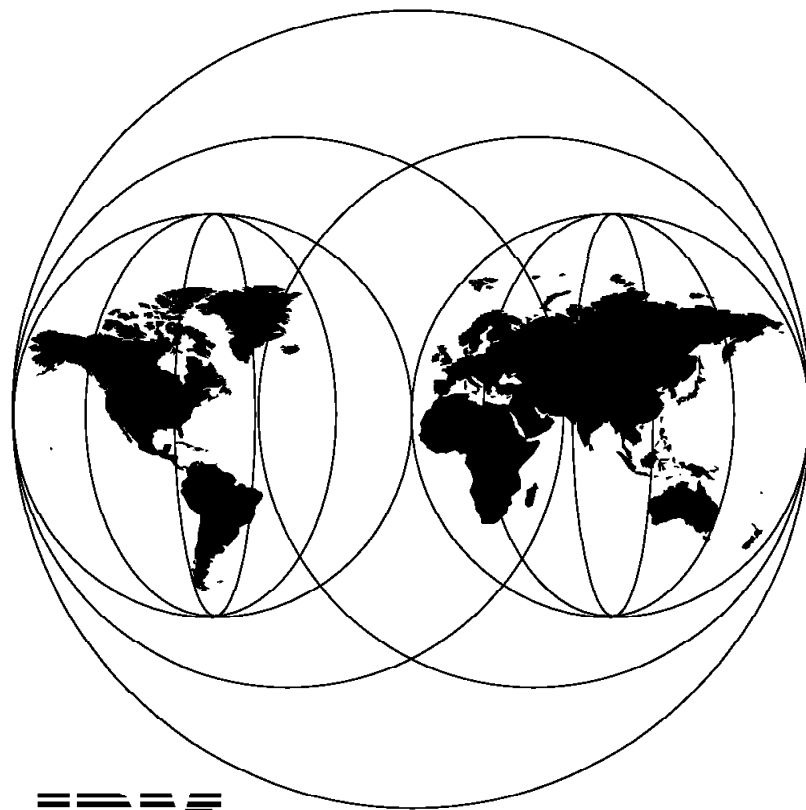# AS/400 Electronic-Mail Capabilities

January 1998

IBM

International Technical Support Organization

Rochester Center

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AS/400 Electronic-Mail Capabilities

January 1998

┌─ **Take Note!** ──┐

Before using this information and the product it supports, be sure to read the general information in Appendix D, "Special Notices" on page 211.

└───┘

First Edition (January 1998)

This edition applies to Version 3 Release 2 of OS/400 (5763-SS1) or Version 3 Release 7 of OS/400 (5716-SS1) or Version 4 Release 1 of OS/400 (5769-SS1)

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Contents

Preface

This redbook describes the Electronic Mail (E-Mail) capabilities of the AS/400 system having OS/400 Version 3 Release 2, OS/400 Version 3 Release 7, or OS/400 Version 4 Release 1 installed. Although it is not possible to describe every mail client or every connectivity environment, the intent of this manual is to provide information on the most common mail clients that can connect to the AS/400 system.

In addition, this manual provides an overview of the electronic mail environment, an introduction to TCP/IP and the SMTP protocol, considerations when connecting to the Internet, e-mail tips, and general problem solving considerations.

This redbook was written for AS/400 administrators, OfficeVision/400 administrators, or anyone responsible for exchanging e-mail between any of the POP3 clients or Client Access/400 based MAPI clients connected to an AS/400 system.

Several practical examples are presented to demonstrate the necessary configuration tasks.

Some knowledge of OS/400, Internet Mail (SMTP), and OfficeVision/400 as well as TCP/IP communication is assumed. The manual is designed to discuss many of the concepts necessary to understand how the AS/400 system inter-operates with e-mail clients. It is not intended to provide detailed information on specific tasks associated with installing, configuring, and managing specific e-mail clients. It does, however, reference other publications that contain detailed information on how to install, configure, and manage specific e-mail clients in an AS/400 environment.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization Rochester Center.

Wilfried Blankertz is an Advisory International Technical Support Specialist for the AS/400 system at the International Technical Support Organization, Rochester Center. He writes extensively and teaches IBM classes worldwide on all areas of AS/400 Groupware solutions and AS/400 Systems Management. Before joining the ITSO in 1995, he worked as a systems engineer in IBM Germany supporting customers with the AS/400 system and its predecessor systems (IBM System /3, /32, /34, /36, and /38) for over 20 years.

Gerhard Faller is an OV/400 and AS/400 printing support specialist working for the AS/400 service and support center at IBM Germany. He also now supports Lotus Notes and the SMTP MTA on the Integrated PC Server. He has supported customers on the AS/400 system and the predecessor systems (System /36 /38) for the last 10 years.

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Bob Simmons is a Senior OSS/Software Analyst in the IBM Lotus Integration Center in Dallas, TX. He has extensive background and experience on the AS/400 system in the areas of OfficeVision/400, Application Development, and OV/400 APIs. He now specializes in OV/400 to Lotus Notes Migration. He has been with IBM for 28 years.

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Thanks to the following people for their invaluable contributions to this project:

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Chapter 1. Today's Mailing Environment

In this chapter, we describe the general techniques and prerequisites of mail transmission and also how to combine different existing mail environments, particularly the connectivity standards that are in common use.

Electronic mail, called e-mail, is information that is sent virtually to and from users of an interconnected network by using a computer with special application software.

Introduction

There are now several AS/400 e-mail implementation options from which to choose. But which one is right for you? In Chapter 3, "Available Mail and Messaging Products for AS/400 Users" on page 45, we provide overviews of each option. Here we discuss some of the basic capabilities that can influence your decision process. All of the e-mail systems do a good job of providing e-mail capabilities. In fact, all of them can exchange mail with each other without any additional software or hardware required. But they do differ in some capabilities that may or may not be important to you:

- Ease of exchanging mail with the Internet
- Initial cost
- Administration cost
- Range of other groupware capabilities (calendar/scheduling, and so on)
- Integration with other applications
- Support for mobile workers
- Advanced features (mail delegation, automatic handling of mail, and so on)
- Client hardware requirements: Non-Programmable Terminal (NPT), Network Station, low-end PC, high-end PC
- Appearance of user interface (for example, "green-screen", that is a non-graphical, character based display or terminal emulation) level of integration with PC desktop

The options are:

- OfficeVision/400 (OV/400)
- Lotus Notes
- The built-in AS/400 POP3 server

OV/400 is a traditional host-based product. It is the only option that supports nonprogrammable terminals (NPTs) (that is, "green-screens"). In addition, it is a good choice for older PCs because they may not perform adequately with Notes or a POP client. Notes and POP clients are typically more likely to be well accepted by heavy PC users because they are built upon the PC desktop model.

Another fundamental difference is in where the mail is stored.

- OfficeVision/400 stores all of its mail on the AS/400 server.

- POP mail systems go to the other extreme in that they store all their mail on the POP client workstation.

- Lotus Notes is flexible. It can store the mail on the server and it can optionally keep a "replicated" copy of the mail on the client workstation.

1

Depending on requirements, users may prefer one or the other. For users who want to view their mail from more than one workstation, having the mail reside on the server is clearly desirable. Users who carry their workstation around with them (for example, laptop computer users) often prefer to have their mail on that workstation so they can work with the mail even when not connected to a network.

System administrators may prefer to keep the mail off the AS/400 server so they do not consume disk space when users receive large mail attachments and do not delete unneeded mail as they should. On the other hand, mail backup can be centralized when it resides on the server.

Internet affinity is important to some users. The POP mail system was developed originally for the Internet and, therefore, has the most Internet affinity. Both Notes and OV/400 use formats and address types different from Internet mail. Notes does, however, permit the definition of Internet e-mail addresses and, starting with the Domino 4.5 server, also includes a POP3 capability.

If in addition to e-mail, calendar and scheduling is a requirement, there are fewer options. POP3 does not include this function (though separate products such as Lotus Organizer can be added to satisfy the requirement). OfficeVision has good calendar and scheduling functions. Starting in Release 4.5, Notes also includes calendar and scheduling functions. If even richer groupware capabilities are needed, Notes is the clear winner.

If low cost is imperative, you cannot beat POP3 because it is part of the base AS/400 operating system. Also, if you have Client Access and Windows clients, you can use the Lotus Mail client (previously called "cc:Mail for the Internet") that comes bundled with Client Access. It has essentially the same user interface as Notes mail so you can easily move to Notes later.

If users require more advanced e-mail features such as mail delegation and automated mail handling, Lotus Notes is again the winner. OV/400, to a lesser degree, also provides some advanced features whereas POP3 has no such features on the server. However, some POP clients such as Lotus Mail do provide workstation-based automated mail handling including facilities to permit easy creation of custom mail handling rules.

From an administrative perspective, Notes requires the highest level of administrator training. POP, because of its limited functionality, probably requires the least amount of administrator involvement. However, POP, in simplicity, has no advanced administrative functions whatsoever so even tasks such as deleting a user are cumbersome.

Chapter 2. Short Introduction to TCP/IP, Internet, and Other Standards

The mail related enhancements in OS/400 during the last few years have one objective in common, which is to support many different mailing standards and office applications. To accomplish this, one solution is to implement all important mail protocols in OS/400 or OfficeVision/400. However, this is a never ending task because of the many existing protocols.

The solution chosen was to select a common protocol that is already implemented by many other mailing applications basically for the same reason (that is, to exchange mail with unlike office applications).

Similar to many other communication applications, the most common standard for mail is based on TCP/IP, the Internet communication standard. Therefore, to understand the contents of the other chapters in this book, some basic understanding of TCP/IP and specially SMTP/MIME. is required.

Many excellent publications have been written on the topic of TCP/IP and the Internet. The aim of this chapter, therefore, is to provide only a short overview for the benefit of those readers who may not be familiar with the topic or who may desire a quick refresh.

Note: The description in this chapter is *not* AS/400 related; for detailed information on the support and configuration in OS/400 Version 3, refer to *OS/400 TCP/IP Configuration and Reference Version 3*, SC41-3420, and for Version 4, the order number of that book has been changed SC41-5420.

For those readers who already know enough about TCP/IP and the Internet in general, but want to refresh the knowledge on SMTP or SMTP/ MIME. we provide more details on these topics in "Simple Mail Transfer Protocol (SMTP)" on page 37 and "Multipurpose Internet Mail Extensions (MIME)" on page 39.

We have included a selection of publications on advanced TCP/IP and Internet topics for your reference in "TCP/IP and Internet Publications" on page 213.

Why TCP/IP?

The need to interconnect networks that use different protocols was recognized early in the 1970s during a period when the use and development of networking technology was increasing. The rapid growth in networking over the past three decades has allowed users much greater access to resources and information as well as causing significant problems when merging, or interconnecting, different types of networks. Open protocols and common applications were required, leading to the development of a protocol suite known as *Transmission Control Protocol/Internet Protocol* (TCP/IP), which originated with the U.S. Department of Defense (DoD) in the mid-1960s and took its current form around 1978.

An interesting article about the history of the Internet can be found at the following URL:

`http://www.isoc.org/internet-history/`

The Growth of TCP/IP

In the early 1980s, TCP/IP became the backbone protocol in multi-vendor networks such as ARPANET, NFSNET, and regional networks. The protocol suite was integrated into the University of California at Berkeley's UNIX operating system and became available to the public for a nominal fee. From this point on, TCP/IP has become widely used due to its inexpensive availability in UNIX and its spread to other operating systems, resulting in increasing use in both local area network (LAN) and wide area network (WAN) environments.

Today, TCP/IP provides the ability for corporations to merge differing physical networks while giving users a common suite of functions. It allows inter-operability between equipment supplied by multiple vendors on multiple platforms, and it provides access to the Internet. In fact, the Internet, which has become the largest computer network in the world, is based on the TCP/IP protocol suite.

The Internet consists of large international, national, and regional backbone networks that allow local and campus networks and individuals access to global resources. Use of the Internet has grown rapidly over the last few years as illustrated in Table 1.

Table 1. Internet Growth			
Date	**Hosts**	**Networks**	**Domains**
July 1989	130,000	650	3,900
July 1992	992,000	6,569	16,300
July 1993	1,776,000	13,767	26,000
July 1995	6,642,000	61,538	120,000
July 1996	12,881,000	134,365	488,000
January 1997	16,146,000	n/a	828,000
Note: The source of these figures can be found at the following URLs:			
`http://info.isoc.org/guest/zakon/Internet/History/HIT.html#Growth` `http://www.nw.com/zone/WWW/dist-bynum.html`			

As opposed to the Internet, the term *intranet* has evolved recently to describe TCP/IP networks that are entirely under the control of a private authority or company. These intranets may or may not have connections to other independent intranets (which are then referred to as *extranets*) or the Internet. They may or may not be fully or partially visible to the outside depending on the implementation.

So why has the use of TCP/IP grown at such a rate? The reasons include the availability of common application functions across differing platforms and the ability to access the Internet, but the primary reason is that of inter-operability. The open standards of TCP/IP allow corporations to interconnect or merge different platforms. An example is the simple case of allowing file transfer capability between an MVS/ESA host and, perhaps, a Hewlett Packard workstation.

TCP/IP also provides for routing multiple protocols from and to diverse networks. For example, a requirement to connect isolated networks using IPX, AppleTalk, and TCP/IP protocols using a single physical connection can be accomplished by using routers utilizing TCP/IP protocols.

One further reason for the growth of TCP/IP is the popularity of the socket programming interface, which is the programming interface between the TCP/IP transport protocol layer and TCP/IP applications. A large number of applications today have been written for the TCP/IP socket interface.

Internet Standards and Request for Comments (RFC)

We mentioned in the previous section that the Internet is a large multinational, multi-vendor, multi-platform network. That might give reason to ask some questions such as:

- Are there any standards for such a diverse network?
- Who establishes and reviews them?
- Who assigns network addresses?
- Who manages the Internet?

The Internet Activities Board (IAB) is the non-profit, coordinating committee for Internet design, engineering, and management. The IAB members are committed to making the Internet function effectively and evolve to meet a large-scale, high-speed future. The IAB sets the Internet standards and manages the Request For Comments (RFC) publication process.

RFC is the mechanism through which the Internet protocol suite has been evolving. For example, an Internet protocol can have one of six states: standard, draft standard, proposed standard, experimental, informational, and historic. In addition, an Internet protocol has one of five statuses: required, recommended, elective, limited use, and not recommended. By communicating using the RFC, new protocols are being designed and implemented by researchers from both academic institutions and commercial corporations. At the same time, some old protocols are being superseded by new ones.

The RFC standards are described in the "Internet Official Protocol Standards" RFC, currently RFC 2000.

The task of coordinating the assignment of values to the parameters of protocols is delegated by the Internet Architecture Board (IAB) to the Internet Assigned Numbers Authority (IANA). These protocol parameters include op-codes, type fields, terminal types, system names, object identifiers, and so on. The "Assigned Numbers" RFC, currently RFC 1700, documents these protocol parameters.

To obtain registered IP addresses (see "IP Addressing" on page 7) and domain names (see "Domain Name System (DNS)" on page 21), you need to contact the Internet Network Information Center (InterNIC), the administrative body for the Internet.

Registration is available online at the NIC Web site using the following URL:

```
http://rs.internic.net/about-rs.html
```

TCP/IP Architecture

TCP/IP, as a set of communications protocols, is based on layers. Unlike SNA or OSI that distinguishes seven layers of communication, there are only four layers in the TCP/IP model. They enable heterogeneous systems to communicate by performing network-related processing such as message routing, network control, error detection, and correction.

The layering model of TCP/IP is shown in Figure 1 with an explanation of each layer following thereafter:

```
┌─────────────────┐        ┌──────────────────────────────────────────────┐
│                 │        │           FTP, Telnet, Rexec, DNS, ...         │
│   Application   │        │         RIP, OSPF, DHCP, BootP, SNMP, ...      │
│                 │        │         SMTP, POP, NFS, X Window, HTTP, ...     │
│                 │        │                                                │
│                 │        │                Sockets, RPC, ...               │
└─────────────────┘        └──────────────────────────────────────────────┘

┌─────────────────┐        ┌──────────────────────────────────────────────┐
│    Transport    │        │                   TCP, UDP                     │
└─────────────────┘        └──────────────────────────────────────────────┘

┌─────────────────┐        ┌──────────────────────────────────────────────┐
│   Internetwork  │        │            IP, ICMP, IGMP, ARP, ...            │
└─────────────────┘        └──────────────────────────────────────────────┘

┌─────────────────┐        ┌──────────────────────────────────────────────┐
│ Network Interface│       │        LAN, X.25, SNA, ATM, FR, Asynch, ...    │
└─────────────────┘        └──────────────────────────────────────────────┘
```
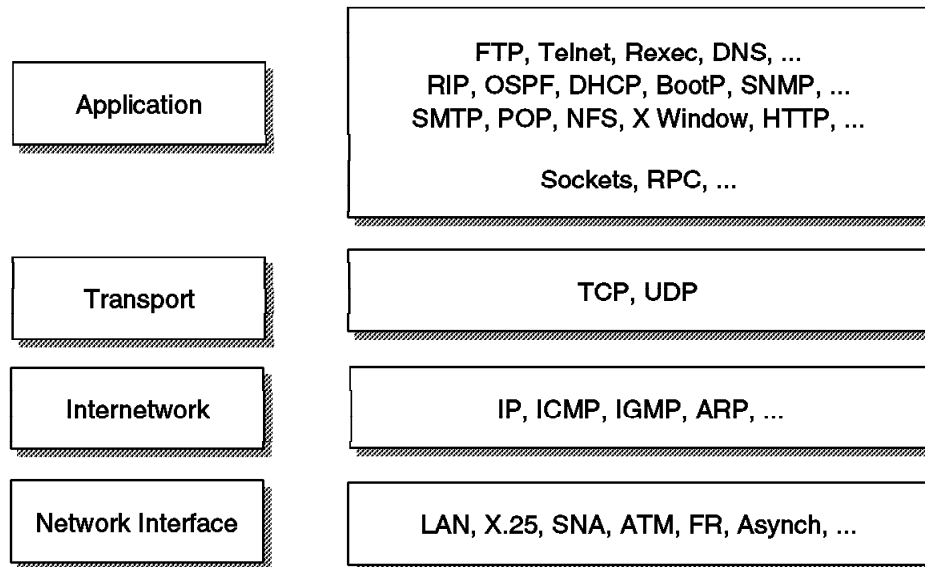
Figure 1. TCP/IP - Architecture Model: Layers and Protocols

Application Layer

> The application layer is provided by the program that uses TCP/IP for communication. Examples of applications are TELNET, FTP, e-mail, Gopher, and SMTP. The interface between the application and transport layers is defined by port numbers and sockets that is described in more detail in "Ports and Sockets" on page 17.

Transport Layer

> The transport layer provides communication between application programs. The applications may be on the same host or on different hosts. Multiple applications can be supported simultaneously. The transport layer is responsible for providing a reliable exchange of information. The main transport layer protocol is TCP. Another is User Datagram Protocol (UDP), which provides a connectionless service in comparison to TCP, which provides a connection-oriented service. That means that applications using UDP as the transport protocol have to provide their own end-to-end flow control. Usually, UDP is used by applications that need a fast transport mechanism.

Internet Layer

> The Internet layer provides communication between computers. Part of communicating messages between computers is a routing function that

ensures that messages are correctly delivered to their destination. The Internet Protocol (IP) provides this routing function. Examples of Internet layer protocols are IP, ICMP, IGMP, ARP, and RARP.

Network Interface Layer

The network interface layer (sometimes also referred to as link layer, data link layer, or network layer) is implemented by the physical network that connects the computers. Examples are LAN (IEEE 802.x standards), Ethernet, X.25, ISDN, ATM, Frame Relay, or asynch.

Note that the RFCs actually do not describe or standardize any network layer protocols per se; they only standardize ways of accessing those protocols from the Internet layer.

TCP/IP Internet Layer Protocols

This section provides a short overview of the most important and common protocols of the TCP/IP Internet layer.

Internet Protocol (IP)

IP is the layer that hides the underlying physical network from the upper layer protocols. It is an unreliable, best effort, and connectionless packet delivery protocol. Note that best effort means that the packets sent by IP may be lost, out of order, or even duplicated, but IP does not handle these situations. It is up to the higher layer protocols to deal with these situations.

One of the reasons for using a connectionless network protocol was to minimize the dependency on specific computing centers that used hierarchical connection-oriented networks. The DoD intended to deploy a network that would still be operational if parts of the country were destroyed. During earthquakes, this has proved to be true for the Internet.

IP Addressing

IP uses *IP addresses* to specify source and target hosts on the Internet. (For example, we can contrast an IP address in TCP/IP with a fully-qualified NETID.LUNAME in SNA). An IP address consists of 32 bits, which is usually represented in the form of four decimal numbers, one decimal number for each byte (or octet). For example:

```
00001001 01000011 00100110 00000001        a 32-bit address
    9       67       38       1            decimal notation (9.67.38.1)
```

An IP address consists of two logical parts: a network address and a host address. An IP address belongs to one of four classes depending on the value of its first four bits. This is shown in Figure 2 on page 8.
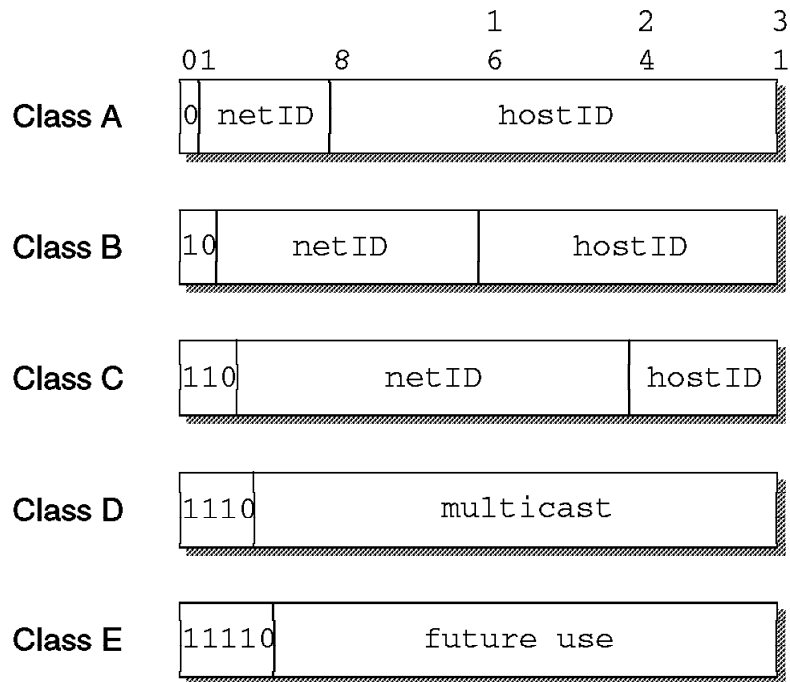
Figure 2. IP Assigned Classes of IP Addresses

- Class A addresses use 7 bits for the <network> and 24 bits for the <host> portion of the IP address. That allows for 126 (2**7-2) networks with 16777214 (2**24-2) hosts each, a total of over 2 billion addresses.

- Class B addresses use 14 bits for the <network> and 16 bits for the <host> portion of the IP address. That allows for 16382 (2**14) networks with 65534 (2**16-2) hosts each, a total of over 1 billion addresses.

- Class C addresses use 21 bits for the <network> and 8 bits for the <host> portion of the IP address. That allows for 2097150 (2**21) networks with 254 (2**8-2) hosts each, a total of over half a billion addresses.

- Class D addresses are reserved for multi-casting (a sort of broadcasting, but in a limited area, and only to hosts using the same class D address).

- Class E addresses are reserved for future use.

Some values for these host IDs and network IDs are pre-assigned and cannot be used for actual network or host addressing:

All bits 0   Stands for *this*, which is this host (IP address with <host address>=0) or this network (IP address with <network address>=0). When a host wants to communicate over a network, but does not yet know the network IP address, it may send packets with <network address>=0. Other hosts on the network interpret the address as meaning *this network*. Their reply contains the fully-qualified network address, which the sender records for future use.

All bits 1   Stands for *all*, which is all networks or all hosts. For example:

`128.2.255.255`

means all hosts on network 128.2 (class B address).

This is called a directed broadcast address because it contains both a valid <network address> and a broadcast <host address>.

Loopback The class A network 127.0.0.0 is defined as the loopback network. Addresses from that network are assigned to interfaces that process data inside the local system and never access a physical network (loopback interfaces).

IP Subnets

Due to the explosive growth of the Internet, the principle of assigned IP addresses became too inflexible to allow easy changes to local network configurations. Those changes might occur when:

- A new type of physical network is installed at a location.
- Growth of the number of hosts requires splitting the local network into two or more separate networks.
- Growing distances require splitting a network into smaller networks with gateways between them.

To avoid having to request additional IP network addresses in these cases, the concept of subnets was introduced. The assignment of subnets can be done locally as the entire network still appears to be one IP network to the outside world.

Recall that an IP address consists of the pair <network address><host address>. For example, let's take a class A network; the address format is shown in Figure 3:

```
                                  1        2        3
        01            8          6        4        1
Class A  0  netID  │           hostID
```
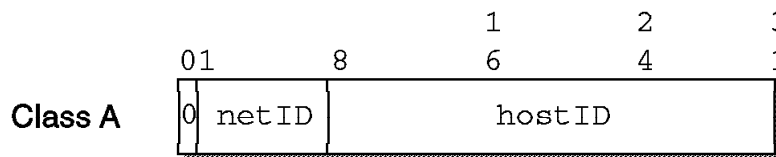
Figure 3. IP Class A Address without Subnets

Let's use the following IP address:

```
00001001 01000011 00100110 00000001        a 32-bit address
    9        67       38       1            decimal notation (9.67.38.1)

        9.67.38.1               is an IP address  (class A)  having

        9                       as the <network address>
          67.38.1               as the <host address>
```

Subnets are an extension to this by considering a part of the <host address> to be a subnetwork address. IP addresses are then interpreted as <network address><subnetwork address><host address>.

We may, for example, want to choose the bits from 8 to 25 of a class A IP address to indicate the subnet addresses and the bits from 26 to 31 to indicate the actual host addresses. Figure 4 on page 10 shows the subnetted address that has thus derived from the original class A address:

```
                          1         2         3
        01        8       6         4         1
Class A  ┌─┬───────┬─────────────────┬────────┐
         │0│netID  │ subnet number   │ host   │
Subnet   │ │       │                 │ ID     │
         └─┴───────┴─────────────────┴────────┘
```
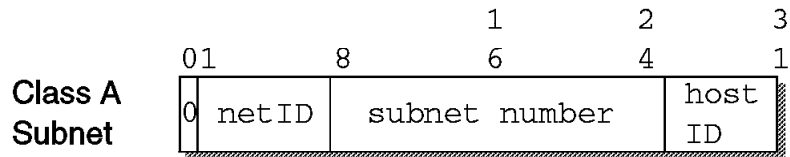
Figure 4. IP Class A Address with Subnet Mask and Subnet Address

We normally use a bit mask, known as the subnet mask, to identify which bits of the original host address field indicate the subnet number. In the previous example, the subnet mask is 255.255.255.192 in decimal notation (or 11111111 11111111 11111111 11000000 in bit notation). Note that, by convention, the <network address> is masked as well.

For each of these subnet values, only $(2{**}18)-2$ addresses (from 1 to 262143) are valid because of the all bits 0 and all bits 1 number restrictions. This split, therefore, gives 262142 subnets each with a maximum of $(2{**}6)-2$ or 62 hosts.

Notice that the value applied to the subnet number takes the value of the full byte with non-significant bits being set to zero. For example, the hexadecimal value 01 in this subnet mask assumes an 8-bit value 01000000 and gives a subnet value of 64 and not 1 as it might seem.

Applying this mask to our sample class A address 9.67.38.1 breaks the address down as follows:

```
    00001001 01000011 00100110 00000001 = 9.67.38.1 (class A address)
    11111111 11111111 11111111 11------   255.255.255.192 (subnet mask)
    ==================================== logical_AND
    00001001 01000011 00100110 00------ = 9.67.38  (subnet base address)
```

and leaves a host address of:

```
    -------- -------- -------- --000001 = 1         (host address)
```

IP recognizes all host addresses as being on the local network for which the logical_AND operation previously described produces the same result. This is important for routing IP data grams in subnet environments (see "IP Routing" on page 11).

Note that the actual subnet number is:

```
    -------- 01000011 00100110 00------ = 68760    (subnet number)
```

Notice that the subnet number previously shown is a relative number (that is, it is the 68760th subnet of network 9 with the given subnet mask). This number bears no resemblance to the actual IP address that this host has been assigned (9.67.38.1) and has no meaning in terms of IP routing.

The division of the original <host address> part into <subnet> and <host> parts can be chosen freely by the local administrator; except that the values of all zeroes and all ones in the <subnet> field are reserved for special addresses.

IP Data Gram

The unit of transfer of a data packet in TCP/IP is called an IP data gram. It is made up of a header containing information for IP and data that is only relevant to the higher level protocols. IP can handle fragmentation and re-assembly of IP data grams. The maximum length of an IP data gram is 65,535 bytes (or octets). There is also a requirement for all TCP/IP hosts to support IP data grams of size up to 576 bytes without fragmentation.

The IP data gram header is a minimum of 20 bytes long:

```
                          1   1     2         3
 0    4    8              6   9     4         1
┌────┬────┬─────────┬─────────────────────────┐
│VERS│HLEN│ Service │      Total Length       │
│    │    │  Type   │                         │
├────┴────┴─────────┼────┬────────────────────┤
│        ID         │FLG │     Fragment       │
│                   │    │      Offset        │
├──────────┬────────┴────┼────────────────────┤
│   TTL    │ Protocol    │      Header        │
│          │             │     Checksum       │
├──────────┴─────────────┴────────────────────┤
│            Source IP Address                │
├─────────────────────────────────────────────┤
│          Destination IP Address             │
├──────────────────────────────┬──────────────┤
│         IP Options           │   Padding    │
├──────────────────────────────┴──────────────┤
│                  Data ...                   │
│                   ...                       │
│                   ...                       │
└─────────────────────────────────────────────┘
```
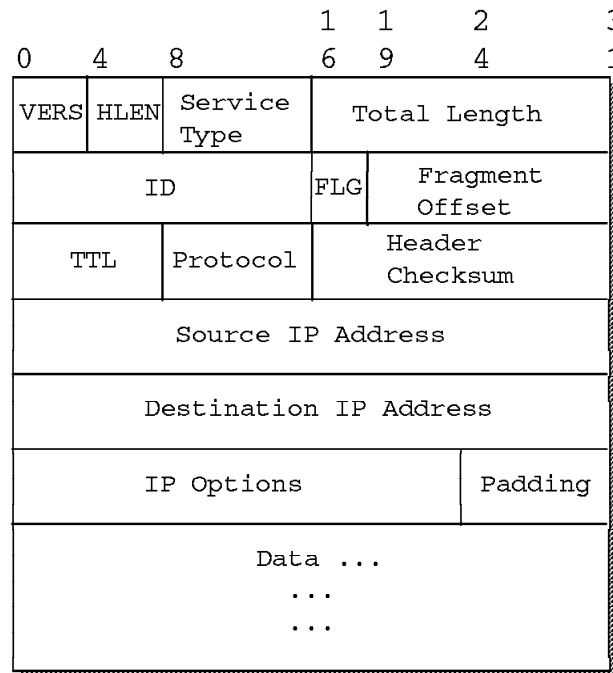
Figure 5. IP Format of an IP Data Gram Header

We do not elaborate on the format of the IP data gram header. You can find this information in the listed publications.

IP Routing

There are two types of IP routing: direct and indirect.

Direct Routing: If the destination host is attached to a physical network to which the source host is also attached, an IP data gram can be sent directly simply by encapsulating the IP data gram in the physical network frame. This is called direct delivery and is referred to as direct routing.

Indirect Routing: Indirect routing occurs when the destination host is not on a network directly attached to the source host. The only way to reach the destination is through one or more IP gateways (note that in TCP/IP terminology, the terms gateway and router are used interchangibly for a system that actually performs the duties of a router). The address of the first of these gateways (the first hop) is called an indirect route in the context of the IP routing algorithm. The address of the first gateway is the only information needed by the source host.
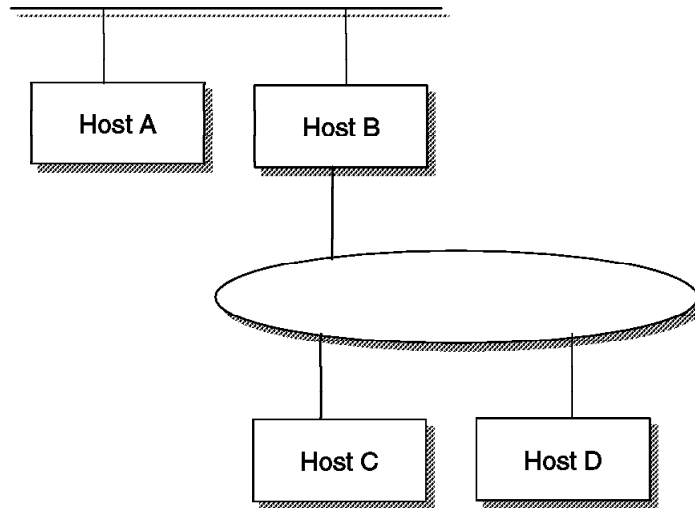
Figure 6. IP Direct and Indirect Routes. (Host C has a direct route to hosts B and D, and an indirect route to host A through gateway B).

IP Routing Table: The determination of available direct routes is derived from the list of local interfaces available to IP and is composed by IP automatically at initialization. A list of networks and associated gateways (indirect routes) needs to be configured to be used with IP routing if required. Each host keeps the following set of mappings between:

- Destination IP network addresses
- Routes to next gateways

These are stored in a table called the IP routing table. Three types of mappings can be found in this table:

1. The direct routes for locally attached networks

2. The indirect routes for networks reachable through one or more gateways

3. The default route, which contains the (direct or indirect) route to be used in case the destination IP network is not found in the mappings of type 1 and 2.

See the network in Figure 7 on page 13 for an example configuration.
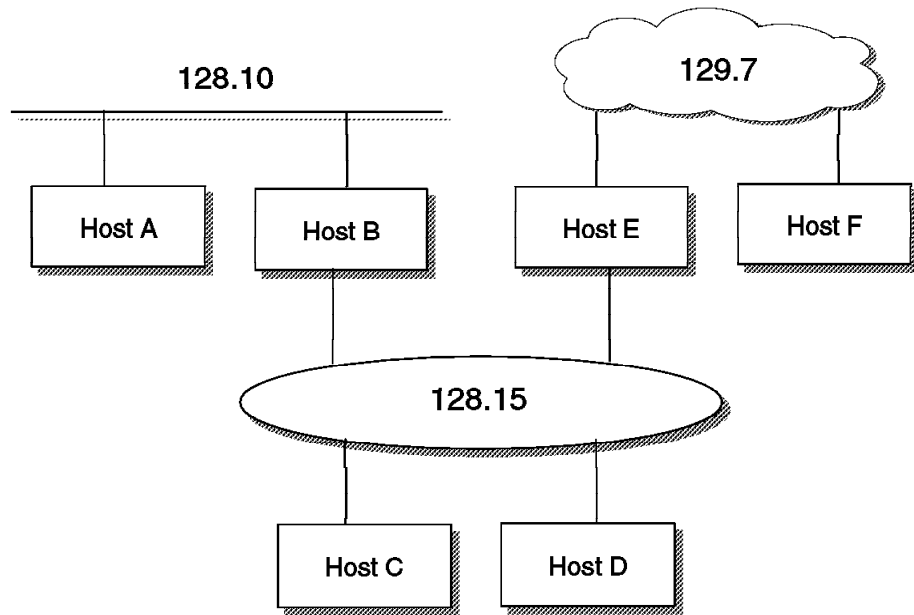
Figure 7. IP Routing Table Scenario

The routing table of host F might contain the following (symbolic) entries:

```
destination      router     interface

    129.7.0.0    F          lan0
    128.15.0.0   E          lan0
    128.10.0.0   E          lan0
    default      B          lan0
    127.0.0.1    loopback   lo
```

Figure 8. IP Routing Table Example

IP Routing Algorithm: IP uses a unique algorithm to route an IP data gram. It is called the IP routing algorithm that is illustrated in the following figure, including the support of subnets:

Take destination
IP address

Bitwise AND dest_IP_addr
with local_subnet_mask(s)

Bitwise AND local interface(s)
with local_subnet_mask(s)

Is there a match?

YES

NO

Deliver directly using
the corresponding
local interface

Is there an indirect
route entry?

YES

NO

Deliver indirectly
to the corresponding
router's IP address

Is a default route
specified?

YES

NO

Deliver indirectly
to the default router's
IP address

Send ICMP error message
"network unreachable"

Figure 9. IP Routing Algorithm (with Subnets)

Notes:

1. This is an iterative process. It is applied by every host handling a data gram,
   except for the host to which the data gram is finally delivered.

2. Routing tables and the routing algorithm are local to any host in an IP network.
   To forward IP data grams on behalf of other hosts, routers need to exchange
   their routing table information with other routers in the network. This is done
   using special routing protocols, some of which are discussed in "TCP/IP
   Routing Protocols" on page 27.

The Future Version of IP (IPv6)

It has been mentioned in "IP Addressing" on page 7 that the address space of the
current version of IP, IP Version 4, or IPv4 allows for almost four billion valid
addresses. One might think that this should be sufficient to cope with the growth of
many more years. The truth is that, due to the impacts of growth as well as the
restrictions of subnetting, the IP address space is nearing exhaustion by the year
2001 or so.

Apart from the problem of running out of IP addresses, there are other
requirements that should be met by the next generation of IP:

- Allow encapsulation of its own or other protocols.

- Incorporate class of service to distinguish between different types of traffic.

- Provide for multi-casting.

- Provide for authentication and encryption.

- Provide a mechanism for autoconfiguration.

- Preserve the virtues of IPv4 such as globally unique addressing, data gram service, independence from physical network characteristics, flexible topology, and free available standards.
- Provide for transition from IPv4.
- Be compatible with IPv4.

That has led to the initiative of defining a new version of IP, which is finally named IP Version 6 or IPv6 after it has gone by the name of IPng (next generation IP) for some time. The specifications of IPv6 and associated protocols and issues can be found in RFCs 1883 to 1886.

IPv6 uses 128-bit addresses instead of the 32-bit addresses of IPv4, which provides a large enough address space, and it also fulfills the other requirements as previously listed.

IPv6 is just facing its initial implementations in commercially available TCP/IP products, but there are no IPv6 networks available to the general public yet. Internet providers are, however, expected to open IPv6 networks in the 1998 time frame.

More information about IPv6 networks can be found at the following URL:

`http://www-6bone.lbl.gov/6bone/`

Internet Control Message Protocol (ICMP)

Although ICMP is shown in Figure 2 on page 8 as being in the same protocol layer as IP, it is actually an integral part of IP. ICMP is occasionally used for reporting some errors in data gram delivery.

Perhaps one of the most useful commands available on all TCP/IP implementations is the PING (Packet INternet Groper) application. PING uses ICMP to send an Echo data gram to a specified IP address and wait for it to return. This is useful for debugging purposes and also for knowing if a remote host can be reached from the local host.

Interfacing with the Network Layer

Though the network interface layer itself is not covered by the TCP/IP standards, the RFCs do specify certain methods to access that layer from the higher layers. Before we describe some of the protocols that interface with the network layer, we need to distinguish between different types of networks that the Internet layer can be connected with:

Multiaccess broadcast networks
In a network of this type, any system (TCP/IP host) can have multiple connections to other hosts simultaneously, and it can also send information to all other hosts on the same network with a single, special kind of message (broadcast). Local area networks (LANs) typically represent this type of network. Protocols such as ARP, ProxyARP, RARP, BootP, and DHCP are used with this type of network. We briefly describe some of them in this and following sections.

Multiaccess non-broadcast networks
In a network of this type, any host can have multiple connections to other hosts simultaneously but there are no broadcast mechanisms in place.

Examples of this type of network are X.25, Frame Relay, and AnyNet Sockets over SNA.

Point-to-point networks
In a network of this type, a host can only have one connection to one other host at any time, and there are no broadcast mechanisms in place. Examples of this type of network are SNAlink and asynchronous connections (using SLIP or PPP, which are briefly described in this section).

Notes:

1. The term *connection* in the three paragraphs before applies to any single IP interface of a host in any of the network types mentioned. For instance, a host can have multiple point-to-point interfaces and, thus, more than one connection at a time, but still only one per interface.

2. Some publications only distinguish between broadcast and non-broadcast networks.

Hardware Address Resolution (ARP and RARP)

The Address Resolution Protocol (ARP) maps Internet addresses to hardware addresses. When an application attempts to send data over a TCP/IP network capable of broadcasting, IP requests the appropriate hardware address mapping using ARP. If the mapping is not in the mapping table (ARP cache), an ARP broadcast packet is sent to all the hosts on the network requesting the physical hardware address for the host. For more information about ARP, see RFC 826.

An exception to the rule constitutes the Asynchronous Transfer Mode (ATM) technology where ARP cannot be implemented in the physical layer as previously described. Therefore, an ARP server is used with whichever host has to register upon initialization to resolve IP addresses to hardware addresses.

Some network hosts do not know their IP addresses when they are initialized. This can especially be true in the case of a host needing to be booted from diskette. Reverse ARP (RARP) can be used by, for example, a diskless workstation to determine its own IP address. In this case, the workstation already knows its hardware address (discovered at initialization) and broadcasts a request to an RARP server to map the addresses. It is necessary to have an RARP server in your network to implement RARP.

Serial Line Interface Protocol (SLIP)

The Serial Line Internet Protocol (SLIP) allows you to set up a point-to-point connection between two TCP/IP hosts over a serial line (for example, a serial cable or a RS-232 connection into a modem and over a telephone line). You can use SLIP to access a remote TCP/IP network (such as a service provider's network) from your local host or to route data grams between two TCP/IP networks. For more information about SLIP, see RFC 1055.

SLIP has several deficiencies such as:

- Only being able to transport IP data grams. (It cannot be used to route other protocols.)
- Having no ability to determine the address of the host at the other end of the connection. (Both hosts must know each other's addresses.)
- Having no error correction or data compression facility, therefore, being unreliable across noisy and low speed lines.

SLIP is not an Internet standard, but it is in widespread use. Due to the fact that most implementations incorporate SLIP and that for many applications, the issues previously listed are not important, it is a good choice for remote connection (or dial-in access). However, for use between hosts across a dynamic environment such as a large WAN, the problems are a major consideration and make SLIP an inadequate protocol to link routers.

Point-to-Point Protocol (PPP)
The Point-to-Point Protocol (PPP) is an Internet standard that has been developed to overcome the problems associated with SLIP. PPP allows addresses to be negotiated across a connection instead of being statically defined; this is not broadcasting because the negotiation is limited to a single link rather than to all hosts. PPP implements reliable delivery of data grams over both synchronous and asynchronous serial lines. It also allows compression to be negotiated and can be used to route a wide variety of network protocols. For more information about PPP, see RFCs 1717 and 1661.

Note: Do not confuse the terms point-to-point connection and Point-to-Point Protocol (PPP). A point-to-point connection is a link between two specific interfaces, while PPP is a protocol used to communicate over the link.

TCP/IP Transport Layer Protocols and Interfaces
This section provides a brief overview of the protocols of the TCP/IP transport layer.

Ports and Sockets
Each process that wants to communicate with another process identifies itself to the TCP/IP protocol suite by one or more ports. A port is a 16-bit number used by the host-to-host protocol to identify to which higher-level protocol or application program (process) it must deliver incoming messages.

As some higher-level programs are themselves protocols standardized in the TCP/IP protocol suite such as TELNET and FTP, they use the same port number in all TCP/IP implementations. (Port 23 is used by a TELNET server; ports 20 and 21 are used by an FTP server.) Those assigned port numbers are called well-known ports and the standard applications are called well-known services.

The well-known ports are controlled and assigned by the Internet Assigned Numbers Authority (IANA) and, on most systems, can only be used by system processes or by programs executed by privileged users. The assigned well-known ports occupy port numbers in the range 0 to 1023. The ports with numbers in the range 1024-65535 are not controlled by the Internet central authority and, on most systems, can be used by ordinary user-developed programs.

Confusion due to two different applications trying to use the same port numbers on one host is avoided by writing those applications to request an available port from TCP/IP. Because this port number is dynamically assigned, it may differ from one invocation of an application to the next.

UDP, TCP, and ISO TP-4 all use the same port principle. To the extent possible, the same port numbers are used for the same services on top of UDP, TCP, and ISO TP-4.

Let's first consider the following terminologies:

- A socket is a special type of file handle that is used by a process to request network services from the operating system.

- A socket address is the triple:

      {protocol, local-address, port number}

  In the TCP/IP suite, for example:

      {tcp, 193.44.234.3, 12345}

- A conversation is the communication link between two processes.

- An association is the 5-tuple that completely specifies the two processes that constitute a connection:

      {protocol, local-address, local-port, foreign-address,foreign-port}

  In the TCP/IP suite, for example:

      {tcp, 193.44.234.3, 1500, 193.44.234.5, 21}

  may be a valid association.

- A half-association is either:

      {protocol, local-address, local-port}

  or

      {protocol, foreign-address, foreign-port}

  that specifies each half of a connection.

- The half-association is also called a socket or a transport address. That is, a socket is an end point for communication that can be named and addressed in a network.

The socket interface is one of several application programming interfaces (APIs) to the communication protocols. Designed to be a generic communication programming interface, it was first introduced by the 4.2BSD UNIX system. Although it has not been standardized, it has become a de facto industry standard.

The socket interface is differentiated by the services that are provided to applications: stream, data gram, and raw sockets services.

Stream socket interface (SOCK_STREAM)
It defines a reliable connection-oriented service (over TCP, for example). Data is sent without errors or duplication and is received in the same order as it is sent. Flow control is built-in to avoid data overruns. No boundaries are imposed on the exchanged data, which is considered to be a stream of bytes. An example of an application that uses stream sockets is the File Transfer Protocol (FTP).

Data gram socket interface (SOCK_DGRAM)
It defines a connectionless service (over UDP, for example). Data grams are sent as independent packets. The service provides no guarantees; data can be lost or duplicated, and data grams can arrive out of order. An example of an application that uses data gram sockets is the Network File System (NFS).

Raw socket interface (SOCK_RAW)

It allows direct access to lower-layer protocols such as IP and ICMP. This interface is often used for testing new protocol implementations. An example of an application that uses raw sockets is the PING command.

User Data Gram Protocol (UDP)

UDP is basically an application interface to IP. It provides no additional reliability, flow-control, or error recovery. It simply serves as a multiplexer/demultiplexer for sending/receiving IP data grams using ports to direct the data grams.

```
┌────────────┐   ┌────────────┐        ┌────────────┐
│ process 1  │   │ process 2  │        │ process r  │
└────────────┘   └────────────┘        └────────────┘
      ▲                ▲                      ▲
      │                │                      │
┌──────────┬──────────┬─────────┬──────────┐
│ port a   │ port b   │  ...    │ port z   │
├──────────┴──────────┴─────────┴──────────┤
│      UDP - Port De-Multiplexing          │
└──────────────────────────────────────────┘
                    ▲
                    │
┌──────────────────────────────────────────┐
│                   IP                      │
└──────────────────────────────────────────┘
```
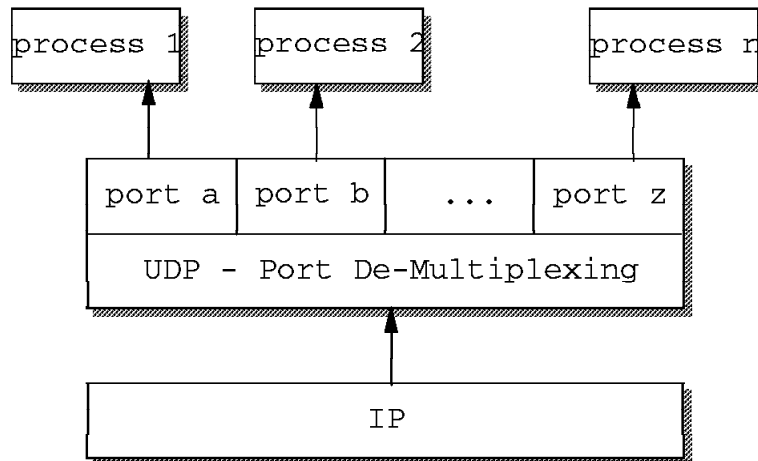
Figure 10. UDP Demultiplexing Based on Ports

Transmission Control Protocol (TCP)

We have previously discussed IP, the unreliable connectionless packet (data gram) system that forms the basis of the TCP/IP protocol suite. TCP is the higher level protocol that provides reliability, flow control, and some error recovery. Most of the TCP/IP application protocols such as TELNET and FTP use TCP as the underlying protocol.

TCP is a connection-oriented, end-to-end reliable protocol providing logical connections between pairs of processes. Within TCP, a connection is uniquely defined by a pair of sockets (that is, by a pair of processes on the same or different systems that are exchanging information).

The two processes communicate with each other over the TCP connection (InterProcess Communication - IPC) as shown in Figure 11 on page 20.

```
        process 1              process 2
           ↑                      ↑
           |                      |
   ┌─────┬────────┬─────┐  ┌─────┬────────┬─────┐
   │ ... │ port m │ ... │  │ ... │ port n │ ... │
   ├─────┴────────┴─────┤  ├─────┴────────┴─────┤
   │        TCP         │◄─►│        TCP         │
   └────────────────────┘  └────────────────────┘
           ↕        reliable        ↕
              TCP connection
   ┌────────────────────┐  ┌────────────────────┐
   │        IP          │◄─►│        IP          │
   └────────────────────┘  └────────────────────┘
              unreliable
               IP datagrams

        host A                 host B
```
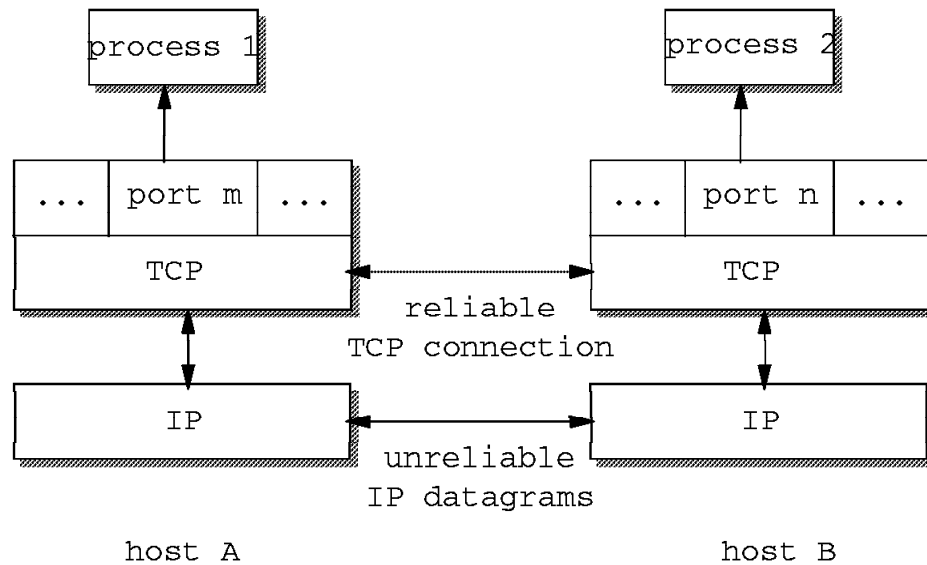
Figure 11. TCP Connection Between Processes. (Processes 1 and 2 communicate over a TCP connection carried by IP data grams).

TCP/IP Application Protocols

One of the reasons why TCP/IP is so popular is that there are many simple and useful standard applications available. We summarize several common TCP/IP applications in this section.

Remote Login and Terminal Emulation (TELNET)

TELNET (teletypewriter network) is the virtual terminal protocol in TCP/IP. It allows users of one host to log into a remote host and interact as normal terminal users of that host.

For readers who are familiar with SNA, we can relate TELNET in TCP/IP to the terminal emulators (3270 or 5250 types) in SNA. In fact, all of the IBM TCP/IP product implementations provide TELNET support of 3270 terminal emulation in addition to the many other terminal emulation protocols such as the widely used DEC VT terminal emulation types.

File Transfer Protocols (FTP and TFTP)

FTP (File Transfer Protocol) provides the functions of transferring files between two TCP/IP hosts. Since FTP is built on the services of TCP in the transport layer, it provides a reliable and end-to-end connection during the file transfer operation. Security is provided by the normal user ID and password authentication.

TFTP (Trivial File Transfer Protocol) is a somewhat simplified companion of FTP. It operates on UDP and, therefore, does not guarantee reliable end-to-end connection or delivery. It also offers only limited security based on client host name authorization. Nonetheless, TFTP is quite commonly used in conjunction with BOOTP to distribute startup program code to diskless network stations (see "Bootstrap Protocol (BOOTP)" on page 26 for more information on BOOTP).

Remote Printing (LPR and LPD)

The line printer requester (LPR) allows access to printers on other computers running the line printer daemon (LPD) as though they were on your computer. The clients provided (LPR, LPQ, LPRM, LPRMON, or LPRPORTD) allow the user to send files or redirect printer output to a remote host running a remote print server (LPD). Some of these clients can also be used to query the status of a job as well as to delegate a job. For more information about remote printing, see RFC 1179.

Remote Command Execution (REXEC and RSH)

Remote shell (RSH) and remote execution (REXEC) are similar protocols that allow you to run programs and commands on different computers. The results are received and displayed on the local host. This can be useful for small computers to harness the power of large systems.

Domain Name System (DNS)

Recall that TCP/IP hosts are addressed by 32-bit IP addresses that are represented in decimal notation. For example, to TELNET to a remote host with IP address of 9.67.38.1, the users typically entered `TELNET 9.67.38.1`. This was both cumbersome and error prone.

Quickly, this evolved to the use of symbolic high-level machine names. That is, instead of typing `TELNET 9.67.38.1`, you can now enter `TELNET small`, where small is then internally translated to the IP address 9.67.38.1.

This introduces the problem of maintaining the mappings between IP addresses and high-level machine names in a coordinated and centralized way.

Initially, host names to address mappings were maintained by the Internet Network Information Center (InterNIC, previously NIC) in a single file (HOSTS.TXT) that was fetched by all hosts using FTP. Most hosts have a copy of that file, which may or may not be current or correct.

Due to the explosive growth in the number of hosts, this mechanism became too complicated and time-consuming, and was replaced by a new concept: the domain name system (DNS).

The domain concept lies in decentralizing the naming mechanism by distributing responsibility (and authority) for mapping between names and addresses. For example, consider the internal structure of a large organization. As the chief executive cannot do everything, the organization is probably partitioned into divisions, each of them having autonomy within certain limits. Specifically, the executive in charge of a division has authority to make direct decisions without permission from the chief executive.

Domain names are formed in a similar way and often reflect the hierarchical delegation of authority used to assign them. For example, consider the name:

`small.itso.raleigh.ibm.com`

Here, itso.raleigh.ibm.com is the lowest-level domain name, a subdomain of raleigh.ibm.com, which again is a subdomain of ibm.com, a subdomain of com. We can also represent this naming concept by a hierarchical tree (see Figure 12 on page 22).
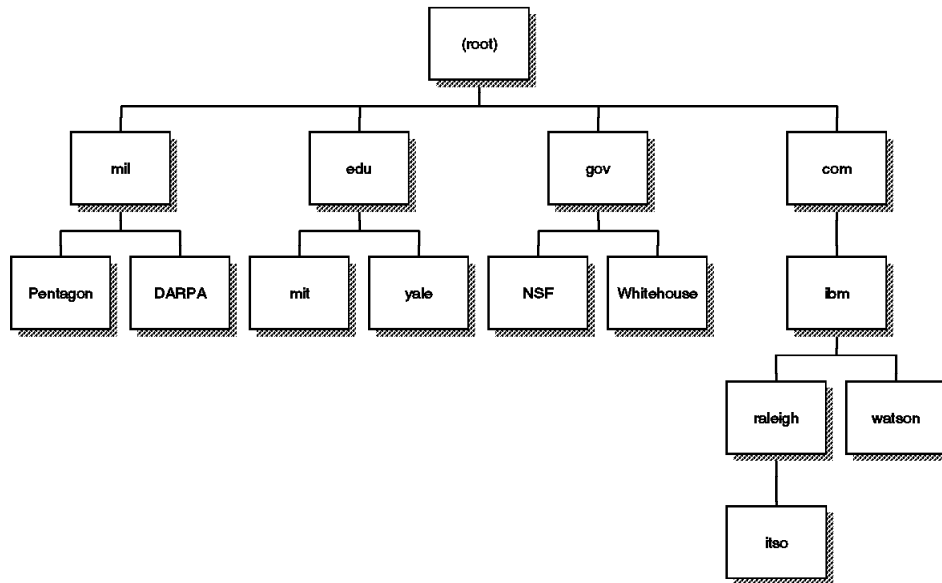
Figure 12. Hierarchical Namespace. (Chain of authority in assigning domain names)

Table 2 shows some of the top-level domains of today's Internet domain namespace.

Table 2. DNS - Some Top-Level Internet Domains	
Domain Name	**Meaning**
com	Commercial organizations
edu	Educational institutions
gov	Government institutions
int	International organizations
mil	US Military
net	Major network support centers
org	Non-profit organizations
country code	ISO standard 2-letter identifier for country-specific domains

Mapping Domain Names to IP Addresses

Mapping names to addresses consists of independent, cooperative systems called name servers. A name server is a server program answering requests from the client software called a name resolver.

There are various types of implementations of the resolve functions and the name server functions (for example, full versus stub resolvers, and primary, secondary versus cache name servers). We do not elaborate on them.

Conceptually, all Internet domain servers are arranged in a tree structure that corresponds to the naming hierarchy in Figure 12. Each leaf represents a name server that handles names for a single subdomain. Links in the conceptual tree do not indicate physical connections. Instead, they show which other name server a given server can contact.

Figure 13 on page 23 shows the domain name resolution process:

- A user program issues a request such as the gethostbyname() sockets call. (This particular call is used to ask for the IP address of a host by passing the hostname.)
- The resolver formulates a query to the name server.
- The name server checks to see if the answer is in its local authoritative database or cache, and if so, returns it to the client. Otherwise, it queries the other available name servers.
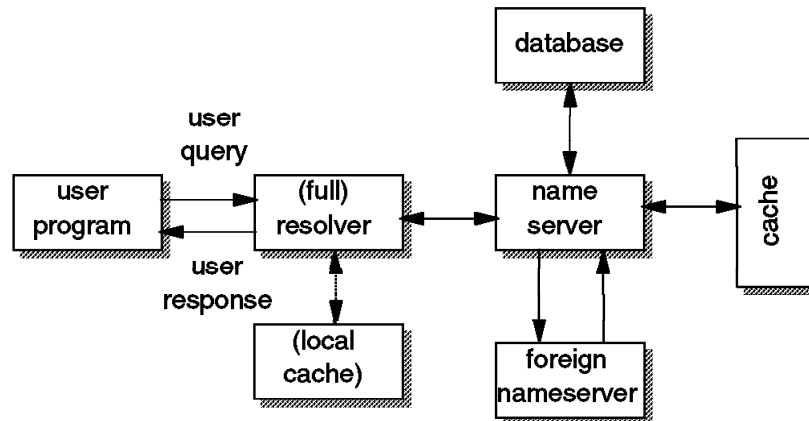
Figure 13. DNS Resolver and Domain Name Server

Inverse Mapping

In some cases, it may be necessary to find a host name for a given IP address. This is called inverse mapping and is a standard function of most DNS servers available today. A special domain, in-addr.arpa, is being used for inverse name queries.

Transport

The query/reply messages are transported by either UDP or TCP.

Dynamic DNS (DDNS)

The Dynamic Domain Name System (DDNS) is a protocol that defines extensions to the Domain Name System to enable DNS servers to accept requests to update the DNS database dynamically and securely.

Note: DDNS currently is an Internet Draft (ID), which means that there is no standard specified yet. Nonetheless, IBM has fully implemented DDNS in its OS/2 Warp Server products.

These extensions define mechanisms for adding and deleting a set of names and associated resource records. Further, DDNS uses DNS security extensions to authenticate hosts that request to create or update entries in the DDNS server database. Without client authentication, another host can impersonate an unsuspecting host by remapping the address entry for the unsuspecting host to that of its own. Once the remapping occurs, important data such as logon passwords and mail intended for the host are, unfortunately, sent to the impersonating host instead.

IBM implements fail-safe RSA public-key digital signature technology to secure the DNS database updates so that the database entries cannot be changed by unauthorized hosts.

Simple Mail Transfer Protocol (SMTP)

The Simple Mail Transfer Protocol is an electronic mail protocol with both client (sender) and server (receive) functions. Since SMTP is a rather old protocol, many aspects of modern electronic mail are missing in its definitions. It basically assumes that messages only consist of plain text in 7-bit U.S. ASCII format with a line length of no more than 1000 characters. Since SMTP is the most important Internet standard within the context of this book, we added some more in-depth information in "Simple Mail Transfer Protocol (SMTP)" on page 37.

Multipurpose Internet Mail Extensions (MIME)

To overcome the shortcomings of SMTP, a new architecture has been defined that allows for a much greater variety of what can be contained in an electronic message such as:

- Eight-bit text and lines longer than 1000 characters
- International code pages and character sets
- Binary and multimedia objects such as
    - Fonts
    - Images, audio, and video objects

MIME is defined in RFCs 2045 to 2049 and currently has a state of draft standard. MIME does not solely apply to electronic mail; it rather defines a way to incorporate different objects in any electronic message. For instance, it is used widely throughout the Internet today by means of browsing the World Wide Web (see "The World Wide Web (WWW)" on page 30). For more details, see also "Multipurpose Internet Mail Extensions (MIME)" on page 39.

Post Office Protocol (POP)

The post office protocol is an electronic mail protocol with both client (sender/receiver) and server (storage) functions. POP allows mail for multiple users to be stored in a central location until a request for delivery is made by an electronic mail program. For more information about POP, see RFC 1725.

Remote Procedure Call (RPC)

Remote Procedure Call is a standard developed by SUN Microsystems and used by many vendors of UNIX systems.

RPC is an application programming interface (API) available for developing distributed applications. It allows programs to call subroutines that are executed at a remote system. The caller program (called client) sends a call message to the server process and waits for a reply message. The call message includes the procedure's parameters and the reply message contains the procedure's results.

Sun-RPC consists of the following parts:

- RPCGEN: A compiler that takes the definition of a remote procedure interface and generates the client stubs and the server stubs.
- XDR (eXternal Data Representation): A standard way of encoding data in a portable fashion between different systems. It imposes a big-endian byte

ordering and the minimum size of any field is 32 bits. This means that both the client and the server have to perform some translation.

- A run-time library.

The concept of RPC is similar to that of an application program issuing a procedure call:

- The caller process sends a call message and waits for the reply.
- On the server side, a process is dormant awaiting the arrival of call messages. When one arrives, the server process extracts the procedure parameters, computes the results, and sends them back in a reply message.

The RPC Call Message consists of several fields. For example:

- Remote program number
- Remote program version number
- Remote procedure number

Portmap

The Portmap or Portmapper is a server application that maps a program number and its version number to the Internet port number used by the program. Portmap is assigned the reserved (well-known service) port number 111.

Portmap only knows about RPC programs on the host it runs on. For Portmap to know about the RPC program, every RPC program should register itself with the local Portmapper when it starts up.

The RPC client (caller) has to ask the Portmap service on the remote host about the port used by the desired server program.

Network File System (NFS)

The Network File System (NFS) enables machines to share file systems across a network. It allows authorized users to access files located on remote systems as if they were local. It is designed to be machine-independent, operating system-independent, and transport protocol-independent. This is achieved through implementation on top of RPC.

X Window System

The X Window System (hereafter referred to as X) is one of the most widely used graphical user interface (GUI), or bitmapped-window display systems.

Current X releases contain two numbers: A version number indicating major protocol or standards revisions and a release number indicating minor changes. At the time of this book's publication, the latest version is X11 Release 6, also known as X11R6.

There are two main components in X that communicate with each other:

X-Server
A dedicated program that provides display services on a graphic terminal on behalf of a user at the request of the user's X-client program. It controls the display and handles the keyboard and the mouse (or other input devices) for one or more X-clients. Equally, it is responsible for output to the display, mapping colors, loading fonts, and keyboard mapping. Typically, X-server programs run on high-performance graphics

PCs and workstations as well as X terminals, which are designed to run only the X-server program.

X-Client

The actual application designed to employ a graphical user interface to display its output. Typically, many X-clients compete for the service of one X-server per display per user. Xterm and Xclock are two examples of X-clients.

Transport

The X Window System uses sockets to communicate over a TCP/IP network.

TCP/IP Configuration and Management Protocols

This section provides a brief overview of some of the protocols used to configure and manage TCP/IP networks.

Bootstrap Protocol (BOOTP)

The BOOTstrap Protocol (BOOTP) enables a client workstation to be initialized with a minimal IP stack and request its IP address, a gateway address, and the address of a name server from a BOOTP server. Once again, a good example of a client that requires this service is a diskless workstation. If BOOTP is to be used in your network, then you must make certain that both the server and client are on the same physical LAN segment. BOOTP can only be used across bridged segments when source-routing bridges are being used, or across subnets if you have a router capable of BOOTP forwarding, also known as a BOOTP relay agent.

Dynamic Host Configuration Protocol (DHCP)

The Dynamic Host Configuration Protocol (DHCP) is based on BOOTP and extends the concept of a central server supplying configuration parameters to hosts in the network. DHCP adds the capability to automatically allocate reusable network addresses to workstations or hosts, and it supports the following functions:

Automatic Allocation

DHCP assigns a permanent address to a host.

Dynamic Allocation

DHCP assigns a leased IP address for a limited period of time. This is the only mechanism that allows automatic reuse of addresses that had been previously assigned but are no longer in use.

Manual Allocation

The host's address is manually configured by the network administrator.

You may have more than one DHCP server in your network, each server containing a pool of addresses and leases in local storage. A client may be configured to broadcast a request for address assignment and can select the most appropriate response from those servers that answers the request. One potential advantage with DHCP is a reduction in the workload required to manually configure addresses for all workstations in a segment.

According to RFC 1541, a DHCP server does not need to be in the same subnet or on the same physical segment as the client, which requires the use of a BOOTP relay agent.

Simple Network Management Protocol (SNMP)

With the growth in size and complexity of the TCP/IP-based networks, the need for network management became important. The current network management framework for TCP/IP consists of:

1. SMI (Structure and Identification of Management Information) describes how managed objects contained in the MIB (Management Information Base) are defined.
2. MIB-II (Management Information Base, second version) describes the managed objects.
3. SNMP defines the protocol used to manage these objects.

A network management station executes network management applications that monitor and control network elements such as hosts, gateways, and terminal servers. These network elements use a management agent to perform the network management functions requested by the network management stations. SNMP is used to communicate management information between the network management stations and the agents in the network elements.

TCP/IP Routing Protocols

This section provides a brief overview of some of the protocols used to update routing tables among routers in TCP/IP networks. This process is called dynamic routing because the routers ensure that updates are sent automatically according to protocol specifications.

In contrast to that, static routing requires system administrators to enter all required routing information at every host and gateway for a TCP/IP internetwork to function as desired.

Routing Information Protocol (RIP)

The Routing Information Protocol creates and dynamically maintains network routing tables. RIP arranges to have gateways and routers periodically broadcast their routing tables to neighbors. Using this information, a RouteD server can update a host's routing tables. For example, RouteD determines if a new route has been created, if a route is temporarily unavailable or if a more efficient route exists. For more information about routing using RIP, see RFC 1058.

The Routing Information Protocol Version 1 is commonly known as RIP. It uses a distance vector algorithm, which means it calculates the best path to a destination based on the number of hops in the path. Each hop represents a router through which a data gram must pass to reach the destination.

RIP is widely used and easy to implement, but it is known to have several limitations:

- The maximum number of hops is 15 (16 refers to an unreachable destination), making RIP inadequate for large networks that may have more than 15 routers on any single path.
- RIP is not a secure protocol. It does not authenticate the source of any routing updates it receives.
- RIP cannot choose the best path based on delay, cost, reliability or load.
- RIP does not support variable length subnet masks .

- RIP can take a relatively long time (compared to other protocols such as OSPF) to converge or stabilize its tables after an alteration to the network configuration has occurred.

The Routing Information Protocol Version 2 (RIP-2) was created to fix some of the limitations of RIP. It is still less powerful than protocols such as OSPF, but it has the advantages of being easy to implement and having a lower network overhead. This overhead includes network traffic and CPU time. RIP-2 can interoperate with RIP, and it can implement variable length subnetting.

Open Shortest Path First (OSPF)

OSPF is a complex protocol utilizing a link state, shortest path first algorithm. In a link-state protocol, each router broadcasts link status information to each of its neighboring routers instead of distance vector information. Each neighboring router then propagates the status information to its own neighbors until the information has been sent to every router in the network. Each router then uses the status information to build a complete routing table utilizing a calculated cost for each link based on load, time delays, or reliability.

The biggest advantage of OSPF in comparison to either RIP or RIP-2 is that of the time taken to converge after a change to the network. The link-state protocols always stabilize the propagated routing tables much faster than the distance vector protocols.

OSPF supports variable length subnetting and multicasting (a broadcast mechanism that only sends to a number of specific hosts rather than every one in the network). It also introduces the concept of areas, where the autonomous system is divided into areas, each responsible for its own topology. Area topology is not propagated to other areas; border routers maintain connectivity between the separate areas across an OSPF backbone, reducing the amount of routing information that must be exchanged.

See RFC 1583 for more information about OSPF.

Classless Inter-Domain Routing (CIDR)

It has been mentioned in "IP Addressing" on page 7 that, due to the impacts of growth, the IP address space is nearing exhaustion soon if addresses are assigned as they are requested or as they used to be assigned previously. We have pointed out that the next version of IP, IPv6, can easily overcome that problem (see "The Future Version of IP (IPv6)" on page 14), but what can be done until IPv6 is fully deployed?

One idea is to use a range of class C addresses instead of a single class B address. The problem with this is that each network must be routed separately because standard IP routing understands only class A, B, and C network addresses (see "IP Routing" on page 11).

Within each of these types of networks, subnetting can be used to provide better granularity of the address space within each network, but there is no way to specify that multiple class C networks are actually related (see "IP Subnets" on page 9). The result of this is termed the *routing table explosion* problem: A class B network of 3000 hosts requires one routing table entry at each backbone router, whereas

the same network, if addressed as a range of class C networks, requires 16 entries.

The solution to this problem is a scheme called Classless Inter-Domain Routing (CIDR). CIDR is described in RFCs 1518 to 1520.

CIDR does not route according to the class of the network number (hence, the term classless) but solely according to the high order bits of the IP address that are termed the IP prefix. Each CIDR routing table entry contains a 32-bit IP address and a 32-bit network mask, which together give the length and value of the IP prefix. This can be represented as <IP_address network_mask>. For example, to address a block of eight class C addresses with one single routing table entry, the following representation is sufficient: <192.32.136.0 255.255.248.0>. From a backbone point of view, this refers to the class C network range of 192.32.136.0 to 192.32.143.0 as one single network because of the identical IP prefix as illustrated in Figure 14:

```
    11000000 00100000 10001000 00000000 = 192.32.136.0 (class C address)
    11111111 11111111 11111--- -------- = 255.255.248.0 (network mask)
    ================================== = logical_AND
    11000000 00100000 10001--- -------- = 192.32.136  (IP prefix)

    11000000 00100000 10001111 00000000 = 192.32.143.0 (class C address)
    11111111 11111111 11111--- -------- = 255.255.248.0 (network mask)
    ================================== = logical_AND
    11000000 00100000 10001--- -------- = 192.32.136  (same IP prefix)
```

Figure 14. Classless Inter-Domain Routing - IP Supernetting Example

This process of combining multiple networks into a single entry is referred to as supernetting because routing is based on network masks that are shorter than the natural network mask of an IP address in contrast to subnetting (see "IP Subnets" on page 9) where the subnet masks are longer than the natural network mask.

CIDR is implemented and used in today's Internet backbone routers based on the Border Gateway Protocol (BGB-4). It is scarcely used at the local network level where splitting up the available address space is more of a problem than expanding the address space.

Internet User Applications and Protocols

This section provides a brief overview of some of the protocols and applications that have made the task of using the Internet both easier and popular over the past couple of years.

Gopher

Gopher is a client/server protocol designed for information location and retrieval. The client function provides a menu-driven interface to access the files stored on a Gopher server. The server function allows descriptive names to be assigned to the files, thus, making it easier to identify the content of each file. Gopher was designed at the University of Minnesota.

For more information about Gopher, see RFC 1436.

The World Wide Web (WWW)

The World Wide Web is a global hypertext system that was initially developed in 1989 by Tim Berners Lee at the European Laboratory for Particle Physics, CERN in Switzerland to facilitate an easy way of sharing and editing research documents among a geographically dispersed group of scientists.

In 1993, the Web started to grow rapidly, which was mainly due to the NCSA (National Center for Supercomputing Applications) developing a Web browser program called Mosaic, an X Windows-based application. This application provided the first graphical user interface to the Web and made browsing more convenient.

Today, there are Web browsers and servers available for nearly all platforms. You can get them either from an FTP site for at no cost (free) or buy a licensed copy. The rapid growth in popularity of the Web is due to the flexible way people can navigate through world-wide resources in the Internet and retrieve them. To get an idea of the growth of the Web, Table 3 presents some statistics.

The number of Web servers is also increasing rapidly and the traffic over port 80, which is the well known port for HTTP Web servers, on the NSF backbone has had a phenomenal rate of growth also. The NSFNET was converted back to a private research network in 1995; therefore, comprehensive statistics of backbone traffic are no longer readily available, if they are at all.

Table 3. Growth of The World Wide Web				
Date	**Web Sites**	**Web Traffic**	**FTP Traffic**	**E-mail Traffic**
June 1993	130	0.5	42.9	6.4
June 1994	2738	6.1	35.2	6.4
March 1995	n/a	23.9	24.2	4.9
June 1995	23 500	n/a	n/a	n/a
June 1996	230 000	n/a	n/a	n/a
January 1997	650 000	n/a	n/a	n/a
Note: The source of those figures can be found at the following URL: `http://www.mit.edu/people/mkgray/net/web-growth-summary.html`				

Hypertext Transfer Protocol (HTTP)

The hypertext transfer protocol is a protocol designed to allow the transfer of hypertext markup language (HTML) documents. HTML is a tag language used to create hypertext documents. Hypertext documents include links to other documents that contain additional information about the highlighted term or subject. Such documents may contain other elements apart from text such as graphic images, audio and video clips, and even virtual reality worlds (these are described in VRML, the scripting language for that kind of element).

HTTP is based on request-response activity. A client, running an application called a browser, establishes a connection with a server and sends a request to the server in the form of a request method. The server responds with a status line, including the message's protocol version and a success or error code followed by a message containing server information, entity information, and possible body content.

An HTTP transaction is divided into four steps:

1. The browser opens a connection.
2. The browser sends a request to the server.
3. The server sends a response to the browser.
4. The connection is closed.

On the Internet, HTTP communication generally takes place over TCP connections. The default port is TCP 80, but other ports can be used. This does not preclude HTTP from being implemented on top of any other protocol on the Internet or on other networks. HTTP only presumes a reliable transport; any protocol that provides such guarantees can be used, but the mapping of the HTTP request and response structures onto the transport data units of the protocol in question is outside the scope of this document.

Except for experimental applications, current practice requires that the connection be established by the client prior to each request and closed by the server after sending the response. Both clients and servers should be aware that either party may close the connection prematurely due to user action, automated timeout, or program failure, and should handle such closing in a predictable fashion. In any case, closing the connection by either or both parties always terminates the current request, regardless of its status.

What we just described means that, in simple terms, HTTP is a connectionless protocol. To load a page including two graphics, for example, a graphic-enabled browser opens three TCP connections: one for the page, and two for the graphics. Most browsers, however, can handle several of these connections simultaneously.

HTTP is stateless because it keeps no track of the connections. If a request depends on the information exchanged during a previous connection, this information must be kept outside the protocol.

The Advent of Java

Java is an important new technology in the world of the Internet. In summary, it is a simple, robust, object-oriented, platform-independent, multi-threaded, dynamic general-purpose programming environment for creating applications for the Internet and intranet. Java includes the following components:

Java Language

Java is a programming language developed by Sun Microsystems, which is object-oriented, distributed, interpreted, architecture neutral, and portable. Java can be used to create downloadable program fragments, so-called applets, that augment the functionality of a Java-capable browser such as HotJava or Netscape Navigator.

Java Virtual Machine

The Java Virtual Machine (JVM) is an abstract computer that runs compiled Java programs (or precisely, that interprets Java byte-code that has been produced by a Java compiler). JVM is virtual because it is generally implemented in software on top of a real hardware platform and operating system. In this way, it is architecture-neutral and platform-independent. All Java programs should be compiled to run in a JVM.

The following diagram describes in simple terms how Java is implemented:
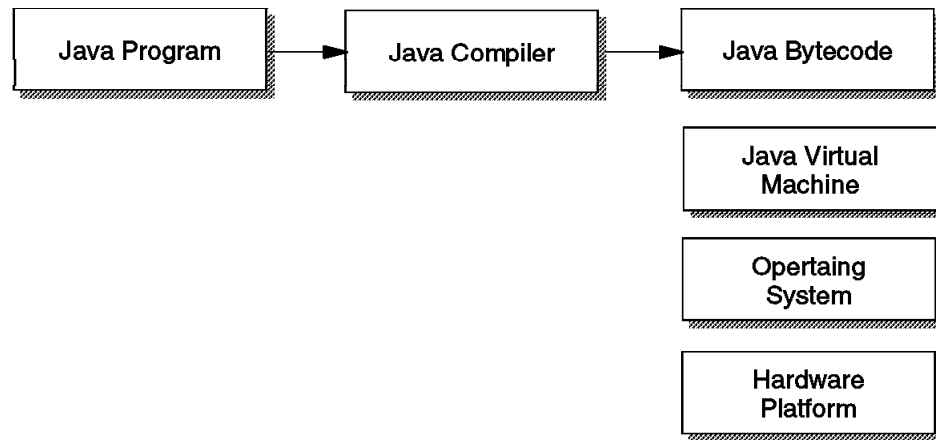
Figure 15. Implementation of Java

HotJava

HotJava is a Java-enabled Web browser developed by Sun Microsystems that allows you to view Java applets.

JavaOS

JavaOS is a highly compact operating system developed by JavaSoft that is designed to run Java applications directly on microprocessors in anything from personal computers to pagers. JavaOS runs equally well on a network computer, a PDA, a printer, a game machine, or countless other devices that require a compact OS and the ability to run Java applications.

Java Beans

An initiative called Java Beans is brewing a similar set of APIs that make it easy to create Java applications from reusable components. Java Beans can be used in a wide range of applications from simple widgets to full-scale, mission-critical applications. Many software vendors, including IBM, have announced plans to support it.

JavaScript

JavaScript is an HTML extension and programming language developed by Netscape that is a simple object-based language compatible with Java. JavaScript programs are embedded as source directly in an HTML document. They can control the behavior of forms, buttons, and text elements. It is used to create dynamic behavior in elements of the Web page. In addition, it can be used to create forms whose fields have built-in error checking routines.

For more information about Java, check out the following URLs:

```
http://ncc.hursley.ibm.com/javainfo/
http://java.sun.com/
```

TCP/IP and Internet Security

In this section, we briefly introduce some concepts and protocols that allow you to establish various degrees of security in TCP/IP networks.

One may say that the Internet is great because there is so much information out there that can be accessed easily and quickly. Electronic communication has become a lot easier because of the Internet, no doubt, but it can also be a dangerous thing at times.

Imagine that someone can get into your system and destroy data at random just because you forgot to implement security that can prevent it. Or, worse, imagine that someone taps into your communication, learns your passwords, and then uses your account information to do electronic shopping.

One of the major concerns when providing commercial services on the Internet is providing for transaction security and communications security.

Information exchanges are secure if all the following statements are true:

- Messages are confidential.
- The information exchange has integrity.
- Both sender and receiver are accountable.
- You can authenticate both parties in the exchange.

There are certainly other ways of compromising information on the Internet that you might think of; so how do you protect yourself against them?

Secure Sockets Layer (SSL)

SSL is a security protocol that was developed by Netscape Communications Corporation along with RSA Data Security, Inc. The primary goal of the SSL protocol is to provide a private channel between communicating applications that ensures privacy of data, authentication of the partners, and integrity.

SSL provides an alternative to the standard TCP/IP socket API, which has security implemented within it. Hence, in theory, it is possible to run any TCP/IP application in a secure way without changing it. In practice, SSL is so far only implemented for HTTP connections.

In fact, the protocol is composed of two layers:

- At the lower layer is the SSL Record protocol. It is used for data encapsulation.

- On the upper layer is the SSL Handshake protocol used for initial authentication and transferring encryption keys.

The SSL protocol addresses the following security issues:

Privacy
> After the symmetric key is established in the initial handshake, the messages are encrypted using this key.

Integrity
> Messages contain a message authentication code ensuring the message integrity.

Authentication
>During the handshake, the client authenticates the server using an asymmetric or public key.

SSL requires each message to be encrypted and decrypted and, therefore, has a high performance and resource impact. In addition, since only the server is authenticated, SSL is not suitable for applications such as electronic banking that require the server to authenticate their clients.

Firewalls

One way to deal with network security is the installation of a specialized server, a so-called firewall. Firewalls tend to be seen as a protection between the Internet and a private network. But generally speaking, a firewall should be considered as a means to divide the world into two or more networks (one or more secure networks and one or more non-secure networks).

Imagine a company where all the departments are connected to the internal network including sales, accounts, development, and human resources departments. The administrator wants to restrict access from the development department machines to the human resources department machines and from the sales department to the development department.

To provide maximum security, a good firewall design is paramount:

- Anything not explicitly permitted should default to denied.
- Increasing complexity leads to bugs, which lead to opportunities.
- The server should be kept in a physically secure environment.
- It should provide extensive logging.
- It should turn off known problems and non-essential daemons (applications and services).

Most of the firewalls available today offer one or more of the following services, some of which we briefly describe in the paragraphs following this list:

- Filtering gateways
- Proxy application layer gateways
- Circuit layer gateways (SOCKS servers)
- Domain name server hiding
- Mail handling
- Auditing and logging

Multiple technologies are needed to provide capabilities and protection. The IBM Secure Network Gateway (SNG), for instance, is based on IBM's technology and has been used for nearly 10 years to protect internal IBM networks.

Screening Filters

The screening filter looks at each IP packet flowing through it, controlling access to machines and ports in the private network and possibly limiting access from the private network to the Internet. Screening filters operate at the IP layer and cannot control access at the application layer.

Proxy Servers

Proxy servers are used to control access to or from the private network relaying only acceptable communications from known users.

Users in the private network can access an application such as FTP in the proxy server using their usual utilities (clients). Users authenticate themselves to the proxy server and can then access the application on the desired machine in the public network. Proxy servers can also be used from the public network to access applications in the private network, but this exposes login names and passwords to attackers in the public network.

SOCKS Servers

SOCKS servers are similar to proxy servers without the requirement for double connections. With SOCKS, users can benefit from secure communications without needing to be aware that it is happening.

Users have to use new versions of applications called SOCKSified clients. The SOCKSified client code directs its requests to the SOCKS port on the firewall. Sessions are broken at the firewall the same as with proxy servers. With SOCKS, however, the connection to the destination application is created automatically once the user is validated.

Both the client and the SOCKS server need to have SOCKS code. The SOCKS server acts as an application-level router between the client and the real application server. SOCKS is for outbound sessions only. It is simpler for the private network user, but does not have secure password delivery so it is not intended for sessions between public network users and private network applications.

The majority of Web browsers are SOCKSified and you can get SOCKSified TCP/IP stacks for most platforms. For additional information, refer to the following URLs:

```
http://www.raleigh.ibm.com/sng/sng-socks.html
http://www.socks.nec.com
```

IP Security Architecture (IPSec)

Currently available as Internet Drafts (IDs), several security mechanisms are being described that address security, authentication, and encryption at the IP layer rather than on upper transport or application layers. The IP Security Architecture defines two specific headers to provide security services for IP data grams. Those may be applied either separately or combined.

IP Authentication Header (AH)

The IP Authentication Header (AH) can be used to provide connectionless integrity and data origin authentication for IP data grams, and optionally, to provide anti-replay integrity. This header protects an entire IP data gram, including all immutable fields in the IP header. AH does not provide confidentiality (no encryption).

IP Encapsulated Security Payload (ESP)

The Encapsulating Security Payload (ESP) can be used to provide confidentiality, data origin authentication, connectionless integrity, anti-replay integrity, and limited traffic flow confidentiality. Unlike AH, ESP provides security only for the protocols encapsulated by it, not the protocol that carries it.

More information on IPSec can be found at the following URL:

`http://www.ietf.cnri.reston.va.us/ids.by.wg/ipsec.html`

Transporting Other Protocols over TCP/IP

We have so far regarded the TCP/IP network and transport protocols as a means of communications for TCP/IP applications. In reality, those protocols can also be employed to connect systems that run applications that normally do not have anything to do with TCP/IP. Those applications expect to communicate over protocols such as NetBIOS, SNA, or IPX.

Whenever an application or a protocol is made to use a transport protocol other than the one it has originally been designed for, we call that non-native transport.

NetBIOS over TCP/IP

RFCs 1001 and 1002 define a way to support applications using the NetBIOS API to use a TCP/IP network for transport. Essentially, NetBIOS is not a protocol but an application programming interface that knows little about any underlying networking protocols. NetBIOS is used mostly in LAN environments and is implemented to use the IEEE 802.2 interface. That renders NetBIOS unusable for TCP/IP networks because it cannot be routed in that way.

RFC 1001/1002 implementations of NetBIOS over TCP/IP alleviate that problem and have become increasingly important with the presence of operating systems such as OS/2 Warp Server, Windows NT, and Windows 95, which partly rely on NetBIOS for communications.

SNA over TCP/IP

The IBM Multiprotocol Transport Network Architecture (MPTN) defines another way of using any transport network for any kind of application. The ultimate goal and great benefit of MPTN is that applications remain unchanged even if their native transport network is replaced by a non-native transport network.

In a specific implementation of MPTN, a TCP/IP network can be used to transport SNA applications using either dependent or independent logical unit (LU) communication, and it also supports Advanced-Program-to-Program Communication (APPC) and Advanced-Peer-to-Peer Networking (APPN).

Another implementation, MPTN, also supports the transport of TCP/IP sockets applications over SNA networks.

IPX over TCP/IP

In a similar way as with NetBIOS over TCP/IP (RFC 1001/1002), RFC 1234 describes a way to transport the Novel Internet Packet Exchange (IPX) protocol over IP. However, in this case, IPX data grams are encapsulated in UDP data grams before being sent over an IP network. This makes an entire TCP/IP network appear as a single IPX network to NetWare servers and requesters.

IPX offers functions to NetWare servers and IPX routers that are similar to the functions that IP provides for TCP/IP networks. Therefore, a connectionless delivery over UDP is desired when sending IPX over IP.

Simple Mail Transfer Protocol (SMTP)

Simple Mail Transfer Protocol (SMTP) is known as the Internet electronic mail protocol. The objective is a mail transmission in a reliable and efficient way.

SMTP defines the form and the appearance of a mail document according to the header ("FROM" and "TO" field) and the transformation of an e-mail address into a message (SMTPUserID@domain). Only mail that contains plain English text can be delivered without having the need of encoding. Every other content such as special character sets for languages has to be encoded by MIME (refer to "Multipurpose Internet Mail Extensions (MIME)" on page 39).

The combination of three standard protocols define SMTP:

RFC 821   RFC 821 is an exchange standard that describes the mail exchange between two computers such as TCP/IP hosts. The capability to transfer mail across transport service environments is an important feature of SMTP. RFC 821 also defines a client/server protocol. Often the client SMTP acts as a server for a user mailing program; therefore, it is easier to refer to SMTP sender and SMTP receiver. Usually the client SMTP is initiating the session (SMTP sender) and the server SMTP is responding to the session request (SMTP receiver). When the transmission channel is established, the mail command that indicates the sender of the mail can be sent. If the SMTP receiver can accept the mail for the recipient, the SMTP sender receives a reply about the successful transmission.

RFC 822 and RFC 1049

These are message format standards (protocol name is MAIL) that define the format of a mail message:

RFC 822 defines SMTP as a message representation protocol that specifies only details about the header without touching the message body, which appears as flat ASCII text. RFC 822 describes the syntax of the header fields as well as the definition of a set of header fields.

RFC 1049 defines the document types that are different from 7-bit plain ASCII text. By adding a Content-Type header field, the different document types can be indicated and the recipient gets the mail represented as it was intended by the sender.

RFC 974   This is a routing standard that describes using the domain name system (protocol name is DNS-MX).
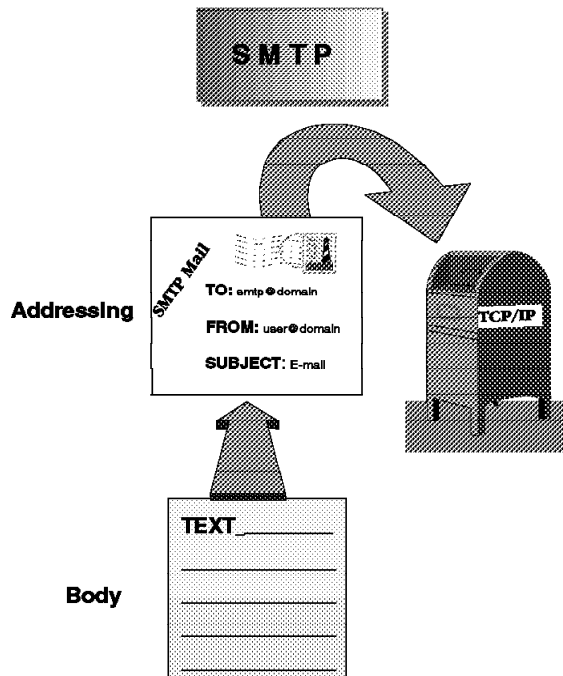
Figure 16. SMTP Overview

SMTP Limitations

- No specification for mail containing multi-media files such as images or audio.

- No specification for mail containing text in foreign language using different characters such as Asian or European languages.

- Each mail message is able to contain only a 7-bit ASCII text with a limit of 1000 characters length per line. Therefore, non-textual data has to be converted into 7-bit ASCII characters to make it representable and also printable.

- X.400 gateways are able to deliver messages containing non-textual bodies. The exchange of mail containing ASCII text between X.400 hosts and RFC 822 hosts is possible without causing problems. If the mail contains non-textual data, either it has to be converted into ASCII format or it has to be discarded. In the later case, the RFC 822 user gets a notification saying that discarding has occurred. The user is not allowed to extract useful information from the message body either by using an external mechanism or transferring back into an X.400 message handling system (for example, Internet mail) where the information is useful.

How Does SMTP Work?

The means of delivery that SMTP is using is based on *end-to-end-delivery*. This means that the connection from an SMTP client to the destination SMTP's server is a direct connection. The mail is kept at the SMTP server until it is transmitted and copied successfully to the recipient's SMTP.

To exchange mail between the TCP/IP SMTP mailing system and local mailing systems, some implementations are needed to get a connection. These are mail gateways or physical IP connections. Using a mail gateway for sending mail, SMTP cannot route mail directly to the recipient's host. In the specification of

end-to-end-delivery, SMTP transmits the mail from host-to-gateway, gateway-to-gateway, or gateway-to-host. This means SMTP is not defined for the mail transmission that happens beyond the TCP/IP network to the destination host.

Multipurpose Internet Mail Extensions (MIME)

MIME is a standard mail content representation specification that has been defined in RFC 1521 and 1522 by the Internet standards community. This standard was developed to let different mail systems communicate with each other by means of distributing and receiving e-mail without any loss of content.

MIME is an extension to SMTP as defined in RFC 822. The following data formats can be transmitted with MIME:

- Executable files such as images, audio, and video files
- Text, also rich text
- Spread sheet
- Multi-part messages
- Binary object
- Text data that has national language characters included
- Mail messages that may be rejected by an SMTP server because the size of the message is too large
- Mail messages that have to be translated from ASCII to EBCDIC and vice versa by an SMTP gateway. Sets of code page mappings allow a transfer of different languages.

RFC 1521

RFC 1521 describes and specifies the format of Internet message bodies (adds a structure and typing information) and shows several mechanisms that solve most of the RFC 822 limitation problems.

The following fields are integrated in the message body structure:

- *MIME-Version header field*
- *Content-Type header field*
- *Content-Transfer-Encoding header*
- *Content-ID header field*
- *Content-Description header field*

MIME Version Header Field: By adding a MIME-Version header field to the top level of a mail message, the mail-processing agent is able to distinguish between mail that was composed:

- With the new Internet message body format standard (encoded by MIME)
- By an older software
- By a non-conform software

The header field must include a version number such as:

```
MIME - Version:  1.0
```

If a message arrives with a version value other than 1.0, it is checked by conformed software and the user gets a warning message saying that a message was delivered with an unrecognized MIME Version.

Content Type header field
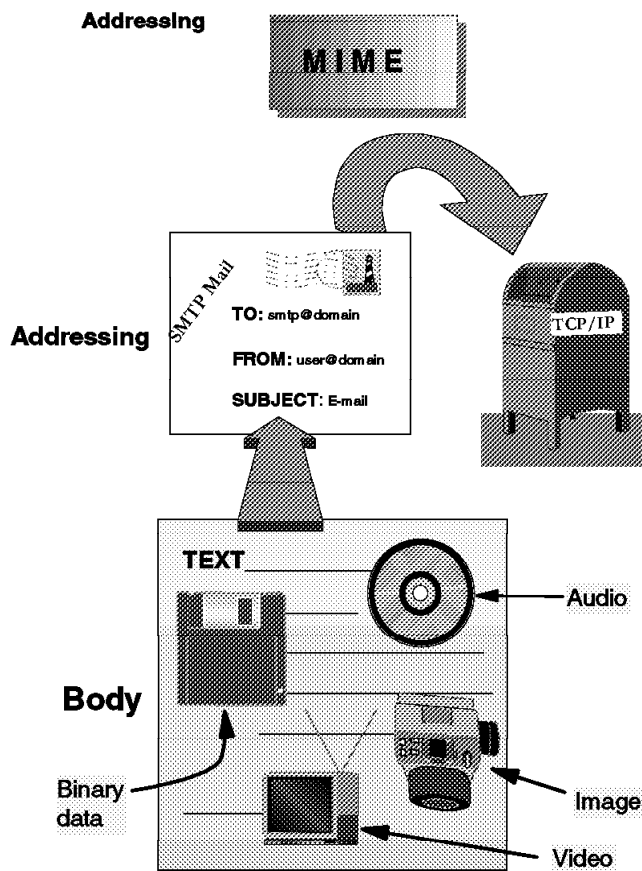
Figure 17. MIME Overview

By giving general type and subtype identifiers and by providing auxiliary
information, the nature of the data that resides in the message body can be
specified. The top-level Content-Type specifies the general type of data while the
subtype specifies the specific type of the data (for example, `Image/xyz`). The
subtype field is a mandatory field with any default settings. There are seven
standard predefined Content-Types existing:

Text   A *text* value represents textual information in numerous character sets
          and formatted text description languages in a standard. The subtype
          plain indicates unformatted text.

Multipart A *multipart* value is used as a combination of multiple parts of an entity
          and also independent data types into one single message.

          Four different subtypes are available such as:

          - *Mixed* as the primary one.
          - *Alternative* represents the same data in multiple formats.
          - *Parallel* for representing the parts simultaneously.
          - *Digest* for multipart entities where each part of the entity consists of
            the Content-Type *Message*.

Application

An *application* value can be used as an implementation of an electronic mail file transfer service or as a transmission of other kind of data such as:

- Spread sheets
- Data for mail-based scheduling systems
- Languages for computational e-mail
- Uninterpreted binary data (in this case, the subtype *octet-stream* is used).
- Information to be processed by a mail-based application

If you have PostScript documents, the subtype *PostScript* is chosen.

Message A *message* value can be used as encapsulation of another mail message where the message itself is all or a part of a formatted RFC 822 conformed message, and it may contain its own Content-Type header field.

Image An *image* value can be used as transmission of image data (picture). It requires a display device to get the information. Two subtypes are defined for the image formats being used:

- jpeg
- gif

Audio An *audio* value can be used as transmission of audio data (voice data). The initial subtype is called *basic*. For these kind of data, an audio output device is necessary.

Video A *video* value can be used as transmission of video data and also as composition of video and audio data. The initial subtype is called *mpeg*. For these kind of data, a capability to display moving images is mandatory (multi-media, hardware, and software).

If a message is typed as plain text with a U.S. ASCII character set by the protocol, which is a default RFC 822 message, its Content-type field contains:

```
Content-type:text/plain; charset=us-ascii
```

If there is no Content-type field and the MIME-Version header is present, the RFC 822 default is automatically assumed, and the receiving user agent can also assume that this message format was the sender's intent.

If there is neither a Content-type field nor a MIME-Version header present, the RFC 822 default must still be assumed without being sure of the sender's intent.

Content-Transfer-Encoding header field

This field is needed to specify auxiliary encoding for mail that contains data or character set limitations. The encoding has to be applied to let the mail pass through the mail transport mechanism. Many Content-Types are delivered in their natural format such as 8-bit character or binary data. That sometimes causes transmission problems due to using transport protocols that cannot transmit such data (see "SMTP Limitations" in this chapter). Therefore, a mechanism is needed to transfer data properly.

The data has to be re-encoded into a 7-bit short-line format indicated by a Content-Transfer-Encoding header field.

The Content-Transfer-Encoding header field contains the type of transformation that has been used to represent the message body for an acceptable transport. To keep a transparent overview of encoding mechanisms and to avoid an unnecessary amount of field values, it has been decided to define only two, but important and sufficient encoding mechanisms and five field values.

Encoding mechanisms:

Readable A readable encoding of data, which is mostly done in a 7-bit format.

Dense A dense encoding of data to transmit largely binary data efficiently.

Field values:

7-bit These are relatively short lines, not longer than 998 octets. Decimal values of 0 or greater than 127 or not allowed. Some examples of 7-bit ASCII characters sets are:

- U.S. ASCII - CCSID 00367
- ISO-2022JP-CCSID 05052

8-bit These are similar to 7-bit, but decimal values greater than 128 can be used. Some examples of 8-bit ASCII character sets are:

- ISO-8859-1-CCSID 00819 (Latin1)
- ISO-8859-7-CCSID 00913 (Greek)
- All the ISO-8859-n character sets are 8-bit ASCII.

Binary This refers to data where any sequence of octets is allowed.

Quoted-Printable
This means that text is being left to a large extent readable in their encoded form.

Base64 This means that data consists mainly of non-text-characters.

The Content-Transfer-Encoding field is designed in such a way as to enable an invertible mapping between natural representation of a type of message data and an exchangeable one using the 7-bit mail transport protocols (for example, SMTP).

Content-ID header field:

This field can be used to set up a reference from one message body to another message body.

Content-Description header field:

This field can be used to give some information about the message body content and is to be given in the U.S. ASCII character set.

RFC 1522
RFC1522 describes and specifies the message header extensions for non-U.S. ASCII text such as adding a version field and adding typing information to the header.

Some mail relaying programs are known to change the layout of a message header compared to the original message in different ways:

- Parts of a message header field might be deleted.

- The sequence of addresses in the "TO" and "CC" fields might be rearranged.
- The order of header fields (for example, the vertical ones) might be rearranged.
- Message headers might be wrapped and be placed at a different place compared to the original message.
- Message headers might be parsed incorrectly.

Chapter 3. Available Mail and Messaging Products for AS/400 Users

Traditionally, IBM OfficeVision for OS/400 (OV/400) was *the* solution for electronic mail for AS/400 customers. However, with the enhancements of Version 3 Release 2 and Version 3 Release 7, OV/400 is no longer the *only* choice[1] .

While this book emphasizes the possibilities to interchange mail between all of these different mail applications, rather than explaining all mail and messaging products in detail, this chapter gives just an overview of each type of mail application.

OV/400 and Justmail for OS/400

IBM OfficeVision for OS/400 (OV/400) is an office system that provides a complete host-based integrated office solution including mail, directory, calendar, word processing, document storage and retrieval, and search services. OV/400 provides a consistent platform and interface for company communications as well as an application integration platform for building enterprise solutions.

Of particular importance for e-mail on the AS/400 system is the Send Distribution (SNDDST) CL command. See Appendix B, "Sending Mail to the Internet from an AS/400 System" on page 193 for more information on SNDDST and how it can be used to send messages and objects from the AS/400 system to POP3 users or the Internet.

JustMail is a subset of OV/400 that provides an entry-level electronic mail system including a simple note editor.

If non-programmable terminals (NPT) also need e-mail connectivity, OV/400 or JustMail provides the appropriate capabilities. OV/400 as well as JustMail supports both PCs and NPTs, including small PCs not powerful enough to support modern client/server applications. A rich set of published APIs are also available to integrate their functional capabilities into line-of-business applications.

Enhancements from Version 3 Release 2 and Version 3 Release 7 to both OV/400 and JustMail are:

- Linguistics support for Russian provided by POE, the IBM linguistics engine.

- Additional main menu options that allow more applications to be directly accessed from OfficeVision.

- Extended capability for administrators to delete or change ownership of public nicknames and distribution lists.

Enhancements from Version 3 Release 2 and Version 3 Release 7 to OV/400 are:

- An option to specify a calendar as a resource calendar that prevents items from being double-booked on this calendar.

---

[1] This chapter applies to V3R2, V3R7, and V4R1 releases of OS/400.

- Notification of all scheduling conflicts for recurring meetings for all dates and for all invitees.
- A command line has been added to the main OV/400 menu that allows you to enter OV/400 or AS/400 commands.
- Extra user options have been added that allow the administrator to specify up to 10 programs that the user can call by entering the option number (50-59).
- Public nicknames and distribution lists have been added to the Work with Objects by Owner panel when accessed through option 4 from the Administration menu.
- OV/400 now supports a comprehensive graphical user interface (GUI) Graphical Access for OV/400.
- Year 2000 support has been added. When we reach the year 2000, OfficeVision is ready. It is adapted to handle the move into the next century without corrupting your data.
- Additional printer drawers have been added. OV/400 lets you use six paper input drawers to print from; this is in addition to being able to select manual feed, envelope feed, or continuous feed.
- Spelling functions can now be used for Russian documents with the new IBM supplied Russian language dictionary.
- OV/400 now differentiates between new mail and unopened mail on the main menu.
- Integrated PC Server is the new name for the file server I/O processor (formerly known as FSIOP).

Enhancements from Version 4 Release 1 to OV/400 are:

- Internet addressing is made easier. You are no longer required to map directory entries (UserID/Address) to the Internet address. In addition, a new optional send panel (an OV/400 enrollment option) allows entry of Internet addresses up to 78 characters long.
- The new mail indicator is enhanced by adding an "Unopened Mail" indicator in place of the "New Mail" indicator. In V3R2 and V3R7, this function was accomplished through a PTF.
- A new bar code feature can save you mailing costs by printing a bar code on your envelopes.
- You can now use the Mail Service Framework for local mail distribution. A new keyword (USEMSFLCL) on the CHGDSTA command activates this function.

OV/400 provides the flexibility to integrate with other mid-range, host, and local area network (LAN) products.

POP3 Clients

Version 3 Release 2 and Version 3 Release 7 of OS/400 includes a Post Office Protocol (POP3) server, which is the client of the post office standard for the Internet. POP3 allows a server to behave as if the destination for e-mail is not a client, but a server that receives mail on behalf of a client. The POP3 protocol then defines how a client interacts with its post office server. The client can then ask about the mail stored there, request that it deliver your mail, and allow you to delete

any unwanted mail. Refer to Chapter 5, "AS/400 System as Mail Server for Any POP3 Client" on page 69 for additional details on the OS/400 POP3 client/server interface.

Lotus Mail 4.5

cc:Mail is the award-winning mail system that has set the standard for graphic e-mail. Lotus Notes has adopted the cc:Mail user interface and most other mail systems have copied aspects of it. Lotus Mail 4.5 has many cool features such as:

- Built-in automatic spell checking
- Nested folders
- Drag-and-drop filing
- Configurable trash deletion policies
- Full-text search
- Easy-to-create personal rules for automatic mail processing
- Built-in attachment viewers
- Support for working with your mail offline
- User-personalized signature text
- "Type-down" addressing
- Personal distribution lists
- And more

Lotus Mail 4.5 (and its predecessor, "cc:Mail for the Internet") has all of the preceding features plus several others. It supports "business card addressing" where an Internet e-mail address can be entered directly without requiring the creation of an address book entry. In addition, any URL string in a text message is automatically highlighted and clicking on it launches your Web browser to bring up that Web page.

When used with Client Access, Lotus mail has even more added features. First, installation is unbelievably easy. User identity and server information is obtained from existing Client Access information. Next, it runs on any network connection supported by Client Access including TCP/IP, SNA (also over twinaxial cable), and IPX. And, in addition to Internet-style e-mail addresses, both OfficeVision-style addresses or FAX telephone numbers may be used to address e-mail. Finally, the AS/400 system distribution directory appears to the user as a cc:Mail address book including "type-down" address searches and automatic name resolution.

On the other hand, there are several features of the traditional cc:Mail products that are not available with Lotus Mail. First, two other Lotus products, Lotus Organizer (calendaring and scheduling) and Lotus Forms are bundled with the traditional cc:Mail products but are not included with Lotus Mail. Next, you cannot use Lotus Mail as a client to a traditional cc:Mail LAN-based post office. And finally, several features of cc:Mail are not available with Lotus Mail:

- Rich text
- Bulletin boards
- Delegation of mail

Note: The first time a Lotus mail product was delivered with the Windows '95 client for Client Access for OS/400, it was called *cc:Mail for the Internet Release 1.0*. The follow up release of the same product was then renamed by Lotus to *Lotus Mail 4.5*, which, in turn, is also packaged with Client Access for Windows 95 in addition to the Client Access client for Windows NT. In the context of this book,

both product names, *cc:Mail for the Internet Release 1.0* and *Lotus Mail 4.5* are used interchangeably unless otherwise noted. However, this does **not** apply to *cc:Mail Release 7* or previous releases of cc:Mail.

Lotus Notes

Lotus Notes is IBM's strategic groupware offering, the marketing objective for all AS/400 accounts with groupware/office needs. It is the world's leading messaging and groupware software. It enables communication with colleagues, collaboration in teams, and coordination of strategic business processes.

Lotus Notes goes beyond traditional e-mail. With Notes, you can collaborate and share ideas with team members on joint projects, access bulletin boards, participate in group discussions, create document libraries, and access news databases. It is the next logical step from electronic mail to a single cost-effective infrastructure for electronic messaging and groupware. Lotus Notes, an application development environment, facilitates creation of custom business applications that coordinate everyday business processes from start to finish to achieve results. Lotus Notes customers consistently find significant payback on their Notes investment. According to an independent study, Notes users have achieved an average of 179% annual return on their investment.

IBM OV/400 Support for Lotus Notes Clients

As opposed to the other mail and messaging products described in the previous sections, IBM OV/400 Support for Lotus Notes Clients (or short *SLNC*) is a connection between these products, providing an interesting combination. It is actually an add-on product to a standard Lotus Notes client and offers IBM OfficeVision for OS/400 and OfficeVision JustMail for OS/400 customers and other AS/400 customers the ability to connect the Windows 3.1 version of Lotus Notes 4.5 client to the mail, directory, and calendar services of the AS/400 system.

Using this new connection:

- Mail is sent to OV/400 user IDs and downloaded to the Notes client.

- Nicknames and distribution lists can be downloaded to the Notes client on demand.

- Calendars on the Notes client hard drive and AS/400 system are synchronized.

- You can have interchangeable access to calendars and mail using either the graphical user interface of the Notes client or the non-programmable terminal (NPT) interface of OV/400.

- The client can be used in a disconnected state.

- The client can connect to other Lotus Notes servers on the Integrated PC Server or other platforms and begin working with other Notes functionality.

IBM OV/400 Support for Lotus Notes Clients is a co-existence as well as a user migration tool for OV/400 and JustMail/400 users to Lotus Notes. Migration to a Lotus Notes server is accomplished by the Notes administrator pressing a button, filling out some user-specific information, and pressing another button that sends a package through the mail to the user. In the cover note to the package sent by the administrator, the user finds a button that says "migrate me". When they press that

button, their client is automatically switched from the OS/400 mail and calendar services to the Notes server.

For more information on IBM and Lotus migration and coexistence, visit the World Wide Web site at:

http://www.software.ibm.com/is/ibm-lotus.

IBM OV/400 Support for Lotus Notes Clients is an excellent solution for customers who:

- Want to start using a GUI client for OV/400 but are not ready to migrate to Notes.
- Have a desire to migrate to Lotus Notes but need to provide an office solution for NPTs.
- Want a user controlled Lotus Notes migration, not a sudden cut over.
- Want to continue AS/400 central management of resources rather than adding the complexity and costs of managing another platform and server.

IBM OV/400 Support for Lotus Notes clients, Version 3 Release 1, is also intended for AS/400 customers who do not have OfficeVision or JustMail but want to start using electronic mail and calendar services with a graphical user interface.

Chapter 4. Electronic Mail Support in OS/400

There are two major topics that are part of e-mail support on every AS/400 system, the AnyMail framework and the system distribution directory. The AnyMail framework and the exit programs that are used by it can be thought of as the OS/400 "mail engine". The system distribution directory is how all local e-mail users are defined to the functions that support e-mail on the AS/400 system.

The AnyMail Mail Server Framework

AnyMail/400 is a set of functions that provide mail applications on the AS/400 system. AnyMail/400 mail server framework contains AnyMail/400 functions that are integrated with OS/400 licensed programs; these function allow the AS/400 system to become, in a transparent way, a mail server by delivering and managing electronic mail communications to the customers. AnyMail is a true framework in that the exits that are used to work with OS/400 licensed programs are true APIs that can be used by any product or customer provided exit program to add to or alter the electronic mail functions supported by AnyMail.

One of the principal purposes of AnyMail/400 mail server framework is to allow the AS/400 system to send, receive, and forward electronic messages originating from or designated to different types of mailing systems. This includes mail distribution services such as SNADS, SMTP, X.400, and so on.

The importance of the AS/400 system as a mail server is more than managing mail processing. For the customers that already have an AS/400 system, it is the fastest and most efficient way to implement office automation. AnyMail/400 uses the existing System Network Architecture Distribution Services (SNADS) facilities to communicate across the network.

The mail server can receive an e-mail message, process it, and deliver it to other networks, even in the format used for those networks.

AnyMail Mail Server Framework Introduction

The AnyMail/400 mail server framework is a set of programs that form an open structure to allow mail applications to be developed and run on the AS/400 system. The primary function of the mail server framework is to allow the processing and distribution of electronic mail messages that may contain data, voice, video, graphics, multimedia, and so on.

AnyMail/400 provides a set of functions that give us an interface to support other mail services. These functions are performed by the mail server framework and it creates, queues, and distributes the mail server framework message information.

To understand how the mail server framework can support electronic messages and how the message is received and sent by it, the process is divided into the following steps (see Figure 18 on page 52):

- AnyMail/400 receives the electronic messages from anywhere (for example, from SNADS or SMTP).

- SNADS or SMTP uses an Application Program Interface (API) to build a mail server framework message. At this point, the message has information about the sender, target, attachment included, formats, and protocols.

- When the mail server framework message is built, it can be sent to the mail server framework. The message is put on a queue and waits to be processed by the distribution portion of the mail server framework.

- The mail server framework processes the message following a sequence of steps in a predefined order. Each of these steps have an **exit point** and pass control to an **exit point program** for the message process.

- After the mail server framework finishes processing the message through all of the exit points, it can be delivered, forwarded, or not delivered to the local or remote destination.
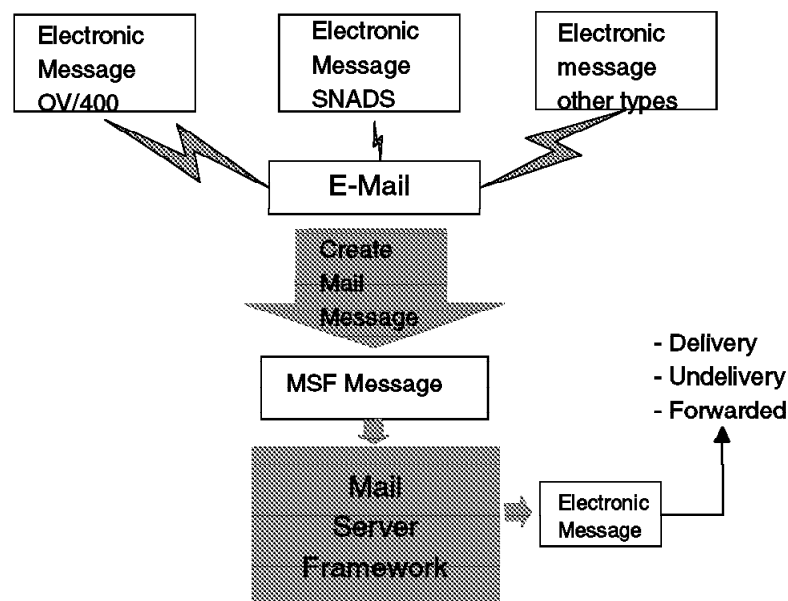
Figure 18. General Flow of Electronic Mail through AnyMail/400 Framework

Note: AnyMail Server Framework is also known as Mail Server Framework.

AnyMail Mail Server Framework Concepts

The AnyMail mail server framework introduction clarifies that the mail server framework is not a mail application, but rather an open structure within which electronic messages can be processed and then delivered to a local or remote destination. The AnyMail mail server framework concepts introduce how the mail server framework messages are processed into the mail server framework structure.

Mail Server Framework Message

Before the e-mail message can get into the mail server framework, it has to create a mail server framework message. This message is the package that contains all of the information that defines the electronic message that is needed for the mail server framework to be considered as valid information and determines which exit point can process the message and pass the package to the respective exit point programs. The message contains the following information:

Recipient List: The recipient list is a list of recipients required to receive the message.

Envelope List: The envelope list contains a list of envelopes with information such as the subject, reference, creation date, creation time, and priority.

Originator List: The originator list contains the address of the person that originated the message.

Attachment Reference List: The attachment reference list is a list of references to the associated attachment that accompanies the message.

Reply-to List: The reply-to list is a list of the people that are to receive a reply when one is created.

Original recipient list: The original recipient list contains a list with all of the recipients of a message.

Report-on List: The report-on list contains a list of recipients that receive a message when the mail server framework message is not sent or forwarded.

Report-to List: The report-to list contains a list of addresses that did receive the message in the case of a non-delivery status (or that did for a delivery status).

The details of each of these points are described on page 44 in the *AnyMail/400 Mail Server Framework Developer Guide*, GG24-4449-00.

Finally, when the mail server framework receives the message with all of the message information, the package is stored in a queue waiting to be processed by a sequence of steps. Each of these steps are called **exit points**.

Exit Points

An exit point is a specific place within the mail server framework where the control is passed to one or more programs. Those programs are called **exit point programs**.

The exit points are made to provide the functions needed to process the message through the mail server framework. Each of these exit points can be configured by the specific exit point programs provided by the system or it can be made by the user.

Using these exit points, the mail server framework processes the e-mail message in a specific order. When all of the exit points have finished their processing, the mail server framework assumes that the processing has been completed. If you only need to perform a few of them, the mail server framework allows you to determine which steps can be skipped to successfully complete the process.

Exit points can be divided into four groups; each of these groups depend on their own macro-processes: addressing, pre-delivery, delivery, and management (see Figure 19 on page 54).

| Addressing | List Expansion |
| | Address Resolution |

Pre-Delivery Processing	Envelope Processing
	Attachment Convertion
	Security and Authority

| Delivery | Local Delivery |
| | Message Forwarding |

Management	Non-Delivery
	Attachment Management
	Accounting
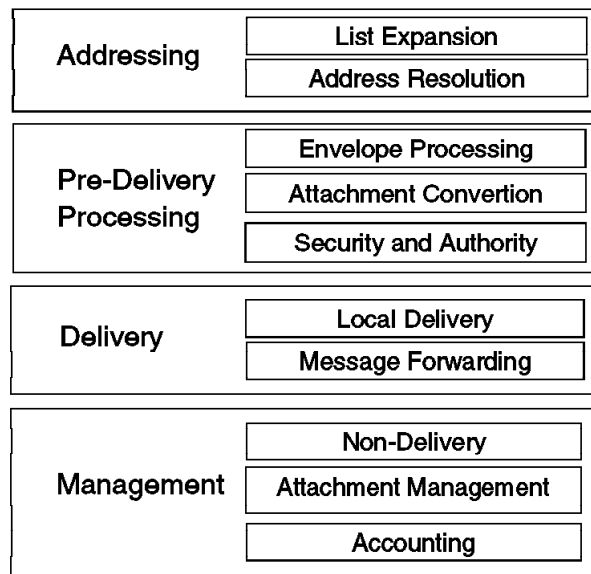
Figure 19. Exit Point Group

Addressing
This group has two exit points (list expansion and address resolution). Their objectives are to expand the distribution list, even if the distribution list contains a secondary distribution list, and resolve the individual addresses.

Pre-Delivery
This group contains three exit points (envelope processing, attachment conversion, and security and authority). They are primarily used to convert from one format to another. Both envelope processing and attachment conversion are needed when mail from the "EBCDIC" world is sent to the "ASCII" world or vice versa (for example, from OV/400 to POP and vice versa).

Delivery
This group contains the local delivery and message forwarding exit points. Their purpose is to deliver the message to local locations or forward it to remote locations.

Management
This group contains three exit points (non-delivery, attachment management, and accounting). Their objectives are to perform the cleanup activity prior to the message being deleted.

The purpose of each exit point is to provide specific functions that are needed in the e-mail message process by their exit point programs. The information that the e-mail message gives to the exit point program when it is called is the only input required by the exit point program. The exit point programs can change the

information in the e-mail message to provide all of the needs for the next exit point in the framework.

The exit points provided by **IBM** are shown in Figure 20.

List Expansion: The objective of this exit point is to expand all of the distribution lists found in the mail server framework and replace them by the actual e-mail address. If the distribution list contains secondary distribution lists, these are also expanded.

Address Resolution: The purpose of this exit point is to resolve the individual addresses by giving the correct information to the mail server framework message. The address resolution exit point program has to direct the message to the local delivery, remote delivery, or non-delivery exit point for each address in the list.

Envelope Processing: This exit point allows message envelope alterations and conversions. An envelope is information such as subject, date, time, and priorities. Updates, in addition to converting from one envelope format to another, are done depending on the recipients message type.

Attachment Conversion: This exit point allows for conversion of any attachment from one format to another if it is needed by the exit point program.

Security and Authority: This exit point checks the user's authority to see if the message can be delivered or forwarded to another user.
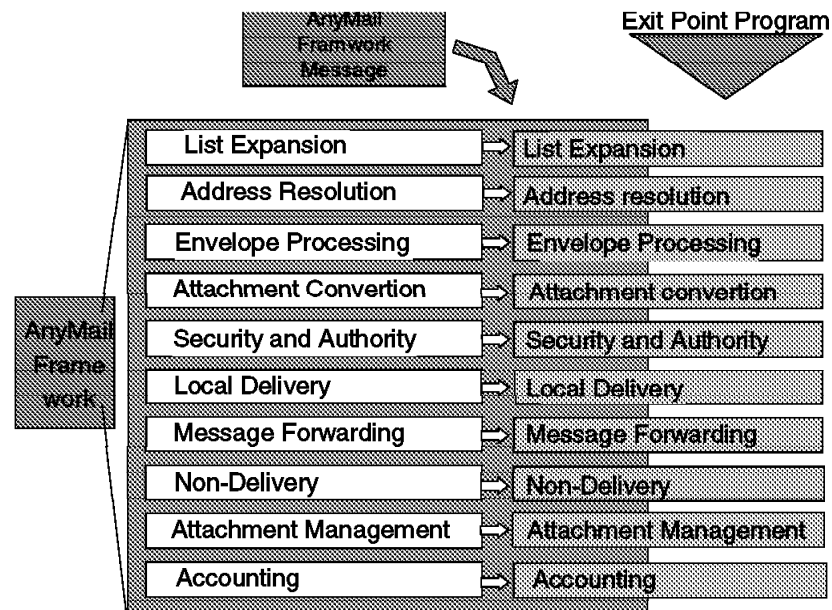

Figure 20. Exit Point and Exit Point Programs

Local Delivery: This exit point calls the local delivery exit point program to deliver the mail server framework message to a local recipient.

Message Forwarding: This is the exit point from where the mail server framework message can be forwarded to the remote recipients.

Non-Delivery: The purpose of this exit point is to process the mail server framework messages that are not delivered or forwarded. One of the actions that can be taken by this exit point is to send the message back to the originator to inform them that the e-mail message was not sent.

Attachment Management: Allows for the management of attachments referenced by the mail server framework message as a part of the message distribution.

Accounting: This exit point manages the audit trail activities.

Exit Point Programs

Exit point programs are programs that already exist on the system or can be written by programmers. OS/400 provides an Application Program Interface (API) that allows users to write their own application programs in a high-level language.

To process the mail server framework message, each exit point can call different exit programs. This exit point program checks the message information, performs its respective task, changes the information, and finally returns the message back to the next exit point with all of the information required by it.

The AS/400 operating system provides 12 predefined exit points for the mail server framework. Each of these exit points has a set of exit point programs. To see the registered exit points supplied by IBM, enter the following command on the command line:

```
WRKREGINF FORMAT(MSF*)
```

See Figure 21. If you want to see the exit point program associated with each exit point, select option 8 to work with exit point programs (see Figure 22 on page 57).

```
                     Work with Registration Information

 Type options, press Enter.
   5=Display exit point   8=Work with exit programs


                         Exit
     Exit                Point
 Opt Point               Format     Registered  Text
   _ QIBM_QZMFMSF_ACT     MSFF0100    *YES       MSF Accounting Exit
   8 QIBM_QZMFMSF_ADR_RSL MSFF0100    *YES       MSF Address Resolution
   _ QIBM_QZMFMSF_ATT_CNV MSFF0100    *YES       MSF Attachment Conversion
   _ QIBM_QZMFMSF_ATT_MGT MSFF0100    *YES       MSF Attachment Management
   _ QIBM_QZMFMSF_ENL_PSS MSFF0100    *YES       MSF Envelope Processing
   _ QIBM_QZMFMSF_LCL_DEL MSFF0100    *YES       MSF Local Delivery
   _ QIBM_QZMFMSF_LST_EXP MSFF0100    *YES       MSF List Expansion
   _ QIBM_QZMFMSF_MSG_FWD MSFF0100    *YES       MSF Message Forwarding
   _ QIBM_QZMFMSF_NON_DEL MSFF0100    *YES       MSF Non Delivery
   _ QIBM_QZMFMSF_SEC_AUT MSFF0100    *YES       MSF Security and Authority
   _ QIBM_QZMFMSF_TRK_CHG MSFF0100    *YES       MSF Track Mail Message Change
   _ QIBM_QZMFMSF_VLD_TYP MSFF0100    *YES       MSF Validate Type
                                                                     More...
 Command
 ===> _____
 F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel
```

Figure 21. Exit Point and Exit Point Program Provided by IBM

```
                          Work with Exit Programs

   Exit point:    QIBM_QZMFMSF_ADR_RSL      Format:    MSFF0100

   Type options, press Enter.
     1=Add    4=Remove    5=Display    10=Replace

                 Exit
               Program      Exit
   Opt         Number       Program          Library

   _              500        QCQAPRSL         QSVMSS
   _             1000        QZDSNPAD         QSYS
   _             1300        QTMMADRS         QTCP
   _             1600        QTMMCCAD         QTCP
   _             2000        QZMFSNPA         QSYS




                                                                    Bottom
   Command
   ===>
   F3=Exit    F4=Prompt    F5=Refresh    F9=Retrieve    F12=Cancel
```

Figure 22. Exit Point and Exit Point Program Provided by IBM

Basic Operations

There are two basic operations in the mail server framework that you need to know:

- How to start the mail server framework
- How to end the mail server framework

Both cases have Control Language (CL) commands to perform the function.

How to Start the Mail Server Framework

To start the mail server framework, use the Start Mail Server Framework
(STRMSF) command with the following parameters (see Figure 23 on page 58).

- **MSGOPT** (How to process the mail message): This parameter has three
  options.

  - *RESUME: Allow the processing of the existing mail server framework
    messages from the point where the mail server framework was ended.

  - *RESET: The mail server framework reprocesses all of the existing mail
    server framework messages.

  - *CLEAR: This option deletes all the existing mail server framework
    messages. This option is used for some error conditions. The messages
    cannot be recovered after this option is used.

- **NBRMSFJOB** (Number of mail server framework jobs): This parameter is used
  to allow the processing of several mail server framework messages at the same
  time.

  The number of mail server framework jobs started by default when the
  STRMSF command is executed is three, and these jobs are handled by the
  QSYSWRK subsystem. To change this number, enter the STRMSF
  NBRMSFJOB(n) command, where *n* is the number of jobs that run
  concurrently.

When the system is IPLed, one mail server framework job under the
QSYSWRK subsystem is started by default. To change that number, use the
following command:

```
CHGJOBD JOBD(QSYS/QZMFEJBD) RQSDTA('STRMSF MSGOPT(*RESUME) NBRMSFJOB(1)')
```

```
                      Start Mail Server Framework (STRMSF)

 Type choices, press Enter.

  How to process mail messages . . MSGOPT          *RESUME
  Number of MSF jobs . . . . . . . NBRMSFJOB        3_____


                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 23. Start Mail Server Framework Display

How to End the Mail Server Framework

This command ends all the mail server framework jobs in the QSYSWRK
subsystem. All of the jobs are restarted when the mail server framework itself is
restarted. The command used to end the mail server framework is the End Mail
Server Framework (ENDMSF) command. The parameters for this command are
shown in Figure 24.

- **OPTION** (How to end): This parameter is used to end the jobs immediately or
  in a controlled manner.

   - *CNTRLD: Allows the mail server framework jobs to finish processing
     before they end.

   - *IMMED: This option ends all the mail server framework jobs immediately.
     The jobs are restarted when the mail server framework is restarted if
     *RESUME is used on the restart.

- **DELAY** (Delay time): This parameter is used to specify the maximum time that
  the mail server framework jobs can take to finish their processing. This
  parameter is only used if the end option is *CNTRLD.

```
                    End Mail Server Framework (ENDMSF)

 Type choices, press Enter.

  How to end . . . . . . . . . . .   *CNTRLD        *CNTRLD, *IMMED
  Delay time, if *CNTRLD . . . . .   30             1-999999

                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 24. End Mail Server Framework Display

System Distribution Directory

The system distribution directory is supplied with OS/400. There may be other directories that exist on the AS/400 system but there is only one system distribution directory.

The directory contains a collection of entries for users on both the local system and remote systems that are authorized to send and receive distributions on the network. Distributions are defined to be messages, data, or objects that are sent between network users.

The information from the system distribution directory is used to determine the correct actions for the user (for example, where to store the mail/message, how to distribute, and so on).

Each entry in the system distribution directory contains information about network users. This information includes the user's ID and address along with a textual description. Optional fields for each entry specify information such as the user's e-mail address (for example, X.400 O/R address or SMTP address). An entry can be for a specific user or for a group of users.

Two types of users are handled from the system distribution directory:

- Remote user: This user can sign on to a system other than the one containing the system distribution directory entry.

  Note: Remote SMTP user addresses are **not required to be configured** in the system distribution directory. The **only** reason to define a remote SMTP address in a system distribution directory is when there is a **requirement** to have an "alias" UserID Address that must be mapped to a specific SMTP address so that an OV/400 user can send mail to the SMTP address and use the "alias" UserID Address.

- Local user: This user can sign on to this system containing the system distribution directory entry.

  All local OV/400 and POP3 users are **required** to be configured in the system distribution directory.

Working with the AS/400 System Directory

```
                    Work with Directory Entries

Type options, press Enter.
  1=Add      2=Change   4=Remove    5=Display details   6=Print details
  7=Rename   8=Assign different ID to description   9=Add another description

Opt  User ID   Address   Description

 1   _____   _____

     USERID08  SYSAV3R7  Tim Cunningham    3-6088 G215   USERID11 WBL123196
     USERID09  SYSAV3R7  Marianne Rosin    3-6088 G215   USERID11 WBL123196
     USERID11  SYSAV3R7  Happy Just d.l.P. 3-6088 G215   USERID11 WBL123196
     USERID15  SYSAV3R7  Rolando Figueroa  3-6088 G215            WBL123196
     LABUSER   SYSAV3R7  LABUSER
     MRK       SYSAV3R7  Marv on SYSAV3R7
     NICKHUTT  SYSAV3R7  Nick Hutt
     NTW01     SYSAV3R7  NTW01
     NTW02     SYSAV3R7  NTW02
     NTW03     SYSAV3R7  NTW03
     NTW04     SYSAV3R7  NTW04
                                                                   More...
 F3=Exit      F5=Refresh   F9=Work with nicknames   F11=Sort by description
 F12=Cancel   F13=Work with departments   F17=Position to   F24=More keys
```

Figure 25. Work with Directory Entries (WRKDIRE)

Take option 1 (Add) on the first line of the display and press the Enter key. The
"Add Directory Entry" display is activated.

```
                         Add Directory Entry

 Type choices, press Enter.

   User ID/Address: . . . .   PCHAPPOP   SYSAV3R7
   Description:. . . . . .    Happy Just de la Paisieres, POP3-SMTP client
   System name/Group . . .    SYSAV3R7               F4 for list
   User profile  . . . . .    PCHAPPOP               F4 for list
   Network user ID . . . .

   Name:
     Last  . . . . . . . .
     First . . . . . . . .
     Middle  . . . . . . .
     Preferred . . . . . .
     Full  . . . . . . . .

   Department  . . . . . .                          F4 for list
   Job title . . . . . . .
   Company . . . . . . . .
                                                                   More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F18=Display location details
 F19=Add name for SMTP   F20=Specify user-defined fields
```

Figure 26. Add Directory Entry (ADDDIRE) - Display 1

Fill in the required fields that are described:

User ID/Address: The unique user ID and address has to be used for a local user. We recommend that the user ID is the same as the user profile whenever possible. For remote users, you can either use the unique ID and address and add each user or use a *ANY entry for the user ID to make distribution for all users of this remote system possible.

Systemname/group: The display automatically contains the system name for your local system. This system name is used for a local user. For a remote user entry, enter the system name and if the system being referred to uses the system group in addition to the system group name, the systemname/group must exactly match the routing table entry (for SNADS).

User profile: If the entry is for a local user, you must enter the user profile for that user.

Page forward to see the display in Figure 27.

```
                             Add Directory Entry

  Type choices, press Enter.

   Mail service level  ..   2                   1=User index
                                                2=System message store
                                                3=Other mail service
      For choice 3=Other mail service:
        Field name  . . . .                     F4 for list

    Preferred address . . .   3                 1=User ID/Address
                                                2=O/R name
                                                3=SMTP name
                                                4=Other preferred address
      Address type  . . . .                     F4 for list
      For choice 4=Other preferred address:
        Field name  . . . .                     F4 for list



                                                                    More...
   F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F18=Display location details
   F19=Add name for SMTP    F20=Specify user-defined fields
```

Figure 27. Add Directory Entry (ADDDIRE) - Display 2

Please note the **F19=Add name for SMTP** function key.

Mail service level: The mail service level indicates where mail is stored within your system.

1 = User index. The mail is stored in a user index. That is the way network files and OfficeVision/400 mail are stored. This is required for OV/400 mail users. The user index (*DRX) is an internal object in library QUSRSYS. The *DRX contains an entry for each incoming distribution and for each incoming document distribution. The *DRX also contains entries for outgoing distributions when the sending user requests confirmation of delivery or when an error occurs during the distribution. These entries stay on the *DRX until deleted by either the end user or through the CL commands (DLTDST) or RCVDST KEEP(*NO) for incoming distributions. If library QUSRSYS is lost, cleared, or deleted, the *DRXs are lost. The *DRXs can be restored by using the save/restore function for mail. If the system directory files

are restored, the *DRXs are re-created when needed. The *DRX is deleted when a user is removed from the system distribution directory.

For more information, see the *OfficeVision/400 Programmers* guide.

2 = System message store. The mail is stored on the system supported message store and can be accessed by a POP3 client.

The messages are stored within the Integrated File System (IFS). The integrated file system is a part of OS/400 that supports stream input/output and storage management similar to personal computer and UNIX operating systems while providing an integrating structure over all information stored in the AS/400 system. The key features of the integrated file system are:

- Support for storing information in stream files that can contain long continuous strings of data. These strings of data might be, for example, the text of a document or the picture elements in a picture. *The stream file support is designed for efficient use in client/server applications.*

- A hierarchical directory structure

- A common interface that allows users and applications to access not only the stream files but also database files, documents, and other objects stored in the AS/400 system.

3 = Other mail service. Other mail service support must be previously installed. The user-defined fields must be added with a filed type of *MSFSRVLVL (Mail Server Frame Work Service Level, see the user-defined fields that can be used with the Change System Directory Attributes (CHGSYSDIRA) command before you can use this function). That is the way Lotus Notes SMTP MTA clients store their mail.

Preferred address: The preferred address tells the Mail server framework what fields to use in the system distribution directory for the address.

1 = User ID/Address. Used for OfficeVision/400 and SNADS.

2 = O/R name. X.400 O/R name is preferred.

3 = SMTP name. Only valid in conjunction with an SMTP address. To add an SMTP address, use F19=Add name for SMTP.

4 = Other preferred address. Indicates a preferred address has been defined as a user-defined field with *ADDRESS.

Within the system distribution directory, you can only enter a SNADS address. USERID and USER ADDRESS are limited to eight characters each and certain special characters are not supported. To send mail to an SMTP user, you need to have an SMTP address that is also comprised of two parts: SMTP user ID and SMTP domain. But the SMTP user ID can be up to 24 characters and the SMTP domain name up to 255 characters; however, the combined length of both cannot exceed 255 characters. This two part name is also referred to as an alias. To participate in the communication functions such as SMTP and OfficeVision/400, the user must be enrolled in the system distribution directory with a SNADS name and an entry in the system alias table must be added so a conversion process that is called **alias** can be used.

If you are using the Work with Directory Entries (WRKDIRE) command, use the **F19** (*Add name for SMTP*) to define your SMTP User ID and SMTP domain. **F19** displays the Work with Names for SMTP (WRKNAMSMTP) command for you and a display similar to the one in Figure 28 on page 63 is shown.

```
                             Add Name for SMTP
                                                    System:    SYSAV3R7
   Type choices, press Enter.

     User ID . . . . . . . . .    PCHAPPOP    Character value, *ANY, F4 for list
     Address . . . . . . . . .    SYSAV3R7    Character value, F4 for list



     SMTP user ID  . . . . . .    Happy_Just
     SMTP domain . . . . . . .    SYSAV3R7.IBMITSC.IBM.COM
   _____
   _____
   _____

     SMTP route  . . . . . . .     _____
   _____
   _____
   _____



     F3=Exit    F4=Prompt    F12=Cancel
```

Figure 28. Add Name for SMTP

The name you enter for *SMTP User ID* can be the same, but does not have to be the same as the name in *User ID*. Actually, in most cases, the User ID part of an SMTP address is a longer name (in many cases, even the person's real first and last name with an underscore (_) special character separating both parts instead of spaces). The name must, however, match exactly the name used in an SMTP address to send mail to this person. That is, for incoming SMTP mail, OS/400 searches for this name and for outgoing mail the *SMTP User ID* forms the part of the SMTP address on the left side of the at-sign (@).

The contents of the *SMTP domain* field forms the part of the SMTP address on the right side the at-sign (@). For local users to receive SMP mail, the *SMTP domain* must be equal to the TCP/IP host name[2] of this AS/400 system.

However, the display shown after pressing **F19** may also look the same as the one shown in Figure 29 on page 64. This is the case if you converted the SMTP alias table to system distribution directory "user-defined"[3] fields using the Convert SMTP Names (CVTNAMSMTP) command. Without converting, the contents of the *SMTP User ID* field cannot be longer than 24 characters; after converting the SMTP table, you can have user IDs with a length of up to 64 characters. See "Directory

---

[2] However, the term *domain* implies that this address can also be used to specify multiple systems; in such case, it is *one of* the host names on this system. See "How An AS/400 System is Known by Many SMTP Domain Names" on page 186 for more information.

[3] The term user *defined* may be confusing; since these fields are not defined by a user, the system is rather using the facility *user-defined fields* to create new fields within the directory for the purpose to store the SMTP information instead of using a separate table.

Conversion" on page 64 for more information on how and why you want to convert the system distribution directory.

```
                    Specify User-Defined Fields

 Type choices, press Enter.


      SMTPAUSRID  SMTP    Happy_Just_____
 _____
 _____
 _____
 _____
 _____
 _____
 _____


      SMTPDMN    SMTP    SYSAV3R7.IBMITSC.IBM.COM_____
 _____
 _____
 _____
 _____
 _____
 _____
 _____

                                                           More...
 F3=Exit   F5=Refresh   F12=Cancel
```

Figure 29. SMTP Names in System Distribution Directory after Converting

Directory Conversion

As shipped with the TCP/IP Utilities licensed program product on the AS/400 system, SMTP/MIME support defines its own system alias table and personal alias table objects. This is a separate object from the system distribution directory. This is due mostly to the requirements to support a previously released function that takes advantage the format of the alias table files.

The system alias table and system distribution directory are linked by a common UserID/Address "key" although every entry in the system alias table does not have to appear in the system distribution directory (and vice versa).

It is possible to *convert* the system distribution directory and alias tables so that they are combined into the system distribution directory. This can almost be thought of as a logical "join" on the UserID Address fields. Entries in the system alias table that are not "joined" with a corresponding system distribution directory entry are effectively not used. The result of the conversion is that the system distribution directory has three new user-defined fields that contain the SMTP user name and SMTP Domain that used to be configured for in the system alias tables. Also as a result of the conversion, the system alias tables as well as the personal alias tables function are disabled for that AS/400 system.

The advantages and disadvantages of conversion are shown in the following list:

Advantages of Conversion
- Once converted, all the e-mail addresses are in the same directory. There is less chance of a problem that is caused when the alias table object or system distribution directory is restored independently and some entries that should be in both tables are not in one of the saved copies that was restored.

- Longer SMTP IDs are available (64 characters after converting, versus 24 before).
- SMTP aliases can be shadowed to other AS/400 systems as part the system distribution directory shadowing.
- Updating, changing, or removing an SMTP address can now be done with a program using the following commands:
  - Change Directory Entry (CHGDIRE)
  - Add Directory Entry (ADDDIRE)
  - Remove Directory Entry (RMVDIRE)

Disadvantages of Conversion

- SMTP **personal aliases** are not converted and are also not **disabled**. This is only an issue if using OfficeVision or JustMail on that AS/400 system
- The Work with Names for SMTP (WRKNAMSMTP) command is no longer available (you see message TCP9610).
- **Conversion is not reversible.**
- The size of the system distribution directory is increased; depending on the amount of entries, the performance of the functions that use it may be affected.

Performing the Convert SMTP Names (CVTNAMSMTP) Command

By default, SMTP addresses are kept in separate file objects from the system distribution directory. The UserID and Address is used as a common "key" to determine which system distribution directory entries have an SMTP address configured in an "SMTP Alias Table".

A *conversion* function is available to merge SMTP Alias Table entries into the system distribution directory.

To determine if the conversion has already been performed, run **WRKNAMSMTP**. If disabled (that is, you receive error message TCP9610), the SMTP alias tables have already been converted.

If it might be necessary to "unconvert"[4] the directory and alias tables, follow these steps *before converting*:

1. Type the following command:

   ```
   CPYF FROMFILE(QUSRSYS/QATMSMTPA) TOFILE(privatelib/QATMSMTPA) CRTFILE(*YES)
   ```

   to save a copy of the alias table in a private library.

2. Type the following command:

   ```
   CHGPF FILE(privatelib/QATMSMTPA) MAXMBRS(*NOMAX)
   ```

To convert, run **CVTNAMSMTP** to start the conversion. The following lines are shown:

---

4 Note though that this is not a supported procedure.

```
> cvtnamsmtp
  Conversion of SMTP aliases started.
  Directory attributes changed.
  Directory entry for *ANY CASNET was changed.
  Directory entry for *ANY ILICSMTP was changed.
  Directory entry for *ANY ILIC2 was changed.
  Directory entry for POPBSIR DALN50SR was changed.
  Member SYSALIASES file QATMSMTPA in QUSRSYS cleared.
  Data area QTMCVTSMTP created in library QUSRSYS.
  Ownership of object QTMCVTSMTP in QUSRSYS type *DTAARA changed.
  Conversion of SMTP aliases completed successfully.
```

To verify that the conversion completed, use the **WRKNAMSMTP** command. The message "WRKNAMSMTP command disabled." should be shown.

To undo SMTP conversion, perform the following steps:

1. Type the following command:

   ```
   CPYF FROMFILE(privatelib/QATMSMTPA) TOFILE(QUSRSYS/QATMSMTPA)
   FROMMBR(SYSALIASES) MBROPT(*REPLACE) CRTFILE(*NO)
   ```

   to copy the member from the saved copy of the alias table to the production copy

2. Type the following command:

   ```
   CHGPF FILE(QUSRSYS/QATMSMTPA) MAXMBRS(1)
   ```

   to restore the original setting

3. Type the following command:

   ```
   DLTDTAARA(QUSRSYS/QTMCVTSMTP)
   ```

   to delete the data area that is the indicator to most programs that conversion has been done.

4. Type the following command:

   ```
   WRKNAMSMTP
   ```

   to add an entry so the file member SYSALIASES is changed.

5. Type the following command:

   ```
   CHGSYSDIRA USRDFNFLD((SMTPAUSRID SMTP *RMV *DATA 064)
   (SMTPDMN SMTP *RMV *DATA 256) (SMTPRTE SMTP *RMV *DTA 256))
   ```

   to erase the directory user-defined fields used during shadowing.

6. Type the following command:

   ```
   WRKREGINF
   ```

   to find QIBM_QOK_VERIFY, the exit program that verifies shadowed directory entries. Type 8 (Work with the exit program); then type 4 (Remove the exit program).

Note: Any changes made to SMTP names in the directory while shadowing was on are lost.

Summary of Different Mail Types in the AS/400 System Directory

```
Type of Mail User              System Directory Entry

OV/400 User                    Mail Service Level = 1 (User Index)
                               Preferred Address = 1 (User
                               ID/Address)

AS/400 POP3 User               Mail Service Level = 2 (System
                               Message Store)
                               Preferred Address = 3 (SMTP Name)

External Internet User         Mail Service Level = 2
                               Preferred Address = 3 (SMTP Name)

Lotus Notes User on IPCS       Mail Service Level = 4 (Other Mail)
                               Preferred Address = 3 (SMTP Name)
```

You can use F19=Add/Change SMTP name to update the SMTP UserID/SMTP
Domain if you use the WRKDIRE with option 1=Add or option 2=Change.

Mail Service Level 1 is an OfficeVison/400 enrolled user. For mail service level 3,
you must use F19 to enter the SMTP UserID and domain name or it does not work.
A Lotus Notes user is a user that was registered with the ADDNTSUSR (Add Notes
User) command.

Not shown in the preceding table are special cases of system distribution directory
entries such as those that might be added to do address forwarding or context
switching. See the appendixes of this redbook for more on some of these special
case system distribution directory entries.

Note: The special case of an indirect user (this is a local user who does not sign
and the mail is automatically printed) is not relevant for the theme of this book.

Chapter 5. AS/400 System as Mail Server for Any POP3 Client

This chapter describes the general e-mail environment in relation to the AS/400 system. The existing mail server framework facility and the enhanced TCP/IP function, together with the new POP3 server implementation, define the AS/400 system as a scalable e-mail server. The POP3 server function is available with V3R2 and V3R7.

At the client side, there are many POP3 client implementations. This chapter also covers these implementations in general.

Today's E-Mail Landscape

Many corporations have implemented two or more different electronic mail (e-mail) systems in their organization. Managing this heterogeneous environment with conflicting formats, protocols, and services can be difficult. On the other hand, e-mail is becoming an essential business tool to handle the workflow and processes in the organization more efficiently.

With the enhancements made in V3R2 and V3R7, the AS/400 system can expand its role as a scalable mail server and message handling server for non-programmable terminals and PC clients. To allow AS/400 systems to act as mail servers in the world of Internet and multimedia e-mail for a wide variety of e-mail clients, it must meet the popular Internet standard interface for mail servers.

This common interface is called Post Office Protocol (POP). This protocol describes how a mail program running on an end-user workstation may receive mail stored on a mail server system. In other words, the destination for e-mail is not a client but a server that receives mail on behalf of the client. The POP protocol defines how a client interacts with the POP server. The clients can run on Windows, OS/2, UNIX, and MacIntosh platforms. The latest version of POP (Version 3) is recommended. The POP Version 3 mail interface is defined in RFC 1725 (request for comment, a protocol recommended by the Internet Architecture Board).

The **POP3 Server** is a simple store-and-retrieve mail system and manages temporary electronic **mailboxes** for the POP3 users' mail. The mail is stored until the client retrieves the mail from the mailbox when it is connected and requests a deletion. The mail remains in its original form (ASCII) while it is stored on the AS/400 system in the POP3 server.

In the RFCs, sometimes the mailbox managed by a POP3 server is referred to as *maildrop*.

The message or mail sent by a POP3 client is transferred to the POP3 server using the Internet's standard messaging protocol, called Simple Message Transfer Protocol (SMTP). If the content of the SMTP message is other than plain text, the content is encoded in Multipurpose Internet Mail Extensions (MIME).

Multipurpose Internet Mail Extensions (MIME) is another Internet standard for sending mail with headers that describe the contents of the mail messages to the

receiving client. This is helpful to send different types of mail attachments such as video, audio, image, binary files, enriched text, or text messages between mail systems. POP3 servers support MIME.

The term POP or POP3 is used throughout this chapter and should be considered synonymous.

The World of POP3 Clients

Among the wide variety of POP mail clients, you can choose several popular clients to attach to an AS/400 server and receive their mail.
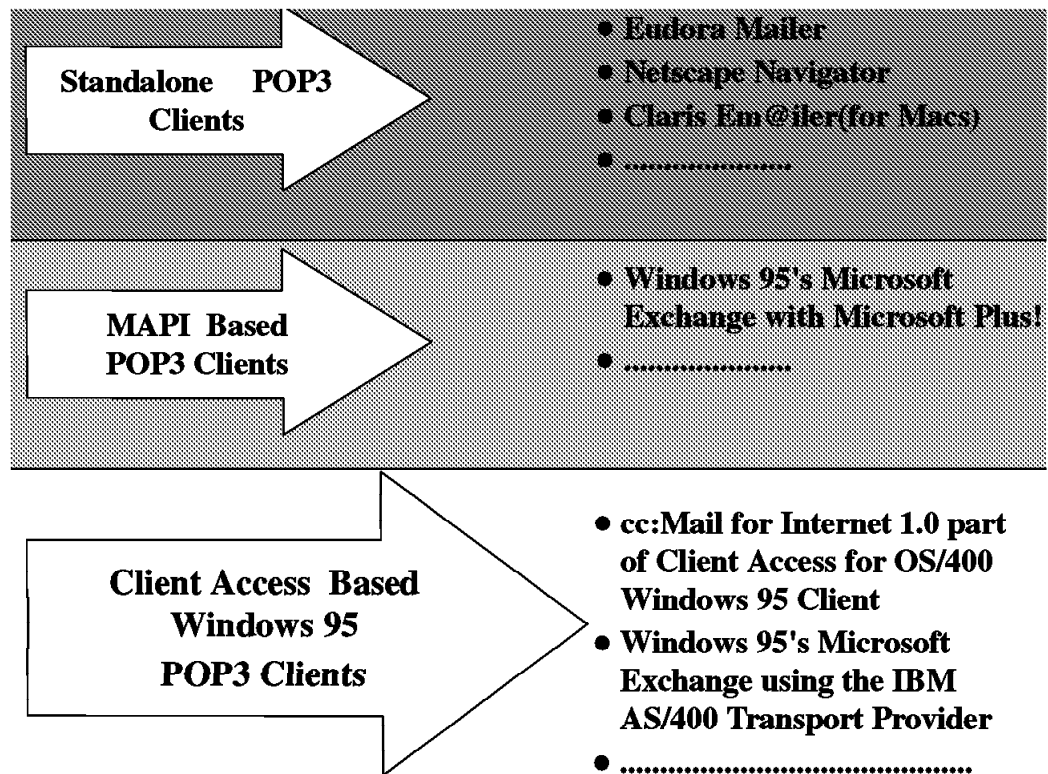

Figure 30. Overview of Available POP Clients

The available POP3 clients can be divided in two categories:

- POP3 clients
- Client Access based Windows 95 clients

POP3 Clients

The term **POP3 client** describes the kind of POP3 clients that are using POP3 support as described in RFC 1725.

They can be *stand-alone* POP3 clients or they can be *MAPI based* POP3 clients.

The MAPI implementation is the standard that Microsoft announced for mail clients to use the messaging framework for Windows 95 clients.

Figure 31 on page 71 shows a simplistic relationship between the client application/protocol layers and the AS/400 POP server interface. Pay attention to the fact that in this environment, the interface is defined at the server side, <u>not</u> at the client side. So the AS/400 POP3 server can accept mail exchange with any POP3 client that conforms to the standard POP3 client definition.

Another fact is that the standard POP3 client can run on any available operating system on the PC such as OS/2 Warp, Windows 3.1, Windows 95, and Windows NT.
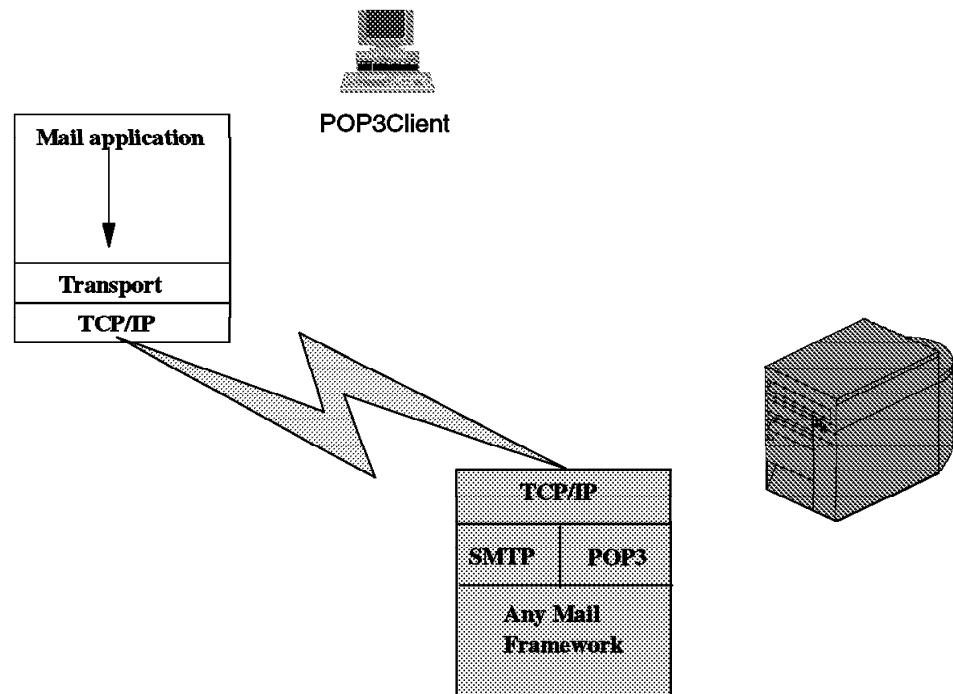

Figure 31. Relation Standard POP Client to POP Server

Some examples of standard stand-alone POP clients are:

- Eudora mailer
- Netscape Navigator
- Claris Em@iler (for Macs)
- Warp Ultimail-lite

An example of a standard MAPI based POP client is Microsoft's Internet Mail for Windows 95. This product comes with the Microsoft Plus! package.

Client Access Based Windows 95 Clients

The Client Access based Windows 95 client is implemented by IBM for exchanging Mail with the AS/400 system. The POP3 server is enhanced by implementing extended functions. The verb flow between the Client Access based Windows 95 client and the POP3 server can, in addition, use the extended functions. At the client side, the mail application uses the MAPI service providers such as the *Transport provider* and the *AS/400 Address Book provider*. Refer to "MAPI Architecture" on page 123 for more information. These services are installed on

the client as a result of the installation of either Client Access for OS/400 V3R1M1 Windows 95 client or the installation of cc:Mail for Internet 1.0, which is part of Client Access for OS/400.
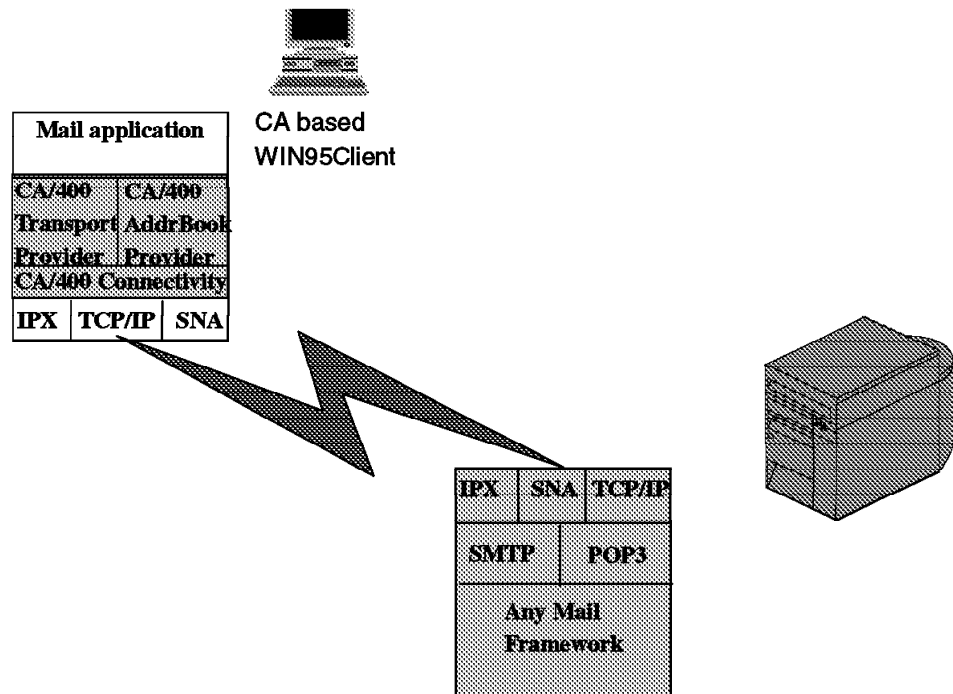

Figure 32. Relation Extended MAPI POP Client to AS/400 System

Examples of extended MAPI based POP clients are:

- Windows 95' Microsoft Exchange (requires Client Access for OS/400 or Windows 95 client V3R1M1 to connect to the AS/400 POP3 server - see "MAPI Architecture" on page 123)

- cc:Mail for the Internet Release 1.0

Looking at these mail products, you can distinguish two different implementations at the client side. The cc:Mail for Internet 1.0 (part of Client Access for OS/400 V3R1M1 Windows 95 client) is totally implemented by IBM. It uses the MAPI interface that is shipped with the Windows 95 operating system. The Microsoft Exchange product does not require the Microsoft Plus! package. Instead, it uses the IBM supplied transport provider and the AS/400 Address Book provider.

These clients run only with the Windows 95 operating system.

To summarize which request from the clients (sent mail, retrieve mail, or address book support) is supported and which support is used within the AS/400 system, see Figure 33 on page 73.

| Type of Client | MAIL | | | Address Book support |
| | Retrieve | Sent is handled from | | |
		SMTP	POP3	
POP3	●	●		
CA based TCPIP	●		●	●
CA based IPX	●		●	●
CA based SNA	●		●	●
Anynet TCIP/SNA	●	●		

Figure 33. Relation: POP Clients to AS/400 Support

AS/400 System as POP3 Mail Server

The **POP3 Server** is shipped and packaged with the TCP/IP (TC1) product (5716-TC1 for V3R7M0 and 5736TC1 for V3R2M0). It is a function of the base product similar to the FTP and SMTP components. This function has full POP client/server support and an additional National Language Version (NLV) support. The POP3 server provides a disconnected type of support through a dial-up TCP/IP connection. The AS/400 system supports the Serial Line Internet Protocol (SLIP) to allow remote systems to dial into the AS/400 system over a telephone line using a modem. Users can log on remotely through a modem and receive their mail from the POP server.

OV/400 users and POP clients can exchange mail (including MIME mail) by using the **AnyMail/400** Mail Framework. This is a mail distribution structure that is designed to provide transparent mail delivery across the spectrum of different mail services. In other words, AnyMail/400 Mail Framework helps to route mail within the AS/400 system. It contains a series of programming code to handle mail requests other than the traditional SNADS. The product 5763TC1/5716TC1 provides such programming code to the AnyMail Mail Framework.

Because the mail sent by POP3 clients goes through the AS/400 AnyMail Mail Framework, it is a built-in gateway function to SNADS networks and Facsimile Support/400.

AnyMail/400 Framework with the related exit programs provides a method for OfficeVision for OS/400 (OV/400) clients to send and receive **multimedia mail** objects using MIME messaging. Mail destined for OV/400 is processed into OV/400-compatible mail and OV/400 mail destined for MIME clients has the appropriate MIME headers added. See "The AnyMail Mail Server Framework" on page 51 for more information.

An important part of the integration for groupware applications on the AS/400 system is the AS/400 system distribution directory. The POP3 server uses the

system distribution directory for all e-mail addressing information. There are two different e-mail functions that require access to this addressing information:

- Address resolution
- Address Book presentation

Address resolution is a mail routing function within the AnyMail Framework that determines the destination for that message. This is based on the addressing information that is associated with an e-mail message. This resolution is derived from information in the system distribution directory of the AS/400 system.

Address Book presentation is a mail client user interface function that provides the user with access to the information in the address book available to that user. The user can address the mail by selecting from a list of persons in an address book. "Address Book" on page 117 covers more details about the Address Book architecture. An example of mail clients using the Address Book presentation is Client Access based Windows 95 clients.
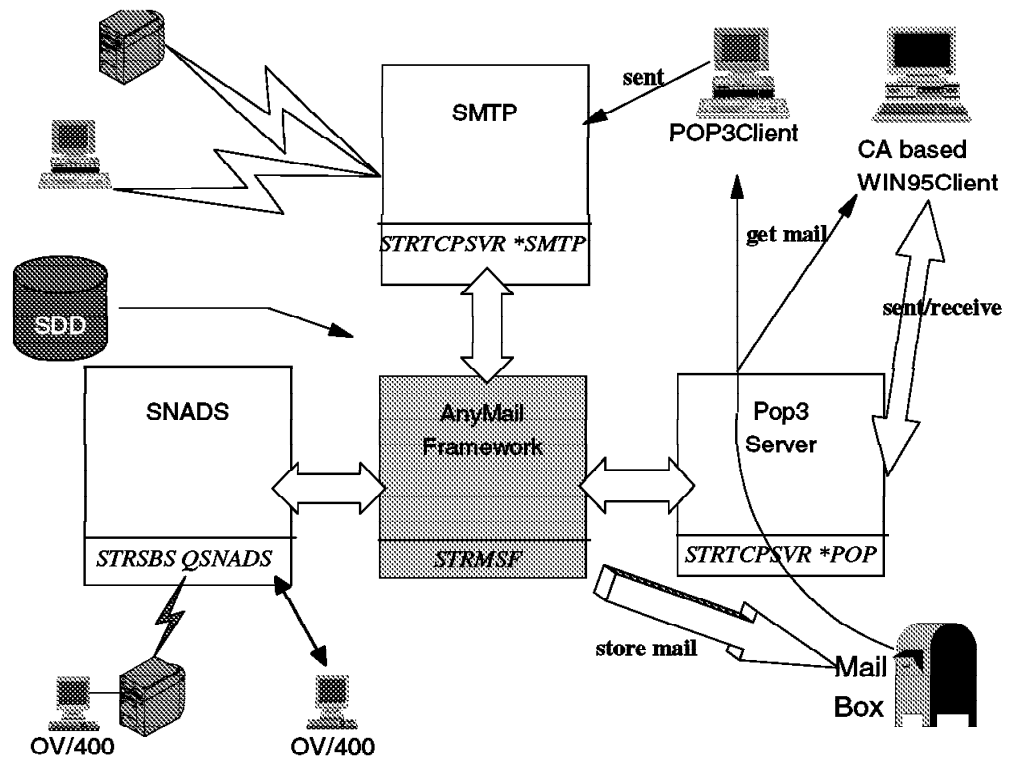

Figure 34. Pop3 Server Interactions

Figure 34 shows the interactions between POP3 clients and Client Access based Windows 95 clients with the AS/400 e-mail components.

In summary, with V3R2 and V3R7, a simple mail transport mechanism on the AS/400 system is implemented that allows exchange of mail between POP3 clients, OfficeVision for OS/400, MAPI based clients, SNADS, and SMTP mail systems. With this implementation, there is a seamless integration into the existing AS/400 system's e-mail infrastructure. Any POP3 client can exchange e-mail with OfficeVision/400 users without a separate gateway product.

The AS/400 system, with its AnyMail/400 Framework and the provided POP3 program exits, supports a broad range of mail clients.

Components of the POP3 Server

The POP3 server operates on the AS/400 system entirely above the Machine Interface (MI) and interfaces with other AS/400 components to provide inter-operability between the POP3 clients and SNADS type products such as OV/400. These components include SMTP, the AnyMail Framework, and TCP/IP through sockets.

Server Communications

This component takes care of the communications and data path to the POP3 clients to perform the mail functions on the AS/400 system. Furthermore, it implements POP3 verbs and extended functions for the Client Access based Windows 95 clients (see "AS/400 Support for Extended Functions" on page 117). The main part is the **POP3 Server** itself, which runs as multiple server jobs in subsystem QSYSWRK.

There is always one job in the **listen** state waiting on the TCP/IP port defined in the TCP/IP service table for POP3. The **Listen Job** is *standby* on the server job queue; it responds to the connection request and passes the listen socket to another server job and becomes *active*.
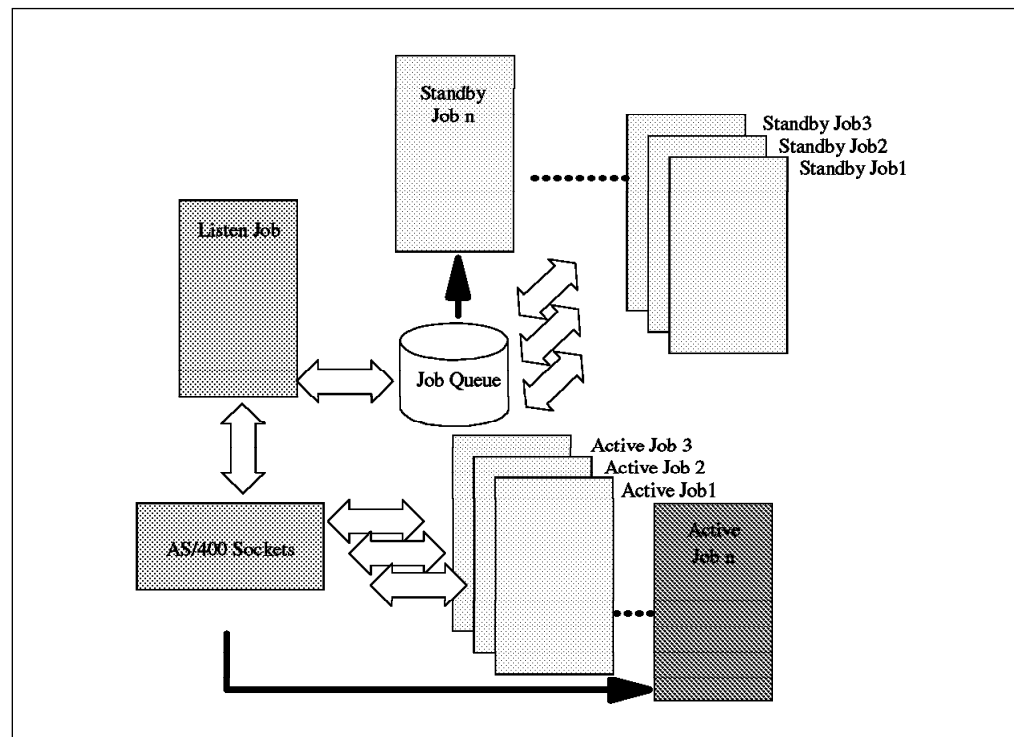

Figure 35. POP3 Server Job Structure

The initial job handles all of the client requests until a QUIT verb is received (see "Supported POP3 Verbs" on page 77). This causes the server job to terminate the connection, delete any messages that are marked for deletion, and puts itself back into the server job queue.

The POP3 server puts mail data into the AnyMail Framework.

The POP3 server provides a retrieve mail function for the POP3 clients that are attached to the AS/400 system. This means that the mail is delivered to a **POP Mailbox** that is unique to each client. The POP3 client can query and retrieve mail from its mailbox. The mailbox is not a permanent mail store for the client's information. It is a temporary storage place until the client requests to delete the mail.

The mailbox provides automatic support for disconnected clients because the client is connected to the server only during mail/receive. The POP Mailbox has a directory structure that is created under the IFS structure with the directory name /QTCPTMM. Figure 36 shows the mailbox directory structure.

```
                          Work with Object Links

  Directory  . . . . :   /QTCPTMM/MAIL

  Type options, press Enter.
    3=Copy    4=Remove   5=Next level    7=Rename    8=Display attributes
   11=Change current directory ...

  Opt    Object link           Type     Attribute     Text
         qlockbox              DIR
         USERID11              DIR
         USERID15              DIR
         PCHAPCCM              DIR




  Parameters or command
  ===>
```

Figure 36. Mailbox Structure under IFS Using Work with Object Links (WRKLNK) Command

Other directories that can be found under /QTCPTMM are /SMTPBOX, /ATTABOX, /ENCODE, and /TMP. These are temporary working directories. Under the specific user mailboxes, you can find the pending messages that were not retrieved from the recipient clients.

Chapter 6. The POP3 Environment

This chapter covers the e-mail capabilities of the AS/400 POP3 server and how it interacts with other AS/400 mail components such as OfficeVision for OS/400, SNADS, and SMTP. This is made possible by using the AS/400 AnyMail Mail Framework. This helps in routing the mail within the AS/400 system and takes care of mapping names when mail exchange takes place between TCP/IP and SNA based mailing. See Chapter 3, "Available Mail and Messaging Products for AS/400 Users" on page 45 for more information about the AnyMail Mail Framework.

Supported POP3 Verbs

To POP3 client software uses commands called *verbs* to allow transactions with the POP3 server. These verbs are defined in RFC 1725. Nine verbs are required and two are optional. The AS/400 POP3 server supports the eleven verbs described in Table 4.

Table 4. Supported POP3 Verbs

Verbs	Required	Description
USER	Yes	Identify user ID to POP3 server.
PASS	Yes	Give server your password for logon verification.
STAT	Yes	Queries number of messages in your mailbox and the total size of the messages in bytes.
LIST	Optional	Query the mailbox contents to learn the size and message ID for each message therein.
RETR	Yes	Retrieves the message from the POP3 server mailbox to the client.
DELE	Yes	Marks a message for deletion from your POP3 mailbox.
RSET	Yes	Un-marks any message marked for deletion.
TOP	Yes	Retrieves message header and data from the message.
UIDL	Optional	Queries the mailbox to obtain a unique ID for each message. This can be used for later connections to identify a message.
NOOP	Yes	Does nothing but a client/server handshake.
QUIT	Yes	Quit client session.

Figure 37 on page 78 shows a simple example of a verb flow sequence between a POP3 client and the AS/400 POP3 server.
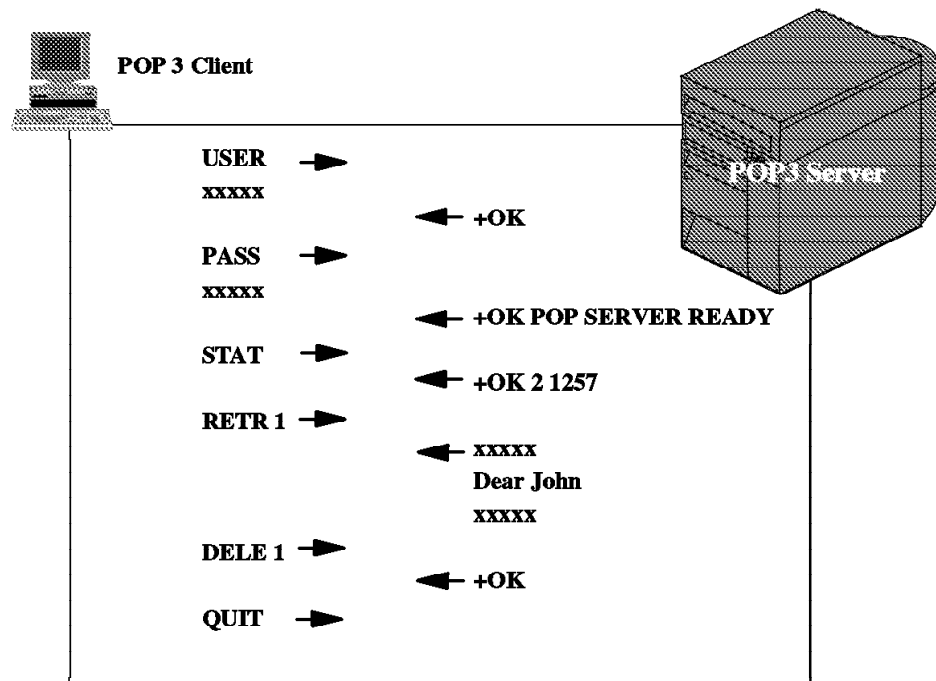
Figure 37. Verb Flow between POP3 Client and AS/400 POP Server

How the Mail Flows Through the AS/400 System

The following chapters describe the flow of mail to, from, and within the AS/400 system.

The focus is on:

* The mail flow from and to *local* POP3 clients.

* The mail flow from and to *remote* POP3 clients.

* From and to OfficeVision for OS/400 users sending or receiving mail from any POP3 Client.

The *local* POP3 Client and *remote* POP3 Client is the definition for which the AS/400 system is **the Mail Server** for this POP3 Client (the *local* AS/400 system or any *remote* system).

Keep in mind that this is not the type of connection! A *local* POP3 client can be connected with a LAN, WAN, intranet, or Internet and may not be at the same physical location.

Mail Flow to Local POP3 Client

Figure 38 shows the steps for the incoming mail flow from any POP3 client to a local POP3 client.

The incoming mail can come from a local client or from a POP server any place in the Internet or intranet.

1. The mail (with or without MIME attachments) that is addressed to a *local* POP3 client is sent to SMTP.

2. SMTP checks the recipients host name to determine that this is for a *local* POP3 Client. In this case, the mail data is routed into the AnyMail Framework.

3. AnyMail Framework handles the mail and checks the information from the system distribution directory for instructions to store the mail. In this case, the mail service level is the system message store.

4. AnyMail Framework puts the data into the recipient's mailbox. In case the mailbox does not exist, the first time mail is received, a mailbox is created.

5. The mail remains in the mailbox until the client makes a connection with the AS/400 system.

6. The receiving POP3 client makes the connection to the POP3 server and retrieves the mail. After successful transmission, the POP3 client sends a request to the POP3 server to mark the data for deletion. The POP3 server deletes the mail after the POP3 Client ends the session.
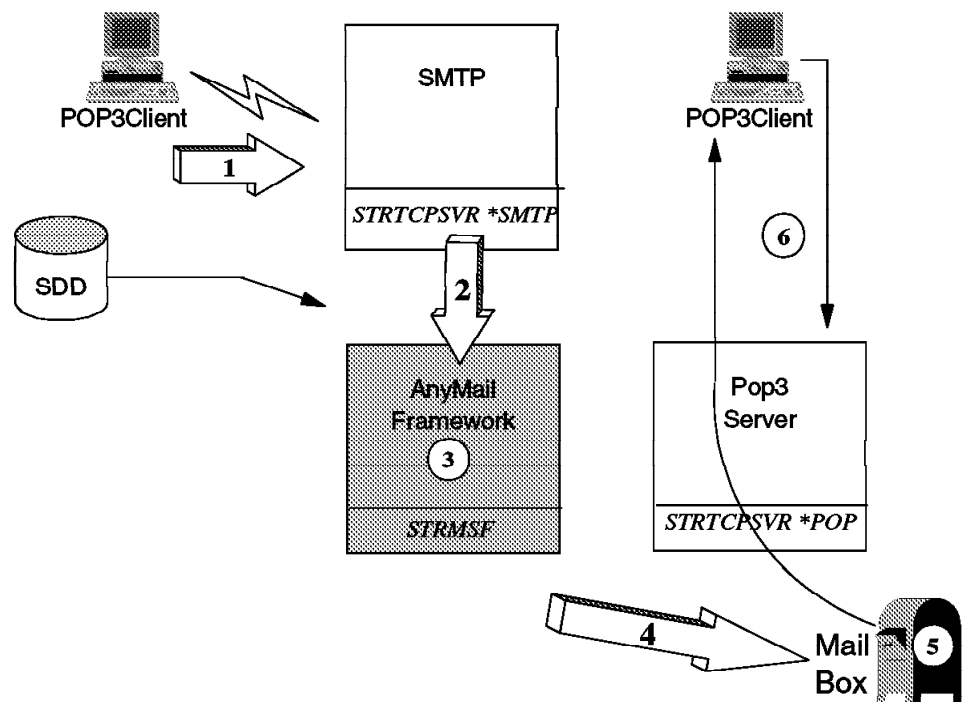

Figure 38. Mail Flow to Local POP3 Client

Mail Flow to Remote POP3 Client

Figure 39 shows the steps for the incoming mail flow from a POP3 client to a remote attached POP3 client.

The remote attached client can be located in WAN or in the Internet or Intranet.

1. The mail (with or without MIME attachments) is sent from a POP3 client to another POP3 client. SMTP is the interface within the AS/400 system.

2. SMTP checks if the mail is for this system (host name). In this case, it is not for this system. No other function such as SMTP is involved.

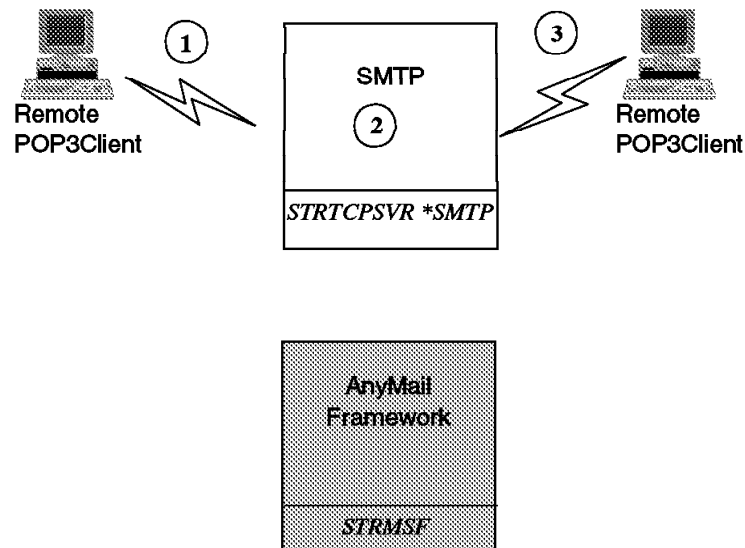3. SMTP passes the mail to the destined remote mail server.

Figure 39. Mail Flow to Remote POP3 Client

Mail Flow - POP3 Client to OfficeVision/400 User

Figure 40 on page 81 shows the steps for the mail flow from a POP3 client to a local OfficeVision/400 user or a remote SNADS node (for example, MVS or AS/400 system):

1. Mail (with or without a MIME attachment) is sent from a POP3 client to SMTP.

2. SMTP checks if the mail is for this system (host name) or if it can be handled from SMTP. In this case, it routes the mail data into the AnyMail Framework.

3. AnyMail Framework handles the mail and checks the system distribution directory, which recognizes that this mail is for an OV/400 user (mail service level = User index). All conversion from ASCII to EBCDIC is done. Plain text

results in a Final Format Text (FFT) OfficeVision document and every MIME attachment (non-text) results in a document with a type of PC file.

4. To deliver the OV/400 mail, the data is routed to SNADS.

5. Depending on the location of the OV/400 recipient, SNADS delivers locally or forwards the mail to the remote system. The FFT mail and the PC files (if they exist) are placed on the SNADS distribution queue in the QSNADS subsystem.

6. The SNADS sender sends the data out of the queue to the local OfficeVision for OS/400 user or the remote SNADS node.
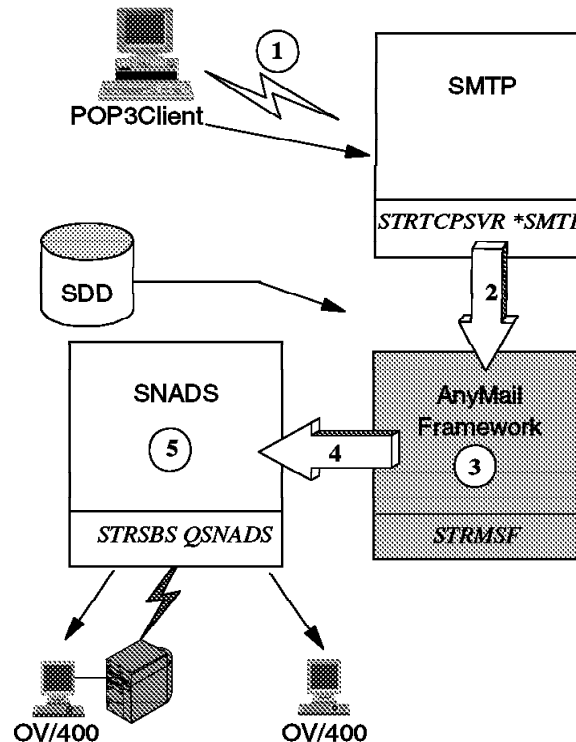

Figure 40. Mail Flow between a POP3 Client and OfficeVision/400 User

Mail Flow OV/400 User to Local POP3 Client

Figure 41 on page 82 shows the steps for the mail flow from an OfficeVision/400 user to a local POP3 client.

1. Mail is sent from an OfficeVision/400 user and put into the SNADS distribution queue.

2. The SNADS sender sends the data into the AnyMail Framework.

3. The AnyMail Framework checks that this is for a local POP3 client (local system distribution directory entry and mail Service level = 3 (system message store). The mail data is converted from EBCDIC to ASCII and the MIME Note created.

4. AnyMail Framework moves the data into the recipient's mailbox.

5. The mail remains in the recipient's mailbox until the client sets up the connection with the AS/400 system.

6. The POP3 Client sets up the connection.

7. It retrieves the mail from its mailbox and then requests that the POP3 server marks the data for deletion. The POP3 Server deletes the mail after the POP3 client ends the session.
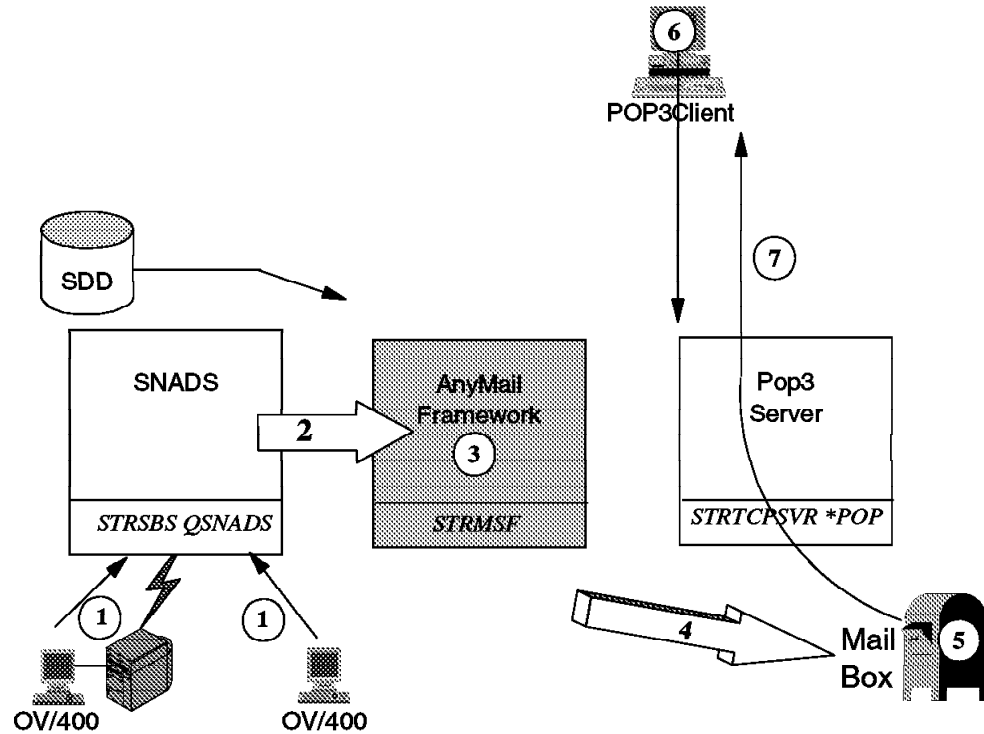

Figure 41. Mail Flow between OfficeVision/400 and Local POP3 Client

Mail Flow from an OV/400 User to Remote POP 3 Client

Figure 42 on page 83 shows the steps for the mail flow from an OfficeVision/400 user to a remote POP3 client.

1. Mail is sent from an OfficeVision/400 user and put into the SNADS distribution queue.

2. The SNADS sender sends the data into the AnyMail Framework.

3. The AnyMail Framework checks the system distribution directory entry preferred address = SMTP. The Host.Domain indicates that this is a remote address. The mail data is converted from EBCDIC to ASCII and the MIME Note created.

4. AnyMail Framework places the mail on an SMTP queue for transmission.

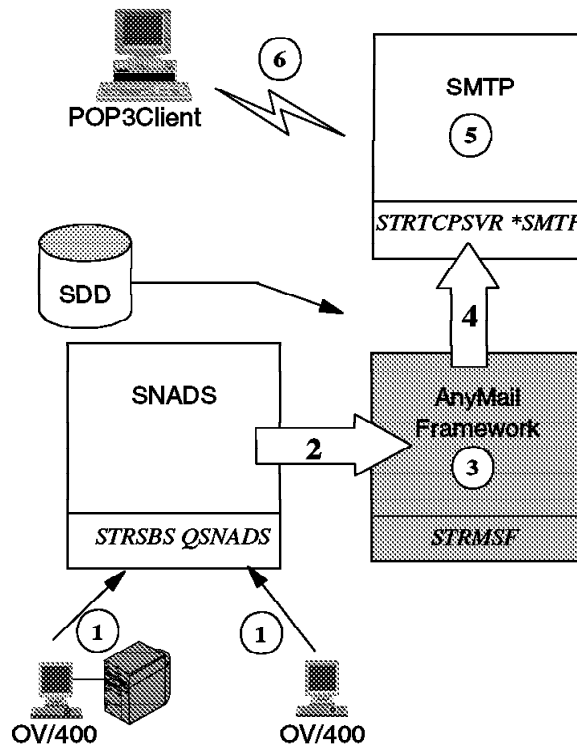5. The mail is forwarded to the POP3 recipient's mail server.

Figure 42. Mail Flow between an OV/400 Client and Remote POP3 Client

Installation and Configuration on the AS/400 System

The following steps are required to establish the AS/400 system as a POP3 server.

1. Check that the required AS/400 software is installed.

2. Configure TCP/IP and SMTP.

3. Check the configuration of the POP Server.

4. Add users to the AS/400 system distribution directory.

5. Start the required AS/400 software.

Required AS/400 Software

The following AS/400 Licensed Program Products (LPPs) are required to have the AS/400 system act as a POP3 server for POP3 clients.

Table 5. Required Software for the AS/400 System		
Description	**For V3R7M0**	**For V3R2M0**
TCP/IP Connectivity Utilities packed with no charge includes POP3 Server.	5716TC1	5736TC1

This can be checked by using the GO LICPGM command and selecting option 10, (Display installed licensed programs).

TCP/IP and SMTP Configuration

Once the TCP/IP Connectivity Utilities are installed, you need to check if the interfaces, routes, and the local domain and host names have been configured. Use the Configure TCP/IP (CFGTCP) command to activate the "Configure TCP/IP" menu to check this.

```
  CFGTCP                          Configure TCP/IP
                                                          System:   SYSAV3R7
  Select one of the following:

         1. Work with TCP/IP interfaces
         2. Work with TCP/IP routes
         3. Change TCP/IP attributes
         4. Work with TCP/IP port restrictions
         5. Work with TCP/IP remote system information

        10. Work with TCP/IP host table entries
        11. Merge TCP/IP host table
        12. Change local domain and host names
        13. Change remote name server

        20. Configure TCP/IP applications
        21. Configure related tables
        22. Configure point-to-point TCP/IP

  Selection or command
  ===>
```

Figure 43. Configure TCP/IP Menu

From the TCP/IP main menu (CFGTCP), first take option 1 (Work with TCP/IP interfaces) to add the required interfaces.

A TCP/IP interface needs to be added for the line description being used to connect the POP3 clients Internet. You may also use the Add TCP/IP Interface (ADDTCPIFC) command to add the interface:

```
ADDTCPIFC INTNETADR('9.5.23.177') LIND(TRNLINE)
SUBNETMASK('255.255.255.192')
```

```
                        Work with TCP/IP Interfaces
                                                        System:   SYSAVR37
  Type options, press Enter.
   1=Add    2=Change    4=Remove    5=Display   9=Start    10=End

       Internet          Subnet           Line      Line
  Opt  Address           Mask             Description Type

       9.5.23.177        255.255.255.192  ITSCTRN     *TRLAN
       127.0.0.1         255.0.0.0        *LOOPBACK   *NONE
```

Figure 44. Work with TCPIP Interfaces

Use option 2 to add route information. Specify the IP address of the router as the default routing entry on the AS/400 system (next hop). This tells the AS/400 system to look for this router if it cannot find a TCP/IP address on its own local network, or use the Add TCP/IP Route (ADDTCPRTE) command.

```
ADDTCPRTE RTEDEST(*DFTROUTE) SUBNETMASK(*NONE)
NEXTHOP('1.1.1.1')
```

```
                        Work with TCP/IP Routes
                                                    System:    SYSAV3R7
  Type options, press Enter.
    1=Add    2=Change    4=Remove    5=Display

                                          Type
          Route                  Subnet   of              Next
   Opt    Destination            Mask     Service         Hop

          *DFTROUTE              *NONE    *NORMAL         1.1.1.1
```

Figure 45. Work with TCPIP Routes

The Add TCP/IP Host Table Entry (ADDTCPHTE) command adds an Internet address and its associated host names along with an optional text description field to the local host table. For each entry, the host table is defined to allow one Internet address, up to four host names, and a text description field.

```
ADDTCPHTE INTNETADR('9.4.73.130') HOSTNAME((LIMERICK))
TEXT('AS/400 Lotus Notes System')
```

A remote name server is a function on a remote system that maps a name (such as SYS1.ABC.COM) to an Internet address (such as 128.3.1.4). The remote name server can also map an Internet address to a name. If a name server has been configured on this AS/400 system, those values are used here. If a name server has never been defined, the AS/400 system does not use a name server. The local host table is always searched regardless of whether a remote name server has been defined. However, if a remote name server is defined, you can specify whether you want the local table or remote name server searched first. After searching one, the other is searched.

Use option 13 (Change remote name server) to specify the name of the remote name server of the Internet service provider to which you connect.

Specify a host and domain name. When applying for your Internet address, you can also specify a domain name for your network to be known as. Your domain name should consist of *as400name.companyname.com* where your host name is *as400name* and the domain name is companyname.com. (use option 12 (Change local domain and host names) on the Configure TCP/IP menu). See Figure 46 on page 86.

```
                      Change Local Domain and Host Names
                                                         System:   SYSAV3R7
 Type choices, press Enter.

   Local domain name . . .   IBMITSC.IBM.COM



   Local host name . . . .   SYSAV3R7
```

Figure 46. Change Local Domain and Host Names

If you are connecting to the Internet, the Internet service provider (ISP) should
provide access to a name server. The AS/400 system cannot act as a name
server so you must use the one provided by the ISP. If you do not plan to connect
to the Internet but only send mail within your own network, you must either provide
a PC based name server or use option 10 (Work with TCP/IP host table entries) on
the CFGTCP menu.

Saving the TCP/IP Configuration

Once you have configured your TCP/IP environment, save the configuration using
the Save Object (SAVOBJ) command.

```
SAVOBJ OBJ(QATOC* QATM*) LIB(QUSRSYS)
DEV(TAP01) OBJTYPE(*FILE)
```

To test the TCP/IP configuration:

* Start TCP/IP using the Start TCP/IP (STRTCP) command.

* Then test it using PING:

  ```
  PING RMTSYS(*INTNETADR) INTNETADR('9.4.73.212')
  ```

* Now test the connection to a remote system:

  ```
  PING RMTSYS(LIMERICK)
  ```

  or

  ```
  PING '10.4.73.198'
  ```

SMTP Configuration

Notes:

If you read the book *OS/400 TCP/IP Configuration and Reference Version 3*,
SC41-3420 (or SC41-5420 for Version 4), you will find some misleading
information on:

* A SNADS distribution queue called QSMTPQ
* A location TCPIPLOC
* A system name TCPIP

Do **not configure** such a system name entry and if it already is on your
system, remove it by using option 2 on the *Configure Distribution Service*
(CFGDSTSRV) command.

The reason is that the TCPIP route was only used by an SMTP implementation in OS/400 *before* Version 3 Release 1 to route OV mail to an SMTP "bridge" to find the SMTP address in an alias table and send the mail. If you have converted the directory or changed the userid's to have an SMTP Preference, any mail sent to that userid is routed to the *new* SMTP/MIME support, which looks for the SMTP address in the system distribution directory or an alias table (if not converted) and sends the mail. This "new bridge" is the desired path as it contains many enhancements not in the "old bridge". Also, there is the possibility of getting a piece or pieces of mail in a loop when configuring a directory entry pointing to QSMTPQ. Mail can loop going out of the old bridge and routing back into the new bridge and back again and so forth.

However, do not remove the distribution queue QSMTPQ.

```
                      Configure TCP/IP SMTP    (CFGTCPSMTP)
                                                   System:
 Select one of the following:

    1. Work with system alias table
    2. Work with personal alias table
    3. Change SMTP attributes

 SNADS related options:
   10. Work with directory entries
   11. Work with distribution queue for SMTP
   12. Configure distribution services


  Selection or command
  ===>
```

Figure 47. Configure TCP/IP Menu

You have almost completed configuring SMTP. Use the Change SMTP Attributes (CHGSMTPA) command to define whether or not the SMTP server will autostart and so on.

```
                   Change SMTP Attributes (CHGSMTPA)

 Type choices, press Enter.

 Autostart server . . . . . . . .     *YES          *YES, *NO, *SAME
 Retries by minute:
   Number of retries  . . . . . .     3             0-99, *SAME, *DFT
   Time interval  . . . . . . . .     30            0-99, *SAME, *DFT
 Retries by day:
   Number of retries  . . . . . .     0             0-9, *SAME, *DFT
   Time interval  . . . . . . . .     0             0-9, *SAME, *DFT
 Retry remote name server . . . .     *NO           *YES, *NO, *SAME
 Automatic registration . . . . .     *YES          *NO, *YES, *SAME
   User ID prefix . . . . . . . .     QSM           Name, *SAME, *DFT
   Address  . . . . . . . . . . .     QSMRMTAD      Name, *SAME, *DFT
   System name  . . . . . . . . .     TCPIP         Character value, *SAME, *DFT
   Alias table type . . . . . . .     *SYSTEM       *SAME, *SYSTEM, *PERSONAL
 User ID delimiter  . . . . . . .     '?'           *SAME, *DFT, ?, =, ., &, $...



                                                                      More...

```

Figure 48. SMTP Attributes - Part 1

The *Autostart server* specifies whether to start the SMTP server automatically when
TCP/IP is started by the Start TCP/IP (STRTCP) command. If the Start TCP/IP
Server (STRTCPSVR) command is used, this parameter is ignored and the SMTP
server is started regardless of the value of this parameter.

The *Automatic registration* specifies (for incoming mail) whether the remote user ID
and address are automatically added to the system directory as an SMTP user.

```
                   Change SMTP Attributes (CHGSMTPA)

 Type choices, press Enter.

 Mail router  . . . . . . . . . .     *NONE



 Coded character set identifier      00819         1-65533, *SAME, *DFT
 Mapping tables:
   Outgoing EBCDIC/ASCII table .     *CCSID        Name, *SAME, *CCSID, *DFT
     Library  . . . . . . . . . .                  Name, *LIBL, *CURLIB

   Incoming ASCII/EBCDIC table .     *CCSID        Name, *SAME, *CCSID, *DFT
     Library  . . . . . . . . . .                  Name, *LIBL, *CURLIB




                                                                      Bottom

```

Figure 49. SMTP Attributes - Part 2

Parameter *CCSID* is used for converting **all** simple mail from ASCII to EBCDIC and
vice versa.

POP3 Client Configuration

First you need to use the Create User Profile (CRTUSRPRF) command to create the POP3 client to pass security when the client signs on to the AS/400 system.

```
                        Create User Profile (CRTUSRPRF)

 Type choices, press Enter.

 User profile . . . . . . . . . .   PCHAPPOP       Name
 User password  . . . . . . . . .   marcel         Name, *USRPRF, *NONE
 Set password to expired  . . . .   *NO            *NO, *YES
 Status . . . . . . . . . . . . .   *ENABLED       *ENABLED, *DISABLED
 User class . . . . . . . . . . .   *USER          *USER, *SYSOPR, *PGMR...
 Assistance level . . . . . . . .   *SYSVAL        *SYSVAL, *BASIC, *INTERMED...
 Current library  . . . . . . . .   *CRTDFT        Name, *CRTDFT
 Initial program to call  . . . .   *NONE          Name, *NONE
   Library  . . . . . . . . . . .                  Name, *LIBL, *CURLIB
 Initial menu . . . . . . . . . .   *signoff       Name, *SIGNOFF
   Library  . . . . . . . . . . .      *LIBL       Name, *LIBL, *CURLIB
 Limit capabilities . . . . . . .   *NO            *NO, *PARTIAL, *YES
 Text 'description' . . . . . . .   Happy Just de la Paisieres,POP3-SMTP client
```

Figure 50. Create User Profile

Note: For security reasons, you may use the *INLMNU (*SIGNOFF)* parameter. In this case, the POP mail user does not actually sign on to the AS/400 system.

Setting Up the AS/400 System Distribution Directory

The system distribution directory contains entries for users who are authorized to send and receive messages on the network. The AnyMail Framework uses the system distribution directory to determine where to send the mail.

Once the user profile is created, you need to use the Work with Directory Entries (WRKDIRE) command to add the user to the system distribution directory. We advise using this command instead of adding the user directly to the directory with the Add Directory Entry (ADDDIRE) command. This is due to the fact that the required option to **Add name for SMTP** is not provided with this command.

```
                      Work with Directory Entries

Type options, press Enter.
  1=Add       2=Change   4=Remove   5=Display details   6=Print details
  7=Rename    8=Assign different ID to description   9=Add another description

Opt  User ID  Address   Description

  1   _____  _____

      USERID08  SYSAV3R7  Tim Cunningham    3-6088 G215   USERID11 WBL123196
      USERID09  SYSAV3R7  Marianne Rosin    3-6088 G215   USERID11 WBL123196
      USERID11  SYSAV3R7  Happy Just d.l.P. 3-6088 G215   USERID11 WBL123196
      USERID15  SYSAV3R7  Rolando Figueroa  3-6088 G215            WBL123196
      LABUSER   SYSAV3R7  LABUSER
      MRK       SYSAV3R7  Marv on SYSAV3R7
      NICKHUTT  SYSAV3R7  Nick Hutt
      NTW01     SYSAV3R7  NTW01
      NTW02     SYSAV3R7  NTW02
      NTW03     SYSAV3R7  NTW03
      NTW04     SYSAV3R7  NTW04
                                                               More...
F3=Exit     F5=Refresh   F9=Work with nicknames   F11=Sort by description
F12=Cancel   F13=Work with departments   F17=Position to   F24=More keys
```

Figure 51. Work with Directory Entries (WRKDIRE)

Take option 1 (Add) on the first line of the display and press the Enter key.

```
                        Add Directory Entry

Type choices, press Enter.

  User ID/Address . . . .   PCHAPPOP  SYSAV3R7
  Description . . . . . .   Happy Just de la Paisieres, POP3-SMTP client
  System name/Group . . .   SYSAV3R7            F4 for list
  User profile  . . . . .   PCHAPPOP            F4 for list
  Network user ID . . . .

  Name:
    Last  . . . . . . . .
    First . . . . . . . .
    Middle  . . . . . . .
    Preferred . . . . . .
    Full  . . . . . . . .

  Department  . . . . . .                      F4 for list
  Job title . . . . . . .
  Company . . . . . . . .
                                                               More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F18=Display location details
F19=Add name for SMTP   F20=Specify user-defined fields
```

Figure 52. Add Directory Entry (ADDDIRE) - Display 1

The "Add Directory Entry" display is activated. Please note the **F19=Add name for SMTP** function key.

Fill in the required parameter information for *User ID/Address, Description, System name/Group, and User Profile* and page forward to see the display that is shown in Figure 53 on page 91.

```
                           Add Directory Entry

 Type choices, press Enter.

   Mail service level  . .   2                    1=User index
                                                  2=System message store
                                                  3=Other mail service
     For choice 3=Other mail service:
       Field name  . . . .                        F4 for list

   Preferred address . . .   3                    1=User ID/Address
                                                  2=O/R name
                                                  3=SMTP name
                                                  4=Other preferred address
     Address type  . . . .                        F4 for list
     For choice 4=Other preferred address:
       Field name  . . . .                        F4 for list




                                                                  More...
   F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F18=Display location details
   F19=Add name for SMTP    F20=Specify user-defined fields
```

Figure 53. Add Directory Entry (ADDDIRE) - Display 2

For the **local user**, you have to pay particular attention to the parameters *Mail service level* and *Preferred address*. For the "Mail service level", you need to set this to the value **2**, which is the System message store.

For the "Preferred address", you need to set the value to **3**, which is the SMTP name. These parameters are important in relation to the mail environment being used with the AS/400 system.

Table 6. Relation Mail Environment / Parameter Values		
Environment	**Mail Service Level**	**Preferred Address**
Standard POP3 client	2	3

Next you need to add the name for SMTP. Press **F19**.

```
                             Add Name for SMTP
                                                         System:   SYSAV3R7
    Type choices, press Enter.

      User ID . . . . . . . . :    PCHAPPOP
      Address . . . . . . . . :    SYSAV3R7



      SMTP user ID  . . . . . .    PCHAPPOP
      SMTP domain . . . . . . .    SYSAV3R7.IBMITSC.IBM.COM




      SMTP route  . . . . . . .
```

Figure 54. Add Directory Entry (ADDDIRE) - Display 4

The name used for the SMTP user ID must be equal to the defined user profile
name. The reason is that the AS/400 system handling the mail uses these names.
We recommend that the SMTP domain is in the format *hostname.domain*.

Next press the Enter key when you see the message SMTP Table Updates Pending
- Press Enter to Update. The directory entry is created and adds the TCP/IP
address to the system alias table that is used by the POP server. You do not need
to restart SMTP or the POP server.

In SMTP, there is a reserved user ID (PostMaster). This user ID is used to send
mail to a system where you do not know a user on the destination system. This
user ID must be monitored by an individual or system. To use this ID, you can use
a system distribution directory entry as follows:

- User ID POST
- Address MASTER

Use the Work with Directory Entries (WRKDIRE) command to enter this directory
entry and press F19 to add the SMTP user ID = POSTMASTER.

If you have access to a remote name server on your network, configure SMTP to
use it. To configure the remote name server, use option 13 on the CFGTCP menu.

The Configuration of the POP Server

To configure the AS/400 POP3 server, you need to activate the Change POP
Server Attributes (CHGPOPA) command. This can be done in various ways:

- Take option 20 (Configure TCP/IP applications) from the *CFGTCP* menu. Then
  select option 16 (Change POP server attributes).

- Select option 16 (Change POP server attributes) from the Configure TCP/IP
  Applications (CFGTCPAPP) command.

- Enter the Change POP Mail Server Attributes (CHGPOPA) command.

The display in Figure 55 on page 93 is shown.

```
                   Change POP Server Attributes (CHGPOPA)

 Type choices, press Enter.

 Autostart servers  . . . . . . .   *YES          *YES, *NO, *SAME
 Number of initial servers  . . .   3             1-20, *SAME, *DFT
 Inactivity timeout . . . . . . .   600           10-65535 seconds, *SAME, *DFT
 Message split size . . . . . . .   128           32-2048 kilobytes, *SAME, *DF
 MIME CCSID:
   Coded character set identifier   00819         *SAME, *DFT, 00819, 00912...
   When to use  . . . . . . . . .   *BESTFIT      *SAME, *BESTFIT, *ALWAYS
 Allow standard POP connection  .   *YES          *SAME, *YES, *NO
 Host server connection . . . . .   *ALL          *SAME, *NONE, *ALL, *IP...
               + for more values
 Address book:
   Enabled  . . . . . . . . . . .   *NO           *SAME, *NO, *YES
   Refresh interval . . . . . . .   60             1-65535 minutes, *NONE


                                                                         Bottom
 F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel    F13=How to use this display
 F24=More keys
```

Figure 55. Change POP Server Attributes (CHGPOPA) Display

The following parameters are important for POP3 clients:

- *MIMECCSID* is used to convert MIME mail from ASCII to EBCDIC that is sent to an OV/400 user.

- *Autostart servers* specifies whether to automatically start the POP mail server when TCP/IP is started by the STRTCP command. When the POP mail server is started by the STRTCPSVR command, the AUTOSTART parameter is ignored and the POP mail server is started regardless of the value of this parameter. If STRTCPSVR *POP is specified and the POP server is already running, an additional server job is started.

- *Number of initial servers* specifies the number of POP mail server jobs to start when POP is started by either the Start TCP/IP (STRTCP) command or the Start TCP/IP Server (STRTCPSVR) command. These jobs allow new clients to connect to the server without having to wait for the overhead associated with starting a new job. The server tries to keep at least this number of jobs available for connecting to new clients as the number of connected clients changes. This is a performance enhancement for the POP mail server that reduces the system overhead each time a client connects. See Figure 35 on page 75 for the POP3 server job structure.

- *Allow standard POP connection* specifies if clients are allowed to connect to the POP server using the standard POP (TCP/IP) connection protocol. If you are also using Client Access for OS/400 to connect to the POP server, use the HOSTSVRCNN parameter. Specify *NO if you do <u>not</u> use the Client Access based Windows 95 client.

The changes take effect the next time the POP3 server is started either by the Start TCP/IP (STRTCP) command or by the Start TCP/IP Server (STRTCPSVR) command.

Start the Required AS/400 Software

The next step is to make sure that the software needed for activating the POP3 server is started on the AS/400 system. You can look for these jobs in the QSYSWRK subsystem.

The following commands start the necessary functions:

- **STRMSF**
  - This command starts the QMSF jobs in QSYSWRK.
- **STRTCPSVR** *SMTP
  - This command starts the QTMS* jobs in QSYSWRK.
- **STRTCPSVR** *POP
  - Look for QTPO* jobs in QSYSWRK.
- **STRSBS QSNADS**
  - This command starts the QSNADS subsystem.

The Start TCP/IP Server (STRTCPSVR) command starts the TCP/IP application servers that have been configured, including the SMTP and POP server applications. When you start the POP server, the command calls the start program, *QTMMJOBS*. This program verifies if the server is not already up and running. If not, it submits the initial server job to the QSYSWRK subsystem. The first server job initializes the server environment and queries the configuration file that is created with the *CHGPOPA* command. It determines the number of additional server jobs to start. After starting the additional server jobs, the initial job waits for a client connection (see Figure 35 on page 75).

Note

The SMTP server should be started before the QMSF job, or the QMSF job should be ended and restarted after starting the SMTP server. Otherwise, a remote SMTP mail sent before the SMTP server is started ends up in the QMSF mail queue.

If you are using Client Access connections, run the Start Host Server (STRHOSTSVR) command.

```
STRHOSTSVR *ALL
```

The Start Host Server (STRHOSTSVR) command is used to start the optimized host server daemons and the server mapper daemon. There is one server daemon for each of the host server types. In addition, there is one server mapper daemon for all host servers that provides support for client applications to obtain a particular host server daemon's port number. This port number is then used by the client application to connect to the host server's daemon. The daemon accepts the incoming connection request and routes it to the server job for further processing.

You can end the POP3 server with the End TCP/IP Server (ENDTCPSVR *POP) command. This causes the POP3 server to shut down. *Be careful here: If you forget the parameter *POP, all TCP servers are ended.* The program, *QTMMJOBS*, is called to end the server. The mail that was not received by the POP clients remains in their mailboxes. The mail does not actually get deleted until a *QUIT* verb is received from the client (see "Supported POP3 Verbs" on page 77).

The POP3 jobs can be seen when you use the Work with Active Job (WRKACTJOB) command. The naming conventions used are:

• **QTPOP**xxxxx for the standard IP connection server jobs.

```
                         Work with Subsystem Jobs                  SYSAV3R7
                                                          11/19/96  13:38:58
 Subsystem  . . . . . . . . . . :    QSYSWRK

 Type options, press Enter.
   2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
   8=Work with spooled files    13=Disconnect


 Opt  Job          User        Type     -----Status-----  Function
      QIPX         QSYS        BATCH    ACTIVE
      QMSF         QMSF        BATCH    ACTIVE
      QTCPIP       QTCP        BATCH    ACTIVE                      More...
      QTMSNMP      QTCP        BATCH    ACTIVE          PGM-QTOSMAIN
      QTMSNMPRCV   QTCP        BATCH    ACTIVE          PGM-QTOSRCVR
      QTPOC00095   QTCP        BATCH    ACTIVE
      QTPOI00094   QTCP        BATCH    ACTIVE
      QTPOP00093   QTCP        BATCH    ACTIVE
      QTPOSNA      QTCP        PJ       ACTIVE
      QTPOPABCH    QTCP        BATCH    ACTIVE
      QZHQSRVD     QUSER       BATCH    ACTIVE
                                                                   More...
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F11=Display schedule data
 F12=Cancel
```

Figure 56. Updated Work with Subsystem QSYSWRK Jobs Display

An updated display in Figure 56 shows the jobs that are related to the POP3
server function.

Saving and Restoring

Once you have configured your TCP/IP environment, save the configuration using
the Save Object (SAVOBJ) command:

```
SAVOBJ OBJ(QATOC* QATM*) LIB(QUSRSYS)
DEV(TAP01) OBJTYPE(*FILE)
```

The POP3 server stores mail in the IFS until it is retrieved by the recipient. In the
following display, you can see the path to the mail using the Work with Object Links
(WRKLNK) command.

```
                       Work with Object Links

 Directory  . . . . :   /QTCPTMM

 Type options, press Enter.
   3=Copy   4=Remove   5=Next level   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt   Object link          Type      Attribute    Text
       ATTABOX              DIR
       ENCODE               DIR
       MAIL                 DIR
       SMTPBOX              DIR
       TMP                  DIR
                                                               Bottom
 Parameters or command
 ===>

```

Figure 57. WRKLNK Showing the Mail Directory

To save undelivered mail, use the following command:

```
SAV DEV('qsys.lib/tap01.devd') OBJ(('/QTCPTMM/MAIL/*'))
```

To restore the undelivered mail, use the following command:

```
RST DEV('qsys.lib/tap01.devd') OBJ(('/QTCPTMM/MAIL/*')) OPTION(*NEW)
```

Note: This restores all mail that was not delivered at the time of the save. This
mail is then received by the recipient a second time.

How to Remove a POP3 User

It may be necessary to remove a POP3 user from the AS/400 system. Keep in
mind that there is no checking for mail in the mailbox!

 • Remove the user's system distribution directory entry.

 • Sign on the POP3 client and receive any mail.

 • Remove the POP3 client's user profile from the system.

If by accident, the system distribution directory entry and the user profile were
deleted without retrieving and deleting the mail from the POP3 client:

 • Use the Work with Object Links (WRKLNK) command and activate
   '/QTCPTMM/MAIL/<user profile ID>'. Use option 4 to delete the mail items.

 • *'/QTCPTMM/MAIL/'*. Use option 4 to delete the user's mailbox directory.

You need ***SECOFR** authority to do this.

Installation and Configuration of the POP3 Clients

For the scenario that is used in this chapter to test the mail exchange between
various POP3 clients and OfficeVision/400, three different clients were installed and
configured. Two clients are SMTP based POP3 clients (Eudora Light and
Netscape Navigator Gold). The third one is a Client Access based Windows 95
client, which is Lotus Mail.

In the next paragraph, we show the mail configuration of the POP3 clients. For the installation and configuration of Lotus Mail, we refer to Chapter 8, "Set Up Lotus Mail 4.5" on page 161. For the installation of the other POP clients (Eudora Light and Netscape Navigator Gold), refer to the installation manuals that come with these products. You also can download these products with the installation instructions from the Internet. For Eudora Light, use *http://www.galttech.com/sharware.shtml*; for Netscape Navigator Gold, use the address *http://home.netscape.com* and select the appropriate Web pages for the downloads.

It is not the intention to describe in detail the steps that are required to configure the POP3 clients for the e-mail environment. Only the basic steps are defined. To define (for example) the local address book or nicknames for the recipients, refer to the manuals that come with the software.

Configuration of the Netscape Navigator Gold Client

After the installation of Netscape Navigator Gold, click on the icon for this product. A display similar to the one in Figure 58 is shown. Select the *Options* function and click on *Mail and News Preferences*.
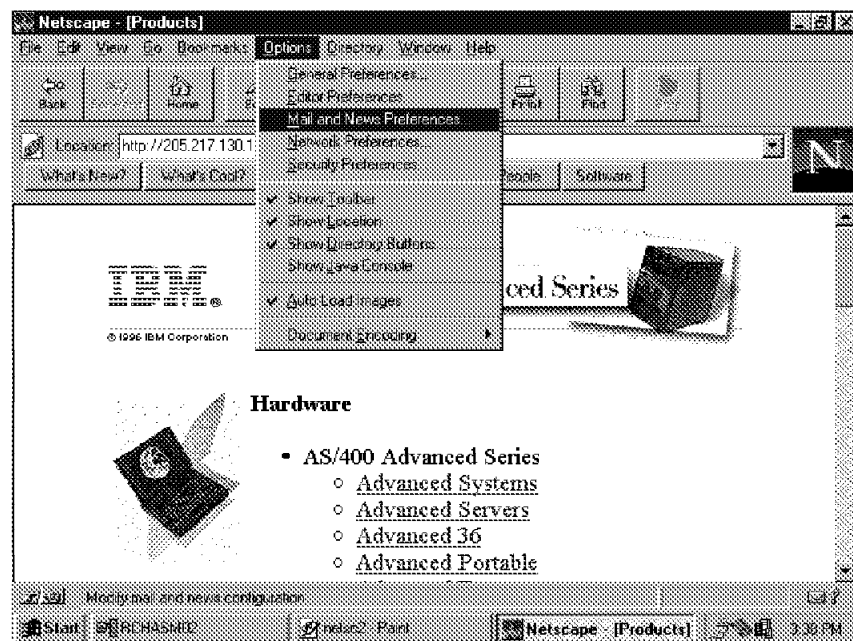
Figure 58. Configuration of Mail Preferences, Display 1

The window in Figure 59 on page 98 is shown. Select the *Servers* tab. Next, fill in your values for the following parameters:

- Outgoing Mail (SMTP) Server:
  - Hostname.domain
- Incoming Mail (POP3) Server:
  - Hostname.domain
- POP3 User Name:

– User Profile name is defined in the AS/400 POP3 server with the CRTUSRPRF command and added in the system distribution directory with the WRKDIRE command. Be sure that you added the name for SMTP with *F19=Add name for SMTP*.

Keep the default values for the other parameters as shown on this window. For test purposes, we used a one-minute interval to check for mail.
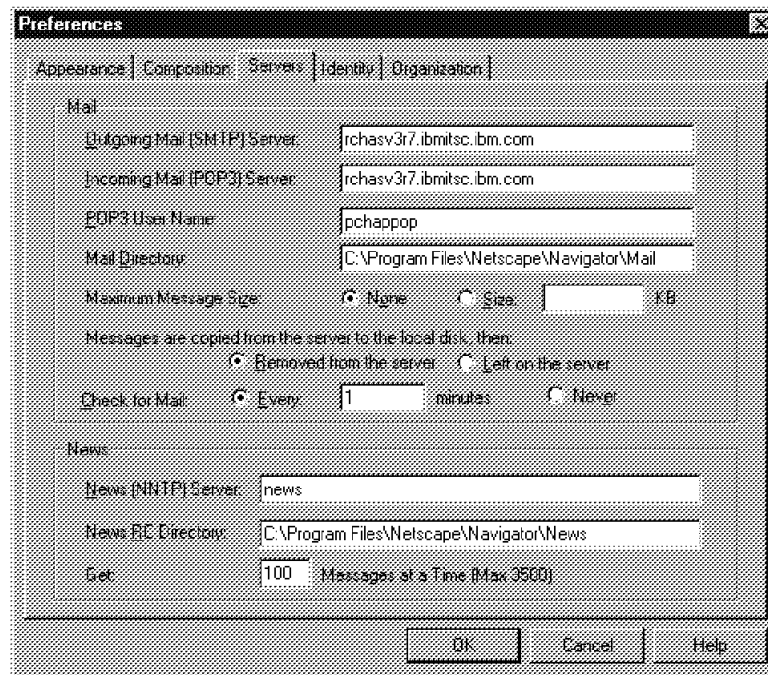
Figure 59. Configuration of Mail Preferences, Display 2

Next select the *Identity* tab. Fill in your values for the following parameters shown in Figure 60 on page 99:

- Your name:

  - The name that is put into the header information of the mail document that you send.

- Your Email:

  - It is the combination of User ID.hostname.domain of your AS/400 mail server.

- Reply-to Address:

  - It is combination of User ID.hostname.domain.
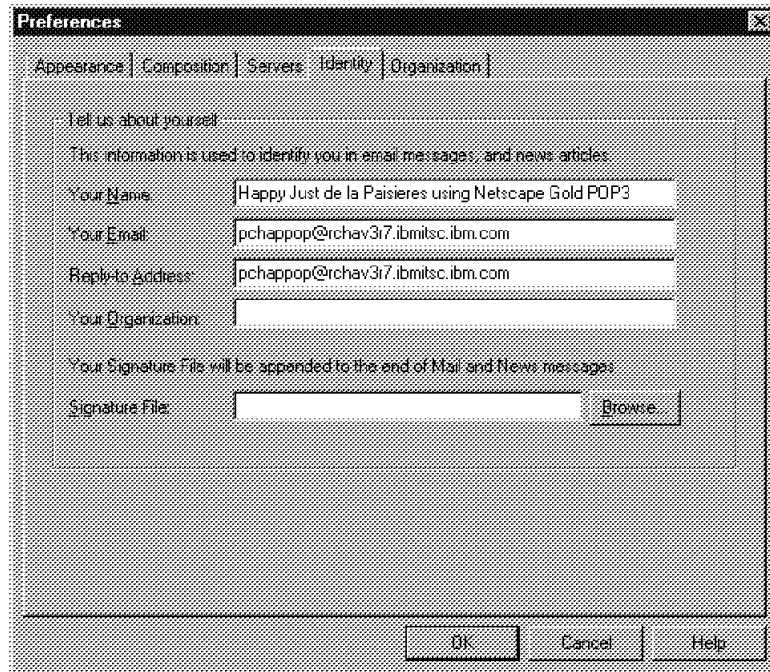
Figure 60. Configuration of Mail Preferences, Display 3

These steps conclude the e-mail configuration steps for the Netscape Navigator
Gold POP3 client.

Configuration of the Eudora Light Client

After the installation of the Eudora Light client, select the *Special* function and click
on *Settings*. Figure 61 is shown; select *Getting Started*.
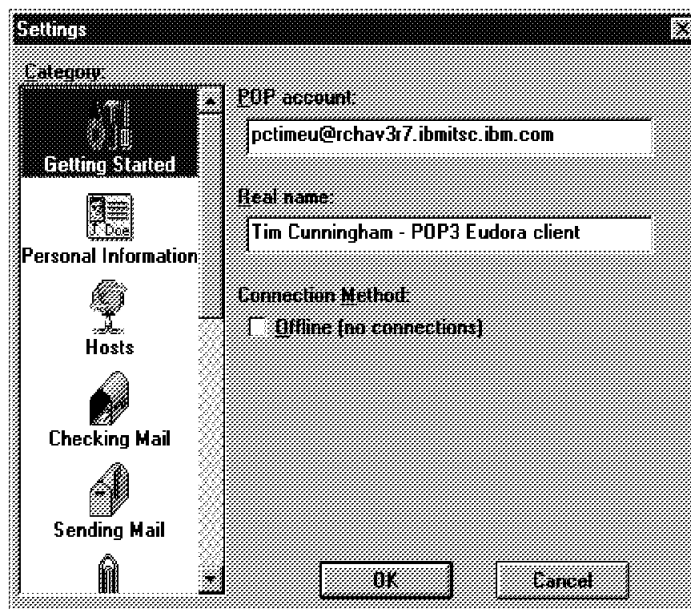
Figure 61. Setting - Getting Started, Eudora Display 1

The POP account information consists of the User ID as defined on the AS/400 POP3 server, the host name, and the domain.

Next select *Personal Information* and enter the real name information.

Figure 62. Setting - Personal Information, Eudora Display 2

Next select the *Hosts* icon and enter the SMTP information (see Figure 63). This information consists of the host name and domain.

Figure 63. Settings - Hosts, Eudora Display 3

Click on the *Checking Mail* icon. Go through the values. In this scenario, the incoming mail is checked every two minutes.
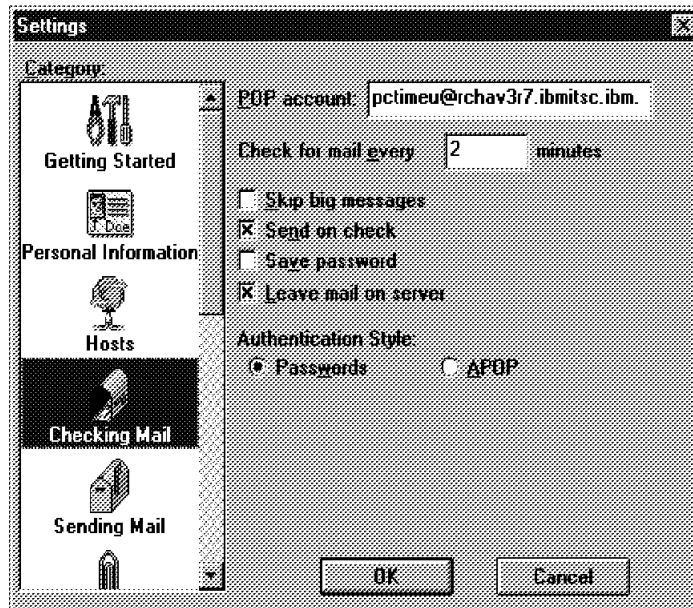
Figure 64. Settings - Checking Mail, Eudora Display 4

The same applies for the next icon, *Sending Mail* (see Figure 65).
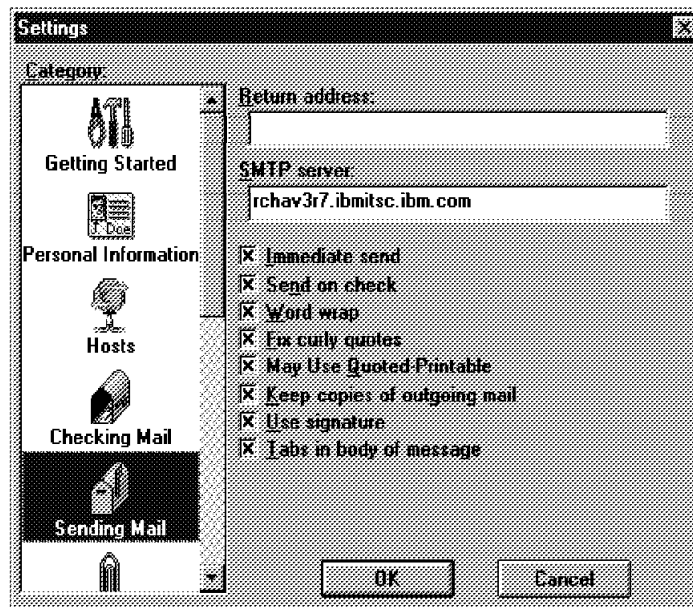
Figure 65. Settings - Sending Mail, Eudora Display 5

When you finish the configuration settings, click on *OK*. The *Enter Password* pop-up window is shown. Enter the password. Click on OK and the client tries to set up the connection and log into the AS/400 POP3 server.
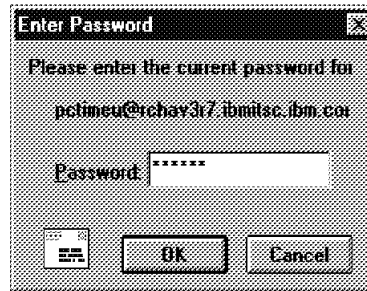
Figure 66. Logging into the AS/400 POP3 Server

Scenario 1 - Mail Flow between POP3 Clients and OV/400 Users

After you define the users, add them to the system distribution directory, define and activate the SMTP and POP application servers at the AS/400 side. The next step is to install and configure the POP3 clients.

The scenario used to send mail between POP3 clients and the OfficeVision for OS/400 users is shown in Figure 67.
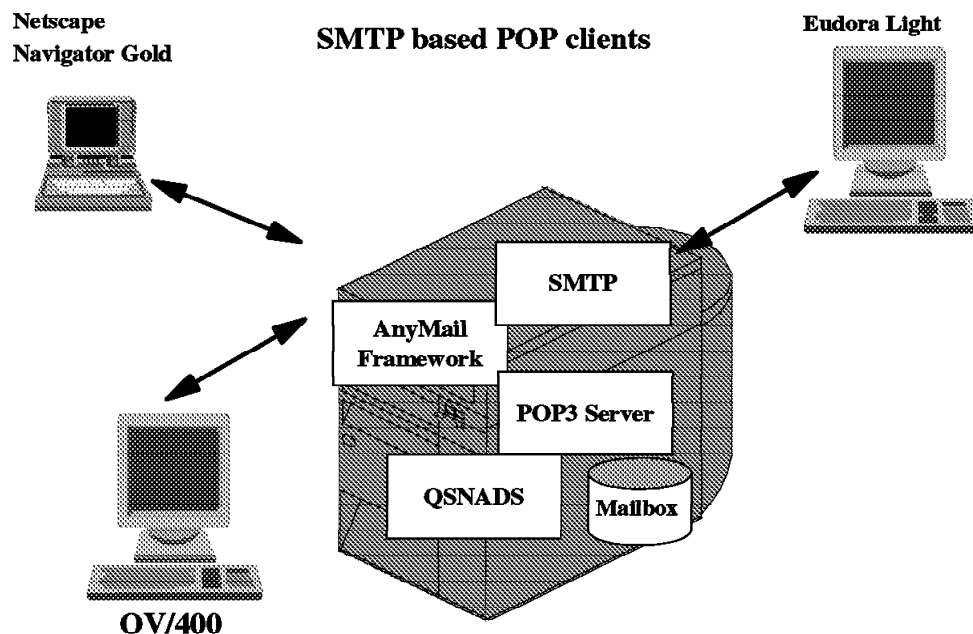
Figure 67. E-Mail Scenario using POP3 Clients, OV/400, and POP3 Server

Sending Mail between Netscape Navigator and OfficeVision for OS/400

To send a message to an OfficeVision/400 user or to another POP3 client through the AS/400 POP3 server, click on the *File* function. Select *New Mail Message* and the window in Figure 68 is shown.
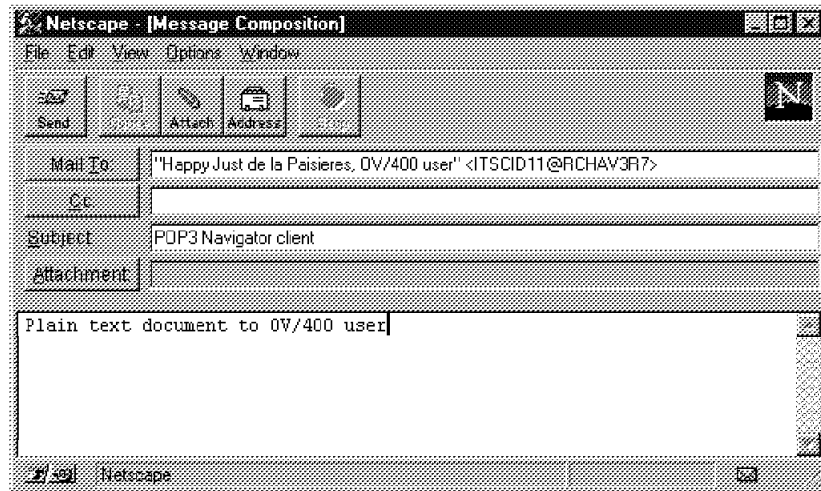
Figure 68. Netscape Message Composition

Complete the mail information and click on the *Send* button. The *Mail To:* information can be typed in or selected from the *Address Book.*

To check if the mail is sent successfully, click on the *Window* function and select *Netscape Mail*. The window in Figure 69 on page 104 is shown. First you have to enter your password (defined with the CRTUSRPRF command).
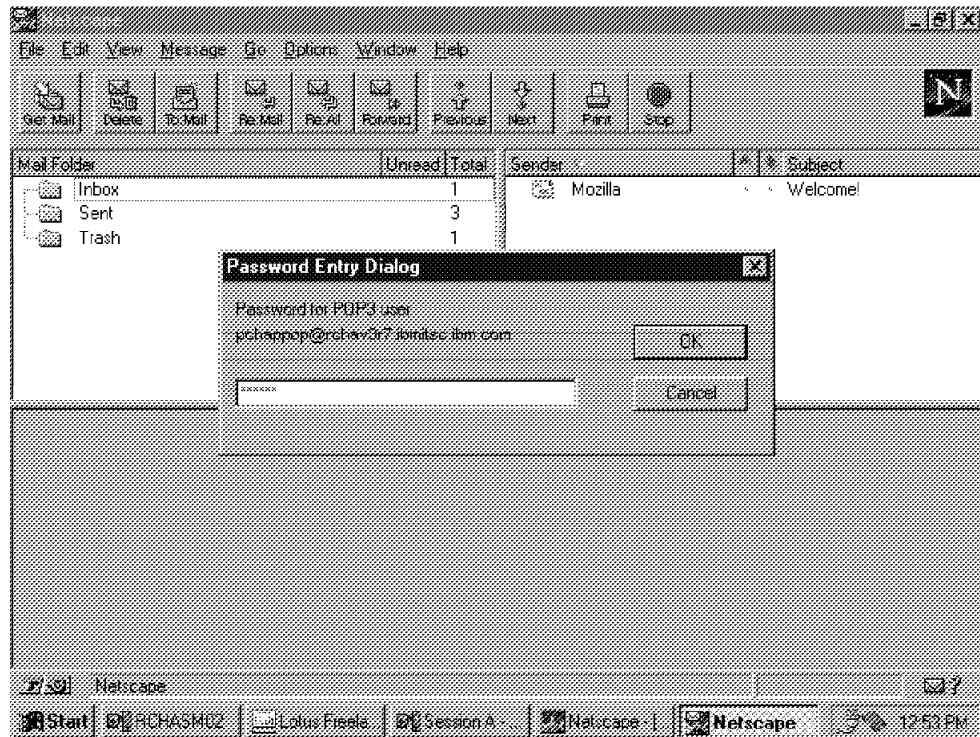
Figure 69. Netscape Mail Password Entry Dialog

The password you enter must pass the validation check. If it is accepted, you can open the *Sent* Mail Folder by clicking on it. The content of this folder is displayed at the right side. Click on the message you just sent and the body of the text document is displayed at the bottom of the window (see Figure 70).
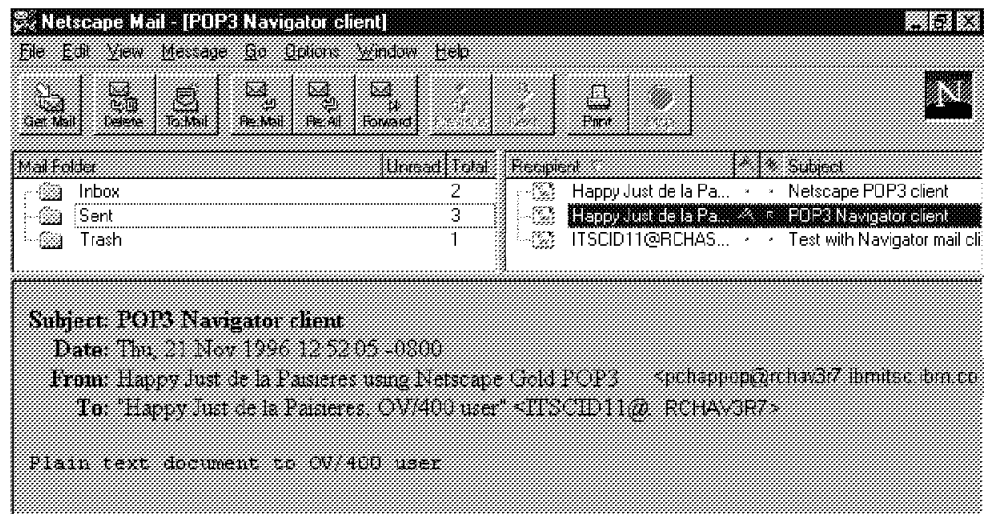
Figure 70. Netscape Mail Boxes

The OfficeVision for OS/400 user is notified on the main menu (see Figure 71 on page 105) that *New Mail* has been arrived.

```
                         OfficeVision for OS/400
                                                  System:   SYSAV3R7
     Select one of the following:

          1. Calendars                               Time:    1:34
          2. Mail
          3. Send message                       November        1996
          4. Send note                          S  M  T  W  T  F  S
          5. Documents and folders                             1  2
          6. Word processing                    3  4  5  6  7  8  9
          7. Directories/distribution lists    10 11 12 13 14 15 16
          8. Decision support                  17 18 19 20 21 22 23
          9. Administration                    24 25 26 27 28 29 30

         50. Operational Assistant Menu         New mail
```

Figure 71. OfficeVision for OS/400 menu

Selecting option *2. (Mail)* shows the new and pending mail entries. Enter option 5
in front of the mail with the status *New* (see Figure 72) to view the content of the
new mail.

```
                           Work with Mail

     Working with mail for  . . . . . :    USERID11 SYSAV3R7


     Type options, press Enter.
       2=Revise a copy    4=Delete      5=View     6=Print   8=Work with details
       9=Print options   10=Forward   11=Reply   12=File remote   13=File local
      14=Authority       15=Fill form

                     -------From-------                             Date
     Opt  Status      User ID  Address  Description                 Received
      5   NEW         PCHAPPOP SYSAV3R7 POP3 Navigator client       11/21/96
          OPENED      PCHAPPOP SYSAV3R7 Test with Navigator mail client 11/20/96
```

Figure 72. Work with Mail

The next display shows the text portion of the message and the header containing
the addressing information.

```
MAIL        P:12                 VIEW Instruction        Pg:1       Ln:1
<2....:....3....:....4....:....5....v....6....:....7....:....8....:....9>...:.
*
Message-ID:<3294C0F5.54D8@sysav3r7.ibmitsc.ibm.com>
Date: Thu, 21 Nov 1996 12:52:05 -0800
From:  Happy Just de la Paisieres using Netscape Gold POP3 <pchappop@syst
Reply-To: pchappop@sysav3r7.ibmitsc.ibm.com
MIME-Version: 1.0
To: "Happy Just de la Paisieres, OV/400 user" <ITSCID11@SYSAV3R7>
Subject: POP3 Navigator client


------------------------------------------------------------------------

Plain text document to OV/400 user
```

Figure 73. View the New Mail

After reading the mail, you can decide to reply to the mail item and resend the message to the originator.

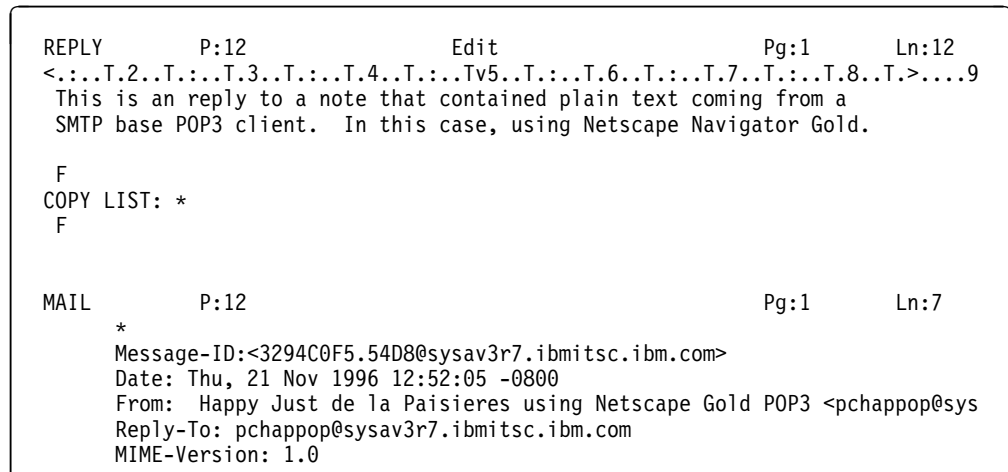Enter your response and press the F10 key to send the mail.

```
REPLY          P:12                    Edit                    Pg:1        Ln:12
<.:..T.2..T.:..T.3..T.:..T.4..T.:..Tv5.T.:..T.6..T.:..T.7..T.:..T.8..T.>....9
 This is an reply to a note that contained plain text coming from a
 SMTP base POP3 client.  In this case, using Netscape Navigator Gold.

 F
COPY LIST: *
 F


MAIL          P:12                                            Pg:1        Ln:7
        *
        Message-ID:<3294C0F5.54D8@sysav3r7.ibmitsc.ibm.com>
        Date: Thu, 21 Nov 1996 12:52:05 -0800
        From:  Happy Just de la Paisieres using Netscape Gold POP3 <pchappop@sys
        Reply-To: pchappop@sysav3r7.ibmitsc.ibm.com
        MIME-Version: 1.0
```

Figure 74. Reply the Incoming Mail

The Netscape Navigator POP3 client sees the incoming mail by clicking on the Window function. Then click on the *Get Mail* button to show if there are new messages on the server. The value that is used in the configuration parameter *Check for Mail* of the Mail Preferences controls the incoming mail flow to the client. You see the content of the new message by clicking on the new entry in the mailbox. Figure 75 shows this.
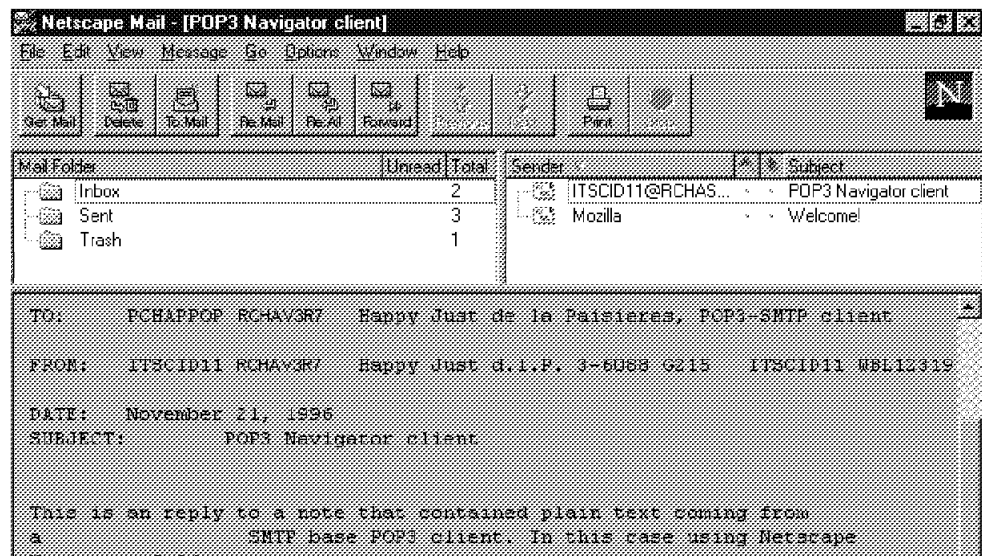
Figure 75. Netscape Mail, Receive from the Inbox

Sending Mail between Eudora Light and OfficeVision for OS/400

Select the *Message* function and *New Message* to send mail from this client to an OfficeVision for OS/400 user. Figure 76 shows an example of a mail document that is sent to OV/400.
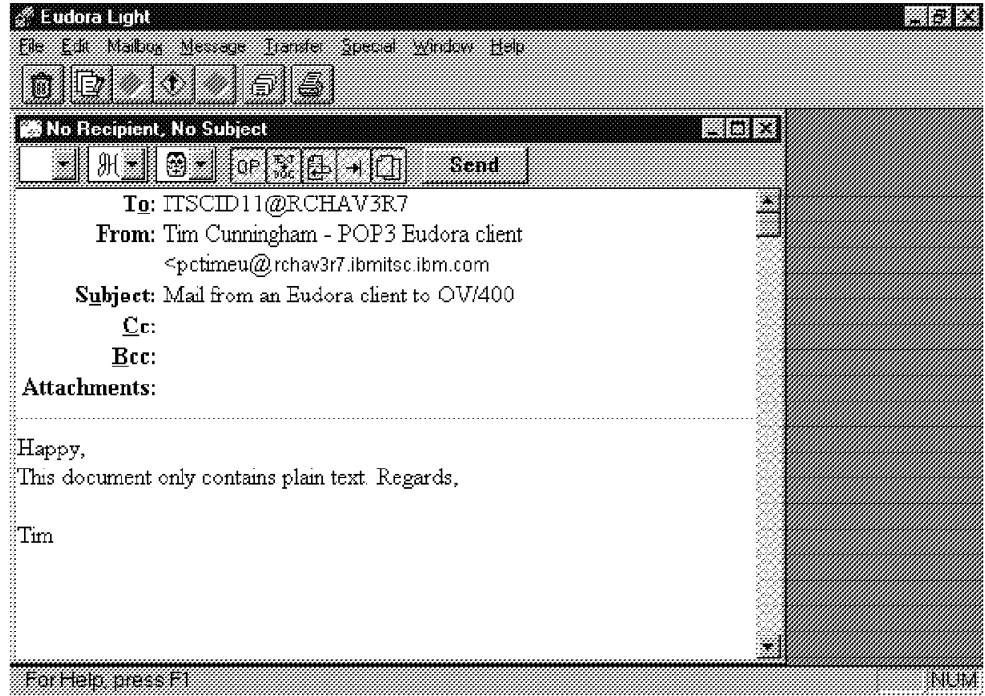
Figure 76. Sending a New Message to an OV/400 User

You can check to be sure that the new message is sent by selecting the *Mailbox* function (see Figure 77 on page 108).
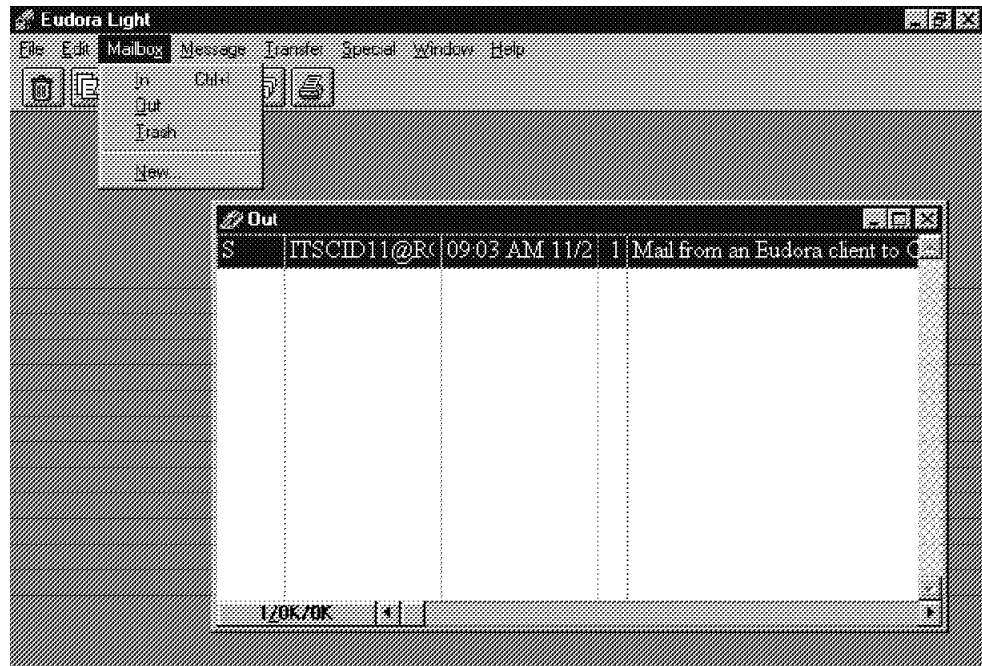
Figure 77. Content of the Outgoing Mailbox

The OfficeVision for OS/400 user can open mail to view the mail that has arrived from the Eudora Light POP3 client.

```
                        Work with Mail

  Working with mail for  . . . . . :   USERID11 SYSAV3R7


  Type options, press Enter.
    2=Revise a copy   4=Delete      5=View      6=Print   8=Work with details
    9=Print options  10=Forward   11=Reply   12=File remote   13=File local
   14=Authority      15=Fill form

                    -------From-------                              Date
  Opt  Status       User ID  Address  Description                  Received
       NEW          PCTIMEU  SYSAV3R7 Mail from an Eudora client to O 11/22/96
       OPENED       PCHAPPOP SYSAV3R7 POP3 Navigator client          11/21/96
       OPENED       PCHAPPOP SYSAV3R7 Test with Navigator mail client 11/20/96
```

Figure 78. OfficeVision for OS/400 Work with New Mail

```
MAIL          P:12                    VIEW Instruction              Pg:1        Ln:1
<2....:....3....:....4....:....5....v....6....:....7....:....8....:....9>...:.
*
Mime-Version: 1.0
To: USERID11@SYSAV3R7
From: Tim Cunningham - POP3 Eudora client <pctimeu@sysav3r7.ibmitsc.ibm.c
Subject: Mail from an Eudora client to OV/400


 ------------------------------------------------------------------------


Happy,
This document only contains plain text. Regards,

Tim
```

Figure 79. OfficeVision for OS/400 View New Mail

The flow of replying to this note and sending it to the Eudora Light originator is
similar to the one that is described in the earlier section between Netscape
Navigator and OV/400.

Scenario 2 - Mail Flow between Local POP3 Clients

To send a message to another locally attached POP3 client (in this example, to a
Lotus Mail user), first select the *Message* function. Next select *New Message* and
enter your information (see Figure 80).
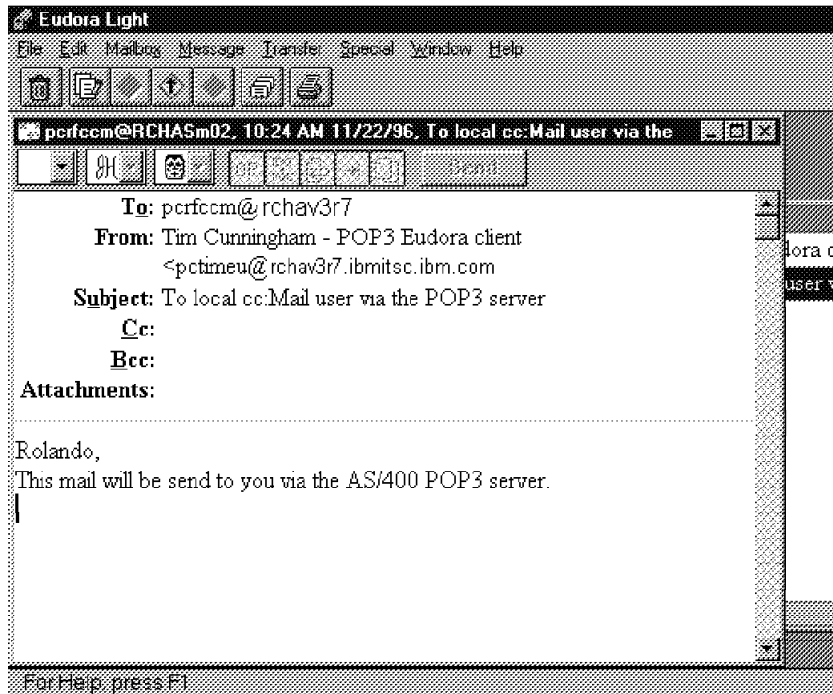
Figure 80. Mail to Another Local POP3 Client

```
                         Work with Object Links

 Directory  . . . . :   /QTCPTMM/MAIL

 Type options, press Enter.
   3=Copy   4=Remove   5=Next level   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt   Object link         Type      Attribute    Text
       qlockbox            DIR
       A960321CG           DIR
       USERID11            DIR
       USERID15            DIR
       PCHAPCCM            DIR
       PCHAPEU             DIR
       PCHAPPOP            DIR
 5     PCRFCCM             DIR
       PCTIMEU             DIR
                                                                    More...
```

Figure 81. WRKLNK Command to Show the Mailbox

Assuming that the Lotus Mail client is not logged into the POP3 server, you can
check the content of the recipient's mailbox by using the Work with Object Links
(WRKLNK) command. See Figure 82 and Figure 81 for the information.

```
                         Work with Object Links

 Directory  . . . . :   /QTCPTMM/MAIL/PCRFCCM

 Type options, press Enter.
   Copy    4=Remove   5=Next level   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt.  Object link         Type      Attribute    Text
       JW280067.NOT        STMF
```

Figure 82. WRKLNK Command to Show Pending Entries in the Mailbox
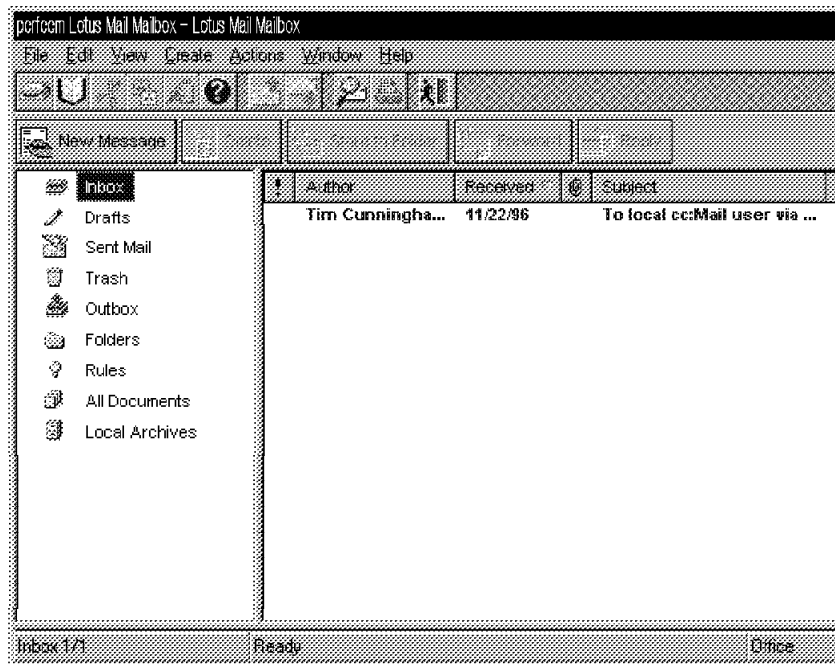
Figure 83. Mail Received from Another Local POP3 Client

The Lotus Mail user is notified that new mail arrived. Clicking on this mail item shows the content of the new message. Figure 83 and Figure 84 displays the information.
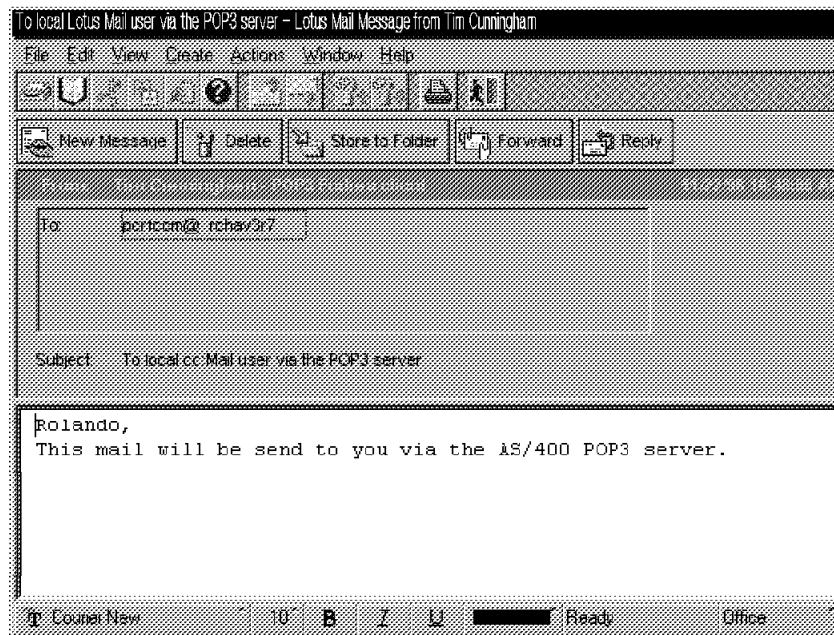

Figure 84. Mail Content

Scenario 3 - Sending Multimedia (MIME) Mail

Mail containing MIME is handled in different ways in relation to the type of the mail client to which the mail is destined. When the mail is sent from one POP3 client to another POP3 client, the mail is delivered as is. The mail content is not affected by the mail POP server, so the POP3 to POP3 message is transparent.

This does not apply to mail that is sent from a POP client to an OfficeVision for OS/400 user. The AnyMail Framework converts MIME text into an OV/400 note and converts any binary attachments into PC files. If you want to view the binary attachments, you have to download them to your PC and use the proper PC viewer.

The MIME message consists of multiple parts. Figure 85 shows an updated example of a MIME note that consists of multiple parts.

```
FROM: PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM
X-TO-OFFICEVISION:USERID11 SYSAV3R7
DATE: SUN, 24 NOV 1996 15.16.40 -0700
X-TO-OFFICEVISION: "HAPPY JUST D.L.P.
3-6088 G215   USERID11 WBL123196"
<USERID11 SYSAV3R7>
FROM: "HAPPY JUST DE LA PAISIERES -
Lotus Mail USER. PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
SUBJECT: TRACE TEST..IMPORTANCE: MEDIUM PRIORITY: NORMAL
X-MAILER: IBM INTERNET MESSAGING FRAMEWORK
MESSAGE-ID: <848877401-0-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>

MIME-VERSION: 1.0 CONTENT-TYPE: MULTIPART/MIXED;
BOUNDARY="MIME.PART.BOUNDARY.=.3298D758"

--MIME.PART.BOUNDARY.=.3298D758.
CONTENT-TYPE: TEXT/PLAIN; CHARSET=ISO-8859-1

CONTENT-ID: <848877401-1-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
CONTENT-TRANSFER-ENCODING: QUOTED-PRINTABLE DATA WITH MIME

=.......--MIME.PART.BOUNDARY.=..3298D758
CONTENT-TYPE: IMAGE/X-MS-BMP;NAME="DANGER.BMP"

CONTENT-ID:<848877402-2-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
CONTENT-TRANSFER-ENCODING: BASE64 CONTENT-DESCRIPTION: <DANGER.BMP>
CONTENT-DISPOSITION: ATTACHMENT; FILENAME="DANGER.BMP"

AZUCSWESCDUDGGAINTQ1SZVLGO0CGGKNA4UAA5YUKGACNAGEA58BQ
etc.  etc.  etc.   etc.  etc.   etc.   etc.
AD7O3SAALTC+WCRWHSA68FNWAMH5YGHIOESYWIEG4NAG4BDQIDAAE

=--MIME.PART.BOUNDARY.=.3298D758--
```

Figure 85. Example of a MIME Message

The header contains information related to the content type of the document being sent in the addressing data. For example, content type *Multipart/Mixed* means that the document contains one or more multimedia attachments besides plain text. Each attachment starts and ends with a *boundary*.

The content type directs the POP server to handle the attachments. When the type is not *Text/plain, Text/enriched*, or *Message/RFC822*, the attachment is stored as a binary PC file.

Content type *Message/RFC822* means that the document contains embedded notes, a note within a note. This is usually the case when the original note is forwarded with added comments.

Figure 86 shows the note that is sent from a POP3 client using Netscape Navigator to an OV/400 user. The note contains a bitmap that is added to the note as an attachment.
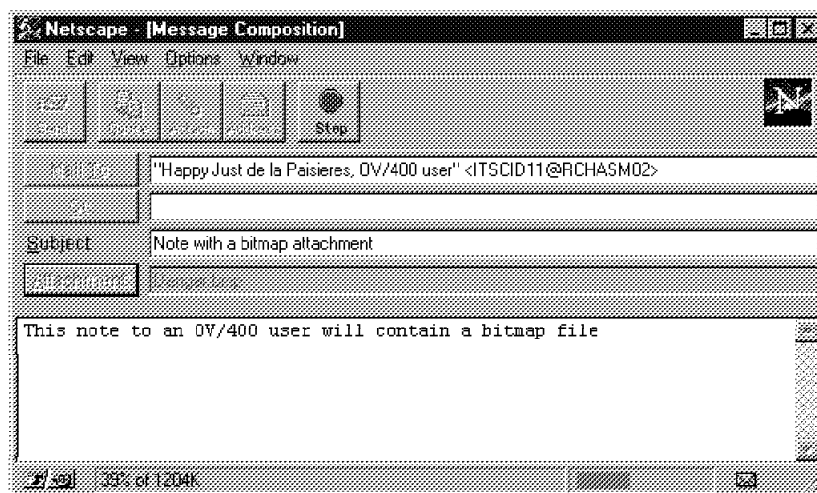

Figure 86. Netscape Message Composition

Figure 87 displays the bitmap attachment as a separate icon on the lower part of the document. This document is opened by clicking on the *Sent* box.
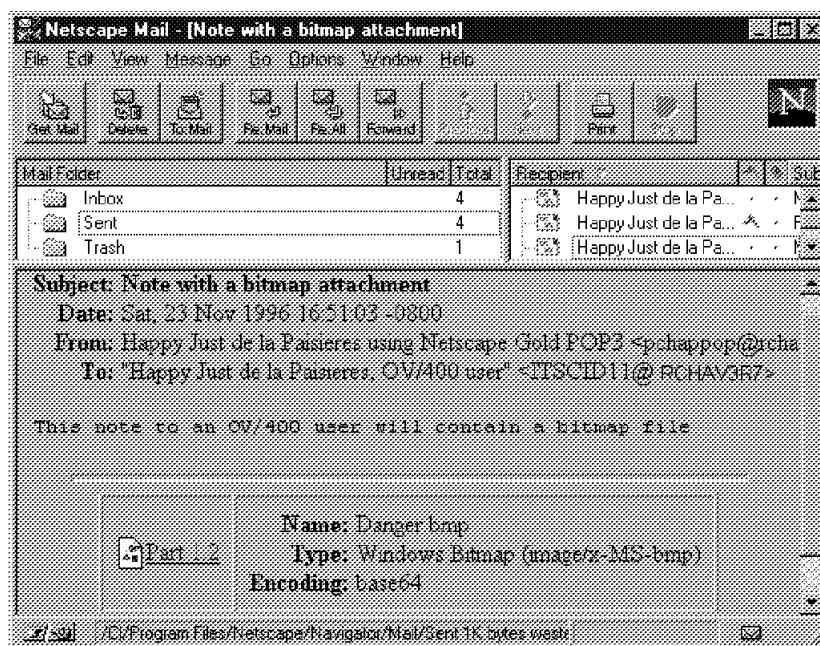
Figure 87. Netscape Message with MIME

The note that is sent to the OfficeVision for OS/400 user is converted by AnyMail Framework. The multimedia part of the MIME note is converted to an OV/400 document PC file, being a binary representation of the multimedia part. The name that is created for this PC file is derived from the header information containing the content type for the image and the name (in this example, *Danger.bmp*). The PC file name is stored in the Document Interchange Architecture (DIA) part of the OV/400 document. This PC file can be forwarded to another POP3 client. Figure 88 displays the converted MIME note received by the OfficeVision for OS/400 user.

```
                            Work with Mail

 Working with mail for  . . . . . :    USERID11 SYSTEM02


 Type options, press Enter.
   2=Revise a copy   4=Delete      5=View     6=Print    8=Work with details
   9=Print options  10=Forward   11=Reply   12=File remote   13=File local
  14=Authority      15=Fill form

                    -------From-------                            Date
 Opt  Status      User ID  Address   Description                 Received
  5   NEW         PCHAPPOP SYSTEM02  Note with a bitmap attachment  11/23/96
      NEW         PCHAPPOP SYSTEM02  (Danger.bmp)                   11/23/96
      OPENED      QSM00008 QSMRMTAD  SMTP  29                       11/22/96
      OPENED      QSM00008 QSMRMTAD  SMTP  25                       11/22/96
      OPENED      PCTIMEU  SYSTEM02  Mail from an Eudora client to O 11/22/96
      OPENED      PCHAPPOP SYSTEM02  POP3 Navigator client          11/21/96
      OPENED      PCHAPPOP SYSTEM02  Test with Navigator mail client 11/20/96
```

Figure 88. OfficeVision for OS/400 - Work with Mail

The text part of the note displayed in Figure 89 shows that the multimedia attachment is of the type image and subtype bitmap. The PC file *Danger.bmp* can be stored locally on the AS/400 system in a shared folder or on a remote system.

```
MAIL        P:12                VIEW Required Hyphen      Pg:1      Ln:16
<2....:....3....:....4....:....5....v....6....:....7....:....8....:....9>...:.
*
Message-ID:<32979BF6.7CC9@system02.systand.ibm.com>
Date: Sat, 23 Nov 1996 16:51:03 -0800
From:  Happy Just de la Paisieres using Netscape Gold POP3 <pchappop@syst
Reply-To: pchappop@system02.systand.ibm.com
MIME-Version: 1.0
To: "Happy Just de la Paisieres, OV/400 user" <USERID11@SYSTEM02>
Subject: Note with a bitmap attachment

 -----------------------------------------------------------------------

 This note to an OV/400 user will contain a bitmap file

 -----------------------------------------------------------------------
Type/Subtype: image/x-MS-bmp
Description: (Danger.bmp)
```

Figure 89. OfficeVision for OS/400 - View of Text Note

Figure 90 on page 115 displays the information that is shown if option 13 (File local) is used.

```
                              File Document

 Document type . . . . . :   IBM personal computer file

 Type choices, press Enter.

   Document  . . . . . . .   Danger.bmp              Name, *NONE
   Folder  . . . . . . . .   USERID11
                                                     Name, *NONE, F4 for list
   Document description      Note with a bitmap attachment
   Subject . . . . . . . .   (Danger.bmp)

   Authors . . . . . . . .
   Keywords  . . . . . . .

                                                     F4 for list
   Document class  . . . .                           F4 for list
   Allow revisions . . . .   Y                       Y=Yes, N=No
   Delete from mail  . . .   N                       Y=Yes, N=No
   Project . . . . . . . .
                                                                   More...
 F3=Exit   F4=Prompt   F5=Refresh   F9=Change authority   F12=Cancel
 F19=Display messages
```

Figure 90. Option 13 - File Local, Display File Document

The PC file, as forwarded from OfficeVision, arrives on the POP3 client (see Figure 91).
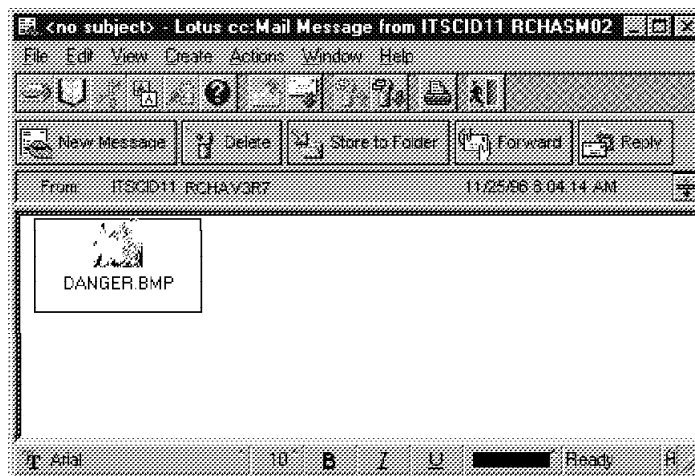
Figure 91. PC File Forwarded to a Lotus Mail User

Figure 92 on page 116 displays the bitmap in a PC viewer being activated by clicking on the bitmap icon.

Figure 92. Bitmap Shown in a PC Viewer

Chapter 7. Configure a Client Access Based Mail Client

This chapter describes the e-mail capabilities of the AS/400 system in an extended POP environment that we call Client Access based Windows 95 client. The extensions made in the POP3 server interact with Client Access to the MAPI supported POP client as implemented by IBM. As described in Chapter 4, "Electronic Mail Support in OS/400" on page 51, IBM implemented MAPI service providers that can be used on a Windows 95 client. This function is provided with Client Access for OS/400 for a Windows 95 client, V3R1M1.

AS/400 Support for Extended Functions

POP3 as defined in RFC 1725 also gives the possibility to define an extended interface in the implementation of the POP3 server by a software vendor. The objective of the extended interface is to provide additional functions for use with the POP clients that are aware of the extended interface. The AS/400 POP3 server is implemented with this interface to interact with the Client Access/400 based POP clients (for example, Lotus Mail).

Mail Send Functions

As stated before, the POP3 server has a simple store and forward mechanism. RFC 1725 does not provide verbs to allow the client to send mail to the POP3 server. The client can only <u>retrieve</u> mail from the mailbox (see "Supported POP3 Verbs" on page 77).

On the other hand, by directing the mail through the AnyMail Mail Framework on the AS/400 system, the POP3 server can act as a mail gateway for multiple transport types. One set of extensions to the AS/400 POP3 server allows clients to send mail directly to the POP3 server instead of to SMTP. This allow clients to use address types that the AS/400 POP server understands in addition to the standard Internet type. It also allows clients to connect to the AS/400 system with connection types supported by the AS/400 POP Server in addition to the standard TCP/IP (that is, IPX or SNA).

Address Book

The AS/400 POP3 server uses the information in the system distribution directory for e-mail addressing. For Client Access based Windows 95 client, the AS/400 POP3 server can act as an address book server. The extended functions allow these clients to use it. The address book is presented to the client through an MAPI interface. The user can address the mail to be sent by selecting from a list of persons.

The selected entries in the address book are obtained from the system distribution directory or from the distribution lists. You can specify an interval to refresh these entries from the system distribution directory with the Change POP Server Attributes (CHGPOPA) command. Clients cannot update the selected entries in the address book; updates are made indirectly by updating the system distribution directory. The entries are reformatted to the MAPI address type and properties. For an optimized performance (lookup and transmission), the entries in the address book are cached in separate cache sets (see Figure 99 on page 122).

Address Book Data

The data in the address book contains entries created from individual system distribution directory entries (WRKDIRE, CHGDIRE, ...) or from distribution lists (WRKDSTL, CHGDSTL, ...) and is stored in UNICODE. Each address book entry consists of the following fields:

- Display-name
- MAPI-address-type. This can be one of:
    - INTERNET
    - OFFICEVISION
    - AS400FAX
- E-mail-address

Selected System Distribution Directory Entries

Not all entries in the system distribution directory are reflected in the address book cache. The following rules apply for selected entries:

- *ANY* entries are never included.
- *Preferred address* parameter must be one of:
    - User ID/Address (see Figure 93).
    - SMTP name (see Figure 93). The SMTP address data must also be filled in (see Figure 96 on page 120).
    - Other preferred address (FAXTELNB is the only type reflected) (see Figure 94 on page 119).

```
                         Change Directory Entry

  User ID/Address . . . . :   PCHAPCCM  SYSAV3R7

  Type changes, press Enter.

    Mail service level  . .   2                    1=User index
                                                   2=System message store
                                                   3=Other mail service
      For choice 3=Other mail service:
        Field name  . . . .                        F4 for list

    Preferred address . . .   3                    1=User ID/Address
                                                   2=O/R name
                                                   3=SMTP name
                                                   4=Other preferred address
      Address type  . . . .                        F4 for list
      For choice 4=Other preferred address:
        Field name  . . . .                        F4 for list
```

Figure 93. Example of Required Parameters, Display 1

The only supported address type for option 4 (Other preferred address) that is reflected in the address book is *FAXTELNB* in conjunction with the *FAXTELNBR* from the *Field name* (see Figure 94 on page 119 andFigure 95 on page 119).

```
                          Select Address Type

   Type option, press Enter.
     1=Select

   Opt      Address type
               ORNAME
               CCMAIL
               TNDENDGN
               ATDGNDEN
               ATRGEDGE
               ATSVDS
               USER
               FULNAM
               NETUSRID
               TELNBR1
               TELNBR2
               FAXTELNB
               SMTP
               MIME
               ATCCMIME
```

Figure 94. Example of Required Parameters, Display 2

```
                          Select Field Name

   Type option, press Enter.
     1=Select

   Opt      Field name      Product ID
               USER            *IBM
               FULNAM          *IBM
               NETUSRID        *IBM
               TELNBR1         *IBM
               TELNBR2         *IBM
               FAXTELNBR       *IBM
               CCMAILADR       *IBM
```

Figure 95. Example of Required Parameters, Display 3

The SMTP related data, user ID, and domain must be provided if one is selected as *Preferred address* option 3, *SMTP name* (see Figure 96 on page 120).

```
                              Change Name for SMTP
                                                       System:    SYSAV3R7
     User ID/Address . . . . . :    PCHAPCCM SYSAV3R7



  Type choices, press Enter.

    SMTP user ID  . . . . . .     pchapccm
    SMTP domain . . . . . . .     SYSAV3R7.IBMITSC.IBM.COM




    SMTP route  . . . . . . .
```

Figure 96. Example of Required Parameters, Display 4

The QTPOBBATCH job (see Figure 99 on page 122) retrieves the selected system
distribution directory fields and caches this data on the AS/400 system. This
cached data is used to satisfy the queries from the MAPI based POP3 client. By
using caching, there are no calls to the system distribution directory APIs for each
POP3 client request. This improves the performance.

Mapping Selected Entries into the Address Book Cache

A subset of the system distribution directory entries is mapped into the address
book cache. The mapping structure is:

- **MAPI-address-type**:
  - If *Preferred address* is option 1=User ID/Address, then assign:
    - OFFICEVISION
  - If *Preferred address* is option 3=SMTP name, then assign:
    - INTERNET
  - If *Preferred address* is option 4=Other preferred address with the value
    FAXTELNB, then assign:
    - AS400FAX
- **Display-name**:
  - If *Full Name* is not blank, use it.
  - Otherwise, use the *Description*.
- **Email-address**:
  - If *Preferred address* is option 1=User ID/Address, then use the system
    distribution directory's data (DEN and DGN) with a blank in between.
  - If *Preferred address* is option 3=SMTP name, and the *SMTP route* field is
    not blank, use this information. Otherwise use the *SMTP user ID* and
    SMTP domain information with the @ character in between.
  - If *Preferred address* is option 4=Other preferred address with the value
    FAXTELNB, use the FAXTELNBR field.

Distribution Lists

All distribution lists are reflected in the address book cache. In this case, only the
distribution list itself is cached, not the individual entries that belong to the
distribution list.

Mapping Distribution List Data into the Address Book

As stated before, all distribution lists are reflected in the address book cache. The mapping structure is:

- **MAPI-address type**:
  – Assigned OFFICEVISION
- **Display-name**:
  – Assigned *Description* data
- **Email-address**
  – Assigned *List ID* and *List ID qualifier* with a blank in between

Figure 97 shows the related items that reflect the address book cache.

```
                      Display Distribution List Entries

 List ID . . . . . . . . :   E-MAIL    RESIDENT
 Description . . . . . . :   Members of the AS/400 e-mail capability residency
 Owner . . . . . . . . . :   USERID11


 Type options, press Enter.
   5=Display details   6=Print details


 Opt   User ID   Address    Description
       USERID08  SYSAV3R7   Tim Cunningham    3-6088 G215    USERID11 WBL123196
       USERID09  SYSAV3R7   Marianne Rosin    3-6088 G215    USERID11 WBL123196
       USERID11  SYSAV3R7   Happy Just d.l.P. 3-6088 G215    USERID11 WBL123196
       USERID15  SYSAV3R7   Rolando Figueroa  3-6088 G215             WBL123196
```

Figure 97. Distribution List Entries

Activating the Address Book Support

You must use the Change POP Server Attributes (CHGPOPA) command to activate the address book support for MAPI based POP3 clients. Be aware that by default, this support is not activated. See Figure 98 for the related address book parameters.

```
                    Change POP Server Attributes (CHGPOPA)

 Type choices, press Enter.

 Autostart servers  . . . . . . .    *YES          *YES, *NO, *SAME
 Number of initial servers  . . .    3             1-20, *SAME, *DFT
 Inactivity timeout . . . . . . .    600           10-65535 seconds, *SAME, *DFT
 Message split size . . . . . . .    128           32-2048 kilobytes, *SAME, *DFT
 MIME CCSID:
   Coded character set identifier    00819         *SAME, *DFT, 00819, 00912...
   When to use  . . . . . . . . .    *BESTFIT      *SAME, *BESTFIT, *ALWAYS
 Allow standard POP connection  .    *YES          *SAME, *YES, *NO
 Host server connection . . . . .    *ALL          *SAME, *NONE, *ALL, *IP...
              + for more values
 Address book:
   Enabled  . . . . . . . . . . .    *YES          *SAME, *NO, *YES
   Refresh interval . . . . . . .    60            1-65535 minutes, *NONE
```

Figure 98. The POP3 Server Attributes Display

The cache objects shown in Figure 99 on page 122 are created, verified, and refreshed when you start the POP3 server if the address book is enabled (*YES). The refresh is done as entered in the *Refresh interval* parameter. The AS/400 POP3 server accepts address book requests from Client Access based Windows 95 clients. The refresh interval defaults at 60 minutes. If this interval is set to a lower value, it can influence the performance. This may be the case with a large system distribution directory. If the value *NONE* is specified, the address book cache is created at the POP3 server startup. It is not refreshed while the server is running.

Every update that is made with the Change POP Server Attributes (CHGPOPA) command is affected after you restart the POP3 server. This is done with the Start TCP/IP Server (STRTCPSVR) command.
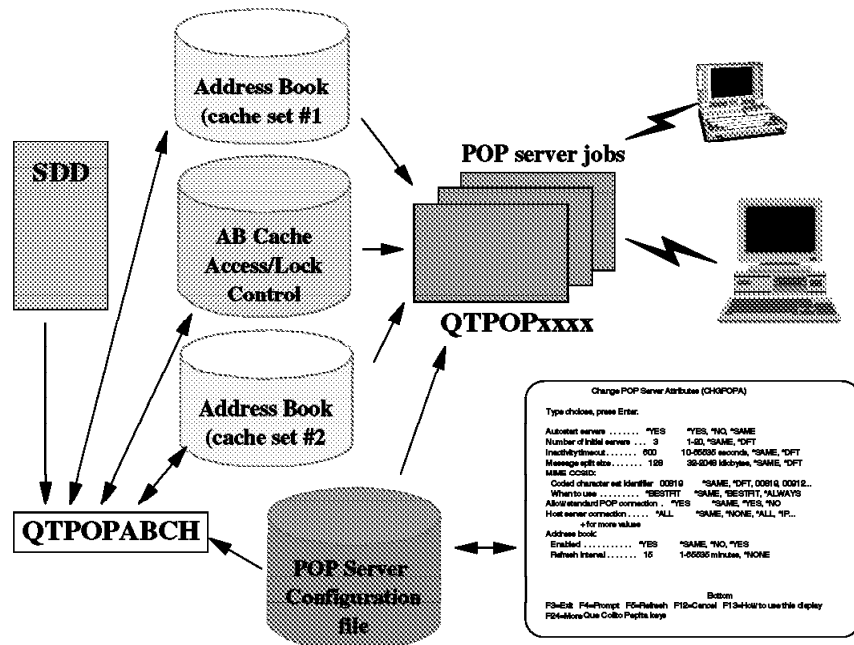
Figure 99. Address Book Support Architecture

Starting Up the Address Book

To see if the address book is started, check the following steps:

- POP server is started per normal procedures.

- If POP server configuration data indicates the address book is enabled, check the following steps:

  - POP server job automatically submits an Address Book Cache Refresh job called *QTPOPABCH* under the QSYSWRK subsystem.

  - All POP server jobs handling a client request are started ready to accept an address book request in addition to a mail request.

Refresh Job QTPOPABCH

To know how the refresh job QTPOPABCH works, check the following steps:

- Creates and maintains cache objects on library QUSRSYS:
  - A cache is made up of a set of three user-space objects.
  - Two separate cache sets exist on the system.
  - Only one cache set is active at any one time.
  - Separate *access control object* indicates which set is active.
  - During refresh from system distribution directory, the inactive cache is updated. After completion, the *active cache indicator* in the *access control object* is switched. This allows client queries to continue while the refresh is in process.

- Refresh logic is always performed at POP server startup:

  The refresh searches on the system distribution directory and builds a full cache; this is a lot of work if the refresh interval is short and the system distribution directory is large when the QTPOPABCH performs its refresh logic.

  - The QTPOPABCH job checks to see if the system distribution directory has been updated since the current active cache was built. The QTPOPABCH job uses the last change date/time stamps of the system distribution directory.
  - If the system distribution directory has not been updated, the current active cache is left in place.
  - If the system distribution directory has been updated, the QTPOPABCH job performs a real refresh.

  We expect that the vast majority of refresh intervals will come and go without really building a new cache.

- If the CHGPOPA ADRBOOK Refresh interval is *NONE, the job QTPOPABCH self terminates after the startup refresh is complete; otherwise, the job QTPOPABCH goes into loops between sleep for Refresh and wake up, and performs refresh logic until the POP server shutdown.

MAPI Architecture

Microsoft Windows 95 mail is based on the MAPI (Messaging Application Programming Interface) architecture. A description and explanation about MAPI is available from Microsoft MAPI SDK Docs online.

Here is a brief description:

- MAPI architecture: A modular architecture

- *Client Applications*: The client application can be any software such as word processing, spread sheet, or the mail client such as cc:Mail for the Internet or Microsoft Exchange provided by Windows 95.

- MAPI Subsystem: Consists of three parts:
  - MAPI spooler
  - Common user interface
  - Client and service provider programming interfaces

- *Service Providers* are drivers that connect the MAPI client applications to a messaging system. A few of these service providers are packaged with MAPI. Other service providers come with other products such as Client Access. The following three types are mostly used:
  - Message store
  - Address book
  - Message transport

- *Address Book Provider* manages an address book, enables users to address messages, and creates single recipients or distribution lists for read/write address books.

- *Transport Provider* handles the message transmission between the messaging system and the message store provider. This service is not shipped by Windows 95, but is provided by other products depending on the client that is used.

MAPI supplies two of its own service providers:

- Message Store known as Personal Folder
- Address Book Provider known as Personal Address Book (PAB)

These can be used as stand-alone or in combination with other service providers.

If you use the product cc:Mail for the Internet, the POP transport provider and the AS/400 address book provider is given by the cc:Mail product and is called *cc:Mail for IBM AS/400*.

When the cc:Mail for Internet is installed over Windows 95, the transport provider is added to the structure. This transport provider is used to allow the changing message between the cc:Mail and the AS/400 system (see Figure 100 on page 125).

If you are planing to use the Microsoft Exchange client provided by Windows 95, this software uses its own transport provider called *IBM AS/400*. This transport provider is given by the product Client Access/400 for Windows 95.

Note: The product required for the cc:Mail for the Internet is Client Access/400; the product required by the Microsoft Exchange client is V3R1M1 for Windows 95.
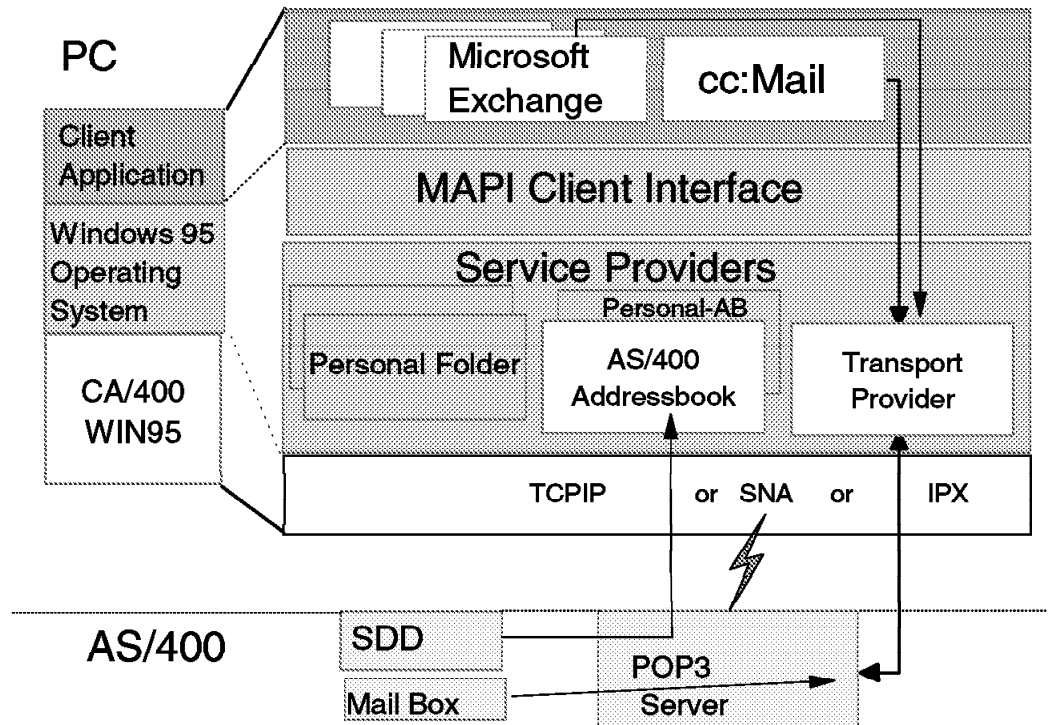
Figure 100. MAPI Architecture

The MAPI client interface is provided by Microsoft Windows 95 and is shipped with
the product. A prerequisite for installing for cc:Mail for the Internet is the MAPI
interface. This is checked during the installation of cc:Mail for the Internet and, if
necessary, installed from the same CD.

How the Mail Flows Through the AS/400 System

The following chapters describe the flow of mail within the AS/400 system. Note
that the mail can flow into and from the POP3 server from multiple sources.

Mail Flow between Client Access Based Windows 95 Clients

Looking at the mail flow between these POP3 clients, you must make a
differentiation between *local* and *remote* mail flow.

The local mail reflects the mail exchange between local Client Access based
Windows 95 clients both of which have mailboxes on the same POP3 server. The
remote mail flow defines the mail exchange between users who have their mail
delivered to different hosts.

For the local attached Client Access based Windows 95 client, the mail goes
directly from the sender to the POP3 server. From there, the mail goes into the
AnyMail Framework. No SMTP connection is required on the client that sends the
mail. Furthermore, the POP3 server provides address book functions to the Client
Access based Windows 95 client.

Local Mail Flow

Figure 101 shows the steps for the incoming mail flow from a Client Access based Windows 95 client to another locally attached Client Access based Windows 95 client. For the cc:Mail for the Internet Release 1.0 clients, the local mail flow is the same (the mail flow does not depend on the type of connection being made). Client Access can provide a TCP/IP, SNA, or IPX connection to the AS/400 system.

1. The mail sent from the client goes directly into the POP3 server.

2. AnyMail Framework receives the data.

3. AnyMail Framework handles the mail and checks for the recipient's destination (local in this case).

4. AnyMail Framework puts the data into the recipient's mailbox. In case the mailbox does not exist, the first time mail is received, a mailbox is created.

5. The mail remains in the mailbox until the client makes a connection with the AS/400 system.

6. The receiving Client Access based Windows 95 client makes the connection, retrieves the mail from its mailbox, and sends a request to the POP3 server to mark the data for deletion.
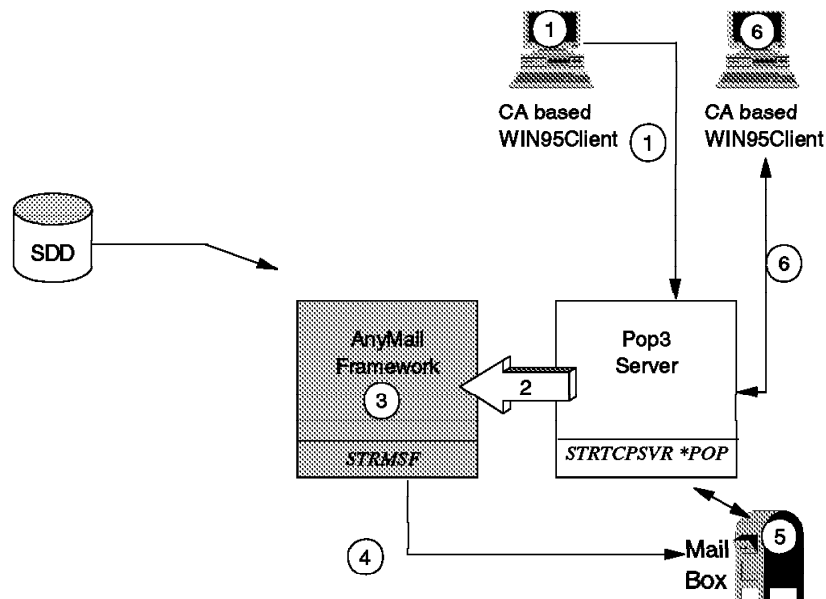
Figure 101. Local Mail Flow between Client Access Based Windows 95 Clients

Remote Mail Flow using the TCP/IP Protocol

Figure 102 on page 127 shows the steps for the incoming mail flow from a Client Access based Windows 95 client to any non-local POP3 client, whether it is a cc:Mail, any POP3 client, or to a local POP3 client.

1. The mail sent from the client goes directly into the POP3 server.

2. AnyMail Framework receives the data.

3. AnyMail Framework checks for the recipient's destination (in this case, remote).

4. Mail destined for external system is passed to SMTP for transmission to the remote located POP3 client.

5. SMTP transmits the mail to the remote located POP3 client.
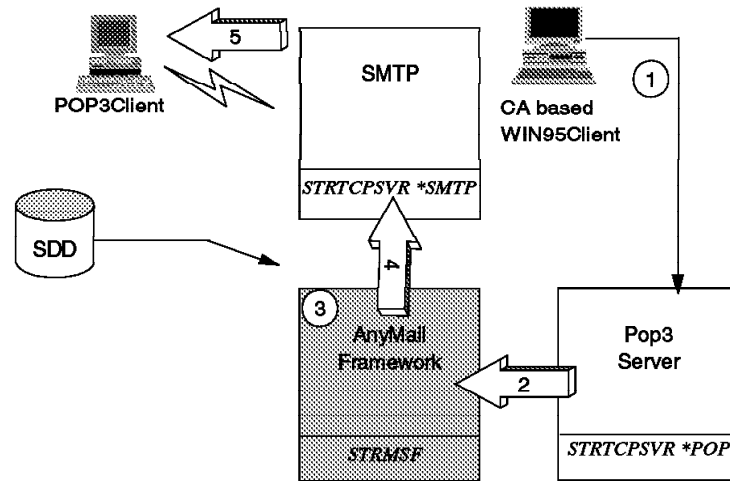
Figure 102. Mail Flow from Local Client Access Based Windows 95 Clients to Any Remote POP3 Client over SMTP

Remote Mail Flow using the SNA Protocol

Figure 103 on page 128 shows the steps for the incoming mail flow from a Client Access based Windows 95 client to any remote attached POP3 client.

The steps are similar to the ones mentioned in "Remote Mail Flow using the TCP/IP Protocol" on page 126. The only difference is that in Step 3, the mail is passed to SNADS and a SNADS distribution is created. In Step 4, the mail contained in the SNADS distribution is placed on a SNADS distribution queue in the QSNADS subsystem. In Step 5, a SNADS sender then does the actual sending of the distribution.
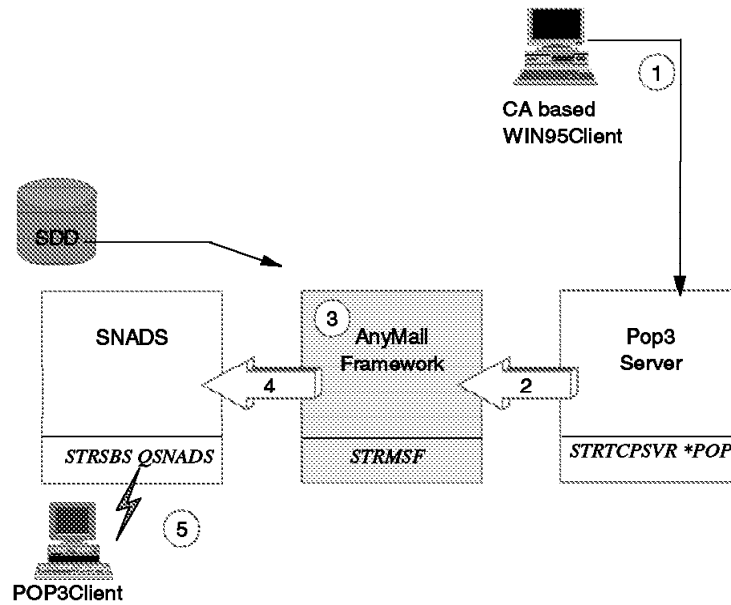
Figure 103. Mail Flow between Client Access Based Windows 95 Clients to Any POP3 Client over SNA

Address Book Data Flow

Figure 104 on page 129 shows the steps for the address book data flow if a local Client Access based Windows 95 client wants to use the IBM AS/400 address book.

The address book extraction was done based on the time interval that is defined in the Change POP Server Attributes (CHGPOPA) command. See "Address Book" on page 117 for more information.

1. Client Access based Windows 95 client sends the request to the POP3 server.

2. The POP3 server handles the request.

3. The POP3 server transmits the data from the Current Address book cache to the Client Access based Windows 95 client.
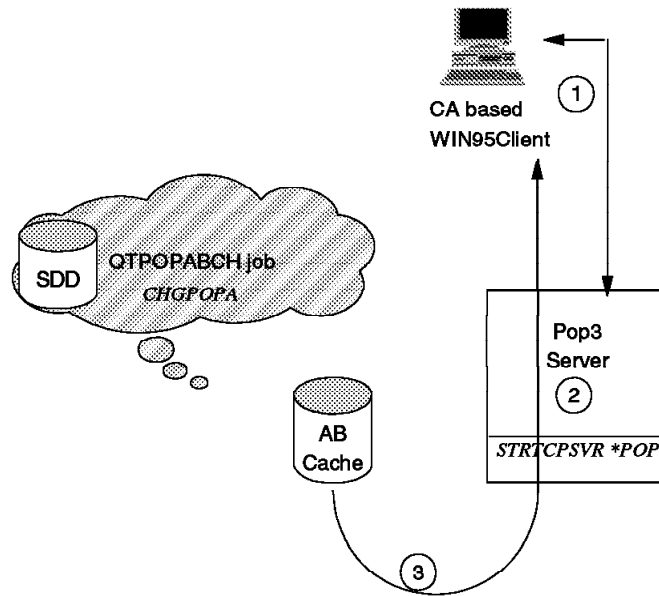
Figure 104. Address Book Data Flow to Local Client Access Based Windows 95 Clients

Required AS/400 Software

The following AS/400 Licensed Program Products (LPP) are required to have the AS/400 system act as a POP3 server for a Client Access based Windows 95 client.

Table 7. Required Software for the AS/400 System		
Description	**For V3R7M0**	**For V3R2M0**
TCP/IP Connectivity Utilities packed with no charge includes POP3 Server	5716TC1	5736TC1 + PTF SF34433 and SF34435
Host Servers	5716SS1 Option 12	5736SS1 Option 12
Client Access/400 Family-Base	5716XA1	5736XA1
Client Access/400 for WIN95	Must be at **V3R1M1**	Must be at **V3R1M1**
Optional Facsimile support	5798TAY	5798TAY

This can be checked by using the GO LICPGM command and option 10 (Display installed licensed programs).

TCP/IP and SMTP Configuration

When the TCP/IP Connectivity Utilities program is installed, you need to check if the interfaces, routes, and the local domain and host names are configured. Use the CFGTCP command to activate the "Configure TCP/IP" menu to check the values.

```
CFGTCP                          Configure TCP/IP
                                                        System:    SYSAV3R7
   Select one of the following:

        1. Work with TCP/IP interfaces
        2. Work with TCP/IP routes
        3. Change TCP/IP attributes
        4. Work with TCP/IP port restrictions
        5. Work with TCP/IP remote system information

       10. Work with TCP/IP host table entries
       11. Merge TCP/IP host table
       12. Change local domain and host names
       13. Change remote name server

       20. Configure TCP/IP applications
       21. Configure related tables
       22. Configure point-to-point TCP/IP

   Selection or command
   ===>
```

Figure 105. Configure TCP/IP Menu

For questions about the values for these options, contact your local system
administrator. For setting up the clients, you need information that can be obtained
using option 12 (Change local domain and host names) of the Configure TCP/IP
menu (see Figure 106).

```
                     Change Local Domain and Host Names
                                                        System:    SYSAV3R7
   Type choices, press Enter.

     Local domain name . . .   IBMITSC.IBM.COM



     Local host name . . . .   SYSAV3R7
```

Figure 106. Change Local Domain and Host Names

Next check the SMTP attributes:

```
                      Change SMTP Attributes (CHGSMTPA)

 Type choices, press Enter.

 Autostart server . . . . . . . .   *YES            *YES, *NO, *SAME
 Retries by minute:
   Number of retries  . . . . . .   3               0-99, *SAME, *DFT
   Time interval  . . . . . . . .   30              0-99, *SAME, *DFT
 Retries by day:
   Number of retries  . . . . . .   0               0-9, *SAME, *DFT
   Time interval  . . . . . . . .   0               0-9, *SAME, *DFT
 Retry remote name server . . . .   *NO             *YES, *NO, *SAME
 Automatic registration . . . . .   *YES            *NO, *YES, *SAME
   User ID prefix . . . . . . . .   QSM             Name, *SAME, *DFT
   Address  . . . . . . . . . .    QSMRMTAD        Name, *SAME, *DFT
   System name  . . . . . . . . .   TCPIP           Character value, *SAME, *DFT
   Alias table type . . . . . . .   *SYSTEM         *SAME, *SYSTEM, *PERSONAL
 User ID delimiter  . . . . . . .   '?'             *SAME, *DFT, ?, =, ., &, $...



                                                                    More...

```

Figure 107. SMTP Attributes

The *Autostart server* specifies whether to start the SMTP server automatically when
TCP/IP is started by the Start TCP/IP (STRTCP) command. When SMTP is started
by the Start TCP/IP Server (STRTCPSVR) command, this parameter is ignored.
The SMTP server is started regardless of the value of this parameter.

The *Automatic registration* specifies (for incoming mail) whether the remote user ID
and address are automatically added to the system directory as an SMTP user.

Setting Up the AS/400 System Distribution Directory

The system distribution directory contains entries for users who are authorized to
send and receive messages on the network. The AnyMail Framework uses the
system distribution directory to determine where to send the mail. First you need to
use the Create User Profile (CRTUSRPRF) command to create the POP3 client to
pass security when the client signs on to the AS/400 system.

```
                      Create User Profile (CRTUSRPRF)

 Type choices, press Enter.

 User profile . . . . . . . . . .   PCHAPPOP        Name
 User password  . . . . . . . . .   marcel          Name, *USRPRF, *NONE
 Set password to expired  . . . .   *NO             *NO, *YES
 Status . . . . . . . . . . . . .   *ENABLED        *ENABLED, *DISABLED
 User class . . . . . . . . . . .   *USER           *USER, *SYSOPR, *PGMR...
 Assistance level . . . . . . . .   *SYSVAL         *SYSVAL, *BASIC, *INTERMED...
 Current library  . . . . . . . .   *CRTDFT         Name, *CRTDFT
 Initial program to call  . . . .   *NONE           Name, *NONE
   Library  . . . . . . . . . . .                   Name, *LIBL, *CURLIB
 Initial menu . . . . . . . . . .   *signoff        Name, *SIGNOFF
   Library  . . . . . . . . . . .      *LIBL        Name, *LIBL, *CURLIB
 Limit capabilities . . . . . . .   *NO             *NO, *PARTIAL, *YES
 Text 'description' . . . . . . .   Happy Just de la Paisieres,POP3-SMTP client
```

Figure 108. Create User Profile

Note: For security reasons, you may use the parameter *INLMNU (*SIGNOFF)*. In this case, the POP mail user does not actually sign on to the AS/400 system.

Once the user profile is created, you need to use the Work with Directory Entries (WRKDIRE) command to add the user to the system distribution directory. We recommend using this command instead of adding the user directly to the directory with the Add Directory Entry (ADDDIRE) command. This is due to the fact that the required option to **Add name for SMTP** is not provided with this command.

```
                       Work with Directory Entries

 Type options, press Enter.
   1=Add       2=Change   4=Remove   5=Display details   6=Print details
   7=Rename    8=Assign different ID to description   9=Add another description

 Opt  User ID   Address   Description

  1    _____   _____

       USERID08  SYSAV3R7  Tim Cunningham   3-6088 G215   USERID11 WBL123196
       USERID09  SYSAV3R7  Marianne Rosin   3-6088 G215   USERID11 WBL123196
       USERID11  SYSAV3R7  Happy Just d.l.P. 3-6088 G215  USERID11 WBL123196
       USERID15  SYSAV3R7  Rolando Figueroa 3-6088 G215            WBL123196
       LABUSER   SYSAV3R7  LABUSER
       MRK       SYSAV3R7  Marv on SYSAV3R7
       NICKHUTT  SYSAV3R7  Nick Hutt
       NTW01     SYSAV3R7  NTW01
       NTW02     SYSAV3R7  NTW02
       NTW03     SYSAV3R7  NTW03
       NTW04     SYSAV3R7  NTW04
                                                                    More...
 F3=Exit      F5=Refresh   F9=Work with nicknames   F11=Sort by description
 F12=Cancel   F13=Work with departments   F17=Position to   F24=More keys
```

Figure 109. Work with Directory Entries (WRDIRE)

Take option 1 (Add) on the first line of the display and press the Enter key.

```
                        Add Directory Entry

 Type choices, press Enter.

   User ID/Address . . . .   PCHAPPOP   SYSAV3R7
   Description . . . . . .   Happy Just de la Paisieres, POP3-SMTP client
   System name/Group . . .   SYSAV3R7                F4 for list
   User profile  . . . . .   PCHAPPOP                F4 for list
   Network user ID . . . .

   Name:
     Last  . . . . . . . .
     First . . . . . . . .
     Middle  . . . . . . .
     Preferred . . . . . .
     Full  . . . . . . . .

   Department  . . . . . .                        F4 for list
   Job title . . . . . . .
   Company . . . . . . . .
                                                              More...
 F3=Exit    F4=Prompt    F5=Refresh   F12=Cancel   F18=Display location details
 F19=Add name for SMTP    F20=Specify user-defined fields
```

Figure 110. Add Directory Entry (ADDDIRE) - Display 1

The "Add Directory Entry" display is activated. Please note the **F19=Add name for SMTP** function key.

Fill in the required parameter information for *User ID/Address, Description, System name/Group, and User Profile* and page forward to see the display in Figure 111.

```
                        Add Directory Entry

 Type choices, press Enter.

   Mail service level  . .   2                    1=User index
                                                  2=System message store
                                                  3=Other mail service
     For choice 3=Other mail service:
       Field name  . . . .                        F4 for list

   Preferred address . . .   3                    1=User ID/Address
                                                  2=O/R name
                                                  3=SMTP name
                                                  4=Other preferred address
     Address type  . . . .                        F4 for list
     For choice 4=Other preferred address:
       Field name  . . . .                        F4 for list




                                                              More...
 F3=Exit    F4=Prompt    F5=Refresh   F12=Cancel   F18=Display location details
 F19=Add name for SMTP    F20=Specify user-defined fields
```

Figure 111. Add Directory Entry (ADDDIRE) - Display 2

For the **local user**, pay particular attention to the parameters *Mail service level* and *Preferred address*. For "Mail service level", set the value to **2**, which is the System message store.

For the "Preferred address", set the value to **3**, which is the SMTP name. These parameters are important in relation to the mail environment being used with the AS/400 system. See Table 8 for the relationship.

Table 8. Mail Service Level and Preferred Address for Client Access Based Windows 95 Clients		
Environment	**Mail Service Level**	**Preferred Address**
Client Access based Windows 95 client client using TCP/IP	2	3
Client Access based Windows 95 client using SNA	2	3

<u>Do not</u> use *Preferred address=4* and *Address type=CCMAIL*. This is also related to *cc:Mail address* and *cc:Mail comment*. These values, as shown in Figure 112, were created in V3R1 for future support of a cc:Mail product. They should not be used for creating POP3 mail entries.

```
                        Change Directory Entry

 User ID/Address . . . . :   PCHAPPOP  SYSAV3R7

 Type changes, press Enter.

   cc:Mail (trademark of Lotus Development Corporation):
     cc:Mail address . . .



     cc:Mail comment . . .
```

Figure 112. Add Directory Entry (ADDDIRE) - Display 3

Next add the name for SMTP; press **F19**.

```
                            Add Name for SMTP
                                                         System:    SYSAV3R7
   Type choices, press Enter.

     User ID . . . . . . . . :    PCHAPPOP
     Address . . . . . . . . :    SYSAV3R7



     SMTP user ID  . . . . . .    PCHAPPOP
     SMTP domain . . . . . . .    SYSAV3R7.IBMITSC.IBM.COM




     SMTP route  . . . . . . .
```

Figure 113. Add Directory Entry (ADDDIRE) - Display 4

The name used for the SMTP user ID must be equal to the defined user profile name. The reason is that the AS/400 system handling the mail uses these names. The SMTP domain must be in the format *hostname.domain*.

Next, press the Enter key when you see the message *SMTP Table Updates Pending - Press Enter to Update*. The directory entry is created and adds the TCP/IP address to the system alias table that is used by the POP server. You do not need to restart SMTP or the POP server.

The Configuration of the POP Server

To configure the AS/400 POP3 server, activate the Change POP Server Attributes (CHGPOPA) command. This can be done in various ways:

- Take option 20 (Configure TCP/IP applications) on the *CFGTCP* menu. Then select option 16 (Change POP server attributes).

- Select option 16 (Change POP server attributes) on the Configure TCP/IP Applications (CFGTCPAPP) command.

- Enter the Change POP Mail Server Attributes (CHGPOPA) command.

The display in Figure 114 on page 136 is shown.

```
                    Change POP Server Attributes (CHGPOPA)

 Type choices, press Enter.

 Autostart servers  . . . . . . .   *YES          *YES, *NO, *SAME
 Number of initial servers  . . .   3             1-20, *SAME, *DFT
 Inactivity timeout . . . . . . .   600           10-65535 seconds, *SAME, *DFT
 Message split size . . . . . . .   128           32-2048 kilobytes, *SAME, *DF
 MIME CCSID:
   Coded character set identifier   00819         *SAME, *DFT, 00819, 00912...
   When to use  . . . . . . . . .   *BESTFIT      *SAME, *BESTFIT, *ALWAYS
 Allow standard POP connection  .   *YES          *SAME, *YES, *NO
 Host server connection . . . . .   *ALL          *SAME, *NONE, *ALL, *IP...
                 + for more values
 Address book:
   Enabled  . . . . . . . . . . .   *YES          *SAME, *NO, *YES
   Refresh interval . . . . . . .   15             1-65535 minutes, *NONE



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 114. Change POP Server Attributes (CHGPOPA) Display

The values to be entered with the various parameters are related to the type of
POP3 clients that are connected to the AS/400 POP3 server. These can be
divided in:

- **General setup for the POP3 server:**

    - *Autostart servers* specifies whether to automatically start the POP mail
      server when TCP/IP is started by the STRTCP command. When the POP
      mail server is started by the STRTCPSVR command, the AUTOSTART
      parameter is ignored and the POP mail server is started regardless of the
      value of this parameter. If STRTCPSVR *POP is specified and the POP
      server is already running, an additional server job is started.

    - *Number of initial servers* specifies the number of POP mail server jobs to
      start when POP is started by either the Start TCP/IP (STRTCP) command
      or the Start TCP/IP Server (STRTCPSVR) command. These jobs allow
      new clients to connect to the server without having to wait for the overhead
      associated with starting a new job. The server tries to keep at least this
      number of jobs available for connecting to new clients as the number of
      connected clients change. This is a performance enhancement for the
      POP mail server that reduces the system overhead each time a client
      connects. See Figure 35 on page 75 for the POP3 server job structure.

- **Setup for the Client Access based Windows 95 clients only:**

    - *Host server connection* specifies the types of connection protocols to be
      supported for Client Access for OS/400 clients connected to the POP
      server. You can specify *IP, *IPX, *SNA, and *ALL.

    - *Address book* specifies whether the POP server is enabled to support client
      requests for address book information. Address book information is
      extracted from the AS/400 system distribution directory and stored
      separately. It is optionally refreshed from the AS/400 system distribution

directory on a timed interval. The *refresh interval* you choose should be based on the processor utilization and the size of your address book. The value to be set affects the processor time needed for the refresh.

Changes made with the CHGPOPA command require you to stop and then restart the following software before it becomes active:

- POP3 Mail Server:
  - ENDTCPSVR *POP
  - STRTCPSVR *POP

SNA Environment

When you specify *SNA as the host server connection for the Client Access based Windows 95 client, the next step is to check the number of SNA servers. This number is not affected by the *Number of initial servers* parameter. This value only determines the number of POP server jobs to be started. The number of SNA servers is determined by the prestart job configuration and set with the Change Prestart Job Entry (CHGPJE) command. Figure 115 shows the display.

```
                      Change Prestart Job Entry (CHGPJE)

 Type choices, press Enter.

 Subsystem description  . . . . .   qsyswrk       Name
   Library  . . . . . . . . . .      qsys         Name, *LIBL, *CURLIB
 Program  . . . . . . . . . . .    qtmmsrvr       Name
   Library  . . . . . . . . . .      qtcp         Name, *LIBL, *CURLIB
 User profile . . . . . . . . . .  *SAME          Name, *SAME
 Start jobs . . . . . . . . . . .  5              *SAME, *YES, *NO
 Initial number of jobs . . . . .  *SAME          1-1000, *SAME
 Threshold  . . . . . . . . . .    *SAME          1-1000, *SAME
 Additional number of jobs  . . .  *SAME          0-999, *SAME
 Maximum number of jobs . . . . .  *SAME          1-1000, *SAME, *NOMAX




                                                                       Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display       F24=More keys
```

Figure 115. Change Prestart Job Entry (CHGPJE) Display

The SNA prestarted jobs are managed by the *QSYSWRK* subsystem and the job names are *QTPOSNA*.

To view only the SNA POP3 jobs, the WRKJOB(QTPOSNA) command shows these jobs (see Figure 116 on page 138).

```
                                 Select Job                            SYSAV3R7
                                                              11/19/96  11:30:10
    Type option, press Enter.
      1=Select


                                                                       Entered
    Option  Job        User      Number  Type   -----Status-----  System
            QTPOSNA    QTCP      020085  PJ     ACTIVE            11/05/96
            QTPOSNA    QTCP      020084  PJ     ACTIVE            11/05/96
            QTPOSNA    QTCP      020083  PJ     ACTIVE            11/05/96

```

Figure 116. Work with Job (WRKJOB) Display

IPX/SPX Environment

When you specify *IPX as the host server connection for the Client Access based
Windows 95 client, the next step is to check the IPX/SPX environment. The IPX
description and IPX circuit must be created on the AS/400 system. Use the
WRKIPXD command and the WRKIPXCCT command to check it (see Figure 117).

```
                        Display IPX Description                     SYSAV3R7
                                                              11/19/96  11:52:16
    IPX description  . . . . . . . . . :   RESIDENT
    IPX internal network number  . . . :   10A10020
    IPX routing protocol . . . . . . . :   *NLSP
    IPX router name  . . . . . . . . . :   *NONE

    IPX maximum datagram size  . . . . :   576
    IPX packet forwarding  . . . . . . :   *YES
    IPX hop count  . . . . . . . . . . :   64
    SPX maximum sessions . . . . . . . :   1000
    SPX watchdog abort timeout . . . . :   120000
    SPX watchdog verify timeout  . . . :   30000
    SPX are you there timeout  . . . . :   60000
    SPX default retry count  . . . . . :   10
    LAN hello  . . . . . . . . . . . . :   20
    WAN hello  . . . . . . . . . . . . :   20
    Designated router interval . . . . :   10
    Holding time multiplier  . . . . . :   3
                                                                       More...
    Press Enter to continue.
```

Figure 117. IPX Job Description Display

The IPX internal network number value is used in configuring the IPX client.

The IPX/SPX environment (STRIPX "description") must be started before the
STRHOSTSVR command and the STRTCPSVR *POP command are run. If you
fail to do so, the POP3 IPX jobs will not start.

The token-ring line description maximum frame size should be set at 4096 bytes.

Starting the Required Support

The next step is to make sure that the support needed for activating the POP3 server is successfully started on the AS/400 system. You can look for these jobs in the subsystem QSYSWRK.

The following commands must be started and checked for:

- **STRIPX** (IPX only):
    - QIPX job is started in subsystem QSYSWRK.
- **STRHOSTSVR *ALL**:
    - QZ* jobs are started in subsystem QSYSWRK.
- **STRMSF**:
    - QMSF* jobs are started in subsystem QSYSWRK.
- **STRTCPSVR** *SMTP:
    - QTMS* jobs are started in subsystem QSYSWRK.
- **STRTCPSVR** *POP:
    - QTPO* jobs are started in subsystem QSYSWRK.
- **STRSBS QSNADS**:
    - QSNADS subsystem is started.

The Start TCP/IP Server (STRTCPSVR) command starts any of the TCP/IP or OS/400 application servers that have been configured. This includes the SMTP and POP server applications. When you start the POP server, the command calls the start program *QTMMJOBS*. This program verifies that the server is not already up and running. If not, it submits the initial server job to the QSYSWRK subsystem. The first server job initializes the server environment and queries the configuration file that is created with the CHGPOPA command. It determines the number of additional server jobs to start. After starting the additional server jobs (see Figure 35 on page 75), the initial job waits for a client connection.

You can end the POP3 server with the End TCP/IP Server (ENDTCPSVR) command. This causes the POP3 server to shut down. The program, *QTMMJOBS*, is called to end the server. The mail that was not received by the POP clients remains in their mailboxes. The mail does not actually get deleted until a *QUIT* verb is received from the client (see "Supported POP3 Verbs" on page 77).

The POP3 jobs can be seen when you use the WRKACTJOB command. The naming conventions used are:

- **QTPOP**xxxxx for the standard IP connection server jobs
- **QTPOC**xxxxx for the CA/400 IP connection server jobs
- **QTPOI**xxxxx for the CA/400 IPX connection server job
- **QTPOSNA** for the CA/400 SNA connection server job
- **QTPOPABCH** for the address book cache refresh job

    Refer to "Address Book" on page 117 for more information.

```
                           Work with Subsystem Jobs                     SYSAV3R7
                                                             11/19/96   13:38:58
     Subsystem  . . . . . . . . . . :    QSYSWRK

     Type options, press Enter.
       2=Change   3=Hold   4=End    5=Work with   6=Release   7=Display message
       8=Work with spooled files    13=Disconnect


     Opt  Job           User        Type      -----Status-----  Function
          QIPX          QSYS        BATCH     ACTIVE
          QMSF          QMSF        BATCH     ACTIVE
          QTCPIP        QTCP        BATCH     ACTIVE                     More...
          QTMSNMP       QTCP        BATCH     ACTIVE            PGM-QTOSMAIN
          QTMSNMPRCV    QTCP        BATCH     ACTIVE            PGM-QTOSRCVR
          QTPOC00095    QTCP        BATCH     ACTIVE
          QTPOI00094    QTCP        BATCH     ACTIVE
          QTPOP00093    QTCP        BATCH     ACTIVE
          QTPOSNA       QTCP        PJ        ACTIVE
          QTPOPABCH     QTCP        BATCH     ACTIVE
          QZHQSRVD      QUSER       BATCH     ACTIVE
                                                                        More...
     Parameters or command
     ===>
     F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F11=Display schedule data
     F12=Cancel
```

Figure 118. Updated Work with Subsystem QSYSWRK Jobs Display

An updated display (see Figure 118) shows the jobs that are related to the POP3
server function.

Installation and Configuration of the POP3 Clients

For the scenario that is used in this chapter to test the mail exchange between
various POP3 clients and OfficeVision/400, different clients were installed and
configured. The cc:Mail for the Internet (part of Client Access/400 for Windows95)
was used.

In the following paragraphs, we show the mail configuration of the POP clients. For
the installation and configuration of Lotus Mail, refer to Chapter 7, "Configure a
Client Access Based Mail Client" on page 117 and Chapter 8, "Set Up Lotus Mail
4.5" on page 161.

Setting Up the Installation of Microsoft Exchange Client

The Microsoft exchange client is provided by Windows 95 and you can see it in the
option *Program* pop-up menu. You must also have an icon called *Inbox* in your
desktop. This icon is used to show how the product must be configured to do
messaging with the AS/400 system.

Setting Up the Microsoft Exchange Client

The first step is set up the properties of the products. By doing this, the product has the service providers needed to work.

To set up the configuration of the Microsoft exchange product, do the following steps:

1. Install the product Client Access/400 for windows 95 V3R1M1.

2. Install the service package for Client Access/400 (SF34290).

3. The Client Access/400 product installs the *Transport Provider* to the MAPI architecture and the address book to the AS/400 system.

4. At this point, you can set up your AS/400 user profile. To do it, refer to "Setting Up the AS/400 System for Lotus Mail Client" on page 167. That section shows you the configuration for the cc:Mail user profile in the AS/400 system, but is the same configuration that has to be done for the Microsoft exchange user profile.

5. Re-boot your PC.

6. At the Signon display to the AS/400 system, enter the user ID already created.

7. Configure the services of Microsoft exchange. To do it, click with the right mouse button on the icon *Inbox* and select the option properties and then click on **Add**. The windows are shown in Figure 119.
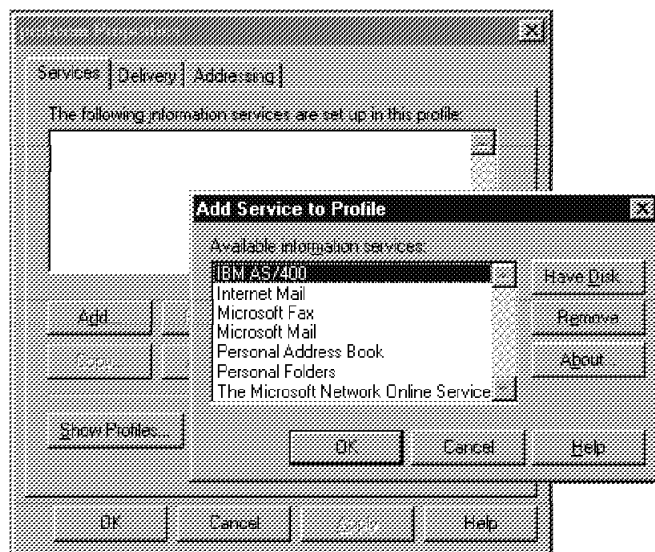
Figure 119. Microsoft Exchange Services

In that window, do the following steps:

- Select the information service called IBM AS/400 and click on OK. A window called IBM AS/400 Properties shows the server name. Click on Apply and then on OK.

- In the properties window, click on **Add**, select the Personal Address Book, and click on OK. The Personal Address window is shown with the service name and the folder. Click on **OK**.

- In the Properties window, click on **Add**, select the Personal Folder, and click on OK. A Create/Open Personal Folder window is shown. Write down the file name, which is the same as your user profile name. Click on **Open** and a window called Create Microsoft Personal Folder is shown where you can type a password or not. Click on OK.

At this point, the user properties window is similar to Figure 120.

Figure 120. Microsoft Exchange Services

8. Re-boot the PC and use the user profile created for the Microsoft Exchange product on the AS/400 Signon display.

Scenario 1 - Mail Flow between POP3 Clients and OV/400 Users

After defining the users, add them to the system distribution directory. Define and activate the SMTP and POP application servers at the AS/400 side. The next step is to install and configure the POP3 clients.

The scenario used to send mail between POP3 clients and the OfficeVision for OS/400 users is shown in Figure 121 on page 143.
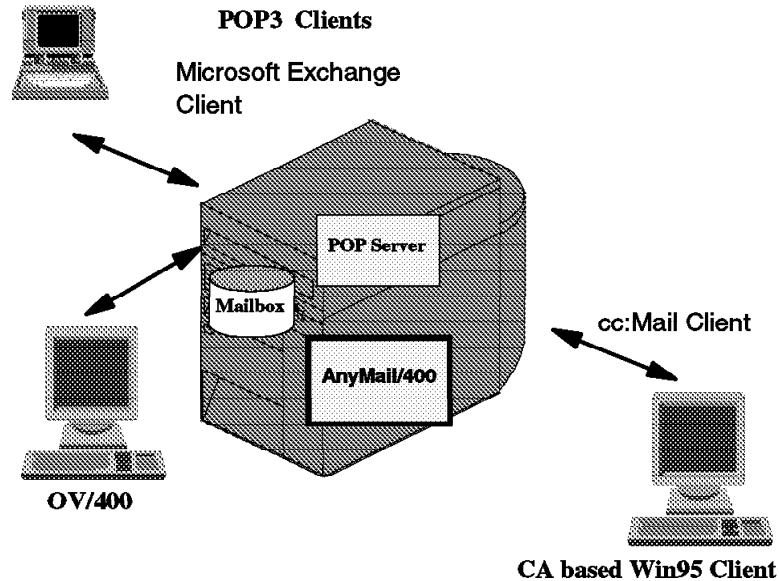
Figure 121. E-Mail Scenario using POP3 Clients, OV/400, and POP3 Server

Sending Mail between Lotus Mail and OV/400

To send and receive message from Lotus Mail to OfficeVision/400, check the following steps:

1. Install Lotus Mail on the PC (see "Install Lotus Mail 4.5" on page 162).

2. Set up the Lotus Mail user profile (see "Set Up Your Lotus Mail User Profile" on page 164).

3. Set up the Lotus Mail client on the AS/400 system (see "Setting Up the AS/400 System for Lotus Mail Client" on page 167).

4. Re-boot the PC.

5. On the Signon to AS/400 display, enter the Lotus Mail user profile and password (created in Step 3).

6. Check the AS/400 connection, a window similar to Figure 122 is shown.
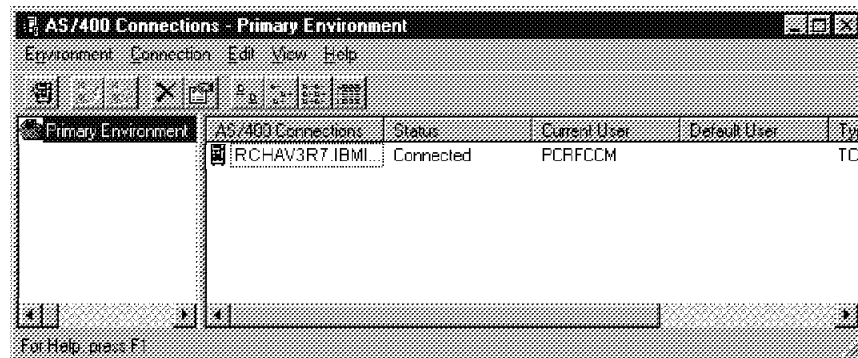
Figure 122. AS/400 Connection

7. Open the Lotus Mail folder. You are prompted for the Login/Profile name that you created for the Lotus Mail client. Enter the password and click on OK.

   Remember that this user profile and password must be the same as the user profile and password created on the AS/400 system in Step 3.

8. At this point, it is possible to send a message to OV/400. To send a message, do the following steps:

   a. On the Lotus Mail Mailbox window, click on **New Message**.

   b. On the Lotus Mail message window, click on **Address**.

   c. On the address book window, select the IBM AS/400 Address Book (see Figure 123).
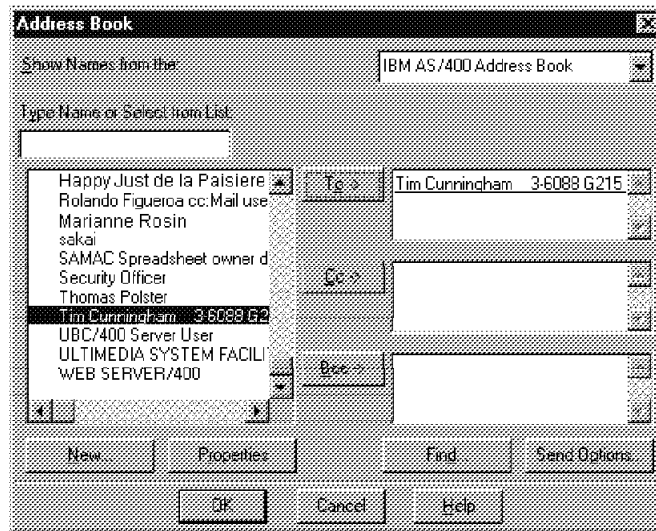
Figure 123. Address Book Window

   d. Select the user to receive the message and click on **TO** and then on **OK**.

   e. On the Lotus Mail message window, fill in the subject and the note. Press **Send** to send the message to the OV/400 user, and press **Yes** on the confirmation window (see Figure 124 on page 145).
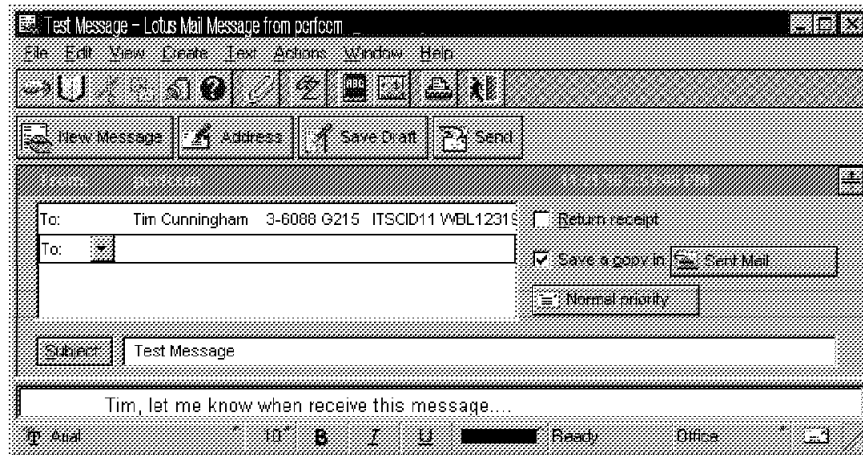
Figure 124. Lotus Mail Message Window

f. On the command line on the AS/400 system, enter the STROFC command and select option **2. Mail** to see the new message received by the AS/400 user (see Figure 125).

```
                              Work with Mail

   Working with mail for  . . . . . :    USERID08 SYSAV3R7


   Type options, press Enter.
     2=Revise a copy    4=Delete      5=View      6=Print    8=Work with details
     9=Print options   10=Forward    11=Reply    12=File remote   13=File local
    14=Authority       15=Fill form

                   -------From-------                              Date
   Opt  Status     User ID  Address  Description                  Received
    5   NEW        PCRFCCM  SYSAV3R7 Test Message                  11/21/96




                                                                      Bottom
   F3=Exit    F5=Refresh        F6=Work with outgoing mail status
   F9=Work with action items    F10=Display new mail   F12=Cancel   F24=More keys
```

Figure 125. Work with Mail

g. Select option 5 to view the message (see Figure 126 on page 146).

```
MAIL        P:12                  VIEW Instruction        Pg:1      Ln:1
<2....:....3....:....4....:....5....v....6....:....7....:....8....:....9>...:.
*
Date: Thu, 21 Nov 1996 15:57:20 -0700
X-To-OfficeVision: "Tim Cunningham    3-6088 G215    USERID11 WBL123196" <
From: "Rolando Figueroa cc:Mail user profile , SMTP" <pcrfccm@SYSAV3R7.IB
Message-Id:<848620640-0-pcrfccm@SYSAV3R7.IBMITSC.IBM.COM>
MIME-Version: 1.0
Content-Id:<848620640-1-pcrfccm@SYSAV3R7.IBMITSC.IBM.COM>
Subject: Test Message


------------------------------------------------------------------------

Tim, let me know when receive this message....




 F3=Exit          F7=Window        F12=Cancel          F16=File remote
 F4=Find char     F8=Reset         F13=Edit option     F17=Function
 F5=Goto          F10=Forward      F14=Delete mail     F19=Print
 F6=Find          F11=Reply        F15=File local      F21=Nondisplay keys
```

Figure 126. Message Displayed

> h. To send a reply to the message sender, press F11; then press F6 to type
>   the note (see Figure 127).

```
REPLY       P:12                  Edit Req'd Carrier Ret   Pg:1      Ln:11
<.:...T.2..T.:..T.3..T.:..T.4..T.:..Tv5..T.:..T.6..T.:..T.7..T.:..T.8..T.>....9
 Rolando, the message was received successfully...

 F
COPY LIST: *
 F



MAIL        P:12                                          Pg:1      Ln:7
     *
     Date: Thu, 21 Nov 1996 15:57:20 -0700
     X-To-OfficeVision: "Tim Cunningham    3-6088 G215    USERID11 WBL123196"
     From: "Rolando Figueroa cc:Mail user profile ,SMTP" <pcrfccm@SYSAV3R7.I
     Message-Id:<848620640-0-pcrfccm@SYSAV3R7.IBMITSC.IBM.COM>
     MIME-Version: 1.0

 F1=Copy        F10=Send         F16=Adjust/Paginate   F21=Nondisplay keys
 F2=Move        F12=Cancel       F17=Functions         F22=Spell functions
 F3=Exit/Save   F13=Edit options F18=Search/Replace    F23=Word spell aid
 F6=Find        F14=Get options  F19=Print/View        F24=More keys
```

Figure 127. Message Reply

> i. Press F10 to send and F3 to exit.
>
> j. After a few seconds, you see the message in the Lotus Mail MailBox
>   window (see Figure 128 on page 147).
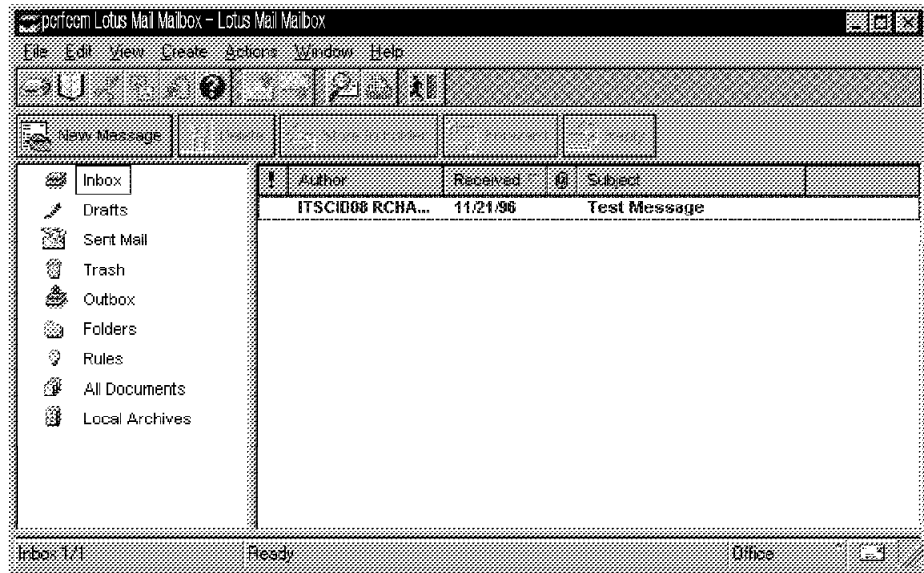
Figure 128. Lotus Mail MailBox Window

      k. Now the message can be accessed by double-clicking on it.

Scenario 2 - Sending Mail between Local Client Access Based Windows 95 Clients

To send a message to another locally-attached POP3 client (in this example, to a Lotus Mail user), first select the *Message* function. Next select *New Message* and enter your information (see Figure 129).
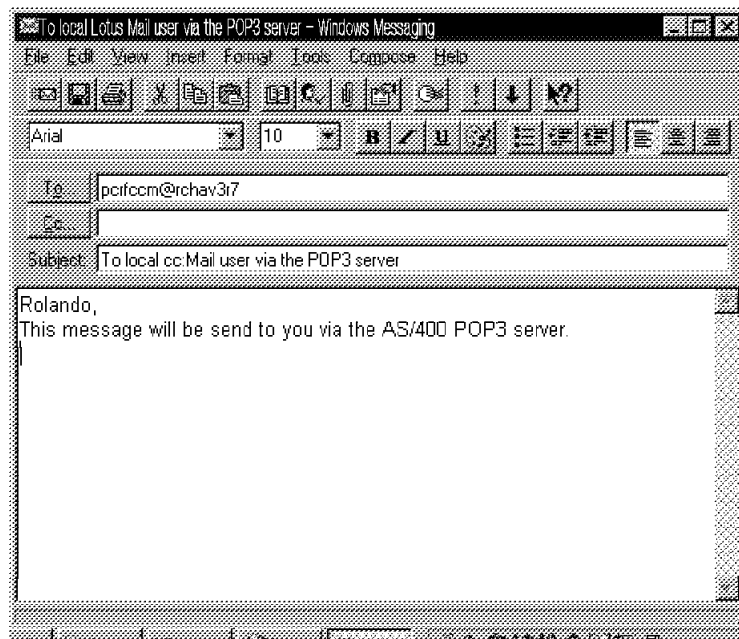
Figure 129. Mail to Another Local Client Access Based Windows 95 Client

```
                      Work with Object Links

 Directory  . . . . :   /QTCPTMM/MAIL

 Type options, press Enter.
   3=Copy   4=Remove   5=Next level   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt   Object link          Type      Attribute    Text
       qlockbox             DIR
       A960321CG            DIR
       USERID11             DIR
       USERID15             DIR
       PCHAPCCM             DIR
       PCHAPEU              DIR
       PCHAPPOP             DIR
  5    PCRFCCM              DIR
       PCTIMEU              DIR
                                                               More...
```

Figure 130. WRKLNK Command to Show the Mailbox

Assuming that the cc:Mail client is not logged into the POP3 server, you can check
the content of the recipient's mailbox by using the Work with Object Links
(WRKLNK) command. See Figure 131 and Figure 130 for the information.

```
                     Work with Object Links

 tory  . . . . :   /QTCPTMM/MAIL/PCRFCCM

 options, press Enter.
 opy   4=Remove   5=Next level   7=Rename   8=Display attributes
 Change current directory ...

  Object link          Type      Attribute    Text
  JW280067.NOT         STMF
```

Figure 131. WRKLNK Command to Show Pending Entries in Mailbox
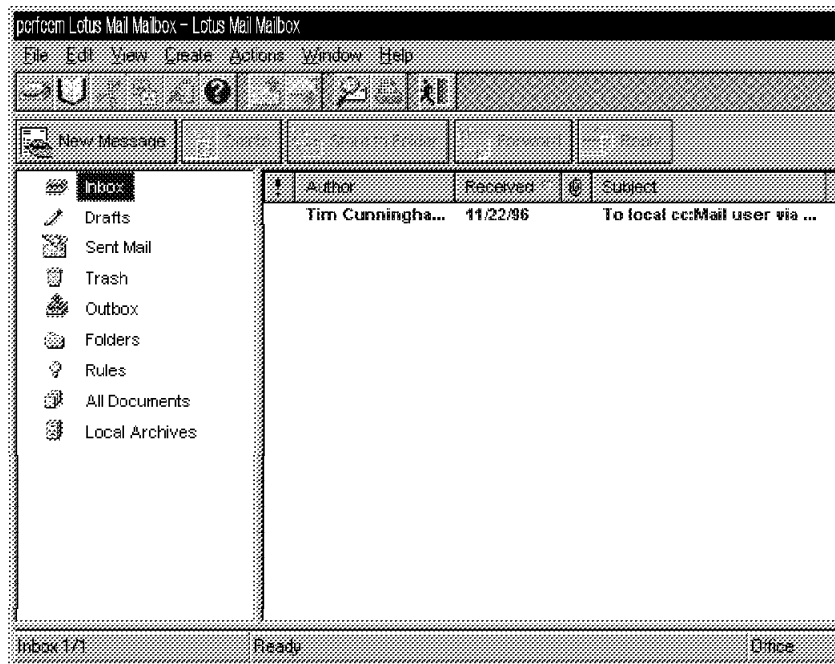
Figure 132. Mail Received from Another Local POP3 Client

The cc:Mail user is notified that new mail arrived. Clicking on this mail item shows the content of the new message. Figure 132 and Figure 133 displays the information.
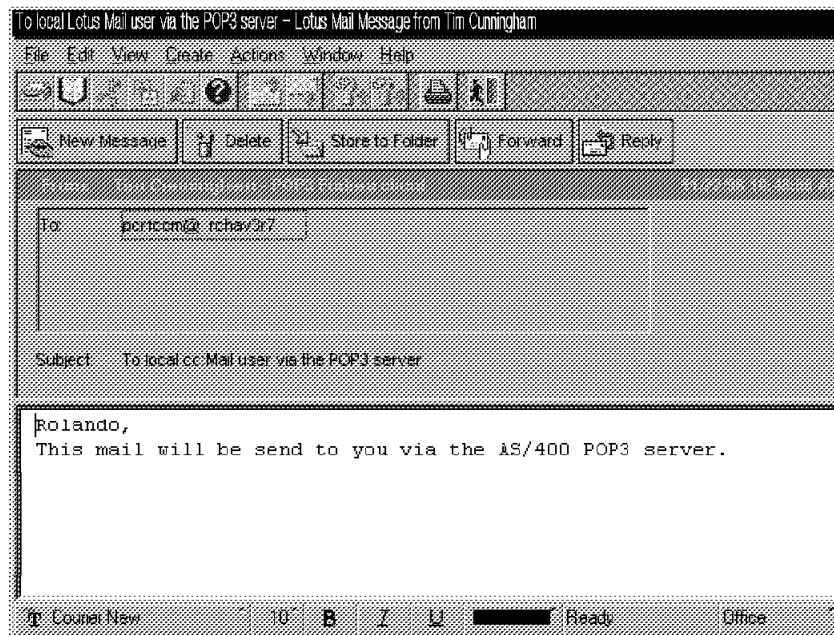
Figure 133. Mail Content

Scenario 3 - Sending Multimedia (MIME) Mail

Mail containing MIME is handled in different ways in relation to the type of the mail client to which the mail is destined. When the mail is sent from one POP client to another POP client, the mail is delivered as is. The mail content is not affected by the mail POP server so the POP-to-POP message is transparent.

This does not apply to mail that is sent from a POP client to an OfficeVision for OS/400 user. The AnyMail Framework converts MIME text into an OV/400 note and converts any binary attachments into PC files. These files can be viewed by the OfficeVision for OS/400 user with the corresponding PC viewer after copying these files to the local disk drive or shared folders.

The MIME message consists of multiple parts. Figure 134 shows an updated example of a MIME note that consists of multiple parts.

```
FROM: PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM
X-TO-OFFICEVISION:USERID11 SYSAV3R7
DATE: SUN, 24 NOV 1996 15.16.40 -0700
X-TO-OFFICEVISION: "HAPPY JUST D.L.P.
3-6088 G215    USERID11 WBL123196"
<USERID11 SYSAV3R7>
FROM: "HAPPY JUST DE LA PAISIERES -
cc:Mail USER. PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
SUBJECT: TRACE TEST..IMPORTANCE: MEDIUM PRIORITY: NORMAL
X-MAILER: IBM INTERNET MESSAGING FRAMEWORK
MESSAGE-ID: <848877401-0-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>

MIME-VERSION: 1.0 CONTENT-TYPE: MULTIPART/MIXED;
BOUNDARY="MIME.PART.BOUNDARY.=.3298D758"

--MIME.PART.BOUNDARY.=.3298D758.
CONTENT-TYPE: TEXT/PLAIN; CHARSET=ISO-8859-1

CONTENT-ID: <848877401-1-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
CONTENT-TRANSFER-ENCODING: QUOTED-PRINTABLE DATA WITH MIME

=......--MIME.PART.BOUNDARY.=..3298D758
CONTENT-TYPE: IMAGE/X-MS-BMP;NAME="DANGER.BMP"

CONTENT-ID:<848877402-2-PCHAPCCM@SYSAV3R7.IBMITSC.IBM.COM>
CONTENT-TRANSFER-ENCODING: BASE64 CONTENT-DESCRIPTION: <DANGER.BMP>
CONTENT-DISPOSITION: ATTACHMENT; FILENAME="DANGER.BMP"

AZUCSWESCDUDGGAINTQ1SZVLGO0CGGKNA4UAA5YUKGACNAGEA58BQ
etc.   etc.   etc.    etc.   etc.    etc.    etc.
AD703SAALTC+WCRWHSA68FNWAMH5YGHIOESYWIEG4NAG4BDQIDAAE

=--MIME.PART.BOUNDARY.=.3298D758--
```

Figure 134. Example of a MIME Message

The header contains the addressing data information related to the content type of the document being sent. For example, content type *Multipart/Mixed* means that the document contains plain text besides one or more multimedia attachments. Each attachment starts and ends with a *boundary*.

The content type directs the POP server to handle the attachments. When the type is not *Text/plain, Text/enriched*, or *Message/RFC822*, the attachment is stored as a binary PC file.

Content type *Message/RFC822* means that the document contains embedded notes (a note within a note). This is usually the case when the original note is forwarded with added comments.

Figure 135 shows the note that is sent from a POP3 client using Netscape Navigator to an OV/400 user. The note contains a bitmap that is added to the note as an attachment.
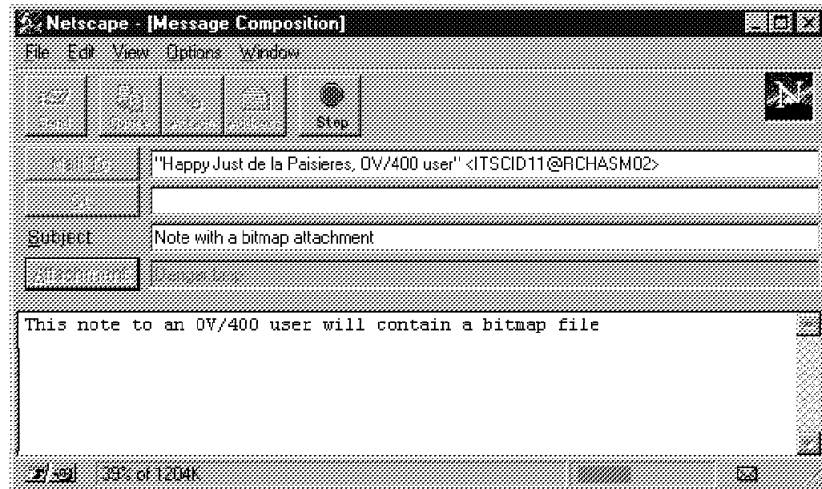
Figure 135. Netscape Message Composition

Scenario 4 - SNADS Tunneling

SNADS tunneling is a technique that allows POP3 users to send multimedia (MIME) mail across a SNADS network without converting it to OfficeVision mail.

Tunneling refers to a technique in which you can send protocol-based traffic across another protocol-based network. With SNADS tunneling, the MIME message is encapsulated as a SNADS object distribution data file. These types of files are treated as unformatted and they are passed to the receiver <u>as is</u>. This means no transformation takes place.
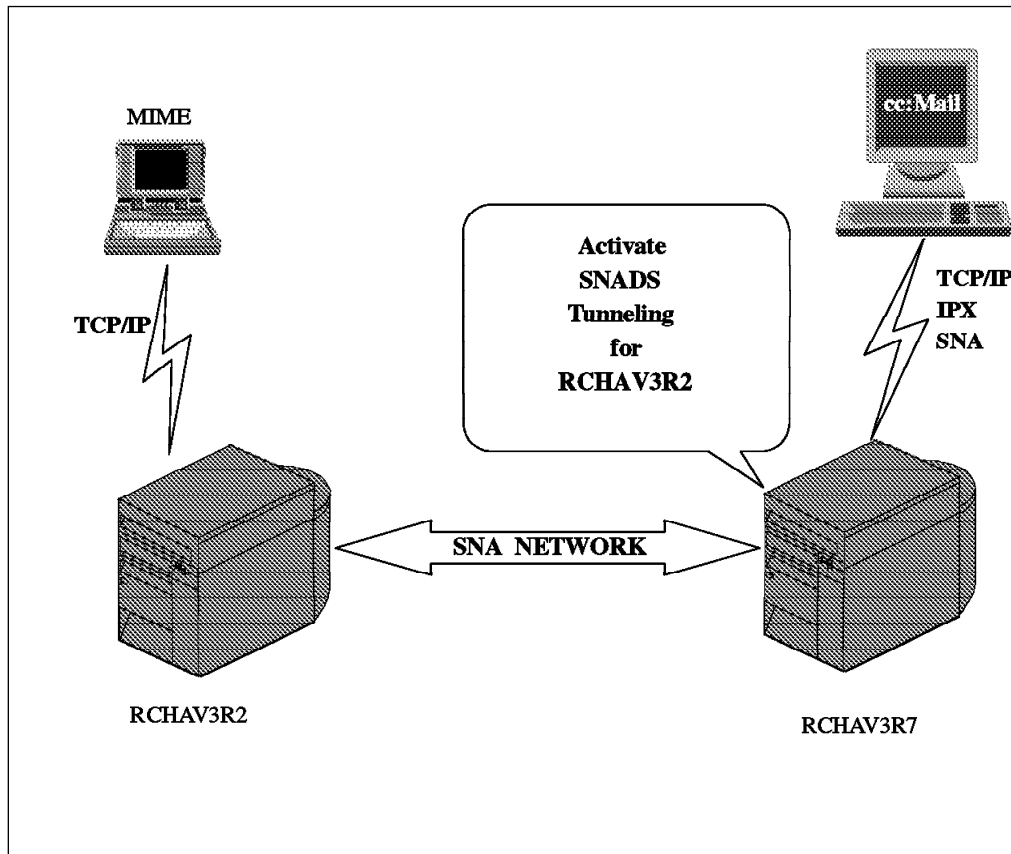
Figure 136. SNADS Tunneling Example

Tunneling is determined by the directory entry for the system or the user to which you are sending mail. It only affects the way the mail is <u>transported</u>, not the way it is delivered. To allow SNADS tunneling in the AS/400 system, there are two possibilities available:

1. Change the *ANY* entry for the receiving mail system:

   • Changing this directory entry ensures that all users on the other system are tunneled.

2. Change the directory entry for the receiving mail user:

   • Changing this directory entry ensures that only this user on that system is tunneled.

In the scenario displayed in Figure 136, there are two AS/400 systems, both with POP3 clients. The systems are connected using the SNADS protocol <u>only</u>. The cc:Mail for the Internet user on AS/400 system SYSAV3R7 wants to send MIME mail to a another client user on system SYSAV3R2, which may be a cc:Mail for the Internet or any other POP3 client. That means that on system SYSAV3R7, the SNADS tunneling function must be defined.

On the AS/400 system SYSAV3R7 in this example, enter the Work with Directory Entries (WRKDIRE) command to check if an *ANY* user is defined on the system. If so, see Figure 137 on page 153. Enter option 2 to change this directory entry.

```
                      Work with Directory Entries

 Type options, press Enter.
   1=Add       2=Change   4=Remove   5=Display details   6=Print details
   7=Rename    8=Assign different ID to description   9=Add another description

 Opt  User ID   Address    Description

      *ANY      *ANY       All VM users
  2   *ANY      SYSAV3R2   All Users on SYSAV3R2
      USERID08  SYSAV3R7   Tim Cunningham    3-6088 G215   USERID11 WBL123196
      USERID09  SYSAV3R7   Marianne Rosin    3-6088 G215   USERID11 WBL123196
      USERID11  SYSAV3R7   Happy Just d.l.P. 3-6088 G215   USERID11 WBL123196
      USERID15  SYSAV3R7   Rolando Figueroa  3-6088 G215            WBL123196
```

*Figure 137. Work with Directory Entries - *ANY User*

Enter *TNDENDGN* as the value in the field *Address type*. The address type is a
mail server framework type name. This is specified in the Add Mail Server
Framework Configuration API. More information can be found in the manual
AnyMail/400 Mail Server Framework Developer Guide, GG24-4449.

This concludes the SNADS Tunneling definition on the AS/400 system.

```
                       Change Directory Entry

 User ID/Address . . . . :   *ANY      SYSAV3R2

 Type changes, press Enter.

   Mail service level  . .   1                    1=User index
                                                  2=System message store
                                                  3=Other mail service
      For choice 3=Other mail service:
        Field name  . . . .                       F4 for list

   Preferred address . . .   1                    1=User ID/Address
                                                  2=O/R name
                                                  3=SMTP name
                                                  4=Other preferred address
      Address type  . . . .   TNDENDGN            F4 for list
      For choice 4=Other preferred address:
        Field name  . . . .                       F4 for list
```

*Figure 138. Change Directory Entry - *ANY User with Tunneling*

If no *ANY* entry is available, you have to change the entry for the user you want
the mail sent to.

If directory shadowing is active between the two AS/400 systems, you can either
change the *Any* entry or the user entry. In addition, the user's address is available
with the IBM AS/400 address book within the sending cc:Mail for the Internet client
and does not have to be created. Figure 139 on page 154 is an example of a
shadowed directory entry from the recipient PCAPEU. Enter *TNDENDGN* as the
value in the field *Address type* if you want to activate the tunneling option for this
user.

```
                        Change Directory Entry

 User ID/Address . . . . :   PCHAPEU    SYSAV3R2

 Type changes, press Enter.

   Mail service level  . .   2                     1=User index
                                                   2=System message store
                                                   3=Other mail service
     For choice 3=Other mail service:
       Field name  . . . .                         F4 for list

   Preferred address . . .   1                     1=User ID/Address
                                                   2=O/R name
                                                   3=SMTP name
                                                   4=Other preferred address
     Address type  . . . .   TNDENDGN              F4 for list
     For choice 4=Other preferred address:
       Field name  . . . .                         F4 for list

                                                                  More...
```

Figure 139. Change Directory Entry - User PCAPEU with Tunneling

In our example, the cc:Mail for the Internet user sent a MIME note. First, you need
to get the remote POP recipient address. Either the address is available in the IBM
AS/400 address book (this is the case if directory shadow is active between the two
AS/400 systems) and you can select this address, or you have to create a new
address. To do this, click on your address book function and create a new
address. Keep in mind that you have to select the OfficeVision Address (see
Figure 140 on page 155).
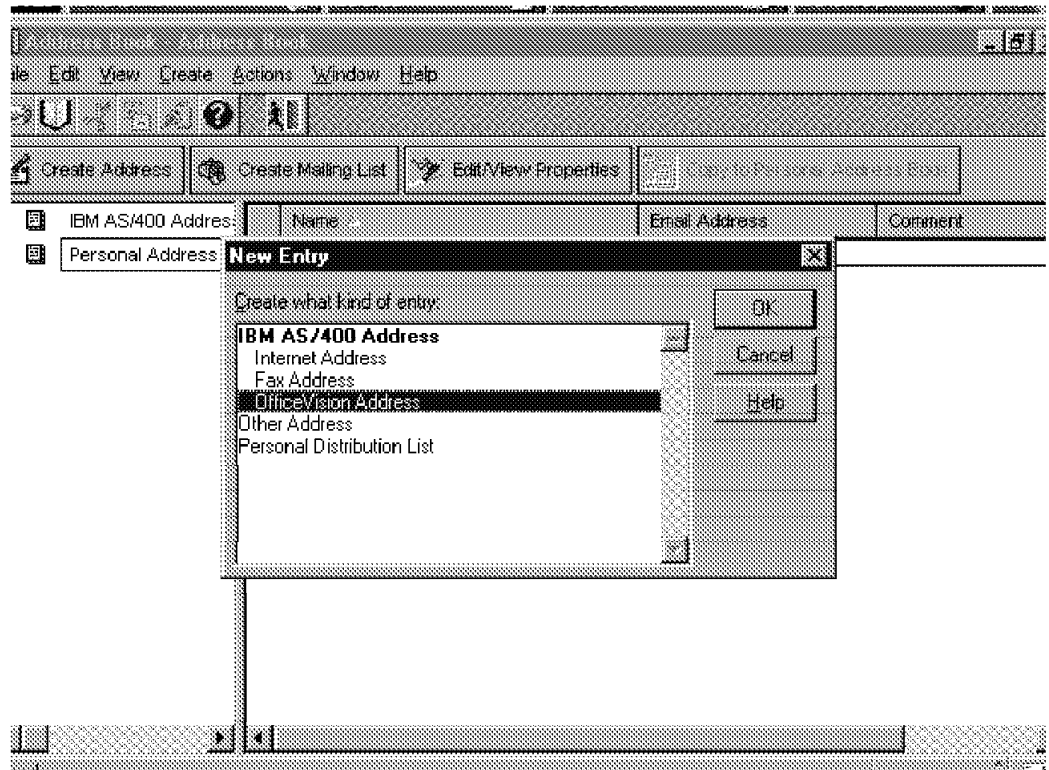
Figure 140. Select the OfficeVision Address

Fill in the required fields (see Figure 141 on page 156). Click on the OK button to store the address in the personal address book.
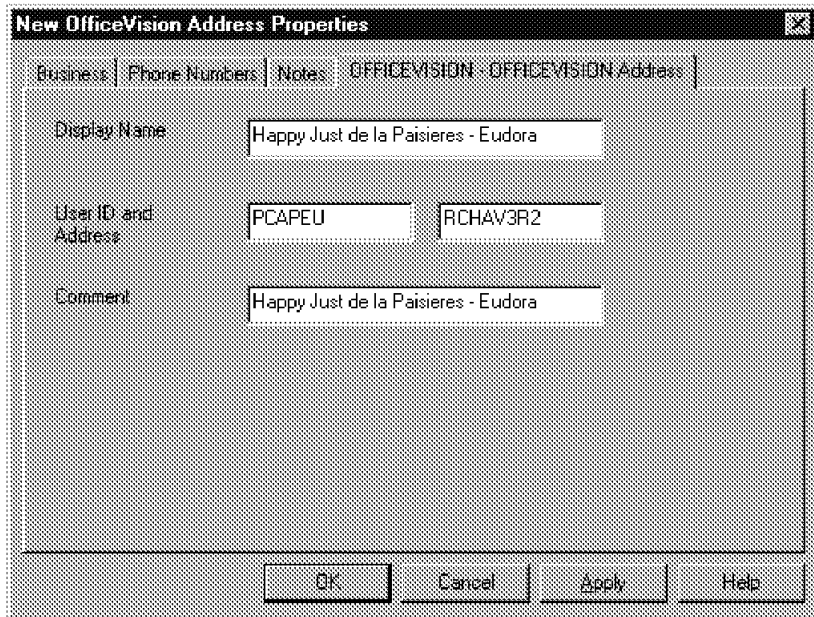
Figure 141. Create an OfficeVision Address

Select *New Message*, click on *Address*, select *Lotus Mail Personal Address Book*, and select the new address that was created previously (see Figure 142).
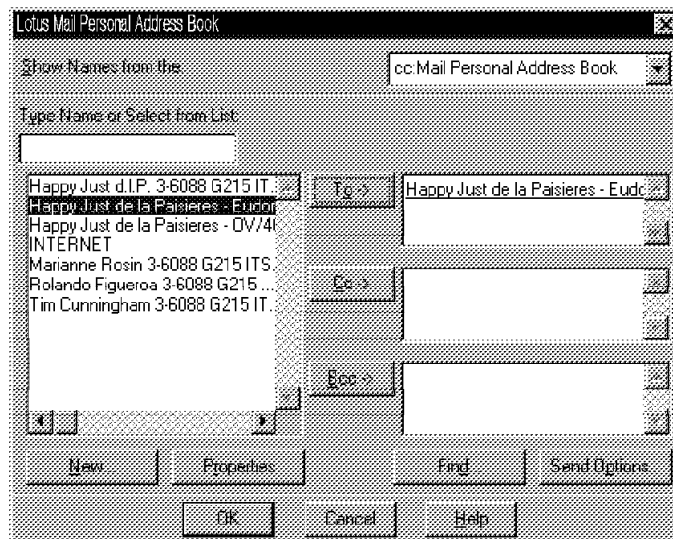
Figure 142. SNADS Tunneling - Set Up Sender Client, Display 2

The next step is to create the MIME note. Click on the *Attach File* icon and select the bitmap that is attached to the MIME note. In this example, *Computer.sym* was

used. The attached bitmap is represented in the MIME document as an icon. See Figure 143 on page 157.
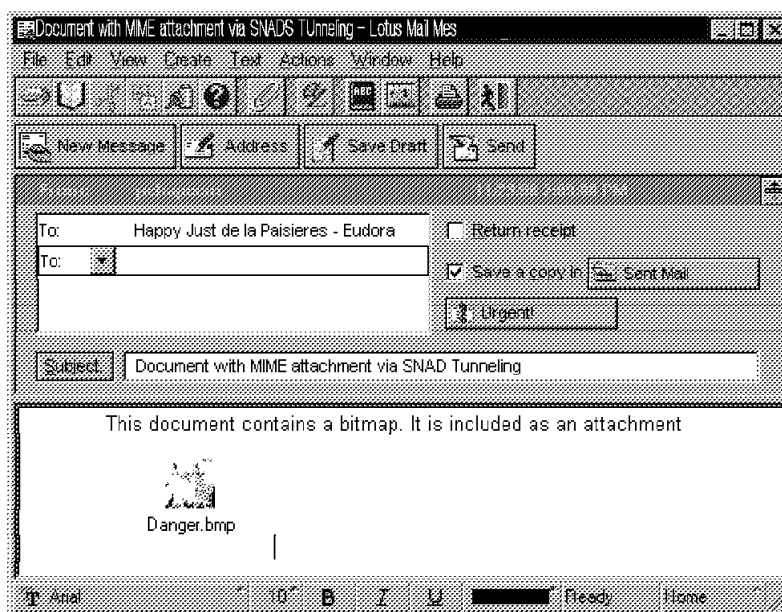
Figure 143. SNADS Tunneling - Set Up Sender Client, Display 3

Next click on the *Send* button and the MIME note can be seen in the out box before it is sent to the remote POP3 recipient. Figure 144 shows the document with the attachment figure.
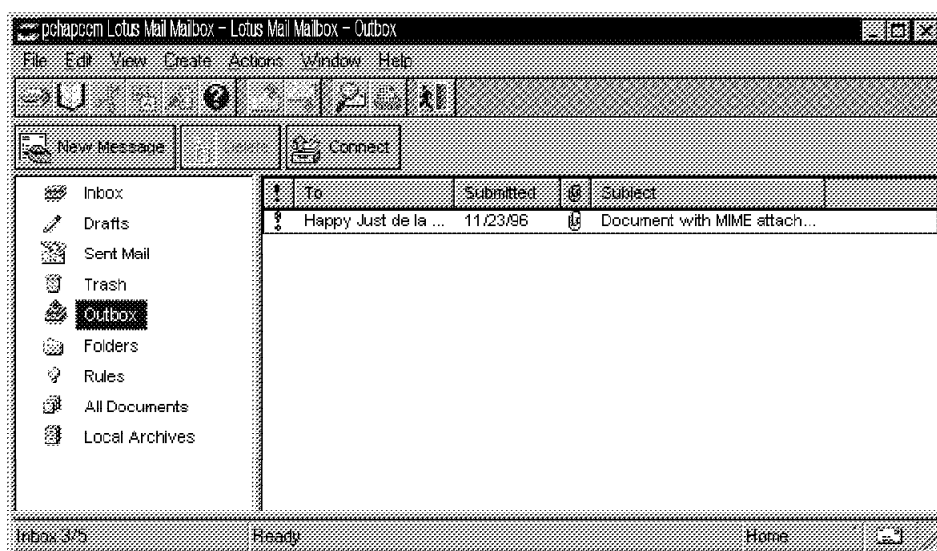
Figure 144. SNADS Tunneling - Set Up Sender Client, Display 4

Assuming that the both AS/400 systems were set up correctly and all server programs and subsystems (that is, QSNADS) were activated, the POP3 recipient

receives the MIME note from the mailbox. To verify this data transfer, you can use the Display Distribution Log (DSPDSTLOG) command on both the sending and receiving systems.

Figure 145 shows that the Eudora Light client copies the bitmap to the hard disk of the PC.
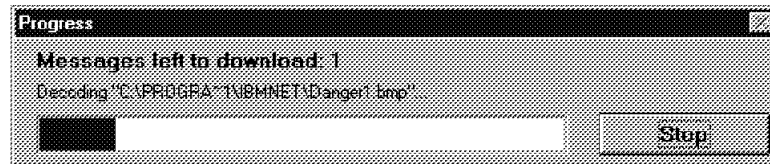
Figure 145. SNADS Tunneling - Eudora Receiving Client, Display 1

Select the *In* mailbox on the Eudora client and open the document (see Figure 146).
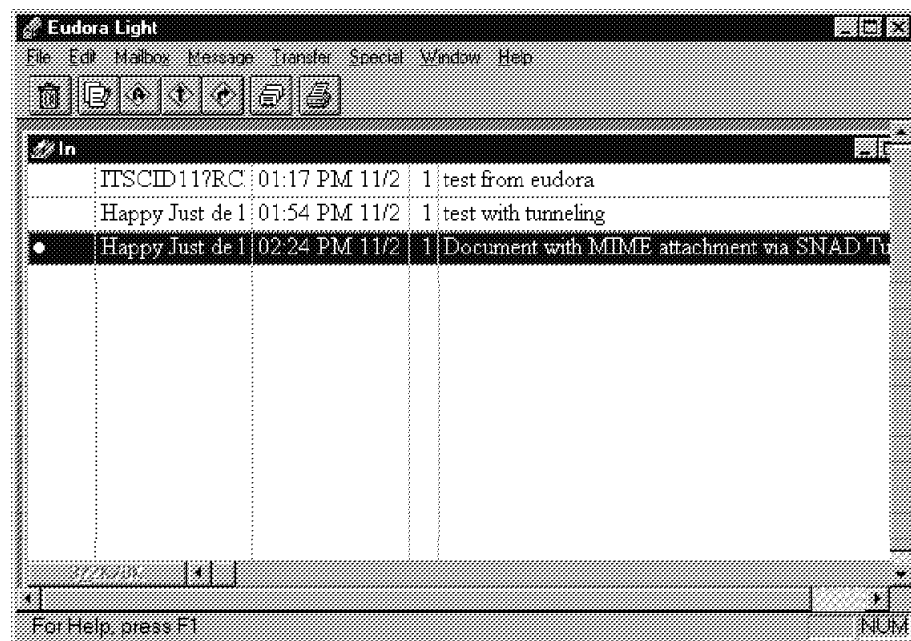
Figure 146. SNADS Tunneling - Eudora Receiving Client, Display 2

The text part of the MINE document shows the address information and the content type *text/plain* (see Figure 147 on page 159).
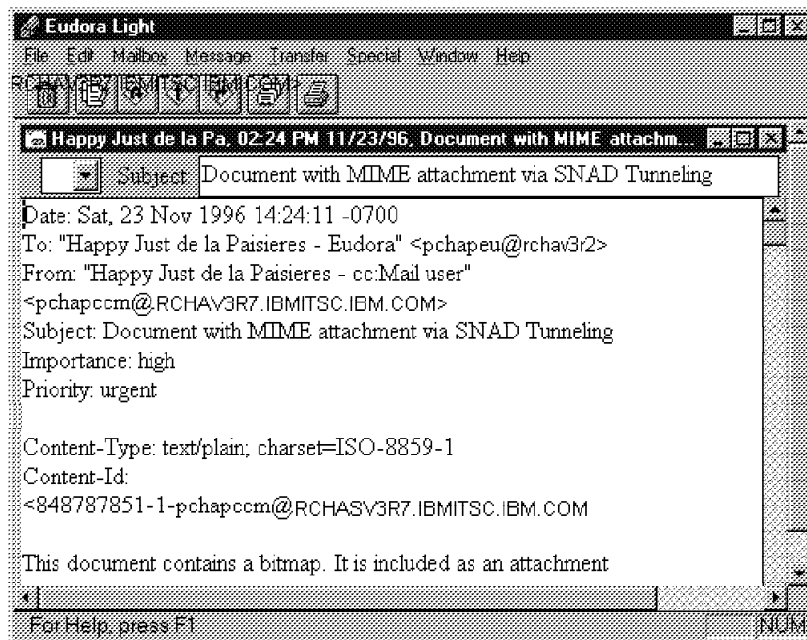
Figure 147. SNADS Tunneling - Eudora Receiving Client, Display 3

The multimedia part (the bitmap) of the document displays the content type *image/x-MS-bmp*. It also shows that the bitmap is converted to the PC hard disk. You need a PC viewer to open this file.
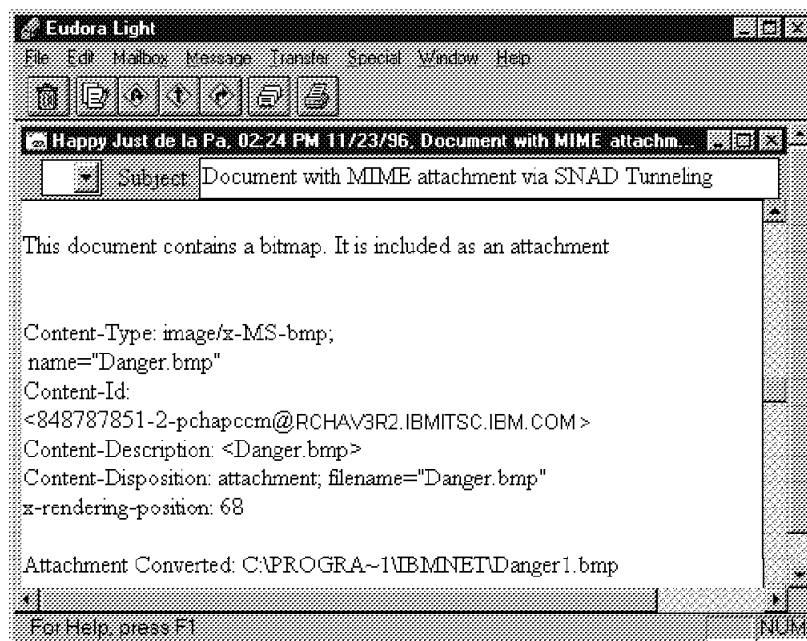
Figure 148. SNADS Tunneling - Eudora Receiving Client, Display 4

To show how different POP clients can handle a received MIME note, the same document was sent through the SNADS tunneling to a Netscape Navigator recipient. Figure 149 on page 160 shows the text part of the document.
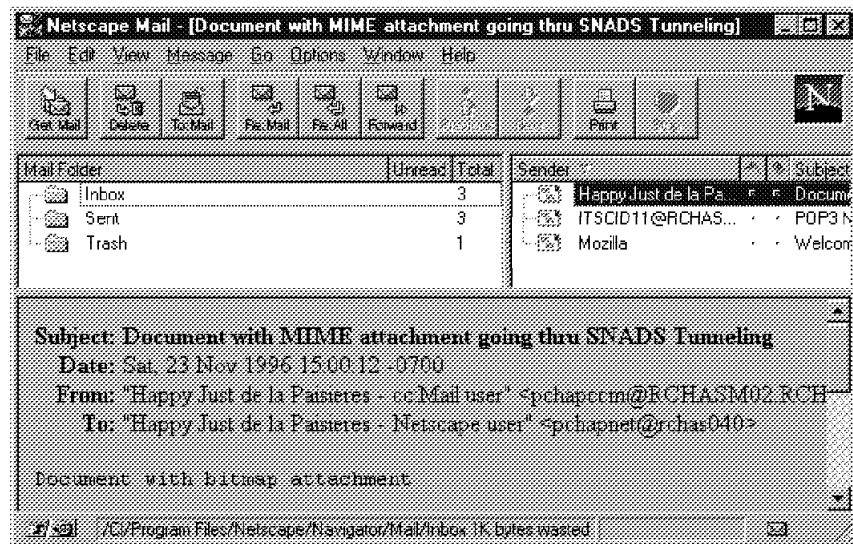
Figure 149. SNADS Tunneling - Netscape Receiving Client, Display 1

Figure 150 displays the multimedia attachment. If the PC viewer is installed on the recipient, you can open the bitmap by clicking on the icon.
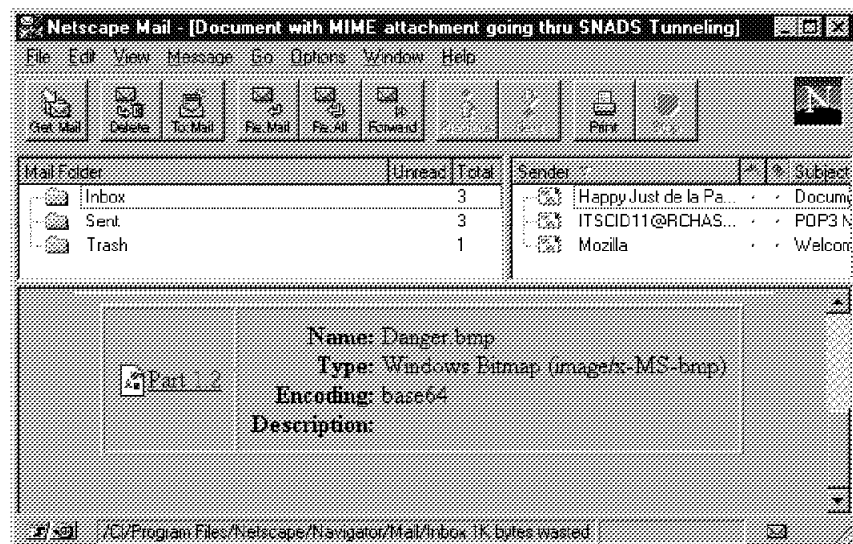
Figure 150. SNADS Tunneling - Netscape Receiving Client, Display 2

Chapter 8. Set Up Lotus Mail 4.5

The Lotus Mail 4.5 is an e-mail client application supporting the Internet e-mail standards POP3 and MIME with a tight integration of Client Access for Windows. It is a replacement for the MAPI version of the product called cc:Mail for the Internet 1.0.

The Lotus Mail 4.5 works under Client Access/400 for Windows 95 and takes advantage of the 32-bit operating system. This client application allows you to send and receive messages from the OfficeVision/400 and from Internet without using a separate Internet gateway.

Basic Concept

The Lotus Mail is a POP Client with an integration of Client Access for Windows 95 to interact with its server, the AS/400 system. The POP3 server is the interface for the client, for sending and retrieving mail from the mailbox, and accessing the AS/400 address book.

Setting Up the Lotus Mail Client

The Lotus Mail client can connect to the AS/400 system through a TCP/IP, SNA, or IPX connection. Client Access for Windows 95 supplies the transport provider that communicates with the POP3 Server on the AS/400 system to receive or send mail, and provides the address book provider to get the information from the system distribution directory (see Figure 151).
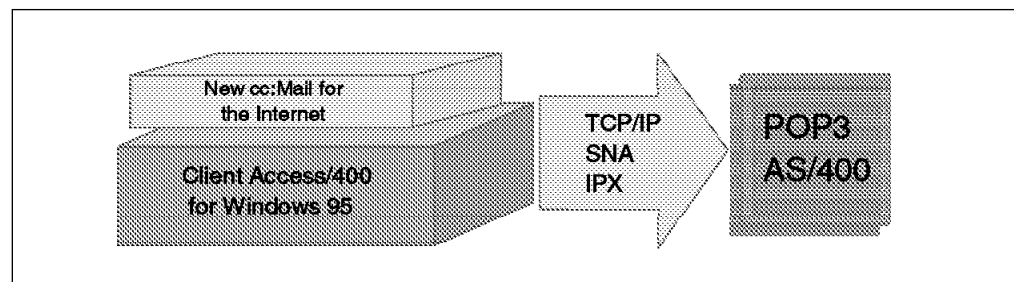
Figure 151. General Interaction

The following information helps to get the Lotus Mail client set up to connect with the AS/400 POP3 mail server.

What You Need Before You Start

- Both system administrator and Lotus Mail users need to review the README.400 file. Choose Notepad or any simple editor to read the README.400 or copy and rename the file with an extension other than .400:

- Lotus Mail CD or access to the network drive where the Lotus Mail CD install image has been copied.

  Lotus Mail can be installed directly from the CD or from a network drive.

  – To copy the CD install image to a network drive, use the XCOPY command. On an MS-DOS prompt, type the following command:

    ```
    XCOPY cd-source-directory target-directory /s
    ```

- For example, if the CD is located on the G drive and you want to copy the CD install image to a directory named ccmail on your D drive, type the following command:

```
XCOPY g:\  d:\lmail\ /s
```

- AS/400 Client Access for Windows 95 installed on your PC **V3R1M1**. The function required to connect the Lotus Mail client through a Client Access connection and access the AS/400 system distribution directory is part of the base support component of Client Access/400 for Windows 95 except for the SNA connection. For the SNA connection, you need NETSOFT.

- Depending on the specific protocol that was used to connect to the AS/400 system (Client Access TCP/IP, SNA, or IPX), you must "Verify the connection" and then connect to your AS/400 system. If TCP/IP was used, you can use the "VFYTCPCNN" (Verify TCP/IP connection) command or "PING" to perform the verification to ensure your connection is operational.

- 30MB of free hard disk space for Lotus Mail

- Your AS/400 host name

- Your AS/400 user profile name and password. You may also see this referred to as your POP3 User Id and password.

Client Access Setup Tips

The following two references provide complete information on Client Access installation and configuration:

- *AS/400 Client Access for Windows Setup Manual*, SC41-3512

- *Online Client Access User's Guide*

In the configuration of your AS/400 connection, make the default user entry the same as your AS/400 user profile name. This name is also referred to as your POP3 user ID.

Install Lotus Mail 4.5

1. Start the LMAIL\DISK1\SETUP.EXE application from the Lotus Mail CD or from the network drive where the Lotus Mail 4.5 install image is located.

2. At the introductory window, click on Next (see Figure 152 on page 163).

Figure 152. Introductory Window of Lotus Mail 4.5

3. Select Computer network (LAN). Make this selection even if you plan to use a telephone line connection. Click on Next.

4. If you already have the Windows Messaging System installed, click Next to install Lotus Mail and go to Step 5; otherwise, do the following steps:

   • If you do not have Windows Messaging installed, Setup asks you to install it now.

   • At the Windows Messaging Setup window, click on Continue.

   • At the Name and Organization Information window, enter your name and organization. Click OK.

   • At the Confirm Name and Organization window, click OK.

   • You may be asked to restart your computer here. If the Windows Messaging Restart window is displayed, click Restart Windows. After the restart, return to Step 1 of Installation of Lotus Mail.

5. At the Welcome window, click Next.

6. At the User Information window, enter your name and company name. Click Next.

7. At the Choose Destination Location window, choose the destination directory for your Lotus Mail 4.5 programs. Click Next.

8. At the Select Program Folder window, choose a folder for your Lotus Mail 4.5 programs (for Lotus Applications, see Figure 153 on page 164). Click Next.
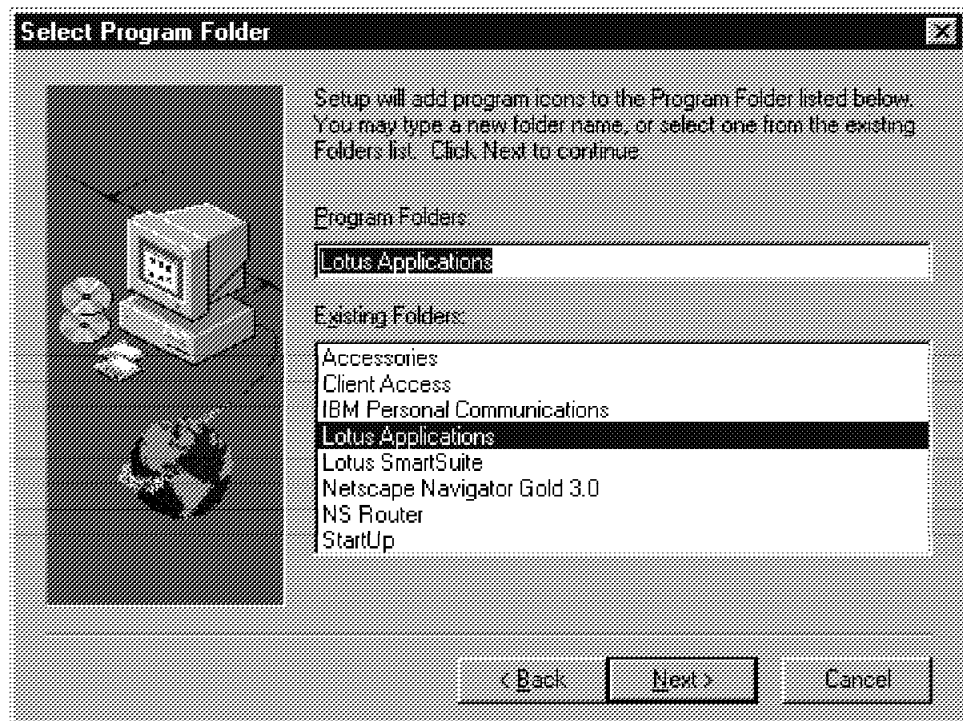
Figure 153. Select Program Folder of Lotus Mail 4.5 Installation

9. At the Setup Complete window, select the restart your computer option. Your computer must be restarted before you can use Lotus Mail. Click Finish.

Set Up Your Lotus Mail User Profile

1. The first time you start Lotus Mail, you must create your Lotus Mail user profile. To start Lotus Mail, double-click the Lotus Mail for Internet icon.

2. Type a new logon/profile name and password. A new logon/profile must be created. Do not use the IBM AS/400 profile or any other profile that may be listed. Click OK (see Figure 154).
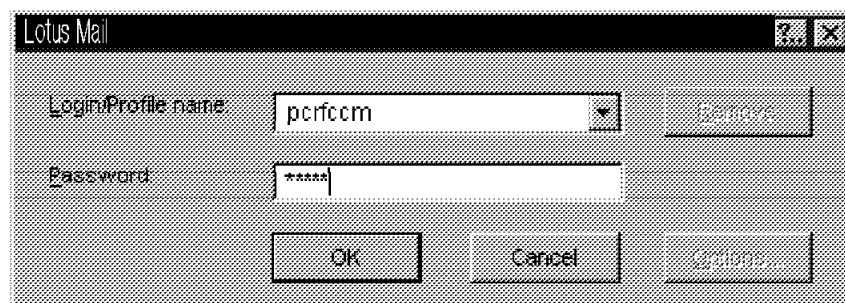
Figure 154. Lotus Mail 4.5 Installation

3. You are asked if you want to create a new profile. Click Yes.

4. At the Lotus Mail for IBM AS/400 window, select Internet service provider as your primary POP3 mail service. Click Next. If you have Client Access/400 installed and need a MAPI interface, select IBM AS/400 Client Access to provide your primary access. Click Next on each window until you get to the AS/400 Signon display.

5. At the Signon to AS/400 display, type your AS/400 user profile password.

6. At this point, you need to set up the user profile on the AS/400 system (see "Setting Up the AS/400 System for Lotus Mail Client" on page 167).

Configure Internet Transport (Optional)

Configuring the IBM Internet Transport is optional. The values set as the default will work. To change the default values:

1. Start the Lotus Mail 4.5 Application with the profile just created.

2. Click on the File pull-down.

3. Select Tools.

4. Select Services.

5. Highlight the **Lotus Mail for IBM AS/400** service. Click Properties (see Figure 155).
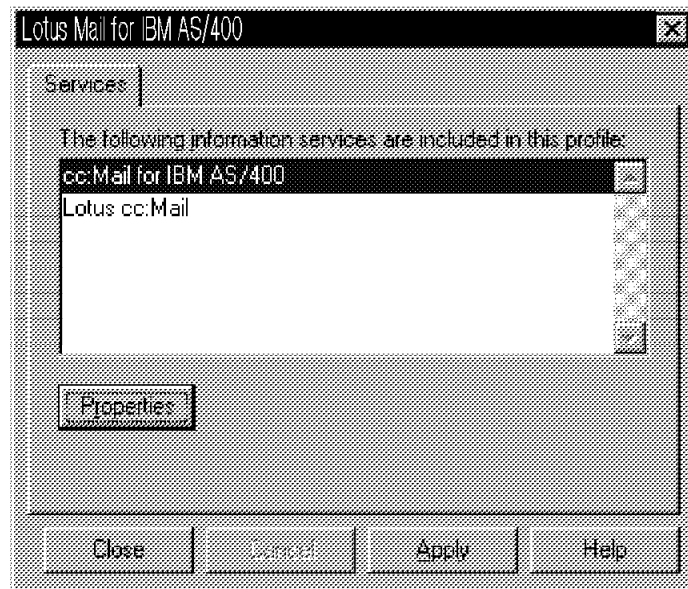
Figure 155. Services Window of Lotus Mail 4.5 Installation

6. The IBM AS/400 Properties window is shown. Click on the Hosts tab to display information that can be customized. Click OK. Click Close.

7. An exit and start of the Lotus Mail 4.5 application is required before the Internet Transport changes become active.

Configure Addressing (Optional)

To use the AS/400 system distribution directory, which is named as the IBM AS/400 address book, it can be added to the list of address books searched when addressing mail. To add the IBM AS/400 address book to your search list:

1. Double-click the Mail icon in the control panel (Windows 95).

2. Click on the Addressing tab.

3. Under the heading, *When sending mail, check names using the address list in the following order* (see Figure 156):

   - Click add. Click on IBM AS/400 address book.
   - Click add. Click Close. Click OK.

We recommend that you keep the Lotus Mail Personal Address book as the first address book in the list.
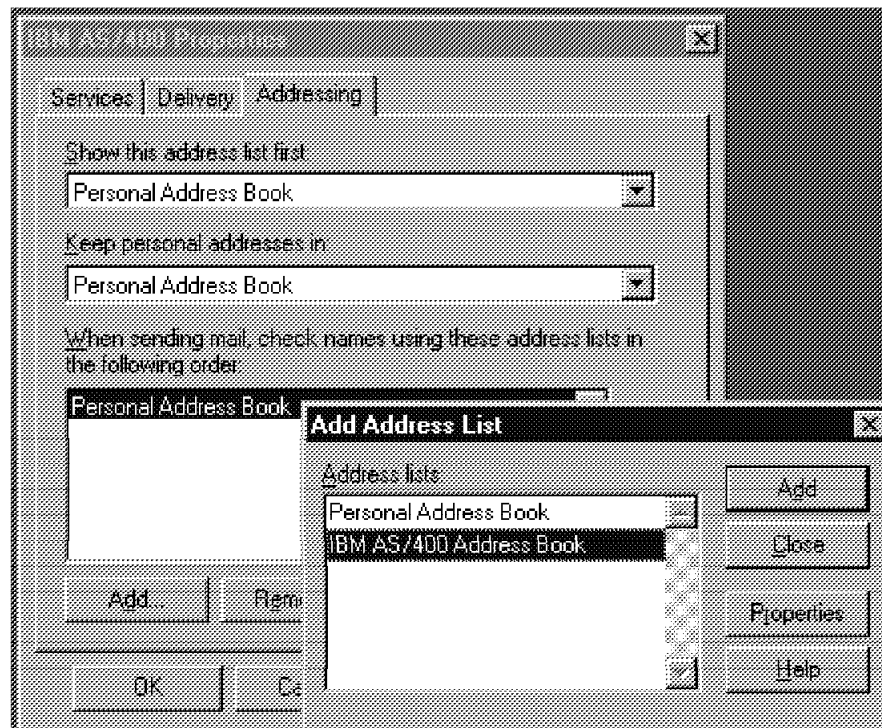
Figure 156. Addressing List

System Administrator Task

The information documented in this section is used by your AS/400 administrator. In addition, please review the README.400 file. For complete information on the AS/400 POP3 mail server, refer to the *TCP/IP configuration and Reference*, SC41-3420. The following configuration changes must be made on the AS/400 system using the Change POP3 Server attributes (CHGPOPA) command before cc:Mail clients can connect to the AS/400 POP3 mail server.

Configure the POP3 server attributes so the cc:Mail client can connect to the AS/400 system using a Client Access connection. *SNA should be used for the HOSTSCVRCNN parameter for clients connected through Netsoft router (Twinax, SDLC, Async, or LAN), Microsoft SNA Server, and OEM "routers".

```
                    Change POP Server Attributes (CHGPOPA)

 Type choices, press Enter.

 Autostart servers  . . . . . . .  AUTOSTART     *YES
 Number of initial servers  . . .  NBRSVR        3
 Inactivity timeout . . . . . . .  INACTTIMO     600
 Message split size . . . . . . .  MSGSPLIT      128
 MIME CCSID:                        MIMECCSID
   Coded character set identifier                00819
   When to use  . . . . . . . . .                *BESTFIT
 Allow standard POP connection  .  ALWSTDCNN     *YES
 Host server connection . . . . .  HOSTSVRCNN    *ALL
                              + for more values
 Address book:                     ADRBOOK
   Enabled  . . . . . . . . . . .                *YES
   Refresh interval . . . . . . .                15




                                                            Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 157. Change POP Server Attributes

The Parameter Address Book specifies whether the POP server is enabled to support client requests for address book information. Address book information is extracted from the AS/400 system distribution directory and stored separately. It is optionally refreshed from the AS/400 system distribution directory on a timed interval.

> An end and start of the AS/400 POP3 mail server is required before the CHGPOPA changes become active. Use the following commands:

> **ENDTCPSVR *POP**   (End POP3 mail server)

> **STRTCPSVR *POP**   (Start POP3 mail server)

- Each Client Access cc:Mail user must have:

  – An AS/400 user profile (CRTUSRPRF).

  – An AS/400 system distribution directory entry (ADDDIRE) with the Message Service Level set to 2 (system message store).

Setting Up the AS/400 System for Lotus Mail Client

To send and receive messages from the Lotus Mail client to OV/400 and vice versa, the following setup is required on the AS/400 system:

1. Use the CRTUSRPRF command to create a user profile on the AS/400 system (see Figure 158 on page 168).

   The user profile and password on the AS/400 system must be the same as the user profile and password created for the Lotus Mail user in Step 2 of "Set Up Your Lotus Mail User Profile" on page 164.

   This user is only used to get the connection to the AS/400 system. You can change the Initial menu parameter to ***signoff** , which means that the user cannot sign on to the AS/400 system.

```
                        Create User Profile (CRTUSRPRF)

 Type choices, press Enter.

 User profile . . . . . . . . . .   PCRFCCM      Name
 User password  . . . . . . . . .   consu        Name, *USRPRF, *NONE
 Set password to expired  . . . .   *NO          *NO, *YES
 Status . . . . . . . . . . . . .   *ENABLED     *ENABLED, *DISABLED
 User class . . . . . . . . . . .   *USER        *USER, *SYSOPR, *PGMR...
 Assistance level . . . . . . . .   *SYSVAL      *SYSVAL, *BASIC, *INTERMED...
 Current library  . . . . . . . .   *CRTDFT      Name, *CRTDFT
 Initial program to call  . . . .   *NONE        Name, *NONE
   Library  . . . . . . . . . . .                Name, *LIBL, *CURLIB
 Initial menu . . . . . . . . . .   *signoff     Name, *SIGNOFF
   Library  . . . . . . . . . . .    *LIBL       Name, *LIBL, *CURLIB
 Limit capabilities . . . . . . .   *NO          *NO, *PARTIAL, *YES
 Text 'description' . . . . . . .   Rolando Figueroa, cc:Mail user profile.


                                                                     Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters    F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 158. Create User Profile Display

2. Use the WRKDIRE command to **add** the user to the system distribution
   directory (see Figure 159).

```
                       Work with Directory Entries

 Type options, press Enter.
   1=Add      2=Change   4=Remove   5=Display details   6=Print details
   7=Rename   8=Assign different ID to description   9=Add another description

 Opt  User ID   Address   Description
  1
  _   ‾‾‾‾‾‾‾   ‾‾‾‾‾‾‾
  _   USERID08  SYSAV3R7  Tim Cunningham    3-6088 G215    USERID11 WBL123196
  _   USERID09  SYSAV3R7  Marianne Rosin    3-6088 G215    USERID11 WBL123196
  _   USERID11  SYSAV3R7  Happy Just d.l.P. 3-6088 G215    USERID11 WBL123196
  _   USERID15  SYSAV3R7  Rolando Figueroa  3-6088 G215             WBL123196
  _   LABUSER   SYSAV3R7  LABUSER
  _   MRK       SYSAV3R7  Marv on SYSAV3R7
  _   NICKHUTT  SYSAV3R7  Nick Hutt
  _   NTW01     SYSAV3R7  NTW01
  _   NTW02     SYSAV3R7  NTW02
  _   NTW03     SYSAV3R7  NTW03
  _   NTW04     SYSAV3R7  NTW04
  _   NTW05     SYSAV3R7  NTW05
                                                                     More...
 F3=Exit      F5=Refresh   F9=Work with nicknames   F11=Sort by description
 F12=Cancel   F13=Work with departments   F17=Position to   F24=More keys
```

Figure 159. WRKDIRE Display

Fill in the following data in the directory entry:

* *User ID/Address, Description, System name/group, and User profile* (the
  same as the cc:Mail user (see Figure 160 on page 169)).

* *Mail service level* and *Preferred address*; page forward to the display with
  these parameters (see Figure 161 on page 169).

```
                         Add Directory Entry

 Type choices, press Enter.

   User ID/Address . . . .   PCRFCCM    SYSAV3R7
   Description . . . . . .   Rolando Figueroa cc:Mail user profile, SMTP
   System name/Group . . .   SYSAV3R7   _____    F4 for list
   User profile  . . . . .   PCRFCCM___            F4 for list
   Network user ID . . . .

   Name:
     Last  . . . . . . . .   _____
     First . . . . . . . .   _____
     Middle  . . . . . . .   _____
     Preferred . . . . . .   _____
     Full  . . . . . . . .   _____

   Department  . . . . . .   _____       F4 for list
   Job title . . . . . . .   _____
   Company . . . . . . . .   _____
                                                                  more...

 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F18=Display location details
 F19=Add name for SMTP   F20=Specify user-defined fields
```

Figure 160. Add Directory Entry Display

```
                         Add Directory Entry

 Type choices, press Enter.

   Mail service level  . .  2                    1=User index
                                                 2=System message store
                                                 3=Other mail service

     For choice 3=Other mail service:
       Field name  . . . .                       F4 for list

   Preferred address . . .  3                    1=User ID/Address
                                                 2=O/R name
                                                 3=SMTP name
                                                 4=Other preferred address
     Address type  . . . .                       F4 for list
     For choice 4=Other preferred address:
       Field name  . . . .                       F4 for list


                                                                   More...
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F18=Display location details
 F19=Add name for SMTP   F20=Specify user-defined fields
```

Figure 161. Add Directory Entry Display

- Finally press **F19** to add the name for the SMTP entry (see Figure 162 on page 170) and press Enter.

  Note: You see the message SMTP table updates pending. Press Enter to update. After that, press F3 to return to the command line.

```
                        Add Name for SMTP
                                               System:   SYSAV3R7
  Type choices, press Enter.


    User ID . . . . . . . . :   PCRFCCM
    Address . . . . . . . . :   SYSAV3R7



    SMTP user ID  . . . . . .   PCRFCCM
    SMTP domain . . . . . . .   SYSAV3R7.IBMITSC.IBM.COM




    SMTP route  . . . . . . .

  F3=Exit    F4=Prompt    F12=Cancel
  (C) COPYRIGHT IBM CORP. 1987, 1996.
```

Figure 162. Add Name for SMTP

Chapter 9. Lotus Notes Mail Integration on the Integrated PC Server

Lotus Notes integration for OS/400 allows you to use all server functions of a Lotus Notes server installed on the IBM Integrated PC Server for the AS/400 system (formerly known as *File Server Input/Output Processor (FSIOP)*) within an AS/400 system unit. In addition to the standard Lotus Notes capabilities, a set of functions is provided to allow a tight integration of Lotus Notes with OS/400. These integration functions are:

- Notes administration from an AS/400 user interface
- Directory shadowing
- Database integration with DB2/400
- Backup and restore with ADSM
- Integration of Lotus Notes mail with AS/400 mail

The subject of this chapter is **e-mail**; therefore, it covers only the last of the functions previously listed. All other aspects of Lotus Notes on an Integrated PC Server are described in *OS/400 Integration of Lotus Notes*, SC41-3431-02, in the redbook *Using Lotus Notes on the Integrated PC Server for AS/400*, SG24-4779, and in *Mail Integration for Domino 4.5 on IBM Integrated PC Server for AS/400 V3R2*, SG24-4977-01.

The following sections explain:

- "Connecting Two Worlds of Electronic Mail" on page 172:

  What mail integration actually means.

- "Implementation Overview" on page 173:

  How mail integration was implemented.

- "Lotus SMTP/MIME Message Transfer Agent (MTA)" on page 174

  Describes in more detail the **Message Transfer Agent (MTA)**.

Important: Do not attempt to install the Lotus SMTP/MIME (MTA) on a Notes server on the *Integrated PC Server* unless you perform all of the steps summarized in SG24-4977-01.

The descriptions in this chapter cover only Lotus Notes mail integration with the AS/400 system for a Domino Server Release 4.5a or 4.51 installed on an *Integrated PC Server*. The descriptions apply to the 1.0.6 version of the Lotus SMTP/MIME MTA.

The environment covered in this chapter does <u>not include</u> support for:

- Lotus Notes Server Release 4.0 or 4.1:

  The minimum release for this is 4.5.

- Lotus Domino Release 4.5a or later:

  The procedure described in this chapter (as well as all the PTFs for the AS/400 system) apply only to Domino Release 4.5.

  PTFs for the AS/400 licensed products along with revised instructions will be provided within 90 days after general availability of later releases for Lotus

Notes to provide support for the integration of Lotus Notes on the *Integrated PC Server*.

- Any Lotus Notes server installed on other systems:

  For example, this includes a stand-alone PC.

- Lotus Notes-based mail:

  This is part of the standard Lotus Notes functions. That is, as long as a direct connection (using a common protocol) between the Notes servers is provided, no special considerations are needed to support Notes mail being exchanged between users on:

  - The same Domino server
  - Different Domino servers within the same Notes domain
  - Domino servers in different Notes domains

Useful Publications

The following list contains publications we found useful and relevant to the information on this topic. For a complete listing of publications used in producing this book, refer to Appendix E, "Related Publications" on page 213.

- *OS/400 Integration of Lotus Notes*, SC41-3431-02
- *Using Lotus Notes on the Integrated PC Server for AS/400*, SG24-4779
- *Lotus Notes 4 Administrator's Guide*, 12389
- *OS/400 TCP/IP Configuration and Reference Version 3*, SC41-3420

The documentation for the SMTP/MIME MTA is provided in the form of Lotus Notes databases:

- *SMTP MTA Release Notes*, RNTMPL.NSF
- *SMTP/MIME System Administration Guide*, SMTPAG.NSF

Connecting Two Worlds of Electronic Mail

The mail integration for Lotus Notes on the *Integrated PC Server* provides a link between two big worlds of electronic mail:

Notes Mail Integration
Lotus Notes SMTP/MIME MTA
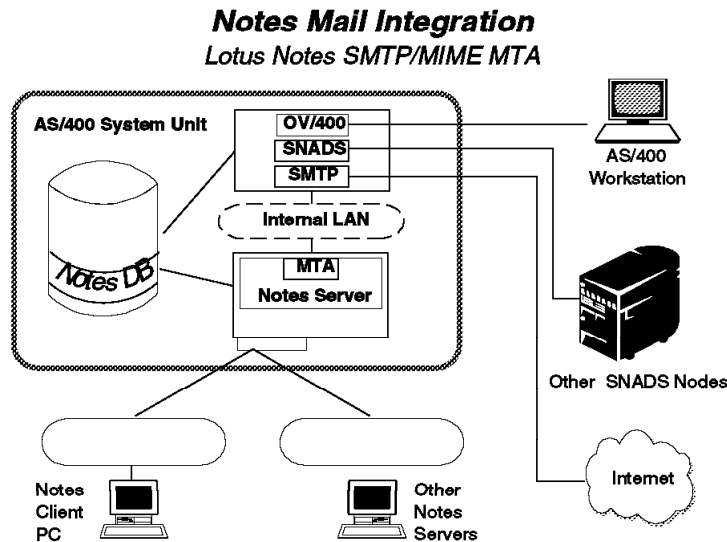
Figure 163. Mail Integration for Lotus Notes on the Integrated PC Server

- Users of *OfficeVision for OS/400* can exchange mail with:

  - OfficeVision users on the same AS/400 system
  - OfficeVision users on other AS/400 systems connected through SNADS
  - OfficeVision users on other platforms such as MVS or VM
  - Users of any other mail application connected to the AS/400 system through SNADS, SMTP, or X.400

- Lotus Notes users connected to a Notes server on the *Integrated PC Server* can exchange mail with:

  - Notes users on the same server
  - Notes users on the other servers in the same Notes domain
  - Notes users on the other servers in other Notes domains
  - Uses of any other mailing application that can be reached through a mail gateway or message transfer agent (MTA)

Using the mail integration for Lotus Notes on the *Integrated PC Server*, all users previously listed are able to exchange electronic mail with each other.

Implementation Overview

Several components have to work together to allow mail exchange between a Notes server on the AS/400 system's *Integrated PC Server* and OS/400 on the same AS/400 system.

The components involved are:

- The Lotus Notes server running under OS/2 on the *Integrated PC Server*

- The SMTP/MIME MTA, an "add-in" that is an installable extension to a Lotus Notes server providing **message routing** capabilities to exchange mail with SMTP/MIME based networks. "Lotus SMTP/MIME Message Transfer Agent (MTA)" on page 174 describes the Lotus SMTP/MIME MTA in more detail.

- The SMTP/MIME support for OS/400 provided by the *TCP/IP Connectivity Utilities for the AS/400*, licensed program 5763-TC1 (for V3R2) or 5716-TC1 (for V3R7).

- The AnyMail/400 Mail Server Framework (MSF) provided by OS/400.

- The OS/400 Mail Integration for Lotus Notes (a part of option 24 of OS/400) allows the installation and automatic configuration of the SMTP/MIME MTA for a Lotus Notes server installed on the *Integrated PC Server*. A set of PTFs is needed to provide this function for V3R2 and V3R7; you can get all of them by ordering `SF37478` for V3R2 (`SF35096` or `SF37489` for V3R7) and all prerequisite PTFs.

Lotus SMTP/MIME Message Transfer Agent (MTA)

The acronym **MTA** stands for **Message Transfer Agent**. In the terminology used for Lotus Notes, an **agent** is a program running under control of a Lotus Notes server or client with no direct interactions with the users. Generally speaking, it may be compared with a batch program on the AS/400 system.

The Lotus Notes SMTP/MIME MTA provides advanced messaging features and extensions to Domino 4.5 servers:

- Transfers SMTP between SMTP networks (both Internet and intranet) and Lotus Notes users.

- The implementation of MIME extends SMTP to support the transfer of:

   - Rich text
   - Images
   - Binary data
   - Audio
   - Video

It is a separate product from Lotus, but it can be requested free of charge from the Lotus home page on the World Wide Web.

The documentation for the MTA is provided as part of the product in the form of Notes databases.

The SMTP/MIME MTA is a Notes "Add-In" task. Because of this, the MTA is configured by adding information to some documents in the Public Address Book (PAB). However, within the context of using a Notes server on the *Integrated PC Server* of an AS/400 system, the MTA is configured for you automatically by the MTA installation program.

Normally, the MTA on a stand-alone Notes server can be managed (started and stopped) from the Notes server console. The Notes server on an *Integrated PC Server* can also be started and stopped using the Start Network Server Application (STRNWSAPP) command.

Appendix A. Additional OS/400 E-Mail Topics

This appendix is designed to provide additional important e-mail topics that do not specifically fit into categories covered previously in this publication. The topics discussed are of a general nature and are not covered in any specific order.

Implement Long Line Truncation PTF

Applicable PTF numbers are:

- VRM320 SF40855
- VRM370 SF40856
- VRM410 SF40813

The following PTF Cover Letter contains details on the problem and the recommendation to correct the problem.

Problem Description

SMTP/MIME mail clients generate mail with lines of text that are much longer than the OfficeVision user agent displays. By default, OfficeVision displays only the first 73 characters of each line of a message and a message cannot be scrolled to the right beyond the column 73. By contrast, some mail clients generate lines 74 or 80 characters long. Some MIME mail clients send entire paragraphs of text as a single line, making lines hundreds or thousands of characters wide.

Problem Resolution

To make ASCII client mail more readable in OfficeVision environments, this PTF enables the AS/400 Mail Server Framework to modify messages as they are converted from ASCII(MIME) to EBCDIC(FFT).

Two modifications are possible:

1. Split long lines into two or more shorter lines.

2. Add FFT commands to messages, overriding parameters in the OfficeVision text profile active for the recipient of the mail. With these FFT commands, wide messages can be viewed without modifying OfficeVision text profiles.

To get either of these modifications to take place, the *special instructions* must be followed. When the special instructions are followed, it affects all mail that is converted from ASCII to EBCDIC.

Special Instructions

To activate this PTF, perform the following steps:

1. Create a character data area named QUSRSYS/QMAILFMT by entering the following in any AS/400 command line:

   ```
   CRTDTAARA DTAARA(QUSRSYS/QMAILFMT) TYPE(*CHAR) LEN(100)
             VALUE('73/55/0')
   ```

   In the example, the length of 100 on the CRTDTAARA is arbitrary but should be sufficient for any combination of values to be put in the data area. All other parameters except for the value should be typed exactly as shown.

2. Change the object owner to QSYS:

```
CHGOBJOWN OBJ(QUSRSYS/QMAILFMT) OBJTYPE(*DTAARA)
      NEWOWN(QSYS)
```

3. Grant the proper authority to the data area:

```
GRTOBJAUT OBJ(QUSRSYS/QMAILFMT) OBJTYPE(*DTAARA)
      USER(*PUBLIC) AUT(*ALL)
```

4. Stop and restart the Mail Server Framework:

```
ENDMSF
STRMSF
```

To change the behavior of the PTF:

1. Change the value in the QUSRSYS/QMAILFMT data area:

```
CHGDTAARA DTAARA(QUSRSYS/QMAILFMT) VALUE('80/55/1')
```

2. Stop and restart the Mail Server Framework:

```
ENDMSF
STRMSF
```

The MAILFMT space is read only once when QMSF is started. If the parameters are changed, QMSF must be stopped and restarted to become aware of the changes.

Data Area Values

The value in the QMAILFMT data area can contain up to eight numbers defined as follows:

```
LL/PL/FFF/LM/RM/GFID/FWD/FA
Note:

A / separates each field.
A // is an empty field and defaults are used.
A space in any position ends the parameter string.
Any numbers or characters after a space are ignored.
```

```
LL   Line Length, from 1 to 255, default is 255.

     The maximum number of characters in a line.  A long line
     is split at a space character preceding this count, or
     at this count for lines without a space.  Tab characters
     count 1 character.
```

```
PL   Page Length, from 1 to 32752, default is 32752.

     The maximum number of lines on each page.  If more than
     this number of lines are received without a form feed, one
     is inserted at this point.
```

```
FFF  Further Formatting Flag, 1 for yes, 0 for no, default is 0.

     If this flag is set to 1 (one), two FFT commands, SHM (Set
     Horizontal Margins) and SFG (Set FID thru GFID) are
     inserted in ALL messages converted from ASCII to EBCDIC.
     If this flag is set to 0 (zero), SHM and SFG are not
     inserted and the remaining parameters are ignored.
```

The SHM command is used to set two values: LM (left margin) and
RM (right margin). The SFG command is used to set three values:
global font identification (GFID), font width (FWD), and font
attributes (FA).

LM   Left Margin, from 0 to 32767, default is 1.

     Left margin value to be inserted in the SHM FFT command in
     units of 1/1440 of an inch. A value of 0 will cause the
     left margin in the user's text profile to be used. A value
     of 1 represents the left edge of the screen. Ignored if
     FFF is 0.

RM   Right margin, from 0 to 32767, default 30480.

     Right margin value to be inserted in the SHM FFT command
     in units of 1/1440 of an inch. A value of 0 will cause the
     right margin in the user's text profile to be used.
     Ignored if FFF is 0.

GFID Global font ID, from 1 to 65534, default is 85.

     Font ID to be inserted into the SGFSFG FFT command. 85 is a
     Courier 12-pitch font. Ignored if FFF is 0.

FWD Font width, from 1 to 1440, default is 120.

     Font width to be inserted into the SGFSFG FFT command. 120
     represents 120/1440, or 1/12 of an inch. Ignored if FFF
     is 0.

FA   Font attributes, 1 for fixed or 2 for proportional,
     default is 1.

     Font attributes to be inserted into the SGFSFG FFT command.
     Ignored if FFF is 0.

Examples

Here are some values to consider for the QMAILFMT data area:

'73/55/0'
Lines over 73 characters long are split into multiple lines so that all text can be
viewed with the default OfficeVision text profile. Page breaks are added every 55
lines, and the users OV/400 text profile are not overridden.

'80/55/1'
Lines over 80 characters long are split into multiple lines. This is a good choice if
Lotus Mail 4.5 is widely used, since those clients send lines whose maximum
length are 80 characters. The right-most few characters of 80-character lines are
not visible with the default OfficeVision text profile. But the default FFT commands
inserted in the message override the users text profile and the message can be
scrolled to the right to view all the data.

'//1'
All default values are used, but insert FFT commands in the message. This is
useful if some application on your system needs long lines to be kept intact.

OfficeVision users can scroll to the right to see parts of a message which would otherwise be hidden.

'255/32752/0/1/30480/85/120/1'
These are the default values. The framework behaves just as if this PTF was not installed.

'//////' or '//' or ' '
No numbers means use all default values.

Note: The MAILFMT settings affect **all** mail, (RFC 822 and MIME text) that comes from ASCII into EBCDIC.

Calculating FFT Values

For many mail environments, it is not necessary to calculate values for LM, RM, GFID, FWD, and FA. The default values allow mail of the maximum width (255 characters) to be viewed.

If you want to set the margins to specific columns, you need the following information:

- Left column number
- Right column number
- Pitch of the font (in characters per inch)

Calculate values for the margins (LM and RM) using this formula:

- LM = (left column number - 1) / (characters per inch) * 1440
- RM = (right column number - 1) / (characters per inch) * 1440
- Exception: use a margin of 1, not 0, for column 1.

```
Example 1:

   - left column number = 1
   - right column number = 255
   - GFID = 85, Courier 12
   - font pitch = 12 characters per inch

   LM = 1
   RM = ((255-1)/12)*1440 = 30480
   FWD = 1440/12 = 120

   Assuming 55 lines/page, the QMAILFMT value is:
   '255/55/1/1/30480/85/120/1'

Example 2:

   The default OV/400 Systems text profile has margins set at
   columns 19 and 91 for a line length of 73 characters.
   To set up the equivalent mail formatting using the
   Courier 10 font, enter the following values:

   - left column number = 19
   - right column number = 91
   - GFID = 11, Courier 10
   - font pitch = 10 characters per inch
   LM = ((19-1)/10)*1440 = 1.8*1440 = 2592
   RM = ((91-1)/10)*1440 = 9.0*1440 = 12960
```

```
           FWD = 1440/10 = 144


      Assuming 55 lines/page, the QMAILFMT value is:
      '73/55/1/2592/12960/11/144/1'


Example 3:

      - left column number = 1
      - right column number = 132
      - GFID = 223, Courier 15
      - font pitch = 15 characters per inch
      LM = 1
      RM = ((132-1)/15)*1440 = 12576
      FWD = 1440/15 = 96


      Assuming 55 lines/page, the QMAILFMT value is:
      '132/55/1/1/12576/223/96/1'


Three examples of SFG parameters:

        Font style   GFID   FWD   FA   Comments.

     a: Courier 10    11    144   1    Alias Courier 72. 10 ch/in.
     b: Courier 12    85    120   1                      12 ch/in.
     c: Courier 15   223     96   1                      15 ch/in.
     For FWD = 10 ch/in set it to 144.
              12 ch/in set it to 120.
              15 ch/in set it to 96.


This is the end of the PTF Cover Letter.
```

The following example is a CL program that prompts for the long line truncation parameters and automatically updates the required data area.

In the following example, either the STRPDM (Start PDM) or the STRSEU command is used to enter the source members into the appropriate files in the QGPL library.

COMMAND SOURCE

```
  SOURCE FILE . . . . . . .  QGPL/QCMDSRC
  MEMBER   . . . . . . . . .  SETLLTDFT
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6

   100     CMD         PROMPT('Long Line Truncation Defaults')
   200     PARM        KWD(LLEN) TYPE(*DEC) LEN(3) DFT(255) +
   300                   CHOICE('(1-255)') PROMPT('Line Length')
   400     PARM        KWD(PLEN) TYPE(*DEC) LEN(5) DFT(32752) +
   500                   CHOICE('(1-32752)') PROMPT('Page Length')
   600     PARM        KWD(LETMAR) TYPE(*DEC) LEN(5) DFT(1) +
   700                   CHOICE('(0-32767)') PROMPT('Left Margin')
   800     PARM        KWD(RIGMAR) TYPE(*DEC) LEN(5) DFT(30480) +
   900                   CHOICE('(0-32767)') PROMPT('Right Margin')
  1000     PARM        KWD(GLOFID) TYPE(*DEC) LEN(5) DFT(00085) +
  1100                   CHOICE('(1-65534)') PROMPT('Global Font ID')
  1200     PARM        KWD(FONWIT) TYPE(*DEC) LEN(4) DFT(0120) +
  1300                   CHOICE('(1-1440)') PROMPT('Font Width')
  1400     PARM        KWD(FONATT) TYPE(*DEC) LEN(1) DFT(1) +
```

```
     1500                          CHOICE('(1=Fixed, 2=Proportional)') +
     1600                          PROMPT('Font Attributes')
                                   * * * *  E N D   O F   S O U R C E  * * * *
```

PROMPT OVERRIDE PROGRAM SOURCE

```
  SOURCE FILE . . . . . . .  BSILIB/QCLSRC
  MEMBER  . . . . . . . . .  SETPMTLLT
  SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6

   100   START: PGM   PARM(&CMDNAME &RTNSTRING)
   200          DCL   VAR(&CMDNAME) TYPE(*CHAR) LEN(20)
   300          DCL   VAR(&RTNSTRING) TYPE(*CHAR) LEN(5700)
   400          DCL   VAR(&LINLEN) TYPE(*DEC) LEN(3 0)
   500          DCL   VAR(&PAGLEN) TYPE(*DEC) LEN(5 0)
   600          DCL   VAR(&LFTMAR) TYPE(*DEC) LEN(5 0)
   700          DCL   VAR(&RGTMAR) TYPE(*DEC) LEN(5 0)
   800          DCL   VAR(&GLOFON) TYPE(*DEC) LEN(5 0)
   900          DCL   VAR(&FONWID) TYPE(*DEC) LEN(4 0)
  1000          DCL   VAR(&FONATR) TYPE(*DEC) LEN(1 0)
  1100          DCL   VAR(&LINWRK) TYPE(*CHAR) LEN(3) VALUE('255')
  1200          DCL   VAR(&PAGWRK) TYPE(*CHAR) LEN(5) VALUE('32752')
  1300          DCL   VAR(&LFTWRK) TYPE(*CHAR) LEN(5) VALUE('00001')
  1400          DCL   VAR(&RGTWRK) TYPE(*CHAR) LEN(5) VALUE('30480')
  1500          DCL   VAR(&GFWRK) TYPE(*CHAR) LEN(5) VALUE('00085')
  1600          DCL   VAR(&FWDWRK) TYPE(*CHAR) LEN(4) VALUE('0120')
  1700          DCL   VAR(&FAWRK) TYPE(*CHAR) LEN(1) VALUE('1')
  1800          DCL   VAR(&FLAG) TYPE(*CHAR) LEN(1)
  1900          DCL   VAR(&LLEN) TYPE(*CHAR) LEN(11) +
  2000                  VALUE('??LLEN(   )')
  2100          DCL   VAR(&BINLEN) TYPE(*CHAR) LEN(2)
  2200          DCL   VAR(&STRINGLEN) TYPE(*DEC) LEN(5 0) VALUE(100)
  2300          DCL   VAR(&PLEN) TYPE(*CHAR) LEN(14) +
  2400                  VALUE(' ??PLEN(      )')
  2500          DCL   VAR(&LETMAR) TYPE(*CHAR) LEN(16) +
  2600                  VALUE(' ??LETMAR(      )')
  2700          DCL   VAR(&RIGMAR) TYPE(*CHAR) LEN(16) +
  2800                  VALUE(' ??RIGMAR(      )')
  2900          DCL   VAR(&GLOFID) TYPE(*CHAR) LEN(16) +
  3000                  VALUE(' ??GLOFID(      )')
  3100          DCL   VAR(&FONWIT) TYPE(*CHAR) LEN(15) +
  3200                  VALUE(' ??FONWIT(     )')
  3300          DCL   VAR(&FONATT) TYPE(*CHAR) LEN(12) +
  3400                  VALUE(' ??FONATT( )')
  3500   RETRY: RTVDTAARA  DTAARA(QUSRSYS/QMAILFMT (100 1)) RTNVAR(&FLAG)
  3600          MONMSG     MSGID(CPF1015) EXEC(DO)
  3700          CRTDTAARA  DTAARA(QUSRSYS/QMAILFMT) TYPE(*CHAR) LEN(100)
  3800          GOTO       CMDLBL(RETRY)
  3900          ENDDO
  4000          IF         COND(&FLAG *NE '1') THEN(DO)
  4100          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (1 100)) VALUE(' ')
  4200          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (100 1)) VALUE('1')
  4300          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (4 1)) VALUE('/')
  4400          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (10 1)) VALUE('/')
  4500          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (11 1)) VALUE('1')
  4600          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (12 1)) VALUE('/')
  4700          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (18 1)) VALUE('/')
  4800          CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (24 1)) VALUE('/')
```

```
4900         CHGDTAARA   DTAARA(QUSRSYS/QMAILFMT (30 1)) VALUE('/')
5000         CHGDTAARA   DTAARA(QUSRSYS/QMAILFMT (35 1)) VALUE('/')
5100         GOTO        CMDLBL(NOINIT)
5200         ENDDO
5300         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (1 3)) RTNVAR(&LINWRK)
5400         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (5 5)) RTNVAR(&PAGWRK)
5500         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (13 5)) RTNVAR(&LFTWRK)
5600         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (19 5)) RTNVAR(&RGTWRK)
5700         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (25 5)) RTNVAR(&GFWRK)
5800         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (31 4)) RTNVAR(&FWDWRK)
5900         RTVDTAARA   DTAARA(QUSRSYS/QMAILFMT (36 1)) RTNVAR(&FAWRK)
6000 NOINIT: CHGVAR      VAR(&LINLEN) VALUE(&LINWRK)
6100         CHGVAR      VAR(&PAGLEN) VALUE(&PAGWRK)
6200         CHGVAR      VAR(&LFTMAR) VALUE(&LFTWRK)
6300         CHGVAR      VAR(&RGTMAR) VALUE(&RGTWRK)
6400         CHGVAR      VAR(&GLOFON) VALUE(&GFWRK)
6500         CHGVAR      VAR(&FONWID) VALUE(&FWDWRK)
6600         CHGVAR      VAR(&FONATR) VALUE(&FAWRK)
6700         CHGVAR      VAR(%SST(&LLEN 8 3)) VALUE(&LINWRK)
6800         CHGVAR      VAR(%SST(&PLEN 9 5)) VALUE(&PAGWRK)
6900         CHGVAR      VAR(%SST(&LETMAR 11 5)) VALUE(&LFTWRK)
7000         CHGVAR      VAR(%SST(&RIGMAR 11 5)) VALUE(&RGTWRK)
7100         CHGVAR      VAR(%SST(&GLOFID 11 5)) VALUE(&GFWRK)
7200         CHGVAR      VAR(%SST(&FONWIT 11 4)) VALUE(&FWDWRK)
7300         CHGVAR      VAR(%SST(&FONATT 11 1)) VALUE(&FAWRK)
7400         CHGVAR      VAR(%BIN(&BINLEN)) VALUE(&STRINGLEN)
7500         CHGVAR      VAR(&RTNSTRING) VALUE(&BINLEN)
7600         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &LLEN)
7700         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &PLEN)
7800         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &LETMAR)
7900         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &RIGMAR)
8000         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &GLOFID)
8100         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &FONWIT)
8200         CHGVAR      VAR(&RTNSTRING) VALUE(&RTNSTRING *TCAT &FONATT)
8300  STOP:  ENDPGM
```

CL PROGRAM SOURCE

```
SOURCE FILE . . . . . . .  BSILIB/QCLSRC
MEMBER  . . . . . . . . .  SETLLTDFT
SEQNBR*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6

 100  START: PGM         PARM(&LINLEN &PAGLEN &LFTMAR &RGTMAR &GLOFON +
 200                       &FONWID &FONATR)
 300         DCL         VAR(&LINLEN) TYPE(*DEC) LEN(3 0)
 400         DCL         VAR(&PAGLEN) TYPE(*DEC) LEN(5 0)
 500         DCL         VAR(&LINWRK) TYPE(*CHAR) LEN(3)
 600         DCL         VAR(&PAGWRK) TYPE(*CHAR) LEN(5)
 700         DCL         VAR(&LFTMAR) TYPE(*DEC) LEN(5 0)
 800         DCL         VAR(&LFTWRK) TYPE(*CHAR) LEN(5)
 900         DCL         VAR(&RGTMAR) TYPE(*DEC) LEN(5 0)
1000         DCL         VAR(&RGTWRK) TYPE(*CHAR) LEN(5)
1100         DCL         VAR(&GLOFON) TYPE(*DEC) LEN(5 0)
1200         DCL         VAR(&GLOWRK) TYPE(*CHAR) LEN(5)
1300         DCL         VAR(&FONWID) TYPE(*DEC) LEN(4 0)
1400         DCL         VAR(&FWIWRK) TYPE(*CHAR) LEN(4)
1500         DCL         VAR(&FONATR) TYPE(*DEC) LEN(1 0)
1600         DCL         VAR(&FATWRK) TYPE(*CHAR) LEN(1)
```

```
1700            CHGVAR     VAR(&LINWRK) VALUE(&LINLEN)
1800            CHGVAR     VAR(&PAGWRK) VALUE(&PAGLEN)
1900            CHGVAR     VAR(&LFTWRK) VALUE(&LFTMAR)
2000            CHGVAR     VAR(&RGTWRK) VALUE(&RGTMAR)
2100            CHGVAR     VAR(&GLOWRK) VALUE(&GLOFON)
2200            CHGVAR     VAR(&FWIWRK) VALUE(&FONWID)
2300            CHGVAR     VAR(&FATWRK) VALUE(&FONATR)
2400            IF         COND(&LINLEN *LT 1 *OR &LINLEN *GT 255) +
2500                         THEN(DO)
2600            SNDPGMMSG  MSG('Line must be between 1-255, value of ' +
2700                         *CAT &LINWRK *CAT ' was entered') +
2800                         MSGTYPE(*COMP)
2900            RETURN
3000            ENDDO
3100            IF         COND(&PAGLEN *LT 1 *OR &PAGLEN *GT 32752) +
3200                         THEN(DO)
3300            SNDPGMMSG  MSG('Line must be between 1-32752, value of' +
3400                         *BCAT &PAGWRK *CAT ' was entered') +
3500                         MSGTYPE(*COMP)
3600            RETURN
3700            ENDDO
3800            IF         COND(&LFTMAR *LT 0 *OR &LFTMAR *GT 32767) +
3900                         THEN(DO)
4000            SNDPGMMSG  MSG('Left Matgin must be 0-32767, value of ' +
4100                         *CAT &LFTWRK *CAT ' was entered') +
4200                         MSGTYPE(*COMP)
4300            RETURN
4400            ENDDO
4500            IF         COND(&RGTMAR *LT 0 *OR &RGTMAR *GT 32767) +
4600                         THEN(DO)
4700            SNDPGMMSG  MSG('Left Margin must be 0-32767, value of ' +
4800                         *CAT &RGTWRK *CAT ' was entered') +
4900                         MSGTYPE(*COMP)
5000            RETURN
5100            ENDDO
5200            IF         COND(&GLOFON *LT 1 *OR &GLOFON *GT 65534) +
5300                         THEN(DO)
5400            SNDPGMMSG  MSG('Global Font ID must be 1-65534, value +
5500                         of ' *CAT &GLOWRK *CAT ' was entered') +
5600                         MSGTYPE(*COMP)
5700            RETURN
5800            ENDDO
5900            IF         COND(&FONWID *LT 1 *OR &FONWID *GT 1440) +
6000                         THEN(DO)
6100            SNDPGMMSG  MSG('Font Width must be 1-1440, value of ' +
6200                         *CAT &FWIWRK *CAT ' was entered') +
6300                         MSGTYPE(*COMP)
6400            RETURN
6500            ENDDO
6600            IF         COND(&FONATR *LT 1 *OR &FONATR *GT 2) THEN(DO)
6700            SNDPGMMSG  MSG('Font Attribute must be 1-2, value of ' +
6800                         *CAT &FATWRK *CAT ' was entered') +
6900                         MSGTYPE(*COMP)
7000            RETURN
7100            ENDDO
7200            CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (1 3)) VALUE(&LINWRK)
7300            CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (5 5)) VALUE(&PAGWRK)
7400            CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (13 5)) VALUE(&LFTWRK)
```

```
       7500         CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (19 5)) VALUE(&RGTWRK)
       7600         CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (25 5)) VALUE(&GLOWRK)
       7700         CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (31 4)) VALUE(&FWIWRK)
       7800         CHGDTAARA  DTAARA(QUSRSYS/QMAILFMT (36 1)) VALUE(&FATWRK)
       7900         ENDMSF     OPTION(*IMMED)
       8000         STRMSF
       8100  STOP:  NDPGM
                    * * *  E N D  O F  S O U R C E  * * * *
```

To create the command, use the following command:

```
CRTCMD CMD(QGPL/SETLLTDFT) PGM(QGPL/SETLLTDFT) PMTOVRPGM(QGPL/SETPMTLLT)
```

To create the prompt override program, use the following command:

```
CRTCLPGM PGM(QGPL/SETPMTLLT) SRCFILE(QGPL/QCLSRC)
```

To create the CL program, use the following command;

```
CRTCLPGM PGM(QGPL/SETLLTDFT) SRCFILE(QGPL/QCLSRC)
```

To activate the command, use the following command:

```
SETLLTDFT (F4=prompt)
```

The following display is shown:

```
                  Long Line Truncation Defaults (SETLLTDFT)

 Type choices, press Enter.

 Line Length  . . . . . . . . .   255        (1-255)
 Page Length  . . . . . . . . .   00066      (1-32752)
 Left Margin  . . . . . . . . .   00001      (0-32767)
 Right Margin . . . . . . . . .   00080      (0-32767)
 Global Font ID . . . . . . . .   00086      (1-65534)
 Font Width . . . . . . . . . .   0120       (1-1440)
 Font Attributes  . . . . . . .   1          (1=Fixed, 2=Proportional
```

Enter the appropriate values and press Enter to update the data area.

OV/400 NON-Convert Option

OfficeVision/400 normally converts all documents to code page 256 and stores them in that code page, regardless of the code page in which they were created. This scheme works as long as the document is sent to another AS/400 system with the same primary language as the originating AS/400 system.

When converting such an OV document to ASCII, information about the original code page is not available, and the ASCII Latin 1 code page is used. As a result, all non-Latin 1 characters from the original document are lost.

The OfficeVision/400 non-convert option solves this problem by allowing documents to be saved in their original code page.

To activate the non-convert option, create the following data area:

```
CRTDTAARA DTAARA(QUSRSYS/QOVXLATECP) TYPE(*CHAR) LEN(256) VALUE(NY)
TEXT('DATA AREA TO CONTROL CODE PAGE CONVERSIONS')
```

Change the object owner of the data area:

```
CHGOBJOWN OBJ(QUSRSYS/QOVXLATECP) OBJTYPE(*DTAARA) NEWOWN(QSYS)
CUROWNAUT (*SAME)
```

Grant authorities to use the data area object:

```
GRTOBJAUT OBJ(QUSRSYS/QOVXLATECP) OBJTYPE(*DTAARA) USER(*PUBLIC)
AUT(*ALL)
```

Change the option value in the data area:

```
CHGDTAARA DTAARA(QUSRSYS/QOVXLATECP) VALUE(xx) where each x = Y or N.
```

Note: Only the first two positions in the data area are used.

```
Position 1 Controls RFT data conversion to CP 256.
Y = Suppress Conversion, N = Perform Conversion.
Position 2 Controls FFT data conversion to CP 256.
Y = Suppress Conversion, N = Perform Conversion.
```

What to Check When SMTP or POP3 Mail Does Not Work

Check the following general things when mail is not flowing properly between any of the supported mail POP3 clients on the AS/400 system:

- Client Access Host servers:

      ```
      To start: STRHOSTSVR *ALL
      QUSER and General Security Error
      ```

- Mail Server Framework:

      ```
      To check: WRKACTJOB JOB(QMSF)
      To start: STRMSF
      ```

- POP3 server:

      ```
      To check: WRKACTJOB JOB(QTPO*)
      To start: STRTCPSVR *POP
      ```

- SMTP server:

      ```
      To check: WRKACTJOB JOB(QTSMTP*)
      To start: STRTCPSVR *SMTP
      ```

- SMTP/MIME mail is not accepted when an AS/400 system has exceeded the configured system storage threshold. This is to prevent an inflow of mail from using up the entire system storage and causing it to fail.

   To check if the current system ASP (auxiliary storage pool) is under the system storage threshold limit:

      ```
      DSPSYSSTS, upper right-hand corner of the screen
      ```

   If you do not know what the storage threshold limit configured is, use the following command and options:

   – STRSST
   – Option 3 (Work with disk units)
   – Option 2 (Work with disk configuration)
   – Option 3 (Work with ASP threshold)

   For V3R2, the sequence of steps is:

   – STRSST

- Option 3 (Work with disk units)

- Option 4 (Work with ASP threshold)

The threshold used is for "ASP 1". The current %Used is displayed to the far right. If %Used exceeds the configured threshold limit, either storage on the system has to be freed up or the threshold limit must be set higher than the current %Used value. The threshold limit can be reset by selecting (Option 1=Select) ASP 1.

- POP3 or MAPI client receives "Unable to send mail message":

Some mail client jobs may need to search the system distribution directory to obtain recipient information and may receive the error `An error of unexpected or unknown origin has prevented the operation from completing` while attempting to search the directory.

Viewing the QTPOPABCH job log shows the MSGPCI9A9C message - Search data does not exist.

This can be remedied by releasing all locks placed on the file QUSRSYS/QAOKL03A (including QSNADS, QMSF, and QSERVER). Once those locks are released, issue the following commands to rebuild the search database:

```
CHGSYSDIRA ALWSCH(*NO)
CHGSYSDIRA ALWSCH(*YES)
```

By ending and restarting the search function, the corrupted file can be rebuilt.

- Missing QMSF exit programs:

There are several exit point programs for QMSF POP3 services. If for any reason they are not found, mail is not delivered.

Use the following command to check the appropriate exit point:

```
WRKREGINF EXITPNT(QIBM_QZMFMSF_ADR_RSL)
```

Using option 8 allows you to work with the exit programs.

When this option is invoked, the following programs should be registered:

```
1000    QZDSNPAD    QSYS
1300    QTMMADRS    QTCP
2000    QZMFSNPA    QSYS
```

If the program QTMMADRS QTCP is not shown, that is an indication that the exit programs required for SMTP/MIME (POP3 Server) support is not registered as part of the TC1 product installation. Before trying to re-register these programs check, to make sure the TC1 (TCP/IP Product) is installed on the AS/400 system.

To re-register the exit points once it has been determined that TCP/IP was installed successfully, call the following program using this syntax:

```
CALL  QTCP/QTMMSNAP
```

Otherwise, you must use option 8 with the following data to re-register the exit points:

```
Exit point  . . . . . . . . . . . . . . . :   QIBM_QZMFMSF_ADR_RSL
Exit point format . . . . . . . . . . . . :   MSFF0100

Exit program number . . . . . . . . . . . :   1000
Exit program  . . . . . . . . . . . . . . :   QZDSNPAD
  Library . . . . . . . . . . . . . . . . :     QSYS
Text description  . . . . . . . . . . . . :   SNADS Address Resolution

Exit program data CCSID . . . . . . . . . :   37
Exit program data length  . . . . . . . . :   28
Exit program data . . . . . . . . . . . . :
SPCL010001A101A201A301C001AT


Exit point  . . . . . . . . . . . . . . . :   QIBM_QZMFMSF_ADR_RSL
Exit point format . . . . . . . . . . . . :   MSFF0100

Exit program number . . . . . . . . . . . :   1300
Exit program  . . . . . . . . . . . . . . :   QTMMADRS
  Library . . . . . . . . . . . . . . . . :     QTCP
Text description  . . . . . . . . . . . . :

Exit program data CCSID . . . . . . . . . :   37
Exit program data length  . . . . . . . . :   16
Exit program data . . . . . . . . . . . . :
SPCL010001B001B1


Exit point  . . . . . . . . . . . . . . . :   QIBM_QZMFMSF_ADR_RSL
Exit point format . . . . . . . . . . . . :   MSFF0100

Exit program number . . . . . . . . . . . :   2000
Exit program  . . . . . . . . . . . . . . :   QZMFSNPA
  Library . . . . . . . . . . . . . . . . :     QSYS
Text description  . . . . . . . . . . . . :   Preferred Address Selector

Exit program data CCSID . . . . . . . . . :   37
Exit program data length  . . . . . . . . :   12
Exit program data . . . . . . . . . . . . :
SPCL01009999
```

Make sure you specify the CRTEXITPNT(*YES) parameter if you use option 1=Add
on the Work with Exit Programs display to re-register the exit point programs.

How An AS/400 System is Known by Many SMTP Domain Names

A common requirement for setting up SMTP/MIME for mail serving on an AS/400
system in a TCP/IP network is to allow a single AS/400 system to be known by
multiple host domain names. For example, a single mail server has POP3 users
Smith@companyA.com, Smith@companyB.com, Smith@companyC.com, and so
on where these users are distinct POP3 users that are all different "local" users to
the AS/400 system. This might be done in a case where an AS/400 system is
serving as a mail server for multiple companies. Each company wants its own
distinct host domain name and also does not want to be concerned whether any
other SMTP users that wanted to use an SMTP user name of "Smith" might be
defined on the same AS/400 mail server.

The following recommended approach allows a single AS/400 system to receive mail for many different TCP/IP host domain names. The method used is to define multiple IP addresses for a single AS/400 system. These multiple IP addresses can each be associated with a physical interface or there can be multiple logical IP addresses defined for each physical interface. AS/400 RISC system (V3R7 and later) can support up to 128 logical IP addresses per physical interface up to a maximum of 512 logical IP addresses per system. You can use the ADDTCPIFC command to define additional logical IP addresses to a physical line (physical lines each have a line description - WRKLIND).

Once you define an IP address for each company, you need to then define a distinct host.domain name to each IP address (for example, companyA.com, companyB.com, companyC.com, and so on). The association of names with addresses should be done using a DNS (domain naming service) server if one is present in the network. Otherwise, the host table can be used to accomplish it (ADDTCPHTE).

Since the AS/400 system has been defined to have multiple IP addresses and host.domain names, mail can be sent to any of these host.domain names and it is routed to and processed as being "local" on that AS/400 system.

When local POP3 users are defined in the system distribution directory, they can use any of the host.domain names that are defined for an AS/400 system. The SMTP user name must be unique for that host domain name (for example, there can only be one Smith in the domain defined by companyB.com).

Using this approach allows distinct POP3 users that all might just happen to have the same SMTP user name "Smith" to receive SMTP/MIME messages addressed to different host.domain names (for example, smith@companyA.com, smith@companyB.com, smith@companyC.com, and so on) even though they are actually local POP3 users on the same physical AS/400 server.

How a POP User Can Receive Mail Sent to Different Domains Names

This requirement is to allow the SAME POP3 user to receive mail sent to different host.domain names (for example, smith@domain.companyA.com and smith@companyB.com are really the SAME POP3 mail user Smith@server.domain1.companyA.com). This requirement can arise for various reasons such as a company merger or the consolidation of mail systems.

An aliases approach is recommended as a solution. The aliasing should be done for a single IP address so that it can be known as server.domain.companyA.com, domain.companyB.com., or companyA.com. This approach allows any of these host names to be used when Smith is registered as a local POP3 user. SMTP/MIME messages sent to any of these addresses are delivered to that same POP3 mailbox as the host names local server. Server.domain.companyA.com, domain.companyB.com., and companyA.com are defined to be aliases for each other, and all resolve to the same Internet address.

This can be accomplished with the AS/400 TCP/IP Host Table by entering up to four host names for a single Internet address. It can also be accomplished with CNAME records in a DNS server, with each CNAME record referencing the "real" host name of the AS/400 system.

Note: This is still only one local domain name for the AS/400 system and that is what is shown as the part of a return address if the return address is generated in the case when sending SMTP/MIME mail from OV/400.

Using this approach, the intent is that user Smith is a single POP3 user that wants to receive mail sent to any of the host domains domain2.companyA.com, domain1.companyB.com., and so on.

Forwarding Internet Mail

To perform the forwarding function through user-defined fields, the following fixes are required:

```
V3R2:  OS/400 SF43715 TCP/IP SF43699
V3R7:  OS/400 SF43803 TCP/IP SF43799
V4R1:  OS/400 SF42782 SF42810
```

MSF and *SMTP should be ended and restarted after applying these fixes.

The following example shows how to create the system distribution directory entry that can forward mail to a new domain. To be clear, this function allows mail that is sent from:

- OV/400 or JustMail locally or from any other SNADS server
- A local POP3 client
- ANY SMTP/MIME capable server on the Internet or intranet
- Lotus Domino through the STMP/MIME MTA

to any old SMTP address configured to receive mail for an AS/400 system to be forwarded to any new STMP address. The new SMTP address can be a user on the local AS/400 system or anyplace else including:

- OV/400 or JustMail locally or any other SNADS server
- A local POP3 client
- ANY SMTP/MIME capable server on the Internet or intranet
- Lotus Domino through the STMP/MIME MTA

The system distribution directory is used to define the new forwarding address using a user-defined field.

Mail sent to the "olduserid@domain" mail address is switched to the "newuserid@domain" and forwarded because of the Preferred address of field name FORWARDING and the address newuserid@domain being configured in the user-defined field [5]. Mail sent to the Userid Address "OLD ADDR" from OV/400 is forwarded to the new address in the FORWARDING user-defined field also.

Note: It does **not** matter if you have done the conversion of the alias table or not. You do **not** have to change the system alias table. The forwarding SMTP addresses are configured in a user-defined field in the system distribution directory. They do **not** automatically appear in the alias table just because they are defined as a forwarding address.

---

[5] In these examples, "olduserid@domain" and "newuserid@domain" are meant to be REPRESENTATIVE addresses. It is entirely possible to forward "olduserid@domain" to "olduserid@newdomain" or "olduserid@domain" to "newuserid@newdomain" with the forwarding function.

This forwarding trick does not (cannot) use the "old" OV to SMTP bridge (QSMTPQ support) once you have altered the system distribution directory to do forwarding.

To set up forwarding:

1. Define two user-defined fields in the system distribution directory:

   ```
   CHGSYSDIRA USRDFNFLD((FORWARDING *NONE *ADD *ADDRESS 256)
                        (FWDSRVLVL *NONE *ADD *MSFSRVLVL 1))
   ```

   You only do this step once per AS/400 system and the fields are defined in the system distribution directory in that system from then on.

   Note: If you have saved the system distribution directory (it is in QUSRSYS), save it again after you add the user-defined fields.

2. Change the OLD ADDR entry in the system distribution directory associated with the old address (for example, "olduserid@domain" associated either by the system distribution directory or by the system alias table) as follows:

   ```
   CHGDIRE USRID(OLD ADDR)
     USRDFNFLD((FORWARDING *NONE newuserid@domain))
     MSFSRVLVL(FWDSRVLVL *NONE)
     PREFADR(FORWARDING *NONE ATMIME)
   ```

On some systems, "ATMIME" is not defined and, in this case, use "MIME" in place of "ATMIME".

```
<<<<<<<<CAUTION>>>>>>>>>
```

Be Careful! DO NOT FORWARD to your OWN (OLD) address!

Also, there is no test for "circular forwarding": Directory entry A forwards to B that forwards BACK to A (even indirectly). If this is done, the result is an addressing "loop". QMSF jobs stay busy forwarding to an address that forwards to an address that forwards to... (you get the idea) and the QMSF job does little else on that system except loop and use up your CPU.

```
<<<<<<<<Be Careful>>>>>>>>>
```

Each directory entry representing an "old" address must be changed to configure the "new" address. This must be done whenever you want mail to be forwarded to some new address where "newuserid@domain" is the new forwarding address.

Note: There is **no** restriction on how many "old" addresses might be forwarded (from the same system or many different systems) to the **same** "new" address in this manner.

In this example, all the mail sent to OLD ADDR from OV/400 or the SMTP/MIME address "olduserid@domain" (associated with OLD ADDR by the System Alias table or the SMTP/MIME address in its system distribution directory entry) is forwarded to the mail address "newuserid@domain".

Note: Mail can still be sent FROM OLD ADDR with OV/400 or from a POP3 user defined by the system distribution directory entry with the olduserid@domain. As long as they are still enrolled on OV or are valid local POP3 users, changing to route to a forwarding address only means that no mail is returned to their old e-mail location.

You do **not** have to define "newuserid@domain" in the system alias table or otherwise in the system distribution directory on the forwarding AS/400 system. It might make sense to define it in the following cases:

- When it represents a user that is truly local to the same forwarding AS/400 system (as in the case the mail sent to an old address of a POP3 user might be forwarded to another POP3 user).

- (Only when sending to and from OV/400). When the user at the **new** address is now a "remote" user and to send mail back to OV/400 users on the old system. In this case, a new system distribution directory entry should be added that maps the new SMTP address to a **new** User ID Address by the system distribution directory or system alias table.

If object distribution messages (SNDNETF, SNDNETMSG, and SNDNETSPLF) are sent to OLD ADDR from any other SNADS system, they are **not** forwarded.

These messages are forwarded to remote users through SNADS routing if the system distribution directory entry routes mail to another system (due to the system name in the system distribution directory).

If the system distribution directory represents a local recipient object, distribution messages are delivered to the local user as configured in the system distribution directory entry.

Split Messages Do Not Get Reassembled

Some mail clients such as MS Exchange Internet Gateway and Domino SMTP/MIME MTA do not reassemble messages that are split up, which is stated as a requirement function in the RFC.

To avoid this when sending to one of these clients, you can use CHGPOPA to set the split size to 2MB.

If 2MB is not large enough, on V3R2 or V3R7, install a PTF:

```
V3R7:  SF37157
V3R2:  SF44806
V4R1 and later:  no PTF required.
```

Then create a data area QUSRSYS/QTMSNOSPLT.

When you send to the Internet, you can never be sure you are sending to an NT or Notes user, so you may want to send it to them also. Of course, **not** splitting up a MIME note can possibly get you into trouble on **other** kinds of mail servers that cannot handle an infinite SMTP/MIME message size.

Creating a Resource Calendar

OfficeVision/400 now supports resource calendars as well as user calendars. A resource calendar is used for scheduling a resource such as a conference room or overhead projector. You can still use your personal user calendar to schedule your activities.

You may be using a user calendar to track resources. Note that a user calendar does not always check for schedule conflicts and lets you schedule meetings even though there is a conflict. A resource calendar always checks for conflicts and does not allow you to schedule conflicting meetings or events. Thus, you can be sure there is only one meeting or event scheduled for a given conference room or

other resource at a time. You can use the new function to change user calendars (which are used to track resources) to resource calendars.

To create a new resource calendar or change an existing user calendar to a resource calendar, you must have *SECADM or *ALLOBJ authority. To create a resource calendar:

1. On the Daily, Weekly, Monthly, Group, Composite, or Six Month Calendar, press the F13 (More Tasks) key:

   The More Calendar Tasks display is shown.

```
                        More Calendar Tasks

   Select one of the following:

        1. Change calendar session
        2. Work with calendars
        3. Work with groups
        4. Copy calendar items
        5. Remove calendar items
        6. Work with distribution lists
        7. Work with meetings
        8. Search remote calendars
        9. Work with user-defined functions
       10. Change Meeting Authority

   Selection


         __


   F3=Exit     F9=Six Month Calendar    F12=Cancel    F13-Display Messages
```

2. For Selection, type "2" to select the Work with Calendars option.

3. Press the Enter key.

   The Work with Calendars display is shown.

4. Press the F6= (Create new Calendar) key.

   The Create Calendar display is shown.

```
                        Create Calendar

   Type choices, press Enter.

     Calendar . . . . . . .   CONFRM1
     Copy from  . . . . . .
     Calendar type  . . . .   2                    1=User, 2=Resource
     Text . . . . . . . . .
     Owner  . . . . . . . .   BSI       SYSN30S    F4 for list
     Manager  . . . . . . .   BSI       SYSN30S    F4 for list
     Notify manager . . . .   N                    Y=Yes, N=No
       For choice Y=Yes:
         Notify mode  . . .   1                    1=Message queue only
                                                   2=Message queue and mail
     Authority  . . . . . .   1                    1=Accept default authority
                                                   2=Change authority



   F3=Exit    F4=prompt   F5=Refresh    F9=Six Month Calendar
   F10=Set Working Times  F12=Cancel     F19=Display Messages
```

5. For calendar, type the name of the calendar you want to create.

6. For calendar type, type "2" to select the resource option.

You can also create a resource calendar by using the CRTCAL command.

Appendix B. Sending Mail to the Internet from an AS/400 System

This appendix is designed to provide additional examples of sending e-mail information using the AS/400 Send Distribution (SNDDST) CL command and the AnyMail/400 Sendmail API.

This is intended for users that might be writing e-mail capable AS/400 applications.

Support for Sending E-Mail through SNDDST

The SNDDST command was intended to allow AS/400 applications to send mail to OV/400 users. Even though it is an OV/400 API, the OfficeVision for AS/400 product does **not** have to be installed to use this command on any AS/400 system.

The SNDDST command can be used to send text messages, AS/400 save files, database files, or objects that are in folders including OV/400 documents or PC files (binary objects) to any OV user (local or in a SNADS network), any POP3 user, any user on the Internet[6]. Note that just because any AS/400 object (such as a database file) can be sent to any user, there is no guarantee that the recipients can actually use the object that was sent. An example is sending an AS/400 save file to a POP3 client on the Internet. It arrives as a binary attachment but is not much use to the recipient.

The SNDDST command can be used in CL programs that are running as part of a batch job. In this case, the running job's user profile **must** be configured as a "local" user in the AS/400 system's system distribution directory. A program that uses SNDDST may be called interactively. Each user that calls that program must also be enrolled as a local user in the system distribution directory.

Since the SNDDST command can be used to send mail to POP3 users or the Internet, the AS/400 SMTP/MIME support attempts to create a return address for the sending user.

The sending user's system distribution directory entry is identified automatically by the SNDDST function using the caller's job user profile and looking that up in the system distribution directory. The User ID Address that defined that user profile to the system distribution directory is then used as the originator address. If the message is sent to a POP3 user or the Internet, the SMTP/MIME support uses the SMTP address defined by that originating user's system distribution directory entry. If there is no SMTP address defined, then UserID?Address@localhostdomain[7] is automatically used as the return address on SMTP/MIME mail.

---

6 In this context, "Internet" should be taken to mean any users that use SMTP/MIME to communicate within a network of servers using TCP/IP. That might mean Domino on Integrated PC Server since it looks similar to another TCP/IP system and its users can be sent messages in SMTP/MIME format.

7 Where User ID and Address are the names that define the system distribution directory entry for the originator, "?" is a "User ID delimiter" defined in the CHGSMTPA parameters (default value is "?"), and the localhostdomain is the AS/400 system's local TCP/IP host name (see CFGTCP, option 12).

If some POP3 or Internet user replies back to the originator's return address, the reply is routed back an OV/400 local mailbox (Mail service level set to 1=User index - the default) or to a POP3 mailbox (Mail service level set to 2=System message store). Which mailbox used depends on how the system distribution directory entry is defined for the return address by the "Mail service level" attribute in their system distribution directory entry. Since OV/400 might not be installed or a user might not be enrolled in OV/400, the QRYDST and RCVDST commands must be used to work with replies (or any other messages) that are mailed back to a user of SNDDST that has their Mail service level set to 1=User index. If the Mail service level is set to 2=System message store, there is no API provided to receive the SMTP/MIME mail from a local POP3 mailbox, and possibly a POP3 client is required to handle the replies or messages returned to the SNDDST user.

Sending Messages from an AS/400 System with SNDDST to the Internet

This is important for AS/400 users that need to send a text message to the Internet, POP3 clients, or Domino users. Any binary object in a folder can be sent to any POP3, OV, or Internet user with the SNDDST command. Using SNDDST to send readable or browsable attachments can require more than just identifying the folder object to mail. (In V4R1, SNDDST has been modified to send directly to Internet addresses with new parameters (see the TOINTNET parameter).)

A possible way to accomplish sending text messages is to create an AS/400 database file that contains the message to be sent. Each line of text is represented by one record in the file. For the text to be viewable by most mail clients (including OV/400 users), the maximum size of the record should be 77 characters. A hex "06", which is a required carrier return, should be placed in position 77 of each record. This maintains the readability of the text for most mail clients.

The next step is to use the SNDDST CL command:

```
SNDDST TYPE(*FILE) TOUSERID((<recipient User ID Address>))
TOINTNET((SMTP user names)) DSTD(<some distribution id>) MSG(<Some
option message string>) DOCFILE(<name of the databasefile>) DOCMBR(<Name
of the database file member with the text>) DOCTYPE(*FFT) SNDFMT(*NOCHG)
```

Note: TOINTNET is supported only on V4R1 and later releases.

This should produce an SMTP/MIME plain text message that shows up in the in-basket of a POP3 client as a complete, plain text message.

The previous method attempts to create a message that has the text inside the body of the message sent. Some users have requested a way to create a message that has the text sent in a "browsable" attachment.

There is an alternate method that uses a conversion command called CPYTOPCD that essentially copies the database file records to a *PCFILE in a designated folder. After copying the database file to the *PCFILE document in a folder, the folder document can be mailed with SNDDST as an attachment as follows:

```
SNDDST TYPE(*DOC) TOUSERID((<recipient User ID Address>)) TOINTNET((SMTP
user names)) DSTD(<some distribution id>) MSG(<Some option message
string>) DOC(<name of the converted to PCFILE>) FLR(<Name of the folder
with the PCFILE>)
```

The PCFILE is sent as an ASCII attachment but should be viewable as text. Be aware that some mail clients may not have a browser that can view or launch the attachment from within the mail client.

Support for Sending Long Messages through SNDDST

The message sending support of the Send Distribution command is being enhanced. The text message on the SNDDST command (SNDDST TYPE(*MSG)) is limited to 256 characters and the Internet addressing support added to the command in Version 4 Release 1 (the TOINTNET parameter) does not support the message only case (TYPE(*MSG) means the TOINTNET parameter cannot be used on command).

That requirement is being answered with new support in the SNDDST command. The support has been PTFed into current releases. The support consists of a new TYPE value (TYPE(*LMSG)) and a new parameter (LONGMSG) on the SNDDST command.

Releases and PTF numbers are:

```
        Release  PTF #
        =======  ========
        V3R2M0   SF45328
        V3R7M0   SF45415
        V4R1M0   SF45226
```

```
Send Distribution (SNDDST)

  TYPE(*LMSG)

      The text specified on the Long Message prompt (LONGMSG
      parameter) is sent as an final-form text document (FFTDCA)
      note.  LONGMSG allows up to 5000 characters, which is about
      one page of text.  The "details" parameters (Subject,
      Reference, Author, Due Date, and so on)  are supported with
      TYPE(*LMSG).  In version 4, the TOINTNET parameter is also
      supported with TYPE(*LMSG).

  LONGMSG(*NONE/'long-message-text')

      Specify the text to send to the recipients as an final-form
      text document (FFTDCA).  The possible values are:

          *NONE
             No text is sent.  This is the default and required when
             TYPE is not *LMSG.

          long-message-text
             Specify the text (5000 characters maximum) to send to
             the recipients.  The text is put into a final-form
             text document (FFTDCA) that is sent as a note.

              The text must be formatted by using the following
              controls within the text.

             o  :/N - Will cause a new line (Carrier return).
             o  :/P - Will cause a new paragraph.
                      New line plus a blank line.
```

<pre>
                            (Carrier return and Required carrier return)

                    The document is set up with 10 characters to the inch,
                    the font ID is 11, the left margin at position 1, and
                    the right margin at position 75. If :/N is not used to
                    start a new line, the text will continue past the right
                    margin and is not viewable by some e-mail clients.
                    Blanks are not removed from the text, but left in place
                    for indentation and alignment. No extra text (that is,
                    Recipient List, Date/Time, Subject, or Sender) is put
                    into the document.

                    The character ID of the text in LONGMSG can be specified
                    on CMDCHRID parameter.

                    Technical note to programmers: Any of the FFTDCA
                    controls (in hexadecimal) can be inserted in the text to
                    provide more control of the format if the previous controls
                    are not enough.
</pre>

Using the Send Distribution (SNDDST) command with the *Long Message*
(LONGMSG) parameter eliminates the need to create a message in a database file
and then send the file when more than 256 characters but less than 5000
characters are needed.

Sending Spooled File from OV/400 Document

 You can also use the SNDDST command to send an AS/400 spooled file to any
e-mail recipient including POP3 users or the Internet. This can be accomplished by
creating an OV/400 document with a single instruction in the document.

The "RUN" instruction allows you to call any AS/400 program that produces printed
output to imbed the spooled file into the document when the document is printed.
The following displays shows the run instruction and how it should be entered. The
printer file name must match the name of the print file used in the program that is
being called.

```
  .run                    Run Instruction
 This instruction marks the point in the document where a CL command should
 be run, and the print file where the output should be placed.

 Type choices, press Enter.

 Command . . . . .RUNQRY QRY(BSILIB/AS400DB) QRYFILE((BSILIB/*SAME))
                  OUTTYPE(*PRINTER)


 Print file . . . . . . QPQUPRFIL
 S/38 command . . . . . N                Y=Yes, N=No
 Instruction length . .   4              1-255, Blank=Entire instruction

 F3=Exit     F4=Prompt    F12=Cancel      F16=Delete instruction
```

The following command sends the spooled file to a recipient:

```
SNDDST TYPE(*DOC) TOUSRID(BSI DALN30S) DSTD('Send Spool File')
         SNDFNT(*FINALFORM) DOC(AS400DB) FLR(BSI)
```

The spooled file is sent to the recipient named in the SNDDST command. In V4R1, the *Internet Recipient* (TOINTNET) parameter can be used to send to an Internet user.

Using SNDDST and Context Addressing (V3R2 and V3R7)

In V4R1, the TOINTNET parameter was added to the SNDDST command to allow the users of that command to send to Internet addresses without having to register the address under an *alias* User ID and Address. Prior to V4R1, there was another, more limited, method for V3R2 and V3R7 called *context addressing* that allowed the same thing to be done. The PTFs required and setup instructions are described in Appendix C, "Sending Internet Mail from OfficeVision/400" on page 203.

The requirement for context addressing is that the string `/internet` is followed by a least one blank and then `/to <some address>` (where <some address> is an SMTP e-mail address such as `user1@somedomain.com`) that can be repeated followed by at lease one blank and then `/end` must appear in the context of a note. When this is done and the resulting note is mailed to a special "proxy address" such as INTERNET USERS, the resulting note is forwarded to the "/to" SMTP addresses. The SMTP addresses do not have to be defined in the system distribution directory. (The "proxy address" such as INTERNET USERS does have be defined in the system distribution directory.)

This same kind of "ad hoc" or business card addressing can be done with the SNDDST command, provided the same PTFs and setup defined in the PTF cover letter or in Appendix C, "Sending Internet Mail from OfficeVision/400" on page 203 are followed. The trick to this is that the:

- `/internet`,
- `/to <some address>` (which could be repeated)
- `/end`

(each separated by at least one space) must be in the *Subject* or *Description* of an object being mailed from a folder on the AS/400 system.

To do this, the description must be changed as follows:

```
CHGDOCD DOC('<my doc>') FLR('<my folder>') USRID(*CURRENT)
DOCD('/internet /to user@domain.com /end')
```

Or you can use the Subject field:

```
CHGDOCD DOC('<my doc>') FLR('<my folder>') USRID(*CURRENT)
SUBJECT(('<existing subject>
        '/internet /to user@domain.com /end'))
```

Where <my doc> is what I want to send to user@domain.com and <my folder> is the folder where it is stored (<existing subject> has to be the subject being changed).

Then using SNDDST, the same folder object previously updated can be sent:

```
SNDDST TYPE(*DOC) TOUSRID((INTERNET USERS)) DSTD(TEST)
DOC('<my doc>') FLR('<my folder>')
```

Note: There is a "description" parameter, DSTD, on the SNDDST command as well as a SUBJECT. These SNDDST parameters cannot be used to do the "/internet" trick, only those on the folder object being sent.

Also note that this trick does not work for SNDDST TYPE(*MSG).

What this trick does allow is that SNDDST can be used to send text or binaries (that are in a folder) or the "long message" previously described in this appendix to SMTP addresses that are not registered in the system distribution directory or alias table entries on the sending AS/400 system.

Additional Rules for SNDDST Subject Line

When sending files to the Internet (SMTP/MIME) using SNDDST, the "Subject" line of the message may contain data from one of three sources:

- SUBJECT
- DOCD (Document Description
- Library/File/Member

If there is a SUBJECT value coded in the SNDDST command, that value becomes the "Subject" of the message; if there is no SUBJECT value but a DOCD value coded in the SNDDST command, that value becomes the "Subject" of the message; if neither SUBJECT or DOCD are entered, the library name/ file name/ member name of the file being sent becomes the "Subject" of the message.

When sending Documents to the Internet using SNDDST, the "Subject" line of the message may contain data from one of three sources:

- SUBJECT value in the DLO (Document Library Object)

- Description value in the DLO (entered when the document is created or changed by the CHGDOCD command)

- Default value of "Document created on dd/mm/yy"

Similar to the file case, the SUBJECT takes precedence, and if it does not exist, the DOCD is used; and if neither exist, the default is used. The SNDDST command's SUBJECT or DOCD values **are not used** when sending documents, so no matter what is entered there, it is ignored.

If the *MSG parameter is used to send a message to a userid/address in the system distribution directory that has a preferred address of "3=SMTP name", the first line of the body of the message becomes the Subject as there cannot be a "Subject" value entered on the SNDDST command with the *MSG parameter.

AnyMail/400 Sendmail API

This API is intended as an SMTP/MIME only API and can be used to send any MIME note built into an IFS file on an AS/400 system through the SMTP/MIME support installed with the TC1 product.

The major difference between this API and using the SNDDST CL command is that the SNDDST can be used to send something identified on the sending system to an address specified in the command. The AnyMail/400 Sendmail API is a "lower level API" that assumes the ASCII MIME message is already built and is in an IFS file. What ASCII byte string (that might define the message's attachments or text) that makes up the MIME note or how that MIME note is built is determined by the caller.

Send MIME Mail (QtmmSendMail) API

The Send MIME Mail (QtmmSendMail) API provides a front end for
applications to use SMTP and TCP/IP to send mail to the Internet.
When sending mail, applications create an Integrated File
System (IFS) file with a SMTP or MIME formatted piece of mail, which
is Internet ready. The application then calls the QtmmSendMail
API giving it the name of the file and the addresses that the
framework and SMTP use to forward the mail.

Send MIME Mail Parameters

Filename

(Input Char(*)) Character string of the Integrated File System
filename of the ASCII MIME note. The entire path must be
specified.
The file is unlinked after the framework is finished
processing it. This means that if this is the last link, the
file is deleted. This file must contain an Internet-ready
MIME note that adheres to the standards called
Request for Comment (RFC).

Length of filename

(Input Binary(4)) The number of bytes in the filename (the
entire path name). Maximum length is 255 bytes (no NULL assumed
at end).

Originator address (SMTP)

(Input Char(*)) Character string of an SMTP originator address..
The part of the address inside the brackets <>. For example,

"John Smith" < smith@myhost.mytown.com>.

Length of originator

(Input Binary(4)) Length of originator address string (not
including any NULL). Maximum length is 256 bytes.

First recipient address (SMTP)

(Input ADDT0100(*)) First address structure that contains a
recipient address.

Total number of recipients

(Input Binary(4)) Number of recipient address structures (must
be at least one).

Error code

(I/O Char(*)) The structure to return error information.

Send MIME Mail Authorities

The MIME IFS file must exist for the duration of the QMSF framework

pass. The conversion and delivery exit points called by the QMSF
job must be able to read the file. The attachment management exit
program removes the link (unlink). If this is the last link,
the file is deleted.

Directory Authority

   Data authority must be *X for product QMSF.

File Authority

   QTCP and QMSF must have:

   -   data authority *RWX
   -   object authority *all

Send MIME Mail ADDT0100 Format

The following table shows the layout for ADDT0100:

Table 9. ADDT0100 Format			
Offset	**Type**	**Field**	**Description**
00	BINARY(4)	Offset to next address structure.	Number of bytes from the beginning of this address structure to the beginning of the next. Must be at least the size of the fixed part of this address structure and the recipient address length.
4	BINARY(4)	Address Length	Length in bytes of the SMTP address. Maximum length is 256 bytes. This maximum length is determined by Internet standards.
8	CHAR(8)	Address Format name	The characters that identify the particular structure. Current value ADDT0100. Used for level control of the structure.
16	BINARY(4)	Distribution type	Type of recipient • 0 Normal • 1 Carbon Copy • 2 Blind Carbon Copy
20	BINARY(4)	Reserved	This field is reserved and must be set to 0.
*	CHAR(*)	Address	The actual SMTP address (no NULLS included)

Send MIME Mail Error Messages

• CPFA0A9   Object not found.
• CPFA0CE Error occurred with path name parameter specified.
• CPF3C12 Length of data is not valid.
• CPF3C17 Error occurred with input data parameter.
• CPF3C21 Format name &1 is not valid.
• CPF3C39 Value for reserved field not valid.
• CPF3C75 Error occurred with entry lengths and offsets parameter.

- CPF3C88 Number of variable length records &1 is not valid.
- CPF3E0A Resource limits exceeded.

Note: This API, in turn, uses the AnyMail SendMail API to create an SMTP/MIME message that is handled by the MSF framework as are other SMTP/MIME messages that might have be sent from another TCP/IP server or a local POP3 client. Complete details on using the SendMail API can be found in the *AnyMail/400 Mail Server Framework Reference Developer Guide*, GG24-4449.

Appendix C. Sending Internet Mail from OfficeVision/400

Previously, when you used IBM OfficeVision for OS/400 to send mail to an Internet address[8], the recipient's address had to be added to the system distribution directory before you actually sent the mail. The reason is that (prior to V4R1), IBM OfficeVision for OS/400 was only able to accommodate a recipient's address in the form of two up to eight-character long fields called *user ID* and *address* (also called *DEN/DGN*).

To enable users without the special authorities to change the system distribution directory to send "ad hoc" mail to Internet users that are not registered in the system distribution directory, a PTF has been developed for Version 3 of IBM OfficeVision for OS/400 (SF33896 for V3R7 and SF33943 for V3R2) to allow for *context addressing*, also known as *business card addressing*. Using a special syntax, it allows you to specify any Internet address within the body of your note.

For Version 4 IBM OfficeVision for OS/400, an integrated solution has been provided that does not need applying a PTF. However, there are some configuration steps to be done to enable this function. See "Internet Addressing in OV/400 V4R1" on page 207 for information on the V4R1 solution.

An Internet address does not necessarily mean the Internet has to be used to reach the recipient, rather it includes all users who can be reached by an SMTP address, even if the recipient is a POP3 client or a Lotus Notes client on the same AS/400 system.

Internet Addressing through PTFs in V3R2 and V3R7

Applying the PTFs (SF33896 for V3R7 and SF33943 for V3R2), is not enough to activate Internet addressing; you need to perform some manual configuration steps. The following paragraphs explain these configuration steps, "Sending Mail to Internet Addresses in V3R2 or V3R7" on page 205 shows examples on how to use ad hoc addressing when sending mail in version 3.

Implement Internet Addressing in V3R2 and V3R7

To implement these changes, a new exit program for AnyMail, *QZMFCTXT*, is shipped with the PTFs. The program must be registered as an exit program in the mail server framework list expansion point, (QIBM_QZMFMSF_LST_EXP), to activate the function. It can be in any position in the exit point but it should be *after* the QSYS/QZDSNPLE program (exit program 1000). Register the program after you apply the PTF.

1. Load and apply the PTF or its supersede following the instructions in the cover letter.
2. Register the exit program using the following command:

   ```
   WRKREGINF QIBM_QZMFMSF_LST_EXP
   ```

---

[8] In this context, "Internet" means any users that use SMTP/MIME to communicate within a network of servers using TCP/IP. That might mean Domino on the Integrated PC Server since it looks similar to another TCP/IP system and its users can be sent messages in SMTP/MIME format.

3. Select option **8** (Work with exit programs).

   On the next display, enter Option **1** (Add) and enter `QZMFCTXT` as the Exit Program and QSYS as the library. Press Enter. On the next display, press **PF10** (Additional parameters) and page down to the second display. Fill in the displays as shown in Figure 164.

```
                        Add Exit Program (ADDEXITPGM)

 Type choices, press Enter.

 Exit point . . . . . . . . . . > QIBM_QZMFMSF_LST_EXP
 Exit point format . . . . . . . > MSFF0100     Name
 Program number . . . . . . . . > 2000          1-2147483647,
 Program  . . . . . . . . . . . > QZMFCTXT      Name
   Library  . . . . . . . . . . >   QSYS        Name, *CURLIB
 Text 'description' . . . . . . > Context switching exit


                        Additional Parameters

 Replace existing entry . . . . . > *NO         *YES, *NO
 Create exit point  . . . . . . .   *YES        *YES, *NO




                                                     More...
```

Figure 164 (Part 1 of 2). Add Exit Program for PTF SF33896 or SF33943

```
                        Add Exit Program (ADDEXITPGM)

   Type choices, press Enter.

   Exit program data:
     Coded character set ID . . . . > 37      Number, *NONE, *JOB
     Length of data . . . . . . . . > 12      0-2048, *CALC
     Program data . . . . . . . . . > SPCL010001CX


                                                     Bottom
```

Figure 164 (Part 2 of 2). Add Exit Program for PTF SF33896 or SF33943

4. End the mail server framework by using the End Mail Server Framework (ENDMSF) command:

   ENDMSF

5. Restart the mail server framework by using the Start Mail Server Framework (STRMSF) command:

   STRMSF

6. A system directory entry must be added that causes the *context switching* program to be executed. The user ID you add is the recipient you enter in the *addressee* field of the OfficeVision note (see example in Figure 165 on page 205). Use the following command to add the directory entry:

```
ADDDIRE USRID(INTERNET GATEWAY)           +
        USRD('Context switching entry') +
        SYSNAME(INTERNET)                 +
        MSFSRVLVL(*USRIDX)                +
        PREFADR(NETUSRID *IBM ATCONTXT)
```

You can make up your own names for user ID/address, system name, and description. All other parameters must be entered exactly as shown previously.

Sending Mail to Internet Addresses in V3R2 or V3R7

The way Internet addressing is used in V3R2 and V3R7 is called *context addressing* because the SMTP addresses have to be entered in the context of the note, which can be the body of the text as shown in our example, but you can also enter those addresses within the *Subject* or *Reference* fields. The following example shows an OfficeVision note sent to an Internet recipient. After typing the STROFC command, select option 4 (Send note). The display in Figure 165 is shown.

```
                       Send Note

 Type mailing information, press F6 to type note.
   Subject  . . . . . . . . . .   _____
 _____
   Reference . . . . . . . .     _____
 _____

 Type distribution list and/or addressees, press F10 to send.
   Distribution list . . . . .   _____  _____     F4 for list

 -----Addressees------
 User ID    Address     Description
 INTERNET   GATEWAY     Context switching entry

 _____  _____
 _____  _____
 _____  _____
 _____  _____
 _____  _____                             More...

 F3=Exit   F6=Type note   F9=Attach memo slip   F10=Send
 F12=Cancel   F13=Change send instructions   F14=Specify list
```

Figure 165. Send a Note Using Context Addressing

If you want to send this note to one or more Internet addresses, you have to enter the user ID/address (configured in step 6 on page 204) into the addressee fields. In our example, this is INTERNET GATEWAY.

Press **F6** to type the body of the note.

```
NOTE          P:12                Edit
<.:....2...T:..T.3..T.:..T.4..T.:..T.5..T.:..T.6..T.:..T.7..
 F
TO:           INTERNET GATEWAY    Context switching entry

FROM:         XZS2025  RS003     T Bliss - Rochester

DATE:     date
SUBJECT:  E-Mail example
REFERENCE: nada
 F


/internet
/to nobody@some.domain.com
/to santa@north.pole.com
/end
This is the text of the note.  After coding "/end" above,
I can enter other "/to userid@domain.names" and they will
not be used to route the note.  Scanning stopped at "/end".
"/end" is optional but recommended
in case you want "/to" included in the body
of the document and do not
want to send to the string following it.
The "/" keywords can be placed anywhere in the body of the note.
 F
COPY LIST:
 F




 _____
 F1=Copy        F10=Send        F16=Adjust/Paginate
 F2=Move        F12=Cancel      F17=Functions
```

Figure 166. Send a Note using Context Addressing

When you press **F10**(=Send), OV/400 sends the document, which, in fact, means it hands it over to the AnyMail/400 mail server framework. In the framework, the QZMFCTXT exit program finds the document or note and scans it for the following keywords:

    /internet
    /to
    /end

The keywords can be in upper case or lower case. There can be more than one /Internet in the document, but only one is processed. A valid Internet (SMTP) address must follow each /to keyword because all non-blank characters following /to until a blank or end-of-line is encountered are regarded as the e-mail address. The program allows from one to 256 bytes of non-blank data for an SMTP address. You can have up to 32 768 /to keywords and SMTP addresses within one document or note. The first /end encountered stops the scan.

After the Internet addresses are found, the addresses are added to the mail server framework recipient list with the Mail Server Framework Change API.

If no keywords or addresses are found in the note, the distribution is marked as "non-delivery" with an invalid user ID code and the recipient address is changed to *ATCNTXT *UNKNOWN, which is shown in the *ERR entry in the distribution log (DSPDSTLOG).

If you specify Confirmation of Delivery on the note, you do not receive any confirmation of delivery to INTERNET GATEWAY as it is not a "real" recipient.

No confirmation is received for recipients listed in the context of the note that are not registered in the system distribution directory.

Internet Addressing in OV/400 V4R1

In OfficeVision/400, Version 4 Release 1 has been implemented as an integrated solution. That is, on the send displays, a user can enter an Internet address instead of or in addition to the traditional Document Interchange Architecture (DIA) based address in the form of two up to eight-character long fields called *UserID* and *Address*. Even though in V4R1 no PTFs are needed to install Internet addressing, you still need to perform some manual steps to activate this function.

The following paragraphs explain the configuration steps and "Sending Mail to Internet Addresses in V4R1" on page 210 shows examples on how to use ad hoc addressing when sending mail with IBM OfficeVision for OS/400 Version 4 Release 1 or later.

Activate Internet Addressing in V4R1

Before any OV/400 user can send any mail to SMTP addresses, the AS/400 administrator has to perform the following configuration steps:

- "Add a Directory Entry as Route to SMTP Gateway"
- "Configure Route to SMTP Gateway in Distribution Attributes" on page 208
- "Enable Each Single OV/400 User to Send Internet Mail" on page 208 We describe each step in detail in the following paragraphs.

Add a Directory Entry as Route to SMTP Gateway

The AS/400 system administrator must add a new entry to the system distribution directory to define the *Route to SMTP gateway*. The User ID and Address of this entry is later specified with the SMTPRTE parameter for the Change Distribution Attributes (CHGDSTA) command.

The directory entry must specify the following:

- The *User ID* and *Address* (USRID) can be anything, but should indicate that this entry refers to Internet or SMTP users. We suggest:

  `USRID(INTERNET SMTPRTE)`

  Users do not need to know this address, but you must specify the same value when changing the Distribution Attributes in "Configure Route to SMTP Gateway in Distribution Attributes" on page 208.

- The *User entry description* (USRD) again can be anything, but should indicate that this entry refers to Internet or SMTP users.

  Suggestion:

  `USRD('User ID to route Internet addresses')`

- As *User profile name* (USER), `*NONE` should be specified.

- The *System name* (SYSNAME) can be anything different to this system's name or other system in the SNADS network (for example, you might choose: `INTERNET`).

- The *Network User ID* (NETUSRID) must be the same as the User ID and Address (that is, specify `*USRID`).

- The *Mail Service Level* (MSFSRVLVL) must be `*USRIDX.` (that is, option 1 when using the Work with Directory Entries (WRKDIRE) command.
- The Preferred address (PREFADR) must be:
  - *Field Name* = `NETUSRID`,
  - *Product ID* = `*IBM`,
  - *Address Type* = `ATCONTXT.`

Configure Route to SMTP Gateway in Distribution Attributes

The user ID and address for the system distribution directory entry added in "Configure Route to SMTP Gateway in Distribution Attributes" now needs to be specified with the Change Distribution Attributes (CHGDSTA) command. In any AS/400 command line, type `CHGDSTA` and press **F4**.

```
                     Change Distribution Attributes (CHGDSTA)

 Type choices, press Enter.

 Keep recipients  . . . . . . . .    *BCC         *SAME, *BCC, *ALL, *NONE
 Use MSF for local  . . . . . . .    *NO          *SAME, *NO, *YES
 Route to SMTP gateway:
   User ID  . . . . . . . . . . .    INTERNET       Character value, *SAME, *NONE
   Address  . . . . . . . . . . .    SMTPRTE        Character value

                                                                          Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 167. Change Distribution Attributes (CHGDSTA)

Enable Each Single OV/400 User to Send Internet Mail

You also need to enable each single office user to send mail to SMTP addresses. The following steps enable your OV/400 office users to use Internet addressing when sending mail or documents.

1. From the OV/400 main menu, enter Option 9 (Administration).
2. Select option 1 (Work with Office Users).
3. Select option 2 (Change) for each User ID you want to add Internet addressing capabilities.
4. Select option 6 (Environment information).
5. Select "Y" in *Allow Internet addressing*.

You can also use the new Allow Internet Addressing (ALWINTNETA) parameter for the Add Office Enrollment (ADDOFCENR) and the Change Office Enrollment (CHGOFCENR) commands.

The following displays are changed to add the option for Internet addressing and the level of new mail indicator on the main OV/400 menu. These displays are part of the "Enroll Office User" sequence and the "Change Enrollment" sequence and are the "Environment Information" displays for the add or change office user sequence. The mail addressing change is the addition of the "Allow Internet Addressing" line.

- *Allow Internet addressing* = N (No); the user gets the existing send displays when sending a note or sending a document.

  The existing send displays allow only a User ID, Nickname, UserID/Address, or distribution list name as recipient input.

- *Allow Internet addressing* = Y (Yes); the user gets the new send displays when sending a note or sending a document.

  The new send displays allow UserIDs, Nicknames, UserID/Address, distribution list names, and Internet addresses as recipient input.

The default value on the *Add Environment Information* display is N=No. The current value is displayed on the change display.

Add Environment Information Display

```
                    Add Environment Information

  User ID/Address . . . . . . . . :    USER0137 SYSASM01

  Type choices, press Enter.

    Copy from . . . . . . . . . .                    User ID/Address
                                                     F4 for list
    Message notification within
      Office  . . . . . . . . . .   4                1=Never, 2=Notify
                                                     3=Interrupt, 4=Same
    Current library . . . . . . .   USER0137         *CRTDFT, name
    Initial directory . . . . . .                    Name, F4 for list
    Default folder  . . . . . . .   USER0137

                                                     Name, F4 for list
    Word processing choice  . . .   1                1=Standard or
                                                     PC Text Assist
                                                     2=Adapted

    New Mail Indicator  . . . . .   1                1=New, 2=Unopened
    Allow Internet addressing . . . Y                Y=Yes, N=No

  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F19=Display messages
```

Change Environment Information Display

```
                    Change Environment Information

  User ID/Address . . . . . . . . :    USER0137 SYSASM01

  Type choices, press Enter.

    Copy from . . . . . . . . . .                    User ID/Address
                                                     F4 for list
    Message notification within
      Office  . . . . . . . . . .   4                1=Never, 2=Notify
                                                     3=Interrupt, 4=Same
    Current library . . . . . . .   USER0137         *CRTDFT, name
    Initial directory . . . . . .                    Name, F4 for list
    Default folder  . . . . . . .   USER0137

                                                     Name, F4 for list
    Word processing choice  . . .   1                1=Standard or
                                                     PC Text Assist
                                                     2=Adapted

    New Mail Indicator  . . . . .   1                1=New, 2=Unopened
    Allow Internet addressing . . . Y                Y=Yes, N=No

  F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F19=Display messages
```

Sending Mail to Internet Addresses in V4R1

One address per line is allowed. An Internet address (*user@SMTPdomain*) and UserID/Address should not be entered on the same line.

The input lines are free form and either upper case or lower case is allowed. The exception to this is the nickname. It must be entered as it was created. If it was created with upper case letters, then it must be entered in upper case on the send displays. Each line is 78 characters long. For those Internet addresses that are longer than 78 characters (but not longer than 256 characters), an entry has to be added to the system distribution directory pointing to an SMTP alias.

Note: If your network has user IDs, addresses, or nicknames with embedded blanks or '@', this new support should **not** be used because imbedded blanks and '@' are used to differentiate between Internet addresses, user ID or nicknames, and user ID/addresses. Figure 168 is an example of the new send displays for a user with assistance level intermediate. Internet addressing is also available for assistance level basic. Other displays with Internet addressing fields are:

- Forward Mail
- Reply to Mail
- Send Document out of a Folder
- Send Document from Work with Owned Document Lists
- Send Document from Work with Documents in a Document List
- Send Document using the Send Document (SNDDOC) command

```
                         Send Note

 Type mailing information, press F6 to type note.
   Subject  . . . . . . . . . .    Sample of Addressing


   Reference  . . . . . . . .


 Type distribution list and/or addressees, press F10 to send.
   Distribution list . . . . .                    F4 for list

   --------------------------------Addressees---------------------------
   Type nickname, user ID address, or internet address. One per line.
   user01 sysas03 _____
   user06@xnet.abc.com_____
   user03@sysas33.dfw.ibm.com_____
   user04 sysas19_____
   user05@aol.com@internet@ibmlas01_____
   NICKNM_____


 F3=Exit  F6=Type Note  F9=Attach memo slip  F10=Send F11=Change details
 F12=Cancel  F13=Change send instructions  F14=Specify list  F24=More
```

Figure 168. Send Note to Internet Address in OV/400 V4R1

Notes:

1. You cannot enter Internet addresses from the send message display.

2. New send displays are not shown for non-Internet user.

3. There must be at least one blank between SNA UserID/Address.

4. Internet address must have at least one @ (atsign).

5. Only one address per line.

6. Nick names must be in uppercase.

Appendix D. Special Notices

This publication is intended to help administrators for AS/400 systems or Lotus Notes to understand many of the concepts necessary to connect the various mail clients on an AS/400 system having either OS/400 Version 3 Release 2 or Version 3 Release 7 installed. The information in this publication is not intended as the specification of any programming interfaces that are provided by OS/400 or Lotus Notes. See the PUBLICATIONS section of the IBM Programming Announcement for OS/400 Version 3 Release 2 or Version 3 Release 7 for more information about what publications are considered to be product documentation.

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Appendix E. Related Publications

Prerequisite Information

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

- *TCP/IP Fastpath Setup*, SC41-3430
- *OS/400 TCP/IP Configuration and Reference Version 3*, SC41-3420
- *OS/400 TCP/IP Configuration and Reference Version 4*, SC41-5420
- *AS/400 System Concepts*, GC41-9802
- *Integrated File System Introduction*, SC41-3711
- *OS/400 Server Concepts and Administration*, SC41-3740
- *Office Services Concepts and Programmer's Guide*, SH21-0703
- *AS/400 National Language Support*, SC41-3101
- *System Operation for New Users*, SC41-3200
- *System Operation*, SC41-3203
- *Security - Basic*, SC41-3301
- *Security - Reference*, SC41-3302
- *Work Management*, SC41-3306
- *Communications Configuration Guide*, SC41-3401
- *SNA Distribution Services*, SC41-3410
- *Data Management*, SC41-4710
- *CL Programming*, SC41-4721
- *AS/400 Advanced Series Handbook*, GA19-5486

International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 215.

- *Setting Up and Implementing ADSTAR Distributed Storage Manager/400*, GG24-4460
- *Using ADSM to Back Up Lotus Notes*, SG24-4534
- *Lotus Notes Release 4 in a Multiplatform Environment*, SG24-4649
- *Lotus Notes Release 4 on AIX Systems*, SG24-4694

TCP/IP and Internet Publications

For more detailed or advanced knowledge of TCP/IP, please refer to the following selected publications:

- *Internetworking with TCP/IP, Volume I, Principles, Protocols and Architecture* second edition, Prentice-Hall, Inc., 1991, by Douglas E. Comer; ISBN 0-13-468505-9.

  This popular volume is one of the most complete summaries of TCP/IP in print today.

- *TCP/IP Tutorial and Technical Overview*, fifth edition, IBM Corp.,1995, GG24-3376-04, and Prentice-Hall, Inc., 1995, by Eamon Murphy, Steve Hayes, Matthias Enders; ISBN 0-13-460858-5.

This similarly well-regarded publication provides a concise introduction to TCP/IP and an overview of the implementations of the IBM TCP/IP products in heterogeneous networks.

- *Communications for Cooperating Systems - OSI, SNA and TCP/IP*, Addison-Wesley, Publishing Company, Inc., 1992, by R. J. Cypser; ISBN 0-201-50775-7.

  This publication describes the architectural models and approaches of different environments and may be especially helpful for designers of heterogeneous networking systems.

- *The Request For Comments (RFCs)*

  There are more than 2000 RFCs today. For those readers who want to keep up-to-date with the latest advances and research activities in TCP/IP, the ever-increasing number of RFCs and Internet Drafts (ID) is the best source of this information. (See "Internet Standards and Request for Comments (RFC)" on page 5 for more details on RFCs.)

  RFCs can be viewed or obtained online from the Internet Engineering Taskforce (IETF) Web page using the following URL:

  `http://ds.internic.net/ds/dspg0intdoc.html`

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at `http://www.redbooks.ibm.com`.

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- **PUBORDER** — to order hardcopies in United States

- **GOPHER link to the Internet** - type `GOPHER.WTSCPOK.ITSO.IBM.COM`

- **Tools disks**

  To get LIST3820s of redbooks, type one of the following commands:

  ```
  TOOLS SENDTO EHONE4 TOOLS2 REDPRINT GET SG24xxxx PACKAGE
  TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
  ```

  To get BookManager BOOKs of redbooks, type the following command:

  ```
  TOOLCAT REDBOOKS
  ```

  To get lists of redbooks, type one of the following commands:

  ```
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET LISTSERV PACKAGE
  ```

  To register for information on workshops, residencies, and redbooks, type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1998
  ```

  For a list of product area specialists in the ITSO: type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ORGCARD PACKAGE
  ```

- **Redbooks Web Site on the World Wide Web**

  `http://w3.itso.ibm.com/redbooks`

- **IBM Direct Publications Catalog on the World Wide Web**

  `http://www.elink.ibmlink.ibm.com/pbl/pbl`

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Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (`http://www.redbooks.ibm.com/redpieces.htm`). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

How Customers Can Get ITSO Redbooks

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