

Instant Group Communication with QuickML

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ABSTRACT

A number of people are exchanging e-mail messages everyday using mobile phones and PDAs. E-mail is useful not only for one-to-one communication but group communication through mailing lists. However, conventional mailing lists are not as widely used as they should be, because creating and maintaining a mailing list is not an easy task. We propose a simple and powerful mailing list service system called QuickML, with which people can easily create a mailing list and control the member account only by sending e-mail messages. QuickML allows people to enjoy group communication at any place, at any time, and by anyone.

Categories and Subject Descriptors

H.4.3 [Communications Applications]: Electronic mail; H.5.3 [Group and Organization Interfaces]: Asynchronous interaction

General Terms

Design, Human Factors

Keywords

Mailing list, groupware, ubiquitous computing, QuickML

1. INTRODUCTION

A number of people are exchanging e-mail messages and “instant messages” everywhere via the Internet, using various small communication devices. In Japan, almost all the mobile phones in the market have data communication capabilities, and various consumer devices like camcoders and TVs can exchange e-mail messages these days. In a commuter train in Japan, young people are quietly staring at their mobile phones in their hands and typing the numeric keys in full speed using their thumbs to write e-mail messages (Figure 1). Exchanging e-mail messages is now really a common activity performed at any place, at any time, and by anyone.

Most of the current communication devices and services basically support one-to-one communication. If someone wants to ex-



Figure 1: Everyday scene in a Japanese commuter train.

change messages among a group of people, he has to send the same message to all the members, and then other members have to do the same thing to send reply messages to the members. Using an e-mail client program, this can be done by listing all the members in the “Cc:” section of the header part of each message.

Listing the name of all the participants has many disadvantages. First, whenever you send a message, you have to check all the members in the list and see if the list is appropriate. When you exchange messages among the same group of people, you always have to list the same people in the list, checking if group members are not missing and extra person is not included. Second, with this approach, it is difficult to keep a large group for discussion, since it is not easy to list hundreds of people every time in the Cc: section of the mail header. Third, extra resources are sometimes required for sending messages to many people. Using one of the popular mobile e-mail exchange services in Japan, users have to pay money which is almost proportional to the number of messages they send. In that system, sending a message to 100 people costs the same amount as sending different messages 100 times. Small communication devices like mobile phones usually allow only small number of e-mail addresses in the Cc: section. Forth, each member of the group cannot join or leave the group at his will, since the names are specified by the sender. Even when a member of the group wants to leave the group temporarily, he may not be able to do so, since he has to tell his intention to all the other members of the list. In this way, it is difficult to manage a discussion group only by using one-to-one communication media.

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To support group communication using existing e-mail frameworks, "mailing lists"(MLs) have been used for a long time. A mailing list is a single e-mail account which represents a set of e-mail addresses. When an e-mail message is sent to the address of a mailing list, the message is forwarded to all the addresses which are registered as the members of the mailing list. If you make a mailing list for a group, you don't have to send messages to all the members, but you only have to send a single message to the mailing list address. A member of a mailing list can add him to the list or remove him from the list individually. Using a mailing list, all the above-mentioned problems of one-to-one communication are solved.

However, mailing lists are not as widely used as they should be, because of the following reasons. First, creating and maintaining a mailing list is not an easy task, although systems like Majordomo[3] and Mailman[2] are available for handling mailing lists. To make a mailing list, mail transfer agents (MTAs) such as sendmail, qmail, Postfix should do the message distribution task. MTAs are responsible for one of the most important and essential part of computer networks, and they are usually strictly controlled by system managers and changing the behavior of MTAs should be very carefully done. Second, controlling the membership is usually not easy for casual users. Since users frequently want to invite other people or want to change their membership status, many mailing-list support systems provide special commands for performing these operations. Those administration commands are usually difficult for users to remember, and people frequently issue wrong commands which are eventually distributed to all the members of the mailing list.

To handle mailing-lists more easily, various services for mailing-list management are available on the Web. For example, Yahoo! Groups[9] provides various groupware services including mailing list management. Using such services, people can make their own mailing list and register the members easily using Web browsers. Although these systems are useful in many cases, this is not the best solution, because users have to access the Web for creating and maintaining a mailing list account using a browser. Mail-only communication devices cannot be used for creating and managing mailing lists. Since all the messages are handled by an e-mail client software or a communication device, they should be used for all the mailing list management tasks.

If a simpler and more powerful system or service for mailing list management is available, mailing lists can be much more widely used for communication among people. In this paper, we propose a simple and powerful mailing list service called QuickML, which supports easy and dynamic handling of mailing lists only by sending e-mail messages. QuickML is not only useful for creating mailing list freely, but also useful as the basis for the environment where people and various information appliances spontaneously form task groups and communicate with each other.

2. QUICKML

QuickML is a mailing list management system which supports quick creation and easy management of mailing lists. In this section, we show how a new mailing list is created, and how message distribution and member management can be performed using QuickML.

2.1 Mailing List Management

Creating a New Mailing List

A user can create a new mailing list simply by sending an e-mail message to the mailing list address he wants to create. In the exam-

ple shown below, Alice (alice@example.com) can create a new mailing list "party@quickml.com" for the party announcement, making Bob (bob@example.com) as a member of the mailing list. Just by sending this e-mail message, a new mailing list account "party@quickml.com" is created automatically.

```

Subject: Party tonight!
To: party@quickml.com           ← Address of the new ML
From: alice@example.com        ← Creator of the ML
Cc: bob@example.com           ← Other new members

I just created a mailing list
for our party tonight.
- Alice

```

If someone else is using "party@quickml.com" already, an error message is sent back to Alice, saying that the address is not available. In that case, Alice can use a name with subdomain such as "party@alice.quickml.com" to avoid conflicts.

Sending a Message to the Mailing List

If a member sends a message to the newly created mailing list address, the message is sent to all the members. The following message is delivered to both Alice and Bob.

```

Subject: [party:1] Re: Party tonight!
To: party@quickml.com           ← Address of the ML
From: bob@example.com           ← Member's address

What shall we bring today?
- Bob

```

Adding a New Member

If a new user is listed in the Cc: section, he will be added to the mailing list.

```

Subject: Adding Chris
To: party@quickml.com           ← Address of the ML
From: alice@example.com        ← Member's address
Cc: chris@example.com         ← Address of a new member

Chris will join us.
- Alice

```

Joining a Mailing List

A new user can join an existing mailing list by specifying one of the members of the mailing list in the Cc: section of the message.

```

Subject: Let me join
To: party@quickml.com           ← Address of the ML
From: eve@example.com          ← A person who wants to join
Cc: bob@example.com           ← Member's address

I want to join you!
- Eve

```

Unsubscribe

A member can leave the mailing list by sending an empty message to the list.

```
Subject: Bye!
To: party@quickml.com           ← Address of the ML
From: bob@example.com           ← Member's address
                                ← (Empty message)
```

Removing a Member

To remove a member from a mailing list, any member can send an empty message to the mailing list with the member to be deleted in the Cc: section.

```
Subject: Remove
To: party@quickml.com           ← Address of the ML
From: alice@example.com         ← Member's address
Cc: spam@spam.com              ← Address to remove
                                ← (Empty message)
```

Returning to a Mailing List

An old member can join the mailing list again after leaving the list, just by sending a message to the list again.

```
Subject: I'm back!
To: party@quickml.com           ← Address of the ML
From: bob@example.com           ← Member's address

I'm back again!
- Bob
```

Deleting a Mailing List

A mailing list is automatically deleted when all the members have left the list or no message is posted for more than one month.

2.2 Advantages of QuickML

Using QuickML, creation and administration of a mailing list is quite easy. While users of existing Web-based mailing list services like Yahoo! Groups usually send a greeting message to the members after creating a new mailing list on the Web, users of QuickML can send a greeting message to the members and create a mailing list at the same time, without any extra work. Users can create a new mailing list and control the account of the mailing list just by sending e-mail messages. Mobile-phone users can easily create mailing lists and use them for trivial topics. Users can join and leave the mailing list freely by sending simple e-mail messages, without remembering many administration commands.

A user can reply to an e-mail message and create a new mailing list at the same time. When a user receives an e-mail message on a new topic and thinks that the topic should be discussed among a group of people, he can create a new mailing list by replying to the message with a new ML name in the "To:" section and the members' addresses in the "Cc:" section. This is much easier than using Web-based ML services, where the user has to invoke a Web browser, go to the service page, register the name of the new mailing list, and specify the addresses of the members. While it

is usually easy to add existing e-mail addresses to the "Cc:" section using an e-mail client, such a feature is not supported by Web browsers and the users may have to copy the addresses from his address book to the text input area of the Web page.

It is worth noting that there is no administrator in a QuickML-based mailing list. All the members of the mailing list can perform the same operations like adding and deleting members. In many systems, a person who created a mailing list has to take care of the list forever until he closes the list explicitly. Using QuickML, a person who created the list can freely leave the list, making other members take care of it. If nobody takes care of the list for more than one month, the list will be automatically deleted and no extra action should be taken by anybody.

3. IMPLEMENTATIONS

A QuickML server¹ runs as a SMTP (Simple Mail Transfer Protocol)[5] server, and it accepts all the requests defined in SMTP. To make the QuickML server simple, it does not perform various MTA jobs including delivering messages and handling errors, but it delegates most of these tasks to existing MTAs like `sendmail` and `Postfix`. When a QuickML server receives a message, it first checks if the message requests administrative tasks like creating a new mailing list, and performs the task according to the request. Then it delegates all the mail transfer tasks to an existing MTA.

Automatic Error Mail Handling

Existing mailing list managers like `Majordomo` and `Mailman` report all the errors to the administrator, and he has to receive many error messages every day. Since the format of the error messages is not standardized, the administrator has to read the error messages and take appropriate actions. For example, he has to distinguish a temporarily unreachable message from a message sent to a wrong address. To eliminate these chores, QuickML server automatically processes error messages to remove unreachable mail addresses from mailing lists.

We implemented the automatic error mail handling mechanism by using XVERP[1] extension of `Postfix`[8] mail server. QuickML server automatically removes a mail address from a mailing list when it receives error messages five times from the same address. Since the XVERP extension adds a unique ID to "Return-Path:" field of each mail message, a returned mail can be easily identified.

Automatic Subdomain Handling

One of the most effective features of QuickML server is automatic subdomain handling. Anyone can create a mailing list with arbitrary subdomain name. QuickML server employs DNS's wildcard MX mechanism[7] to gather all incoming mails to any subdomains into a host where QuickML server is running. The following snippet illustrates a sample configuration of a BIND name server to run QuickML server at `qml.example.com` (192.168.0.1) accepting all incoming mails to any subdomains of `example.com`.

```
$ORIGIN example.com.
@      IN  MX  10  qml
*      IN  MX  10  qml
qml    IN  A    192.168.0.1
      IN  MX  10  qml
```

4. EXPERIENCES

¹QuickML server is written in an object-oriented script language Ruby. The source code is available at <http://quickml.com/quickml/>.

QuickML has been open to the public² since the end of 2001, and about 55,000 people are using the system at the end of May 2003. We observed several interesting usage patterns of QuickML.

- Many people requested us for special administration capabilities, such as distinction between administrators and other members, before they actually tried the system. We did not want to make the system complicated, and refused to add these features. Several months after the introduction of QuickML, we receive less requests for additional features, maybe because people understood that such distinctions are rarely needed for casual group communications.
- We have seen “power users” creating a number of mailing lists. People were not used to creating mailing lists very often, but since QuickML-based mailing list is so easy to make, some people seem to make new mailing lists whenever the topic of their discussion has changed. In this sense, the name of the mailing list can work like the subject of e-mail messages.
- One of the authors created about 315 mailing lists in 9 months, and the other created 147 mailing lists. The first author receives about 100 e-mail messages every day, and about 31% of the messages are delivered from QuickML.
- Many people are worried about the privacy and security issues of the system. Since the running code of QuickML is open to the public, users can tell what is actually happening on the QuickML server and know the privacy levels.

Since a non-member cannot send messages to the list, it is difficult to send “SPAM” messages. If someone joins the mailing list for sending SPAM messages, it is possible for all the members but the SPAM sender to get rid of the mailing list and create a new one.

- Many users prefer using subdomain names for the lists. Contrary to our expectation, nobody has tried to make a simple ML name like “a@quickml.com”, etc., maybe to save time for handling ML name collision.
- About 45% of the users are using QuickML from their mobile phones. The authors and colleagues are using QuickML from their mobile phones for exchanging information while attending a conference, meeting at an unfamiliar place, etc.

5. STATISTICAL OBSERVATIONS

We observed various interesting characteristics of the usage of mailing lists from the statistical data retrieved from the server log data, which keeps the timestamps of mailing list activities.

5.1 Growth of QuickML Users

Figure 2 shows the number of QuickML users since November 2001, when QuickML was announced to the public. Although we have not been advertising QuickML very much, the number of users is constantly growing, maybe because users of QuickML can easily invite other users and let them know about the service.

5.2 Number of Posted Messages

Figure 3 shows the total number of messages sent via QuickML. The upper graph shows the total number of messages since November 2001, and the lower graph shows the total number of messages

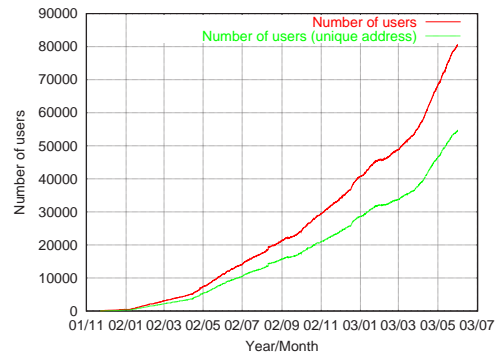


Figure 2: Growth of QuickML users.

between May 25th and May 31st, 2003. Currently, almost all the users of QuickML are Japanese people living in the same time zone, and we can observe that they send more messages in the evening than in the morning.

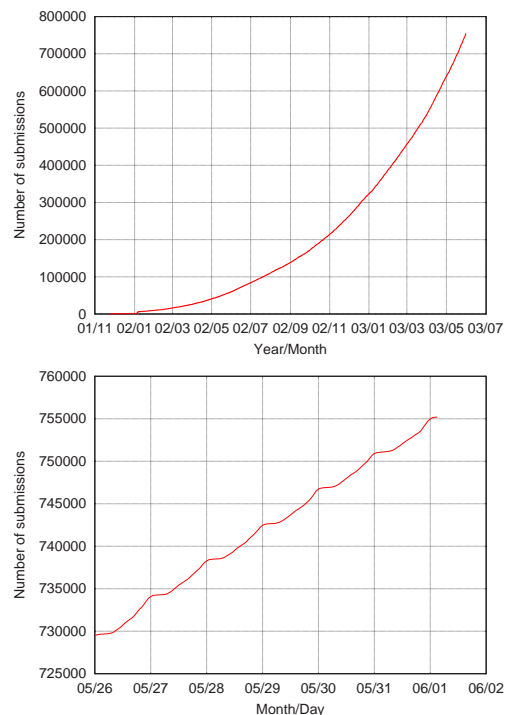


Figure 3: Number of posted messages.

Figure 4 shows the number of existing mailing lists and disappeared mailing lists. We can see that many mailing lists are created every day, and almost the same number of mailing lists are disappearing, after finishing its role.

Figure 5 shows the correlation between the size of mailing lists and their lifetime. The “lifetime” of a mailing list means the time period between the first message and the last message sent to the mailing list, and it can be very small if the mailing list is used only temporarily. We can see that mailing lists with many members tend to live longer than small mailing lists.

²<http://quickml.com/>

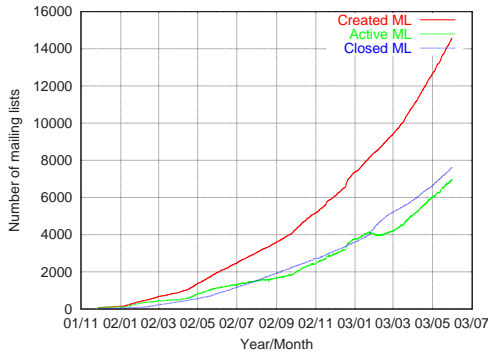


Figure 4: Number of mailing lists.

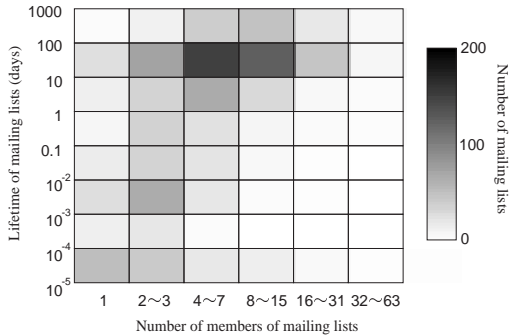


Figure 5: Correlation between ML size and ML lifetime.

5.3 Number of ML Members

Figure 6 shows the distribution of the numbers of members in the mailing lists. We can see that mailing lists with 4 to 7 members are most common, and the distribution almost obeys the logarithmic normal distribution function shown by the dotted line. (Many of the mailing lists with only one member seems to be created for test or by mistake.)

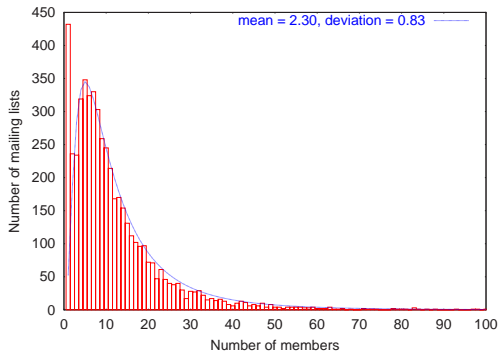


Figure 6: Distribution of ML sizes.

5.4 Lifetime of Mailing Lists

Figure 7 shows the distribution of the lifetime of mailing lists. We can clearly tell that most of the QuickML mailing lists are short-lived and disappear after the default limit lifetime of one month.

Figure 8 shows the log plot of the same data. The graph obeys the exponential distribution, and we can infer that the extinction rate of the mailing lists is always almost constant.

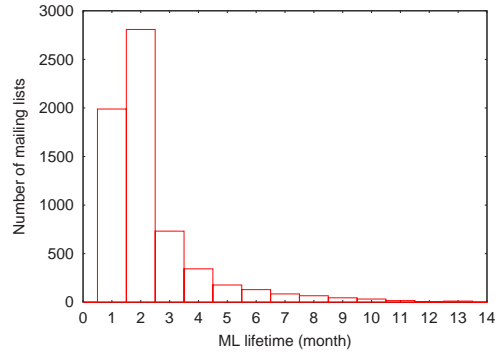


Figure 7: Mailing list lifetime.

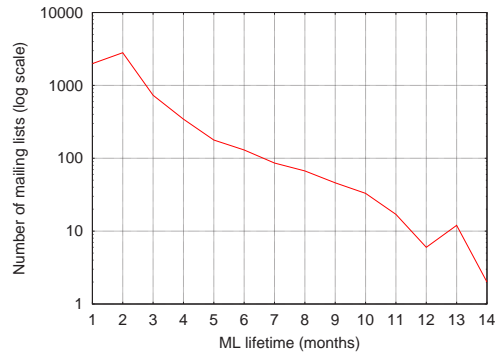


Figure 8: Mailing list lifetime (log plot).

6. RELATED SYSTEMS

On the Web, there are many services which support group communications. Yahoo! Groups[9] is one of the largest services which support various groupware features including mailing list management. Although these services have many features and useful, it is not convenient enough for exchanging information for today's party, where members can change dynamically. QuickML supports such temporary and casual group communication for e-mail users.

Recently, Wiki Wiki Web[6] (Wiki for short) is getting popular for casual communication on the Web. Users of Wiki can make a new Web page at any time, and any user can freely edit the page. Wiki is quite different from QuickML because it is a browser-based system and the discussions are open to all the people on the Internet, but it resembles QuickML in that any user can easily create a new Web page with a unique title, and use the place for group communication.

Dey et al. are proposing a toolkit for constructing context-aware applications[4], and they created a location-based mailing list system using the toolkit, where e-mail messages are sent to the subscribers who are currently in the building. Location-based casual communication would be very important in the ubiquitous computing environment, and we are thinking about using location information with QuickML.

7. USING AGENTS WITH QUICKML

If you add a computer program as a member of a mailing list, you can use that program as an agent for performing a special task. For example, by adding an “archiver agent” as one of the members of a mailing list and making it store all the messages sent to the list, you can easily archive the ML messages, and you may be able to ask it to search for the old articles. You can add a “reminder agent” to the list and ask it to send messages occasionally. In this way, you can add arbitrary message agent to the mailing list to make the group communication effective. Figure 9 shows a Web page automatically created by a mail archiver agent, which is added to the authors’ mailing list for the discussion on our paper submission. Mailing list articles are automatically converted to HTML and messages can be viewed from a Web browser.

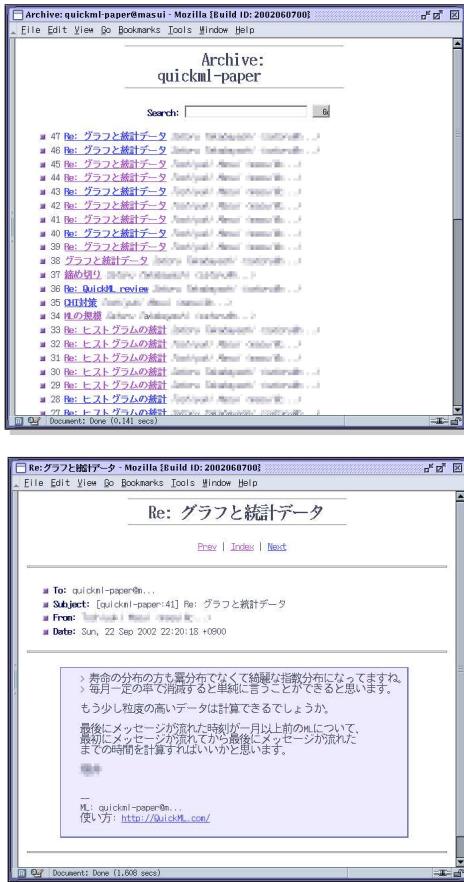


Figure 9: Web pages created by the mail archiver.

You can also add various information appliances as the members of a mailing list and make them cooperatively work for special tasks. For example, you can make a mailing list for recording TV programs on football. You can make a mailing list “football-tv”, and add yourself, a TV tuner, a VCR, and an agent for checking TV program information on the net. When the TV program checking agent finds a football program, it sends a message to you and other information appliances, and they work together to record the program at the right time. All the exchanged messages are also delivered to you, so you know what is happening, and you can change the behavior of the information appliances if you like.

In this way, various hardware, software and users can cooper-

atively work together by dynamically creating message-exchange groups. The communication can be based on protocols other than SMTP and real e-mail messages, but communication between agents, information appliances, and users using readable texts is a good candidate for general-purpose communication in the age of ubiquitous computing.

8. CONCLUSIONS

We proposed a simple and powerful mailing list service system called QuickML for creating and managing mailing lists only using e-mail messages. Tens of thousands of users are now exchanging messages using QuickML, and the number of users is constantly growing. People now create and use mailing lists for various group communication purposes, where they never thought of using mailing lists before the introduction of QuickML. A variety of message agents can be added to a mailing list to perform various tasks, and we believe that QuickML can be one of the major communication medium in the age of ubiquitous computing. We hope readers try and enjoy QuickML by sending an e-mail message to QuickML.com and making your own mailing list.

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