

## 스마트 홈을 위한 프라이빗 클라우드 게이트웨이

수жат 후세인, 무하마드비랄 아민, 이승룡, 정태충  
컴퓨터 공학과 경희대,

e-mail : {shujaat.hussain,mbilalamin,sylee}@oslab.khu.ac.kr, tcchung@khu.ac.kr

### A private cloud gateway for smart homes

Shujaat Hussain, Muhammad Bilal Amin, Mahmood Ahmad, Sungyoung Lee and Tae Choong Chung

Dept. of Computer Engineering, Kyung Hee University, Korea

email : {shujaat.hussain,mbilalamin,rayemahmood,sylee}@oslab.khu.ac.kr, tcchung@khu.ac.kr

#### Abstract

*Smart home is one of the emerging domains to come up after advances in home appliances and automation technologies. There are many commercial solutions for smart homes yet many of them have yet to truly exploit the potential of private cloud for low level contextual services and ability to migrate to public cloud for more processing and storage. We propose a private cloud gateway for smart home which will have the ability to sense the new devices, ability to detect context of the situation and act in an appropriate way. It will also record the user logs which will be audited for improvement of the overall system.*

#### 1. Introduction

A smart home consists of devices and systems that are semi or fully automatic and share a common interface [1]. Smart home's main purpose is ease of use which varies from entertainment, health services and communication. Recently a lot of efforts are being put in this area. In Open Services Gateway Initiative (OSGI), the gateway services connects many smart home appliances inside the home and form a bridge so that a smart home user can access it through internet outside his home.

Cloud computing can offer a similar gateway with its elastic model, scalability and pay as you go model [2]. Cloud computing can cut huge costs and flexibility to upgrade later.

In this paper we propose a private cloud architecture which acts as a gateway for the smart cloud. It will detect and sense all the devices coming and going as well as organize the schedule and react according to the behavior of the user.

This paper is organized as follows. A related work is in Section 2. Section 4 presents the architecture of private cloud gateway for smart homes and Section 5 concludes the paper.

#### 2. Related Work

A context aware smart home monitoring system [3] based on pressure measurement sequences and focuses on the analysis of transfers performed by the user in different home activities like sleeping, showering etc. Another technique [4] describes a ubiquitous architecture for virtualized networked devices and hides their complexity and heterogeneity. Different intelligent techniques are used for

automatic learning and context information to make it a smart environment. An adaptive middleware design [5] is proposed for context aware applications and it uses application specific utility functions to choose for different alternates for providing the specific context. They are also working on self-configuration and fault tolerance in provision of context information. Guidelines have been provided for increasing verbal prompt efficiency in smart homes [6].

Another approach described in [7] is internet based remote control system for smart homes. Sensors and smart appliances are connected to design and implemented control panel and are monitored from the cloud/ internet.

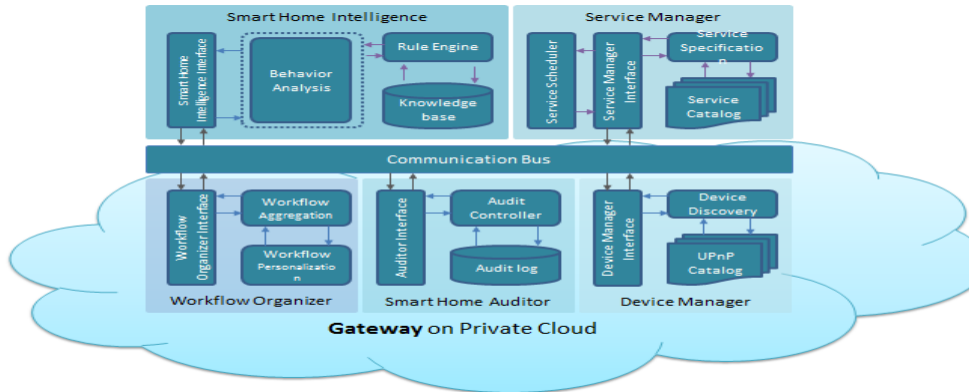
KT [8] has launched a smart home pad tablet which provides a number of services. Some of the services provided are home security service, health services, entertainment system and a very basic form of context awareness which shows videos, news, nearby shopping centers and entertainment through user analysis.

Smart Home systems is a company that design and install custom smart homes for clients on different budgets and it provides services which range from security and surveillance systems to home theatres, media servers, lighting control, environmental control, automated shades and structured wiring.

Samsung Smart HomeNet [9] is an initiative taken by Samsung and is aimed at providing specialized content and services according to user needs. It is based mainly on smart phones and uses cloud computing. It introduces a smart manager that can control a refrigerator, washing machine and other smart appliances. It emphasizes on controlling

electricity costs, providing different smart apps like news and weather and context aware suggestions like groceries to buy from a mart.

### 3. Proposed Architecture



Device Manager comes into play when a new device comes into the smart home/ environment. There are three main components in the device manager i.e. the device discovery, UPnP catalog and the device manager interface.

The device discovery module senses a new smart device in the vicinity. It signals to UPnP catalog to give it information about the new device i.e. the type of the service, services it can be provide, minimum/maximum power usage etc.

UPnP catalog will be updated through a service manager interface which will get information from the service manager. They will pass information through the communication bus. The device manager will host on the private cloud based locally as there will be sensitive information

The service manager has all the information about the services that are available in the smart home. It also gives and updates information about the device services to the device manager. The service manager interface is the door to the three modules i.e. service catalogue, service specification and service scheduler.

The device scheduler ensures that no two users of a smart house create a deadlock for a smart appliance and all the users can use smart appliances with maximum benefits.

Whenever a user enters a room the work flow organizer will check all the smart devices and the workflow organizer will look whether there is a preference of the user that is already saved. The workflows will be suggested from the workflow personalization modules. The user can also define different workflows which will be stored against this user for future recommendation and suggestion. The workflow aggregator then gives the user defined and the previously stored workflows for the devices

The main idea is to build a gateway for the all the modules necessary to build an UPnP based adaptive home cloud.

present in the room to the workflow organizer interface.

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