

# Have You Checked Your Mail Today?

*by Kathy Zuzeck, IBM TPF New Business Development, Laura Underhill, IBM TPF ID Core Team, and Gary Fisher, IBM TPF Development*

**T**hrough snow, sleet, or dead of night ... the mail must go through! Mail has been written and sent by numerous methods over the years. The type of mail and the method of delivery continues to change as technologies advance. Today, Internet mail, also known as electronic mail (e-mail), is widely regarded as one of the most prolific uses of the Internet. Mail is an important Internet service, and the reliability and availability of the servers that store, send, and receive Internet mail is critical to providing a dependable mail service.

TPF Internet mail server support takes advantage of the high-performance, availability, and reliability characteristics of the TPF system to provide a high-volume, high-speed mail server that can scale up to handle very large numbers of users and mail items. The TPF Internet mail servers can reduce the cost of ownership of a large Internet mail service with a single-image system, simplifying system management and operations.

TPF is a proven system and is ideal to meet the demands of Internet mail. The robustness and architecture of the TPF system provide a solid foundation for TPF Internet mail server support and allow for a design point of up to 250 million mailboxes.

This is an Internet mail server designed and intended for high-end, heavy-duty daily usage. The TPF Internet mail server is positioned to be the backbone or relay for a large mail-serving operation. For example, you can use TPF Internet mail server support for the following:

- To manage mail between your enterprise and your employees, or your enterprise and your business partners
- As a means for your TPF applications to send and receive information that can be read by off-the-shelf products
- As a means for your TPF applications to directly access mailboxes en masse, which makes broadcasting information easy.

More specifically, you can:

- Send direct customer notifications, such as airline schedule changes, hotel room upgrades, credit card security warnings, fare base changes, and so on
- Set up business-to-business messaging, such as host-to-host traffic, AVS messages (airline advisory messages), and queue-placed passenger name records (PNRs)
- Enhance enterprise resource planning (ERP) functions, such as enabling e-mail for crew bidding and crew scheduling
- Open new channels to customers by using a push model (that is, publish and subscribe)
- Create a push model architecture for your enterprise to effectively share information stored on the TPF system.

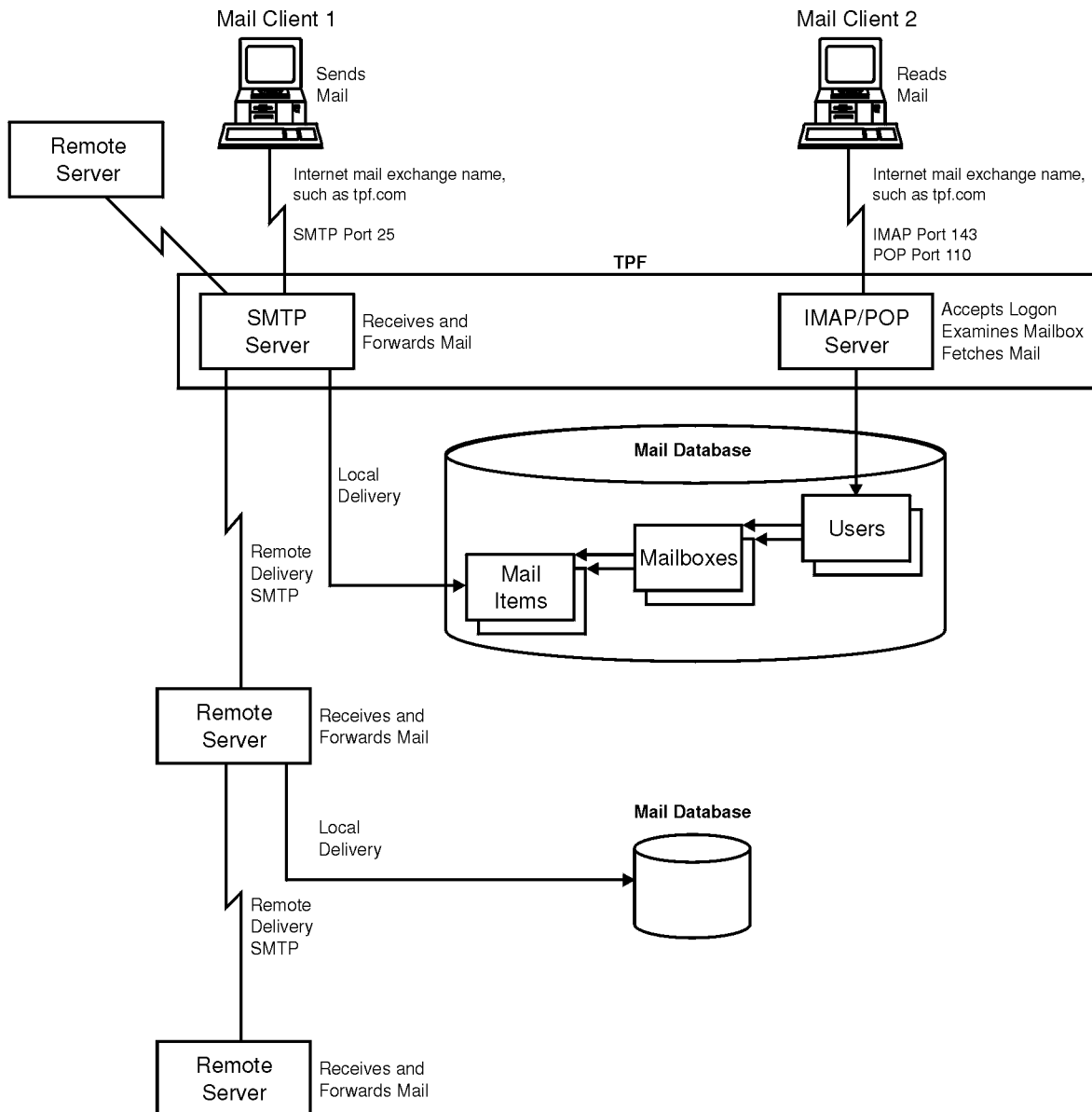
## **What Is It and How Does It Work?**

TPF Internet mail server support provides a set of servers that implement the standard Internet mail protocols on the TPF system. Users, or mail clients, interact with the TPF Internet mail servers to send and retrieve Internet mail (e-mail). The TPF system supports the following standard Internet protocols:

- Simple Mail Transfer Protocol (SMTP)
- Internet Message Access Protocol (IMAP) Version 4
- Post Office Protocol (POP) Version 3

SMTP describes how mail messages are delivered from one computer user to another. IMAP and POP describe how mail messages that are received on a computer (that is, a mail server) are retrieved by a mail client (usually another computer, such as a PC). In other words, SMTP handles the Internet mail being sent to a server, and POP and IMAP handle the retrieval of Internet mail from the server.

The following figure shows the interrelationships of the actions and protocols that are involved when sending and receiving Internet mail on the TPF system.



When sending mail to another user, the mail client (Mail Client 1 in the figure) must use SMTP to put mail in the Internet mail system. Typically, the mail client uses a mail server client program such as Microsoft Outlook, Netscape, or other client program. This mail server client program connects to the SMTP server on well-known port 25 and sends the mail. On the TPF system, the SMTP server is based on Secure Mailer (also known as Postfix).

Once the SMTP server stores the mail, the server indicates to Mail Client 1 that it has received mail so that the client can disconnect or send more mail. The

SMTP server must determine if this mail is destined for a user on the local domain (where the SMTP server is running) or for a user on a remote domain. If the user is on the local domain, the SMTP server calls the local delivery function. If the mail is for a user on a remote domain, the SMTP server becomes an SMTP client and attempts to contact the server for that domain to transfer the mail item and delete it from local storage.

At some point the receiving mail client (Mail Client 2 in the figure) attempts to check the mail. Similarly to Mail Client 1 with SMTP, Mail Client 2 uses a mail server client program that connects to the IMAP server on well-known port 143, or to the POP server on well-known port 110, and retrieves the mail. On the TPF system, the IMAP and POP servers are based on the Cyrus project.

POP and IMAP differ in that POP retrieves a mail item, sends the mail to the user and, optionally, deletes the copy from the mail server to free the resources of the server. IMAP allows the client to keep the mail in mailboxes on the server and provides operations for creating, deleting, and renaming mailboxes, as well as other mail and mailbox management functions.

### What Did We Do?

We took the UNIX version of the best mail server products and ported them to the TPF system; we then enhanced aspects of these mail server products to take advantage of the strengths of TPF. These strengths allow more processor resources to perform work rather than giving more resources to the operating system to manage work. For example, TPF Internet mail server support:

- Reduces I/O overhead by using the TPF find and file access method instead of a hierarchical file system (HFS)
- Starts work only when needed by using the TPF create macros instead of having multiple daemons run continuously and wait for work
- Starts work only when needed by using the activate on receipt (AOR) process instead of having users connect, wait, and potentially swap out while waiting for data
- Reduces queuing overhead by grouping mail for delivery; that is, instead of delivering each individual message one at a time (which increases the system overhead significantly), mail items are queued and delivered in groups.

All of these enhancements for the TPF-based mail server were made for scalable performance, allowing for linear growth and the ability to handle very large volumes of mail at one time. That's not all. Other enhancements include:

- Support for multiple domains in a single server
- The ability of a TPF processor to seamlessly take over mail from a failing TPF processor
- Throttles that allow you to limit the number of entry control blocks (ECBs) that process queues, set how often to retry deferred mail, and set how long to store the mail before sending a notification and deleting the deferred mail
- An access list, common for Internet mail servers, which allows you to accept or reject mail from specific sites or users
- Quick access to user profiles, mailboxes, and mail items by using an indexed hashing technique that has very little I/O overhead.

There are also functional messages that allow you to perform various administrative tasks, such as creating a user account, creating or deleting mailboxes, setting storage limits for mailboxes, managing access control for mailboxes, and so on.

TPF Internet mail server support is designed for the most demanding Internet mail environments, providing a scalable architecture that is capable of handling a quarter of a billion users in a single TPF processor complex. TPF Internet mail server support provides a cost-effective backend or commercial mail serving solution as well as allowing TPF applications to readily participate in Internet mail. As we watch Internet mail volumes continue to rise, the reliability and scalability of the TPF Internet mail server will be recognized strengths in a world that becomes more and more dependent on Internet mail.

For more information about TPF Internet mail server support, send an e-mail (!) to [tpfinfo@us.ibm.com](mailto:tpfinfo@us.ibm.com).

For more information about Postfix (Secure Mailer), go to: <http://www.postfix.org>.

For more information about the Cyrus project, go to: <http://www.cmu.edu/computing/cyrus>.

---

*IBM is a registered trademark of International Business Machines Corporation. Microsoft and Outlook are trademarks of Microsoft Corporation in the United States, other countries, or both. Netscape and Netscape Navigator are registered trademarks of Netscape Communications Corporation in the United States and other countries. UNIX is a registered trademark of The Open Group in the United States and other countries. Other company, product, and service names may be trademarks or service marks of others.*