

## The City Tour Service in Mobile Ad-hoc Group

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**Abstract**— With the recent explosive growth of mobile devices, the demand of high quality contents in mobile network is increasing. To ensure the low delay contents sharing in mobile network, there is a need to deploy service platform which provides the intelligent services in the localized ad-hoc group. The service platform can provide a common structure to create and support the direct services at user's edge node. Mobile subscribers come together in same area, establish a temporal ad-hoc group and they connect to the same Wi-Fi access point. People who have common interest can communicate for sharing contents and information. For them, service platform can support the storing, caching, and management of contents, in order to share the high quality contents among proximity group in mobile network. The feature of proximity group services has instantly generated social relation. In this paper, we propose the architecture of service platform for providing a city tour service. Also, we provide the design and the development of the proximity services which is composed of a contents sharing service and a proximity chatting service. Our platform and service can be applied to the campuses and malls as well as tour group.

**Keywords**— service platform; ad-hoc community; proximity service; city tour service; contents sharing

### I. INTRODUCTION

The demand of mobile data services which create, store, make use of contents is increasing [1]. To deliver the high quality contents services in mobile network, it is necessary to deploy caching server in the edge node and provide the contents sharing service among the localized ad-hoc group. It is profitable to support the low delay contents through an edge node and reduce the traffic to core network [2-5].

Two major technologies that allow wireless connection between mobile devices are Bluetooth and Wi-Fi. Both are available on most modern mobile phones, tablets, laptops, and other electronic devices. Wi-Fi can achieve much higher transmission speed and wider range than Bluetooth. So Wi-Fi technology has dominated for most high-bandwidth internet-based applications [6].

For the user-centric service, the service platform is essential to provide a common structure to create and provide the direct services at user's edge node over Wi-Fi [7-9]. Also, mobile subscribers come together in same area such as city tour, establish an ad-hoc group, and get a same

interest. For them, the intelligent service platform can support the storing, caching, and management of contents, in order to share the high quality contents among proximity group in mobile network.

In this paper, we propose the architecture of service platform for providing a city tour service in mobile ad-hoc group. And, we provide the design and the development of the proximity services which is composed of a contents sharing service and a proximity chatting service.

This paper is organized as follows. Section II presents the architecture of service platform for providing a city tour proximity service. We explain the functions of social sharing unit, content sharing unit, chat server, content server, service discovery unit, and mobile device. And we describe the service activation sequence flow.

In Section III, we present the city tour proximity service which is composed of a contents sharing service and a proximity chatting service. And we show the proximity chatting service flow. Finally, Section IV summarizes and concludes the paper.

### II. SERVICE PLATFORM FOR MOBILE ADHOC SERVICE

The city tour services are based on the localized ad-hoc group connected to Wi-Fi. These groups have instantly generated social relation, on the basis of interest rather than intimate relations. The proximity group members can share the information of same topics at the same place at the same time. Their shared contents are photo, audio, video, text, and file. Shared contents must be guaranteed user's anonymity and considered a lifetime because of a member's temporal relation.

This proximity group service can be very useful in moving vehicle. For example, the tour guide and tourists can share the information of tour spot, restaurant, hotel, and shopping place, by making the dynamic proximity community.

#### A. Service Platform Architecture

For the mobile ad-hoc group services, we designed the service platform which supports the content management and the social sharing.

The proposed service platform architecture is shown in Figure 1. There are two parts of the mobile device and the service platform. The service platform consists of Social Sharing Unit, Content Sharing Unit, Chat Server, Content Server, and Service Discovery Unit. And Mobile Device has Client App and Discovery Agent.

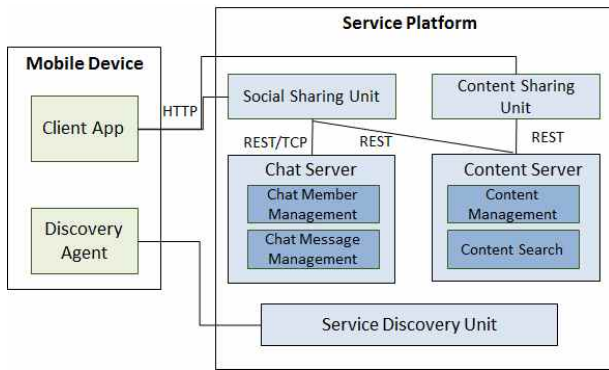


Figure 1. Service Platform Architecture

Users receive a city tour service in mobile device. The Discovery Agent of a mobile device discovers the connection information of the mobile device in the network. It gets the Access Pointer IP address and the service connection URL (Uniform Resource Locator). Client App of mobile device performs the service request and response according to user interaction.

Social Sharing Unit and Content Sharing Unit in service platform are web application for user interaction. They request the chat service or content service, and receive HTTP (Hypertext Transfer Protocol) based response from Chat Server or Content Server. They are composed of JavaScript, HTML5, and CSS (Cascading Style Sheets). JavaScript handles events, and HTML5 and CSS are the view part of web applications.

Chat Server provides the chat member management function based on REST interface and the chat message management function based on TCP socket connection. The chat member management function manages the member nicknames to guarantee an anonymity among the proximity ad-hoc community. It is the unique member identifier and it cannot be duplicated in the same Wi-Fi. The chat member management function performs the management to add and delete members. The chat message management function posts and stores the members' chat messages. If a member leaves a Wi-Fi network, the member's temporal relation disappears.

Content Server provides the contents management to cache, store, and delete contents, and the contents consumption like download or streaming. Also it supports the keyword based search.

Service Discovery Unit manages the service lists deployed to service platform and returns the service connection URL to mobile device.

### B. Service Activation Sequence Flow

For using the city tour service, user mobile device must be connected to Wi-Fi access point, and it gets a service connection URL. And then, mobile users are offered the city tour services from a client app deployed to mobile device.

Figure 2 shows these service activation sequence flow between mobile device and service platform. The related functions of service activation are service discovery unit, social chat unit, discovery agent, and client app.

The flows of connection to Wi-Fi network and the service activation are as follows.

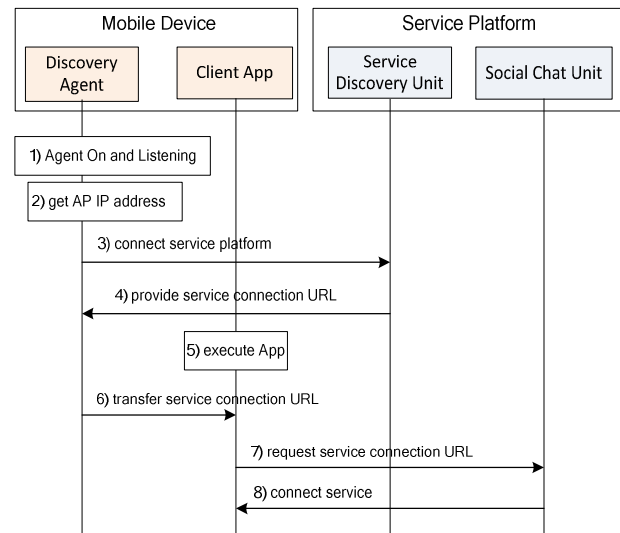


Figure 2. Service Activation Sequence Flow

- Discovery Agent of mobile device is on and waits to listen to signal.
- Discovery Agent gets the IP address of access point.
- Discovery Agent connects to Service Discovery Unit of service platform.
- Service Discovery Unit returns the service connection URL to Discovery Agent.
- Mobile user executes a Client app.
- Discovery Agent transfers the service connection URL to client app.
- Client App requests service connection URL.
- User confirms service connection and uses the service.

### III. CITY TOUR SERVICE

We have implemented a city tour service which shows the temporal social relation features of service platform. Service development device was done on the Samsung Galaxy Note 8.0, running Android version 4.3 (Jelly Bean).

The demonstrated city tour service is composed of a contents sharing service and a proximity chatting service.

In contents sharing service, members can upload, list, and search the shared contents. The proximity chatting service provides the social sharing space to share information messages and contents among members who have same interest.

Figure 3 shows the proximity chatting service UI of city tour service. We define the intelligent agent which manages the chat member presence. When members enter the social sharing space with nickname, they can see the member lists and post the information messages. They upload contents and view shared contents and contents information.

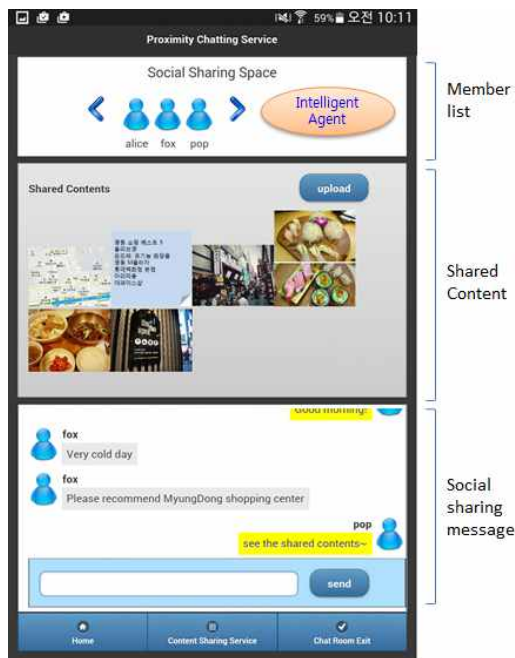


Figure 3. Proximity Chatting Service

The detail flow of proximity chatting service is shown in Figure 4. It shows the relation among components of service platform. A member creates the unique nickname and starts the proximity chatting service. Social Sharing Unit requests to get chat member lists and content lists. The chat server returns member lists and the content server returns the content lists.

When the members input the chat message for information sharing, the chat server transfers the messages to all members. While chatting, members can upload and share the related contents.

The advantage of the city tour service provides the useful information based on the temporal ad-hoc relation. People connected to the same Wi-Fi form an ad-hoc community, and people who have common interest can communicate for information sharing. Even if they are moving, service platform maintains the proximity community services.

Also, for privacy protection, when a person who uploaded content leaves a Wi-Fi network, the shared contents will be considered expired and disappear. It reflects the feature of ad-hoc services. Also, the shared contents

among temporal members need to have an anonymity guaranteed.

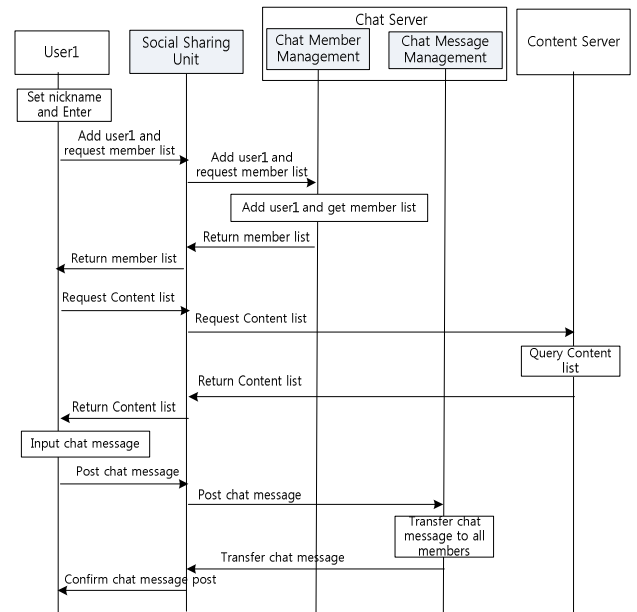


Figure 4. Proximity Chatting Service Flow

#### IV. CONCLUSION

In this paper, we presented the service platform for providing a city tour service in the mobile ad-hoc group. Our service platform supports the storing, caching, and management of contents, in order to share the high quality contents among the proximity ad-hoc group in mobile network.

We developed the city tour service, which is composed of a content sharing service and a proximity chatting service. The advantage of the city tour service provides the useful information based on the temporal ad-hoc community.

The lifetime of shared contents is not permanent because of a member's temporal relation. The chatting service based on user nickname can guarantee anonymity among ad-hoc members.

For further study, we have a plan to extend the service platform for the proximity intelligent advertisement and recommendation. It would be taken into account that platform provides the environment for advertisement and recommendation lifecycle management.

#### ACKNOWLEDGMENT

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