

# A Method for Providing Personalized Home Media Service Using Cloud Computing Technology

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**Abstract.** . Because of the increasing number of multimedia files, the storage ability and computing resources of a single computer are no longer sufficient for satisfy the demand of home networks. With respect to providing home media services, home network technologies have a limitation in that the technologies work only in a home network. Therefore, in this paper, we propose an efficient method that uses cloud computing to store, process and manage a large amount of multimedia content, as well as a remote access technology to receive home media services in WLAN and in a home network. For exchanging information between a cloud and a home network, Assist Gateway is proposed. Assist Gateway can obtain information of multimedia content from a cloud and provide it to the users. Moreover, the users can control the media devices deployed in their home network through Assist Gateway; this is the most important advantage of the proposed method.

**Keywords:** UPnP, Cloud Computing, Remote Access, Home Network, Assist Gateway.

## 1 Introduction

UPnP (Universal Plug and Play) is the most important protocol in a home network. It is a technology used for sharing device functions and services. Further, DLNA is an international standard for the home network technology supported by a collaboration of major companies. These are efficient technologies for sharing and using multimedia content between various heterogeneous devices in a home network. However, the limitation of these technologies is that they work only in a home network. The function of remote access is not efficiently used and has been studied only to a limited extent. To solve this problem, many studies that aimed at supplement multimedia sharing and playing technology with remote access functions in UPnP were conducted [1] [2] [4]. Because of the increasing number of multimedia files, the storage ability and the processing power of a single computer are no longer sufficient for satisfying the demand for processing large amounts of media content for mobile media services. To solve this problem, we propose an efficient method that uses cloud

computing to store, process, and manage a large amount of multimedia content, as well as a remote access technology to receive home media services in WLAN and in a home network. The proposed method consists of four components namely, Cloud Computing, Assist Gateway, Media Device, and UI for providing optimized home network service.

The remainder of this paper is organized as follows: Section 2 discusses the related work for a better understanding of the proposed method. Section 3 describes the proposed method and explains its main functions. Finally, Section 4 concludes the paper.

## **2 Related Work**

Nowadays, many researchers are studying the sharing of multimedia content and the communication between home networks. In [1], a new service for multimedia sharing was proposed. This service provided a content exchange between users' homes as well as access to its own content in a nomadic situation. In [2], the researchers proposed the architecture to provide an efficient in-home media content distribution mechanism associated with a home gateway in order to enable local and P2P content sharing on home networks.

All the cited research related to home networks focus on the efficiently transmission and sharing of multimedia content between home networks. However, the main drawback of all the above mentioned approaches is their inability to ensure scalability and safety for storing multimedia content in the proposed systems. Therefore, in this paper, we propose a method to solve the above mentioned problems.

## **3 Proposed Method**

The proposed method uses cloud computing technology for storing, analyzing and managing a large amount of multimedia data, as well as UPnP technology to freely access UPnP devices in a home network for sharing multimedia content. The core of the proposed method is Assist Gateway using the UPnP technique. Figure 1 illustrates the architecture of the proposed method.

### **3.1 Cloud Server**

Cloud Server stores and manages a large amount of multimedia content stored and shared in a home network. Multimedia content, stored by users in Assist Gateway, are automatically sent to Cloud Server through FTP. For providing personalized management services, Cloud Server generates and issues each user an OAuth-based authentication-id that is managed by Assist Gateway. For personalized services, Cloud Server creates virtual computing resources and storage for each user using Xen technology in the cloud environment. The multimedia content of each user is stored in a private virtual space. For providing multimedia streaming services to heterogeneous

devices, we designed a multimedia content transcoding module in Cloud Server. The multimedia transcoding module is designed and implemented on the basis of MapReduce [3], which can efficiently process large amounts of data using the Hadoop Distributed File System (HDFS). The multimedia transcoding module is a multimedia content converter that converts multimedia formats to a uniform type for heterogeneous devices. Multimedia content is converted into an MPEG-4 format, which can be played in any kind of multimedia device including smart phone, tablet PC, and smart TV.

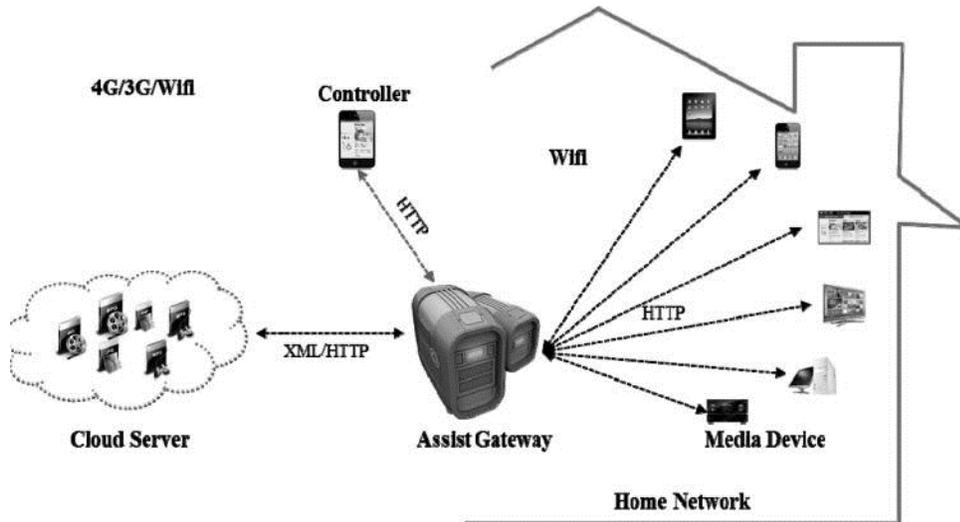


Fig. 1. Architecture of the proposed method

### 3.2 Assist Gateway

For obtaining information of multimedia content from cloud and providing it to the users, we designed Assist Gateway for a home network. Assist Gateway manages user and multimedia information. For providing a safe personalized multimedia service, a login function is implemented in Assist Gateway. Assist Gateway is similar to the remote access server offered by the UPnP Remote Access Architecture and the media server proposed by the UPnP AV Architecture. Assist Gateway stores and manages the OAuth-based authentication-id generated by Cloud Server for users. Assist Gateway simultaneously obtains metadata with the multimedia content list for classifying the content. Multimedia metadata are composed of many attributes such as title, author, duration, resolution, date, size, and URL. Assist Gateway uses the UPnP protocol for maintaining communication with Media Device and providing multimedia content to users. To support multimedia services using UPnP, Assist Gateway provides the functions of MS and RAS proposed by UPnP AV and RA architectures, respectively. For providing convenient multimedia services and user-

friendly functions, Assist Gateway offers an automatic device matching function that uses the resolution of multimedia content for selecting an adaptable Media Device.

### 3.3 UPnP Devices

Controller is a mobile device that verifies the multimedia content list supported by Assist Gateway and is able to control multimedia streaming and Media Device remotely. Controller provides CP and RAC functions of UPnP AV and RA architectures, respectively. Media Device requests the multimedia streaming service from Cloud Server using a multimedia content URL that is selected by the user, and plays it. Media Device has MR functions of the UPnP AV architecture.

## 4 Conclusion

In this paper, we proposed a method for providing personal multimedia service in WLAN as well as in a home network. We utilized cloud computing technologies to store and manage the multimedia content. By using the proposed method, the users could utilize the multimedia service commodiously and securely.

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