Expression of interest in participating in the Workshop on the Web of Things

Service platform with Web based interface to control devices

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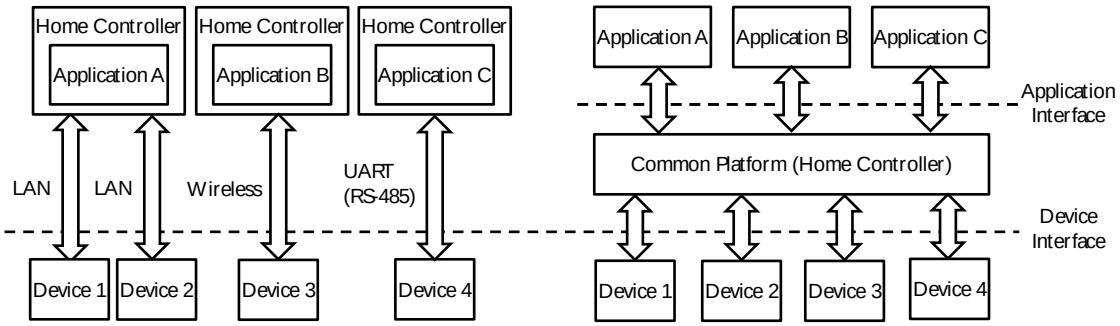
Background

By connecting the devices to the home network, the smart home has gained the public attention. For example, the HEMS, one of the smart home applications, would realize energy-efficiency and reduction of the energy consumption. With spread of the home network services and increase of the devices connected to the home network, it becomes more complicated and more difficult for the application developers to develop applications because it requires them deep knowledge about the devices and the communications protocols. Therefore the development of architecture for the home network services to support the application developers becomes important.

Figure 1(a) shows an example of the architecture for the smart home applications. In this architecture, every home controller connects to one or more devices each of which has its proprietary communication interfaces (Device Interface). For this reason, each single application should be developed to meet with the Device Interface of each of the connecting devices to monitor and control them. On the other hand, as the communications protocols have been standardized, the devices are connected with the standardized protocol to the home controller which works as a common platform (PF) as shown in Figure 1(b). In this architecture, it becomes possible to abstract the Device Interface by the common PF and the devices could be accessed from any home network applications which are also connected to the common PF at the Application Interface.



(a) Vertical Connection (b) Horizontal Connection based on Common PF

Figure 1. Vertical and horizontal connection for home network services

Service architecture for controlling devices

The application interface is independent from the device interface by introducing the common PF described in Figure 1(b). As a result of this, the home network applications can be placed on the Internet. It is possible to monitor and control the devices connected to the home network from the application on the Internet. This conceptual architecture is shown in Figure 2.

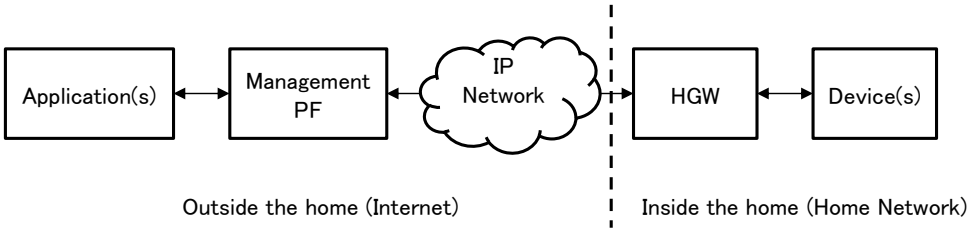


Figure 2. Conceptual architecture

In Figure 2, left hand side from the HGW is the Internet outside the home and right hand side is the home network. The HGW bridges the Internet and the home network. Devices such as home appliances and sensors connected to the home network will be monitored and controlled from the application. The HGW converts the various types of the communications protocols used for the communication with the devices to the protocol which could be used on the Internet for the communication with the management PF. The management PF is placed on the Internet and provides the Web based application interface. The HEMS application runs through this interface.

Functional architecture

Figure 3 shows the functional architecture. The functions are composed of three categories; the device operation, the application execution and the management.

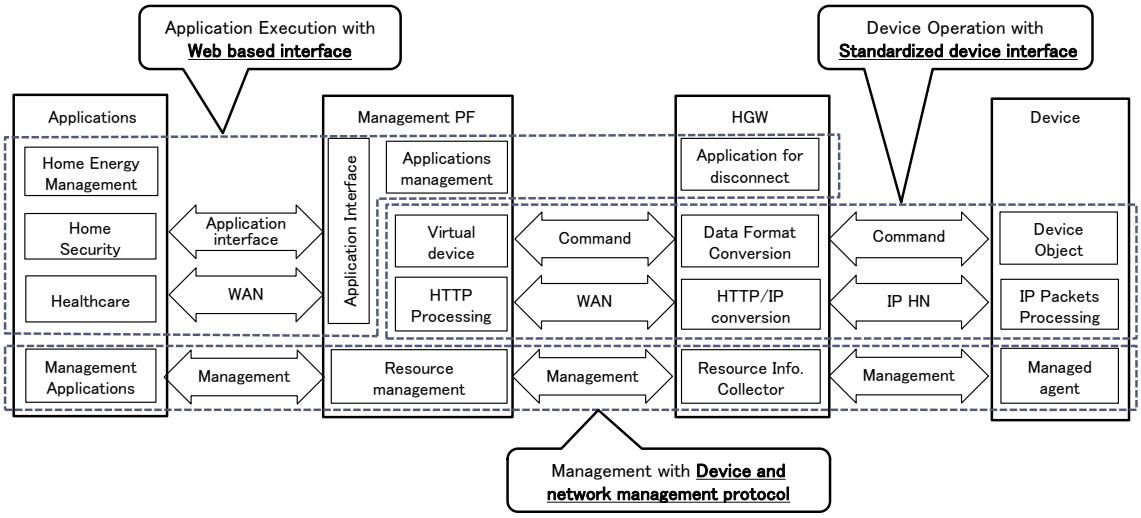


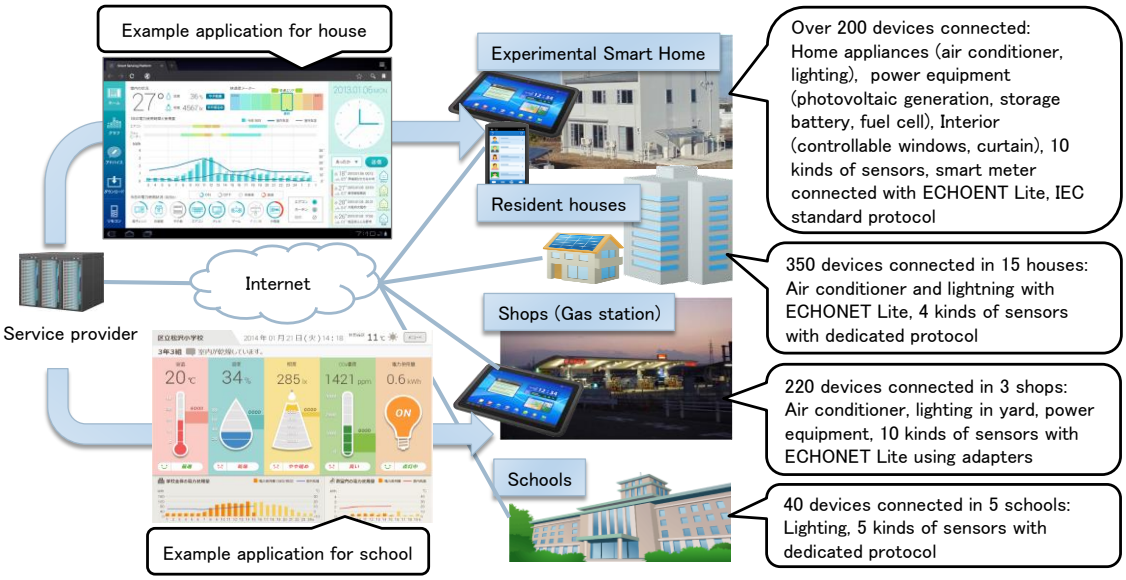
Figure 3. Functional Architecture

The device has the device object, which is a logical model of the information of the device and of control items that could be remotely controlled from the application. The data form for the remote control is specified as the tuple of <property, value>. Since the device object is specified for each type of the devices, existing products by different manufacturers would be remotely controlled exactly in the same way if they are the same device type. For example, air conditioners have properties of the operating status, the temperature setting and the operation mode which are defined as the property configurations in ECHONET Lite. SEP 2.0 and KNX also define similar property configurations.

The tuple of <property, value> is the data form to control the device. The device command is transferred to the HGW on the IP based communications protocol through the home network and to the management PF on the HTTP based protocol through the WAN. The HGW converts the device command between the home network and the WAN since the form of the tuples on the home network is different from that on the WAN. The virtual device on the management PF is the device representation corresponding to the device object of the basic device. The applications remotely monitor and control the devices by specifying the properties of the virtual devices through the application interface.

We have already applied for 24 building based on this architecture described in Figure 4. This trial is going now in 3 categories fields such as houses, shops, schools located in the wide area in Japan. All buildings are connected to the service providers through the Internet. Over 800 devices are locally connected to the HGW of each building through

the local area networks and communicated to the service providers via the HGW to be monitored and controlled from the applications.



Acknowledgement

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