

# **FLOATING NOTE - A LOCATION BASED MESSAGING APPLICATION**

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## **ABSTRACT**

This paper introduces the concept of floating note and proposes an approach to a floating note application. The approach is considered to increase the value of public access wireless networks. The service was implemented as a web service in a public access WLAN network. The architecture of the system and the implementation of the service are described.

## **KEYWORDS**

Location based messages, WLAN, public access wireless network.

## **1. INTRODUCTION**

Use of public access networks has increased as users have been given new messaging technologies. Internet has increased its popularity with E-Mail and Instant Messengers, mobile phones with SMS messaging. As public access Wireless Local Area Networks (WLAN) become more available, there is a possibility to introduce new kinds of messaging services that take advantage of user positioning.

By considering the location of the user a service can display information that is useful only in a specific location. In this paper this approach is used to create a public messaging system that gives users a possibility to view and post messages that are bound to the user's current location. Messages will stay "floating" where they are posted for everyone to see. If you've ever felt like scribbling something clever on a wall somewhere, now you can. This doesn't even require a wall, only a suitable device to open your eyes for the Floating Notes (FN).

Floating Note system was designed after considering existing messaging services. The messages are shown in a structure that resembles message forums on the web. Figure 1 illustrates how users can see their current location and the topics of messages in that location. A person could walk into a café, sit at a table, enjoy a nice cappuccino and admire the view from the bar. He could then post a note from his table commenting on the experience. Another customer could then read the note when he arrives at the same table, take a picture with his digital camera and then post his own message with the current view from the table.

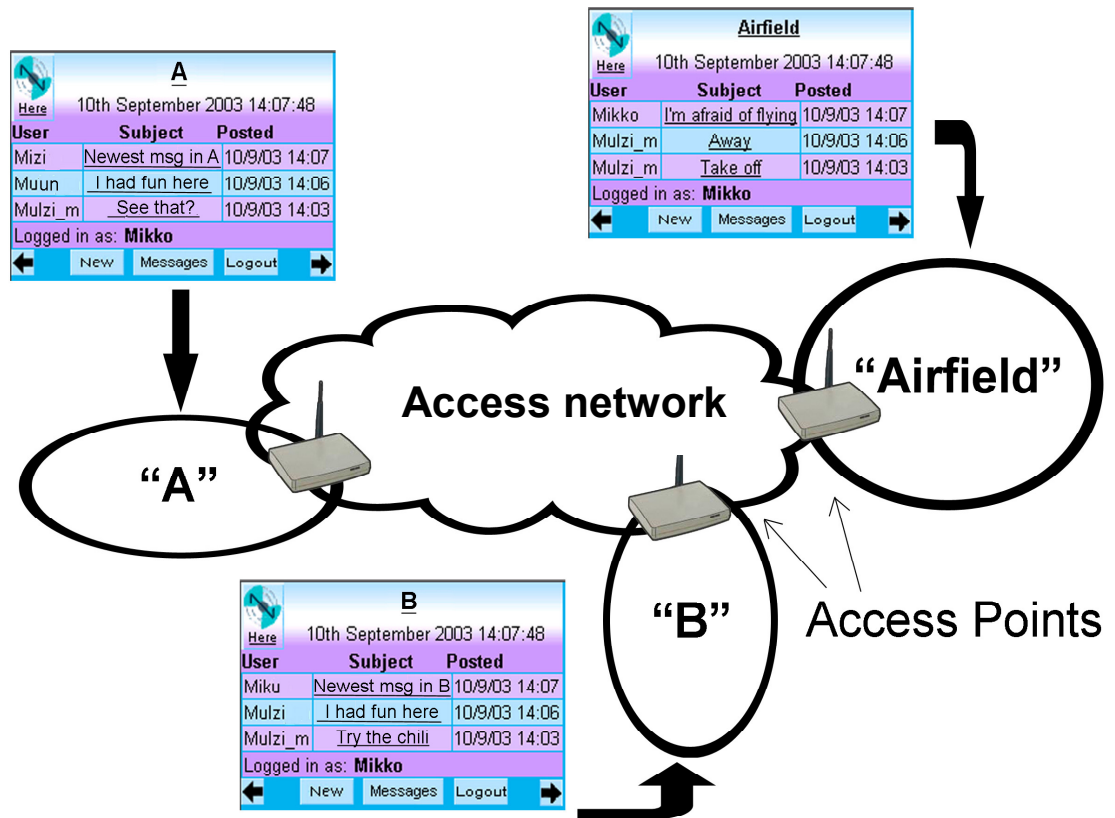


Figure 1. Floating Note service.

Realization of the previously mentioned application requires a positioning system. In a WLAN, positioning can be performed multiple ways. The easiest way to determine the location of a user is cell based positioning. Cell means the coverage area an Access Point (AP). A WLAN network normally consists of multiple cells. Granularity of the location information is equal to the size of the cells. If more accurate results are required, they can be achieved for example with signal strength measurements from several access points [5]. Predetermined measurements from a client device are used to form a signal map. The position of the device is determined by comparing signal measurements to the signal map. An example of a commercial product of this type is the Ekahau Positioning Engine (EPE) [2].

## 2. FLOATING NOTE APPLICATION OVERVIEW

The application developed in this work was named "Skyline". The name "Skyline" derives from outdoor use, floating messages and clear visible skyline of the testing area by the lake Saimaa in Lappeenranta Finland. The "Skyline" was built for use in the WLPR.NET [6], which covers parts of Lappeenranta. Floating Note is a centralized server-side web -service using PHP: Hypertext Preprocessor (PHP) to generate pages and MySQL database to store information about users and messages.

Users can access the service with a laptop or a PDA device that has a web browser and access to WLPR.NET. With this service users can post notes containing text or images to

specific location in the WLPR.NET coverage area. Notes in a specific location can be browsed by topics and individual notes can be selected to view the content of the message. The service also allows users to select other locations than their own. An administrator interface was implemented to allow control over content and users.

### 3. ARCHITECTURE OF FLOATING NOTE SERVICE

The FN application acquires the location information of a user from a separate service. This service is the *Location Information Service (LIS)*, which was developed in the laboratory of Communications Engineering at the Lappeenranta University of Technology. LIS allows FN and other services to get information on a users location in the WLPR.NET. Figure 2 shows the positioning environment divided in layers. FN, other services, LIS and the positioning system are located in the WLAN network. The services which need user information use Simple Object Access Protocol (SOAP) to access LIS.

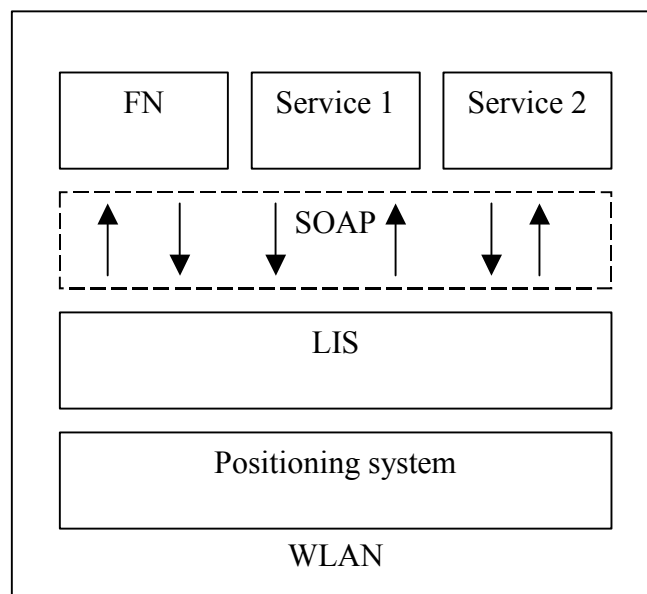


Figure 2. The positioning environment and Floating Note application

#### 3.1 Operation of Location Information System

LIS is middleware that provides access to location information for different services. LIS was originally developed to be used for public WLAN services. The functionality of LIS is illustrated in Figure 3. The positioning system which LIS uses is cell based. RADIUS service is used to gather user location information to a position database from the wireless access points. LIS can then retrieve position information from the position database, which is updated from RADIUS data.

LIS has a user interface where users can register their devices. In the registration process users select a LIS nickname to use as their identification. The registration process determines automatically the MAC address of the device used for the registration. This MAC address is used to position the user. Services like FN can register themselves to the LIS. When users log in to LIS management interface, they can then see a list of registered

services in the LIS. Users can then select which services are allowed to use the location information of the user. When a service sends a request for the location of a specific user, the service identifies itself by name and authenticates itself with a password. The request contains the LIS nickname of the targeted user. Finally, LIS checks if the service is allowed by the user and sends the response.

Service interaction with LIS is done with SOAP. SOAP is a lightweight protocol for exchanging typed and structured information between peers [1]. SOAP enables the service to call methods from the LIS. LIS provides a set of methods, which can be used to query location information. LIS retrieves the actual location information from a database and sends an answer for the service. LIS methods can also produce a list of locations or set triggers for tracking users. Triggers can be used to notify the service when the user specified in the trigger changes location [4].

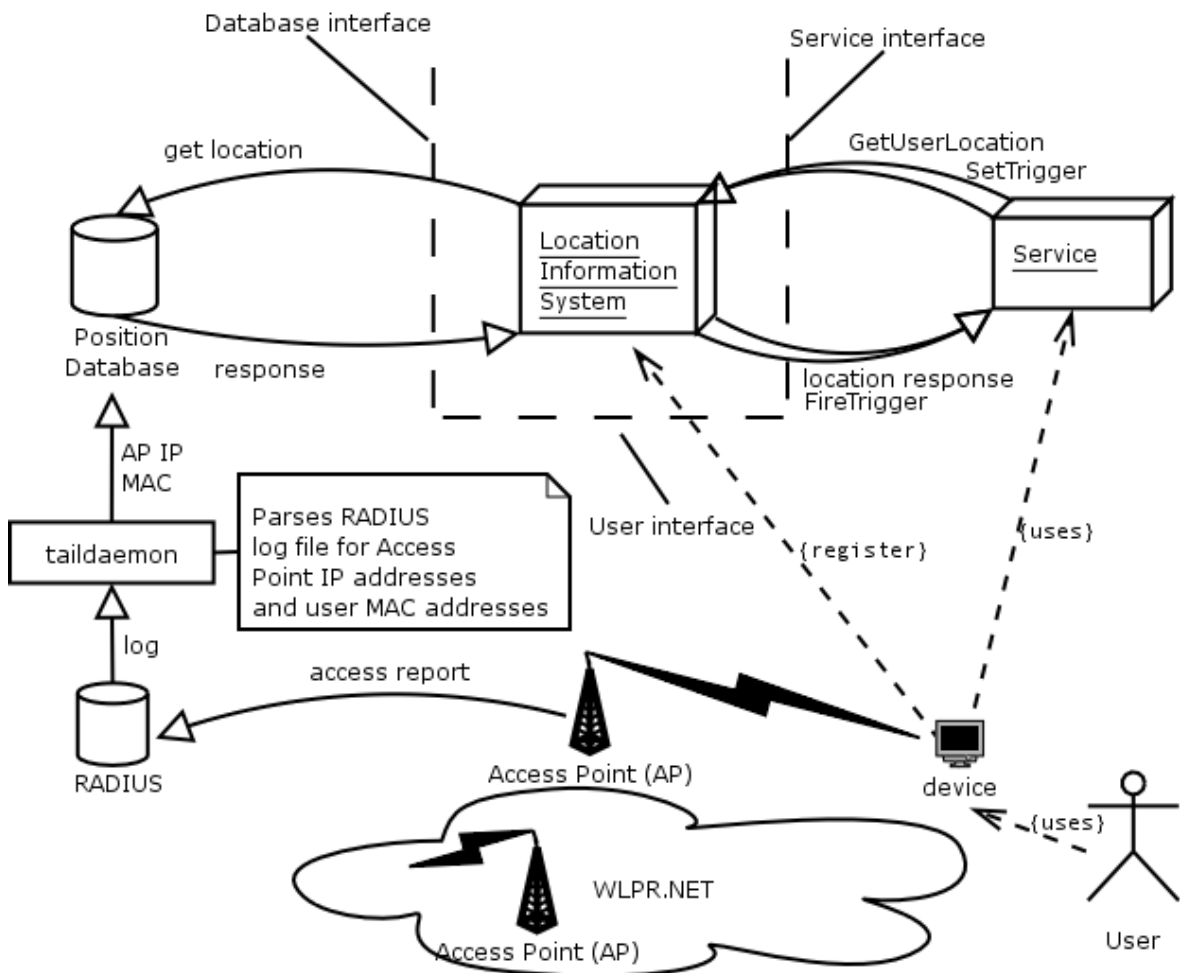


Figure 3. Interaction between the LIS and the service [4]

Figure 3 shows the components related to the LIS service system. A *user* has access to the WLAN network via a wireless *access point*. The *location information* of the user's *device* is stored into a *Position Database* from where it is retrieved when the user executes an action in the *Service* that requires the *location information* of the *user*. The *Service* uses

SOAP to pass *requests* to the LIS. The *request* specifies the user whose location information is to be retrieved from the *Position Database*. LIS authenticates the *request* and passes the acquired information back to the service.

### 3.2 Operation of Floating Note

Operation of Floating Note service is presented in Figure 4. A HTTP server (Apache) is used together with a PHP interpreter. The service is basically a collection of PHP scripts which process user input and data from a database, messages (text + images) and location information from the LIS. Database is used to store information about registered users and posted messages. Messages can include images, which are uploaded to the server and stored in a directory. LIS queries are run when a user opens a page that needs location information.

When a user opens the main page the of the Floating Note service, the user's current location is requested from the LIS and the newest messages are fetched from the database. If a user views the content of a note, the service asks for the body of the message from the database with possible links to images. The service then shows the contents of the note as a HTML page for the user.

Currently LIS provides only the unique identifier of an access point as the location information. Also the low number of AP's limits the positioning accuracy. The FN service can handle more accurate locations when they are presented in identifiable strings. Location browsing would then require more categorizing than in an access point oriented approach.

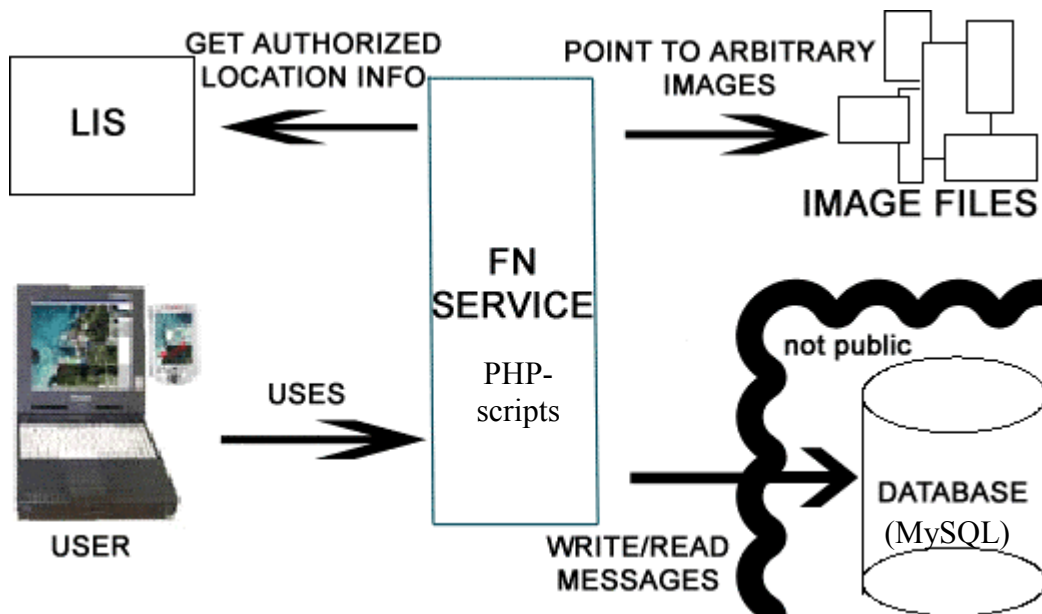


Figure 4. FN application architecture

To be able to use the Floating Note service, users have to create an account in the service. This way the LIS nickname, that is required to be able to retrieve the location information of the user, can be stored as an attribute in the registration process. Users can then be

identified and moderated more easily. There are two types of users in the Floating Note service: a normal user and a system administrator. The main user interface of the normal user includes the following functions:

- Viewing message topics in a certain location.
- Viewing a whole note.
- Writing a new message.
- Adding an image to a note.
- Selecting a different location.

The system administrator has a different interface for monitoring the Floating Note service. The Floating Note service has automatic clean-up functions that are used when there are too many messages in one location or too many images in the server. The administrator must still handle all the messages that have offending content or otherwise violate the rules of usage.

### 3.2.1 User Interface

The main screen displays a specified amount of notes in a location. A user can browse through to older or newer messages and then select a note to view it wholly. Figure 5 shows the main screen and Figure 6 is an example of a note. Lower banner in Figure 5 has all the buttons required for navigation and the upper left button takes the user always to the current real location. A user can select a different location by pressing the location description in the upper banner on figure 4. A new location can then be selected from a list of all the locations in the service.



Figure 5. The main screen

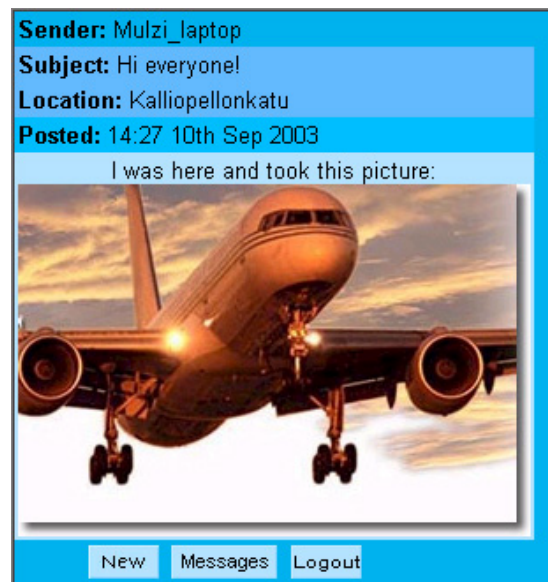
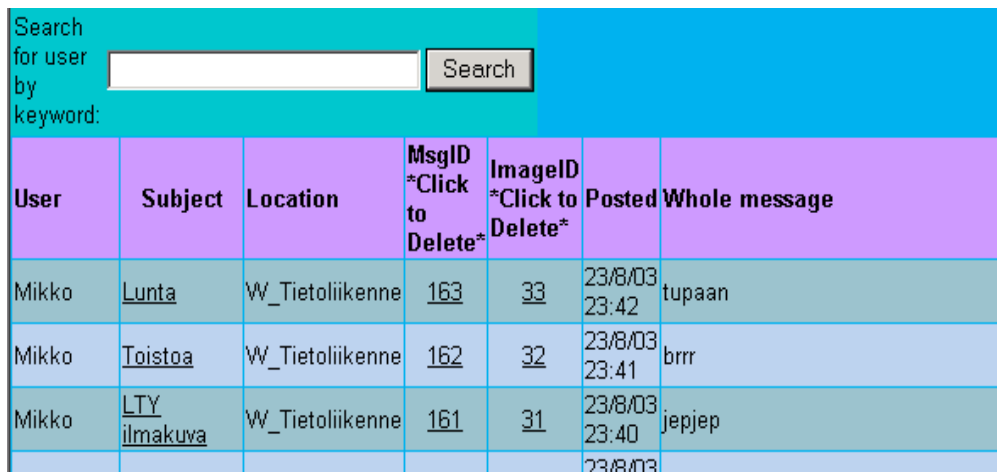


Figure 6. A floating note

Writing a new note is done by pressing “New” on the lower banner in Figure 5. When writing a message the user can add an image to the message by sending it to the server or browsing through images that are already on the server. The user is not limited to posting to his current location but can change the location when writing a note.

### 3.2.2 Administrator Interface

The administrator is given tools to control the service. Users can be searched via keyword, their information can be viewed and registration deleted if necessary. The screen shows some amount of the newest messages in all locations. The top of the administrator interface is shown in Figure 7. The list shows the whole note with images and the list can be browsed chronologically. Images can also be browsed and deleted separately.



The screenshot shows a search interface with a text input field for a user name and a 'Search' button. Below this is a table with the following columns: User, Subject, Location, MsgID \*Click to Delete\*, ImageID \*Click to Delete\*, Posted, and Whole message. The table contains three rows of data:

User	Subject	Location	MsgID *Click to Delete*	ImageID *Click to Delete*	Posted	Whole message
Mikko	<a href="#">Lunta</a>	W_Tietoliikenne	<a href="#">163</a>	<a href="#">33</a>	23/8/03 23:42	tupaan
Mikko	<a href="#">Toistoa</a>	W_Tietoliikenne	<a href="#">162</a>	<a href="#">32</a>	23/8/03 23:41	brrr
Mikko	<a href="#">LTY ilmakuva</a>	W_Tietoliikenne	<a href="#">161</a>	<a href="#">31</a>	23/8/03 23:40	jepjep

Figure 7. Administrator interface

An important part of the system administration is assigning new location descriptions. The LIS service provides an unique ID that expresses the WLAN cell where the user is situated. The administrator should then assign his own description that expresses the location more comprehensible to the user.

## 4. DISCUSSION

This paper presents an approach to a Floating Note system that gives the mobile user of a WLAN network a possibility to leave notes in different physical locations. The approach was specified so that it would benefit from communication and use of the network. The user requires only a laptop or a PDA with a web browser and a WLAN connection to take full use of the service. Users can leave notes that have an image attached to it or view notes from other locations from their current position.

The application was implemented and tested in the WLPR.NET public network in Lappeenranta. Users are register to the service, which is controlled by an administrator

who has also control over the users and content throughout the system. The service leaves many options and possibilities for further development. New functionalities can be added to the service, which could be for example creating different views for different user groups.

Swedish Institute of Computer Science has developed very similar application called GeoNotes. Major differences between Floating Note and GeoNotes are architectural. GeoNotes retrieves the location information and does most of the message editing and sorting on the client-side whereas Floating Note works entirely on server-side. GeoNotes is implemented with Java and is being tested at StockholmOpen.net network [3].

Message boards were also considered for their ability to develop and grow into popular interaction forums. With message boards users can have conversations about specific topics and anyone can participate by posting a message. It was considered that Floating Note could work similarly with the current location as the base of the discussion topic.

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