

*P-Mail - Private Email and  
Instant Messaging with  
Intelligent Software Agents*

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# *P-Mail - Private Email and Instant Messaging with Intelligent Software Agents*

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## ***Introduction***

This paper describes P-Mail, a Private Email system developed by Reticular Systems, Inc. P-Mail is a messaging system designed to ensure that email messages remain private. Privacy is assured because email never resides on any server device. P-Mail is a peer-to-peer messaging service. The message moves from the sending machine to the receiving machine and is never stored on any intermediate machine.

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## ***Motivation***

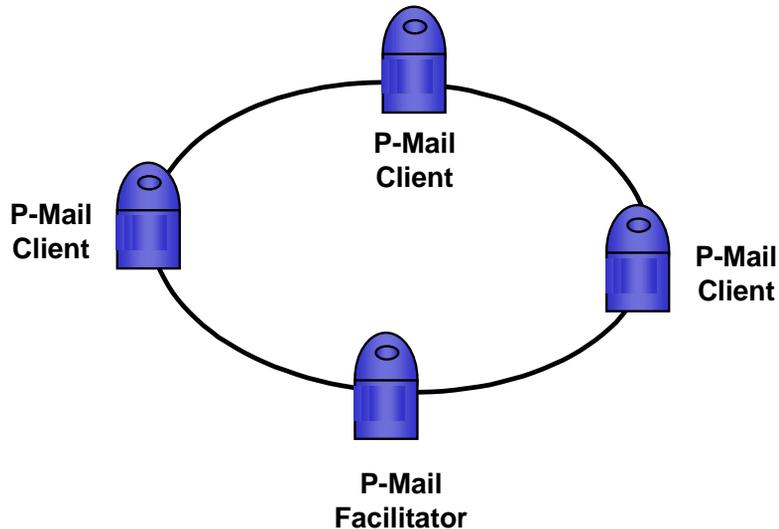
P-Mail was developed to demonstrate the use of Reticular Systems, Inc. Agent-Builder agent construction toolset. P-Mail also served as a research vehicle for developing advanced facilitator agent design concepts.

Many organizations have encountered legal problems because of email. Email users wrongfully assume that email is private and that if it is removed from the sending machine and the receiving machine that it no longer exists. However, many users (from Ollie North to Bill Gates) have discovered that this is not true. Most modern email systems utilize SMTP and POP mail servers. The email often actually resides on the server rather than on a client machine. These servers are usually backed up on a periodic basis. As a result, an email message is likely to be stored on the server machine, backed up to tape and exist for an indefinite period of time.

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### *System Description*

P-Mail provides true privacy in an Email system. Each P-Mail client is actually an intelligent software agent. An agent can communicate with any other agent that it knows about and that will accept its messages. Messages exist only on the sending and receiving machines and are never stored in a server. P-Mail uses TCP/IP and can work on any machine that supports TCP/IP. P-Mail can work with static IP addresses or DHCP. Figure 1 shows a simple P-Mail implementation.



**Figure 1. The P-Mail Concept**

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A facilitator agent is provided to manage communications between agent. A facilitator can be viewed as providing agent name service and access control. The facilitator never receives the contents of an email message. A facilitator merely determines which agents in a collection of agents are allowed to communicate with each other.

P-Mail provides a number of additional benefits in addition to privacy and security. These include elimination of SPAM and real-time email status display.

P-Mail operates in the following manner. When a P-Mail client agent comes online it registers with the facilitator agent at a public address that is known to all agents. Likewise, when a client agent goes offline, it also communicates with the facilitator and unregisters itself.

When a user (lets call him Ollie) desires to send P-Mail to another recipient of P-Mail (we'll call him Bill), Ollie's P-Mail agent checks with the facilitator to see if Bill is willing to communicate with Bill. Each agent maintains an *associates* list of all other agents that it is willing to exchange email with. If the agent is not on the associates list of the intended recipient, the agent queries the facilitator for the intended recipients communication address information. It can then send the recipient a message informing it that some new email client desires to communicate with it. In this case, Bill will receive a message that Ollie wants to communicate with him. Bill can refuse the message, agree to accept a single message from Ollie or add Ollie to his associates list.

After Ollie is added to Bill's associate list, Ollie's agent sends the email to Bill's agent. Ollie and Bill can now exchange private email messages. Note that this technique ensures that Bill never receives SPAM. No one can send Bill a message unless he first agrees to accept it.

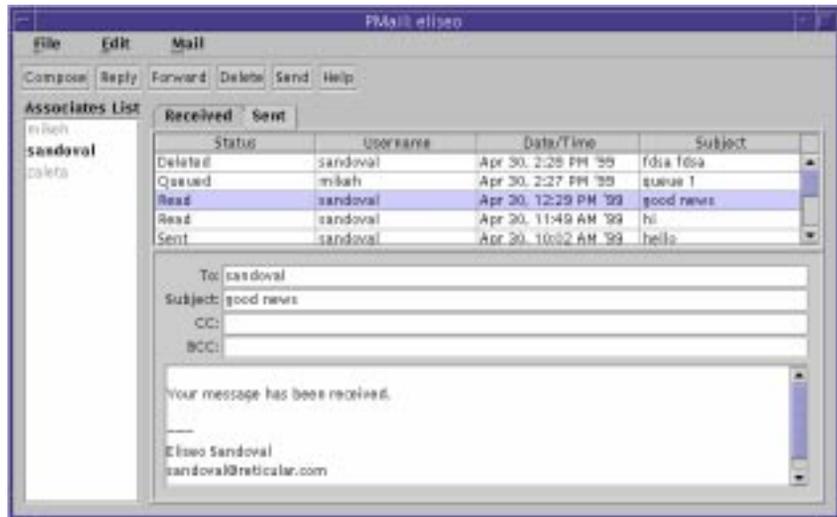
The P-Mail clients on both sending and receiving machines can display status of the P-mail messages. Status indicators are provided to tell the P-Mail sender when the mail is actually sent, whether the recipient has read it and the disposition of the email message (deleted, forwarded or saved). Thus the email sender has visibility of what the receiver is doing with his P-Mail communication.

## *The Concept Demonstration*

Reticular Systems, Inc. constructed a rapid prototype demonstration of the P-Mail system. This prototype includes a number of P-Mail clients and a facilitator. Note that the primary purpose of the prototype is to illustrate the use of AgentBuilder tools for intelligent software agent construction. The P-Mail system is not meant to be a fully function mail or instant messaging system. However, the basic system does provide a departure point for future agent-based peer-to-peer message systems designs.

### **Sending P-Mail**

The basic P-Mail Control Panel is shown in Figure 2. This figure illustrates the basic operation of P-Mail. The panel is divided into three major segments. These are the associates list, the mail status display, and the mail composition/viewing area.



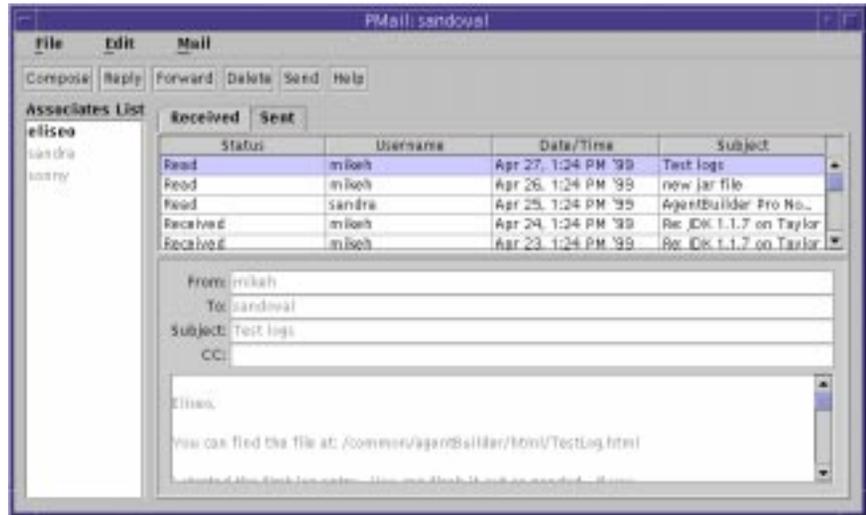
**Figure 2. The P-Mail Send Control Panel**

The associates list provides a display of all P-Mail clients that are on the user's associate list. A client that is not currently on line is grayed out in the list.

A tabbed panel allows the user to select either the Send or Receive panels for display. The Send panel is used to compose new messages and displays the status of messages already sent.

### Receiving P-Mail

The P-Mail tabbed panel used for displaying received P-Mail is shown in Figure 3. The user can reply to the mail, delete it, or forward it using controls on this panel.



**Figure 3. The P-Mail Receive Control Panel**

When a P-Mail user who is not on the client's recipient list tries to send mail to the client, the dialog box shown in Figure 4 is displayed. This gives the user an opportunity to refuse the message, communicate one time with the P-Mail sender, or add the sender to the associates list.

### The Facilitator

The P-Mail facilitator provides name service and access control services to the P-Mail clients. The control panel for the facilitator in the demonstration system is shown in Figure 5.



Figure 4. Communicating with an Unknown P-Mail Client

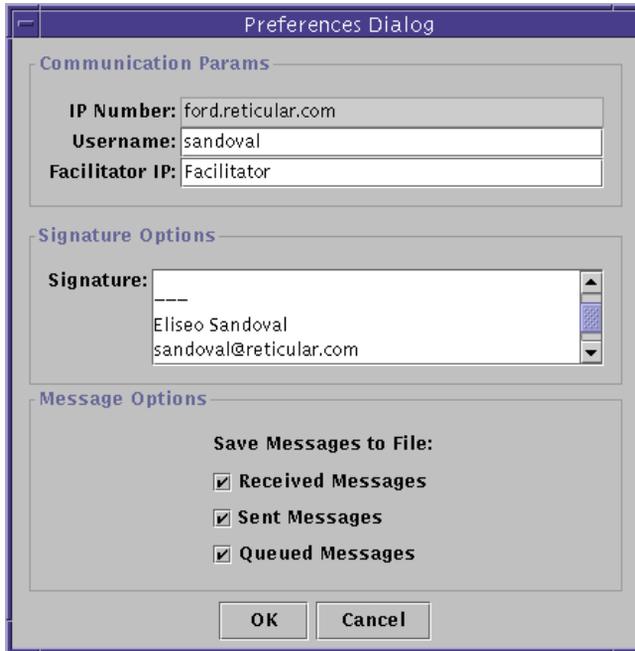


Figure 5. The Facilitator Agent Control Panel

This control panel displays a directory of agents known to the facilitator. In addition, it provides an indication of the advertisements and subscriptions for each of the P-Mail clients.

### Setting User Preferences

A Preference Control Panel is provided to control setup and use of the P-Mail agents, facilitator and system. This panel is used to set up communications parameters such as IP number, user name, facilitator IP address, etc. The user's signature block is also maintained here. The user can choose to not save any messages, thereby making his P-mail messages completely private. The Preferences Control Panel is shown in Figure 6 .



**Figure 6. The P-Mail Preference Control Panel**

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### *Future Work*

There are a number of areas for additional research and development planned for P-Mail. Some of these include:

- Facilitator Enhancement - additional capabilities in the facilitator to handle large populations of clients (thousands of users)
- Authentication - use of digital signatures to verify a client agent
- Encryption - encryption of message contents
- Interface to Existing Email - integrating P-Mail with traditional POP mail services
- Integration with existing directory services