Service Discovery Using Broadcasting Data Channel

Md. Kamrul Hasan*, Husne Ara Rubaiyeat**, Sungyoung Lee*, Young-Koo Lee*
*Dept. of Computer Engineering, Kyung Hee University
**Dept. of Biomedical Engineering, Kyung Hee University
Email: kamrul@oslab.khu.ac.kr, rubaiyeat@yahoo.com, sylee@oslab.khu.ac.kr, yklee@khu.ac.kr

Abstract

Traditional service discovery mechanisms so far necessitate centralized registry containing all the service descriptions. Though centralized service registration is intuitive, it does not facilitate users in their usual ways of doing things. Moreover, centralized repository is not scalable for high query rate. We propose that service description be broadcast through the advertising data channels so that computers can parse and queue the service descriptions interesting to the users. The current technologies such as Digital Media Broadcast (DMB), Car Navigation Systems and Wireless Broadband can bring our idea to reality.

1. Introduction

Today is the age of Ubiquitous Computing where technology and services waive themselves into our daily life. The success of a system now depends how proactively it provides service to the user. Especially when the user is roaming in vehicles, the system should provide the right service at the right place. A person sitting in his home or office can surf through the internet or put a query in the search engine. But a person in the car will only be completely satisfied if he sees a number of nearby restaurants' menu in the dashboard display at lunchtime and if possible place an order to a restaurant while he is waiting at a traffic signal. The person might be going to the restaurant for the first time or he might forget the way to it. So, the Car Navigation System will show him the way. In the lunchtime it is very difficult to find a parking place. When the person approaches the restaurant building the layout of the parking lot is visible in the display with number of free slots in each floor. The person finds a parking place quickly and enters the restaurant. He finds his food ready!

There are two ways to implement the scenario. One is there is a centralized registry of all the restaurant services and the users personal agent places a query by GPS location or area and a list of favorite food to the centralized repository. The same can be done for finding the parking service of the building by sending a query to the centralized repository. The problem is there should be a few centralized repositories of services known to all the devices roaming in the road. The user needs to know the location and the menu he/she wishes to take. However, people usually choose a menu after seeing it on some advertisement or leaflet. The centralized query-response model does not support the paradigm and asks the users to change their ways of doing things.

The query response model necessitates the user or the computerized agent to know what to search, at the least. On the other hand, broadcasting model provides all the information to the user ahead of time. So, the user does not need to query the centralized repository. This saves the user from any special mental involvement. The computer agent can summarize the information received and show them on the display. A navigator can show the information on the map by using some visualization techniques. The user can interact with the display and perform any further computation such as placing an order to a restaurant or finding the detailed layout of the parking.

There are few advantages of the broadcast model over the centralized query-response model. First, broadcast model reduces the necessity of memorizing what to find. Second, centralized server may become the bottleneck. Third, centralized service registry usually support only one type of interaction with the system or services, such as UDDI provide web service description for interaction with the service. But broadcasting can indicate the type of service and methods of interaction with it.

But broadcasting is not enough to satisfy the demand of most up to date information. A broadcast channel cannot provide the number of seats available in all the restaurants because the information is too dynamic to broadcast. Accessing a particular service is necessary to find the most up to date information. So, broadcast channel along with direct access to a particular service is necessary for a truly ubiquitous system.

From the navigator developers' point of view, it relieves them annotating each of the restaurants and their menus, which are subject to change time to time, on the digital map.

2. Related Works

Digital Multimedia Broadcasting (DMB) is used in digital radio transmission system for sending multimedia (radio, TV, and data) to mobile devices. It is an offshoot of European technology, Digital Audio Broadcast (DAB) developed as a research project name Eureka. DMB was developed in South Korea under the national IT project, originally as the next generation digital technology to replace the FM radio. Two types of DMB are available Satellite DMB (S-DMB)

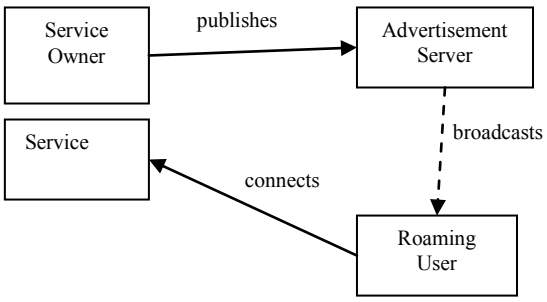
and Terrestrial DMB (T-DMB). DMB broadcast can be received even at the speed of 120km/h with occasional blackouts in the tunnels which recovers quickly. T-DMB is more popular because it's free, although it has less resolution than S-DMB.

Data channel receivers are now embedded into the DMB receivers through numerous efforts such as [1], [2]. Recently, a prototype [3] has been made in Singapore to broadcast real time traffic information through DMB data channel using TPEG standard. However, DMB data channel is capable of delivering not only the information, but also various useful service descriptions, such as restaurant service, parking service etc.

3. Main Idea

We propose, DMB broadcast data channel be used for publishing useful services to the roaming users. The useful services ranges from restaurant and parking service to any other widely used services, such as express bus\train time and booking. DMB data channel has been designed to broadcast data. We propose, the channel can be used to broadcast service description. This proactive model will increase the usability of the system, as usually people do not even know what to search (such as what to eat in lunch).

Searching services from centralized server has some drawbacks. It needs a considerable user attention. User needs to know what to search. From system point of view, searching mechanism has a fixed protocol and has a fixed way of accessing the services. As for example, an UDDI registry will keep the service descriptions of web services only, not of UPnP or JINI. There can be many service protocols and many service registries. Asking the users, especially non technical users, to remember all URLs is not a usable system.



(Figure 1) System Model

Figure 1 depicts the model diagram of the system. A service owner will publish its service description to the Advertisement Server. The service description is a text or xml that describes the service, such as a leaflet does. Additionally the description should contain the GPS location of the service, the URL and the protocol to access it.

GPS location will enable the navigator to locate the service on the map and reduce the burden of the navigator company to label them. If needed, the user can search within the service descriptions stored locally to take a decision. The URL and access protocol will enable the agent on the navigator to automatically connect to the services to retrieve further information. As WiMAX is getting popular, cars will be equipped with wireless broadband. At this moment, public buses in Seoul are offering Wibro enabled PCs for internet access. So, automated access to services from car is quite feasible even today.

A. Broadcasting Model

The service descriptions should be broadcasted periodically so that vehicles roaming in a region can get the information at least once before passing the place. The service descriptions from different regions should be multiplexed together and periodically broadcasted. But the DMB broadcasting data channel has a maximum broadcasting capability. This limits the number of service descriptions that can be broadcasted over a period. One solution to the problem is to broadcast highly ranked service descriptions. But that will lead to starvation for low ranked services. So, a rank elevation scheme should be taken based on the elapsed time period.

4. Conclusion

We propose a proactive service model based on DMB data channel. The descriptions of the services along with URL and protocol broadcasted can help automated interaction with the service. The model is very much useful to a roaming user, especially to persons driving cars.

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