Data Synchronization Between Adjacent User Devices for Personal Cloud Computing

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Abstract

This paper describes ad hoc data synchronization among devices for sharing contents. The purpose of this paper is to share user data in heterogeneous environments, without depending on central server. This technology can be applied to synchronize personal data between a device and a personal cloud storage for personal cloud services. The ad hoc synchronization needs sync agent service discovery module, user authentication module, network adapter, and application data synchronization module. The method described in this paper is better than existing synchronization technology based on client-server in availability, performance, and scalability quality attributes.

Introduction

Nowadays many people get used to smart phones such as iPhone or GalaxyS based on Android and the types of devices are various including IPTV and PC. And then, people want to use same data on a same platform even though their devices are different. This means that the technology should be enhanced compared to existing technology which exchanges data between a mobile phone and PC using USB, etc.. Now a user's data can be shared among the user's various devices by uploading and downloading to/from a cloud server via Internet in personal cloud environments.

In this paper, ad hoc data synchronization among devices for sharing contents is described. The purpose of this paper is to share user data in heterogeneous environments, without depending on a central server. This technology can be applied to synchronize personal data between a device and a personal cloud server for personal cloud services.

In chapter 2, existing data synchronization based on client-server and some of issues for it will be discussed. In chapter 3, the proposed ad hoc data synchronization technique for data-sharing will be described. Finally, this paper will conclude in Chapter 4.

Related Works

Current representative application data synchronization services are Funambol[2] based on SyncML standard[1], ActiveSync of Microsoft[3], and MobileMe of Apple[4]. These application data synchronization services are based on data synchronization between a mobile phone and a central server. This means the mobile phone should be connected to a certain data server to synchronize the application data. Fig.1 shows the network topology of Microsoft synchronization framework. As shown in the figure, the user data such as contacts or e-mail is uploaded or downloaded via a certain server on the Internet.

Architecture

Fig.1 shows a layered structure for ad hoc data synchronization on a device. There are four layers on a device: 1) Ad hoc Data Sync Agent layer, 2) User Authentication layer, 3) service discovery protocol layer, and 4) network layer such as Bluetooth, Zigbee, WiFi, and so on.

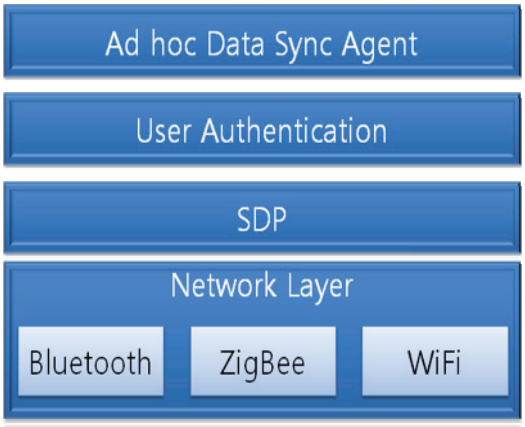

Fig.1. The architecture of ad hoc data synchronization

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Ad hoc Data Sync Agent Layer. Ad hoc Data Sync Agent layer connects with other Ad hoc Data Sync Agent on a different device and then exchange application data each other.

User Authentication Layer. User Authentication Layer authenticates a user to try to connect with the device from another. The authentication is done by the user identification and password of each device.

SDP Layer. This layer is service discovery protocol layer. Ad hoc Data Sync Agent tries to synchronize with adjacent devices. Service Discovery Protocol Layer finds network services to connect with the device.

Network Layer. There are several network services such as Bluetooth, Zigbee, WiFi, and so on.

Procedure

Fig.2 shows the procedure for ad hoc data synchronization. The steps to synchronize are as follows.

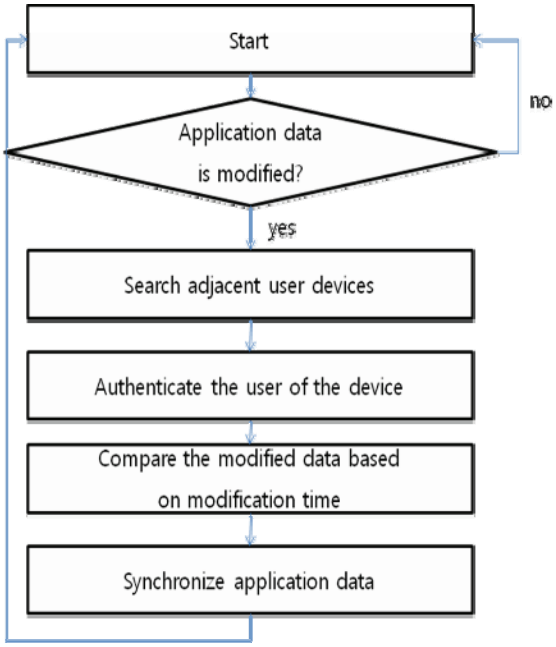

Fig. 2. The procedure of ad hoc data synchronization

The steps are as follows. First, an application modifies its data and then the modification event is occurred. Second, Ad hoc Data Synchronization Layer captures the event and searches a user's adjacent devices to connect with the device which the modification happens. Third, if there is an Ad hoc data Synchronization Agent on the other devices, the User Authentication Layer tries to authenticate the user with user identification and a password. Forth, the Ad hoc Data Synchronization Agent compares the data between two devices which is modified at last. Fifth, the Ad hoc Data Synchronization Agent exchanges the data between two devices.

Conclusion

The technology described in this paper can be applied to synchronize personal data between a device and personal cloud storage for personal cloud services.

This paper describes the architecture and procedure for ad hoc data synchronization. There are four layers on a device: 1) Ad hoc Data Sync Agent layer, 2) User Authentication layer, 3) service discovery protocol layer, and 4) network layer such as Bluetooth, Zigbee, WiFi, and so on. Each layer is related to searching Ad hoc Data Synchronization Agent, authenticating a user, exchanging application data, and so on.

The method described in this paper is better than existing synchronization technology based on client-server in availability, performance, and scalability quality attributes. Devices can synchronize at any time with a user's adjacent devices even if the network to data server is broken. This method does not cause useless data traffic on the Internet when different types of devices try to synchronize with others in heterogeneous network environments.

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