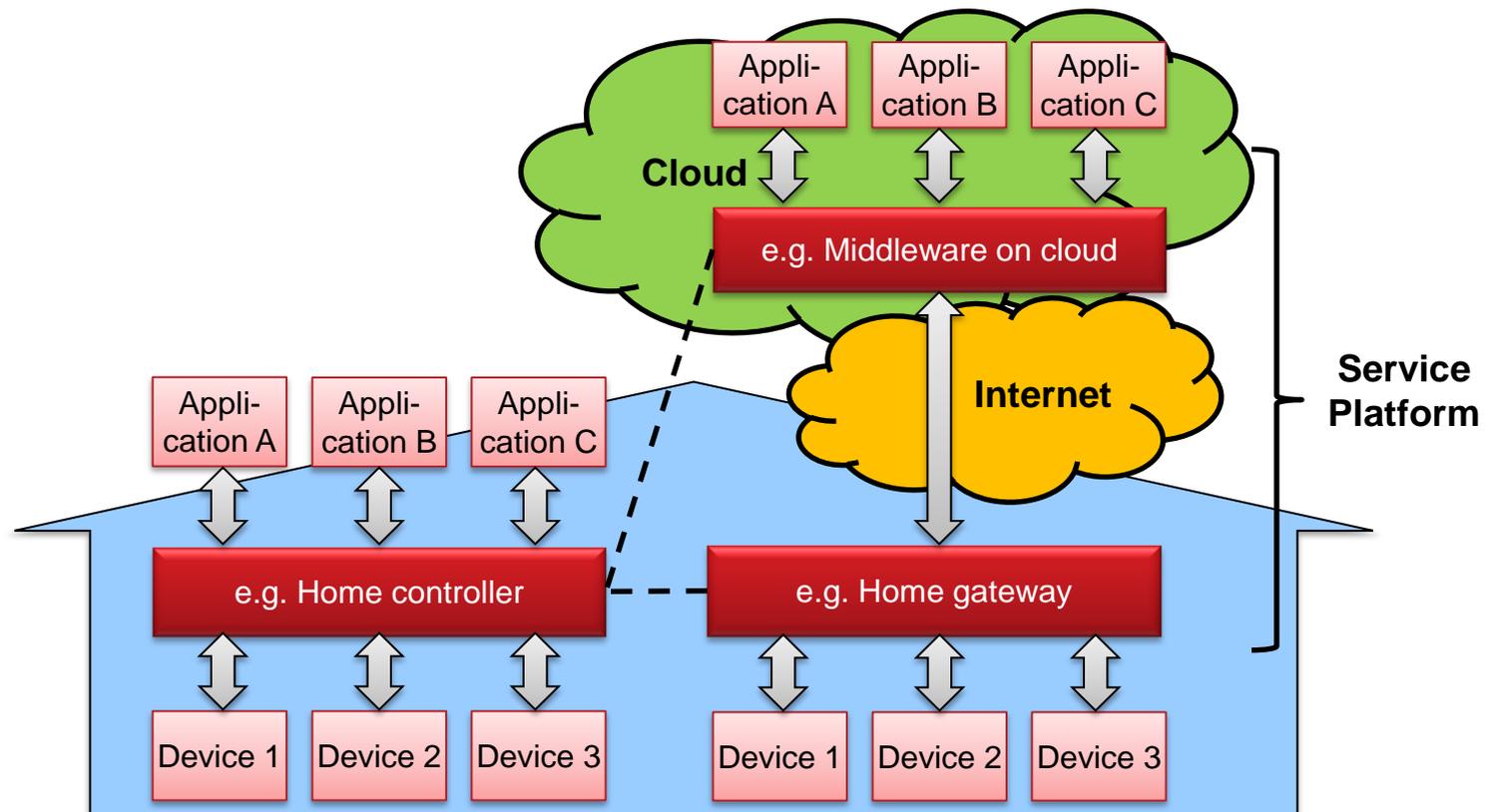
■ 2 types of deployment for service platform

【Aggregate type】

All functions run on one computer

【Distribute type】

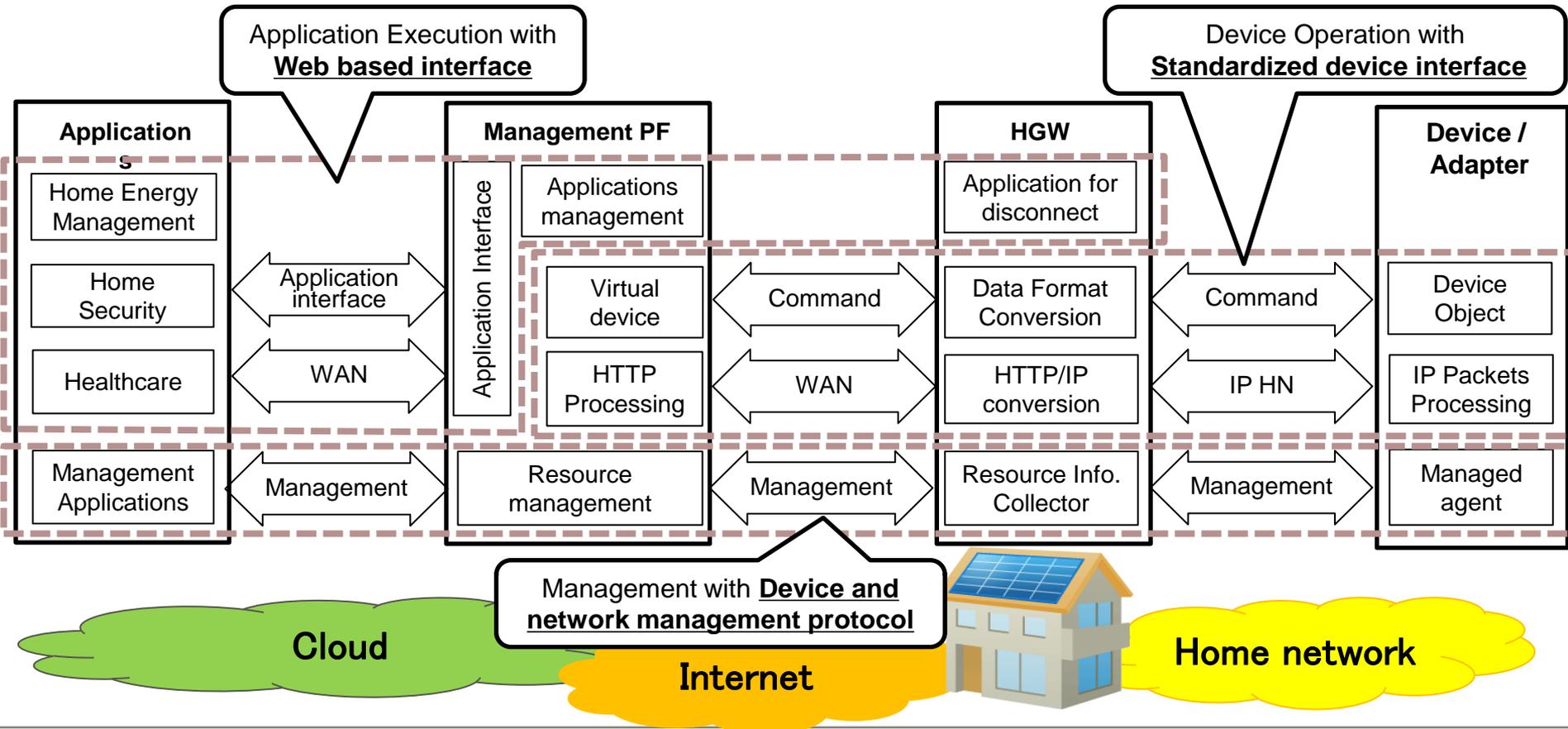
Application interface and Device interface run on Cloud and Gateway separately



Functional architecture

■ Functions are composed of 3 categories

- Application execution with Web based interface
- Device remote operation with Standardized device interface
- Remote management with device and local network



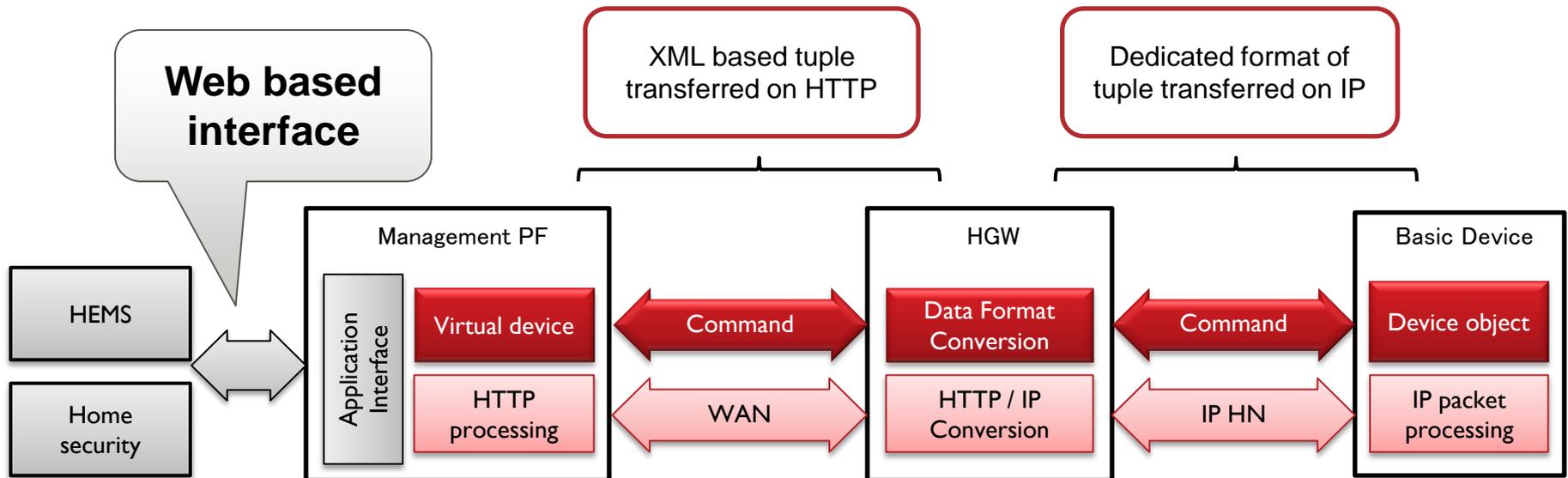
- Basic devices as regular device for service platform
 - logical model of internal status and control item for device mechanical functions
 - same models for same categories even if different manufacturers produce them
 - Model is extensible according to special feature for manufacturers
- Basic devices support standardized interface such as ECHONET Lite, KNX, SEP 2.0 ...
 - ECHONET Lite: logical models of more than 80 devices are already defined**

Example: Air conditioner class

Property	Value
Operating status	ON/OFF
Operating mode	Auto/Cooling/Heating/ ...
Temperature setting	Temperature value, e.g. 28°C
⋮	
Fault occurrence status	Fault YES/NO

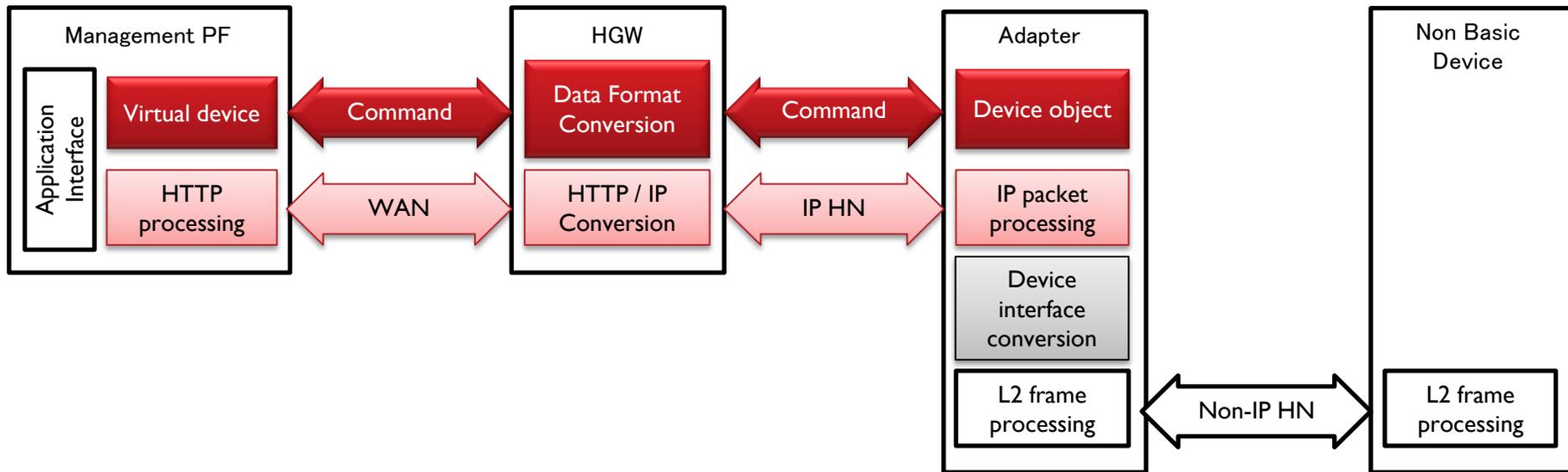
Basic device operation

- HGW convert device command between local network and Internet
 - Tuple of <property, value> is data format for controlling device
 - Device command transfers this tuple with IP on local and HTTP on Internet
 - Virtual device on Management PF corresponds to device object of basic device
 - If property of Virtual device is modified by application, then property of basic device is also modified and status of real device is changed
- Application interface is Web based interface
 - Virtual devices is treated as Web resources in our implementation



Device operation without device object

- Non basic device can also connect to service platform
 - Adapter have device object instead of non basic device.
 - Device interface conversion on adapter communicate with device on dedicated protocol and convert non basic device to device object.
 - HGW and Non basic device can get all functions of adapter in them.



Sample applications for service platform

- 24 facilities with 28 kinds of 820 devices
- ECHONET Lite is used as a communications protocol

Sample application for home



Experimental smart home



200 devices connected
Home appliances (e.g. air conditioner, lighting), power equipment (e.g. photovoltaic generation, storage battery, fuel cell), Interior (e.g. controllable windows, curtain), 10 kinds of sensors, smart meter connected with ECHONET Lite

Residential buildings



350 devices connected in 15 houses
Air conditioner and lighting with ECHONET Lite, 4 kinds of sensors with dedicated protocol

Shops (Gas station)



220 devices connected in 3 shops
Air conditioner, lighting in yard, power equipment, 10 kinds of sensors with ECHONET Lite using adapters

Schools



40 devices connected in 5 schools
Lighting, 5 kinds of sensors with dedicated protocol

Internet



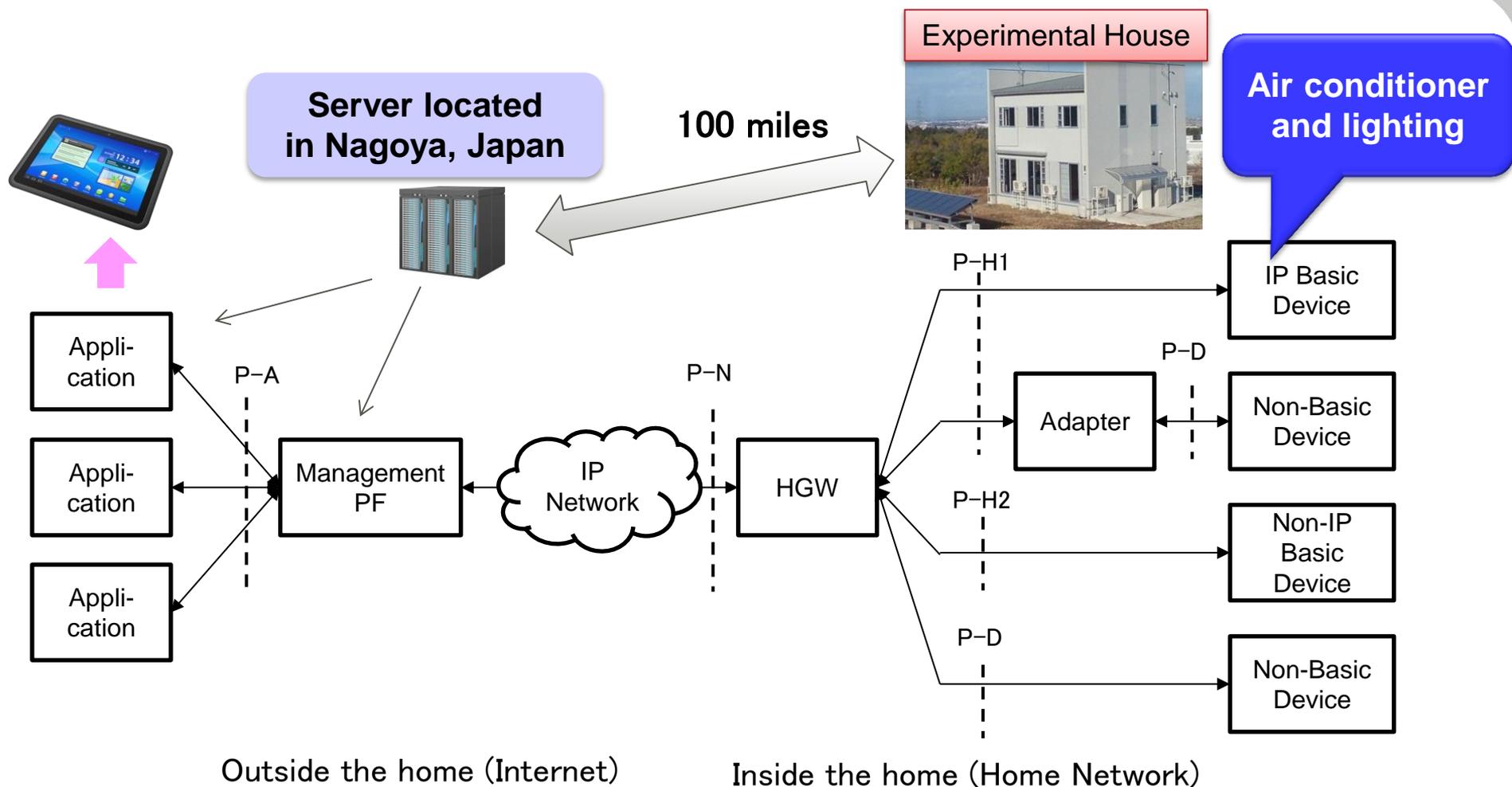
Service provider



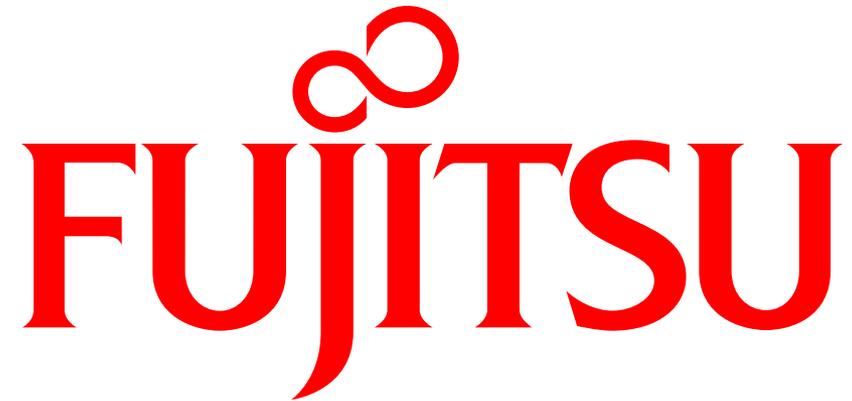
Sample application for school

- Service platform can flexibly connect with multi services and multi devices
 - Platform provide Web based interface to control device on local network
 - ECHONET Lite is used in our implementation. Other standard can be also applied to this service platform
- Framework for Web of things should support existing devices
 - Lots of devices have no Web based interfaces.
 - One of the framework for WoT should include the idea of this service platform

Demonstration Structure



- Air conditioner and lighting in the experimental house located in Kanazawa, Japan will be controlled from here (ITU meeting room) with the HEMS application through the Management PF and the HGW.



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