Steve's Copy

VAX/VMS
Mail Utility Reference
Manual

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MAIL Contents

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Preface

Intended Audience

This manual is intended for all users of the VAX/VMS system.

Structure of This Document

This document is composed of four major sections.

The Format Section is an overview of MAIL and is intended as a quick reference guide. The format summary contains the DCL command that invokes MAIL, listing all command qualifiers and parameters. The usage summary describes how to invoke and exit from MAIL. The command summary lists all MAIL commands that can be used within MAIL.

The Description Section explains how to use MAIL.

The Command Section describes each MAIL command. Commands appear i alphabetical order.

The Examples Section contains examples of common operations that you perform with MAIL.

Associated Documents

For introductory information about the Mail Utility, see the *Introduction to VAX/VMS*.

Conventions Used in This Document

Convention	Meaning
RET	A symbol with a one- to three-character abbreviation indicates that you press a key on the terminal, for example, RET .
CTRL/x	The phrase CTRL/x indicates that you must pres the key labeled CTRL while you simultaneously press another key, for example, CTRL/C, CTRL/Y CTRL/O.
$ SHOW TIME 05-JUN-1985 11:55:22	Command examples show all output lines or prompting characters that the system prints or displays in black letters. All user-entered commands are shown in red letters.
$ TYPE MYFILE.DAT . . .	Vertical series of periods, or ellipsis, mean either that not all the data that the system would displa in response to the particular command is shown that not all the data a user would enter is shown.

Convention	Meaning
file-spec,...	Horizontal ellipsis indicates that additional parameters, values, or information can be entered.
[logical-name]	Square brackets indicate that the enclosed item is optional. (Square brackets are not, however, optional in the syntax of a directory name in a file specification or in the syntax of a substring specification in an assignment statement.)
quotation marks apostrophes	The term quotation marks is used to refer to double quotation marks ("). The term apostrophe (') is used to refer to a single quotation mark.

New and Changed Features

With Version 4.0 of VAX/VMS, MAIL is now a single-key ISAM file (SYS$SYSTEM:VMSMAIL.DAT) containing the following information for each user:

- Username
- Forwarding address (SET FORWARD)
- Personal name (SET PERSONAL_NAME)
- Copy SEND/REPLY flags (SET COPY_SELF)
- Autopurge flag (SET AUTO_PURGE)
- Mail file subdirectory name (SET MAIL_DIRECTORY)
- New mail count (the number of unread mail messages)

New mail commands follow:

ANSWER
ATTACH
COPY
CURRENT
DEFINE/KEY
EDIT
EXTRACT
FIRST
MAIL
MOVE
PURGE
SEARCH
SELECT
SET [NO]AUTOPURGE
SET COPY_SELF
SET FILE
SET [NO]FORWARD
SET [NO]MAIL_DIRECTORY
SET [NO]PERSONAL_NAME
SET WASTEBASKET_NAME
SHOW ALL
SHOW AUTO_PURGE
SHOW COPY_SELF
SHOW FILE
SHOW FORWARD
SHOW MAIL_DIRECTORY
SHOW PERSONAL_NAME
SHOW WASTEBASKET_NAME
SPAWN

Changes to existing MAIL commands follow:

- DELETE command—VAX/VMS Version 4.0 provides two ways to use the DELETE command. As in Version 3.0, you use the DELETE command to remove the message you are currently reading. Or, (new with Version 4.0), you can enter the DELETE command followed by the number of the message you want to remove.

- DIRECTORY command—With Version 4.0 of VAX/VMS, the DIRECTORY command lists a summary of all the messages in the current folder (instead of the current message file). The new DIRECTORY command can take six new qualifiers:

  /BEFORE=date
  /FOLDER
  /FULL
  /NEW
  /SINCE=date
  /START=start=point

- FILE command—With Version 4.0 of VAX/VMS, the behavior of the FILE command has changed. Instead of moving a mail message to an outside file (where you could access it from the DCL command level), the FILE command now moves a mail message to another folder, keeping the message within MAIL. If you do want to make mail messages accessible outside of MAIL, use the EXTRACT command. To add a message to an existing file, use EXTRACT/APPEND.

  You can use the new MAIL command MOVE and the FILE command interchangeably. Both commands copy a mail message to the specified folder and delete it from the current folder.

- FORWARD command—With Version 4.0 of VAX/VMS, the FORWARD command can take two new qualifiers: /EDIT and /NOHEADER.

- HELP command—With Version 4.0 of VAX/VMS, the HELP command provides information about topics, such as "Folders" and "Getting Started" as well as detailed information (including examples) about all the available MAIL commands.

- PRINT command—With Version 4.0 of VAX/VMS, the PRINT command can take three new qualifiers: /COPIES=n, /NOTIFY, and /PRINT.

- READ command—With Version 4.0 of VAX/VMS, the READ command reads messages from the specified folder instead of the specified message file. Three new qualifiers can be used with the READ command: /BEFORE=date, /NEW, and /SINCE=date.

- REPLY command—Version 4.0 of VAX/VMS provides two new qualifiers for the REPLY command: /EXTRACT and /SELF.

- SEND command—Version 4.0 of VAX/VMS provides two new qualifiers for the SEND command: /SELF and /SUBJECT.

MAIL

The VAX/VMS Mail Utility (MAIL) allows you to send messages to other users on your system or on any other computer that is connected to your system by means of DECnet–VAX. You can also read, file, forward, delete, print, and reply to messages that other users send to you.

Messages that you receive are stored in files called mail files. Your default mail file, called MAIL.MAI, is created in your default directory the first time you receive a mail message. You can create other mail files to accompany MAIL.MAI by using one of the following commands:

- COPY
- FILE
- MOVE

You can use mail files to organize mail messages. For example, you can create a mail file named GRADES.MAI and use it to collect mail messages containing information about test scores. Or, you can create a mail file named MEMOS.MAI and use it to collect memos.

All mail files are subdivided into folders. For more information about folders, see the section on Using Folders to Organize Mail Messages.

FORMAT

MAIL *[file-spec] [recipient-name]*

Command Qualifiers	**Defaults**
/EDIT	*/NOEDIT*
/SELF	*/NOSELF*
/SUBJECT="text"	

Command rameters

file-spec

Specifies the name of the file to be mailed.

recipient-name

Specifies the name of a user (or users) or a distribution list to which the file mailed.

When you specify a list of users, separate each name by a comma.

When you specify a distribution list, precede the name of the list by an at sign (@) and enclose both the at sign and the name in quotation marks, as the following example shows:

```
$ MAIL JOKES.DAT "@LIST"
```

MAIL

usage summary

Invoking

To use MAIL interactively, enter the following command in response to the DCL prompt:

```
$ MAIL
```

The utility responds with the prompt:

```
MAIL>
```

Once MAIL has been invoked, you can issue any of the MAIL commands.

Exiting

To exit from MAIL, enter the EXIT command at the MAIL prompt.

```
MAIL> EXIT
```

You can also exit from MAIL by entering CTRL/Z or using the QUIT command.

commands

Syntax

MAIL> command [parameter]

MAIL Commands

ANSWER [file-spec]
    /EDIT
    /EXTRACT
    /LAST
    /[NO]SELF
ATTACH [process-name]
    /PARENT
BACK
    /EDIT
COMPRESS [file-spec]
    /OUTPUT=out-file-spec
COPY foldername [filename]
    /ALL
    /[NO]CONFIRM
CURRENT
    /EDIT
DEFINE/KEY key-name string
    /[NO]ECHO
    /[NO]IF_STATE=state-list
    /[NO]LOCK_STATE
    /[NO]LOG
    /[NO]SET_STATE=state
    /[NO]TERMINATE
DELETE [message-number]
    /ALL
DIRECTORY [foldername]
    /BEFORE=date
    /FOLDER
    /FULL
    /NEW
    /SINCE=date
    /START=start-point

```
EDIT [filename]
    /COMMAND=ini-file-spec
    /CREATE
    /JOURNAL=jou-file-spec
    /OUTPUT=out-file-spec
    /READ
    /RECOVER
ERASE
EXIT
EXTRACT file-spec
    /APPEND
    /ALL
    /MAIL
    /NOHEADER
FILE foldername [filename]
    /ALL
    /[NO]CONFIRM
FIRST
    /EDIT
FORWARD
    /EDIT
    /NOHEADER
HELP [topic]
LAST
    /EDIT
MAIL [file-spec]
    /[NO]EDIT
    /LAST
    /[NO]SELF
    /SUBJECT
MOVE foldername [filename]
    /ALL
    /[NO]CONFIRM
NEXT
    /EDIT
PRINT
    /ALL
    /COPIES=n
    /NOTIFY
    /PRINT
    /QUEUE=queue-name
PURGE
    /RECLAIM
    /STATISTICS
QUIT
READ [foldername] [message-number]
    /BEFORE=date
    /EDIT
    /NEW
    /SINCE=date
REPLY [file-spec]
    /EDIT
    /EXTRACT
    /LAST
    /[NO]SELF
SEARCH [search-string]
```

```
SELECT [foldername]
    /BEFORE=date
    /NEW
    /SINCE=date
SEND [file-spec]
    /[NO]EDIT
    /LAST
    /[NO]SELF
    /SUBJECT
SET [NO]AUTO_PURGE
SET COPY_SELF command, [command]
SET FILE filename
SET FOLDER
    /BEFORE=date
    /NEW
    /SINCE=date
SET [NO]FORWARD [_user-name],address
    /USER=user-name
SET [NO]MAIL_DIRECTORY subdirectory-name
    /LOG
SET [NO]PERSONAL_NAME "text-string"
SET WASTEBASKET_NAME foldername
SHOW ALL
SHOW AUTO_PURGE
SHOW COPY_SELF
SHOW DELETED
SHOW FILE
SHOW FOLDER
SHOW FORWARD
SHOW KEY
    /ALL
    /BRIEF
    /DIRECTORY
    /STATE
SHOW MAIL_DIRECTORY
SHOW NEW_MAIL_COUNT
SHOW PERSONAL_NAME
SHOW WASTEBASKET_NAME
SPAWN command
    /INPUT=file-spec
    /[NO]LOGICAL_NAMES
    /OUTPUT=file-spec
    /PROCESS=subprocess-name
    /[NO]SYMBOLS
    /[NO]WAIT
```

DESCRIPTION

The following sections describe characteristics of the Mail Utility. All the examples displaying an editor are EDT-specific.

1 Using Folders to Organize Mail Messages

All mail files are subdivided into folders. By default, your mail file (MAIL.MAI) contains a folder named MAIL. The MAIL folder contains messages that you have already read. When you receive new mail messages, they automatically enter a folder named NEWMAIL. After you read the messages in the NEWMAIL folder, they automatically move into the MAIL folder. The NEWMAIL folder disappears after you have read all new mail messages and either SELECT another folder or EXIT from MAIL.

When you delete a message it automatically moves into the WASTEBASKET folder. Deleted messages will collect in the WASTEBASKET folder until you empty it. To empty the WASTEBASKET folder, enter one of the following commands:

- EXIT
- PURGE

You can create as many folders as you want. You can use the following commands to create folders:

- COPY
- FILE
- MOVE

You will always know which folder you are currently in because the name of the folder is displayed at the top right corner of the screen when you enter the READ or DIRECTORY command. You can enter the DIRECTORY /FOLDER command to see a display of the existing folders in the current mail file. You can remove a folder by deleting all the messages it contains.

Figure MAIL–1 shows the MAIL hierarchy. The Mail Utility contains mail files. A mail file contains folders. A folder contains mail messages.

2 Notification of Mail

When MAIL sends you a message from another user while you are logged in (with DECnet–VAX enabled), MAIL notifies you with a message on your terminal as the following example shows:

```
New mail on node URANUS from JAIME
```

When DECnet–VAX is not enabled, MAIL displays the message without the node name as follows:

```
New mail from JAIME
```

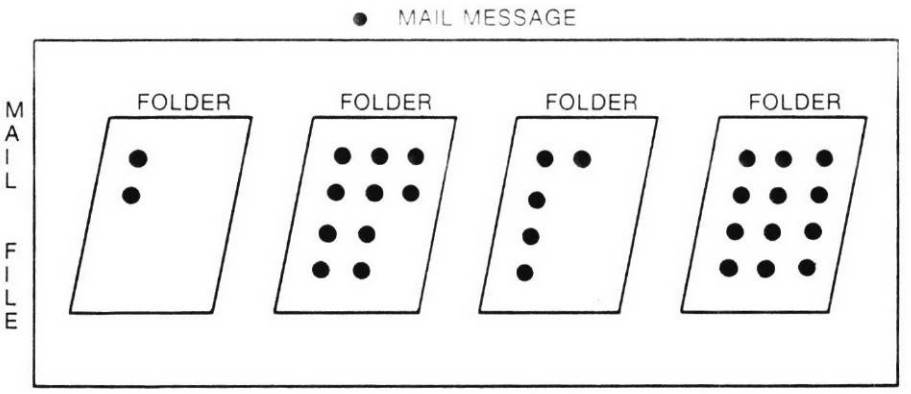
You will also be notified that you have new mail messages when you log in and when you invoke MAIL:

```
You have 2 new messages
```

Note: The date and time that appear on mail messages reflect the receiver's time, not the sender's time.

When you transfer messages to a folder (using COPY, FILE, or MOVE) th messages are listed according to their time-stamp.

Figure MAIL–1 MAIL Hierarchy



3 Using the MAIL Command Line Qualifier /EDIT

The /EDIT qualifier allows command name keywords in the form /EDIT[=(keyword,keyword...)]. The allowed keywords are:

- FORWARD
- REPLY[=EXTRACT]
- SEND

You can use these keywords to set the default for MAIL. For example, to invoke the editor for every mail message you SEND or FORWARD, specify the keywords SEND and FORWARD with the MAIL/EDIT command:

```
$ MAIL/EDIT=(SEND,FORWARD)
```

Or, if you only want to invoke the editor when you are replying to a message, use the keyword REPLY with the MAIL/EDIT command. MAIL invokes the editor and displays a blank screen:

```
$ MAIL/EDIT=(REPLY)
```

The REPLY keyword allows the following option:

=EXTRACT

When you want to reply to and edit the same message, use the REPLY keyword with the =EXTRACT option. MAIL invokes the editor and displays the message to which you are replying:

```
$ MAIL/EDIT=(REPLY=EXTRACT)
```

The =EXTRACT option can be used only with the REPLY keyword.

Remember the following three items when you use the /EDIT qualifier:

- When you do not specify a keyword with /EDIT, the default is /EDIT=(SEND,REPLY).
- When you EXIT from the editor, you complete the SEND or REPLY operation.
- When you want to cancel a SEND or REPLY operation, enter the QUIT command to exit from the editor.

3.1 Changing the Default Editor Invoked by the /EDIT Qualifier

When you define the logical name MAIL$EDIT, its equivalence name is used as the name of a command procedure that will invoke the editor.

If MAIL$EDIT is not defined, callable EDT is invoked.

To change the default editor for MAIL (for example, from EDT to TECO), you must copy the MAIL$EDIT command procedure to your directory and then modify it. First, enter the following command line:

```
$ COPY SYS$SYSTEM:MAILEDIT.COM MAILEDIT.COM
```

This copies the command that the system uses to your directory.

Next, edit MAILEDIT.COM by changing "EDIT" to "EDIT/TECO." The resulting command procedure follows:

```
$ !++
$ ! Default command procedure to invoke an editor for MAIL.
$ !
$ ! Inputs:
$ !
$ !     P1 = Input file name
$ !     P2 = Output file name
$ !
$ ! Note that this procedure is run in the context of a subprocess,
$ ! therefore LOGIN.COM is not executed, creator process logical
$ ! names do not exist, and the default directory is the same as
$ ! the creator process.
$ !--
$ DEFINE/USER SYS$INPUT 'F$LOGICAL("SYS$OUTPUT")'
$ IF P1 .EQS. ""THEN GOTO NOINPUT
$ EDIT/TECO/OUTPUT='P2' 'P1'
$ EXIT
$ NOINPUT:
$ EDIT/TECO 'P2'
```

Finally, enter the following line in your LOGIN.COM file:

```
$ DEFINE MAIL$EDIT disk:[directory]MAILEDIT.COM
```

Disk is the disk on which the file is located and [directory] is your directory name.

4 Using the DCL Command MAIL to Send Files

You can use a single command line to send a file to one or more users by specifying parameters when you enter the DCL command MAIL. When you use the MAIL command with parameters, the command string has the following format:

```
$ MAIL[/SUBJECT="text"] [/SELF] file-spec recipient-name
```

The "text" is the subject of the message. If you include more than one word, you must enclose the text in quotation marks. If you omit the /SUBJECT qualifier, the message is sent without a subject notation.

The /SELF qualifier enables MAIL to send a copy of the message you are sending back to yourself.

File-spec is the name of the file to be mailed. If you specify SYS$INPUT as the file specification, you will be prompted for the text of the message (without a MAIL prompt), as the following example shows:

```
$ MAIL SYS$INPUT:
To: ARMSTRONG
Enter your message below.  Press CTRL/Z when complete, or CTRL/C to quit:
The text of the message is here.
CTRL/Z
$
```

If you do not specify a parameter as the file specification in the command string, you receive the MAIL prompt, indicating interactive MAIL. No wild-card characters are allowed in the file specification. If you omit the file type, the default file type is TXT.

The recipient-name is either the name of a user(s) or a distribution list to which the file is mailed. If you do not specify a recipient-name in the command string, you will be prompted.

The default file type for a distribution list is DIS. Double quotation marks and an at sign (@) are required (for example, "@distribution.dis"). A distribution list name that follows one or more user name specifications must be preceded by a comma.

The following command string contains one qualifier and two parameters:

```
$ MAIL/SUBJECT="for your information" MEETING THOMAS,SLOAN
```

- subject text "for your information" (qualifier)
- file-spec (MEETING) (parameter)
- usernames (THOMAS,SLOAN) (parameter)

Because the file type was omitted, MAIL searches your default directory for the file MEETING.TXT.

The following command string contains the file-spec NOTICE and listname @WRITERS parameters. Because the /SUBJECT qualifier was not included, the message is sent without a subject notation. MAIL assumes the default file type of TXT for the file NOTICE.

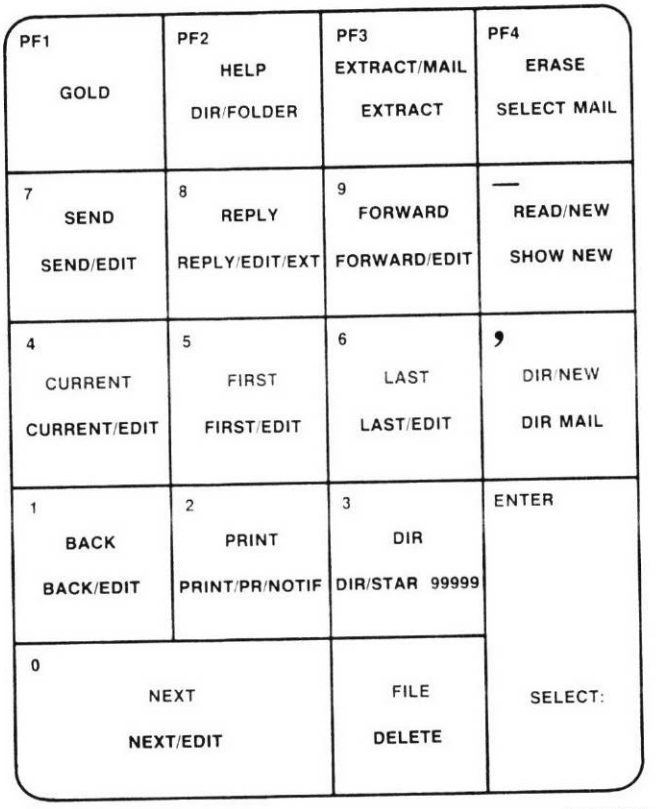
```
$ MAIL NOTICE "@WRITERS"
```

5 Using a Keypad in MAIL

By default, all the keys on your VT100, VT52, or LK201 keypad are defined to execute MAIL commands. When you press a keypad key, a MAIL command executes. Most of the keys have two functions. To use one of the functions, you simply press the key. To use the other function, you press the GOLD key (PF1) before you press the key.

Figure MAIL–2 displays the default key definitions for your keypad in MAIL.

Figure MAIL–2 Default Keypad Definitions



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For example, keypad key 5 is defined as the MAIL command FIRST. When you press keypad key 5, the first message in the current folder is displayed. The alternate function of keypad key 5 is the MAIL command FIRST/EDIT. So, when you press the GOLD key followed by keypad key 5, the editor is invoked along with the first message in the current folder.

MAIL allows you to override the keys defined by default on your VT100, VT52, and LK201 keyboards. You can replace any or all of the default key definitions or you can just reorganize them.

For example, to define the key PF1 as the MAIL command DIRECTORY, enter the following command line:

```
MAIL> DEFINE/KEY PF1 "DIRECTORY"
```

After you fine PF1, you can press it to display the DIRECTORY command.

You can use the /STATE qualifier to increase the number of key definitions available on your terminal. The same key can be assigned any number of definitions as long as each definition is associated with a different state. State names can be any alphanumeric string.

For example, define key PF2 to execute the SET command, specifying a state named ALTERED as follows:

```
MAIL> DEFINE/KEY PF2 "SET "/SET_STATE=ALTERED
```

Then, define key PF3 to output the string "FILE" when the state ALTERED is specified as follows:

```
MAIL> DEFINE/KEY PF3 "FILE" /IF_STATE=ALTERED /TERMINATE
```

Use the /TERMINATE qualifier to end the command line. (When you specify the /TERMINATE qualifier, you can avoid pressing the RETURN key to execute the command line.) After you define PF2 and PF3, you can use them together. Press PF2 to produce the first half of the command line (SET) and press PF3 to finish the command line (FILE).

Any keypad keys that you define during a MAIL session will disappear when you EXIT from MAIL. To retain keypad key definitions from one MAIL session to another, create a file in your top-level directory containing these key definitions (for example, MAIL$KEYDEF.INI) and enter the following command line in your login command file (LOGIN.COM):

```
$ DEFINE MAIL$INIT SYS$LOGIN:MAIL$KEYDEF.INI
```

The file you create (MAIL$KEYDEF.INI) containing your key definitions will act like a login command file for MAIL. You will be able to use any key that has been defined in the file (MAIL$KEYDEF.INI).

The following sample MAIL$KEYDEF.INI contains six key definitions:

```
DEFINE/KEY PF1 "DIRECTORY "     /NOTERMINATE    /SET_STATE=folder
DEFINE/KEY PF1 "/FOLDER"        /TERMINATE      /IF_STATE=folder
DEFINE/KEY PF2 "SELECT "        /NOTERMINATE    /SET_STATE=mail
DEFINE/KEY PF2 "MAIL"           /TERMINATE      /IF_STATE=mail
DEFINE/KEY PERIOD "READ "       /NOTERMINATE    /SET_STATE=new
DEFINE/KEY PERIOD "/NEW"        /TERMINATE      /IF_STATE=new
```

By specifying states, you can press the same key twice (for example, PF1) entering a command (DIRECTORY) the first time and a qualifier (/FOLDER) the second time.

For detailed information about the DEFINE/KEY command and its qualifiers, see the Commands Section.

6 Converting Mail Files

With Version 4.0 of VAX/VMS, the file organization used by the Mail Utility has changed from sequential to ISAM (indexed sequential access method). The organization of a sequential file is different from an indexed file. In a sequential file, the records are processed in the order in which they were originally written. In an ISAM file, records are processed sequentially by an index.

If you are a new VAX/VMS user, you do not need to read this section because you already have ISAM mail files by default. If you are upgrading from VAX/VMS Version 3.0 to VAX/VMS Version 4.0, follow the instructions in this section to convert your sequential mail files to ISAM mail files.

The first time you invoke MAIL interactively with VAX/VMS Version 4.0, MAIL will convert your default mail file (SYS$LOGIN:MAIL.MAI) to an ISAM file. You will not be able to receive new mail during the conversion. When the conversion is complete, MAIL displays the following messages:

```
%MAIL-I-CVTFILE, converting message file DISK$ALTERED:[BURKE]MAIL.MAI;1
        to ISAM message file DISK$ALTERED:[BURKE]MAIL.MAI;2
%MAIL-I-NEWFOLDER, folder MAIL created
%MAIL-S-RENAMED, DISK$ALTERED:[BURKE]MAIL.MAI;1 renamed to DISK$ALTERED:[BURKE]MAIL.OLD;1
Press RETURN to continue>
```

As the messages indicate, when the conversion of your mail file (from sequential to ISAM) is complete, MAIL renames the old sequential MAIL.MAI file to MAIL.OLD.

You may want to convert any old or existing MAI files you created (with the MAIL command FILE before VAX/VMS Version 4.0) to ISAM files if you want to do more than READ them or display a listing of them (DIRECTORY).

MAIL still allows you to access your old MAI files with the new SET FILE command. However, unless you convert your sequential files to ISAM files, you will not be able to use the following new MAIL commands:

COPY
DELETE number
DELETE/ALL
DIRECTORY/BEFORE
DIRECTORY/FOLDER
DIRECTORY/SINCE
PURGE
READ/BEFORE
READ/SINCE
SELECT
SET FOLDER
SET WASTEBASKET
SHOW DELETED
SHOW FOLDER
SHOW WASTEBASKET

Use the following five steps to convert sequential mail files to ISAM mail files.

1 Invoke MAIL:

```
$ MAIL
MAIL>
```

2 Establish the MAI file you want to convert as the current mail file:

```
MAIL> SET FILE file-to-be-converted
```

3 Move all the messages from your old sequential mail file to an ISAM mail file:

```
MAIL> COPY/ALL foldername NEWISAMFILE
```

4 Establish the file named NEWISAMFILE as the current mail file:

```
MAIL> SET FILE NEWISAMFILE
```

5 Select the folder containing the mail:

```
MAIL> SELECT foldername
```

7 Sending Messages Using DECnet–VAX

If you include a node name with the user name, the message is sent by means of DECnet–VAX to that user. If you omit the node name, MAIL assumes that the user is on your node. If you omit the node name and the user is not on your node, MAIL issues an error message.

You can specify node names and user names as logical names. For example, if the user Arthur King is on node KAMLOT and you did not assign a logical name, you would have to type the following:

```
To: KAMLOT::KING
```

However, if you had previously made the following assignment, you could simply respond to the prompt with the logical name ART.

```
$ DEFINE ART KAMLOT::KING
```

If you frequently send messages to certain users on other nodes, you can use MAIL more efficiently by entering the appropriate DEFINE commands in your LOGIN.COM file.

If you define a logical name for a username, you may produce a forwarding loop. For instance, if you define KLEE to be MYNODE::KLEE, and send mail to KLEE while you are logged in on MYNODE, MAIL detects a forwarding loop because MAIL strips the nodename when it is the same as your current node. To allow this kind of logical name (in a LOGIN.COM file, for example) and also avoid a forwarding loop, use the qualifier /TRANSLATION_ATTRIBUTES=TERMINAL when you define the logical name:

```
$ DEFINE/TRANSLATION_ATTRIBUTES=TERMINAL KLEE MYNODE::KLEE
```

8 Sending Messages To Distribution Lists

If you frequently send mail to the same group of users, you may find it helpful to use a distribution list. A distribution list is a file containing the names and nodes of users to whom you want to send messages.

To set up a distribution list, use the DCL command EDIT or CREATE to create a distribution list file with the file type DIS. Enter one user name per line in this file. A distribution list can also include the names of other distribution lists. Your open file quota determines the number of different nodes to which you can send mail (at one time) and the depth to which you can nest distribution lists. You can include comments by entering lines whose first character is an exclamation point (!). The following example shows how to create a distribution list:

```
$ CREATE WRITERS.DIS
!SOFTWARE WRITERS
PIERSON
NODE3::JOSEPHS
LAWRENCE
NODE4::ASHLEY
!NESTED DISTRIBUTION LIST
@STAFF
```

To use the distribution list file, you enter its file name preceded by an at sign (@) in response to the To: prompt (To: @WRITERS). You can enter separate user names along with the distribution list if the distribution list is the last entry (To: BARKER,FLECK,@WRITERS). However, you cannot send mail to more than one distribution list at one time unless they are nested. Note that a nested distribution list must be at the end of the main distribution list file.

MAIL delivers only one copy of the mail message to each fully translated user. For instance, notice how user KLEE is defined as FRED in the following distribution list:

```
$ DEFINE FRED KLEE
$ CREATE MY.DIS
  KLEE
  NODE1::MARSALA
  FRED
  MARSALA
```

User KLEE would receive only one copy of the message since FRED and KLEE are the same username. User MARSALA on NODE1 and user MARSALA on the current node would each receive one copy because they are on different nodes.

9 MAIL Status Messages

The *VAX/VMS System Messages and Recovery Procedures Reference Manual* lists the messages issued by MAIL and provides explanations and suggested user actions for these messages.

MAIL messages are in the following form:

```
%MAIL-l-IDENT, message-text
```

The l is a severity code, either E for error, W for warning, or I for information. The IDENT is a mnemonic representing the specific error that occurred. The message-text is a brief description of the condition that caused the message to be issued.

10 Protection of Mail Files

MAIL files (for example, MAIL.MAI) are protected so that no one can read them, and you cannot accidentally delete them. The protection code that MAIL gives MAI files is: (SYSTEM:RW,OWNER:RW,GROUP:,WORLD:); that is, the system (including the Mail Utility itself) and the owner (you) can read and write to the file, and the group and world are denied all access.

If you want information about setting and changing the protection of files, see the description of the SET PROTECTION command in the *VAX/VMS DCL Dictionary*.

11 System Management and MAIL

SYS$SYSTEM:VMSMAIL.DAT is a single-key ISAM file containing the following information for each user:

- Username
- Forwarding address (SET FORWARD)
- Personal name (SET PERSONAL_NAME)
- Copy SEND/REPLY flags (SET COPY_SELF)
- Autopurge flag (SET AUTO_PURGE)
- Mail file subdirectory name (SET MAIL_DIRECTORY)
- New mail count (the number of unread mail messages)

The system manager can arrange mail forwarding for users without accounts on the system by using the SET FORWARD/USER=user command.

The system manager can set the following flags in a user account by using the Authorize Utility:

- Disnewmail—disables the display of the new mail count when the user logs in to the system
- Nomail—restricts the user from receiving new mail

If you define the logical name MAIL$SYSTEM_FLAGS using the qualifiers /SYSTEM and /EXECUTIVE_MODE ($ DEFINE/SYSTEM/EXEC MAIL$SYSTEM_FLAGS 1), then MAIL$SYSTEM_FLAGS is interpreted as a number in the following way:

Command Parameters

1

Indicates that this node is part of a homogeneous cluster. In other words, all disks are accessible to the cluster and there is a common SYSUAF file and a common VMSMAIL file for the cluster. When this bit is set, MAIL checks to see if the node to which you are sending mail is currently in the cluster. If the node is in the cluster, MAIL bypasses using DECnet and writes directly to the recipient's mail file. (Note that the node must be up for MAIL to determine whether it is part of the cluster.)

2

Directs MAIL to set the cluster breakthrough flag when issuing the $BRKTHRU service to notify the recipient of new mail. This flag is only used in VAXcluster systems, and typically only in homogeneous VAXclusters (in other words, flag 1 is also set).

4

Directs MAIL to include the time the message was delivered in the notification message printed on the recipient's terminal.

Note that if MAIL$SYSTEM_FLAGS is translated to 7, MAIL selects all three flags. If the logical name does not translate, the default is 0.

If the number of new (unread) mail messages displayed on your screen is inconsistent with the actual number of new messages, enter the READ/NEW command when there is no new mail.

In MAIL messages sent via DECnet-VAX, the user can specify node names and user names as logical names. They are translated like VAX RMS specifications: a node name or user name is translated only if it is the first string in the specification. Any access control information in the node name or logical name is ignored.

12 What MAIL Does with Large Mail Messages

When you receive a mail message larger than 3 blocks, it is written to a sequential file. You will see this mail message listed in your mail directory with a file type of MAI, as the following example shows.

```
MAIL$nnnnnnnnnnnnnnnnnnnn.MAI
```

MAIL deletes these MAI files from your mail directory when you delete the messages from within MAIL. If you delete these files outside of MAIL and then attempt to read the associated messages inside of MAIL, you will receive an error message followed by a display of the From:, To:, and Subject: fields.

To avoid the display of these MAI files in your SYS$LOGIN directory, you can create a mail subdirectory. This subdirectory can then contain all your MAI files.

To create a subdirectory containing all your MAI files, use the SET MAIL_DIRECTORY command. For information about SET MAIL_DIRECTORY, see the Commands Section.

QUALIFIERS

When invoking MAIL, you can supply the /EDIT qualifier, which modifies the characteristics of the utility.

/EDIT

Sets the default to /EDIT for the SEND and REPLY commands.

FORMAT

MAIL/EDIT *[=(keyword[=option],...)]*

qualifier values

keyword

Allowed keywords are FORWARD, REPLY, and SEND.

option

The EXTRACT option can be used with the REPLY keyword.

EXAMPLES

1

```
$ MAIL/EDIT
MAIL> SEND
To: EARTH::MAX
Subj: Experiment
Input file does not exist
[EOB]
*
```

This example shows how to use the /EDIT qualifier with the MAIL command enabling you to edit any message you send.

2

```
$ MAIL/EDIT=(REPLY,FORWARD)
MAIL> 14
    .
    .
    .
MAIL> REPLY
To: EARTH::MAX
Subj: Experiment
Input file does not exist
[EOB]
*
```

This example shows how to use the /EDIT qualifier specifying the keywords REPLY and FORWARD enabling you to edit any message you forward or to which you reply.

/SELF

Sends a copy of the message containing the file specification on the command line back to you.

FORMAT

MAIL/SELF *file-specification*

EXAMPLE

```
$ MAIL/SELF experiments.dat
```

This example shows how to use the /SELF qualifier to send a copy of the message containing the file named EXPERIMENTS.DAT back to you.

/SUBJECT

Specifies the subject of the message for the heading. If the text consists of more than one word, enclose the text in quotation marks.

FORMAT

MAIL/SUBJECT="text" *file-specification*

EXAMPLE

```
$ MAIL/SUBJECT="Life in the Big City" file.txt
```

This example shows how to use the /SUBJECT qualifier to send a file named FILE.TXT with a subject heading of "Life in the Big City."

COMMANDS

To enter MAIL commands, first invoke MAIL and then enter the MAIL commands at the prompt, MAIL>. These commands can be abbreviated to a unique, shorter form (usually as short as one letter). Note that D is the short form of DELETE (not DIRECTORY) and R is the short form of REPLY (not READ).

MAIL provides commands that enable you to:

- Read and organize mail messages
- Exchange mail messages with other users
- Remove mail messages
- Tailor the Mail Utility
- Exit from MAIL or transfer control while still in MAIL
- Make hardcopies of mail messages

The following table lists all the available MAIL commands by functional category:

Reading Messages	Organizing Messages
BACK	COPY
CURRENT	DIRECTORY
FIRST	EXTRACT
LAST	FILE
NEXT	MOVE
READ	SELECT
SEARCH	SET FILE
SHOW NEW_MAIL_COUNT	SET WASTEBASKET_NAME
	SHOW FILE
	SHOW WASTEBASKET_NAME

Exchanging Messages	Removing Messages
ANSWER	DELETE
FORWARD	PURGE
MAIL	SET [NO]AUTO_PURGE
REPLY	SHOW AUTO_PURGE
SEND	

Tailoring MAIL	Exiting or Transferring Control
DEFINE/KEY	ATTACH
EDIT	EXIT
HELP	QUIT

Tailoring MAIL	Exiting or Transferring Control
SET [NO]COPY_SELF	SPAWN
SET [NO]FORWARD	
SET [NO]MAIL_DIRECTORY	
SET [NO]PERSONAL_NAME	
SHOW ALL	
SHOW COPY_SELF	
SHOW FORWARD	
SHOW MAIL_DIRECTORY	
SHOW PERSONAL_NAME	

Making Hard Copies of Mail Messages
PRINT

ANSWER

Sends a message to the sender of the message you are currently reading or the one you last read. If you do not specify the name of a file to be sent as your reply, you will be prompted for the text of your reply.

You can use the ANSWER command and the REPLY command interchangeably because they work the same way.

You must be reading a message in order to answer it.

FORMAT

ANSWER *[file-spec]*

command parameter

file-spec
Indicates the name of the file to be sent as a reply.

command qualifiers

/[NO]EDIT
Invokes the EDT editor to edit the reply you are sending. When you EXIT from EDT the edited message is sent. To cancel the sending of the message, enter the EDT command QUIT. If you enter the DCL command MAIL/EDIT=(REPLY) and then decide that you do not want to invoke the editor for your response, enter the MAIL command REPLY/NOEDIT.

/EXTRACT
Invokes the EDT Editor to enable you to edit the current message to which you are replying.

/LAST
Specifies that the last message you sent be used as text for the reply. The only qualifier you can use with /LAST is /SELF.

/[NO]SELF
Determines whether MAIL sends a copy of the response back to you. The default is /NOSELF, unless you have used the SET COPY_SELF command to specify that copies be sent to yourself automatically.

EXAMPLES

```
1  MAIL> ANSWER
   To:  AUTUMN::GREGG
   Subj: RE:Nova Scotia
   Enter your message below.  Press CTRL/Z when complete, or CTRL/C to quit:
```

This example shows how to use the ANSWER command to respond to a message sent by a user named Gregg on node AUTUMN.

```
2   MAIL> ANSWER/EDIT
    To:   ARCTIC::SWENSON
    Subj:   RE:SIAM
    [EOB]
```

This example shows how to use the /EDIT qualifier with the ANSWER command to respond to a message from a user named Swenson on node ARCTIC. When using the EDT editor, the end-of-buffer ([EOB]) sign will move down the screen as you enter text.

ATTACH

Permits you to switch control of your terminal from your current process to another process in your job.

The ATTACH command allows you to move quickly between processes that you have created with the SPAWN command. For example, while you are editing a file, you can SPAWN a subprocess (MAIL) to read a new mail message. Then, you can ATTACH back to the editing session. If you want to read another new mail message, you can ATTACH back to the MAIL subprocess you already created.

FORMAT

ATTACH *process-name*

command parameter

process-name
Indicates the name of the subprocess to which the connection is to be made.

command qualifier

/PARENT
Indicates that you want to attach to the parent process of your current process. If no parent process exists, an error message is displayed. You cannot specify the process-name parameter with the /PARENT qualifier.

EXAMPLE

```
$ EDIT VACATION.TXT
    .
    .
    .
CTRL/Y
$ SPAWN MAIL

%DCL-S-SPAWNED, process MAGNANI_1 spawned
%DCL-S-ATTACHED, terminal now attached to process MAGNANI_1
MAIL> READ
    .
    .
    .
MAIL> ATTACH MAGNANI
%DCL-S-RETURNED, control returned to process MAGNANI
    .
    .
    .
CTRL/Y
$ ATTACH MAGNANI_1
MAIL>
```

This example shows how to SPAWN a subprocess (MAGNANL_1) to invoke MAIL and use the ATTACH command to move between MAIL (MAGNANL_1) and the DCL command level (MAGNANI). The ATTACH command allows you to transfer control between subprocesses.

Note: You always SPAWN a new process and ATTACH to a process that already exists.

BACK

Displays the message preceding the current or last-read message when the last command issued was READ. When the last command issued was DIRECTORY, the BACK command displays the preceding screen of the directory listing.

FORMAT

BACK

command parameters

None.

command qualifier

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the previous message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

COMPRESS

Makes an ISAM mail file smaller.

When you compress a file, the following four steps occur:

1 A temporary file named MAIL_nnnn_COMPRESS.TMP is created. (nnnn is a unique, four-digit number.)

2 The contents (of the file to be compressed) are copied to the temporary file and compressed.

3 The original (uncompressed) file is renamed with a file type of OLD.

4 The newly compressed file is renamed from MAIL_nnnn_COMPRESS.TMP back to its original name.

FORMAT

COMPRESS *[file-spec]*

command parameter

file-spec

The name of the mail file to be compressed. If a file-spec is not specified, MAIL will compress the mail file that is currently open. If there is no open mail file, MAIL will compress the default mail file.

command qualifier

/OUTPUT=out-file-spec

The name of the compressed file.

EXAMPLES

1

```
$ MAIL
MAIL> COMPRESS
%MAIL-S-CREATED, DISK$FUN:[FELLINI]MAIL_08C8_COMPRESS.TMP;1 created
%MAIL-S-COPIED, DISK$FUN:[FELLINI]MAIL.MAI;1 copied to DISK$FUN:[FELLINI]
MAIL_08C8_COMPRESS.TMP;1 (2 records)
%MAIL-S-RENAMED, DISK$FUN:[FELLINI]MAIL.MAI;1 renamed to DISK$FUN:[FELLINI]
MAIL.OLD;2
%MAIL-S-RENAMED, DISK$FUN:[FELLINI]MAIL_08C8_COMPRESS.TMP;1 renamed to
DISK$FUN:[FELLINI]MAIL.MAI;1
```

This example shows how to compress the contents of your default mail file (MAIL.MAI).

2

```
MAIL> COMPRESS trips.mai
%MAIL-S-CREATED, DISK$FUN:[FELLINI]MAIL_08C8_COMPRESS.TMP;1 created
%MAIL-S-COPIED, DISK$FUN:[FELLINI]TRIPS.MAI;1 copied to DISK$FUN:[FELLINI]
MAIL_08C8_COMPRESS.TMP;1 (2 records)
%MAIL-S-RENAMED, DISK$FUN:[FELLINI]TRIPS.MAI;1 renamed to DISK$FUN:[FELLINI]
TRIPS.OLD;2
%MAIL-S-RENAMED, DISK$FUN:[FELLINI]MAIL_08C8_COMPRESS.TMP;1 renamed to
DISK$FUN:[FELLINI]TRIPS.MAI;1
```

This example shows how to compress the contents of a file named TRIPS.MAI.

COPY

Copies a message to another folder without deleting it from the current folder. If the specified folder does not exist, it is created.

If you want to copy a message to a sequential file (outside of MAIL) instead of to a mail file, use the EXTRACT command.

If you enter the COPY command, press RETURN, supply a foldername at the prompt, and then decide (before pressing RETURN again) that you do not want to copy the message, enter CTRL/C. CTRL/C will abort the operation and keep you within MAIL.

FORMAT

COPY *foldername [filename]*

command parameters

foldername

Indicates the name of the folder to which the message is to be copied. If the specified folder does not exist (and you have not entered the qualifier /NOCONFIRM), you are asked whether you want to create it. If you respond with "y," the new folder is created. A folder name can be 1 to 39 characters in length. Valid characters for folder names are A through Z, a through z, dollar sign ($), underscore (_), and 0 through 9.

filename

Indicates the name of the mail file to which the message is to be copied. If the specified mail file does not exist, it is created. If a file name is omitted, the message is copied to the specified folder in the current file.

command qualifiers

/ALL

Indicates that all the currently selected messages are to be copied to another message folder. You select a folder by entering the SELECT command followed by the name of the folder. (See the SELECT command for more information.) If the /ALL qualifier is omitted, only the current message is copied.

/[NO]CONFIRM

Determines whether you will be queried about creating a new folder. The default is /CONFIRM.

EXAMPLES

1
```
MAIL> 2
MAIL> COPY
_Folder: MEMOS
_File: RET
MAIL>
```

This example shows how to put a copy of a mail message into another folder (MEMOS) in the default mail file.

MAIL
COPY

2
```
MAIL> DIRECTORY
                                                    MAIL
#    From     Date           Subject
1    MARK     29-NOV-1985      Upcoming Meetings
2    GRIM     3-DEC-1985       Horror Stories
3    KATE     7-DEC-1985       Getting a Court for Fridays
MAIL> 2
MAIL> COPY
_Folder: TALES
_File: RET
MAIL> SELECT TALES

%MAIL-I-SELECTED, 1 message selected

MAIL> DIRECTORY
                                                    TALES
#    From     Date           Subject
1    GRIM     3-DEC-1985       Horror Stories
```

This example shows how to put a copy of a mail message (from a user named GRIM) into another folder (TALES) and move to that folder to see the copy of the mail message.

3
```
MAIL> 3
MAIL> COPY
_Folder: TENNIS
_File: SPORTS

Folder TENNIS does not exist.
Do you want to create it (Y/N, default is N)? y
%MAIL-S-CREATED, DISK$ATEX:[MCFEE]SPORTS.MAI;1 created
%MAIL-I-NEWFOLDER, folder TENNIS created

MAIL> SET FILE SPORTS
MAIL> DIRECTORY/FOLDER
Listing of folders in DISK$ATEX:[MCFEE]SPORTS.MAI;1
Press CTRL/C to cancel listing
TENNIS
MAIL> SET FILE MAIL
MAIL> DIRECTORY
```

This example shows how to put a copy of a mail message into a new folder (TENNIS) in a new mail file (SPORTS), move to the new file, and move back to the default mail file (MAIL.MAI).

CURRENT

Displays the beginning of the message you are currently reading. If you are reading a long mail message and want to display the first part of the message again, you can enter the CURRENT command.

FORMAT CURRENT

command parameters

None.

command qualifier

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the current message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

DEFINE/KEY

Defines a key to execute a MAIL command. This enables you to press a key to enter a command instead of typing the command name.

FORMAT

DEFINE/KEY *key-name string*

command parameters

key-name

Specifies the name of the key you are defining. Use the following key-names when defining keys:

Key-name	VT100	VT52	LK201
PF1	PF1	red key	PF1
PF2	PF2	blue key	PF2
PF3	PF3	black key	PF3
PF4	PF4	-	PF4
KP0, KP1-KP9	keypad 0-9	keypad 0-9	keypad 0-9
PERIOD	period key	period key	period key
COMMA	comma key	comma key	comma key
MINUS	minus key	minus key	minus key
ENTER	ENTER key	ENTER key	ENTER key
E1,E2	-	-	Find,Insert Here
E3,E4	-	-	Remove,Select
E5	-	-	Previous Screen
E6	-	-	Next Screen
HELP,DO	-	-	Help(15), Do(16)
F17-F20	-	-	Function Keys

Note: You cannot redefine the arrow keys or the function keys 1 through 14.

string

Specifies the string you want entered when you press the defined key. "String" can be a MAIL command, for example, DIRECTORY or SET FILE.

command qualifiers

/[NO]ECHO

Specifies whether the command line is echoed after you press the defined key. You cannot define a key specifying both /NOECHO and /NOTERMINATE. The default is /ECHO.

/[NO]IF_STATE=state_list

Specifies a list of states, any one of which must be set in order to enable the specified key definition. If you omit or negate this qualifier, the current state prevails.

/[NO]LOCK_STATE

Retains the state specified by the /SET_STATE qualifier until you use the /SET_STATE qualifier again to change it. The default is /NOLOCK_STATE.

/[NO]LOG

Specifies whether informational messages are displayed. These messages signal successfully created key definitions. The default is /LOG.

/[NO]SET_STATE=state

Associates a state with the key you are defining. A state name can be any alphanumeric string. If you omit or negate this qualifier, the current state remains unchanged. You cannot define a key specifying both /SET_STATE and /TERMINATE.

/[NO]TERMINATE

Determines whether the specified command string executes when you press the key. When you use /NOTERMINATE, you must press RETURN to execute the command string. You cannot define a key specifying both /SET_STATE and /TERMINATE.

EXAMPLES

1
```
MAIL> DEFINE/KEY PF1 "DIRECTORY"
```

This example shows how to define the keypad key PF1 as the MAIL command DIRECTORY. To enter the DIRECTORY command, press PF1 followed by the RETURN key.

2
```
MAIL> DEFINE/KEY KP6 "EDIT" /TERMINATE
```

This example shows how to define the keypad key 6 as the EDIT command. The /TERMINATE qualifier causes the EDIT command to execute when you press keypad key 6 without having to press RETURN.

3
```
MAIL> DEFINE/KEY COMMA "EXIT"
```

This example shows how to define the comma key on the keypad as the EXIT command. Because the qualifier /TERMINATE was not specified, the default /NOTERMINATE is in effect. To enter the EXIT command, press the comma key followed by the RETURN key.

4
```
MAIL> DEFINE/KEY MINUS "SEND" /TERMINATE /NOECHO
```

This example shows how to define the minus key on the keypad as the SEND command. The /TERMINATE qualifier causes the SEND command to execute when you press the minus key without having to press RETURN. The /NOECHO qualifier prevents the display of the command line on the screen

5
```
MAIL> DEFINE/KEY PF4 "SET " /SET_STATE=ALTERED
MAIL> DEFINE/KEY KP7 "FILE" /TERMINATE /IF_STATE=ALTERED
MAIL> DEFINE/KEY KP8 "FORWARD" /TERMINATE /IF_STATE=ALTERED
MAIL> DEFINE/KEY KP9 "WASTEBASKET" /TERMINATE /IF_STATE=ALTERED
```

This example shows how to define four different keys and associate them with a state named ALTERED:

1. The first definition defines the key PF4 as the SET command and associates this key with a state named ALTERED.
2. The second definition defines the keypad key 7 to "FILE" and makes it dependent on a state named ALTERED. When you press PF4 followed by keypad key 7, MAIL executes the SET FILE command.
3. The third definition defines keypad key 8 to "FORWARD" and also makes it dependent on the ALTERED state. When you press PF4 followed by keypad key 8, MAIL executes the SET FORWARD command.
4. The fourth definition defines keypad key 9 to "WASTEBASKET" and also makes it dependent on the ALTERED state. When you press PF4 followed by keypad key 9, MAIL executes the SET WASTEBASKET command.

DELETE

Deletes either the message you are currently reading or t message you just read and moves it to the WASTEBASKET folder.

When you enter the EXIT or PURGE commands, your WASTEBASKET folder empties automatically.

To recover a message accidentally deleted (while it is still in the WASTEBASKET folder), SELECT the WASTEBASKET folder, READ the desired message, and MOVE it to another folder.

FORMAT

DELETE *[message-number]*

command parameter

message-number

Deletes the message specified by its number instead of the current message.

command qualifier

/ALL

Deletes all the currently selected messages. You select a folder by entering the SELECT command followed by the name of the folder. (See the SELECT command for more information.)

EXAMPLES

1

```
MAIL> DIRECTORY
                                                    MAIL
#   From    Date            Subject
1   MOON    11-APR-1985       Asteroids
.
.
.
5   MARK    11-APR-1985       The Yen
6   MARK    11-APR-1985       The Buck
MAIL> 5
MAIL> DELETE
MAIL> 6
MAIL> DELETE
MAIL> DIRECTORY
                                    MAIL
# From      Date            Subject
1 MOON      11-APR-1985     Asteroids
.
.
.
5 (Deleted)
6 (Deleted)
```

This example shows how to delete two messages from the MAIL folder.

2

```
MAIL> DELETE 24
MAIL>
```

This example shows how to delete message number 24 by entering its message-number after the DELETE command.

DIRECTORY

Displays a list of the messages in the current mail file, including message number, sender's name, date, and subject.

If "foldername" is omitted, MAIL displays a directory of the currently selected messages. Every time you use /BEFORE, /NEW, or /SINCE, you create a new set of selected messages. If there are no currently selected messages, MAIL displays a directory of the messages in the NEWMAIL folder (if unread messages exist) or the MAIL folder. (See the SELECT command for information about selecting messages.)

FORMAT

DIRECTORY *[foldername]*

command parameter

foldername
Indicates the name of the folder containing the messages you want to display.

command qualifiers

/BEFORE=date
Displays a listing of all the mail messages received before the specified date. If no date is specified, a listing of all the mail messages received before the current day ("today") is displayed.

/FOLDER
Displays a listing of all the folders contained in the current mail file.

/FULL
Displays the number of records in the message and whether you have replied to the message. External message identification numbers (for messages larger than 3 blocks) are also displayed.

/NEW
Displays a listing of any new (unread) mail messages. When there are no unread messages, MAIL displays the message "No new messages."

/SINCE=date
Displays a listing of all the mail messages received on or after the specified date. If no date is specified, a listing of all the mail messages received on the current day ("today") is displayed.

/START=start-point
Indicates the first message number you want to display. For example, to display all the messages beginning with number three, enter the command line DIRECTORY/START=3. Use the /START qualifier with the /FOLDER qualifier to indicate the first folder name you want to display. For example, to display all the folder names alphabetically following PLEAT, enter the command line DIRECTORY/START=PLEAT/FOLDER.

EXAMPLES

1

```
MAIL> DIRECTORY
                                                    MAIL
#    From    Date            Subject
1    MARK    11-APR-1985       The Yen
2    MARK    11-APR-1985       The Buck
3    BILL    13-APR-1985       The Pound
4    BILL    13-APR-1985       The Dollar
5    BILL    14-APR-1985       The Cent
6    MARK    17-APR-1985       The Dime
```

This example shows how to display a listing of all the messages in the current folder by using the DIRECTORY command.

2

```
MAIL> DIRECTORY/SINCE=13-APR
                                                    MAIL
#    From    Date            Subject
1    BILL    13-APR-1985       The Pound
2    BILL    13-APR-1985       The Dollar
3    BILL    14-APR-1985       The Cent
4    MARK    17-APR-1985       The Dime
```

This example shows how to use the /SINCE qualifier with the DIRECTORY command to display a listing of all the mail messages in the current folder received on or after April 13, 1985.

3

```
MAIL> DIRECTORY/FOLDER
Listing of folders in DISK$:[BACON]MAIL.MAI;1
    Press CTRL/C to cancel listing
MAIL                                NEW_HIRES
PROJECTS                            SALES_LEADS
```

This example shows how to display a listing of all the folders in the current mail file.

4

```
MAIL> DIRECTORY/FOLDER/START=P
Listing of folders in DISK$:[BACON]MAIL.MAI;1
    Press CTRL/C to cancel listing
PROJECTS                            SALES_LEADS
```

This example shows how to display an alphabetical listing of all the folders in the current mail file beginning with the letter P.

EDIT

Invokes the EDT editor, enabling you to edit a message before you send it. See the *Guide to Text Processing on VAX/VMS* and the *VAX EDT Reference Manual* for information about the EDT editor.

FORMAT

EDIT *[filename]*

command parameter

filename

Indicates the name of the file you want to edit.

command qualifiers

/COMMAND=ini-file-spec

Indicates the name of an EDT startup command file (EDTINI) for "ini-file-spec." If you do not specify a startup command file for "ini-file-spec," the default EDTINI.EDT file set up for the DCL EDIT command takes effect.

/CREATE

Tells MAIL to create a file. MAIL prompts you for a file name when you do not specify one on the EDIT command line.

/JOURNAL=jou-file-spec

Specifies "jou-file-spec" as the name of the journal file.

/OUTPUT=out-file-spec

Specifies "out-file-spec" as the name of the output file.

/READ

Indicates that a journal file or output file will not be created. If you do not specify an existing file with the /READ qualifier, MAIL displays "Input file does not exist" and returns the MAIL> prompt. When you use the /READ qualifier, enter the QUIT command to exit from EDT. If you enter the EXIT command, you are prompted for a file specification.

/RECOVER

Indicates that you want to recover a previous editing session that was prematurely aborted.

EXAMPLES

1

```
MAIL> EDIT/COMMAND=EDTFUN.EDT FILENAME.DAT
    1           This is the first line of text in FILENAME.DAT.
[EOB]
*
.
.
.
* EXIT
DISK$MEGAWORK:[BURTON]FILENAME.DAT;1 13 lines
MAIL>
```

This example shows how to invoke the EDT editor and execute the commands in an EDT startup command file named EDTFUN.EDT to edit an already existing file named FILENAME.DAT before sending it.

2

```
MAIL> EDIT/OUTPUT=OTHER.DAT
_File: ORIGINAL.DAT
    1         This is the first line of text in a file called ORIGINAL.DAT.
.
.
.
* EXIT
DISK$FINEWORK:[DUTZ]OTHER.DAT;1 23 lines
MAIL>
```

This example shows how to use the /OUTPUT qualifier to specify a name for the output file (OTHER.DAT) that is different from the input file (ORIGINAL.DAT).

3

```
MAIL> EDIT/READ
_File: EXISTS.TXT
.
.
.
* QUIT
```

This example shows how to use the /READ qualifier with the EDIT command and exit with the QUIT command.

ERASE

Allows you to clear your screen.

FORMAT	ERASE
command parameters	*None.*
command qualifiers	*None.*

EXIT

Allows you to exit from MAIL. You can also exit from MAIL by pressing CTRL/Z. When you enter the EXIT command, any messages in the WASTEBASKET folder are deleted unless you have issued the command SET NOAUTO_PURGE.

FORMAT EXIT

command parameters

None.

command qualifiers

None.

EXTRACT

Places a copy of the current message into a sequential file. If you want to copy a mail message to a folder in an ISAM mail file, use one of the following commands:

- COPY
- FILE
- MOVE

FORMAT

EXTRACT *file-spec*

command parameter

file-spec
Specifies the name of the output file to which the message is copied. The default file type is TXT. By default, the device and directory will match your current default device and directory.

command qualifiers

/ALL
Copies all the currently selected messages to the specified file. Each message will be separated by a form feed.

/APPEND
Adds the selected message to the end of the specified file. If the file does not exist, it is created. When you do not specify /APPEND, MAIL creates a new sequential file.

/MAIL
Specifies that the output file be a sequential mail file with a default file type of MAI and a protection code of (S:RW,O:RW,G,W). By default, the device and directory will match those of your mail file directory. Like /APPEND, /MAIL adds the selected message to the end of the specified file.

/NOHEADER
Removes the header information (To: From: Subject:) from the mail message.

EXAMPLES

1

```
MAIL> DIRECTORY
                                                    MAIL
#   From     Date            Subject

.
.
.
5   JOAN     12-MAR-86       Spelling Tests
.
.
.
MAIL> 5
MAIL> EXTRACT GRAMMAR
MAIL> EXIT
$ DIRECTORY
.
.
.
GRAMMAR.TXT;1
.
.
.
```

This example shows how to place a copy of a mail message in a sequential file named GRAMMAR.TXT.

2

```
MAIL> EXTRACT/ALL/NOHEADER
_File: OUTER.DAT

%MAIL-I-CREATED, DISK$MEGAWORK:[CROWN]OUTER.DAT;1 created

MAIL>
```

This example shows how to place a copy of all the messages in the currently selected folder into a sequential file called OUTER.DAT. The /NOHEADER qualifier prevents the header information from being copied.

FILE

Moves the current message to the specified folder. You can use the FILE command and the MOVE command interchangeably because they work the same way. (Note that the FILE command deletes the message from the original folder, unlike the COPY command, which leaves a copy.)

If you enter the FILE command, press RETURN, supply a foldername at the prompt, and then decide (before pressing RETURN again) that you do not want to file the message, enter CTRL/C. CTRL/C will abort the operation and keep you within MAIL.

FORMAT

FILE *foldername [filename]*

command parameters

foldername

Indicates the name of the folder to which the current message is to be moved. If the specified folder does not exist, you are asked whether you want to create it. If you respond with "y," the new folder is created.

A folder name can be 1 to 39 characters in length. Valid characters for folder names are A through Z, a through z, dollar sign ($), underscore (_), and 0 through 9.

filename

Indicates the name of the mail file to which the current message is to be moved. If the file name is omitted, the message is moved to the specified folder in the current file.

command qualifiers

/ALL

Moves all the messages in the current folder to the specified folder.

/[NO]CONFIRM

Determines whether you will be queried about creating a new folder. The default is /CONFIRM.

EXAMPLE

```
MAIL> 2
MAIL> FILE    ❶
_Folder: WINNERS    ❷
_FILE: RET    ❸
Folder WINNERS does not exist.
Do you want to create it (Y/N, default is N)? y
%MAIL-I-NEWFOLDER, folder WINNERS created
MAIL> SELECT WINNERS    ❹
%MAIL-I-SELECTED, 1 message selected
MAIL> DIRECTORY    ❺
                                                    WINNERS

#   From    Date            Subject
1   BURK    18-APR-1985       Early American Art
MAIL>
```

❶ Enter the FILE command to move the current message to a new folder.

❷ Specify a name for the new folder.

❸ Press RETURN to retain the default file.

❹ To move to the new folder, enter the SELECT command followed by the name of the new folder (WINNERS).

❺ Enter the DIRECTORY command to see the transferred message in the newly created folder (WINNERS).

This example shows how to FILE a message in a new folder named WINNERS.

FIRST

Displays the first message in the current folder.

FORMAT

FIRST

command parameters

None.

command qualifier

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the first message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

FORWARD

Sends a copy of the message you are currently reading (or have just read) to a user or users. MAIL prompts you for the name of the user or users to whom you want to forward the message.

If you change your mind about forwarding a message after you have already entered the FORWARD command, enter CTRL/C to abort the message. The MAIL> prompt will be displayed.

FORMAT

FORWARD

command parameters

None.

command qualifiers

/EDIT

Determines whether the EDT editor is invoked to edit the message you are forwarding.

/NOHEADER

Enables you to forward a message without the original header information supplied from the user that sent it. The default is /HEADER.

EXAMPLES

1

```
MAIL> 3
From:       PRESTON
To:         MARLEY
Subj:       Snakes
Beasts, under the earth, crawling...
MAIL> FORWARD/NOHEADER
To: SOUND::BURTON
Subj: Snakes Again
    .
    .
    .
MAIL> READ
From:       MARLEY
To:         SOUND::BURTON
Subj:       Snakes Again
Beasts, under the earth, crawling...
```

This example shows how to forward a message to a user (SOUND::BURTON) without the original header information (From: PRESTON, To:MARLEY, Subj: Snakes).

2

```
MAIL> 7
MAIL> FORWARD/EDIT
To:         FOLEY
Subj:       The Thatched Roof
(The text of mail message 7 is displayed here, ready to be edited.)
```

This example shows how to edit a mail message before forwarding it by using the FORWARD/EDIT command.

HELP

Allows you to obtain information about the Mail Utility.

To obtain information about all of the MAIL commands, enter the following command:

```
MAIL> HELP *
```

To obtain information about individual commands or topics, enter HELP followed by the command or topic name.

FORMAT

HELP *[topic]*

command parameter

topic

Indicates a topic about which you want information. To display the list of available topics, enter the HELP command at the MAIL prompt.

command qualifiers

None.

LAST

Displays the last message in the current folder.

FORMAT

LAST

command parameters

None.

command qualifier

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the last message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

MAIL

Sends a message to another user(s). The MAIL command works like the SEND command.

MAIL prompts you first for the name of the user(s) to receive the message. You reply with the user name(s) or with the file name of a distribution list file, in the following format:

```
[[nodename::]username,...] [,] [@listname]
```

Next, MAIL prompts you for the subject of the mail message. To avoid the "Subj:" prompt, specify the /SUBJECT qualifier with the MAIL command.

You can include a file specification with the MAIL command. If you specify a file with the MAIL command, the text in that file is sent to the specified user(s). If you do not specify a file, MAIL prompts you for the text of your message.

Enter the message that you want to send; then press CTRL/Z. Note that once you have typed a line and pressed RETURN, there is no way to edit it. If you decide not to send a message you are typing but want to stay within the Mail Utility, press CTRL/C to abort the message. You will then receive the MAIL> prompt. CTRL/Y exits you from MAIL.

FORMAT

MAIL *[file-spec]*

command parameter

file-spec

Indicates the name of the file to be sent.

command qualifiers

/[NO]EDIT

Determines whether the EDT editor is invoked to edit the message you are sending. The /NOEDIT qualifier overrides the MAIL/EDIT default if you entered the DCL command MAIL/EDIT.

You cannot specify the /EDIT qualifier with the /LAST qualifier.

/LAST

Specifies that the last message that you sent be used as the text for the message you are currently sending.

/[NO]SELF

Determines whether MAIL sends a copy of the message you are sending back to yourself. The /NOSELF qualifier overrides the SET COPY_SELF MAIL command.

/SUBJECT="subject-text"

Specifies the subject of the mail message to be sent.

EXAMPLE

```
MAIL> MAIL
To: TERA::LINDEN
Subj: Vacation
Enter your message below.  Press CTRL/Z when complete, or CTRL/C to quit:
```

This example shows how to use the MAIL command to send a message to a user named Linden on node TERA.

MOVE

Moves the current message to the specified folder. You can use the MOVE command and the FILE command interchangeably because they work the same way. (Note that the FILE command deletes the message from the original folder, unlike the COPY command, which leaves a copy.)

If you enter the MOVE command, press RETURN, supply a foldername at the prompt, and then decide (before pressing RETURN again) that you do not want to move the message, enter CTRL/C. CTRL/C will abort the operation and keep you within MAIL.

FORMAT

MOVE *foldername [filename]*

command parameters

foldername

Indicates the name of the folder to which the current message will be moved. If the specified folder does not exist, you are asked whether you want to create it. If you respond with "y," the new folder is created.

A folder name can be 1 to 39 characters in length. Valid characters for folder names are A through Z, a through z, dollar sign ($), underscore (_), and 0 through 9.

filename

Indicates the name of the mail file to which the current message will be moved. If the specified file does not exist, it is created. If the file name is omitted, the message is moved to the specified folder in the current file.

command qualifiers

/ALL

Moves all the currently selected messages to the specified folder.

/[NO]CONFIRM

Determines whether you will be queried about creating a new folder. The default is /CONFIRM.

EXAMPLE

```
MAIL> 2
MAIL> MOVE    ❶
_Folder: WINNERS    ❷
_File: RET    ❸

Folder WINNERS does not exist.
Do you want to create it (Y/N, default is N)? y
%MAIL-I-NEWFOLDER, folder WINNERS created

MAIL> SELECT WINNERS    ❹

%MAIL-I-SELECTED, 1 message selected
MAIL> DIRECTORY    ❺
                                                    WINNERS
#    From    Date            Subject
1    BURK    18-APR-1985       Early American Art
MAIL>
```

❶ Enter the MOVE command to transfer the current message to a new folder.

❷ Specify a name for the new folder.

❸ Press RETURN to retain the default file.

❹ To move to the new folder, enter the SELECT command followed by the name of the new folder (WINNERS).

❺ Enter the DIRECTORY command to see the transferred message in the newly created folder (WINNERS).

This example shows how to MOVE a message to a new folder named WINNERS.

NEXT

Skips to the next message and displays it. This command is useful if, while reading through your messages, you encounter a long message that you would like to skip over.

FORMAT

NEXT

command parameters

None.

command qualifier

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the next message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

PRINT

Queues a copy of the message you are currently reading (or have just read) for printing. The file(s) created by the PRINT command are not actually released to the print queue until you exit from MAIL, so that multiple messages will be concatenated into one print job.

FORMAT

PRINT

command parameters

None.

command qualifiers

/ALL

Indicates that all the currently selected messages be printed.

/COPIES=n

Indicates the number of copies to be printed.

/NOTIFY

Indicates that you will be notified by a broadcast message when the file or files have been printed.

/PRINT

Releases all messages previously queued with the PRINT command to the print queue. If you do not specify the /PRINT qualifier, messages are not released to the print queue until you exit from MAIL. PRINT/PRINT will not queue the current message for printing. Also note that the only other qualifier you can specify with /PRINT is /NOTIFY.

/QUEUE=queue-name

The name of the queue to which a message is to be sent. If the /QUEUE qualifier is not specified, the message is queued to the SYS$PRINT printer. If you enter the PRINT command more than once specifying a different queue-name, any previously queued messages are released to the print queue

EXAMPLES

1
```
MAIL> 5
MAIL> PRINT/QUEUE=LMNO
MAIL> EXIT
  Job MAIL (queue MARS_PRINT, entry 333) started on QUEUE$LPA0
$
```

This example shows how to print message number 5 on printer LMNO.

2

```
MAIL> PRINT/PRINT

%MAIL-E-NOMSGPRI, no messages printed


MAIL> 14
MAIL> PRINT
MAIL> 23
MAIL> PRINT
MAIL> PRINT/PRINT
  Job MAIL (queue QUASAR_PRINT, entry 333) started on QUEUE$LPA0
```

The first part of this example shows how MAIL displays an error message when you issue the /PRINT qualifier before you use the PRINT command alone. The second part shows how to release mail messages (14 and 23) to the print queue by entering the /PRINT qualifier.

3

```
MAIL> 2
MAIL> PRINT
MAIL> 7
MAIL> PRINT
MAIL> 9
MAIL> PRINT/QUEUE=LMNO
  Job MAIL (queue WRITERS_PRINT, entry 148) started on QUEUE$LPA0
MAIL> 24
MAIL> PRINT
MAIL> 31
MAIL> PRINT/QUEUE=LMRT
  Job MAIL (queue WRITERS_PRINT, entry 149) started on QUEUE$LPA0
```

This example shows how mail messages are released to the print queue when you use the /QUEUE qualifier.

PURGE

Deletes all the messages in the WASTEBASKET folder. When you EXIT from MAIL or issue a SET FILE command (to select a new mail file), an implicit PURGE is done to empty the WASTEBASKET folder.

Purged message space is not available for reuse by VAX Record Management Services (RMS) until you enter the PURGE/RECLAIM command. An automatic PURGE/RECLAIM is done when the amount of deleted space in a mail file exceeds 32,767 bytes. (MAIL uses the CONVERT/RECLAIM utility to reclaim space.)

FORMAT PURGE

command parameters

None.

command qualifiers

/RECLAIM

Releases deleted message space back to VAX Record Management Services (RMS) for reuse.

Because your mail file is locked while PURGE/RECLAIM is running, you will be unable to receive new mail. Users attempting to send you mail while PURGE/RECLAIM is running will receive an error message indicating that their message was not sent successfully.

/STATISTICS

Indicates the amount of released deleted message space in a short statistics display when you use it with PURGE/RECLAIM.

EXAMPLES

1
```
MAIL> PURGE/RECLAIM
MAIL>
```

This example shows how to enter the PURGE/RECLAIM command to delete all the messages in the WASTEBASKET folder and release the deleted message space back to VAX Record Management Services (RMS) for reuse.

2
```
MAIL> PURGE/RECLAIM/STATISTICS
Reclaim Statistics:
        Data buckets scanned:     1
        Data buckets reclaimed:   0
        Index buckets reclaimed:  0
        Total buckets reclaimed:  0
MAIL>
```

This example shows the kind of information that the /STATISTICS qualifier displays about the reclaimed deleted message space.

QUIT

Exits you from MAIL without emptying the WASTEBASKET folder. QUIT performs the same function as CTRL/Y.

FORMAT

QUIT

command parameters

None.

command qualifiers

None.

EXAMPLE

```
MAIL> 2
MAIL> DELETE
MAIL> 6
MAIL> DELETE
MAIL> QUIT
$ MAIL
MAIL> SELECT WASTEBASKET

%MAIL-I-SELECTED, 2 messages selected

MAIL> DIRECTORY
                                    WASTEBASKET
#    From      Date            Subject
1    FRANCO    20-APR-85       Swiss Chocolates
2    ZEUS      22-APR-85       Austrian Pastry
```

This example shows how to use the QUIT command to avoid emptying the WASTEBASKET folder.

READ

Displays your messages. It can be issued with or without parameters.

Pressing the RETURN key is the same as entering the READ command without parameters. If you issue the READ command without parameters or press RETURN immediatedly after MAIL is invoked, MAIL displays the first page of your oldest unread message in your NEWMAIL folder. If there are no unread messages, MAIL displays the oldest message in the MAIL folder. Each time you enter the READ command without parameters, or press RETURN, MAIL displays the next page, or the next message if there are no more pages in the current message.

If a new message arrives while you are in MAIL, you can enter READ/NEW to read the message, and then return to the previous MAIL activity.

Note that every time you use /BEFORE, /NEW, or /SINCE, you create a new set of selected messages.

FORMAT

READ *[foldername] [message-number]*

command parameters

foldername

Indicates the name of the folder containing the messages to be read. If a folder name is specified, MAIL displays messages from that folder. If no folder name is specified, MAIL displays messages from the current folder.

message-number

Indicates the number of the message to be read. The message number represents the position of a message in a folder. If you specify a number greater than the number of messages in the folder, MAIL displays the last message in the folder. Therefore, to read the latest message in a folder, specify a large message number or enter the LAST command.

command qualifiers

/BEFORE=date

Displays mail messages received before the specified date. If no date is specified, all the mail messages received before the current day ("today") are displayed.

/EDIT

Indicates that the EDT editor is invoked. You can use the EDT editor to easily peruse the next message. When you are done, enter the EDT command QUIT. You will see the mail prompt. If you decide to edit the message and want to keep a copy of the newly edited message, enter the EDT command EXIT and supply a file name.

/NEW

Displays new mail messages received while you are in MAIL. If there are no new messages, the message "No new messages" will be printed.

/SINCE=date

Displays mail messages received on or after the specified date. If no date is specified, all the mail messages received after the current day ("today") are displayed.

EXAMPLES

1
```
MAIL> READ/BEFORE=16-MAY
```

This example shows how to use the /BEFORE qualifier with the READ command to display all the mail messages in the current folder received before May 16, 1985.

2
```
MAIL> READ/SINCE=13-OCT
```

This example shows how to use the /SINCE qualifier with the READ command to display all the mail messages in the current folder received on or after October 13, 1985.

3
```
MAIL> READ/NEW
```

This example shows how to read new mail received while you are in MAIL.

REPLY

Sends a message to the sender of the message you are currently reading or the one you last read. If you do not specify the name of a file to be sent as your reply, you will be prompted for the text of your reply. You can use the REPLY command and the ANSWER command interchangeably because they work the same way.

You must be reading a message in order to reply to it.

If you change your mind about replying to a message after you have already entered the REPLY command, enter CTRL/C to abort the message. The MAIL> prompt will be displayed.

FORMAT

REPLY *[file-spec]*

command parameter

file-spec
Indicates the name of the file to be sent as a reply.

command qualifiers

/[NO]EDIT
Invokes the EDT editor to edit the reply you are sending. When you EXIT from EDT, the edited message is sent. To cancel the sending of the message, enter the EDT command QUIT. If you enter the DCL command MAIL/EDIT=(REPLY) and then decide that you do not want to invoke the editor for your response, enter the MAIL command REPLY/NOEDIT.

/EXTRACT
Invokes the EDT Editor to enable you to edit the current message to which you are replying.

/LAST
Specifies that the last message you sent be used as text for the reply. You cannot use /LAST in conjuction with other qualifiers or a file specification.

/[NO]SELF
Determines whether MAIL sends a copy of the response back to you. The default is /NOSELF, unless you have used the SET COPY_SELF command to specify that copies be sent to yourself automatically.

EXAMPLES

1

```
MAIL> REPLY/EXTRACT
To:  FLAXEN::STARCK
Subj: RE:Verbosity
This text was mailed to a user named Starck.
[EOB]
    .
    .
    .
* EXIT
DISK$:[STARCK]MAIL.TMP;1 17 lines
MAIL>
```

This example shows how to use the /EXTRACT qualifier to edit your response to a user named Starck on node FLAXEN before sending it.

2

```
MAIL> REPLY/SELF
To:  FLAME::CORSTAN, HOWE
Subj:  RE:  Ecology
Enter your message below.  Press CTRL/Z when complete,
CTRL/C to quit:
    .
    .
    .
CTRL/Z
New mail on node MARBLE from HOWE
```

This example shows how a user named HOWE on node MARBLE replies to a user named CORSTAN on node FLAME. The /SELF qualifier enables MAIL to return a copy of the reply back to HOWE.

SEARCH

Searches the currently selected folder for the message containing the first occurrence of the specified text string.

FORMAT

SEARCH *search-string*

command parameter

[search-string]

Indicates the text string that MAIL searches for in the currently selected messages. The search starts from the beginning of the messages in the current folder. If a "search-string" is not specified, a search is made for the previously specified string, starting after the message you are currently reading (or have just read).

command qualifiers

None.

EXAMPLE

```
MAIL> SEARCH under the
From:     BURT
To:       ANTON
Subj:     Coal Mines
They commute under the earth...
MAIL>
```

This example shows how to search for the string "under the."

SELECT

Establishes a set of messages that you can affect as a group. You can COPY or MOVE selected messages from one folder to another. Or, you can READ and DELETE, or SEARCH and EXTRACT a set of messages. After you SELECT a set of messages, you can use the following commands to affect them:

COPY
DELETE
DIRECTORY
EXTRACT
FILE
MOVE
READ
SEARCH

You can also use the SELECT command to move from one folder to another.

If you select a folder that does not exist, MAIL displays the following message:

```
%MAIL-E-NOTEXIST, folder foldername does not exist
```

FORMAT

SELECT *[foldername]*

command parameter

foldername
The name of the folder to be selected. If no folder name is specified, the folder with the same name as the mail file is selected.

command qualifiers

/BEFORE=date
Indicates that messages dated before the specified date be selected. If no date is specified, all the messages received before the current day ("today") are selected.

/NEW
Indicates that new (unread) messages be selected. When a mail file other than your default mail file is open, MAIL closes the file and opens your default mail file.

/SINCE=date
Indicates that messages dated after the specified date be selected. If no date is specified, all the messages received on the current day ("today") are selected.

EXAMPLES

1

```
MAIL> DIRECTORY/FOLDERS  ❶
MAIL                    NEWMAIL
WASTEBASKET
MAIL> SELECT WASTEBASKET  ❷

%MAIL-I-SELECTED, 3 messages selected

MAIL> DIRECTORY  ❸
                                        WASTEBASKET
#    From    Date            Subject
1    GORK    19-APR-85       Venus Fly Traps
2    GORK    21-APR-85       The Aloe
3    BURT    22-APR-85       Scales
```

❶ Enter the DIRECTORY/FOLDERS command to display all currently existing folders.

❷ Enter the SELECT command to move to the WASTEBASKET folder.

❸ Enter the DIRECTORY command to display the contents of the WASTEBASKET folder.

This example shows how to use the SELECT command to move from the MAIL folder to the WASTEBASKET folder.

2

```
MAIL> SELECT/BEFORE=12-APR-85

%MAIL-I-SELECTED, 2 messages selected

MAIL> DIRECTORY
#    From    Date            Subject
1    MART    10-APR-85       Food
2    BART    11-APR-85       Soup
```

This example shows how to display all the mail messages received before April 12, 1985.

3

```
MAIL> SELECT/NEW
```

This example shows how to select all the new (unread) mail messages. Because NEWMAIL is the implied folder name, you do not need to specify a folder name.

SEND

Sends a message to another user(s). You can use the SEND command and the MAIL command interchangeably because they work the same way.

MAIL prompts you first for the name of the user(s) to receive the message. You reply with the user name(s) or with the file name of a distribution list file, in the following format:

```
[[nodename::]username,...] [,] [@listname]
```

The distribution list file name must be the last item in the command string.

Next, MAIL prompts you for the subject of the mail. To avoid the "Subj:" prompt, specify the /SUBJECT qualifier with the SEND command.

You can include a file specification with the SEND command. If you specify a file with the SEND command, the text in that file is sent to the specified user(s). If you do not specify a file, MAIL prompts you for the text of your message.

Enter the message that you want to send, then press CTRL/Z. Note that once you have typed a line and pressed RETURN, there is no way to edit it. If you decide not to send a message you are typing but want to stay within the Mail Utility, press CTRL/C to abort the message. You will then receive the MAIL> prompt. CTRL/Y exits you from MAIL.

FORMAT

SEND *[file-spec]*

command parameter

file-spec

Indicates the name of the file to be sent.

command qualifiers

/[NO]EDIT

Determines whether the EDT editor is invoked to edit the message you are sending. The /NOEDIT qualifier overrides the SEND/EDIT default if you entered the DCL command MAIL/EDIT.

If you are interrupted while editing a mail message, a journal file is created containing your edits. To recover your edits, enter the following command line. (You may substitute another word of your choice for the word OOPS.)

```
$ EDIT/RECOVER/JOURNAL=SYS$SCRATCH:MAIL.JOU SYS$SCRATCH:OOPS.TMP
```

The editor is invoked displaying the text of the message you were editing. After you exit from the editor, you can mail the file (in this case, OOPS.TMP) by using the MAIL command SEND, as follows:

```
MAIL> SEND OOPS.TMP
To: MCNALLY
Subject: Vacationing in Venice
```

/LAST

Specifies that the last message that you sent be used as the text for the message you are currently sending. You cannot use /LAST in conjuction with other qualifiers or a file specification.

/[NO]SELF

Determines whether MAIL sends a copy of the message you are sending back to yourself. The /NOSELF qualifier overrides the SET COPY_SELF SEND command.

/SUBJECT="subject-text"

Specifies the subject of the mail message to be sent.

EXAMPLES

1

```
MAIL> SEND/LAST
To: FLIGHT::MYERS
Subj: Geometric Concepts
MAIL>
```

This example shows how to send a copy of the last mail message you sent to a user named Myers on node FLIGHT.

2

```
MAIL> SEND/SELF/SUBJECT="Good Harbor"
To: DAPPER::WAYNE
Enter your message below.  Press CTRL/Z when complete, CTRL/C to quit:
```

This example shows how to send a mail message to a user named Wayne on node DAPPER. The /SELF qualifier enables MAIL to send a copy of the same message back to you. The subject of the message is Good Harbor.

3

```
MAIL> SEND
To: BAKER,MARSTON,@SUPERVISORS
Subject: Handling Stress
Enter your message below.  Press CTRL/Z when complete, CTRL/C to quit:
```

This example shows how to send a mail message to two users (BAKER and MARSTON) and a distribution list (SUPERVISORS).

4

```
MAIL> SEND/EDIT
To: WAMPUS
Subject: Duck Activities
    .
    .
    .
CTRL/Y
    .
    .
    .
$ EDIT/RECOVER/JOURNAL=SYS$SCRATCH:MAIL.JOU SYS$SCRATCH:DUCK.TMP
    .
    .
    .
Command: EXIT
DISK$WRITERS:[FLYNN]DUCK.TMP;1 14 lines
$ MAIL
MAIL> SEND DUCK.TMP
To: WAMPUS
Subject: Duck Activities
```

This example shows how a user named FLYNN recovers an editing session after being interrupted by CTRL/Y. A temporary file named DUCK.TMP is created, which user FLYNN then sends to a user named WAMPUS.

SET/SHOW [NO]AUTO_PURGE

Determines whether MAIL empties the WASTEBASKET folder when you enter the EXIT or SET FILE command. When you use the SET NOAUTO_PURGE command, you must enter the PURGE command periodically to delete the messages in the WASTEBASKET folder.

The default you establish with the SET AUTO_PURGE command remains in effect until you enter the SET NOAUTO_PURGE command.

The SHOW AUTO_PURGE command indicates whether you have used the SET AUTO_PURGE command.

FORMAT

SET [NO]AUTO_PURGE
SHOW AUTO_PURGE

command parameters

None.

command qualifiers

None.

EXAMPLE

```
MAIL> SET AUTO_PURGE
MAIL> SHOW AUTO_PURGE
Automatic deleted message purge is enabled
```

This example shows how to use the SET AUTO_PURGE command to enable MAIL to delete the messages in the WASTEBASKET folder every time you enter the EXIT command or the SET FILE command. The SHOW AUTO_PURGE command displays whether automatic purging is enabled.

SET/SHOW COPY_SELF

Sets the default for determining whether the SEND or REPLY commands return to the sender a copy of the message being sent.

By specifying NOSEND or NOREPLY with the SET COPY_SELF command, you can clear any default copying you have established with the SET COPY_SELF command.

The SHOW COPY_SELF command displays the established copying.

FORMAT

SET COPY_SELF *command [,command]*
SHOW COPY_SELF

command parameter

command

The "command" parameter can be any one of the following: SEND, NOSEND, REPLY, NOREPLY. You can use NOSEND and NOREPLY to reverse previous settings of SEND and REPLY, respectively.

command qualifiers

None.

EXAMPLES

1
```
MAIL> SHOW COPY_SELF
Automatic copies to yourself are disabled
```

This example shows the message MAIL displays when you have not used the SET COPY_SELF command and you enter the SHOW COPY_SELF command.

2
```
MAIL> SET COPY_SELF SEND
MAIL> SHOW COPY_SELF
Automatic copy to yourself on SEND
```

This example shows how to use the SET COPY_SELF command to enable copies of mail messages you SEND to be returned back to you. The SHOW COPY_SELF command indicates that you have enabled automatic copying.

SET/SHOW FILE

Establishes (or opens) another file as the current mail file. By default, your mail file is MAIL.MAI. If you use the COPY command, the FILE command, or the MOVE command to create other mail files (for example, JOKES.MAI or HISTORY.MAI), you can then use the SET FILE command to open the MAIL files.

When you enter the SET FILE command, the WASTEBASKET folder of the current mail file is emptied, the file is closed, and the specified (alternate) file is opened.

The SHOW FILE command displays the name of the mail file that is currently open.

FORMAT

SET FILE *filename*
SHOW FILE

command parameter

filename
Indicates the name of the mail file you are opening.

command qualifiers

None.

EXAMPLE

```
MAIL> SHOW FILE
DISK$:[ARAS]MAIL.MAI;2
MAIL> COPY
_Folder: LIMERICKS
_FILE: JOKES

Folder LIMERICKS does not exist.
Do you want to create it (Y/N, default is N)? y
%MAIL-S-CREATED, DISK$:[ARAS]JOKES.MAI;1 created
%MAIL-I-NEWFOLDER, folder LIMERICKS created

MAIL> SET FILE JOKES
MAIL> SHOW FILE
DISK$:[ARAS]JOKES.MAI
```

This example demonstrates how the SHOW FILE command displays the name of the mail file that is currently open (MAIL.MAI); the COPY command creates a new folder (LIMERICKS) and a new mail file (JOKES); and the SET FILE command opens the mail file named JOKES.MAI.

SET/SHOW FOLDER

Establishes a set of messages that you can affect as a group. You can COPY or MOVE this set of messages from one folder to another. Or, you can READ and DELETE, or SEARCH and EXTRACT a set of messages. After you enter the SET FOLDER command, selecting a set of messages, you can use the following commands to affect them:

COPY
DELETE
DIRECTORY
EXTRACT
FILE
MOVE
READ
SEARCH

You can also use the SET FOLDER command to move from one folder to another. If you use the SET FOLDER command to move to a folder that does not exist, MAIL displays the following message:

```
%MAIL-E-NOTEXIST, folder foldername does not exist
```

The SHOW FOLDER command displays the current folder name.

FORMAT

SET FOLDER *[foldername]*

command parameter

foldername
The name of the folder to be selected. If no folder name is specified, the folder with the same name as the mail file is selected.

command qualifiers

/BEFORE=date
Indicates that messages dated before the specified date be selected. If no date is specified, all the messages received before the current day ("today") are selected.

/NEW
Indicates that new (unread) messages be selected. When a mail file other than your default mail file is open, MAIL closes the file and opens your default mail file.

/SINCE=date
Indicates that messages dated after the specified date be selected. If no date is specified, all the messages received on the current day ("today") are selected

EXAMPLES

1

```
MAIL> DIRECTORY/FOLDERS  ❶
MAIL                NEWMAIL
WASTEBASKET
MAIL> SET FOLDER WASTEBASKET  ❷

%MAIL-I-SELECTED, 3 messages selected

MAIL> DIRECTORY  ❸
                                        WASTEBASKET
#    From    Date            Subject
1    GORK    19-APR-85       Venus Fly Traps
2    GORK    21-APR-85       The Aloe
3    BURT    22-APR-85       Scales
```

❶ Enter the DIRECTORY/FOLDERS command to display all currently existing folders.

❷ Enter the SET FOLDER command to move to the WASTEBASKET folder.

❸ Enter the DIRECTORY command to display the contents of the WASTEBASKET folder.

This example shows how to use the SET FOLDER command to move from the MAIL folder to the WASTEBASKET folder.

2

```
MAIL> SET FOLDER/BEFORE=12-APR-85

%MAIL-I-SELECTED, 2 messages selected

MAIL> DIRECTORY
#    From    Date            Subject
1    MART    10-APR-85       Food
2    BART    11-APR-85       Soup
```

This example shows how to display all the mail messages received before April 12, 1985.

3

```
MAIL> SET FOLDER/NEW
```

This example shows how to select all the new (unread) mail messages. Because NEWMAIL is the implied folder name, you do not need to specify a folder name.

SET/SHOW FORWARD

Sets a forwarding address for your mail. After you enter the SET FORWARD command, the address you specify will receive mail messages.

The default you establish with the SET FORWARD command remains in effect until you enter the SET NOFORWARD command.

The SHOW FORWARD command displays the name of the specified forwarding address.

If you have SYSNAM privilege, you can set and show forwarding addresses for other users.

FORMAT

SET [NO]FORWARD *address*

command parameter

address

Indicates the address (NODE::NAME) to which your mail is forwarded.

command qualifier

[/USER=user-name]

Indicates the name of another user for whom you are setting or showing a forwarding address. You can use the /USER qualifier only if you have SYSNAM privilege.

EXAMPLE

```
MAIL> SET FORWARD NEXUS::LARS
MAIL> SHOW FORWARD
Your mail is being forwarded to NEXUS::LARS
MAIL>
```

This example shows how a user named LARS establishes a forwarding address on node NEXUS with the SET FORWARD command, and displays the forwarding address with the SHOW FORWARD command.

SET/SHOW MAIL_DIRECTORY

Specifies that all MAI files be moved from your SYS$LOGIN: directory to the specified subdirectory.

The SET NOMAIL_DIRECTORY command specifies that all MAI files be moved from the subdirectory back to your SYS$LOGIN: directory.

The SHOW MAIL_DIRECTORY command displays the name of the device and directory containing all your MAI files.

FORMAT

SET MAIL_DIRECTORY *[.subdirectory-name]*

command parameter

[.subdirectory-name]

Specifies the name of the subdirectory in your SYS$LOGIN: directory to which all MAI files are to be moved.

command qualifier

/LOG

Displays a listing of the MAI files moved from the previous directory to the specified subdirectory.

EXAMPLE

```
$ SHOW TRANSLATION SYS$LOGIN
  SYS$LOGIN = "DISK$:[DALTON]"  (LNM$PROCESS_TABLE)
    .
    .
    .
MAIL> SHOW MAIL_DIRECTORY
Your mail file directory is DISK$:[DALTON]
MAIL> SET MAIL_DIRECTORY [.MAIL]

%MAIL-I-CREATED, DISK$:[DALTON.MAIL] created

MAIL> SHOW MAIL_DIRECTORY
Your mail file directory is DISK$:[DALTON.MAIL]
    .
    .
    .
$ SET DEFAULT [DALTON.MAIL]
$ DIRECTORY
```

This example shows how to create a subdirectory containing all your MAI files. (The DCL command SHOW TRANSLATION displays the logical name for your default top-level directory, SYS$LOGIN:.)

SET/SHOW [NO]PERSONAL_NAME

Enables you to append a field to the end of the "From:" field of mail messages you send. You can fill this field with your full name or any other information.

The SET NOPERSONAL_NAME command clears any name you previously specified with the SET PERSONAL_NAME command.

The SHOW PERSONAL_NAME command displays your personal name.

FORMAT

SET [NO]PERSONAL_NAME *"text-string"*

command parameter

"text-string"

Specifies the string for the "From:" field of mail messages you send. You must enclose the string in quotation marks; otherwise, MAIL converts it to uppercase letters. You must begin the string with an alphanumeric character and avoid two consecutive embedded spaces within the string. The length of the "text-string" should not exceed 127 characters.

command qualifier

/USER=name

Used with the SHOW PERSONAL_NAME command to allow a user with SYSNAM privilege to see personal names set by other users.

EXAMPLE

```
MAIL> SET PERSONAL_NAME "Catherine the Great"
    .
    .
    .
MAIL> SEND
    .
    .
    .
New mail on node FLAXEN from ALPHA::BELLINI "Catherine the Great"
    .
    .
    .
From: ALPHA::BELLINI "Catherine the Great"  19-APR-85 15:34
To: FLAXEN::STARCK
```

This example shows how a user named Bellini sets her personal name to Catherine the Great.

SET/SHOW WASTEBASKET_NAME

Enables you to change the name of the WASTEBASKET folder. The WASTEBASKET folder contains messages selected to be deleted. You can delete all the messages in the WASTEBASKET folder by entering either the PURGE or EXIT command. You can avoid deleting messages in the WASTEBASKET folder by entering the QUIT command.

When you change the name of a WASTEBASKET folder while it contains deleted messages, these deleted messages move to the newly named WASTEBASKET folder.

The SHOW WASTEBASKET_NAME command displays the name of the WASTEBASKET folder.

FORMAT

SET WASTEBASKET_NAME *foldername*
SHOW WASTEBASKET_NAME

command parameter

foldername

Indicates the name that replaces the name WASTEBASKET for the folder containing deleted messages. You can use any alphanumeric string for the new WASTEBASKET folder name except MAIL or NEWMAIL.

command qualifiers

None.

EXAMPLE

```
MAIL> SET WASTEBASKET_NAME GARBAGE
MAIL> SHOW WASTEBASKET_NAME
The wastebasket folder name is GARBAGE
MAIL>
```

This example shows how to change and display the name of the WASTEBASKET folder.

SHOW ALL

Displays detailed information about the state of MAIL.

FORMAT

SHOW ALL

command parameters

None.

command qualifiers

None.

EXAMPLE

```
MAIL> SHOW ALL
Your mail file directory is DISK:[SIMPSON].
Your current mail file is DISK$DOCUMENT:[SIMPSON.NEWMAIL]MAIL.MAI;1.
Your current mail folder is MAIL.
The wastebasket folder name is GARBAGE.
Mail file DISK$DOCUMENT:[SIMPSON.NEWMAIL]MAIL.MAI;1
        contains 0 deleted message bytes.

You have 3 new messages.

You have not set a forwarding address.
Your personal name is "Louise Simpson".
Automatic copies to yourself are disabled.
Automatic deleted message purge is enabled.
```

This example shows how a user named Louise Simpson has entered the SHOW ALL command to display the following information about MAIL:

- The name of her mail file directory
- The current mail file and folder
- The name of the WASTEBASKET folder (see the SET WASTEBASKET_NAME command)
- The amount of deleted message space
- The number of any new (unread) messages
- Her forwarding address, if set (see the SET FORWARD command)
- Her personal name, if set (see the SET PERSONAL_NAME command)
- Whether she will receive copies of mail messages when she uses SEND or ANSWER (see the SET COPY_SELF command)
- Whether MAIL empties the WASTEBASKET folder when she uses EXIT or SET FILE (see the SET AUTO_PURGE command)

SHOW DELETED

Displays the amount of deleted message space in the current mail file.

FORMAT

SHOW DELETED

command parameters

None.

command qualifiers

None.

EXAMPLE

```
MAIL> SHOW DELETED
Mail file DISK$NOE:[TORTELLINI.NEWMAIL]MAIL.MAI;1
        contains 2452 deleted message bytes.
```

This example shows how a user named TORTELLINI displays the number of deleted message bytes.

SHOW KEY

Displays the key definitions created by the DEFINE/KEY command.

FORMAT

SHOW KEY *[key-name]*

command parameter

key-name
Specifies the name of the key whose definition you want displayed. See the DEFINE/KEY command for a list of the valid key names.

command qualifiers

/ALL
Displays all the key definitions in the specified state or states. You do not need to specify a keyname.

/BRIEF
Displays only the key definition. By default, you see all the qualifiers associated with the key definition, including any specified state, unless you use /BRIEF.

/DIRECTORY
Displays the names of all the states for which keys have been defined. If you have not defined any keys, SHOW KEY/DIRECTORY displays the DEFAULT and GOLD states (for the default and GOLD key definitions on the MAIL keypad).

/STATE=(state,state,...)
Specifies the name of a state for which the specified key definition(s) are to be displayed. If you specify two or more state names, separate them with commas and enclose the list in parentheses.

EXAMPLES

1

```
MAIL> SHOW KEY PF4
DEFAULT keypad definitions:
  PF4 = "read " (echo,terminate)
```

This example shows how to use the SHOW KEY command to display the definition of the PF4 key. When the PF4 key was defined, two qualifiers (/ECHO and /TERMINATE) were specified.

2

```
MAIL> SHOW KEY/ALL
DEFAULT keypad definitions:
  PF1 = "directory " (echo,state = FOLDER)
  PF2 = "HELP" (echo,terminate)
  PF3 = "select " (echo,terminate)
  PF4 = "read " (echo,terminate)
  KP0 = "NEXT" (echo,terminate)
```

This example shows how to use the SHOW KEY command to display all the key definitions you have created with the DEFINE/KEY command.

SHOW NEW_MAIL_COUNT

Displays the number of unread mail messages.

FORMAT

SHOW NEW_MAIL_COUNT

command parameters

None.

command qualifiers

None.

EXAMPLE

```
MAIL> SHOW NEW_MAIL_COUNT
You have 0 new messages.
```

This example shows how the SHOW NEW_MAIL_COUNT command displays the number of unread mail messages, in this case, zero.

SPAWN

Creates a subprocess of the current process. The context of the subprocess is copied from the current process. You can use the SPAWN command to leave MAIL temporarily, perform other functions (such as displaying a directory listing or printing a file), and then return to MAIL.

FORMAT

SPAWN *[command]*

command parameter

command

Specifies the DCL command string that executes in the context of the created subprocess. When the command completes, the subprocess terminates and control is returned to the parent process. If not specified, a subprocess is created transferring control to the DCL command level.

command qualifiers

/INPUT=file-spec

Specifies an input file containing one or more DCL command strings to be executed by the spawned subprocess. If you specify a command string along with an input file, the command string is processed before the commands in the input file. Once processing is complete, the subprocess is terminated.

/LOGICAL_NAMES

Specifies that the logical names of the parent process be copied to the subprocess. When you do not want the subprocess to use the logical names of the parent process, enter the qualifier /NOLOGICAL_NAMES. The default is /LOGICAL_NAMES.

/OUTPUT=file-spec

Identifies the output file to which the results of the SPAWN operation are written. You should specify an output other than SYS$OUTPUT whenever you specify /NOWAIT to prevent output from being displayed while you are specifying new commands. If you omit the /OUTPUT qualifier, output is written to the current SYS$OUTPUT device.

/PROCESS=subprocess-name

Specifies the name of the subprocess to be created. The default name of the subprocess is USERNAME_n.

/[NO]SYMBOLS

Determines whether the system passes DCL global and local symbols to the subprocess. The default is /SYMBOLS.

/WAIT

Controls whether the system waits until the subprocess is completed before allowing more commands to be specified. The /NOWAIT qualifier allows you to specify new commands while the specified subprocess is running. If you specify /NOWAIT, you should also use /OUTPUT to direct the output to a file (rather than displaying it on the screen) to prevent your terminal from being used by more than one process simultaneously.

EXAMPLES

1
```
MAIL> SPAWN SHOW TIME
```

This example shows how to create a subprocess that will execute the DCL command SHOW TIME while you are in MAIL.

2
```
MAIL> SPAWN PHONE
    .
    .
    .

% EXIT

MAIL>
```

This example shows how to create a subprocess that invokes the VAX/VMS Phone Utility while you are in MAIL. When you EXIT from PHONE, the subprocess disappears and the MAIL prompt returns.

3
```
MAIL> SPAWN DIRECTORY
    .
    .
    .
MAIL>
```

This example shows how to create a subprocess to invoke the DCL command DIRECTORY.

4
```
MAIL> SPAWN /OUTPUT=TIME.DAT SHOW TIME
MAIL> EXIT
$ TYPE TIME.DAT
9-MAY-1985 15:34:07
$
```

This example shows how to create a subprocess to invoke the SHOW TIME command while you are in MAIL. The /OUTPUT qualifier specifies that the file TIME.DAT contain the results of the SHOW TIME command.

5
```
MAIL> SPAWN /NOLOGICAL_NAMES SET HOST
_Node: MARS
    .
    .
    .
$ LOGOUT
CRAMMER logged out at ...

%REM-S-END, control returned to node _BETA::

MAIL>
```

This example shows how to use the SPAWN command to create a subprocess in which you SET HOST to another node. When you want to leave node MARS and move back to node BETA, enter the LOGOUT command. The /NOLOGICAL_NAMES qualifier prevents the logical names of the parent process from being copied to the subprocess.

```
6   MAIL> SPAWN RUNOFF FILENAME.RNO
      .
      .
      .
    MAIL>
```

This example shows how to spawn a subprocess to enter the DCL command RUNOFF. While the subprocess is running, you will be unable to enter other commands. When the RUNOFF command completes the task, the subprocess disappears and the MAIL prompt returns.

```
7   MAIL> SPAWN/NOWAIT/OUTPUT=LOG.DAT RUNOFF FILENAME.RNO
    MAIL>
```

This example shows how to spawn a subprocess to enter the DCL command RUNOFF. The /NOWAIT qualifier enables you to enter other commands while the subprocess is running. The output file, LOG.DAT, contains information about the spawn operation. (The RUNOFF command produces a MEM file, FILENAME.MEM.)

```
8   MAIL> SPAWN STOP/ENTRY=667 SYS$BATCH
    MAIL>
    Batch job ACCOUNTING (queue SYS$BATCH, entry 667) was aborted on
    1-JUN-1985 12:52
    MAIL>
```

This example shows how to create a subprocess to stop a batch job (entry 667).

The following examples demonstrate how to use the MAIL commands, SEND and READ.

EXAMPLES

1

```
$ MAIL
MAIL> SEND
To: BRIGHT::BRITTEN
Subj: June Recitals
Enter your message below.  Press CTRL/Z when complete, CTRL/C to quit:
    .
    .
    .
CTRL/Z
Exit
MAIL>
```

This example shows how to send a mail message to a user named Britten on node BRIGHT.

2

```
$ MAIL
You have 1 new message
MAIL> READ
    .
    .
    .
MAIL>
```

This example shows how to read a new mail message.

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READER'S COMMENTS

Note: This form is for document comments only. DIGITAL will use comments submitted on this form at the company's discretion. If you require a written reply and are eligible to receive one under Software Performance Report (SPR) service, submit your comments on an SPR form.

Did you find this manual understandable, usable, and well organized? Please make suggestions for improvement.

_____

_____

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Did you find errors in this manual? If so, specify the error and the page number.

_____

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SECOND EDITION
1979

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ADDENDUM

Data on the following companies was received after going to press

CALIFORNIA

LOS ALTOS

Letter Perfect (415) 941-1941
330 Second St
Zip 94022 (A14)

SAN DIEGO

The Word Processing Center (714) 225-1025
3725 Talbot St.
Zip 92106 (A11C)

SAN FRANCISCO

Copy Copia (415) 391-0574
220 Montgomery St
Zip 94104 (A11C)

Gretchen Friday (415) 981-3500
50 California St
Zip 94104 (A11C)

Jean's Secretarial Service (415) 822-5323
1449 Mendel Ave
Zip 94124 (A11C)

NEW YORK

NEW YORK

Telemail International (212) 686-2939
276 5th Ave Suite 307
Zip 10001 (A11C)

NOTE: Telemail International has established a domestic and international facsimile network. Contact Mr. Stanley, V.P. Marketing, to learn of the benefits available to all users of facsimile equipment participating in this network.

TEXAS

DALLAS

Energetics Group (214) 351-3089
330 W Mockingbird Ln Suite 624
Across from Love Field
[illegible] 75235 (A14C)

Reception of our first edition, released in early 1978, was understandably greeted with enthusiasm by those listed therein. Judging by the number of orders placed by large corporations, the **Directory of United States Electronic Mail Drops** has also filled a void felt by those who must have timely communication with individuals outside their own facsimile network.

In addition to reflecting an increase of twenty percent in the number of Electronic Mail Drops originally listed, the second edition includes several foreign points. As a supplement to reference data useful in estimating domestic line charges, international dialing procedures, rates and routing codes for hundreds of foreign cities are included in this edition to facilitate price quotation and occasional transmission of copy outside the United States. Firms which offer retransmission services to foreign points on sub minute equipment are also identified.

To accommodate a huge potential of facsimile traffic which permits the originator to pay for message receiving and delivery services, rather than the addressee, this edition identifies Electronic Mail Drops which accept credit cards or bill clientele for services rendered.

Companies, large or small, wishing to be included in the next edition (free of charge) may submit listing details to:

Tahoe Information and Business Services
P.O. Box 4031
Stateline, NV 89449

ALABAMA

Gadsden
FROST & FROST ADVERTISING
1125a Gardner St
Zip 35901 *(A22C)* 205-547-5421

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Zip 36606 *(A24)* 205-476-7248

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Zip 85016 *(A11C)* 602-955-9710

TELECOPIER CTR/CONFIDENTIAL COMM
3443 N Central Ste 609
Zip 85012 *(A21)* 602-264-6221

Scottsdale
TELAFAX COMMUNICATIONS SYS INC
Po Box 4577
Zip 85258 *(C19)* 602-991-4289

Tucson
EDI-TYPE SERVICES
5038 E Broadway
Zip 85711 *(A12)* 602-795-5800

CALIFORNIA

Beverly Hills
POSTAL INSTANT PRESS
9622 Brighton Wy
Zip 90210 *(A24)* 213-274-7589

Brea
THE INTERPRINT SHOP (TIPS)
1001 E Imperial Hwy
Zip 92621 *(A21C)* 714-529-4747

Costa Mesa
TAB COMMUNICATION SERVICE BUREAU
3001 Red Hill Bldg 5 Ste 108
Zip 92626 *(A14)* 714-754-0101

Cupertino
DE HARTS VALLCO COPY CENTER
10835 N Wolf Rd
Zip 95014 *(A24)* 408-257-9118

Emeryville
EXECUTIVE SECRETARIAL SERVICE
Watergate Twr No. 707
1900 Powell St
Zip 94608 *(A24)* 415-655-0348

Glendale
GLENDALE BLUEPRINT CO
120 S Orange St
Zip 91204 *(A23)* 213-241-4077

Hawthorne
CUSTOM STAMP CO INC
Po Box 469
3948 W 132nd St
Zip 90250 *(D11C)* 213-679-2261

Irvine
XEROX REPRODUCTION CENTER
17744 Sky Park Blvd
Zip 92714 *(A13C)* 714-754-1866

Laguna Niguel
COPYMAID COPY CENTER
27601 Forbes Rd Unit 54
Zip 92677 *(A22)* 714-831-2463

Long Beach
THE TELEPHONE SHOP
3803 Atlantic Ave
Zip 90807 *(A24C)* 213-426-9336

Los Angeles
C[illegible] PRINT
404 S Figueroa St 4th Level
Zip 90000 *(A22)* 213-620-6279

COPY PRINT
3200 Wilshire Blvd
Zip 90010 *(A14)* 213-474-0749

COPY PRINT
10880 Wilshire Blvd 19th Flr
Zip 90024 *(A14)* 213-474-0749

POSTAL INSTANT PRESS No. 150
10841 Santa Monica Blvd
Zip 90025 *(A24)* 213-475-0656

POSTAL INSTANT PRESS No. 4
3287 Wilshire Blvd
Zip 90010 *(A24)* 213-386-4200

XEROX REPRODUCTION CENTER
3255 Wilshire Blvd
Zip 90010 *(A24C)* 213-380-7350

Newport
EXEC SECRETARIAL/CONSULTING SVCE
2081 Business Ctr Dr Ste 260
Zip 92715 *(A11C)* 714-833-9592

Newport Beach
CHANDLER MEDIA PRODUCTIONS
901 Dove St Ste 200
Zip 92660 *(A13)* 714-833-7573

Oakland
AARDVARK TYPE
4241 Gilbert St
Zip 94611 *(A13)* 415-655-6876

Pasadena
DIAL-A-MESSENGER
750 E Green St
Zip 91101 *(A11C)* 213-795-1737

San Diego
QUIK PRINT
1369 6th Ave
Zip 92101 *(A21)* 714-234-8289

San Francisco
XEROX REPRODUCTION CENTER
55 Third St
Zip 94103 *(A24C)* 415-495-4820

San Mateo
REPRODUCTIONS UNLIMITED
59 Bovet Rd
Zip 94402 *(A12)* 415-574-8886

Whittier
INTERNATIONAL PRINTERS
13300 E Whittier Blvd
Zip 90602 *(A21C)* 213-698-9471

COLORADO

Denver
COPY BOY INC
1050 17th St
Prudential Plaza Bldg
Zip 80265 *(A22)* 303-534-1133

COPY BOY INC
1660 Lincoln
Lincoln Center Bldg
Zip 80264 *(A22)* 303-623-4700

COPY BOY INC
717 17th St
Energy Center One Bldg
Zip 80202 *(A22)* 303-571-4777

QUIK PRINT
304 17th
Zip 80202 *(A11)* 303-629-6444

RECORD EXECUTIVE ANSWER
11000 E Yale Suite 001
Zip 80232 *(A14)* 303-750-8699

WESTERN TELE-COMMUNICATIONS INC
5455 S Valentia Wy
Zip 80110 *(A24)* 303-779-1228

CONNECTICUT

Hartford
HALPRIN'S SERVICE CENTER
131 Brainard Rd
Zip 06114 *(B12)* 203-522-7838

PRONTO PRINTER
101 Pratt St
Zip 06100 *(A21)* 203-247-5715

DELAWARE

Wilmington
XEROX REPRODUCTION CENTER
704 Delaware Ave
Zip 19801 302-658-7904

DISTRICT of COLUMBIA

Washington
ALL STATE ANSWERING SERVICE
Dupont Circle Bldg Ste 710
Zip 20036 *(A22)* 202-872-0490

AMERICAN SERVICES
1345 19th St Nw
Zip 20036 *(A11C)* 202-638-8072

CALL-A-MESSENGER
1019 K St Nw
Zip 20001 *(A11C)* 202-783-4031

NATIONWIDE ANSWERING SERVICE
1346 Connecticut Ave Nw
Zip 20009 *(A21)* 202-783-6700

WASHINGTON REPRESENTATIVE SERVICES
2215 M St Nw
Zip 20037 *(A21)* 202-223-2411

FLORIDA

Daytona Beach
TIP-TOP PRINTING CO
Po Box 1550
Zip 32015 *(A12C)* 904-253-5945

Ft Walton Bch
DAYS INN
135 Miracle Strip Pkwy Sw
Zip 32548 *(A11C)* 904-244-6184

Lauderhill
FRANK LEONARD PERSONNEL
Greater Ft Laude
2331 No State Rd 7 Ste 144
Zip 33313 *(A24)* 305-735-0114

Miami
XERO COPY CENTER
112 W Flagler St
Zip 33130 *(A21)* 305-358-1256

XEROX REPRODUCTION CENTER
5046 Biscayne Blvd
Zip 33137 *(A24C)* 305-758-3686

No Miami
CHOICE DELIVERY SYSTEMS OF FL INC
11600 Ne 2nd Ave
Zip 33161 *(A11)* 305-757-0303

Orlando
BRUT CO
Po Box 1606
2301 N Orange Ave
Zip 32802 *(A11C)* 305-896-7551

ORLANDO MORTGAGE CO
1310 W Colonial Dr Ste 14
Zip 32804 *(A11C)* 305-843-6233

Panama City
DAYS INN MOTEL
4810 W Hwy 98
Zip 32401 *(A11C)* 904-769-4831

Tallahassee
BUDGET LUXURY INNS OF AMERICA INC
Po Box 3298
Zip 32312 *(A11C)* 904-386-7165

ESSENTIAL REPORTS INC
1311 Executive Center
Zip 32301 *(A21C)* 904-878-5134

Tampa
TAMPA BLUEPRINT CO
1319 N Florida
Zip 33602 *(A12)* 813-223-7861

Winter Park
JIFFY COPY CENTERS INC
120 New England Ave
Zip 32789 *(A21C)* 305-645-0041

HAWAII

Honolulu
LOUISE HALLER & ASSOC INC
540 Alexander Young Bldg
Zip 96813 *(D24)* 808-531-8905

ILLINOIS

Chicago
OFFICE AWAY O'HARE
O'hare Hilton Lower Level
Zip 60666 *(A21C)* 312-686-0400

OFFICE AWAY/MICHIGAN AVE
540 N Michigan Ave
Chicago Marriott Galleria 205
Zip 60611 *(A21C)* 312-644-2118

XEROX REPRODUCTION CENTER
160 N Franklin St Rm 39717
Zip 60606 *(A24C)* 312-454-2776

Des Plaines
NATIONAL TRANSPORTATION SAFETY
2300 E Devon Ave
Zip 60018 *(A24)* 312-827-8858

XEROX REPRODUCTION CENTER
1227 Rand Rd
Zip 60018 *(A24)* 312-297-7610

INDIANA

Indianapolis
INSTA/COM INC
501 W Washington
Rm 226 Lower Level
Zip 46204 *(J13C)* 317-632-1441

W Lafayette
COPY PRINT SHOP
614 W Stadium Ave
Zip 47906 *(A23C)* 317-743-4636

IOWA

Des Moines
DES MOINES BLUEPRINT
1112 Locust
Zip 50309 *(A11)* 515-244-1611

Dubuque
TELAFAX COMMUNICATIONS SYSTEM INC
Po Box 694
210 Jones
Zip 52001 *(D21)* 319-582-7261

KENTUCKY

Frankfort
INSTA/COM INC
314 W Main St
Zip 40601 *(J13C)* 504-223-2034

LOUISIANA

New Orleans
NEW ORLEANS BLUEPRINT
824 Union St
Zip 70112 *(A22C)* 504-525-4271

MASSACHUSETTS

Boston
CALL-A-MESSENGER
Ten Post Office Square
Zip 02109 *(A11C)* 617-482-1671

COPY CO INC
815 Boyleston St
Zip 02116 *(A21C)* 617-267-9267

COPY COP
13 Congress St
Zip 02110 *(A21C)* 617-367-2738

Waltham
XEROX REPRODUCTION CENTER
211 Second Ave
Zip 02154 *(A21)* 617-890-4733

Worcester
BOSWELL'S SECRETARY SERVICE
48 Cedar St
Zip 01609 *(A11)* 617-791-7211

MARYLAND

Baltimore
BUDS NATIONAL PERMIT SERVICE INC
1035 Cromwell Bridge Rd
Zip 21204 *(D22C)* 301-828-1111

HARBOR PRINTING & COPY SERVICE
26 E Baltimore St
Zip 21202 *(A11)* 301-685-7122

XEROX REPRODUCTION CENTER
214 No Charles St First Floor
Zip 21201 *(A23C)* 301-332-0001

Silver Spring
CALL-A-MESSENGER
1101 Ripley St
Zip 20910 *(A11C)* 301-565-2979

MICHIGAN

Ann Arbor
UNIV OF MICHIGAN-CREDIT UNION
Po Box 7850
Zip 48107 *(A13)* 313-761-1595

Battlecreek
EMBOSSING PRINTERS INC
5350 W Dickman
Zip 49017 *(A14)* 616-968-2222

Detroit
XEROX REPRODUCTION CENTER
2381 First National Building
Zip 48226 *(A23C)* 313-964-0100

Troy
XEROX REPRODUCTION CENTER
1021 Naughton St
Zip 48084 *(A23C)* 313-689-8200

MINNESOTA

Minneapolis
ALBINSON INC
7th & Nicolett Mall
Zip 55402 *(D21)* 612-374-1120

INTERIM INCORPORATED
400 Shelard Tower Main Floor
Zip 55426 *(A14)* 612-544-3009

MISSISSIPPI

Jackson
DEPOSIT GUARANTEE BANK
Deposit Guarantee Plaza
Zip 39200 *(A14)* 601-354-8408

MISSOURI

Clayton
SUPERIOR OFFICE SERVICES
7701 Forsyth Ste 1353
Zip 63105 *(A13)* 314-727-2240

Kansas City
BUZZ PRINT
205 E 10th St
Zip 64106 *(A21)* 816-842-0889

DEMAREE STATIONERY STORE
908 Walnut
Zip 64106 *(A24C)* 816-842-9307

St Louis
GARY FERGUSON INC
Ste 3201
One Mercantile Center
Zip 63101 *(A22)* 314-231-2245

OFFICE PLUS/ST LOUIS
111 W Port Plaza Ste 600
Zip 63141 *(A21C)* 314-434-9500

SPECIAL DISPATCH
10629 Liberty Ave
Zip 63132 *(E11)* 314-428-2892

XEROX REPRODUCTION CENTER
2145 Hampton Ave
Zip 63100 *(A11C)* 314-644-2603

MONTANA

Billings
XERO COPY CENTER
Lobby Scrties Bldg
2708 1/2 1st Ave North
Zip 59101 *(A22)* 406-245-7757

NEVADA

Las Vegas
MANPOWER TEMPORARY SERVICES
Mgm Grand Ste 17
3645 Las Vegas Blvd So
Zip 89101 *(A14)* 702-739-8170

Reno
CONVENTION AND SECRETARIAL SERVICE
Mgm Grand Arcade Level
Zip 89500 *(A22)* 702-329-2617

Stateline
TIBS
178 Pineridge Bx 4031
Zip 89449 *(A11C)* 702-588-3866

NEW JERSEY

Cherry Hill
ESS DIV KRANZLEY & CO
1010 So Kings Hwy
Zip 08034 *(D11C)* 609-795-4116

Mountainside
XEROX REPRODUCTION CENTER
284 Sheffield St
Zip 07092 *(A24C)* 201-233-7625

Teaneck
XEROX REPRODUCTION CENTER
107 W Tryon Ave
Zip 07666 *(A24C)* 201-837-1869

NEW MEXICO

Albuquerque
REAY'S TYPOGRAPHIC SERVICE INC
Po Box 25666
Zip 87125 *(C21)* 505-247-0155

NEW YORK

Baldwin
CENTURY BROKERAGE SERVICES LTD
2280 Grand Ave Ste 306
Zip 11510 *(A21)* 516-868-8100

Brooklyn
XEROX REPRODUCTION CENTER
1 Smith St 2nd Floor
Zip 11201 *(A11C)* 212-855-8729

Buffalo
THE COPY CAT
1121 Elmwood Ave
Zip 14221 *(A24)* 716-883-6300

Forest Hills
CENTURY BROKERAGE SERVICES
107-21 Queens Blvd
Zip 11375 *(A13)* 212-793-3100

Jamaica
QUINN COMMUNICATIONS
Aquaduct Race Track
Zip 11400 *(D19)* 212-641-4700

New York
COPY CLEARING HOUSE INC
233 Park Ave
Inter-City Messenger Service
Zip 10017 *(A11)* 212-867-2028

COPY QUICK
41 East 46th St
Zip 10017 *(A11)* 212-751-5915

DIAL-A-MESSENGER
18 E 41st St
Zip 10017 *(A11C)* 212-532-4300

SYNDIFAX
11th Floor Ste Igi
200 E 42nd St
Zip 10017 *(E11C)* 212-986-6663

WORLD-WIDE BUSINESS CENTERS INC
575 Madison Ave
Zip 10022 *(E11C)* 212-486-0948

XEROX REPRODUCTION CENTER
55 Water St
Zip 10041 *(A11C)* 212-952-4660

XEROX REPRODUCTION CENTER
295 Madison Ave
Zip 10017 *(A11C)* 212-397-7448

XEROX REPRODUCTION CENTER
136 W 52nd St
Zip 10019 *(A11C)* 212-397-7530

New York City
CANE COPY CENTER
124 East 40th St
Zip 10016 *(A24)* 212-682-2058

Plainview
XEROX REPRODUCTION CENTER
260 Newton Rd
Zip 11803 *(A24C)* 516-293-4633

Rochester
MIDTOWN PRINTING CTR INC
274 Midtown Plaza
Zip 14604 *(A12)* 716-546-6096

White Plains
XEROX REPRODUCTION CENTER
202 Mamaroneck Ave
Zip 10601 *(A23C)* 914-946-7630

NORTH CAROLINA

Charlotte
CANNON ASSOCIATES
212 S Tryon St Ste 100
Zip 28281 *(A11)* 704-333-0304

CANNON INSTANT PRINTING
Johnston Bldg Ste 100
Zip 28200 *(A14C)* 704-333-0303

Raleigh
PALMER INSTANT COPY SERVICE
5105 Bur Oak Cir
Zip 27600 *(A21)* 919-787-7811

OHIO

Cincinnati
POSTAL INSTANT PRESS
125 E 9th St
Zip 45202 *(A24)* 513-721-1660

Cleveland
XEROX REPRODUCTION CENTER
1231 Superior Ave Ne
Zip 44114 *(A11C)* 216-771-5500

Columbus
BUTLER REPORT CO
Mound & High Fourth Floor
Zip 43215 *(A24)* 614-221-8073

QUIK PRINT
138 N High St
Zip 43215 *(A21)* 614-228-3619

Dayton
ROBERT OFFICE SERVICE
4130 Linden Ave No. 230
Zip 45432 *(A21)* 513-258-2932

Hubbard
TEL-FAX CORP
57 Hubbard-Brookfield
Zip 44425 *(D12)* 216-534-1583

Lakewood
TEL-FAX CORP
14714 Detroit Rm 202
Zip 44107 *(D12)* 216-228-1211

Toledo
PINKUS THE PRINTER
502 Madison
Zip 43604 *(A14C)* 419-243-5386

OKLAHOMA

Oklahoma City
DAVID HALL INVESTMENTS
Po Box 12528
511 United Founders Twr
Zip 73112 *(A13)* 405-848-5606

PROFESSIONAL SUITE TOWERS
1500 City National
Zip 73100 *(A22C)* 405-236-1544

Tulsa
SECRETARIAL CENTER
507 South Main 2nd Floor
Zip 74103 *(A11C)* 918-582-2565

OREGON

Portland
PRINT RIGHT COPY CENTER
819 Sw 6th Ave
Zip 97204 *(A13)* 503-228-6307

Tigard
PRINT RIGHT COPY CENTER
11849 So West Pacific Hwy
Zip 97223 *(A22)* 503-228-6307

PENNSYLVANIA

King/Prussia
XEROX REPRODUCTION CENTER
Zip 19406 *(A24)* 215-265-5580

Media
TRANSLOG SERVICES
600 North Jackson
Zip 19063 *(A23)* 215-565-6424

New Britain
COPY MAGIC BUSINESS SERVICES
Rt 202
Zip 18901 *(A11)* 215-345-1557

Philadelphia
MCKINLEY WOTHERS
1917 E Allegheny Ave
Zip 19134 *(A11)* 215-427-3252

XEROX REPRODUCTION CENTER
1340 Cherry St
Zip 19107 *(A24C)* 215-922-7430

Pittsburgh
LESKO RESEARCH CORP
3 Gateway Center
Zip 15222 *(A13)* 412-566-1680

XEROX REPRODUCTION CENTER
625 Stanwix St
Zip 15222 *(A11C)* 412-281-3100

Quakertown
COPY MAGIC BUSINESS SERVICES
Quaker Village Shopping Ctr
Zip 18951 *(A11)* 215-538-0350

PUERTO RICO

Hato Rey
JARRA CORPORATION
321 Urb Ext Rsvlt
Calle Eleanor Roosevelt
Zip 00908 *(M11)* 809-724-7075

RHODE ISLAND

Providence
XEROX REPRODUCTION CENTER
37 Kennedy Plaza
Zip 02903 *(A24C)* 401-521-6070

SOUTH CAROLINA

Charleston
CHARLESTON BLUEPRINT/SPLY CO INC
Po Box 806 At Hasell
Zip 29402 *(A11C)* 803-722-1619

Columbia
XEROX TELECOPIER SERVICE
1425 Sumter
Zip 29201 *(A11C)* 803-799-9270

Easley
GRAPHICS COMMUNICATIONS
Rt 5 Box 383
Zip 29640 *(C13)* 803-859-6748

SOUTH DAKOTA

Belle Fourche
WAYNE'S SERVICE
Box 9
Zip 57717 *(A93)* 605-892-4794

TENNESSEE

Nashville
INSTA/COM INC
Capitol Blvd Bldg Rm 208
Zip 37219 *(J13C)* 615-256-3485

TEXAS

Austin
GINNY'S COPYING SERVICE
2021 Guadalupe/44 Dobie Mall
Zip 78705 *(A11C)* 512-476-5815

GINNY'S COPYING SERVICE INC
108 Congress Ave
Zip 78701 *(D11C)* 512-477-3605

GINNY'S COPYING SERVICE INC
2700 W Anderson Ln
Zip 78757 *(A11C)* 512-459-4363

IT PRINTING
1800 Lavaca
Zip 78767 *(A11C)* 512-476-6662

SPELCE NEAL ASSOCIATES
Austin Nat'l Bank
Po Box 1905
Zip 78767 *(A24)* 512-476-4644

Corpus Christi
ADMIRAL AIDS
Bank Trust Towers Ste 646
Zip 78704 *(A93)* 512-882-4657

Dallas
DIAL-A-MESSENGER INC
1111 Lagoon Dr
Zip 75207 *(A11)* 214-688-0430

INSTA/COM INC
1525 Viceroy
Zip 75235 *(E13C)* 214-631-1505

QUIK PRINT
One Main Pl Concourse Level
Zip 75250 *(A11)* 214-741-1425

SNAPPY INSTANT PRINTING
5934 Royal Ln Ste 252
Zip 75230 *(A14)* 214-369-4154

XEROX REPRODUCTION CENTER
2931 Irving Blvd
Zip 75247 *(A11C)* 214-747-0537

Fort Worth
XEROX REPRODUCTION SERVICES
416 Taylor St
Zip 76102 *(A14)* 817-338-0373

Houston
AIR COURIERS INTERNATIONAL
16770 Hedgecraft
Zip 77060 *(A11C)* 713-931-6040

CHURCHILL GROUP INC
9039 Katy Freeway Ste 237
Zip 77024 *(A23)* 713-932-0094

XEROX REPRODUCTION CENTER
2929 Milam St
Zip 77006 *(A11C)* 713-526-9252

Lubbock
GINNY'S COPYING SERVICE INC
2618 34th St
Zip 79410 *(A11C)* 806-795-9577

San Marcos
GINNY'S COPYING SERVICE INC
400 University Ave
Zip 78666 *(A11C)* 512-392-1421

UTAH

Bountiful
CARR PRINTING COMPANY
535 West 500 South
Zip 84010 *(A11)* 801-295-2321

Salt Lake City
ALPHA GRAPHICS
28 W 100 South
Zip 84101 *(A23)* 801-364-8451

POSTAL INSTANT PRESS
No. 4 West Second South
Zip 84101 *(A12C)* 801-532-3232

VIRGINIA

Arlington
XEROX REPRODUCTION CENTER
1616 N Fort Meyer Dr
Zip 22209 *(A14C)* 703-841-0839

Falls Church
AMERICAN AUTOMOBILE ASSOCIATION
811 Gatehouse Rd
Zip 22042 *(A14)* 703-222-6332

WASHINGTON

Bellevue
ROSEMARY'S SECRETARIAL SERVICE
Seattle Trust Bldg
10655 Ne 4th No. 400
Zip 98005 *(A39)* 206-454-4383

Richland
BATTELLE PACIFIC NORTHWEST LAB
Battelle Blvd
Rob Bldg
Zip 99352 *(D24)* 509-946-2718

Seattle
FEEKS TELEPHONE ANSWERING SERVICE1
405 Seattle Tower
218 3rd Ave
Zip 98100 *(A24)* 206-624-3495

WEST VIRGINIA

Morgantown
INTERSTATE FLAG CAR ASSOCIATION
383 University Ave
Zip 26505 *(A11C)* 304-296-8111

WISCONSIN

Green Bay
TELEPHONE SECRETARIES OF GREEN BAY
416 Crooks St
Zip 54301 *(A11)* 414-432-1126

Madison
TRANSCEIVER NORTHWEST INC
505 Cottage Grove Rd
Zip 53716 *(A22)* 608-222-7186

Milwaukee
BONDED MESSENGER SERVICE
1610 N Water St
Zip 53202 *(D11)* 414-276-3217

XEROX REPRODUCTION CENTER
732 North Milwaukee St
Zip 53202 *(A21C)* 414-291-9550

ZIGMAN JOSEPH SKEEN
700 N Water St
Zip 53202 *(A24)* 414-273-4680

FOREIGN

London Ec3a8aa
PHOTOPHONE CLUB UlK
41 St Mary Ave
%City Document Exch
Zip ----- *(E11)* 162-356-55

Manitoba 82
XEROX REPRODUCTION CENTER
Winnipeg
246 Portage Ave
Zip ----- *(A21C)* 204-942-2206

Ontario L4t
DIAL-A-MESSENGER
Mississauga
7544 Bath Rd
(A11C)

XEROX REPRODUCTION CENTER
Toronto
703 Don Mills Rd
Zip ----- *(A21C)* 416-425-5183

XEROX REPRODUCTION CENTER
Toronto
390 Bay St
Zip ----- *(A21C)* 416-363-7796

Quebec 89
XEROX REPRODUCTION CENTER
Montreal
2075 University
Zip ----- *(D24C)* 514-288-5109

TRANSMISSION LINE CHARGES

When used in conjunction with the Airline Mileage Tables (p.p. 18-23) the following rate tables provide a convenient reference for estimating interstate facsimile line charges between ELECTRONIC MAIL DROPS

INTERSTATE
LONG DISTANCE MESSAGE TELECOMMUNICATIONS – TWO POINT SERVICE
IN EFFECT JUNE 30, 1978
AMERICAN TELEPHONE AND TELEGRAPH COMPANY & ASSOCIATED COMPANIES
INTERSTATE SERVICE BETWEEN POINTS IN THE UNITED STATES (EXCEPT ALASKA & HAWAII)

RATE MILEAGE ϕ	DIAL STATION	OPERATOR STATION	OPERATOR PERSON	ALL TRAFFIC
	DAY*	DAY, EVENING, NIGHT & WEEKEND*		DAY*
	INITIAL ONE MINUTE	INITIAL THREE MINUTES	INITIAL THREE MINUTES	EACH ADDITIONAL MINUTE
1-10	$ .19	$ .45	$ 1.45	$ .08
11-16	.23	.60	1.60	.11
17-22	.27	.80	1.80	.13
23-30	.31	1.00	2.00	.17
31-40	.35	1.10	2.10	.20
41-55	.39	1.35	2.35	.24
56-70	.41	1.60	2.60	.26
71-124	.43	1.75	2.75	.28
125-196	.44	1.85	2.85	.29
197-292	.46	1.95	2.95	.31
293-430	.48	2.00	3.05	.33
431-925	.50	2.05	3.15	.34
926-1910	.52	2.15	3.30	.36
1911-3000	.54	2.25	3.55	.38

*RATE APPLICATION PERIODS

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
8AM to 5PM	Day Rate Period = FULL RATE						
5PM to 11PM	Evening Rate Period 35% Discount #						Eve 35%#
11PM to 8AM	Night & Weekend Rate Periods 60% Discount #						

ϕ Determined in Accordance with the V H System

#DISCOUNTS

Discounts apply to total charges for Dial Station calls and to Additional Minute Charges only for Operator Station and Person calls.

INTERSTATE
LONG DISTANCE MESSAGE TELECOMMUNICATIONS – TWO POINT SERVICE
IN EFFECT JULY 1, 1977
AMERICAN TELEPHONE AND TELEGRAPH COMPANY AND ASSOCIATED COMPANIES
INTERSTATE SERVICE BETWEEN U.S. MAINLAND AND ALASKA

RATE MILEAGE ϕ	DIAL STATION *	OPERATOR STATION	OPERATOR PERSON	ALL TRAFFIC *	
	DAY	DAY, EVENING, NIGHT & WEEKEND		DIAL	OPR.
	INITIAL ONE MINUTE	INITIAL THREE MINUTES	INITIAL THREE MINUTES	EACH ADDITIONAL MINUTE	
431 – 925	$ .66	$2.30	$4.05	$.47	$ .52
926 – 1910	.69	2.45	4.25	.51	.55
1911 – 3000	.80	2.85	4.75	.62	.66
3001 – 4250	.91	3.25	5.20	.73	.77
4251 – 5750	1.02	3.60	5.65	.84	.88

INTERSTATE SERVICE BETWEEN U.S. MAINLAND AND HAWAII

RATE BAND	DIAL STATION *	OPERATOR STATION	OPERATOR PERSON	ALL TRAFFIC *	
	DAY	DAY, EVENING, NIGHT & WEEKEND		DIAL	OPR.
	INITIAL ONE MINUTE	INITIAL THREE MINUTES	INITIAL THREE MINUTES	EACH ADDITIONAL MINUTE	
1	$.71	$2.70	$4.95	$.53	$.59
2	.77	2.95	5.45	.59	.65
3	.81	3.10	5.80	.62	.68

BAND 1
ARIZ
CAL
IDA
NEV
ORE
UTAH
WASH

BAND 2
ARK MO TEX
COLO MONT WISC
ILL NEB WYO
IOWA NM
KAN ND
LA OKLA
MINN SD

BAND 3
ALA MD PA
CONN MASS RI
DEL MICH SC
DC MISS TENN
FLA NH VT
GA NJ VA
IND NY W VA
KY NC
ME OHIO

BETWEEN UNITED STATES AND CANADA

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
SERVICE BETWEEN POINTS IN THE UNITED STATES (EXCEPT ALASKA AND HAWAII) AND POINTS IN CANADA

IN EFFECT
6-30-78

MILEAGE	DDD DAY* INIT 1 MIN	OPH ALLDYS ALLHRS INIT 3 MINS	PERSON ALLDYS ALLHRS INIT 3 MINS	ALL TRAF DAY* EACH ADDL MIN
1-8	.15	.40	1.10	.07
9-18	.18	.45	1.20	.09
19-30	.22	.55	1.40	.12
31-50	.26	.70	1.60	.16
51-80	.30	.85	1.80	.20
81-110	.34	1.00	2.00	.24
111-140	.38	1.15	2.20	.28
141-180	.42	1.30	2.40	.32
181-220	.46	1.45	2.60	.36
221-270	.50	1.60	2.80	.40
271-345	.54	1.75	3.10	.44
346-430	.59	1.90	3.40	.49
431-630	.65	2.05	3.70	.55
631-900	.71	2.20	4.00	.61
901-1200	.77	2.40	4.40	.67
1201-1610	.82	2.60	4.80	.72
1611-2220	.86	2.80	5.20	.76
2220-OVER	.90	3.00	5.60	.80

* Rate Application Periods

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
8 AM to 6 PM	Day Rate Period Full Rate						
6 PM to 12 Mid	Evening Rate Period 35% Discount(a)						
12 Mid to 8 AM	Night & Weekend Rate Periods 60% Discount(a)						

(a) Discounts

Discounts apply to total charges for Dial Station Calls and to Additional Minute Charges Only for Operator Station and Person Calls.

BETWEEN UNITED STATES AND MEXICO

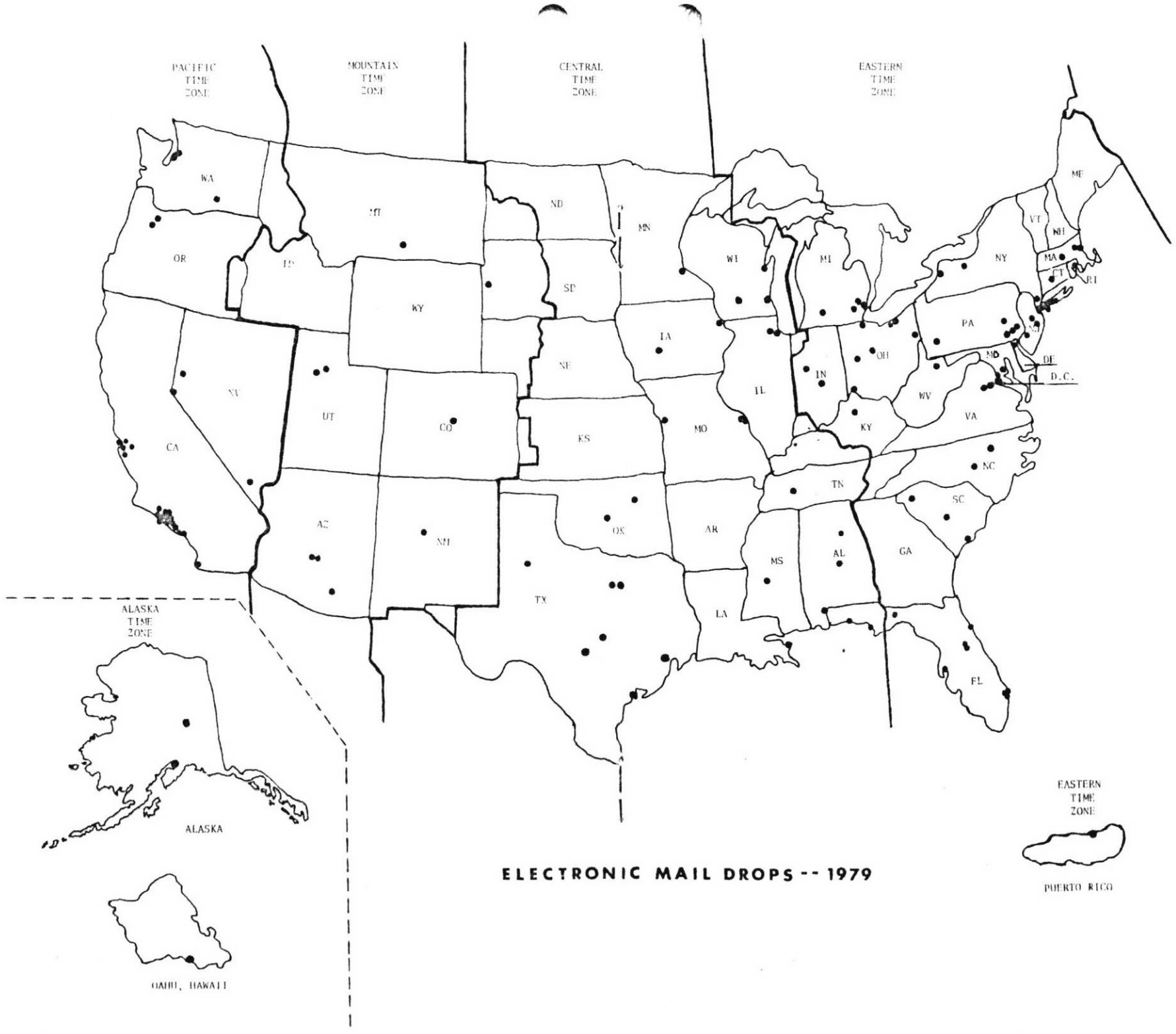
AMERICAN TELEPHONE AND TELEGRAPH COMPANY
FOR DISTANCES IN THE UNITED STATES ON MESSAGES BETWEEN POINTS IN THE UNITED STATES (EXCEPT ALASKA AND HAWAII) POINTS IN MEXICO (OTHER LINE RATES APPLY WITHIN MEXICO)

IN EFFECT
6-30-78

MILEAGE	DDD DAY INIT 3 MINS	DDD EVE INIT 3 MINS	DDD NIGHT INIT 3 MINS	OPH ALLDYS ALLHRS INIT 3 MINS	PERSON ALLDYS ALLHRS INIT 3 MINS	ALL TRAF DAY EACH ADDL MIN	ALL TRAF EVE EACH ADDL MIN	ALL TRAF NIGHT EACH ADDL MIN
1-10	.22	.18	.15	.40	1.10	.07	.05	.04
11-16	.28	.24	.20	.50	1.20	.08	.07	.05
17-22	.40	.34	.25	.65	1.30	.10	.09	.06
23-30	.45	.40	.30	.80	1.40	.11	.10	.06
31-40	.50	.45	.35	.90	1.50	.14	.11	.07
41-55	.60	.53	.40	1.10	1.60	.17	.13	.08
56-70	.70	.60	.45	1.15	1.70	.19	.15	.09
71-124	.80	.65	.55	1.35	1.90	.22	.18	.12
125-196	.90	.75	.65	1.45	2.10	.24	.20	.15
197-292	1.00	.80	.70	1.60	2.30	.26	.21	.15
293-430	1.15	.85	.75	1.75	2.50	.30	.22	.15
431-925	1.35	.95	.85	1.85	2.80	.35	.23	.18
926-1910	1.50	1.05	.95	2.00	3.10	.41	.25	.20
1911-3000	1.65	1.15	1.05	2.15	3.55	.46	.25	.20

Rate Application Periods

Customer Dialed			Operator & Person
Day	Evening	Night	Evening
8A - 6P Mon. - Fri.	6P - 11P Mon. - Fri. & 8A - 11P Sat.	11P - 8A Daily & 8A - 11P Sun.	6P - 8A Mon. - Fri. & All Day Sat. & Sun.



ELECTRONIC MAIL DROPS -- 1979

AIRLINE MILES

	Albuquerque, N. Mex.	Amarillo, Tex.	Atlanta, Ga.	Billings, Mont.	Birmingham, Ala.	Boston, Mass.	Buffalo, N.Y.	Burlington, Vt.	Charleston, S.C.	Charlotte, N.C.	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Dallas, Tex.	Denver, Colo.
Albuquerque, N. Mex.		273	1272	744	1138	1972	1580	1878	1539	1457	429	1129	1251	1421	598	334
Amarillo, Tex.	273		999	809	866	1722	1338	1610	1266	1185	440	891	992	1173	334	358
Atlanta, Ga.	1272	999		1519	140	937	697	951	262	227	1229	587	369	554	721	1212
Billings, Mont.	744	809	1519		1425	1961	1473	1713	1761	1617	370	1073	1304	1369	1092	453
Birmingham, Ala.	1138	866	140	1425		1052	776	1049	402	261	1119	578	406	618	581	1095
Boston, Mass.	1972	1722	937	1861	1052		400	182	820	721	1735	851	740	551	1551	1769
Buffalo, N.Y.	1580	1338	697	1473	776	400		304	699	538	1335	454	393	173	1198	1370
Burlington, Vt.	1878	1610	951	1713	1049	182	304		884	755	1612	749	620	476	1501	1654
Charleston, S.C.	1539	1266	267	1761	402	820	699	884		177	1486	957	506	699	981	1474
Charlotte, N.C.	1457	1185	227	1617	361	721	538	755	177		1362	587	335	435	930	1358
Cheyenne, Wyo.	429	440	1229	370	1119	1735	1335	1612	1486	1362		891	1082	1199	726	96
Chicago, Ill.	1129	891	587	1073	578	851	454	749	757	587	891		252	308	803	920
Cincinnati, Ohio	1251	992	369	1304	406	740	393	620	506	335	1082	252		222	814	1094
Cleveland, Ohio	1421	1173	554	1369	618	551	173	476	699	435	1199	308	222		1025	1227
Dallas, Tex.	588	334	721	1092	581	1551	1198	1501	981	930	726	803	814	1025		663
Denver, Colo.	334	358	1212	453	1095	1769	1370	1654	1474	1358	96	920	1094	1227	663	
Des Moines, Iowa	837	626	739	798	670	1159	760	1049	967	819	583	309	510	617	632	610
Detroit, Mich.	1364	1124	596	1283	641	613	216	516	681	501	1125	238	235	90	999	1156
El Paso, Tex.	229	358	1291	973	1152	2072	1692	1995	1552	1496	653	1252	1335	1525	572	557
Fargo, N. Dak.	961	847	1114	565	1060	1300	910	1149	1317	1153	563	569	820	835	972	612
Houston, Tex.	754	533	701	1315	567	1605	1286	1580	936	927	947	940	892	1114	225	879
Indianapolis, Ind.	1169	915	426	1204	433	807	435	739	594	428	986	165	100	263	763	1000
Jacksonville, Fla.	1488	1219	285	1796	374	1017	879	1079	197	311	1493	863	626	770	908	1467
Kansas City, Mo.	720	481	676	846	579	1251	861	1161	928	803	560	414	541	700	451	558
Knoxville, Tenn.	1280	1009	155	1447	235	818	548	815	316	180	1183	454	219	400	767	1178
Little Rock, Ark.	816	543	456	1143	325	1259	913	1214	723	649	813	552	524	740	293	780
Los Angeles, Calif.	664	937	1936	959	1802	2596	2198	2485	2203	2119	882	1745	1897	2049	1240	831
Louisville, Ky.	1178	915	319	1275	331	826	483	780	500	343	1033	269	90	311	726	1038
Memphis, Tenn.	939	667	337	1213	217	1137	803	1100	604	521	902	482	410	630	420	879
Miami, Fla.	1698	1441	601	2085	665	1255	1181	1347	482	652	1763	1188	952	1087	1111	1726
Minneapolis, Minn.	983	812	907	742	862	1123	731	985	1104	939	642	355	605	630	862	700
Nashville, Tenn.	1119	848	214	1309	182	943	627	916	455	340	1032	397	238	459	617	1023
New Orleans, La.	1029	776	424	1479	312	1359	1086	1361	630	649	1131	833	706	924	443	1082
New York, N.Y.	1815	1560	748	1760	864	188	292	260	641	533	1604	713	570	405	1374	1631
Omaha, Nebr.	721	526	817	703	732	1282	883	1171	1058	918	463	432	622	739	586	488
Philadelphia, Pa.	1753	1494	666	1727	783	271	279	328	562	451	1556	666	503	360	1299	1579
Phoenix, Ariz.	330	598	1592	872	1456	2300	1906	2202	1857	1783	663	1453	1581	1749	887	586
Pittsburgh, Pa.	1499	1244	521	1479	608	483	178	445	528	362	1298	410	257	115	1070	1320
Portland, Oreg.	1107	1304	2172	686	2066	2540	2156	2385	2425	2290	947	1758	1985	2055	1633	982
Raleigh, N.C.	1576	1306	356	1698	491	609	490	665	220	130	1461	642	396	428	1057	1463
St. Louis, Mo.	942	685	467	1057	400	1038	662	966	704	568	795	262	309	492	547	796
Salt Lake City, Utah	481	668	1583	387	1466	2099	1699	1969	1845	1727	371	1260	1453	1568	999	371
San Antonio, Tex.	617	444	882	1252	744	1766	1430	1729	1122	1105	882	1051	1039	1256	252	802
San Francisco, Calif.	896	1157	2139	904	2013	2699	2300	2568	2405	2301	967	1858	2043	2166	1483	949
Seattle, Wash.	1184	1359	2182	668	2082	2493	2117	2333	2428	2285	973	1737	1972	2026	1681	1021
Spokane, Wash.	1030	1176	1961	443	1865	2266	1888	2108	2204	2059	768	1508	1744	1796	1489	826
Syracuse, N.Y.	1718	1475	781	1600	875	264	138	177	738	595	1472	592	514	303	1326	1508
Tulsa, Okla.	604	335	678	930	552	1398	1023	1327	945	853	588	598	661	853	236	550
Washington, D.C.	1653	1391	543	1669	661	393	292	432	453	330	1477	597	404	306	1185	1494
Wichita, Kans.	549	304	776	801	658	1424	1036	1337	1039	933	465	591	702	873	340	437

	Des Moines, Iowa	Detroit, Mich.	El Paso, Tex.	Fargo, N. Dak.	Houston, Tex.	Indianapolis, Ind.	Jacksonville, Fla.	Kansas City, Mo.	Knoxville, Tenn.	Little Rock, Ark.	Los Angeles, Calif.	Louisville, Ky.	Memphis, Tenn.	Miami, Fla.	Minneapolis, Minn.	Nashville, Tenn.	New Orleans, La.
Albuquerque, N. Mex.	837	1364	229	961	754	1169	1488	720	1280	816	664	1178	939	1698	983	1119	1029
Amarillo, Tex.	626	1124	358	847	533	915	1219	481	1009	543	937	915	667	1441	812	848	776
Atlanta, Ga.	739	596	1291	1114	701	426	285	676	155	456	1936	319	337	604	907	214	424
Billings, Mont.	798	1283	973	565	1315	1204	1796	846	1447	1143	959	1275	1213	2085	742	1309	1479
Birmingham, Ala.	670	641	1152	1060	567	433	374	579	235	325	1802	331	217	665	862	182	312
Boston, Mass.	1159	613	2072	1300	1605	807	1017	1251	818	1259	2596	826	1137	1255	1123	943	1359
Buffalo, N.Y.	760	216	1692	919	1286	435	879	861	548	913	2198	483	803	1181	731	627	1086
Burlington, Vt.	1049	516	1995	1149	1580	739	1079	1161	815	1214	2485	780	1100	1347	985	916	1361
Charleston, S.C.	967	681	1552	1317	936	594	197	928	316	723	2203	500	604	482	1104	455	630
Charlotte, N.C.	819	504	1496	1153	927	428	341	803	180	649	2119	343	521	652	939	340	649
Cheyenne, Wyo.	583	1125	653	563	947	986	1493	560	1183	813	882	1033	902	1763	642	1032	1131
Chicago, Ill.	309	238	1252	569	940	165	863	414	454	552	1745	269	482	1188	355	397	833
Cincinnati, Ohio	510	235	1335	820	892	100	626	541	219	524	1897	90	410	952	605	238	706
Cleveland, Ohio	617	90	1525	835	1114	263	770	700	400	740	2049	311	630	1087	630	459	924
Dallas, Tex.	632	999	572	972	225	763	908	451	767	293	1240	726	420	1111	862	617	443
Denver, Colo.	610	1156	557	642	879	1000	1467	558	1178	780	831	1038	879	1726	700	1023	1082
Des Moines, Iowa		546	983	397	821	411	1023	180	651	478	1438	476	485	1333	235	525	827
Detroit, Mich.	546		1479	745	1105	240	831	645	442	723	1983	316	623	1152	543	470	939
El Paso, Tex.	983	1479		1163	676	1264	1473	839	1326	847	701	1254	976	1643	1157	1169	983
Fargo, N. Dak.	397	745	1163		1183	725	1399	549	1004	869	1427	818	882	1716	214	902	1222

Houston, Tex.	821	1105	676	1183		865	821	644	790	388	1374	803	484	968	1056	665	318
Indianapolis, Ind.	411	240	1264	725	865		699	453	290	483	1809	107	384	1024	511	251	712
Jacksonville, Fla.	1023	831	1473	1399	821	699		950	410	690	2147	594	590	326	1191	499	504
Kansas City, Mo.	180	645	839	549	644	453	950		624	325	1356	480	369	1241	413	473	680
Knoxville, Tenn.	651	442	1326	1004	790	290	410	624		479	1941	188	350	736	792	161	547
Little Rock, Ark.	478	723	847	869	388	483	690	325	479		1480	435	129	949	708	325	355
Los Angeles, Calif.	1438	1983	701	1427	1374	1809	2147	1356	1941	1480		1829	1603	2339	1524	1780	1673
Louisville, Ky.	476	316	1254	818	803	107	594	480	188	435	1829		320	919	605	154	623
Memphis, Tenn.	485	623	976	882	484	384	590	369	350	129	1603	320		872	699	197	358
Miami, Fla.	1333	1152	1643	1716	968	1024	326	1241	736	949	2339	919	872		1511	815	669
Minneapolis, Minn.	235	543	1157	214	1056	511	1191	413	792	708	1524	605	699	1511		697	1051
Nashville, Tenn.	525	470	1169	902	665	251	499	473	161	325	1780	154	197	815	697		469
New Orleans, La.	827	939	983	1222	318	712	504	680	547	355	1673	623	358	669	1051	469	
New York, N.Y.	1022	482	1905	1210	1420	646	838	1097	632	1081	2451	652	957	1092	1018	761	1171
Omaha, Nebr.	123	669	878	390	794	525	1098	166	745	492	1315	580	529	1397	290	607	847
Philadelphia, Pa.	973	443	1836	1184	1341	585	758	1038	552	1007	2394	582	881	1019	985	685	1089
Phoenix, Ariz.	1155	1690	346	1225	1017	1499	1794	1049	1607	1137	357	1508	1263	1982	1280	1446	1316
Pittsburgh, Pa.	715	205	1590	949	1137	330	703	781	375	779	2136	344	660	1010	743	472	919
Portland, Oreg.	1475	1969	1286	1239	1836	1885	2439	1497	2115	1759	825	1950	1849	2708	1427	1969	2063
Raleigh, N.C.	902	510	1621	1210	1056	495	414	905	296	774	2237	429	645	695	996	457	776
St. Louis, Mo.	273	455	1054	660	679	231	751	238	392	291	1589	242	240	1061	466	254	598
Salt Lake City, Utah	953	1492	689	863	1200	1356	1837	925	1547	1148	579	1402	1250	2089	987	1393	1434
San Antonio, Tex.	882	1238	503	1207	189	999	1011	707	959	516	1204	949	631	1148	1110	823	507
San Francisco, Calif.	1550	2091	995	1446	1645	1949	2374	1506	2121	1688	347	1986	1802	2594	1584	1963	1926
Seattle, Wash.	1467	1938	1376	1197	1891	1872	2455	1506	2114	1785	959	1943	1867	2734	1395	1975	2101
Spokane, Wash.	1240	1709	1239	969	1704	1644	2237	1287	1899	1573	940	1717	1650	2520	1166	1752	1898
Syracuse, N.Y.	898	354	1828	1042	1403	567	928	998	641	1038	2336	603	923	1212	861	739	1187
Tulsa, Okla.	396	813	674	741	442	591	921	216	676	231	1266	582	341	1176	626	515	548
Washington, D.C.	896	396	1728	1140	1220	495	647	945	430	892	2300	476	765	923	934	569	966
Wichita, Kans.	334	821	661	634	559	620	1031	177	753	348	1197	633	442	1297	546	594	677

	New York, N.Y.	Omaha, Nebr.	Philadelphia, Pa.	Phoenix, Ariz.	Pittsburgh, Pa.	Portland, Oreg.	Raleigh, N.C.	St. Louis, Mo.	Salt Lake City, Utah	San Antonio, Tex.	San Francisco, Calif.	Seattle, Wash.	Spokane, Wash.	Syracuse, N.Y.	Tulsa, Okla.	Washington, D.C.	Wichita, Kans.
Albuquerque, N. Mex.	1815	721	1753	330	1499	1107	1576	942	484	617	896	1184	1030	1718	604	1653	549
Amarillo, Tex.	1560	526	1494	598	1244	1304	1306	685	668	444	1157	1359	1176	1475	335	1391	304
Atlanta, Ga.	748	817	666	1592	521	2172	356	467	1583	882	2139	2182	1961	781	678	543	776
Billings, Mont.	1760	703	1727	872	1479	686	1698	1057	387	1252	904	668	443	1600	930	1669	801
Birmingham, Ala.	864	732	783	1456	608	2066	491	400	1466	744	2013	2082	1865	875	552	661	658
Boston, Mass.	188	1282	271	2300	483	2540	609	1038	2099	1766	2699	2493	2266	264	1398	393	1424
Buffalo, N.Y.	292	883	279	1906	178	2156	490	662	1699	1430	2300	2117	1888	138	1023	292	1036
Burlington, Vt.	260	1171	328	2202	445	2385	665	966	1969	1729	2568	2333	2108	177	1327	432	1337
Charleston, S.C.	641	1058	562	1857	528	2425	220	704	1845	1122	2405	2428	2204	738	945	453	1039
Charlotte, N.C.	533	918	451	1783	362	2290	130	568	1727	1105	2301	2285	2059	595	853	330	933
Cheyenne, Wyo.	1604	463	1556	663	1298	947	1461	795	371	882	967	973	768	1472	588	1477	465
Chicago, Ill.	713	432	666	1453	410	1758	642	262	1260	1051	1858	1737	1508	592	598	597	591
Cincinnati, Ohio	570	622	503	1581	257	1985	396	309	1453	1039	2043	1972	1744	514	661	404	702
Cleveland, Ohio	405	739	360	1749	115	2055	428	492	1568	1256	2166	2026	1796	303	853	306	873
Dallas, Tex.	1374	586	1299	887	1070	1633	1057	547	999	252	1483	1681	1489	1326	236	1185	340
Denver, Colo.	1631	488	1579	586	1320	982	1463	796	371	802	949	1021	826	1508	550	1494	437
Des Moines, Iowa	1022	123	973	1155	715	1475	902	273	953	882	1550	1467	1240	898	396	896	334
Detroit, Mich.	482	669	443	1690	205	1969	510	455	1492	1238	2091	1938	1709	354	813	396	821
El Paso, Tex.	1905	878	1836	346	1590	1286	1621	1034	689	503	995	1376	1239	1828	674	1728	661
Fargo, N. Dak.	1210	390	1184	1225	949	1239	1210	660	863	1207	1446	1197	969	1042	741	1140	634
Houston, Tex.	1420	794	1341	1017	1137	1836	1056	679	1200	189	1645	1891	1704	1403	442	1220	559
Indianapolis, Ind.	646	525	585	1499	330	1885	495	231	1356	999	1949	1872	1644	567	591	494	620
Jacksonville, Fla.	838	1098	758	1794	703	2439	414	751	1837	1011	2374	2455	2237	928	921	647	1031
Kansas City, Mo.	1097	166	1038	1049	781	1497	905	238	925	702	1506	1506	1287	998	216	945	177
Knoxville, Tenn.	632	745	552	1607	375	2115	296	392	1547	959	2121	2114	1890	641	676	430	753
Little Rock, Ark.	1081	492	1007	1137	779	1759	774	291	1148	516	1688	1785	1573	1038	231	892	348
Los Angeles, Calif.	2451	1315	2394	357	2136	825	2237	1589	579	1204	347	959	940	2336	1266	2300	1197
Louisville, Ky.	652	580	582	1508	344	1950	429	242	1402	949	1986	1943	1717	603	582	476	633
Memphis, Tenn.	957	529	881	1263	660	1849	645	240	1250	631	1802	1867	1650	923	341	765	442
Miami, Fla.	1092	1397	1019	1982	1010	2708	695	1061	2089	1148	2594	2734	2520	1212	1176	923	1297
Minneapolis, Minn.	1018	290	985	1280	743	1427	996	466	987	1110	1584	1395	1166	861	626	934	546
Nashville, Tenn.	761	607	685	1446	472	1969	457	254	1393	823	1963	1975	1752	739	515	569	594
New Orleans, La.	1171	847	1089	1316	919	2063	776	598	1434	507	1926	2101	1898	1187	548	966	677
New York, N.Y.		1144	83	2145	317	2445	426	875	1972	1584	2571	2408	2179	194	1231	205	1266
Omaha, Nebr.	1144		1094	1036	836	1371	1008	354	833	828	1429	1369	1146	1021	352	1014	257
Philadelphia, Pa.	83	1094		2083	259	2412	345	811	1925	1507	2523	2380	2151	220	1163	123	1204
Phoenix, Ariz.	2145	1036	2083		1828	1005	1903	1272	504	849	653	1114	1019	2044	932	1983	879
Pittsburgh, Pa.	317	836	259	1828		2165	330	559	1668	1291	2264	2138	1908	268	917	192	950
Portland, Oreg.	2445	1371	2412	1005	2165		2377	1723	636	1720	534	145	290	2281	1531	2354	1411
Raleigh, N.C.	426	1008	345	1903	330	2377		667	1829	1235	2410	2367	2139	519	972	233	1044
St. Louis, Mo.	875	354	811	1272	559	1723	667		1162	792	1744	1724	1500	796	361	712	394
Salt Lake City, Utah	1972	833	1925	504	1668	636	1829	1162		1087	600	701	550	1835	917	1848	808
San Antonio, Tex.	1584	828	1507	849	1291	1720	1235	792	1087		1490	1787	1614	1553	486	1388	573
San Francisco, Calif.	2571	1429	2523	653	2264	534	2410	1744	600	1490		678	727	2435	1461	2442	1369
Seattle, Wash.	2408	1369	2380	1114	2138	145	2367	1724	701	1787	678		229	2238	1560	2329	1437
Spokane, Wash.	2179	1146	2151	1019	1908	290	2139	1500	550	1614	727	229		2010	1353	2100	1227
Syracuse, N.Y.	194	1021	220	2044	268	2281	519	796	1835	1553	2435	2238	2010		1157	290	1173
Tulsa, Okla.	1231	352	1163	932	917	1531	972	361	917	486	1461	1560	1353	1157		1058	130
Washington, D.C.	205	1014	123	1983	192	2354	233	712	1848	1388	2442	2329	2100	290	1058		1106
Wichita, Kans.	1266	257	1204	879	950	1411	1044	394	808	573	1369	1437	1227	1173	130	1106	

FOREIGN ELECTRONIC MAIL DROPS

International facsimile traffic is beginning to emerge between points around the world where the concentration of business is high and message volume is greatest. Relatively high telephone rates encourage the use of sub-minute facsimile equipment to reach these points from the U.S. (Actually, the rates are low on a per mile basis.) The following U.S. Electronic Mail Drops offer sub-minute service to selected overseas points and to private equipment anywhere in the world.

Occasional document transmission may be achieved by using direct dial procedures described on the pages which follow.

SYNDIFAX
200 E 42nd St.
11th Floor, Suite IGI
New York, New York 10017
(212) 986-6663

ARGENTINA,	Buenos Aires
AUSTRALIA,	Canberra
	Melbourne
	Sydney
BELGIUM,	Bruxelles
BERMUDA,	Hamilton
BRAZIL,	San Paulo
CANADA,	Montreal
	Ottawa
	Toronto
DEMARK,	Cipenhagen
ENGLAND,	(See United Kingdom)
FINLAND,	Helsinki
FRANCE,	Paris
GERMANY,	Berlin
	Dusseldorf
	Essen
	Frankfurt
	Friedrich
	Hambourg
	Koln
	Munchen
	Stuttgart
	Trier
	Weisbaden
HONG KONG,	Macoe Islands
IRELAND,	Dublin
ISRAEL,	Tel Aviv
ITALY,	Milano
	Rome
JAPAN,	Tokyo
LUXEMBOURG	
NETHERLANDS,	Amsterdam
PANAMA,	Panama City
PERU,	Lima
PHILIPPINES,	Manila
PUERTO RICO,	San Juan
SCOTLAND,	(See United Kingdom)
SINGAPORE	
SOUTH AFRICA,	Johanesbourg
SWEDEN,	Gothernborg
SWITZERLAND,	Zurich
UNITED ARAB EMIRATES,	Dubai
UNITED KINGDOM,	London, England
	Glasgow, Scotland
VENEZUELA,	Caracas

WORLD-WIDE BUSINESS CENTERS
575 Madison Avenue
New York, New York 10022
(212) 486-1333

AUSTRALIA,	Canberra
	Melbourne
	Sydney
ENGLAND,	(See United Kingdom)
FRANCE,	Paris
ITALY,	Milan
	Rome
PANAMA,	Panama City
UNITED ARAB EMIRATES,	Dubai
UNITED KINGDOM,	London, England
	Glasgow, Scotland

Calling parties outside of the United States has been made easier with an expanded dialing service offered by the Bell System. Certain places outside the continental U.S. may be reached, of course, by simply dialing the appropriate area code and telephone number, i.e., Alaska, Hawaii, Puerto Rico, Bahamas, Bermuda, Virgin Islands, Mexico City and certain border points, and all of Canada. Thirty two countries listed on tne following pages may also be dialed directly from most U.S. telephones. Your information operator will tell you if your city has not yet installed the necessary equipment.

DIALING INSTRUCTIONS

To reach a party overseas by direct dialing the following sequence is followed:

1) Dial 011 - the international access code
2) Then dial the country code
3) Next, the city routing code
4) Last, the local telephone number (if using a Touch Tone™ telephone, the "#" button should be pushed after dialing the local number to save additional time)

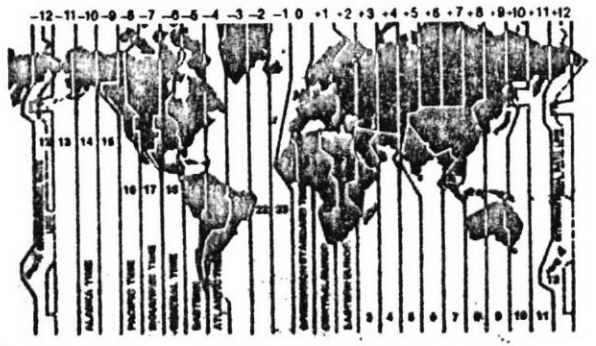
Allow at least 45 seconds to reach your party after dialing is complete.

If you wish to make a person to person, collect, or credit card call rather than station-to-station, dial 01 instead of 011 and an operator will intervene before your call is completed.

It is good to be aware that overseas numbers printed on business cards and business stationery, frequently include a national access digit in the first position for use only when dialing from within that foreign country. Therefore, it should be disregarded when placing your call from the U.S.

The following four pages provide routing codes to hundreds of cities in 32 different countries together with rates and other information. Additional countries and cities are continually being added to the Bell System service so check with you local operator if you need routing codes not listed.

Since business telephone calls made abroad must take into account significant time differences, reference to the Time Zone map and the small representative time table may be helpful.



TIME ZONES **The figure above each Time Zone indicates the number of hours by which the Zone is preceded by (—) or itself precedes (+) Greenwich Standard Time. The map shows the zonal time at mid-night, Greenwich Standard Time.**

Time differences

Business telephone calls made abroad should be placed when people are most accessible. *Here is a guide to the time in some key foreign cities when it is noon in three major American cities:*

	Noon in New York	Noon in Chicago	Noon in LA
Buenos Aires	2PM	1PM	5PM
Honolulu	7AM	8AM	10AM
London	5PM	6PM	8PM
Mexico City	11AM	12PM	2PM
Montreal	12PM	1PM	3PM
Nassau, Bahamas	12PM	1PM	3PM
San Juan	1PM	2PM	4PM
Sydney	4AM	5AM	7AM
Tel Aviv	7PM	8PM	10PM
Zurich	6PM	7PM	9PM
	Following Day		
Tokyo	2AM	1AM	5AM

ANDORRA — COUNTRY CODE 33

CITY	ROUTING CODE
All points	078

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers—5 digits.
Ringing Signals—similar to U.S. (longer).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — also has a transit signal—a rapidly repeated tone while connection being made.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS

Daily	Sun.
$6.75	$6.75

PERSON

$12.00	$12.00

Each add'l minute

$2.25	$2.25

AUSTRALIA — COUNTRY CODE 61

CITY	ROUTING CODE
Adelaide	8
Belgrave	3
Brisbane	72
Canberra	62
Chelsea	3
Culcairn	60
Finley	58
Hobart	02
Melbourne	3
Newcastle	49
Perth	92
Southport	75
Sydney	2
Townsville	77
Whyalla	86
Wonga Park	3

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Number — 5-7 digits.
Ringing Signals — 2 short rings.
Busy Signals—similar to U.S. (faster). Busy signals also indicates all circuits are busy.
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION*†

Daily	Sun.
$9.00	$6.75

PERSON

$12.00	$9.00

Each add'l minute

$3.00	$2.25

*No special reduced night rates.
†Collect calls accepted

AUSTRIA — COUNTRY CODE 43

CITY	ROUTING CODE
Baden bei Wein	2252
Badgastein	6434
Bludenz	5552
Graz	3122
Innsbruck	5222
Kitzbuhel	5356
Klagenfurt	4222
Linz, Donau	7222
Infer	6248
Neunkirchen, Niederoster-reich	2635
Salzburg	6222
Thuringen	5550
Vienna	222
Villoch	4242
Wels	7242
Weiner Neustadt	2622

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-7 digits.
Ringing Signal — tone shorter, pause longer than U.S. tone.
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS

Daily	Sun.
$6.75	$6.75

PERSON

$12.00	$12.00

Each add'l minute

$2.25	$2.25

BELGIUM — COUNTRY CODE 32

CITY	ROUTING CODE
Antwerp	31
Bruges	50
Brussels	2
Charleroi	71
Courtrai	56
Ghent	91
Hasselt	11
La Louviere	64
Libramont	61
Liege	41
Louvain	16
Malines	15
Mons	65
Namur	81
Ostend	59
Verviers	87

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 6-7 digits.
Ringing Signals—similar to U.S. (shorter).
Busy Signal—similar to U.S. (faster).
Other Signals — has different signal for busy circuits. Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	$5.10

PERSON/COLLECT

$12.00	$9.00

Each add'l minute

$2.25	$1.70

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

BRAZIL — COUNTRY CODE 55

CITY	ROUTING CODE
Belem	912
Belo Horizonte	31
Brasilia	612
Curitiba	412
Fortaleza	852
Goiania	622
Niteroi	21
Pelotas	532
Porto Alegre	512
Recife	812
Rio de Janeiro	21
Salvador	712
Santo Andre	11
Santos	132
San Paulo	11
Vitoria	272

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-7 digits.
Ringing Signal — similar to U.S. (slower).
Busy Signal — similar to U.S. (faster).
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night/Sun
$9.00	$6.75

PERSON

$12.00	$9.00

Each add'l minute

$3.00	$2.25

CHINA, REP OF — COUNTRY CODE 86

CITY	ROUTING CODE
Changhua	47
Chungtsing-hsintsun	493
Chungli	3
Chunan	36
Fengyuan	45
Hsinying	66
Hualien	38
Kaohsiung	7
Keelung	32
Lotung	39
Pingtung	77
Taichung	42
Tainan	62
Taipei	2
Taitung	79
Taoyuan	3

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-7 digits.
Ringing Signal — similar to U.S.
Busy Signal — similar to U.S.
Other Signals—number not in use—continuous steady tone.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Sun.
$9.00	$6.75

PERSON

$12.00	$9.00

Each add'l minute

$3.00	$2.25

COSTA RICA — COUNTRY CODE 506

CITY	ROUTING CODE
Routing codes Not required	

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers—6 digits.
Ringing Signal—short tone long pause.
Busy Signal — similar to U.S. (faster).
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night* Sun
$6.00	$5.00

PERSON

$9.00	$7.50

Each add'l minute

$2.00	$1.65

Rates shown are for calls from AR, CA, ID, IL, IN, IO, MI, MN, MT, ND, NE, NV, OH, OR, SD, UT, WA, WI, WY.
*Night rates apply from 6 PM to 5 AM everyday except Sunday.

DENMARK — COUNTRY CODE 45

CITY	ROUTING CODE
Aalborg	8
Aarhus	6
Alterod	3
Ansager	5
Assens	9
Billund	5
Borre	3
Copenhagen 1 or 2	
Esbjerg	5
Gelsted	9
Haderslev	4
Korsor	3
Nykobing	3
Odense	9
Randers	6
Vorgod	7

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-6 digits.
Ringing Signal short tone, very long pause.
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	$5.10

PERSON/COLLECT

$12.00	$9.00

Each add'l minute

$2.25	$1.70

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

EL SALVADOR — COUNTRY CODE 503

CITY	ROUTING CODE
Routing codes Not required	

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers 6 digits.
Ringing Signal — short ring followed by long pause.
Busy Signal similar to U.S. (faster).

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night* Sun
$6.00	$5.00

PERSON

$9.00	$7.50

Each add'l minute

$2.00	$1.65

Rates shown are for calls from AR, CA, ID, IL, IN, IO, MI, MN, MT, ND, NE, NV, OH, OR, SD, UT, WA, WI, WY.
*Night rates from 6 PM everyday ex Sunday.

FRANCE — COUNTRY CODE 33

CITY	ROUTING CODE
Aix En-Provence	91
Bordeaux	56
Cannes	93
Chauvigny	49
Cherbourg	33
Grenoble	76
Le Havre	35
Lourdes	62
Lyon	78
Marseille	91
Nancy	28
Nice	93
Paris	1
Rouen	35
Toulouse	61
Tours	47

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 6-7 digits.
Ringing Signal — similar to U.S. (longer).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — Has a transit signal — a rapidly repeated tone while connection being made.

RATES (Tax Not Included)

First 3 Minutes
STATION*
ALL HOURS

$6.75

PERSON/COLLECT*

$12.00

Each add'l minute

$2.25

*No special reduced night rates.

GERMANY — COUNTRY CODE 49

CITY	ROUTING CODE
Bad Homburg	6172
Berlin	30
Bonn	2221
Bremen	421
Cologne	221
Dusseldorf	211
Essen	201
Frankfurt	611
Hamburg	411
Heidelburg	6221
Koblenz	261
Mannheim	621
Munich	89
Nurnberg	911
Stuttgart	711
Wiesbaden	6121

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 2-7 digits.
Ringing Signal—short tone, long pause.
Busy Signal — faster tone than U.S. Busy signals also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	$5.10

PERSON

$12.00	$9.00

COLLECT
Not available (only to U.S.A.)

Each add'l minute

$2.25	$1.70

*Night rates apply from 5PM-5AM every day.

GREECE — COUNTRY CODE 30

CITY	ROUTING CODE
Archanai	81
Athens	21
Candia, Crete	81
Corinth	741
Eleusis	291
Hydra	298
Kavalla	51
Larissa	41
Naxos	285
Orechastron	31
Piraeus	21
Rhodes	241
Salonica	31
Sparta	731
Volos	421
Zagora	426

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-7 digits.
Ringing Signal — similar to U.S. (faster).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS

$6.75

PERSON/COLLECT

$12.00

Each add'l minute

$2.25

GUATEMALA — COUNTRY CODE 502

CITY	ROUTING CODE
Amatitlan	33
Antigua	32
Guatamala City	2
Quezaltenango	61
Villa Nueva	31

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 2-6 digits.
Ringing Signal—short ring, long pause.
Busy Signal — similar to U.S. (faster).

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night* Sat/Sun
$6.00	$5.00

PERSON

$9.00	$7.50

Each add'l minute

$2.00	$1.65

Rates shown are for calls from AR, CA, ID, IL, IN, IO, MI, MN, MT, ND, NE, NV, OH, OR, SD, UT, WA, WI, WY.
*Night rates apply from 6 PM to 5 AM everyday except Sunday.

HONG KONG — COUNTRY CODE 852

CITY	ROUTING CODE
Castle Peak	12
Cheung Chau	5
Fan Ling	12
Hong Kong	5
Kowloon	3
Kwai Chung	12
Lamma	5
Ma Wan	5
Peng Chau	5
Sek Kong	12
Sha Tin	12
Silvermine Bay	5
Tai-o	5
Tai Po	12
Ting Kau	12
Tsun Wan	12

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 5-7 digits.
Ringing Signal — 2 short rings, pause.
Busy Signal — similar to U.S. (slower). Busy signal also indicates all circuits are busy.
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS

$8.00

PERSON/COLLECT

$12.00

Each add'l minute

$2.65

IRELAND — COUNTRY CODE 353

CITY	ROUTING CODE
Arklow	402
Cork	21
Drogheda	41
Dublin	1
Dundalk	42
Ennis	65
Galway	91
Kildare	45
Kilkenny	56
Killarney	64
Sligo	71
Tipperary	62
Tralee	66
Tullamore	506
Waterford	51
Wexford	53

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-6 digits.
Ringing Signal — 2 short rings, pause.
Busy Signal — similar to U.S. (faster).
Other Signals — has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night/Sun
$5.40	$4.05

PERSON

$9.60	$7.20

Each add'l minute

$1.80	$1.35

ISRAEL — COUNTRY CODE 972

CITY	ROUTING CODE
Afula	65
Akko	4
Ashqelon	51
Bat Yam	3
Beer Sheva	57
Dimona	57
Hadera	63
Haifa	4
Holon	3
Jerusalem	2
Nazareth	65
Netenya	53
Rehovot	3
Tel Aviv	3
Tiberias	67
Zefat	67

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-6 digits.
Ringing Signal — similar to U.S. (slower).
Busy Signal—similar to U.S. (faster). Busy signal also indicates all circuits are busy. Recorded announcements in local language.
Other Signals — Has special signal for number not in use. Recorded announcements in local language.

RATES (Tax Not Included)

First 3 Minutes
STATION*

Daily	Sat/Sun
$9.00	$6.75

PERSON/COLLECT

$12.00	$9.00

Each add'l minute

$3.00	$2.25

*No special reduced night rates.

ITALY — COUNTRY CODE 39

CITY	ROUTING CODE
Bari	80
Bologna	51
Brindisi	831
Capri	81
Como	31
Florence	55
Genoa	10
Milan	2
Naples	81
Padua	49
Palermo	91
Pisa	50
Rome	6
Trieste	40
Venice	41
Verona	45

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-7 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	$5.10

PERSON/COLLECT

$12.00	$9.00

Each add'l minute

$2.25	$1.70

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

JAPAN — COUNTRY CODE 81

CITY	ROUTING CODE
Gifu	582
Hiroshima	822
Kanazawa	762
Kanda	93
Kobe	78
Kyoto	75
Nagoya	52
Niigata	252
Osaka	6
Sapporo	11
Sasebo	956
Tachikawa	425
Tokyo	3
Toyota	565
Yokohama	45
Yokosuka	468

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-7 digits.
Ringing Signal — Very similar to U.S.
Busy Signal — Very similar to U.S. Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION*

Daily	Sun.
$9.00	$6.75

PERSON/COLLECT

$12.00	$9.00

Each add'l minute

$3.00	$2.25

*No special reduced night rates.

LIECHTENSTEIN — 41

CITY ROUTING CODE	
All Points	75

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 5-6 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — similar to U.S. Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS
$6.75
PERSON
$12.00

Each add'l minute
$2.25

LUXEMBOURG — 352

CITY ROUTING CODE	
Routing codes Not Required	

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-9 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	**$5.10**

PERSON/COLLECT

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

MONACO — 33

CITY ROUTING CODE	
All Points	93

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 6-7 digits.
Ringing Signal — similar to U.S. (tone longer).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — Also has a transit signal — a rapidly repeated tone while connection being made.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS
$6.75
PERSON
$12.00

Each add'l minute
$2.25

NETHERLANDS — 31

CITY ROUTING CODE	
Amsterdam	20
Arnhem	85
Eindhoven	40
Groningen	50
Haarlem	23
Heemstede	23
Hillegersberg	10
Hoensbroek	45
Hoogkerk	50
Hoogvliet	10
Loosduinen	70
Nijmegen	80
Oud Zuilen	30
Rotterdam	10
The Hague	70
Utrecht	30

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-7 digits.
Ringing Signal — similar to U.S. (slower).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	**$5.10**

PERSON/COLLECT RATES

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

NORWAY — 47

CITY ROUTING CODE	
Arendal	41
Bergen	5
Drammen	2
Fredrikstad	31
Haguesund	47
Kongsvinger	66
Kristiansund	73
Larvik	34
Moss	32
Narvik	82
Oslo	2
Sarpsborg	31
Skien	35
Stavanger	45
Tonsberg	33
Trondheim	75

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 5-6 digits.
Ringing Signal — similar to U.S.
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	**$5.10**

PERSON/COLLECT

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

PHILIPPINES — 63

CITY ROUTING CODE	
Angeles	40
Bacolod	34
Baguio	442
Cebu	32
Clark Field	7
Cotabato	325
Dagupan	48
Davao	35
Iloilo	33
Lucena	42
Manila	2
San Fernando, La Union	46
San Fernando, Pampanga	45
San Pablo	41
Subic Bay	8884
Tarlac	47

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-7 digits.
Ringing Signal — similar to U.S. (slower).
Busy Signal — similar to U.S. (faster).
Other Signals — Has different signal for busy circuits.

RATES (Tax Not Included)

First 3 Minutes
STATION*†

Daily	Sun.
$9.00	**$6.75**

PERSON

$12.00	**$9.00**

Each add'l minute

$3.00	**$2.25**

*No special reduced night rates.
†Collect calls accepted

REP. SO. AFRICA — 27

CITY ROUTING CODE	
Bloemfontein	51
Cape Town	21
De Aar	571
Durban	31
East London	431
Gordons Bay	24
Johannesburg	11
La Lucia	31
Pietermaritzburg	331
Port Elizabeth	41
Pretoria	12
Richards Bay	352
Sasolburg	16
Somerset West	24
Uitenhage	422
Welkom	17

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-7 digits.
Ringing Signal — 2 short rings, pause.
Busy Signal — similar to U.S. (slower). Busy signal also indicates all circuits are busy.
Other Signals — Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS
$9.00
PERSON
$12.00

Each add'l minute
$3.00

SAN MARINO — 39

CITY ROUTING CODE	
All Points	541

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-6 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night/Sun
$6.75	**$5.10**

PERSON

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

SPAIN — 34

CITY ROUTING CODE	
Barcelona	3
Bilbao	44
Cadiz	56
Ceuta, Sp. No. Afr.	56
Granada	58
Igualada	3
Las Palmas (Canary Is.)	28
Leon	87
Madrid	1
Malaga	52
Palma De Mallorca	71
Pamplona	48
Santander	42
Seville	54
Torremolinos	52
Valencia	63

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 6-7 digits.
Ringing Signal — similar to U.S.
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.
Other Signals — Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	**$5.10**

PERSON/COLLECT

$12.00	**$9.00**

Each add'l minute

$2.25	**$***

*Night rates app. 5PM-5AM Monday through Saturday and all day Sunday.

SWEDEN — 46

CITY ROUTING CODE	
Alingsas	322
Boras	33
Eskilstuna	16
Gamleby	493
Goteborg	31
Helsingborg	42
Karlstad	54
Linkoping	13
Lund	46
Malmo	40
Norrkoping	11
Stockholm	8
Sundsvall	60
Trelleborg	410
Uppsala	18
Vasteras	21

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 5-7 digits.
Ringing Signal — long tone, long pause.
Busy Signal — similar to U.S. (faster).
Other Signals — Has different signal for busy circuits. Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night*
$6.75	**$5.10**

PERSON/COLLECT

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

SWITZERLAND — 41

CITY ROUTING CODE	
Baden	56
Basel	61
Berne	31
Davos	83
Fribourg	37
Geneva	22
Interlaken	36
Lausanne	21
Lucerne	41
Lugano	91
Montreux	21
Neuchatel	38
St. Gallen	71
St. Moritz	82
Winterthur	52
Zurich	1

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 5-6 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — Switzerland has two different busy number/busy circuit signals: a series of rapid high-pitched tones, or a series of lower pitched tones.

RATES (Tax Not Included)

First 3 Minutes
STATION
ALL HOURS
$6.75
PERSON/COLLECT
$12.00

Each add'l minute
$2.25

UNITED KINGDOM — 44

CITY ROUTING CODE	
Belfast (N. Ire.)	232
Birmingham	21
Bournemouth	202
Cardiff (Wales)	222
Durham	385
Edinburgh (Scot.)	31
Glasgow (Scot.)	41
Gloucester	452
Ipswich	473
Liverpool	51
London	1
Manchester	61
Nottingham	602
Prestwick (Scot.)	292
Sheffield	742
Southampton	703

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 3-7 digits.
Ringing Signal — 2 short tones, short pause.
Busy Signal — similar to U.S. (faster).
Other Signals — Has different signal for busy circuits. Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION DIAL
ALL HOURS Each add'l minute
$3.60 **$1.20**

STATION/OPER. ASST.

Daily	Night*
$5.40	**$4.05**

PERSON/COLLECT

$9.60	**$7.20**

Each add'l minute

$1.80	**$1.35**

*Night rates apply 5PM-5AM Monday through Saturday and all day Sunday.

VATICAN CITY — 39

CITY ROUTING CODE	
All Points	6

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Ringing Signal — similar to U.S. (shorter).
Busy Signal — similar to U.S. (faster). Busy signal also indicates all circuits are busy.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night/Sun
$6.75	**$5.10**

PERSON

$12.00	**$9.00**

Each add'l minute

$2.25	**$1.70**

VENEZUELA — 58

CITY ROUTING CODE	
Barquisimeto	51
Cabimas	64
Caracas	2
Coro	68
Guanare	57
Maiquetia	31
Maracaibo	61
Maracay	43
Merida	74
Puerto Cabello	42
Punto Fijo	69
San Cristobal	76
San Juan De Los Morros	46
Valencia	41
Valle De La Pascua	35
Zaraza	38

LOCAL NUMBER FOREIGN AUDIBLE SIGNAL

Local Numbers — 4-6 digits.
Ringing Signal — similar to U.S. (shorter).
Busy Signal — Very similar to U.S. Busy signal also indicates all circuits are busy.
Other Signals — Has special signal for number not in use.

RATES (Tax Not Included)

First 3 Minutes
STATION

Daily	Night* Sun
$8.00	**$6.50**

PERSON

$12.00	**$9.00**

Each add'l minute

$2.65	**$2.15**

Rates shown are for calls from AR, CA, CO, ID, IL, IN, IO, MI, MN, MT, ND, NE, NM, NV, OH, OR, SD, UT, WA, WI, WY.
*Night rates apply from 6 PM to 5 AM everyday except Sunday.

The following points may also be dialed directly. (Information obtained just prior to publication)

COUNTRY/CITY	COUNTRY CODE	ROUTING CODE
CHILE	56	
Santiago		2
Valparaiso		31
ECUADOR	593	
Guayaquil		4
Quito		2
GUAM	671	
KOREA	82	
Pusan		72
Seoul		2
KUWAIT	965	
NEW ZEALAND	64	
Auckland		9
Christchurch		3
Wellington		4
PAPUA	675	
PERU	51	
Arequipa		542
Chiclayo		7423
Lima		14
PORTUGAL	35	
Lisbon		1
Porto		2
SINGAPORE	65	
THAILAND	66	2
UNITED ARAB EMIRATES		
ABU DHABI	979	2
AJMAN	971	29
DUBAI	978	
Aweir		9

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Appear as a 4-position code in brackets with each EMD e.g. (A24C).

FIRST POSITION	MINUTES PER 8½ IN. PAGE				
	2	3	4	6	35; 50; 90 sec.
A			X	X	
B	X		X	X	
C		X	X	X	
D	X	X	X	X	
E	X	X	X	X	X
F			X	X	X
J	X		X		
K	X		X		X
L				X	
M					X
Z	NOT COMPATIBLE				
9	NO INFORMATION AVAILABLE				

SECOND POSITION	TRANSMISSION SERVICES
1	TO COMPATIBLE EQUIPMENT ANYWHERE IN WORLD
2	TO COMPATIBLE EQUIPMENT IN U.S./CANADA
3	TO SELECTED POINTS ONLY
9	NO INFORMATION AVAILABLE

THIRD POSITION	RECEIVING SERVICES
1	MAY BE PICKED UP; MAILED; DELIVERED; DELIVERY RECEIPTS PROVIDED
2	MAY BE PICKED UP; MAILED; DELIVERED
3	MUST BE PICKED UP; DELIVERY RECEIPTS PROVIDED
4	MUST BE PICKED UP
9	NO INFORMATION AVAILABLE

FOURTH POSITION	BILLING
C	SERVICES PROVIDED ON A CHARGE BASIS IF REQUESTED

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MESSAGE SYSTEMS ON THE ARPANET: AN EVOLUTION

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Abstract

Several forms of human telecommunication have been developed using packet-switched computer networks such as the ARPAnet; the most advanced and elaborated is the network message. The ARPAnet was originally planned to provide a means of data and computer resource sharing. There evolved a felt need for communication between its users. The first ARPAnet message systems were an informal response to this need for telecommunication. As the utility of network mail became more evident, formal protocols were promulgated and message systems grew increasingly sophisticated. The unique aspects of this medium have linked memoranda with databases and people with each other in unexpected ways. Current research efforts are bent upon expanding network mail beyond the printed word.

Introduction

Packet-switched computer networks have been in operation for about a decade, and in that time considerable evolution has occurred in their use in human telecommunications. The forms of communication developed in various degrees so far include real-time links, Mailgram-like delivery service using facsimile transmission, teleconferencing, and electronic messages, or network mail.

Real-time links, such as half-duplex terminal-to-terminal conversations, are of limited and specialized interest. Facsimile-based "super-mailgram" service, especially on an international basis using satellite links, has great commercial potential and is a technical challenge; however, conceptually it is a fairly straightforward extension of postal or telegraph service. Teleconferencing shades from real-time links between pairs of people to complex exchanges of messages within a network-mail discipline and a conferencing protocol; considerable work is being done in this area, but as yet no particular paradigm has been generally accepted for its implementation.

It is the purpose of this paper to describe and relate the development of network mail, and in particular on the ARPA Network (ARPAnet). Network mail is at this time the most developed of the computer network telecommunication media, and developmentally the most interesting. It is a thesis of this paper that the development of network mail has been evolutionary rather than deliberate, to a surprising degree; ARPAnet mail has been an organic outgrowth of the network and its computers, and the community of users and developers that form its universe.

A Brief History of Network Mail

Computer-based message service originated well before the development of the ARPAnet. The roots of the medium are found in network communication services such as TWX or TELEX, and in "mailbox" programs to allow users of a time-shared computer to exchange messages. The former are communication networks to connect large distributed populations of users, while the latter emphasize more intense support by computer of the smaller population of users of a single timesharing system. Message technology in the ARPAnet arose as the union of these two antecedents.

ARPAnet message service goes back to the period just after initial activation of the network in 1970. The initial goals of the ARPAnet were to implement use of geographically dispersed computer systems by a distributed population; to develop resource sharing; and to develop the underlying packet switching technology that might later support advanced forms of military information networks. In its early days the network supported remote computer access, high-volume data transfer and multi-computer processing experiments, applications centered on computation and computer science research.

A new use of the network emerged with the realization that the network could also used as a medium for telecommunication among its human users. The network has sufficient capacity to support any conceivable volume of message traffic in addition to its other uses. Low-level software support was present in the form of service programs implementing exchange of information between host computers, a result of the preexisting applications mentioned above. A "market" existed in the East and West Coast research communities wishing to communicate with each other.

The earliest user-level programs for message handling appeared in 1972. These programs assisted the user in creating outgoing messages and reading messages received from others. These programs exploited the underlying network File Transfer Protocol and its associated server processes for message distribution to users of the same or other host computers on the ARPAnet.

Network message service was a immediate success. Message flow quickly grew to become the most visible (if not the heaviest) component of network traffic. Use of the service has had a substantial impact on the organizations involved, causing dramatic shifts away from use of the traditional media such as postal service and the telephone.

As a result of the sudden popularity of network message service, considerable effort began to be directed to development of this medium. Protocols specifically for network mail and standards for the format of network messages were promulgated. Theoretical work was directed to the future development of message systems. As the utility of the medium for network researchers and developers became more apparent, people within the constituent organizations participating in ARPAnet development who were not closely connected to computers began to be drawn into use of network mail systems. This in turn led to demand for mail-handling programs that were more capable, more flexible and equipped with better human interfaces.

In 1975 a second generation of message systems began to appear to meet these needs. With them another evolutionary development began to emerge: the use of message systems as database management tools. The dual thrusts of database manipulation and rapid

hardcopy communication continued to direct further development in the last few years. The third generation of software, which is beginning to emerge, is more properly called message/record systems. In it there will probably be a fission into two lines of development: greater sophistication in database management and office automation, and development of network message communication into transmission of non-text information.

The Nature of Network Electronic Mail

Message service seems to derive its appeal from a combination of properties not found together in any other medium. The ability to deliver messages through the network, by itself, yields the same advantages found in a conventional store-and-forward system. It provides communication at electronic speed, provides record communication, but decouples sender from receiver, eliminating the need for a real-time communication channel.

Additional benefits derive from the capabilities of the host computers connected to the network, combined with the special properties of the network itself. The processing capability of the computer can be applied at both ends of the communication path to provide powerful message creation and handling tools. Taken together, the computer and the network provide geographic independence to message sender and receiver. One can transmit messages or access one's files of received messages from any point on the network.

Operation of ARPAnet Message Communication

In order to illustrate the problems and provide an insight into network mail systems, let us describe briefly the operation of ARPAnet message communication and the present standard form for network messages.

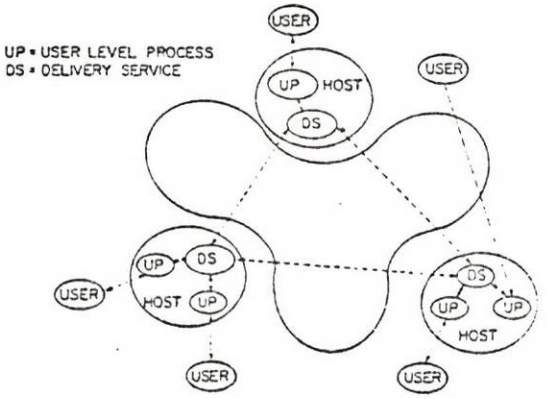

Figure 1. Network Message System.

The current organization of the mail system is shown schematically in Figures 1 and 2. They depict the overall layout and give some idea of what goes on in a typical host computer.* As suggested above, interhost (and in some cases intrahost) message movement is accomplished by file transfer servers in the separate hosts. Taken together, these constitute a message distribution subnetwork within the ARPAnet. The distribution system is coupled to the user through his file space. Outbound messages are packaged as files to be picked up by a "mailer" process that intercedes between the user and the File Transfer Protocol (FTP) server. For clarity the Mailer and FTP processes are shown lumped together in Figure 1 with the title "delivery server". They are shown separately in Figure 2. Incoming messages are appended to a speciál "mailbox" file.

The Mailer process also has the job of dealing with error conditions that may occur in the network. Minor problems, such as a temporary outage of a destination host are dealt with by subsequent delivery attempts. More serious difficulties, such as an improperly addressed or non-existent recipient, cause the Mailer to mark the offending copy of the outbound message as undeliverable.

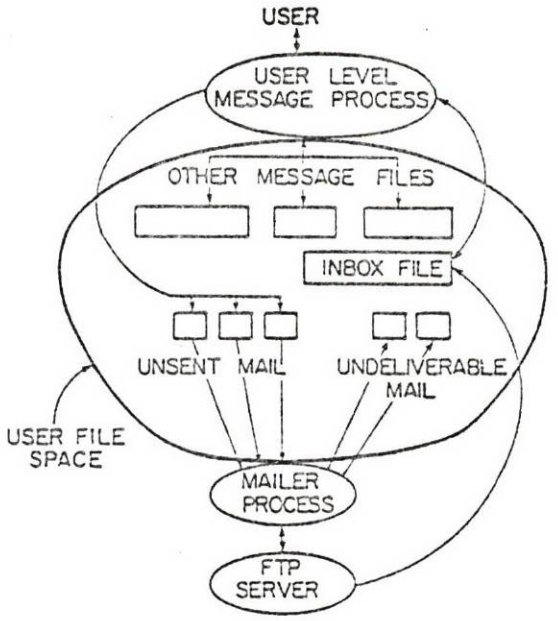

Figure 2. Intra-Host Organization.

In principle, this distribution system constitutes a complete message service. The user can create outgoing messages and access received messages through the basic file-handling functions of the host computer's executive, and perhaps a text editor. Strictly speaking, no other tools are needed. In practice, however, convenient, message-oriented processing functions can do a much better job, and so a variety of user-level message programs have been created.

Thus, referring to Figure 1, the typical user will access his assigned host computer (either locally or through the network), and then call up the message handling program of his choice. This program serves as the user's interface to the network. It takes care of handing over to the delivery service those messages the user has prepared. It detects and provides access to incoming messages that the delivery service has placed in his mailbox.

Depending on its level of sophistication, the message handler provides the user with a more or less complete set of tools for coping with his message traffic. These include functions for writing, reading, storing and retrieving messages. In many cases there are also

---

* Details in Figures 1 and 2 are based on the software organization within a DEC PDP-10 host running the TENEX or TOPS-20 operating system. There are differences among various host types, but the scheme described here is believed to be fairly typical.

functions that allow the user to forward, reply to and annotate the messages he has received.

To promote compatibility between the variety of message programs that now exist in the network, the ARPA community has developed standards at the message level that specify address formats and define allowable message structure, naming message parts and defining their content. Provided the standards are adhered to, a message handling program on one host can "understand" syntactically and deal with messages originating on any other host.

```
Date: 3 Mar 1979 1339-EST
Sender: DDEUTSCH at BBN-TENEXA
Subject: Comments on new Hermes documentation
From: DDEUTSCH at BBN-TENEXA
To: Cerf at ISI
Cc: Dodds at BBN-TENEXA, Mooers at BBN-TENEXA,
 Myer at BBN-TENEXA, DDeutsch at BBN-TENEXA
Message-ID: <[BBN-TENEXA]3-Mar-79 13:39:21.DDEUTSCH>
SideComments: Vint gave me a marked-up copy yesterday.

Vint-

Thank you very much for your extensive comments on the
new level one documentation.  I will pass them on to
Charlotte.  I am sure ...

Debbie
```

Figure 3. A sample message.

Figure 3 shows an example of an ARPAnet message that conforms to the present message standards. The message is defined as being a string of characters which is divided into the Header and the Text by the first empty line occurring after the beginning (in this case the blank line following the line "SideComments:..."). There is no further syntax defined for the Text, it is merely intended to be the body of a message, in any form the user desires. The Header is divided into Fields; each field starts at the beginning of a line with a non-whitespace character (anything but <space> or <tab>), and further consists of Keyword and Contents, ending with an end-of-line before the beginning of the next field. The Keyword is a string of characters that begins the fields and is terminated by <colon><space>.

In Figure 3 we see eight header fields; the line beginning with a space following the line "Cc: ..." is to be interpreted as a continuation of the Cc: field. There are approximately 25 "standard" field names whose keywords are prescribed, such as "Date:" and "To:", and whose contents are to be interpreted in a standard way. In the example, the first seven fields are such standard fields. The eighth field, "SideComments:" has a nonstandard keyword, and thus is understood to be a user-defined field. Some of the more sophisticated message systems implement the creation and recognition of user-defined fields. From this is born the ability to create databases of records with elaborate and specialized structure.

HERMES -- a Modern Message System

In order to illustrate the degree of sophistication that has been attained in about five years of development, and the directions in which network mail is being pushed, we give a very brief description of the HERMES system, developed by Bolt Beranek and Newman, Inc., with support from ARPA, the U.S. Army Materiel Development and Readiness Command, and other agencies. HERMES attempts to implement virtually every function one might reasonably want to perform on messages, considered either as units of communication or records of a database.

Before the specific functionalities of this user program are considered, it is necessary to describe some of the underlying concepts. These are considered principally in terms of "objects" that exist in the "working environment" that HERMES constructs in which to process messages. First there is the particular user's "profile", a file which contains the particular incarnations of the objects with which he wants to work. When the user starts the HERMES program, the user's profile is accessed to initialize the HERMES working environment for the present session. The objects so established are the "switches", the "filters" and the "templates".

HERMES has dozens of switches, entities of two, three, or more states each of which defines the default sense of some optional aspect of operation. Many of the defaults can be overridden in a particular instance by command modifiers. The user tailors the setting of his switches to the particular kinds of operations for which he customarily uses HERMES, and to the particular style of operation he prefers.

"Templates" are central to HERMES' approach to making the handling of messages more tractable. Simply put, a template is a list of specifiers that refer to message fields, certain message attributes, or fixed strings of text. Templates control both creation and transcription functions. As an example of the latter, the message in Figure 3 can be seen to have certain fields that the user probably does not want printed on his terminal when reading the message as a message, such as the Sender: and Message-ID:. So he will establish a default template for printing that specifies, say, the From:, To:, Subject:, and Text. Then HERMES will print a specified message showing only the fields called for, and in the order specified (they can be in any order in the message itself). A similar action occurs on message creation. The user will have established a default template for composition so that the command "Compose" will cause HERMES to prompt him for input of his own desired set of fields, in his order. "Boiler plate" material can also be included in a creation template to be included automatically in a created message.

"Filters" are retrieval specifications for accessing desired kinds of messages in the message-file HERMES is examining. For example, it is possible to ask HERMES to list on the line printer all messages from Jones, Smith and Miller with a date after 1 Jan 1978. HERMES will search the message-file selecting those messages which match all the criteria for listing. Filters can be given either in ephemeral "literal" form as part of a command, or, if they are to be used again, can be prepared and stored as a HERMES object. Filter specifications can be arbitrarily complicated and can be applied to any header field of a message, including user-defined fields; clearly this kind of ability is a key to the database management capabilities which are becoming increasingly important in message technology.

The last major kind of HERMES object is the "sequence". This is an ordered list of message numbers. It is an attribute of a message-file rather than of a user, so named sequences are stored as part of the auxiliary information that HERMES creates in processing a message-file. Sequences can also be specified ephemerally as part of a command ("Print 100:1/from Jones" gives the messages in the first 100

which are from Jones, in reverse order), but they reach their full power when prepared and stored as a permanent object. HERMES provides a sequence editor which implements selection by filter specifications, sorting on any header field, and logical union, intersection, and disjunction of sequences. Stored sequences provide the ability to maintain numerous cross-indices on the records in a message-file or database.

Using the above conceptual mechanizations, HERMES allows the user to select messages and specify their creation or output for all functionalities needed in a message system: message draft preparation, storage, input, and message sending; reporting receipt of mail, and output of it to terminal, printer or file; replying to, forwarding, annotating and filing messages; and searching and indexing functions. HERMES also provides text editing tools for message preparation, optional encryption of text, and an interface to other aids such as a spelling corrector program.

The above summary of HERMES is far too brief to give an impression of how one uses it, or even to describe all the operations possible; many user aids and human interface features not specific to its functional mission have not been mentioned. But it is hoped that some impression has been conveyed of the degree to which powerful communication/database processing has been built around the mechanism of computer network mail. We have come a long way from SNDMSG, which prompted the user through four fields and fired off a message, and READMAIL, which printed the messages as received, period.

Nature of the Net Mail Medium

Simple network messages, on a memorandum model, sprang from the straightforward need to exchange such communication, and from the availability of the "hardware" -- the ARPAnet and its data transfer protocols. As noted above, evolutionary cycles have brought development to the present point of movement into database management and advanced forms of messages, far from the simple memos of eight years ago. But what of acceptance and use of the present medium, with its text messages?

The use of network mail continues to expand into populations of non-computer specialists as the awareness spreads that this medium, different in kind from the more familiar ones, is best for a variety of communication needs. It is neither a slow telephone on paper, nor a fast U. S. Mail, and it is better than either for rapid interactive exchanges, broadcast announcements to an interest group, round-robin discussions, collaborative writing, and many other uses.

The product of communication within this medium is an entity that can be stored permanently in the form in which it arrives; it can also be output in various human-readable forms. It is not ephemeral like the voice signal transmitted by a telephone. But the medium is not a "paper telephone", because while the communication can be rapid, it is not conducted in real time. As previously noted, the dispatch and the receipt of a message are decoupled processes. (One lesson that was painfully learned by some users of network mail was that it did not replace the telephone entirely. If one sent a message to ten people at 5 pm Friday calling a meeting for 10 am Monday, then without some RSVP conventions, one could not assume that all recipients had even seen the message before the meeting. The instant feedback of telephone contact is lacking in the network mail medium.)

A closer analogy to network mail is the postal system. Here the essential difference is made by the coupling of the basic form of the message (part of a computer file) to the processing abilities of the message-handling system. It is as if the post office were tightly coupled with one's own clerical staff and copying machine; fast delivery is only part of the difference.

Experience has shown that a broad class of communications traditionally conducted by telephone are much more appropriately carried on by network message. We are all painfully aware that a telephone call is by its nature an interruption to the recipient, and requires some overhead in time and effort and possibility of failure for the initiator. We tolerate these costs because of great advantages in rapid, interactive, high bandwidth communication that can be achieved. But many contacts are initiated by a need to communicate something quickly but not instantly, something brief, and with only small need for interaction. How pleasant it was found to be able to carry out these latter communications (brief queries and answers, short memos) in a medium that was both efficient and convenient for the parties at both ends.

A Future Direction: Beyond Text

The adage that states, "One picture is worth a thousand words." is truer than ever. The need to be able to transmit illustrations, charts, graphs, and other non-textual data is becoming greater as message services are used for distribution of increasingly complex documents. Systems which suffice to process short memoes cannot meet the requirements of a technical paper, which may include figures and diagrams which are absolutely necessary to its integrity and comprehensibility.

There are number of different digital media which lend themselves well towards inclusion in computer mediated message services. Both vector and bit map graphics can be employed to carry illustrations. Facsimile allows for the high resolution digital storage of photographs and originals. A totally new dimension is added to the message when audio data may be included in it. These kinds of data differ greatly from text in both structure and content.

When a reference is made to "electronic mail" in the business world, the speaker usually has facsimile in mind. Facsimile (or "fax") exists in both analog and digital forms. A scanner "reads" an original, transmits (frequently over a telephone line) a line-by-line scan (the resolution may exceed 250 lines/inch vertically or horizontally), and the receiving printer reproduces the original arbitrary image. Fax units may transmit and receive black and white or gray scale data, depending on model. Many fax machines may take as long as one or two minutes to scan an entire 8-1/2 x 11 page, but more recent ones are able to handle the task in a few seconds.

Computer-generated graphics may be produced in one of several ways. One of the more promising techniques is known as bit mapped graphics. Bit maps are composed of one or more two dimensional arrays or planes. Each cell in these arrays corresponds to a spot on the display. The display is altered by changing the values in the appropriate cells. Bit map images are not of as high a resolution as some facsimile images, but they may go beyond black and white or gray scale to include color in the data they convey. A bit map display of moderately high resolution may be 512 by 512 pixels, although models capable of as many as 1024 by 1024 do exist.

Other graphics techniques rely upon the use of special graphics characters, the definition of lines in terms of a pair of points, and the definition of polygons by the use of multiple vectors. These methods do not require the tremendous amount of storage consumed by bit maps, but they do lack somewhat in the flexibility which is associated with bit maps.

There has been a considerable amount of work done recently on digitized voice. Like facsimile, it requires a considerable amount of storage. Data compression techniques have proven to be valuable tools when either of these media is processed.

What happens when these media are included in messages? Several technical problems crop up. The size (number of bits) of the messages may increase greatly. The use of the non-ASCII data may force the use of mixed or converted by sizes, or of multiple data connections. It becomes necessary to differentiate between the various types of data present in the message itself in order to facilitate correct processing upon receipt of the message.

Facsimile is a well established technology used to encode, transmit, and decode arbitrary textual and graphic images. It is in wide use in today's office. Plummeting hardware costs and the geographic dispersion typical of modern business concerns together make it more economical to transmit images over ordinary phone lines (at about 2 minutes per page) than to rely on more traditional hardcopy mail.

Because facsimile (or "fax") can handle arbitrary images and because it is widely available it makes an excellent vehicle for exploring the possibilities and pitfalls inherent in a multi-media message system. The inclusion of facsimile data in messages will allow

- The elimination of the need to re-key documents which exist in forms which are not machine readable.
- The ability to include photographs, charts, drawings, or other illustrative material along with text in messages.
- Pages to be laid out in such a manner as to enhance their readability or emphasis, using columns, placement of graphics or white space, etc., to achieve this end.
- The use of fonts without restriction by availability of print ball or wheel, or the need for any special font codes.
- Collage or cropped images can be produced electronically and included in the final document without destroying the original.
- Transmission of messages to sites supporting facsimile only, extending the reach of the message system beyond the boundaries of the computer network.

It is through its experience in facsimile that BBN has already developed an experimental facility which converts ASCII text into proportionally spaced facsimile images.

The use of bit mapped graphics in conjunction with facsimile allows even further possibilities. Conversions between the two media will facilitate page and image composition, display of bitmap images on hardcopy, and so forth.

Compressed speech will facilitate the transmission of audio transcripts of talks, meetings, and dictated notes without the need to resort to keyboard transcriptionsv

Text messages have already had considerable impact upon the working habits and environments of many people. What will happen when other media are added? It is difficult to know exactly, but the utility of the message system should be even further enhanced and the information bandwidth of the message itself considerably enlarged.

Conclusion

This paper has traced the development of message technology on the ARPAnet, attempted to summarize the present state of that technology and described one promising future direction. Within less than a decade network mail has become the principal means of communication among the various research groups geographically distributed on the network. As commercial packet-switched networks grow and proliferate, and as more flexible imaging media are added to message systems, there is no reason to doubt that the same will happen in the next ten to fifteen years in business and government. As the utility of this new medium becomes evident to society at large, there will evolve a transformation comparable to the introduction of the telephone.

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Edgar H. Sibley
Panel Editor

A large collection of public-domain mathematical software is now available via electronic mail. Messages sent to "netlib@anl-mcs" (on the Arpanet/CSNET) or to "research!netlib" (on the UNIX® network) wake up a server that distributes items from the collection. The one-line message "send index" causes a library catalog to be sent by return mail.

DISTRIBUTION OF MATHEMATICAL SOFTWARE VIA ELECTRONIC MAIL

JACK J. DONGARRA and ERIC GROSSE

A large pool of high-quality mathematical software is in use at educational, research, and industrial institutions around the country. At present this software is available from a number of distribution agents—for example, AT&T for the PORT library, the International Mathematical Software Library (IMSL), the National Energy Software Center (NESC), and the Numerical Algorithms Group (NAG). All do a fine job with the distribution of large packages of mathematical software, but there is no provision for convenient distribution of small pieces of software. Currently scientists transmit such software by magnetic tapes, but contacting authors and deciphering alien tape formats waste an intolerable amount of time.

A new system, *netlib*, provides quick, easy, and efficient distribution of public-domain software to the scientific computing community on an as-needed basis. A user sends a request by electronic mail to *netlib@anl-mcs* on the Arpanet or to *research!netlib* on the UNIX UUCP network. (Gateways are available to forward mail from other networks such as CSNET, Telenet, and BITNET.) The two addresses mentioned are, respectively, at Argonne National Lab near Chicago and at AT&T Bell Labs in Murray Hill, New Jersey. A request is made up of lines of one of the following forms:

send index.
send index from *library.*
send *routines* **from** *library.*
find *keywords.*

Examples and a few variants of these forms are described in the next section.

NETLIB IN USE

Imagine an engineer who needs to compute several integrals numerically. He consults the resident numerical expert, who advises trying the routine *dqag* for some preliminary estimates and then using *gaussq* for the production runs. The engineer types the following:

mail research!netlib
send dqag from quadpack
send gaussq from go

In a short time, two pieces of mail come back from *netlibd*. The first contains the double-precision Fortran subroutine *dqag* and all the routines from *quadpack* that *dqag* calls; the second contains *gaussq* and the routines it calls. A utility routine *d1mach* called by *gaussq* is not included, since it is probably already installed on the engineer's system; the request could have been changed to "*send gaussq from go core*" to include the "core library" of machine constants and basic linear algebra modules in the search list.

Should the engineer later decide that the routine *dqags* would be more effective, he could ask "*send dqags but not dqag from quadpack*" to get *dqags* and any subroutines not already sent with *dqag*.

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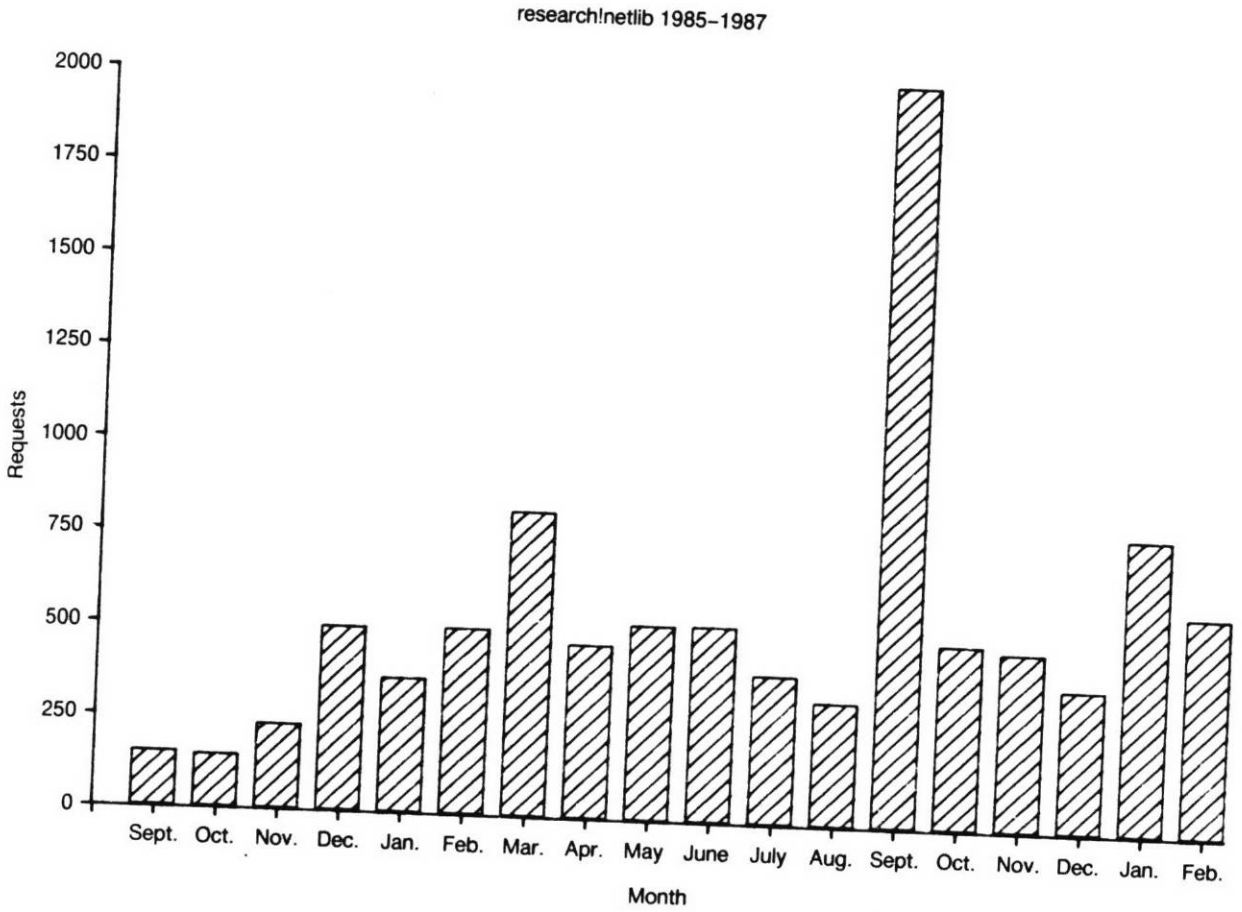

FIGURE 1. Requests Serviced by research!netlib, September 1985–February 1987

Meanwhile, the numerical expert decides she should check on the current contents of netlib. She types the following:

mail research!netlib
send index

The return mail shows an unfamiliar library *toeplitz*, so she sends mail "*send index from toeplitz*" to see what is included. Curious to see a typical routine, she tries "*send only cslz from toeplitz.*"

As typical examples of requests, we give the following:

send dgeco from linpack (retrieves routine DGECO and all routines it calls from the LINPACK library)

send only dgeco from linpack (retrieves just DGECO and not subsidiary routines)

send dgeco but not dgefa from linpack (retrieves DGECO and subsidiaries, but excludes DGEFA and subsidiaries)

send list of dgeco from linpack (retrieves just the file names rather than the contents; this can be helpful when one already has an entire library and just wants to know what pieces are needed in a particular application)

find eigenvalue (retrieves the names of routines in the collection related to the keyword *eigenvalue*)

whois golub (retrieves the address of Gene Golub)

whois france (retrieves all addresses of people in the database living in France)

"Find" returns a one-line description of all routines in the collection that mention the keywords; this can be more convenient than checking the indexes for each sublibrary that might be relevant. "Whois" searches for address and telephone information in a database maintained by Gene Golub; this is soon to be supplemented by the membership files of *SIAM*.

Just how quickly these requests are answered depends on the speed of the network communications involved, but 5 or 10 minutes is typical for Arpanet. CSNET or UNIX uucp may require anywhere from minutes to days to transmit a message from sender to recipient. The actual processing time is insignificant. One user wrote back enthusiastically that the

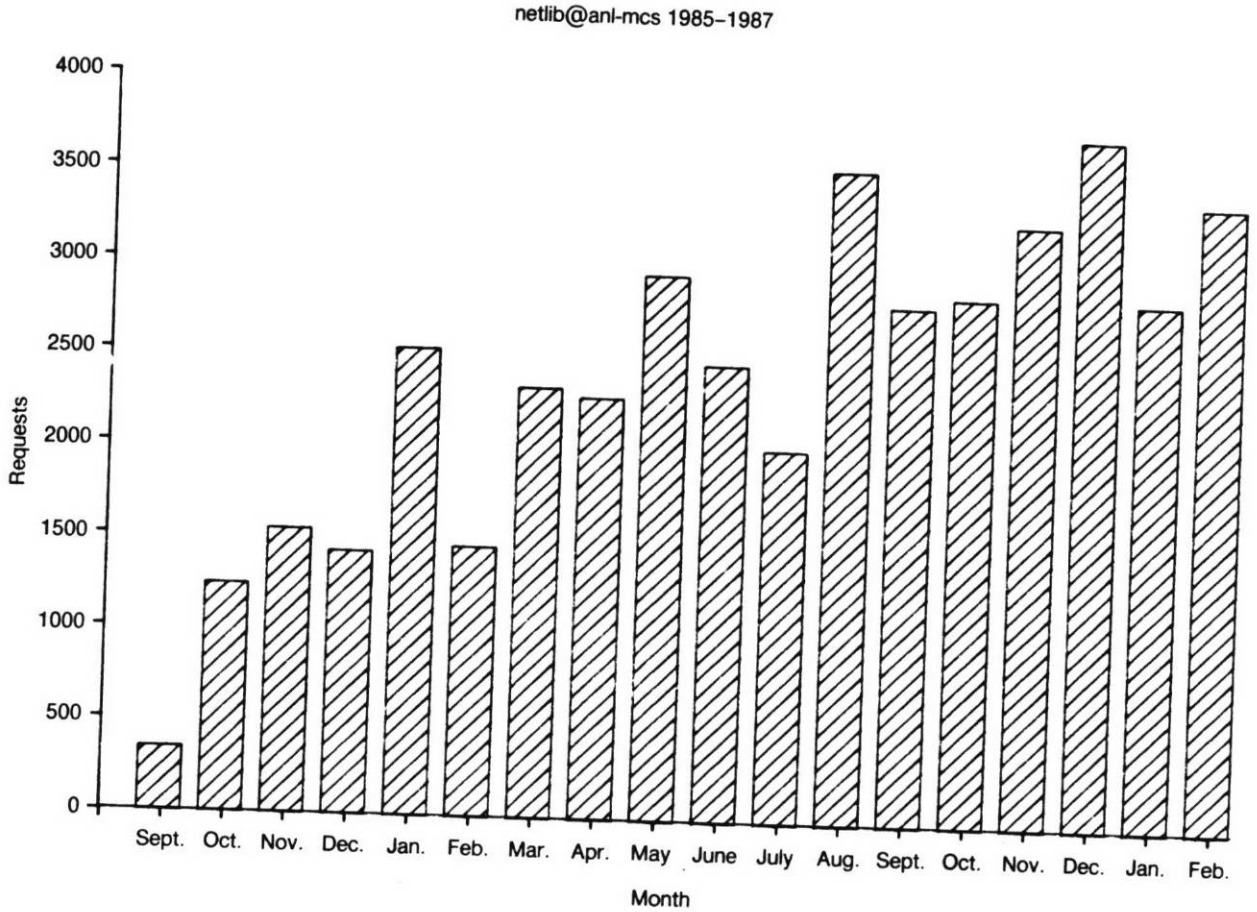

FIGURE 2. Requests Serviced by netlib@anl-mcs, September 1985–February 1987

system was so fast he preferred using it to hunting around on his own machine for the library software.

Netlib has been available since April 1985. To give a feel for the number of requests for software and information, we provide Figures 1 and 2.

MATERIAL AVAILABLE THROUGH NETLIB

Currently netlib offers a wide collection of public-domain software as listed in Table I (next page). In addition, there are miscellaneous other items, such as Golub and Welsch's GAUSSQ, Cleveland's LOWESS scatterplot smoother, Bank and Smith's sparse matrix algorithm, Bjorstad's biharmonic solvers, Grosse's RAINBOW program for generating uniformly spaced colors, incomplete Cholesky factorization, Dongarra and Sorenson's TREEQR eigenvalue method, Cullum and Willoughby's and Lanczos's codes and routines for machine constants and error handling, and other public routines from the PORT library, in particular Gay's nonlinear least squares package. There are a number of spline routines by Cline, Van Zandt, and Woltring. The multigrid program PLTMG by Bank, the MICROSCOPE diagnostic tool by Alfeld, and the multiple precision package by Brent are also in the collection, though they are probably too large to send by mail.

The various standard linear-algebra libraries are included for convenience, but the real heart of the collection lies in the recent research codes and the "golden oldies" that somehow never made it into standard libraries. Almost all of these programs are in Fortran. There is also a collection of errata for numerical books, descriptions and benchmark data for various computers, test data for linear programming collected by Gay, and the "na-list" electronic address book maintained by Golub.

In addition, netlib itself—that is, this article and the shell scripts and C codes that do the automatic processing of requests—is also available. We do *not* send out entire libraries. A computer center setting up a comprehensive numerical library should get magnetic tapes through the usual channels.

THE NETLIB SERVER

The netlib server runs under the UNIX operating system (the eighth edition at Bell Labs and 4.2BSD at Argonne), and consists of a few shell scripts and

TABLE I. Public-Domain Software Available through Netlib

Package	Description
BENCHMARK	Linpack and other timings
BIHAR	Bjorstad's biharmonic solver
BMP	Brent's multiple precision package
CORE	Machine constants, Basic Linear Algebra Subprograms, and extensions
CALGO	Collected algorithms from ACM, published in *ACM Transactions on Mathematical Software*
CONFORMAL	Schwarz–Christoffel conformal mapping programs
DOMINO	A parallel programming environment from the University of Maryland
EISPACK	Solution of eigenvalue problems
ELEFUNT	Cody and Waite's tests for elementary functions
ERRATA	Corrections to numerical books
FISHPAK	Finite-difference approximation for elliptic BVP
FITPACK	Cline's splines under tension
FMM	Codes from a book by Forsythe, Malcolm, and Moler
FNLIB	Fullerton's special-function library
FFTPACK	Swarztrauber's Fourier transforms
HARWELL	MA28 Sparse matrix routine from the Harwell library
HOMPACK	A continuation package
ITPACK	Iterative linear-systems solvers
LANCZOS	Cullum and Willoughby's Lanczos programs
LASO	Scott's Lanczos program for eigenvalues of sparse matrices
LINPACK	Solution of linear equations
LP/DATA	Linear programming test data
MACHINES	Short descriptions of various computers
MICROSCOPE	Alfeld and Harris's system for discontinuity checking
MINPACK	Nonlinear equations and least squares
MINPACK	Optimization routines
ODEPACK	Ordinary Differential Equations package
PARANOIA	Kahan's test of floating point
PCHIP	Hermite cubics by Fritsch and Carlson
PLTMG	Bank's multigrid code—too large for ordinary mail
PORT	The public subset of the PORT library
PPPACK	Spline routines from de Boor
QUADPACK	Quadrature routines
SIAM	Typesetting macros for the *SIAM* journal format
SLATEC	Machine constants and error-handling package from the Slatec library
SPECFUN	Transportable special functions
TOEPLITZ	Solution of systems of equations where the matrix is toeplitz
Y12M	Package for sparse linear systems

C programs. The following discussion assumes some familiarity with UNIX commands.

When mail arrives for netlib, it is piped through a process that strips off punctuation, through a sort process that removes duplicates, and into a C program that parses the request, translates the given library names into a search list, and invokes the system loader with the given routine names as external symbols to be resolved. A requested routine may require that many routines be assembled, to resolve all references (perhaps across libraries). The resulting loader map is edited into a list of file names to satisfy the request. These files, along with a time stamp and disclaimer, are then mailed back to the requester. A logfile records the time, return address, number of characters sent, and requested routine and library names. When the incoming mail includes actual names as well as an electronic return address, the correspondence is also logged.

The programs can tolerate minor syntax deviations, since we do get requests like "Please send me the index for port. Thank you." from people who do not realize they are talking to a program. Users sometimes submit a single request on the subject line of the mail message, so a "Subject:" prefix is also allowed. One user even sent "send index 4 port" so "4" is a synonym for "for" and "from." (This is not such an unreasonable mistake, since the instructions are often given orally.) However, we make no attempt to accept arbitrary English input.

We chose this mode of interaction via electronic mail, keeping the intelligence local to the central depository, because mail is at present the only ubiquitous data-communication service. We considered putting an interactive program at remote sites that would communicate by mail with the depository. That would allow a better dialogue ("Do you want that in single or double?"), but would be difficult to write in the necessary portable way.

COMPARISON WITH OTHER SERVICES

The netlib service provides its users with features not previously available:

- There are no administrative channels to go through.
- Since no human processes the request, it is possible to get software at any time, even in the middle of the night.
- The most up-to-date version is always available.
- Individual routines or pieces of a package can be obtained instead of a whole collection. (One of the problems with receiving a large package of software is the volume of material. Often only a few routines are required from a package, yet the material is distributed as a whole collection and cannot easily be stripped off.)

On the other hand, netlib is simply a clearinghouse for contributed software and therefore subject to various disadvantages that have plagued such projects in the past. The only documents, example programs, and implementation tests are those supplied by the code author or other users. Also, there

may be multiple codes for the same task and no help in choosing which is best. We have made an effort not to stock duplicate copies of machine constants, but in general we have left submitted codes untouched.

In summary, we are not aware of any comparable software distribution service in existence. A number of systems based on netlib are in development, such as the Archive Server tool on SIMTEL20 at White Sands Missile Range and the benchmarking effort at the National Bureau of Standards, Gaithersburg, Maryland. Our system has a different focus from, say, the Quantum Chemistry Exchange, and a more convenient distribution mechanism. Furthermore, we are more selective than many personal-computer "public-bulletin-board" systems: We do not allow users to put their own software automatically in the collection. (We wish to avoid having our computer confiscated as a result of someone posting a stolen charge number.)

The main cost of running this service is for communications. If it becomes necessary, we will require uucp users to call the hosts to pick up their return mail so that such costs are distributed fairly. At an average of a few requests per day, the traffic has been small enough to impose a negligible load on the host systems. Disk costs are controlled by discarding files that the host administrators are not themselves interested in keeping. The current collection occupies 57 Mbytes. Most important, the human costs for maintaining the collection are modest and consist mainly of collecting software. We do not see how we could run such a widely accessible and low-overhead operation if we had to charge for the service—and we are not interested in doing so. (See, however, [1] for a description of the Toolchest electronic ordering system. One problem mentioned there is that users want to see demonstrations of software before purchase.)

HOPES FOR THE FUTURE

There are several areas where we would like to see netlib expand:

- *Editors.* The coverage of netlib obviously will tend to reflect the interests of the collectors, so we would welcome "associate editors" to augment the collection.
- *Depositories.* At present there are just two distribution sites. Mail delays would be reduced if machines on other networks or in other countries were willing to also serve as depositories. (On the other hand, it is difficult even to keep two locations in sync!)
- *New collections.* The software that netlib uses to reply to mail is itself available from netlib, so it would be fairly easy for individuals to, say, announce a service for searching a bibliography that they had collected.

Netlib cannot replace commercial software firms. We provide no consulting, make no claims for the quality of the software distributed, and do not even guarantee the service will continue. In compensation, the quick response time and the lack of bureaucratic, legal, and financial impediments encourage researchers to send us their codes. They know that their work can quickly be made available to a wide audience for testing and use. We hope netlib will promote the use of modern numerical techniques in general scientific computing.

Acknowledgments. We express our gratitude to the many authors and editors who have permitted their codes to be freely distributed and to Gene Golub for his encouragement and help in starting this project. We thank Greg Astfalk of AT&T Laboratories, Princeton, for creating the keyword index, Bill Coughran of AT&T Bell Labs, Murray Hill, for editing the ode library, and David Gay, also of Bell Labs, for editing LP/DATA and PARANOIA. Dave Presotto, of Bell Labs, provided invaluable advice for dealing with network mail systems. The trick of editing a loader map is taken from the GAMS system at the National Bureau of Standards. Finally, the managements of our organizations deserve thanks for sponsoring this public service.

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CR Categories and Subject Descriptors: C.2.3 [**Computer-Communication Networks**]: Network Operations—*public networks*; G.1.0 [**Numerical Analysis**]: General—*numerical algorithms*; G.4 [**Mathematics of Computing**]: Mathematical Software; H.3.0 [**Information Storage and Retrieval**]: General; H.4.3 [**Information Systems Applications**]: Communications Applications—*electronic mail*; K.6.3 [**Management of Computing and Information Systems**]: Software Management—*software development; software maintenance; software selection*
General Terms: Algorithms, Documentation
Additional Key Words and Phrases: Netlib

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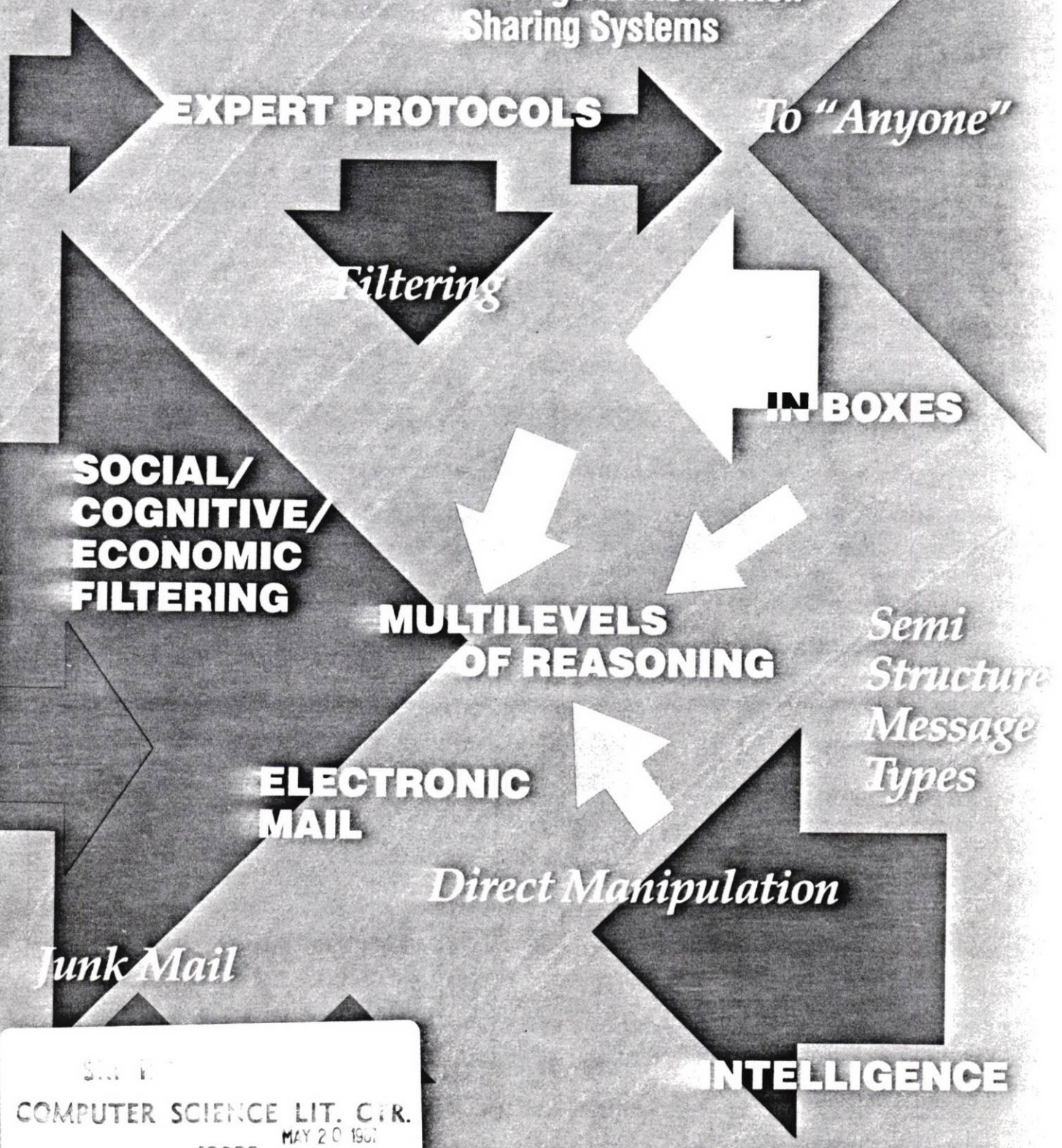
Intelligent Information Sharing Systems



PEOPLE AND THE AUTOMATED OFFICE

by James W. Driscoll

As industrialized societies become service- and knowledge-based economies, increasing the productivity of the office becomes a major challenge. Citing the relatively low capital investment per office employee, vendors of office equipment propose mechanization as the road to productivity. Lurking just behind equipment vendors, software specialists propose complete automation of office tasks. However, present hardware and software strategies for office automation neglect critical facts about human behavior in organizations. Based on the empirical literature on the behavioral impact of new office technology as well as the long-standing tradition of behavioral science research, office redesign is necessary to take maximum advantage of the automation of the office.

In its early installations, word processing disappointed many users. IBM's marketing strategy, to mechanize typing with capital investment in new equipment, specialized the typing task and centralized typists. However, many early installations generated little cost savings, output of disappointing quality, widespread resistance from users, and turnover in the newly formed word processing center—turnover at all levels from typists to supervisors and in many cases even office managers. As leases were canceled, IBM and its many competitors began to modify the initial marketing strategy to accommodate the demands of a human work organization.

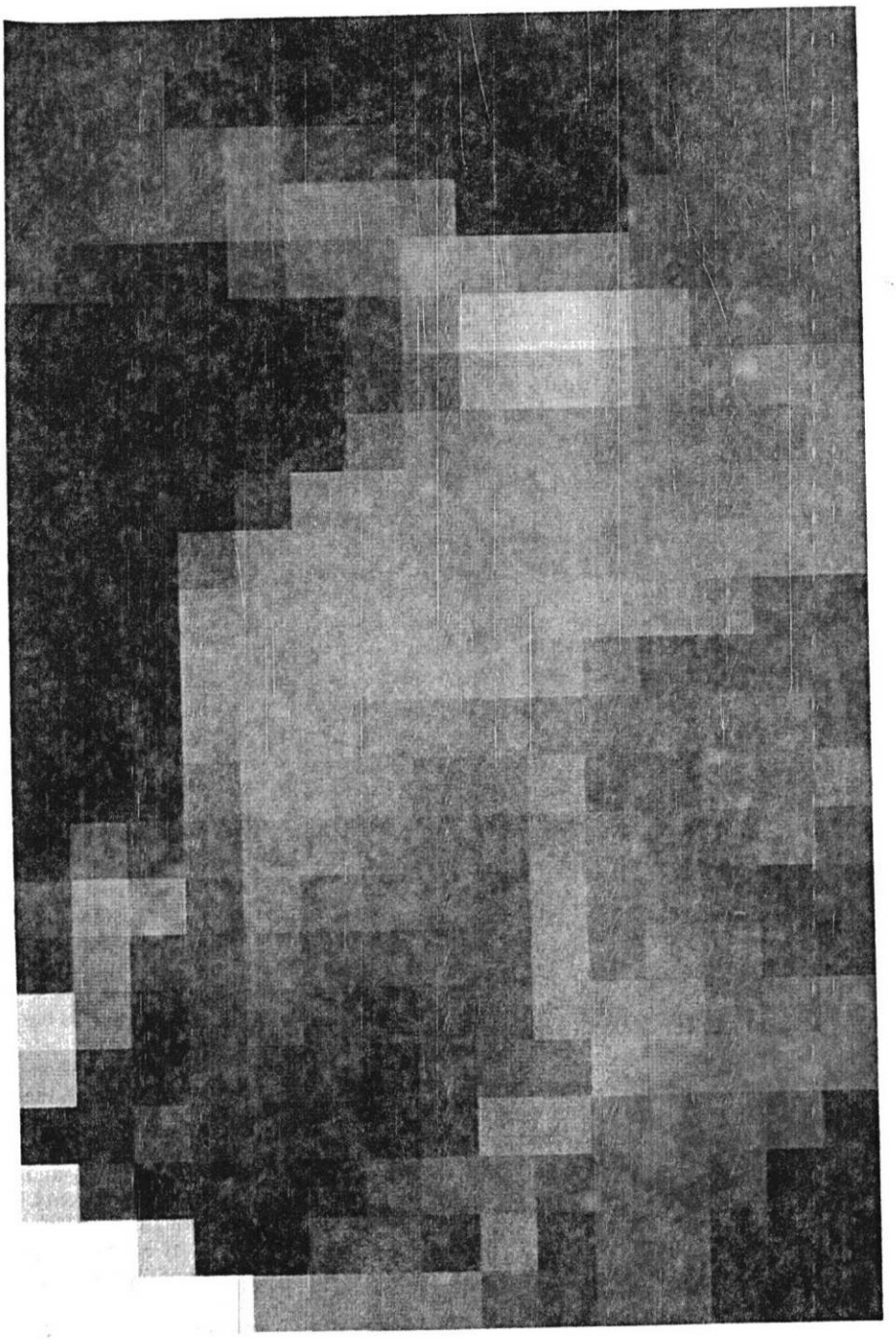
The model of the office as factory misjudged both the variety of tasks and the critical functions in the office. The central center was doomed by such situations as different language groups in many offices—typists had trouble deciphering the secret language of lawyers at 9 a.m. and chemical engineers at 10. More importantly, savings were being sought solely through more efficient typing, but only 20% of secretarial time is spent typing. The much greater potential for savings from the higher salaries of managers and professionals was being neglected. Another mistake was that implementation of word processing equipment usually followed analysis by the *vendor* of needed equipment with little benefit derived from the input of ultimate *users* of the equipment.

Electronic mail threatens to repeat the early disappointments of word processing. Estimates that electronic mail can save two hours a day for every nonclerical worker in an office, with optimistic predictions of $62 billion savings* reflect a questionable diagnosis of managerial and professional work. Firsthand observation shows the critical functions of managers to be building relationships, persuading others, and resolving conflicts. The impact of electronic mail hinges on the ability of managers to complete such sensitive functions by intermittent written communication.

Similar difficulties await the electronic workstation. According to Paul Strassman of Xerox Corp., the electronic workstation can improve the ability of white collar workers at the boundary of organizations (those whose jobs entail working with people outside their organization or department) to respond flexibly and directly to the needs of clients and customers. Strassman cites the possibility of coordination among the workstations by organizational procedures imbedded in the system software. However, behavioral research on such boundary spanning jobs has highlighted the need for flexibility *within* the organization, the opposite of programmed coordination. Effective boundary spanners influence internal procedures and modify standing operating procedures in order to serve clients and customers. Indeed, if any work organization follows all of its routines all of the time, chaos ensues.

As a further complication, managerial and professional work is increasingly accomplished in groups rather than by individuals. A more promising mechanization might be group rather than indi-

 25(12): 106–112, Nov. 1979



The most effective means of reducing resistance to change is to permit the ultimate users to help select the new office technology.

Top management must eliminate any second-class citizenship in the office through new human resource practices.

vidual electronic workstations.

Little attention has been paid to the social redesign of the office, which will be necessary to make the best use of new office equipment. Current mechanization programs neglect much behavioral science wisdom accumulated painfully about the process of organizational change.

SEARCH FOR INCREASED EFFICIENCY

Most organizations today are pursuing office mechanization. Investing significant resources in new hardware, organizations try to increase their efficiency, that is, to accomplish the same performance with fewer resources. Employers seem willing to endure the increased employee alienation psychologists predict is a consequence.

Michael D. Zisman has argued persuasively that significant increases in office productivity will only occur after the initial phase of office mechanization gives way to true office automation. The distinguishing characteristic of office automation is the incorporation of significant control operations in the systems software. While Zisman is no doubt correct that software vendors and systems analysts within the user organizations will design computer languages to encompass more complicated decisions, the advantages are still in efficiency rather than true effectiveness. The organization will continue to do what it is presently doing, but will expend fewer resources. The social costs of displaced workers resulting from automation are expected to be offset by the economic savings.

Automation that saves costs, however, does not imply effectiveness. Increased effectiveness requires a careful diagnosis of the organizations's goals and its environment to determine whether the tasks performed at present ought to be performed at all, much less mechanized or automated. This leads to the third stage of office automation (see Table 1). A diagnosis of the goals in an organization should be the first step, followed by selection of the essential tasks to be supported, and then by office automation.

A pleasant societal offshoot of this three-stage approach is its potential for humanization of office work for employees. The problems of this approach are its long gestation period and the difficulty of getting top management involved in organizational diagnosis.

Each office should be assessed according to the dimensions of organizational design: decision-making, job design, communications, leadership, group development, and human resource development. Each of these aspects will be discussed in detail later in this article.

Effective diagnosis is undertaken by the user organization with a line and human resource perspective. It focuses on strategic questions such as the critical function of each office and the varieties of offices that exist. The discipline for this diagnosis is the applied behavioral science of planned change. Before any organization invests in new electronic equipment, such diagnosis is essential. It is likely to suggest changes that will increase productivity quite separate from the introduction of electronic technology. I would postulate as a general rule that more than 50% of the savings accomplished by any new office equipment can be achieved by a systematic organizational diagnosis.

Offices are the last vestige of 19th century Prussian bureaucracy, with its hierarchy of specialized tasks and reliance on formal authority and written communication. R. E. Likert, University of Michigan psychologist and author of *The Human Organization: Its Management and Value* (New York: McGraw-Hill, 1967), describes the office as an exploitative-authoritative organization. In contrast to the office, other parts of the organization are experimenting with the more open and flexible participative group approach Likert describes. When managers work with other managers they rely increasingly on matrix organizations, temporary task groups, and project teams. And when blue collar workers in manufacturing plants assume higher levels of responsibility in autonomous work groups, they enjoy a flexibility denied most office workers.

The failure of offices to explore innovative organizational designs may well be due to the fact that managers themselves work in offices. Managers enjoy considerable power over other workers as well as the benefit of desirable working conditions. Those who advocate reducing status differentials and increasing the influence of nonmanagers must anticipate resistance due to these fundamental differences in position.

Whatever the reasons for the limited innovation in office design, a new approach to office work is possible.

For the last two decades, behavioral scientists' studies of U.S. companies have identified fundamentally different approaches to organizational design. Clearly, managers create different work environments.

The type of organization known to sociologists as participative, organic, or open not only motivates its members more effectively but also excels in the performance of organizational goals. For knowledge-based organizations coping with complex and changing technologies and markets, most behavioral scientists would expect the participative organization to be more productive. Unfortunately, few organizations take advantage of behavioral innovations when planning for productivity.

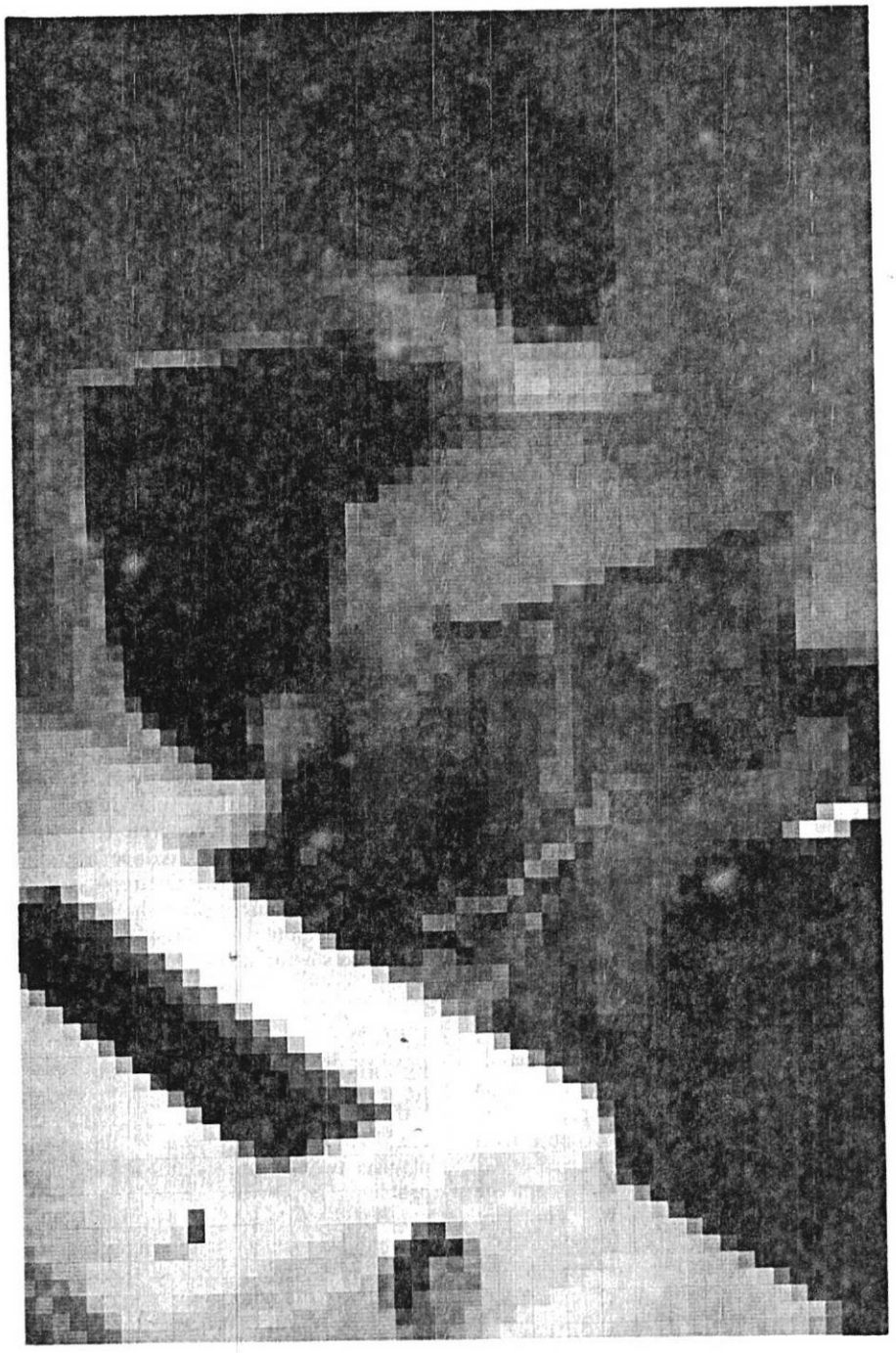
THE DIMENSIONS OF ORGANIZATIONAL DESIGN

Although managers and professionals spend a very small proportion of their time actually making decisions, decision-making is their critical function and much of their time is given to the creation, direction, and maintenance of decision making systems.

Two key dimensions in decision-making are the pattern of participation and the basis of influence. Participation can be seen as a pattern ranging from individual initiative to delegation of authority to subordinates. Decision-making can also involve formal organizational position, political connections, and expertise, among other possible bases of organizational influence. Effective organizational design would emphasize more participation in decision making and the recognition of influence based on task expertise rather than formal job descriptions.

As a general rule, the most effective means of reducing resistance to change when implementing new office technology is to allow the ultimate users to participate in the selection and implementation of the system. The optimal basis for selecting participants is not their level of formal authority or organizational position, but their familiarity with the tasks and functions to be automated. Such expertise is typically dispersed across several organizational levels and among several different departments. New office technology ought to be assessed and implemented by a user group representing a broad slice of the organization.

Closely related to the issue of decision-making is the packaging of specific decisions and tasks into jobs for individual employees. Although researchers have described the nature of jobs in many dimensions, the fundamental distinction among jobs is the extent of discretion allowed to the individual. Combining tasks to provide more employees with substantial responsibility for decision-making in their job contradicts the emphasis on task specialization in classical organization theory. Yet the bulk of empirical research has demonstrated that jobs enriched with discretionary tasks are more effective at



motivating the productivity of the employee than entirely specialized jobs are.

Combining a systematic job redesign with the introduction of new office equipment can greatly enhance the effectiveness of managers and professionals in the office. A routine managerial function such as preparing a report might better be delegated to an office staff member, to whom the task could provide relatively more responsibility. The mix of discretionary and routine tasks can thus help avoid the problems of alienation and turnover among clerical workers, while managers and professionals are freed to concentrate on the most discretionary aspects of their jobs.

Communication among members of an organization has been studied from many angles. Perhaps the simplest insight of the behavioral sciences distinguishes between informal and formal communication.

Formal communication is required and tends to be written and hierarchical. It reflects the organization's need to accomplish its missions. Informal communication, on the other hand, is ad hoc, and tends to be verbal and lateral. It satisfies the individual's need for social satisfaction in the work setting.

Informal communications should be encouraged as a systematic supplement to formal channels. In complex and changing organizational environments, communications must be rapid, spontaneous, and capable of cutting across formal organizational boundaries. Innovative organizations have thus nurtured informal communications and deemphasized the formal.

Informal communications provide an important incentive to some experimental new electronic systems. In every successful installation of electronic mail I have visited so far, the users have developed informal distribution lists to notify each other of social events and gossip (concerts, parties, etc.). While these informal channels have developed among groups experimenting with electronic mail, the formal introduction of the mail system has often encountered massive reluctance to make use of the equipment. Organizations seeking to encourage the use of electronic mail might take the behavioral perspective and cultivate the *informal* use of the system, similar to the white collar worker's use of the telephone for social contacts. Users could develop familiarity with the equipment in the course of enjoyable, informal communications rather than face the electronics as a barrier to the accomplishment of formal organizational tasks.

Employees stay with an organization and perform effectively when there is a good fit between their needs and the opportunities provided.

FOUR LEADERSHIP FUNCTIONS

Another important function of the jobs of managers and professionals is to provide leadership, that is, to help further the mission of the organization. After a long and frustrating history of research, behavioral scientists no longer attempt to identify natural-born leaders nor the traits of successful leaders. Rather leadership is most frequently described as any action by any member of a group or organization to help the organization progress towards its goals.

At least four types of leadership functions can be specified: technical, administrative, social, and institutional. Unfortunately, most practicing managers conceive of leadership as a technical and administrative function and neglect the social and institutional aspects of the role. Therefore, it is not surprising that attempts to support managers in their office settings emphasize the two former roles and inadvertently jeopardize social and institutional contributions. Yet behavioral-science research, beginning with the famous Hawthorne experiments, has shown that human organizations must provide social support to maintain the commitment of members. At the same time, there is the need for institutional direction in establishing organizational goals.

In office work, for example, social leadership involves meeting the needs of individual workers for a close personal involvement in the work group. In several successful word processing installations I have studied, face-to-face personal contact between users of the system and operators of the equipment has helped overcome the frustration resulting from the physical and social distance between the initiator of word processing input and the system operator.

Electronic mail opens up whole new social possibilities. For instance, many organizations currently administer attitude surveys on a regular basis to monitor the feelings and satisfactions of employees. Electronic mail systems provide another medium for conducting such surveys. A survey could be conducted in a very short time, for example, in response to an organizational crisis. In like manner, a confidential complaint service might easily be incorporated into an electronic mail system.

The introduction of electronic technology into the office increases the need for social leadership. The electronic office makes it much easier to get input from all levels of employees into the planning process and easier to communicate institutional decisions throughout the work force. Electronic technology can thus fulfill the social and institutional requirements of a productive organization rather than being addressed simply to technical and administrative components.

THREE STAGES OF OFFICE AUTOMATION.

Stage	Mechanization	Automation	Socio-diagnostic design
Focus	Tasks	Whole procedures	Missions
Criterion	Individual efficiency	Organizational efficiency	Organizational effectiveness
Form	Hardware	Software	Management
Discipline	Electrical engineering	Artificial intelligence	Applied behavioral science
Origin	Vendor	Vendor	User
Obstacle	User resistance	Programming	Management
Feasibility	Present	5 years	Present
Application	5 years	10 years	15 years

Table 1.

Particular attention should be paid to the development of effective working groups as part of the social functions of leadership. Sophisticated managers realize that new groups don't work together well; the comparative advantage of groups over individual contributions only emerges as groups mature. Therefore groups must be allowed a period of time early in their history when little is expected from them in the way of performance. Managers who are most dissatisfied with groups (task forces, committees, and the like) typically call a group of people together, assign them a task to work on immediately, and are then surprised when the group fails to accomplish its objectives on time.

Indeed, predictable crises emerge in the history of a group. Phrased in terms of questions a group member might ask, they are: "Who's in charge here?" "What's in it for me?" and "What do people expect of me in this group?" Sorting through these issues takes time, but once the problems are resolved, groups can make rapid progress on tasks.

These patterns in group development have obvious implications for electronic teleconferencing. Ideally a geographically dispersed project group can function without the need for extensive travel to coordinate their efforts. Teleconferencing—either video or electronic mail—could substitute for face-to-face meetings. However, installation of the electronic system without attention to the social problems in group development would doom such a system.

On the other hand, a manager could convene a long (multiple-day), face-to-face session early in the project group's history and devote the session to an exploration of the difficult social issues. Then, a teleconferencing facility could save the hothouse grown project group substantial travel time during the life of the project. In concrete terms, an organization hoping to reduce meeting time by purchasing the electronic equipment for teleconferencing should at the same time build a conference center for extended startup meetings.

HUMAN RESOURCE DEVELOPMENT

Although performance appraisal, recruitment, management development, etc., have been analyzed in detail by sociologists, two global concepts highlight the problems in most offices. In the first place, there is the distinction between jobs in what labor economists have termed primary and secondary labor markets. In the vernacular, the primary labor market provides "good" jobs. They combine high pay, opportunities for training and advancement, considerate supervision, job security, and protection from arbitrary discipline. By contrast, a substantial portion of office jobs currently falls in the secondary labor market. These jobs combine low pay, little training or advancement, little job security, authoritarian supervision, and arbitrary discipline.

Employers must attempt to move more office jobs into the primary labor market. The commitment of the employee to the organization engendered by this step would allow the use of participative

decision and communications practices as well as ease the implementation of new equipment.

A second important concept in human resource development is the psychological contract. Office employees are motivated to stay with the organization and to perform effectively when they feel there is a good fit between their individual needs and the opportunities provided by the organization. Although office workers have been studied by psychologists much less frequently than managers and professionals have, we do know that individual secretaries and clerks differ substantially in personal preferences. Some seek advancement to higher organizational levels, others want an opportunity to cultivate and use particular technical skills, and still others need only a secure job and source of income among congenial coworkers. Formal systems to identify the needs of individual employees and match them with organizational opportunities should be developed. Counseling sessions, posting job opportunities and allowing open job bidding reflect this orientation. Clear career paths should be made obvious, some for progression upward through office jobs, but also a variety of other career paths to satisfy the different individuals who work in the office.

The question is not whether a new, more effective organizational design will evolve but who will control the evolution. Managers can act now to implement these changes or be forced to accept them by legislation or unionization.

For example, equal employment opportunity litigation is increasingly directed at the office. A number of suits will almost certainly challenge the job evaluation schemes which currently relegate female secretaries and clerks to low salary grades. The Equal Employment Opportunity Commission has already commissioned a major study to investigate job evaluation practices. Initial indications suggest a major threat to current patterns of sex segregation in the office.

Also, unionization of the white collar work force in the U.S. is a likely development in the 1980s as women become increasingly career oriented. A recent report for the Department of Labor described female white collar workers as "ripe for unionization in the 1980s." A central question for labor relations specialists forecasting the level of unionization in the next decade is whether increased office automation will be a force contributing to the increase in unionization or whether its careful introduction becomes a means for managers to maintain their current nonunion status.

Will increased office automation be a force contributing to the increase in unionization?

TWO-PRONGED STRATEGY OF CHANGE

Given the inertia of the traditional organization of office work, a two-pronged strategy of organizational change may be required. The first step in any transition is creating the felt need for change; the process of transition is actually the second stage. The need for change must be directly felt by managers and professionals. Top management must visibly support the new organizational design, through new human resource practices, as a means of eliminating any second-class citizenship in the office.

For the second, process-oriented stage, a nondirective approach is required. Innovations should be allowed to move in the marketplace of ideas within the organization. For example, employers can use new technology in local demonstration projects to diagnose particular office situations and subsequently experiment with related new social designs. Evaluation of these local initiatives encourages the slow diffusion of ideas through the organization.

Such a slow-paced strategic effort is required in the second stage of change because of the nature of the change ultimately desired. The object of the exercise is to increase productivity through a basic change in the nature of office work.

In most organizations, it will be impossible to impose from the top of an organization a single design flexible enough to accomodate all local idiosyncrasies. Moreover, employers ultimately want their office staff to internalize the values underlying the new organizational design as well as becoming familiar with the electronic technology. Superficial commitment will not suffice; if the traditional human resource systems remain in place, managers are taking the risk that equipment may be purchased and then not used. Commitment and local innovation require a slow-paced transition, not specific directions from the top.

The transition to a new organizational design for the office requires careful management. The logical management vehicle for such a transition is a high-level, interdepartmental task force combining the various disciplines within the organization affected by new office technology. Most innovative users in the United States have already formed such a task force to encompass data processing, telecommunications, and administrative services. The mix combines expertise in hardware, software, telecommunications, and methods analysis. However, such task forces seem systematically designed to overlook the third stage in the evolution of automation as described here.

Professionals from the department of human resources or personnel rarely sit on such task forces even though they can bring a number of skills relevant to the change process described here. Implementing the new organizational design involves the modification of job descriptions, job evaluations, supervisory style, management training and development, selection and placement, to list only a few issues relevant to the human resource support staff groups. The task force also requires an applied behavioral scientist familiar with the process and problems of planned change in organizations. A major challenge confronting user organizations is to establish the link between the office automation/office of the future task force and the human resource disciplines within their own organizations. ✲

"Furthermore, I do not question the existence of pure relational data base machines, the covert commercial use of a 512K chip, or the melodic supremacy of Vic Damone."

JAMES W. DRISCOLL

Prof. Driscoll teaches human resource management, labor relations, and psychology at the Sloan School of Management at MIT. He has consulted with a number of vendors and users in the development and assessment of new office technology.

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INTRODUCTION

The document outlines the proposed interaction of a mail-system (HERMES and/or MSG) and NLS running as an inferior fork used to edit message fields. The goal is to allow a user to drop into NLS (TNLS or DNLS) and use the full capabilities of NLS for the creation and editing of messages to be processed by the host message system.

PROTOCOL

USER INTERFACE:

The user may at any point during specification of a message field type an interrupt character recognized by the appropiate mail system. The user then gives a command which the mail system recognizes as a request to invoke NLS.

FORK ACTIVATION PROTOCOLS:

The message system then creates an inferior fork containing NLS and starts it a specified entry point called the mail-system initialization entry point (miep). NLS will then perform any needed initialization and then halt with a register (mail-system initialization communication register - micr) containg either the value "initialization OK" (miok) or "initialization failed" (mifail).

Provided NLS has returned miok in the micr register the mail-system will activate NLS at the mail-system processing entry point (mpep) with a designated register (mail-system processing communication register one - mpcr1) containing the JFN of a sequential file containing the text of the current contents of the message field. The message system will close this file before calling NLS at the mpep. The conventions concering the semantics of the contents of this file are discussed below.

FORK TERMINATION PROTOCOLS:

NLS will read the input file and transform it into an NLS file and load this file for the user. The user then edits this file with NLS until he is satisfied with the contents. She then issues the "QUIT" command to NLS. NLS will then transform this file back into a sequential file, close the file (without releasing the JFN), store the JFN in register mpcr1 and the value "mpok" in the mail-system processing communication register two (mpcr2), and halt. If mpcr2 does not contain the value mpok when NLS halts then NLS was unable to process the request and the mail-system should perform appropiate recovery procedures.

VARIABLES TO BE SPECIFIED (and suggested values):

miep:	7
mpep:	8
miok:	0
mifail:	-1
mpcr1:	1
mpcr2:	2
mpok:	0
mpfail:	-1

MESSAGE CONTENT CONVENTIONS:

To the message process NLS is merely a process which takes as input one sequential ASCII text file and produces another as output. Internally however NLS also maps the input file into an NLS file and maps the completed NLS file back into a sequential file. The internal mappings follow certain conventions which are outlined below. It is hoped that an understanding of the conventions governing these

internal NLS to sequential file mappings will enable the user to take full advantage of the NLS editor.

Wolfgang Dzida

European User Environment Subgroup

The first meeting was held from 20 - 22 July 1981 at GMD, Bonn. People with a variety of backgrounds participated: social and organizational scientists, psychologists and computer scientists. In addition to members of the European User Environment group members of the European Systems group and also the North American User Environment group participated.

Hilary Williamson presented a model of the 'User Environment' from the user's point of view.

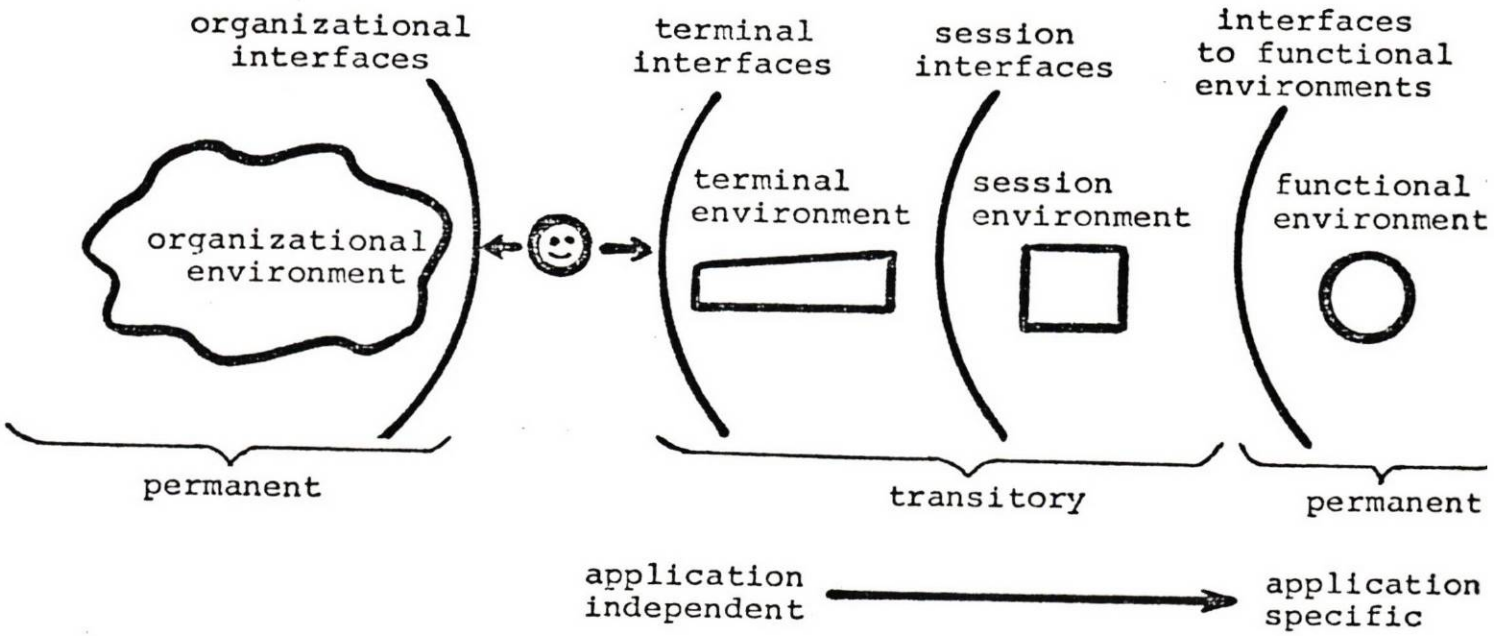

Fig. The User Environment

The 'terminal environment' determines the input/output features of a message system. By this is meant, for instances, the system's appearance to the user, the system's output in certain display areas (so-called windows), the grouping of message fields on the display. It depends on the terminal interface, whether a user is overwhelmed by a mass of information or whether he can discriminate between relevant and irrelevant messages.

The 'session environment' determines the form of dialogue between user and system. This kind of environment may allow the user to interrupt reading a message and to resume a certain task. It depends on the session interface, whether a user can temporarily retain a received message in his in-basket, or whether each message will be archived automatically. Requirements dealing with 'user control', 'self-descriptiveness', 'ease of learning' etc. pertain to the session interface.

...

The 'functional environment' determines the set of functions available to the user. Generally speaking, the functional interface provides access to a set of tools and defines the user's privileges, for instance, the allowance for private filing. It depends on the functional interface, whether the user has access to any referenced message in order to achieve 'proximity of reference' when building a message. The user must be able to deal with both a message he is creating, and one to which he refers. This may be realized by a split screen feature. The feature itself is a terminal interface characteristic, whereas the reference function belongs to the functional interface.

A similar requirement that pertains to the functional interface is that the system should aid the user in 'reconstruction of context' of any received message. That is, in order to understand and give meaning to a received message, the user must be able to easily collect together past messages which help reconstruct the context of that message.

It becomes evident from some of the above mentioned examples that the three kinds of environments are partly interrelated. The User Environment Model allows to describe properly the Messaging User Agent as a part of the model. It depends on the User Agent (UA) how a user can deal with a message structure, for instance: can he make use of a distribution list, can he provide blind copies, can he indicate a pragmatic status? The modes of entering or displaying this information, however, will depend on a particular functional interface design, and the user's terminal and session environments. A representation of the User Environment Model in terms of nets has been attempted. This representation satisfies the need for an unambiguous interpretation of the model, and it will probably facilitate answering the questions: What are originator UA functions versus recipient UA functions versus MSA services, and how do public directory services fit the UA/MSA model?

It was emphasized that for a proper interface design it is necessary to describe user's message transformation activities in detail. The 'classes of operations' described by Miller and Vallee are a first step in this direction. Some requirements related to message transformations have been formulated.

The scope of the User Environment Subgroup also includes the the organizational impacts and inter-dependencies between the 'functional environment' and the 'organizational environment'. The latter is governed by rules of the organization, for instance, rules for certain feedback events in a project team, rules for cooperation between departments. Organizational requirements and requirements of the individual user must be carefully balanced against each other, for example with respect to power, division of labour, functional roles of individuals. Explicit and implicit roles of individuals are important as well as rules which govern interpersonal communication. For instance, 'role taking' is necessary for communication; it means, to calculate the other person's reactions in advance in order to adjust own statements to their way of thinking ("slip into the other person's shoes"). Research is necessary to find out whether lack of role taking behaviour may be aggravated or may be encouraged by the use of message systems.

. . .

A tentative code of ethics for CBMS has been formulated. This code is intended to reflect social and political impacts which should be considered in the design of such system. The reactions to the code of ethics were inhomogeneous.

The second meeting of the European User Environment Group was held from 25 - 27 November 1981 at GMD, Bonn. After the first meeting in July it was planned to deal with "Individual versus Organisational Factors of Messaging". But this plan was cancelled due to a proposal of the North American Systems Group. We were expected to deal with "message headers, naming, addressing and directories" from the user's point of view.

From the user's point of view 'naming' and 'addressing' indicate other kinds of activities than those usually described from the systems's point of view.

From the user's point of view the directory is an external memory. Thus the user needs not have in mind all the subtle details of a potential recipient's location, particularly the technical details. The only thing the user must have in mind is the name of the recipient. Additionally, the user needs a model of the technical addressing process in order to estimate

- the relevance of envelope inscriptions for routing,
- the costs for routing and transport, and
- the time of delivery.

The main issues of direct concern to the user are in timing of delivery and cost of message services. Basic requirements are: Charges for directory services should be low in any case, regardeless of the distance between UAs; costs may accrue to the originator, if parameters of a name are uncertain, incomplete or even wrong, and if these parameters cause routing problems. However, routing problems that are due to system overload should not cause costs which hurt the user.

It was strongly recommended: So far as the user is concerned with addressing, this activity should be close to addressing letters. From the user's point of view addressing is to specify a unique person by certain attributes. When attributes appear on an envelope they are called parameters. The User Environment Group distinguished between essential, optional and private parameters. Essential parameters are those which enable the MSA to identify the recipient. It was emphasized that the burden of identifying rests on the MSA. The originator only deals with names. Optional parameters (for instance the name of the recipient's message system) make it easier for the MSA to deliver the mail.

It is convenient for the user, if some parameters are automatically added on the envelope by the originator's UA. The user should deal with the directory exceptionally. But the originator should be encouraged to make provision for correct envelope inscriptions.

The participants of the November meeting discussed different kinds of directory inscriptions for individuals and for groups. They also attempted to define, what is to be listed in a directory about other directories.

. . .

Some basic requirements for directory services have been formulated, for instance: The user might not only inquire an on line directory service, but he should also be enabled to contact a human assistant for help in the same way that a telephone user can ask the operator for directory assistance.

Besides naming and addressing the participants discussed attributes of a so-called negotiation process which takes place in the UA, and which deals with the reception of a message from the MSA. Attributes relevant for the negotiation process are:

- protection indicator (recipient may reject a message if unable to guarantee message protection),
- presentation indicator (sender may not want delivery if receiving UA cannot guarantee 'high fidelity' presentation),
- solicitation indicator (recipient may reject unsolicited mail; this may affect billing/pricing strategy),
- destination indicator (sender may want only a nominated person to read a message).

Furthermore, some attributes for processing the message content have been described. Although they are conceived to be largely application dependent, some attributes are considered to be of interest to a major part of the user population. For instance: the pragmatic status of a message content; three main status might be distinguished:

- request: either a question or an order or a responsibility transfer (assign to);
- reply: a feedback to a just received request (answer, confirmation);
- notice: messages of this kind are considerd neutral, i.e. a feedback is not expected.

The above mentioned results of the two meetings have been documented. Reports may be ordered by the chairperson's address.

It should be emphasized that the results of the meetings were influenced by some participants who are very experienced in CBMS design and implemenation. A User Environment Group cannot work without such participants. For future work it is necessary to sponsor the attendance of such experts. The chairman of the European User Environment Subgroup highly appreciates each hint on possible sponsorships.

A Catalyst For Office Of The Future

Electronic mail is benefiting from the new communications services that are coming on-stream from a wide variety of sources.

by Morris Edwards
Data Communications Consultant

Electronic mail refers to the delivery, via electronic means, of messages that would otherwise be transmitted physically through the postal system or verbally via the telephone. As such, electronic mail may simply be considered a faster, cheaper or more convenient alternative to the postal system or voice network. A more expansive view, however, sees electronic mails as the forerunner to—and possibly catalyst for—the office of the future, where documents would also be "filed" and "retrieved" electronically and where users would have on-line access to a myriad of information services.

Breaking the barriers

While electronic mail systems are, for the most part, still in the prototype stage, there is little doubt that they will mature and proliferate in the years ahead, given the inadequacies of present mail delivery, the continuing price/performance gains of electronic technology and the corporate emphasis on improved "bottom-line" results. Even so, there are compatibility and other operational problems that must be overcome, not to mention the high price tags that scare off many would-be users.

Take facsimile, for instance, currently the most popular approach to electronic mail, primarily because of its similarity to conventional mail operations. Facsimile machines have traditionally been expensive to lease and use, and their utility stunted by lack of compatibility.

Word processors are still too expensive for the majority of electronic mail applications, and few currently have communications options (less than 10 percent), partly because many applications are intrafacility and so require no communications, and partly because of organizational structures and attitudes.

Another approach to electronic mail, and perhaps the most powerful, involves computer-based message systems. These systems, however, are not only expensive and difficult to implement, but require managers to change their work habits. Even so, as the required software becomes more readily available and as the efficiencies achieved by the pioneering users are publicized more fully, users can expect to see a surge in the use of such systems, especially among technology- or engineering- oriented firms which can more readily adapt to the impersonal environment.

Carrier plans

Despite these advances, the best hope for electronic mail lies in the growing availability of specialized communications services that resolve equipment compatibility problems, reduce operating costs substantially and provide valuable features beyond the scope of the voice network or conventional mail.

Already, one specialized carrier, Southern Pacific Communications (SPC), offers a service geared specifically for facsimile users, while value-added carrier Tymnet provides a store-and-forward message service utilizing its packed network. Among the "biggies," Satellite Business Systems, the IBM-Comsat-Aetna venture, talks about high-speed document distribution as a major element of its planned service offering, while AT&T's proposed Advanced Communications Service is replete with features geared specifically for electronic mail applications.

Further, ITT is waiting in the wings with a packet-switched service for electronic mail, and timesharing firms such as Boeing and General Electric are poised for entry. Even Xerox is rumored to be readying a store-and-forward network capability.

SPC's facsimile service, called Speedfax, transmits a message to any of 30 cities around the country for a flat fee of 25 cents/minute, dropping to 16 cents/minute overnight. This means that a user with a subminute fax machine can send a page of copy from coast to coast for a quarter.

Tymnet's store-and-forward message service, called OnTyme, resolves incompatibilities to permit communications between dissimilar terminals with speed from 300 to 1,200 bps. As an alternative, the carrier will supply users with a turnkey message-switching system comprised of the processor and other hardware and software required for the user's specific application.

Telenet Corp., Tymnet's competitor for value-added network services, has also talked about offering an electronic mail service called TeleMail. The carrier, however, has seemingly decided to concentrate its resources on higher-priority services, leaving TeleMail in limbo for the moment. However, Tymnet does appear to have competition from a timesharing firm called Scientific Timesharing Corp., which introduced an electronic mail system called Mailbox in 1972.

Another competitor

Next year, Tymnet will have another competitor in the form of ITT Domestic Transmission Systems. The ITT subsidiary plans to enter the electronic mail business with its Fax-Pak service, which will perform the necessary conversions in modulation, protocol, code and speed to allow incompatible facsimile machines to communicate with each other. Also, the network will allow users to send messages from a character-oriented terminal to any other subscriber's facsimile unit or terminal. Initially, there will be a speed limitation with the terminal of 30 cps.

Another communications service proposed for electronic mail involves the use of FM radio stations to broadcast messages at a cost comparable with postal rates. According to William Von Meister, president, Digital Broadcasting Corp., Vienna, VA, both local and national organizations could be served by using FM stations in 50 strategically located cities.

At each station, the FM transmitters would be fitted with Digital Broadcasting's encoding equipment. Users wanting to send messages would dial a toll-free number to ac-

cess a data entry terminal for text preparation. Messages would then be switched via leased channels to the appropriate station for broadcast in digital form.

Transmission costs would run 2.5 cents for a page of data broadcast at night, and 15 cents for daytime transmission. Including the cost of a printer, a user would typically pay an average cost of 18 cents per page for a volume of 200 messages per month. Before national coverage can be provided, however, each FM station must gain approval for the service from the FCC. Since electronic mail sounds more like a common carrier offering than a broadcast option, the concept could well face opposition in the FCC's Broadcast Bureau.

AT&T faces similar tough opposition at the FCC with its Advanced Communications Service (ACS) which is clearly geared to electronic mail applications. For one thing, ACS will provide the necessary code conversion, protocol translation and speed matching to allow a large number of diverse terminals and computers to communicate with each other.

As proposed by AT&T, ACS allows a user to prepare and edit a message and hold it in a special "message storage area." Users can elect to send messages on a priority basis or accept various amounts of delay. The message is transmitted to a network "message arrival area" associated with the recipient who in turn has three delivery options: automatic, scheduled and demand.

Satellite Business Systems (SBS) is also targeting electronic mail in its service plans. SBS proposes two types of Batch Document Electronic Distribution System (BDS). It describes BDS-1 as a "communicating copier-like distribution system," whereas BDS-2 is termed an "off-line, local compressed document storage of batched data streams."

Earlier this year, the Postal Service announced a system called ECOM (Electronic Computer Originated Mail) for delivering messages presently originated by large users on computers. ECOM will accept input via a data communications channel or computer tape. A central switching system will route the data to one of 25 other centers called Serving Post Offices (SPOs), located nationwide. There, the messages will be printed, enveloped and delivered.

ECOM's announcement raises several questions in the mind of Steve Caswell, editor of the twice-monthly newsletter, "Electronic Mail and Message Systems."[1] Does it make the Postal Service a common carrier subject to regulation by the FCC? Isn't the Postal Service acting as a computer service bureau by printing all those bills instead of letting the user do it?

These are all major issues that will no doubt be debated at length in Washington over the next few years. As Caswell advises his readers: "Go back nights for that spare law degree. By the time the dust settles on this one, America may need all the lawyers it can produce." □

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DataComm Update!

Electronic Mail: New Transmission Services Help Promote Its Growth

By Morris Edwards
CN Data Communications Consultant

Dale Kutnick, Director of Market Research at The Yankee Group, gives his perspective on electronic mail to CN's Morris Edwards.

Like distributed processing, electronic mail lacks a clear definition, but that does not prevent industry prognosticators from hailing its omnipresence in the "early 1980's." For the present, though, users are left wondering exactly what electronic mail is and how it might best be applied within their organizations.

One thing is clear: Electronic mail will be a major battleground in the clash between AT&T and IBM, and possibly its affiliate, Satellite Business Systems. However, on this occasion, other biggies such as Xerox, Burroughs and Exxon are likely to join the fray, along with that old warrior, the United States Postal Service. This latter participant prompts the question of who will set tariffs and policy, and raises the specter of squabbles between the Federal Communications Commission and the Postal Rate Commission and maybe even the Communications and Postal Service subcommittees of the House and Senate.

Certainly, with the fuzziness and uncertainty surrounding electronic mail, and the involvement of some of the nation's largest companies, there's going to be plenty of grist for the editorial mill. One of the most incisive and illuminating publications in the field is the twice-monthly newsletter, "*Electronic Mail and Message Systems*," which was started last December by International Resource Development, Incorporated. Less incisive but more voluminous, and possibly more entertaining, is The Yankee Group's "Report on Electronic Mail," which comprises a basic 256-page treatise plus quarterly update. Electronic mail is also the subject of major reports by Frost and Sullivan, IRD and the like, as well as seminars put on by the Yankee Group, Frost and Sullivan and similar firms, so no user interested in the topic should go wanting for information.

Conflicting Perceptions

Part of the difficulty in comprehending electronic mail arises from the different perceptions of what it is. This phenomenon is highlighted in a recent report on electronic message systems prepared for the FCC by a joint research team from Kalba Bowen Associates and MIT's Center for Policy Alternatives*. In studying the motives for building such systems, the researchers found a marked distinction between one group of users, whose primary objective was to automate administrative processing tasks, and another group whose goal was simply the movement of text from one place to another, but faster, cheaper and more conveniently than via the current postal service or voice telephone network.

With the former group, information ... how it is stored, collected and used ... is the major concern and the factor determining costs. Communications is simply one aspect of a complex range of information-related activities, and communications systems for messages are designed, like everything else in the system, to serve and be integrated with larger automation objectives. With the latter group, the emphasis falls on creating a simple, ubiquitous and reliable message transmission system to replace letters, telegrams and some telephone calls.

When asked the cost of an ordinary letter, the "message transmission" group answered 15 cents, the report notes, whereas the "office automation" group answered $4 to $6. Accordingly, the office automation group will accept an equipment and communications charge with a new system of $.50 to $1 provided there is a sufficient reduction in the labor costs associated with preparation and mailing. For the message transmission group, costs are dominated by the price of a postage stamp.

When asked about standards, the office automation enthusiasts were wary or indifferent, the report continues. "They believe that the office system must be tailored to the needs of each organization and should not be constrained." In contrast, the message transmission enthusiasts note that standards, however distasteful or hard to achieve, are a prerequisite for ubiquitous service availability.

What Constitutes "Electronic Mail"?

For its study, the research team used the narrow definition of an electronic message system as one for transmitting "character-encoded information by electronic means from terminal to terminal in units recognized as messages which would otherwise be transmitted physically through the postal system or verbally via the telephone." Such a system may or may not produce hard copy, may or may not deliver the message

*Copies of the 328-page study are available for $30 each from Kalba Bowen Associates, Incorporated, 12 Arrow Street, Cambridge, Massachusetts 02138.

to a specific person, and may or may not be part of a larger electronic office or computer system, the report explains. Apparently, the working definition was suggested by the FCC. It clearly excludes conventional facsimile, where information is not character encoded, and services such as Mailgram.

IRD gives a more comprehensive definition of electronic mail: "Delivery of messages from sender to receiver in some visual or digital form via electronic means." The title of the firm's newsletter, however, acknowledges the blurriness of the electronic mail definition by encompassing electronic message systems as well.

"After all, there is really no such thing as 'electronic mail' if one wishes to get strict about it," notes IRD president and EMSS publisher, Ken Bosomworth. "Strictly speaking, the term means letters delivered electronically, yet a 'letter' is a precise term employed by the United States Postal Service to refer to a message contained on a corporeal, or tangible, medium and delivered physically by a third party from sender to receiver."

As to what constitutes electronic mail and message systems, the IRD newsletter is expansive in its view, perhaps overly so since data communications is included as the dominant element over Telex/TWX, facsimile, Mailgram, telegram, message switching and communicating word processors (Tables I and II). Bosomworth explains the reason for its inclusion is the cross-elasticity of data communications with other electronic delivery systems, as well as the tendency for designers to incorporate message delivery systems within today's data communications networks.

As an example of this cross-elasticity, Bosomworth points to the Bethlehem Steel Company, which operates one of the largest facsimile networks in the United States. "The purpose for such a network is to allow the entry of sales orders from field sales personnel," he explains. "This, of course, is a data communications application, but performed via facsimile. To not include data communications in with electronic mail and message systems is to miss the design/application boat."

Bosomworth acknowledges that the biggest problem in including data communications into the definition is its implication of a person/computer relationship, whereas electronic mail systems imply message transmission between two people. "While such a distinction may have been valid five years ago, today any such distinction is meaningless," he claims. "The communication between a person and computer is always only temporary. The data communicated is sooner or later printed out for human eyes."

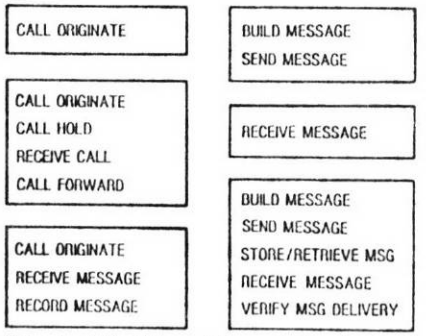
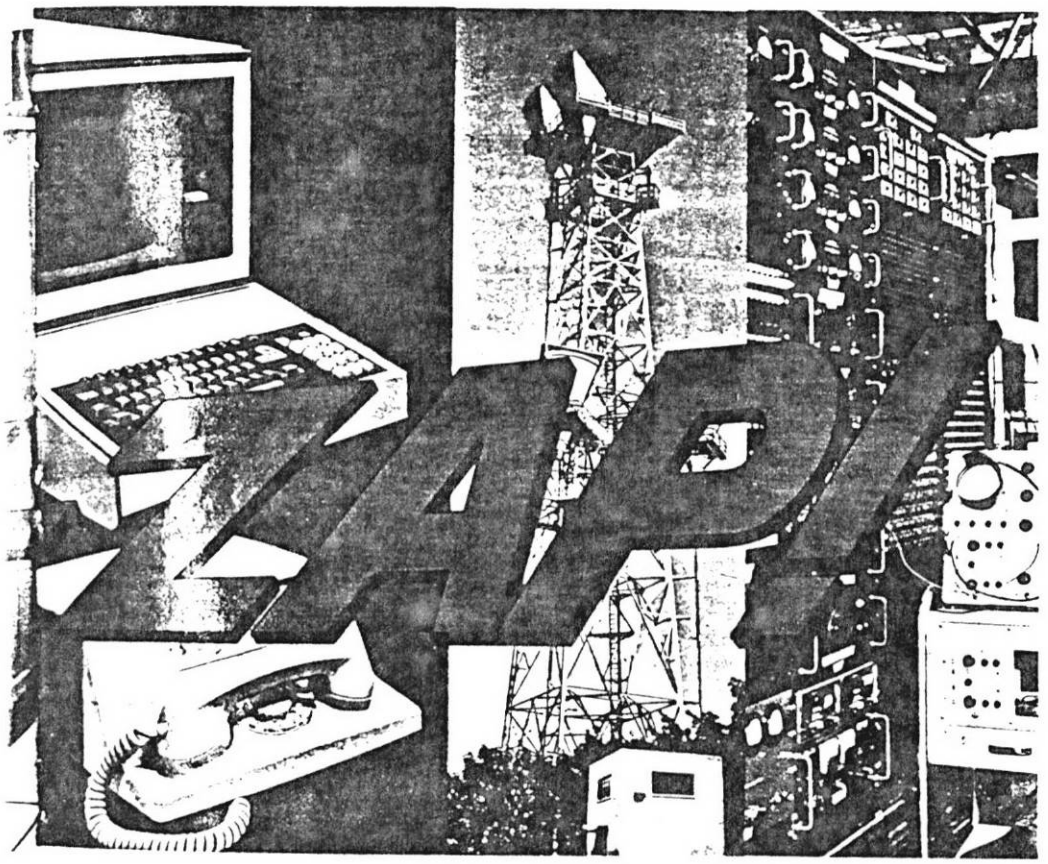


Figure 1—AT&T's Advanced Communications Service offers a range of standard functional features which users can group in a variety of ways to achieve required electronic mail capabilities.



Over the long term, IRD feels the most important issue with electronic mail involves the cross-elasticity among messages. A simple example would be a facsimile communique which can be handled via a data communications network, and vice versa. However, cross-elasticity assessments must also include the postal service, private delivery systems and the telephone network, so determining the best method of communicating a message is often difficult.

Bosomworth believes that a hierarchy has already been established for message transmission based upon the perceived need to pay for delivery of specific messages. "Users will pay for instantaneous voice communications," he notes, as evidenced by the 217 billion calls made yearly. This availability of low-cost, highly effective voice communications greatly impacts the growth of electronic mail and message systems, he believes. "Many messages simply don't need rapid delivery because a telephone call supplemented by a message delivered by the post or intra-company message system suffices," he explains. "While the message may take three days for delivery in hard-copy form, the time is meaningless because the effective communications was handled by phone."

Despite its unclear future, Bosomworth is still bullish on electronic mail. "It is already a $3-billion-plus business in revenues to common carriers alone, with equipment revenues contributing additional billions of dollars," he notes. "In the coming decade, this field seems destined to expand substantially from its current base, which is modest by comparison with other communications media."

In its definition of electronic mail systems, the Yankee Group includes computer-based message systems, facsimile, communicating word processors, telex/TWX and Mailgram, but also adds optical character readers (OCR's). These devices scan typed documents and record the information, and so can be used with ordinary typewriters for data entry.

In explaining the economics of OCR, Dale Kutnick, director of Market Research for The Yankee Group, notes that, with word processors, nearly 75 per cent of an operator's time is spent on text entry. This is a highly inefficient use of a machine costing from $10,000 to $17,000, he claims, when one could use an $800 Selectric typewriter for input and electronically capture the information with an OCR.

While the OCR may cost $15,000, it can handle input from many typewriters, with a consequent savings in text entry costs. Typically, the entered information is stored on diskettes and subsequently fed into a word processor for editing, revisions and final output. Since the processor is now used for the less time-consuming functions of editing and revising text, its efficiency is increased substantially, Kutnick explains.

Implementation Options

Given the inadequacies of present mail delivery, the continuing price/performance gains of electronics technology and the corporate emphasis on improved "bottom-line" results, there's little doubt that elec-

More Electronic Mail

Continued from previous page

tronic mail systems will mushroom in the years ahead. Less clear is what form the system should take, since there are currently cost and operational problems with each approach, and a lack of compatibility between them.

Facsimile is the foremost approach, primarily because of its similarity to mail. However, facsimile machines have traditionally been expensive to lease and use, and their usefulness stunted by lack of compatibility. That situation is changing with the development of faster and less expensive units that meet internationally adopted standards, and with the availability of transmission services geared to facsimile users and capable of resolving equipment incompatibilities.

Word processors are also expensive, and few currently have communications options (less than 10 percent), partly because many applications are intra-facility and so require no communications, and partly because of organizational structures and attitudes. Here again, though, the organizational barriers are coming down and vendors are anticipating user needs by adding bisync communications features on the latest models. IRD expects the cost of communicating word processors to drop to $1000 within the next decade, giving it enormous potential for electronic mail applications.

Computer-based message systems are not only expensive and difficult to implement, but require managers to change their work habits. However, as the required software becomes more readily available and as the efficiencies achieved by the pioneering users are publicized more fully, one can expect to see a surge in the use of such systems, especially among technology or engineering-oriented firms which can more readily adapt to the impersonal environment.

In all of these approaches, the transmission service represents a key catalyst for growth, and one of the more encouraging life signs for electronic mail is the anticipated influx of specialized and value-added carrier services. Already, Southern Pacific Communications offers a specialized service for facsimile users, while Tymnet provides a store-and-forward message service utilizing its packet network. Satellite Business Systems talks about high-speed document distribution as a major element of its planned service offering. Likewise, AT&T's proposed Advanced Communications Service is replete with features geared specifically for electronic mail applications. ITT is waiting in the wings with a packet-switched service for electronic mail, and Xerox is rumored to be readying a store-and-forward network capability.

Fax Transmission Services

SPC terms its service Speedfax and claims savings of up to 45 per cent compared with the dial-up network. Speedfax gives a choice of transmission-only service or a packaged offering which includes the facsimile terminal as well. Pricing is distance-independent. SPC will carry your facsimile message to any of 30 cities around the country for a flat fee of 25 cents/minute, dropping to 16 cents/minute overnight. Using a sub-minute fax machine, then, a user could send a page of copy coast-to-coast for a quarter. SPC also offers store-and-forward service, delivering from one facsimile machine to an incompatible unit. However, the service requires human intervention, which detracts from its utility.

With the packaged service, users can choose a Class I terminal, which is an analog device capable of sending or receiving an 8½-by-11-inch page in about four minutes. This machine operates over dial-up switched channels using SPC's analog facsimile network. Alternatively, users may choose the Class VI terminal, which is a high-volume digital device capable of sending or receiving an average business letter in less than one minute. This machine functions over switched digital channels at 9600 bps. Transmission services are also graded from Class II to Class V to accommodate user-provided facsimile terminals that transmit or receive a page in 4, 3, 2 and 1 minute(s), respectively.

To use the service, the operator dials a local Speedfax access number, enters an identification number, then proceeds as if using the dial-up network. As such, Speedfax is a facsimile equivalent to Execunet, and it has been suggested that users may circumvent the tariff by extending the voice coordination phase of the connection to discuss business matters. Beyond the first minute's use, the charge is based on 6-second increments. If a user wishes to rent a sub-minute Class VI machine from SPC, the tariff is $400, which includes transmission of 500 pages. For the Class I service, the tariff is $49/month, with all pages transmitted for 25 cents per minute.

Competitors in Fax Service

SPC has two competitors for facsimile transmission service. The first is Graphnet, which thus far has maintained a low profile in the industry. The second is ITT Domestic Transmission Systems, whose Fax-Pak service is now expected to be available by mid-1979. Fax-Pak will perform the necessary conversions in modulation, protocol, code and speed to allow incompatible facsimile machines to communicate with each other. Also, the network will allow users to send messages from a character-oriented terminal to any other subscriber's facsimile unit or terminal. Initially, there will be a speed limitation with the terminal of 30 cps.

With its store-and-forward operation, Fax-Pak will provide users with a choice of three separately priced delivery priorities: up to 15 minutes, up to 4 hours, and overnight. Service will be available in the 48 contiguous states and Washington, D.C. via In-Wats facilities. Alternatively, users will be able to access the network via analog or digital private lines to the nearest network concentrator or switching center, or via dial-up service.

Initially, there will be switching centers in Atlanta, Chicago, Houston, Los Angeles, New York and Washington and concentrators in Boston, Cleveland, Dallas, Detroit, Pittsburgh, San Francisco and St. Louis. Within a couple of years, the firm expects to have 10 switching centers and 14 concentrators in place. Use of error-detection and retransmission procedures at each network node will give users a bit error rate of less than 1 in 10^9. Also, facsimile messages will be compressed and assembled into packets of 8K bits each for transmission through the network.

Rate elements will include a monthly subscriber charge, acceptance and delivery charges, usage charges and a one-time installation charge. In an illustrative tariff filed with its 214 application to the FCC, ITT DTS put a monthly subscription fee of $25 on the terminal and a monthly access port charge of $20 for analog facsimile terminals, $100 for digital fax terminals and $75 for non-fax data terminals. Usage rates based on a message of up to 150 packets range from $.70 message for both acceptance and delivery of priority messages (up to 15 minutes), dropping to $.42/message for regular service (up to four hours) and $.20/message for delayed service.

Electronic Mailboxes

Another value-added carrier, Tymnet of Cupertino, California, offers users a store-and-forward message-switching service called OnTyme which allows communications between dissimilar terminals with speeds from 300 to 1200 bps. Further, the same terminals may be used for other on-line applications. For users who prefer to own and operate an in-house message-switching system, Tymnet also supplies a turnkey system including the processor and other hardware and software required for the user's specific application. Users can begin with the OnTyme service and subsequently move to an in-house system without having to change terminals or operating procedures.

Service rates include a $100 monthly charge per subscribing organization to cover maintenance and provision of traffic data. Connect time charges for use by 110- to 300-bps terminals are $.04 per minute in high-density areas and $.08 per minute in low-density areas. Rates for use by 1200-bps terminals are $.06 and $.08 per minute, respectively. Tymnet-provided foreign exchange and WATS access costs from $.12 to $.25 per minute. Usage charges in-

More Electronic Mail . . .

Continued from previous page

Another controversial service that faces tough sledding at the FCC is AT&T's Advanced Communications Service. Thus far, AT&T has supplied no cost information for its proposed packet-switched service, but the message-oriented features of ACS clearly show that AT&T will be going after electronic mail applications in a big way.

For one thing, ACS provides the necessary code conversion, protocol translation and speed matching to allow a large number of diverse terminals and computers to communicate with each other. ACS will support clustered and stand-alone, ASCII and EBCDIC terminals operating at slow and high speeds in asynchronous or synchronous, character or block mode with polled or contention line control. Terminals may be connected into ACS via digital or analog facilities, whether dial-up or point-to-point or multipoint private lines. Computers can also be connected via digital or analog private line facilities.

AT&T proposes two basic classes of service under ACS: Call and Message. Call features provide users with a bidirectional transmission path between originating and terminating stations and are intended for applications requiring real-time interactions between distant ends. Message features include a range of functions for preparing and handling messages and for directing their movement through the network. Besides electronic mail applications, the features are suited to data entry and remote batch work.

Message transmission is unidirectional and messages may be sent to single or multiple destinations. Before sending a message, the user prepares the text with or without a form defined by him. The message may be edited by the terminal operator and stored in a network "message storage area" until sent as directed by the originator. For transmission, the user can select various options so that the messages can be sent on a priority basis or later. The message is transmitted to a network "message arrival area" associated with the recipient who has three modes of delivery to the destination terminal or computer: automatic, scheduled and demand.

In automatic mode, the destination station elects to receive messages from the message arrival area as they arrive. Using scheduled delivery, selected messages may be deferred for delivery at a time specified by the destination station. The demand mode permits the operator at a receiving station to survey the contents of the message arrival area and select specific messages for immediate delivery. Copies of messages sent or delivered can be retained in the network for user record-keeping purposes, and means for verifying delivery of a message can be provided to the originator.

For simplicity of use and applications flexibility, ACS offers a series of standard features supplemented by customization options. Figure 1 shows typical groupings of standard ACS features which users can put together for different applications. Customization is accomplished through a simple network language capability which allows users to build and test customized features and have them installed in the network for their use.

Customized programs will be of two basic types, one with and one without direct interaction with the terminal. Interactive programs are intended to enhance operator effectiveness and the communications capabilities of terminals with such items as message form definitions, message entry validation sequences, message preparation aids and editing functions. Non-interactive programs are prepared by the user to assist in message preparation within a message storage area. Examples include the functions of message consolidation, automatic message distribution and message storage management.

With ACS, the question is not *if* or *how* the service will be used for electronic mail; it's *when*? AT&T's schedule calls for filing of tariffs by mid-1979, with operations beginning with one "node" (in Chicago?), expanding to possibly three by year-end 1979 (New York and Los Angeles?). The initial goal is to offer ACS in as many as 100 metropolitan areas, with as many as 100 nodes in place across the country by the mid-1980's.

However, that schedule will undoubtedly be delayed in view of the number of special interests involved in the issue, and the turmoil in Washington at the FCC, in Congress over the Communications Act rewrite and at the Department of Justice with the anti-trust action against AT&T. The best guess is that ACS may not be available as a viable service until 1981 at the earliest, and possibly not until 1983.

Uncertainty also surrounds the future of Satellite Business Systems following the recent action of the United States District Court of Appeals in Washington, D.C. requiring the FCC to review its approval of the satellite carrier. The Court did not rule that SBS was anti-competitive, only that the FCC had not properly considered the issue of potential antitrust violations. The FCC must now hold formal hearings on the subject, which may delay the scheduled 1981 starting date for service, or may ground the satellite venture completely.

In anticipation of its roof-to-roof intra-company network becoming operational in 1981, SBS has been meeting with facsimile vendors and leading mail users for the last few years to develop preliminary specifications for a high-volume electronic mail system. Recently, SBS spelled out its electronic mail plans in an Application Brief sent to firms interested in developing such systems.

SBS proposes two configurations of a Batch Document Electronic Distribution System (BDS): BDS-1 would be a "communicating copier-like distribution system," while BDS-2 would be an "off-line, local compressed document storage system with high-speed, mailroom-to-mailroom transmission of batched data streams." BDS-1 requires the sending and receiving devices to operate synchronously, whereas BDS-2 provides for store-and-forward operation using a magnetic tape unit for storing documents in digital data form. Each tape would be able to store up to 500 pages.

System	Approximate Revenues to Suppliers ($ million)	Percent
Data Communications	2,500	80
Telex/TWX	245	8
Facsimile	100	5
Mailgram	60	2
Telegram	55	2
Message Switching	90	3
Communicating Word Processors	5	-
Total	3,055	100

Table I—Projected 1978 common carrier revenues from United States electronic mail and message systems. Source: *Electronic Mail and Message Systems*, published by International Resource Development.

All that's new and newsworthy in voice, video and data communication.

COMMUNICATIONS news

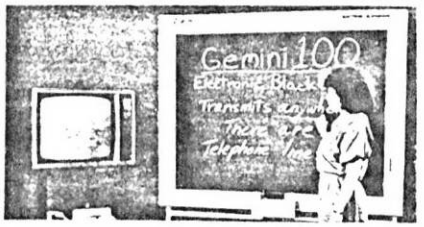
December 1978

COVERING THE TOTAL COMMUNICATIONS INDUSTRY

A Harcourt Brace Jovanovich Publication

ROUTE TO:	IN	OUT

Electronic Blackboards



THE GEMINI 100 electronic blackboard, which transmits handwriting over ordinary phone lines, is being made available through Bell System operating companies (with the exception of New Jersey Bell, which plans introduction next year, and Southern New England Tel). The device transmits material from a pressure-sensitive blackboard in one location to a television screen in another. Two-way conversations go over a second telephone line via a portable conference telephone. The system permits the user to erase a portion of the display or clear the entire blackboard while transmitting.

Late Bits

A readout of communications news at presstime

WESTERN UNION submitted a plan to the FCC to share public television earth stations for commercial communications. Initially, WU would use public TV earth stations in Washington, D.C., New Orleans and Houston for video broadcasting. The Public Broadcasting Service currently uses the Westar satellite system to send programs to 210 public TV stations.

THE ATLANTA AREA *will be the site of the Bell System's first standard lightwave communications system, beginning in the fall of 1980. Last May, AT&T reported the successful one-year trial of a full-service lightwave installation in Chicago.*

HOME BOX OFFICE and Cox Cable Communications signed a multi-year agreement to expand the use of HBO service by Cox, which presently has some 125,000 HBO subscribers in 19 CATV and MDS systems.

CHRISTIAN BROADCASTING NETWORK *ordered more than $1.5 million worth of RCA color television cameras for its new production center in Virginia Beach.*

E-SYSTEMS' ECI Division in St. Petersburg, Florida, established a new Printer Products Business Area with responsibility for the E-Systems line of teleprinters, line printers and digital plotters.

SIEMENS' *Telecommunications Engineering Division, Cherry Hill, New Jersey, received more than $10 million in contracts from Siemens AG, Munich, to develop two new data-switching systems, one for packet switching and one for store-and-forward message switching.*

VIACOM CABLEVISION purchased four Series 8008 five-meter Scientific-Atlanta earth terminals for installation in Cleveland, Dayton, Redding (California) and Oak Harbor (Washington) to carry Showtime programming. The Dayton system also will provide programming from Madison Square Garden, Christian Broadcasting and WTCG in Atlanta.

THE US ARMY *awarded a $4.6 million contract to Computer Sciences Corporation for engineering support to develop tactical data systems.*

COMMUNICATIONS INDUSTRIES, a Dallas-based radio communications company, has completed its acquisition of Certified Communications, a radio common carrier serving St. Louis, for $1.05 million.

TI and Boeing Buy On-Site Earth Terms

Texas Instruments and Boeing Computer Services have signed orders with American Satellite Corporation for on-location earth stations and high-speed data communications services, and Sperry Univac has announced plans to add an additional earth station to its present two-station network, which became operational in September.

Texas Instruments will become the first US firm to establish a high-speed data link to an overseas location through a direct linkup with American Satellite and Intelsat earth stations. Using a 10-meter earth station located at their Dallas facilities, TI will establish two duplex 56 kb/s data links to its offices in London.

The Texas Instruments dedicated Dallas earth station will communicate with an earth station at Etam, West Virginia, which will be linked directly to an Intelsat station for the overseas hop. This service is scheduled to become operational in the spring of 1979.

The Boeing contract adds a fourth earth station in Vienna, Virginia to a network of three stations which ASC has already installed at Kent, Washington; Wichita, Kansas and Philadelphia. The new five-meter earth station will establish a duplex 56 kb/s data channel between Kent and Vienna, a suburb of Washington, D.C. The new station is scheduled to become operational in the spring of 1979.

The new installations will be part of ASC's Satellite Data Exchange (SDX) Service, which uses earth stations located directly adjacent to the user's premises or on a rooftop. The various types of communications are converted into digital form and sent over a single satellite channel.

Birmingham to Host NTC 78 Conference

The National Telecommunications Conference will be held in Birmingham, Alabama, December 4 to 7. "Communications: Forging Ahead" is the theme that has been chosen for the meeting, to emphasize the changing world of communications technology.

NTC's technical program consists of more than 50 technical sessions sponsored by the Communications Society and five other IEEE groups and societies. The sessions are comprised of several panel sessions and approximately 250 papers. Topics to be covered include digital switching, the evolution and features of the stored-program-controlled network, needs for economic information and developments in fiber optics and transmission technology.

For information about the conference, contact *H. L. Uthlaut, Post Office Box 771, Birmingham, Alabama 35201.*

FCC Will Reconsider Transatlantic Decision

The FCC has voted to institute further procedures in its Docket 18875 concerning adoption of policies governing the licensing of transatlantic communications facilities through 1985. The action opens the possibility of approval for a seventh transatlantic cable.

On December 23, 1977, the Commission released a policy guideline (Plan M-4) which set forth the cable and satellite transmissions, and the utilization of those facilities, which the Commission found would satisfy its objective of providing the lowest-cost combination of facilities which would meet traffic requirements. In its action, the FCC rejected plans for a TAT-7 cable proposed by AT&T, ITT, RCA and WUI for operation in 1981. The Commission said the cable was unnecessary because satellites could handle the traffic through the mid-1980s.

Petitions were subsequently filed by the United States International Service Carriers (USISC), the Department of Defense and the National Telecommunications and Information Administration requesting the Commission to reconsider its adoption of Plan 4-M.

In its current action, the Commission determined that it had no basis to modify its plan now, but could not ignore the fact that its guideline for the construction and utilization of transatlantic facilities adopted remains substantially different from the plan adopted by the European countries within CEPT and supported by Teleglobe/Canada.

The Commission noted that the utilization guideline contained in Plan 4-M needs further examination in light of information received in the petitions for reconsideration.

To address these areas of concern, the Commission adopted the further procedures and time schedule calling for the USISC and Comsat to meet with its staff to develop two facilities construction and use plans, to negotiate with their correspondents in CEPT and Teleglobe/Canada, and file a negotiated plan.

German Data Net Will Use SL-10

The first sale outside of Canada of Northern Telecom's SL-10 data packet-switching system has been made to the Deutsche Bundespost, West Germany's telecommunications authority. Under a $600,000 contract, Northern Telecom International will supply an SL-10 as the switching node in a pilot West German data network to be placed in service in Berlin next January.

The Berlin network, called Bernet, initially will connect computers produced by different manufacturers and used by several German universities and scientific and technical institutes, using the X.25 protocol interface standard.

In June of 1977, Bell Canada and the Trans-Canada Telephone System began commercial service on the Datapac packet-switched digital data network, which uses the SL-10 as the backbone.

ITT Worldcom Begins Worldfax

ITT World Communications has inaugurated a high-speed facsimile service between the US mainland and Japan. The service, called Worldfax, operates at a transmission speed of 40 seconds per full-page document and enables the sending of legal material, graphics, preprinted and handwritten forms including documents containing Japanese lettering.

Initially, Worldfax service will be available between ITT Worldcom's offices in New York, Washington, D.C., and San Francisco and KDD in Japan. Customers in these cities will be able to file international Worldfax messages by company-provided messenger service, over-the-counter or by mail. From other locations, customers can file by mail.

Brown Will Become Chairman When deButts Retires February 1

Charles Brown, 57, has been elected AT&T's 11th chairman and chief executive officer, effective February 1. He will succeed John deButts, 63, who is retiring at his own request after more than 42 years in the Bell System, including the last six and one-half years as AT&T chief executive.

William Ellinghaus was elected president and chief operating officer to succeed Brown, and James Olson was named vice chairman and a director to succeed Ellinghaus. William Cashel continues as vice chairman and chief financial officer and a director.

deButts Brown

Brown has held a number of positions with Bell, including president of Illinois Bell. He has been president and chief operating officer of AT&T since 1977.

ON OUR COVER is Teletype Corporation's newest product introduction, the 4540 series of keyboard display-based interactive terminals. The series is comprised of keyboard, display, character printer and line printer modules and a cluster controller that can accommodate 32 devices, up to eight of which can be printers. Turn to page 37 for the beginning of CN's special report on data communications.

DataComm Update!

Value-Addeds Upgrade In the Face of ACS Threat

By Morris Edwards
CN Data Communications Consultant

Value-added carriers such as Telenet and Tymnet lease private lines, interconnect them to form a nationwide network and add "intelligence" at the network nodes to perform switching and limited processing, and to handle error and flow control. Among the values added by such carriers are improved performance from the built-in error detection and correction scheme, added reliability from the dynamic routing capability, and extra flexibility in using a variety of hosts and terminals whose incompatibilities can be overcome by the network processors. Also, since user data is broken into packets for transporting through the network, the carriers are able to share the same lines among many subscribers, and to pass on part of the savings to users in the form of lower tariffs.

Because of these features, value-added carriers claim their services make it easier and cheaper for users to develop and implement new data communications systems, and to expand existing ones by adding locations, applications and new types of terminals. Even so, despite these potential benefits, users have been somewhat slow to embrace the concept of value-added network (VAN) services. That situation may change dramatically, however, now that AT&T has given its seal of approval to the VAN concept with its announcement of Advanced Communications Service (ACS). While it is still unclear when, or if, ACS will become operational, the AT&T announcement alone will cause many users to re-evaluate the role of VAN services in their data communications plans, and most industry observers anticipate a major surge in the use of these services.

AT&T's plans for ACS include filing a tariff by mid-1979 and gradually implementing network nodes, expanding from one initial node to three nodes by year-end 1979. The initial goal is to offer ACS in as many as 100 metropolitan areas, with as many as 100 nodes in place across the country by the mid-1980's. AT&T plans to support the most popular types of terminals, which it estimates at two-thirds of the general-purpose terminal population. Even so, AT&T thinks that only 137,000 terminals and hosts out of an estimated total population of 3.6 million would be connected to ACS by 1983.

Within ACS, each node will perform three primary functions: access control, data switching and message management (see Figure 2). The principal responsibility of access control is to terminate access lines and provide terminal and line handling functions associated with the standard protocols supported by ACS. In the data switching element, user data is assembled into packets and switched over logical paths established through the network from origination to destination. The storage and movement of user messages is the principal responsibility of the third node function.

AT&T explains that each node will be connected to every other node by at least two disjoint paths containing no more than two intermediate nodes. As the network expands, local nodes will be placed into geographic groupings called regions, and tandem switches placed in each region. AT&T explains that large regions are employed to achieve better utilization of long-haul trunks (from tandem switch to tandem switch).

Existing VANs Enhance Services

Meanwhile, unfazed by AT&T's announced intent to compete for VAN service users, Telenet has begun upgrading its network with microprocessor-based concentrators and packet switches, and the carrier has its first customers for private packet networks based around the processor family used in its own facilities. Tymnet has also started the phased evolution to Tymnet II, based on the use of new "super-nodes". These network processors utilize a 32-bit minicomputer and software package developed specifically for the Tymnet network by the parent company, Tymshare, Incorporated.

According to Warren Prince, group vice president for Tymshare's Financial and Network Systems Group, which includes Tymnet operations, Tymnet II will provide users with significant new capabilities and will boost network capacity up to tenfold over the current network. Prince adds that Tymnet II substantially enhances the existing network "which already provides most of what Bell's ACS seems to be promising some time in the mid-1980's."

Comparing Bell's paper network with Tymnet, Prince cites: "size—Tymnet already has more than 300 nodes, or three times what the (AT&T) expect to have several years from now; message switching service—OnTyme was introduced a year ago, and they're just now planning such a service; multiple-host terminal access—hardly a new thing since Tymnet has supported this function since its inception in 1971; subnetworks—Tymnet has been linked to subnetworks for some two years, such as those used by all of the International Record Carriers employing Tymnet node gear to provide interconnection to United States networks."

Extended International Access

Over the past year, Telenet and Tymnet have both extended their international access significantly, particularly in Canada with local access available to users in 55 cities. What follows is an update on the service offerings of Telenet and Tymnet, and of Canada's two packet carriers.

Telenet Rate Schedule

I. Network Access Charge

Dedicated Access Facilities

The rates below include a leased channel port at a Telenet Central Office (TCO), the access line between the customer's location and the TCO, and the associated modems or digital interface units.

Port Speed	Installation Charge[1]	Monthly Charge**
50-300 bps	$400	$ 300
1200 bps	500	340
1800 bps	550	380
2400 bps	600	600
4800 bps	700	800
9600 bps	800	1,100
56000 bps	900	2,100

Public Dial-in Service

	Port Speed	Hourly Charge
Local Dial	110-300 bps	$ 3.25*
	1200 bps	3.25*
In-WATS	110-300 bps	15.00
	1200 bps	15.00

Private Dial-in Service

Port Speed	Installation Charge[1]	Monthly Charge*
110-300 bps	$320	$160
1200 bps	340	215
TWX	300	210

Private Dial-out Service

Port Speed	Installation Charge[1]	Monthly Charge*
75-300 bps	$420	$300
TWX	420	300

Private Packet Exchange Service (PPX)

A special access arrangement enabling a customer to buy a group of ports and associated facilities at any Telenet Central Office for the exclusive use of his organization. Overflow calls to PPX dial-in ports are automatically switched to Telenet public dial-in ports and charged at the hourly rate.

	Installation Charge	Monthly Charge
Packet Exchange Control Arrangement	—	$800*
Local Switching Option	$350	400
Dial-in ports/each		
110-300 bps	120[2]	60[3]
1200 bps	140[2]	90[3]
Dedicated access facilities/each		
(Intraexchange only)		
75-300 bps	140[2]	90[3]
1200 bps	200[2]	130[3]
Leased access ports/each		
2400-9600 bps	75[2]	75[3]
56,000 bps	200[2]	200

Note 1: A $200 discount applies to the installation of multiple dedicated access facilities or private dial ports at a customer site when these facilities are ordered and installed at the same time.
Note 2: A $200 charge applies (in addition to installation charge) to the initial order or to any change of service per PPX.
Note 3: A minimum monthly charge for four ports per category applies.

II. Traffic Charge

Regular Service*
$.50 per thousand packets. Each packet contains up to 128 characters of user data.

Hotline Data Service*
An optional service arrangement providing for a fixed monthly traffic charge in lieu of packet charges for all traffic between two specific network stations. Monthly Charge:
$25 – 50-110 bps ports
$50 – 134.5-300 bps ports
$75 – 1200 bps ports

III. On-site Network Interface Equipment

		Port Speed	Installation Charge[4]	Monthly Charge
TP 1000 Series	TP 1000/3 Ports	75-300 bps	$200	$240
	TP 1000/7 Ports	75-300 bps	200	440
	TP 1000/14 Ports	75-300 bps	200	600
TP 2200 Series	Basic Unit		300	550
	4 Async Ports	50-9600 bps	40	120
	8 Async Ports	50-9600 bps	60	200
	4 Sync Ports	2400-9600 bps	50	175
	1 Sync Port	56,000 bps	50	175
	Memory Module		50	150
	Processor Expansion Module		200	200
	Common Logic Redundancy		250	550
	Switched Port Interface		5	20
TP 4000 Series	Basic Unit		300	850
	4 Async Ports	50-9600 bps	40	120
	8 Async Ports	50-9600 bps	60	200
	4 Sync Ports	2400-9600 bps	50	175
	1 Sync Port	56,000 bps	50	175
	Memory Module		50	150
	Processor Expansion Module		200	200
	Switching Option		150	300
	Common Logic Redundancy		250	700
	Switched Port Interface		5	20

Note 4: A $200 order charge applies (in addition to the installation charge) if customer site equipment is ordered without Dedicated Access Facilities or if an order is modified.

IV. Optional Service Features

	Installation Charge	Monthly Charge
Rotary Feature	$50	$30*
Privacy Feature		
1st Station	25	5*
Addt'l. Stations	5	1*
Caller ID		
1st 5/Each	5	5*
Addt'l. ID's	1	1*
Detailed Connection Service		
Report		60
Magnetic Tape		80

V. Monthly Account Charge

Regular Account	$100
ID/Password Account	10

VI. Volume Discount Plan

Customers who accumulate monthly billings of $5000 or more in discountable charges receive a discount on these charges. Charges marked with (*) are fully discountable. Half of the charges marked with (**) are eligible for the discount rate.

Eligible Monthly Charges Before Discount	Amount of Discount
$ 5,000 – $ 9,000	20% of amount over $5,000
$ 9,000 – $13,000	$800 + 30% of amount over $9,000
$13,000 – $18,000	$2000 + 40% of amount over $13,000
$18,000 or more	$4000 + 50% of amount over $18,000

Figure 1-Telenet rate schedule

Telenet

● Telenet was the first value-added carrier to become operational and now provides local access in 170 United States cities of 50,000 population or more. There is also international access from 55 cities in Canada, and from Mexico, Puerto Rico, 12 countries in Europe and Hawaii, Hong Kong, the Philippines and Singapore.

Over the past year, Telenet began installing microprocessor-based concentrators and packet switches throughout its network, replacing the original minicomputer-based equipment. Telenet developed both the hardware and software for this, its third-generation architecture for packet networks. Also, the carrier expanded its 1200-bps service nationwide and began offering private packet network systems based on its processor product line.

Private Packet Networks

At the heart of Telenet's private network offering is the TP4000 host/terminal interface processor, the most versatile member of a family of compatible network-oriented communications processors, which also includes the TP1000 and TP2200 series of interface devices. In addition to its basic function of interfacing computers and terminals to Telenet or other X.25-compatible networks, the TP4000 offers two additional capabilities ... protocol conversion and packet switching ... which suit it for private as well as public network use. It requires no changes to the user's hardware or software and has an aggregate capacity of 480 ports, with support for a variety of asynchronous and synchronous protocols.

To connect to the Telenet network, the TP4000 requires one or more synchronous access lines, depending on the traffic load and redundancy requirements. When two or more access lines are used, traffic is automatically distributed among the lines to level peak loads and minimize queuing delays. As part of its private network offering, Telenet will also supply a minicomputer-based Network Control Center, or give users the option of relying on the carrier's own network control center facilities and staff.

Software-controlled monitoring in the TP4000 provides constant feedback to the Network Control Center to warn of potential malfunctions before they affect network service. Sophisticated remote diagnostics permit rapid fault isolation to a particular port, which can then be taken out of service remotely without affecting the operation of other ports. The Network Control Center is also responsible for down-line loading of new software for the TP4000 and updating network parameters in the processor.

Telenet's first customer for its private network offering was the British Post Office, which is using the system to expand its range of data communications services between the U.K. and U.S. Hughes Aircraft is installing a pilot system to link facilities in California and Arizona, and according to Dr. Lawrence Roberts, Telenet's Chairman of the Board, a pilot network system for a second major United States corporation will be installed by year end.

In September, Telenet began nationwide communications service for data terminals operating at 1200 bps. Its expanded public dial-in facilities support the new Bell 212 full-duplex modem, with local access available in selected major cities and access nationwide via In-WATS service. In addition to its public dial-in service, which is charged on an hourly basis, Telenet provides private dial-in and leased-line service for terminals operating at speeds to 1200 bps with charges based on a fixed monthly rate (see Figure 1).

Hierarchial Network Structure

Telenet offers two different types of interfacing for connecting computers to the network. One employs a Telenet Processor at the user site to provide multiple asynchronous network access ports at speeds up to 1200 bps and synchronous ports to 56 kbps; the second uses a software package which runs in the communications controller or computer mainframe. In most cases, no changes are required to existing data equipment or software. Programs have been written for IBM, DEC and Honeywell systems and for the Burroughs 7700 and Univac 1100 series machines. Also, independent suppliers are beginning to announce packages for specific machines such as IBM's Series/1.

Telenet's network is hierarchically structured with backbone circuits operating at speeds of 56 kbps. As a result, the network transit delay is less than 200 ms. Each intelligent node functions independently of the rest of the network and is typically interconnected to at least three other nodes to assure continuation of service even if one or two backbone lines should fail. Each node forms the hub of a local distribution network, linking intelligent concentrators in outlying cities via one or more access lines at speeds up to 9.6 kbps.

For reliability, Telenet employs dynamic alternative routing which automatically switches data around defective links. Each node is equipped with standby processor components ready to take over immediately if the active equipment fails. Since the routing control of user data is distributed among network nodes, there is no reliance on a central control computer to establish or monitor virtual circuits ... as distinct from the Tymnet approach. Error detection and correction techniques hold errors to one in every 10^{12} bits transmitted, or seven orders of magnitude better than the error performance of conventional telephone lines.

Charges for Telenet service include a network access port charge and a traffic charge of $.50 per kilopacket within the United States, A kilopacket comprises 1000 packets, each with up to 128 characters of user data. For users with monthly billings over $5000, Telenet offers a discount of 20 per cent, progressively rising to 50 per cent on billings over $18,000.

As an alternative, users can request Hotline Data Service, which is functionally equivalent to a leased line except that the cost is independent of distance. Users pay a flat monthly rate for unlimited traffic. With the Hotline service, when a user turns his terminal on, the network automatically establishes a connection to a pre-specified network address. The service is attractive for users with several hours traffic per day between stations.

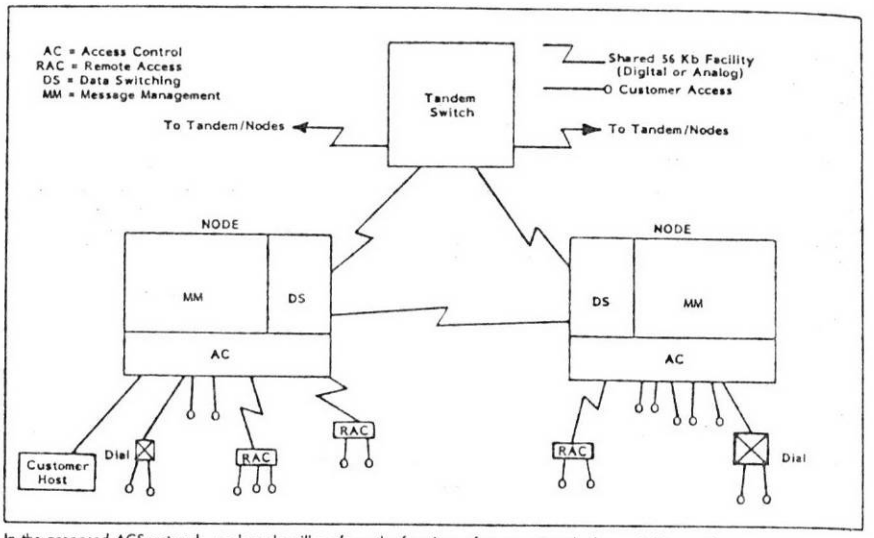
Tymnet

• Tymnet's value-added service was initiated April 1, 1977 and today is available for a single user or up to 256 users from the same organization with toll-free access from about 150 United States metropolitan locations, complemented by nationwide In-WATS coverage. Through interconnection agreements with foreign PTT's, access is also available from 16 foreign countries, including 55 local-access locations in Canada through the Datapac network.

Tymnet provides both data communications and store-and-forward message-switching services over its network (see *Communications News*, November 1978, page 60). It accommodates a variety of synchronous and asynchronous terminals operating at 10, 15, 30 or 120 cps and using ASCII, EBCDIC or Correspondence codes. Service at 4800 bps is available in a limited number of cities; in these locations, users can also employ IBM 2780- and 3780-type terminals. Terminals may access the network on either a dial-up or private-line basis, with the former being far more predominant. Terminals connect with terminal interface processors called Tymsats, which provide automatic speed matching and code conversion to avoid the need to segregate local access ports according to terminal type.

Host computers connect to the network either synchronously or asynchronously. With an asynchronous connection, the host computer interface, called Tymcom, appears to the host as a series of hard-wired asynchronous terminals. Up to four host computers can be connected to a single Tymcom, with a maximum total of 96 asynchronous ports. With this arrangement, the Tymcom is physically adjacent to the host computers.

With a synchronous host computer connection, the Tymcom emulates a bisync cluster controller and it may be located remotely from the computer. Up to four host computers may connect to a single Tymcom, which can support up to 256 simultaneous users.



In the proposed ACS network, each node will perform the functions of access control, data switching and message management. These nodes will be located in geographic groupings called regions, with all nodes in a region homed to all tandem switches in that same region. The tandem switches will then be interconnected to meet traffic design criteria.

In addition to their terminal and computer interface functions, the Tymsats and Tymcoms provide substantial local communications processing capability, including the error detection/retransmission capability which assures virtually error-free transmission over Tymnet. According to the carrier, the probability of an undetected error is 1 in 40-billion bits transmitted.

Supernodes Herald Tymnet II

As of October 1, the network contained about 340 of the Tymsat and Tymcom nodes, with an average of two nodes being added per week. Originally, the nodes were Varian 620i general-purpose minicomputers, but through the years, Tymnet has employed more advanced minicomputers, including the Varian V77 and Interdata 732. This fall, the carrier began deploying its "supernodes" which are based on a 32-bit minicomputer designed specifically for communications applications by Tymshare, Tymnet's parent company.

Known as the Tymnet Engine, the mini "embodies a 'wish list' accumulated over eight years of developing and using our communications network," in the words of Ernie Porcelli, vice president of Tymshare's Data Networks Division. According to Porcelli, microprocessors give the Engine "dramatically increased capacity to meet future demands for more functions and greater speed as needed at any node in the network."

Porcelli says the Engine includes among its standard features direct memory access, memory relocation and protection, six levels of interrupt, 16 sets of 16 registers each, three levels of privileged instruction, extensive microcode and hardware diagnostics, and a versatile, user-engineered console. The Engine includes up to a megabyte of main memory, 750-ns memory cycle time, capacity for up to 300M bytes of disk storage, as many as 32 high-speed synchronous I/O channels, and up to 256 medium-speed asynchronous channels, with complete monitoring facilities for all channels.

The software which runs on the Engine is called ISIS, for Internally Switched Interface System. According to Porcelli, ISIS enables Tymnet to interconnect previously incompatible and dissimilar devices and to handle a gateway process connecting different network technologies, such as between Tymnet and Canada's Datapac. "ISIS not only handles the specific hardware characteristics of a device," he explains, "but it also performs any protocol translation that may be required."

In addition to deploying its new supernodes, Tymnet is also enhancing the inner workings of the network. The carrier terms its upgraded network Tymnet II. Since implementation of the new facilities is evolutionary, there is no time at which the network changes abruptly from Tymnet I to Tymnet II; however, by early 1979, the network's capacity will have been boosted tenfold and users will have "significant new capabilities."

According to Bob Harcharik, Tymnet's president, "The nodes in Tymnet II can handle editing and security functions . . . ciphering for example . . . and will support 56-kbps transmission. Tymnet II supernode processors with ISIS will also support peripherals, enabling users to perform localized communications processing involving disk or tape units under control of the same network hardware handling the normal network data movement chores." Harcharik adds that Tymnet is preparing tariffs covering the new node equipment so that it can be installed for use at subscriber facilities.

Under ISIS, the node processor may be divided into 64 fully protected, independent partitions or job slots, each of which handles a specific communications function. A partition communicates externally using the protocol required for the devices or network being supported by the partition. External communications in the required protocol are converted to a common internal format, passed to a special job called the Dispatcher, and transferred to another partition, which then converts the data to its required external protocol. This means that all matters of protocol resolution are taken care of internally.

In the Tymnet II environment, a wide diversity of network protocols will be accommodated, including X.25, protocols of various airline reservation systems, HDLC/SDLC/ADCCP, and X.75, X.27 and X.28. Also, new interfaces for future devices and network linkages can be developed easily in one of the ISIS partitions, while other job slots continue with their on-going production functions.

Reliability with Minimum Overhead

With the new technology, Tymnet will still be a packet transmission network but not a packet-switching system. With packet-switching technology, packets are fixed-length and contain data from a single source. Tymnet claims that, with interactive terminals, most packets contain very little data so there is considerable overhead. In contrast, Tymnet packets are variable-length and can contain data from multiple users. Also, the logical records associated with each user may vary in length, so that line utilization is maximized and overhead minimized.

When a terminal connects to a local Tymsat, the first information required is a single-character terminal identifier, which indicates terminal speed, code and carriage return delay. The user then enters a unique user name, a password associated with the name, and an indication of the host computer the user wishes to access. This information is transmitted through the network to a centralized Network Supervisor system, which verifies the user name and password and determines if the user is validated for the specified host computer. If any of this information is invalid, the supervisor sends an error message and new request through the network to the user's terminal.

When all log-in information is correctly entered, the supervisor determines the optimum path between the user terminal and host based on three parameters: the number of nodes on each path; the speed of lines comprising each path; and load conditions on each line in a path. Once the supervisor determines the best path, it transmits control information to each node on the selected path. This information includes a virtual circuit number and indications as to neighboring nodes on the virtual circuit. Each node thus knows which of its neighbor nodes receives data associated with a particular virtual circuit number. Having established this information, the network supervisor is no longer involved in the transmission of user data.

When a node receives a physical record, it breaks it down into logical user records, which are stored in buffers. The node then determines all logical records to be sent to a particular neighbor node and builds a new packet accordingly. This means that a packet may contain records received directly from a terminal or computer, as well as records which are "passing through" the node. This breaking down and rebuilding of packets in the node requires extensive processing, but it allows maximum utilization of bandwidth. And, since processor costs are dropping faster than line charges, the carrier feels its decision not to use packet-switching technology was a good one. Tymnet claims it has not found it necessary to use lines with capacity greater than 9.6 kbps and many lines in the network have lower capacity.

For reliability, there are four network supervisor systems in the network at all times, only one of which is in control. The active supervisor continually sends "sleeping pills" to the dormant supervisors. If a dormant supervisor fails to receive required information from the active supervisor within an allotted time, it starts taking over the network. Unconstrained, all other dormant supervisors would also recognize failure of the active system and start the takeover process. However, the backup supervisors are "staggered" such that one will reach a certain point and then commence sending "sleeping pills" to the other backup systems. According to the carrier, this network supervisor backup scheme has proven effective and Tymnet has never been completely "down" since being originally implemented in 1971.

In the Tymnet rate schedule (see table), measured usage charges are based on connect time and on character volume (not packets) transmitted monthly. Alternatively, users may choose dedicated host ports rather than measured access and characters. Monthly charges for host processor interfaces range from a low of $100 for a single user to a maximum of $2750.

TransCanada Telephone System

• Canada's Dataroute and Datapac network services were both developed by the Computer Communications Group of the TransCanada Telephone System, which comprises nine of the major telephone companies in Canada. Dataroute provides digital channels, while Datapac is the packet-switched offering.

Datapac began commercial operation in June, 1977 with two services, Datapac 3000 and Datapac 3101, which support packet-mode devices and Teletype-compatible devices, respectively. Since then, other interface services have been developed to allow a variety of terminals to access the Datapac network. Also, the original four-node network has grown so that, by the end of 1978, there will be eight-Canadian cities equipped with one or more switching nodes.

All nodes connect to at least two others by Dataroute digital lines of 56 kbps. By the end of 1980, TCTS anticipates that 13 cities will be equipped with Datapac nodes. At present there are 56 Datapac rate centers, 36 of which are also Dataroute Serving Areas. In these 36 cities, users may access Datapac via digital or analog lines, but in all other cities, access is via analog facilities.

For switching nodes, the Datapac employs SL10 minicomputers manufactured by Northern Telecom Limited and designed by Bell Northern Research. The SL10 has a multiprocessor architecture with the functionally different modules interconnected via a common bus. Each trunk module can interface a single high-speed trunk line of 56 kbps, while each line module can handle up to 62 subscriber lines with a maximum line speed of 9600 bps. Users with non-packet-mode terminals access Datapac via a Network Interface Machine, or NIM, which may either be an SL10 or NCR 721 minicomputer.

Datapac 3000 service supports packet-mode devices implementing TCTS's SNAP protocol, which is basically the same as X.25 except that it allows the use of bisync framing in addition to the HDLC link control. Access to a node is via point-to-point synchronous lines at 1.2, 2.4, 4.8 or 9.6 kbps, though TCTS plans to offer speeds to 19.2 kbps by 1980. For users of the IBM 3704/3705 communications controller, TCTS supplies a software package called DMEP which allows the terminal user to access an IBM 360/370 host through the Datapac network. At present six Datapac customers use the package, and a variation of it is available in the United States from Cambridge Telecommunications of Burlington, Massachusetts.

Datapac 3101 service supports most asynchronous ASCII teletypewriter terminals which connect to the network via a NIM. Access may be via public or private dial-in ports at speeds of 110 to 300 bps, or via leased line at 110, 300, 600 and 1200 bps. Dial access at 1200 bps will be available in 1979. Most commonly, users employ the Datapac 3000 service to connect their host to the network, and the Datapac 3101 service to connect the asynchronous terminals that will access the host.

Datapac 3201 service, which became operational in June, is geared for retail point-of-sale applications and uses an NCR 721 minicomputer with up to 128K bytes of memory as the NIM. Unlike the 3101-type NIM, this unit can call and select on multipoint lines and may be configured with more than one terminal type and more than one subscriber on each multipoint line. Devices using Datapac 3201 can use the network to access host computers connected via X.25/SNAP interface, or via a special NIM, which again is an NCR 721 mini developed specifically to connect hosts using the bisync line protocol.

Datapac 3203 service is designed for large organizations wanting to implement inquiry/response applications and provide support for an enhanced IBM 2740 Mod II asynchronous protocol. Terminals are supported on shared multidrop lines operating at 1200 bps. Host access is via Datapac 3000 service, with the SL10 NIM performing the polling/selecting of terminals.

Datapac 3303 service will provide support for IBM 3270 devices and emulators, including clusters or stand-alone terminals operating in bisync mode, but not SDLC. TCTS anticipates filing tariffs for the service by year end.

CNCP Telecom

• Canada's other packet carrier, CNCP Telecommunications, offers a variety of services through its Infoswitch nationwide network, which has switching centers in Vancouver, Edmonton, Toronto and Montreal and tariffed access points in 14 cities. To provide users with broader service offerings, Infoswitch will support both circuit switching as well as packet switching applications at asynchronous speeds from 134.5 to 1200 bps and synchronous from 1200 to 9600 bps.

CNCP's first offering, Infoexchange, is a digital circuit-switched service, where a specific channel is assigned and held for the duration of the call. As with other circuit-switched offerings, the Infoexchange tariff is based on call duration, as well as data speed and distance. Infoexchange is transparent to the character content in asynchronous mode, and is bit-sequence independent in synchronous mode.

CNCP's second service, Infocall, is also geared to users who want to employ existing terminals and computers without having to meet X.25 requirements. It uses packet technology, but the network performs packet assembly and disassembly functions. It supports ASCII, EBCDIC, and BED codes, and, in its synchronous version, operates with bisync, SDLC and HDLC.

CNCP is also planning an end-to-end packet-switched service called Infogram, where the user assumes the full responsibility for implementing the Infogram Network Access Protocol (INAP) within his terminal and/or computer equipment.

Tymnet Rate Schedule

I. CHARGES FOR HOST PROCESSOR INTERFACES

All include full period maintenance and, with one exception as indicated, on leased access channel providing connection to TYMNET.

Service	Description	Monthly charge	Nonrecurring installation charge
Single Access	One user each at 110–1200 baud; asynchronous interface; customer pays for leased access channel(s) at cost.	$ 100.	$ 200.
TYMCOM CP–8A	Up to 8 users at 110–300 baud; asynchronous interface to as many as three host processors.	1,000.	1,000.
TYMCOM CP–8A/1200	Up to 8 users at 110–1200 baud; asynchronous interface to as many as three host processors.	1,250.	1,000.
TYMCOM CP–16A	Up to 16 users at 110–300 baud; asynchronous interface to as many as three host processors.	1,500.	1,000.
TYMCOM CP–16A/1200	Up to 16 users at 110–1200 baud; asynchronous interface to as many as three host processors.	1,750.	1,000.
TYMCOM CP–30A	Up to 30 users at 110–300 baud; asynchronous interface to as many as three host processors.	2,150.	1,000.
TYMCOM CP–30A/1200	Up to 30 users at 110–1200 baud; asynchronous interface to as many as three host processors.	2,450.	1,000.
TYMCOM CP–62A/1200	Up to 62 users at 110–1200 baud; asynchronous interface to as many as three host processors.	2,750.	1,000
TYMCOM CP–64S	Up to 64 users at 110–4800 baud; synchronous interface to one host processor; additional software charge may apply.	1,400.	1,000.
TYMCOM CP–256S	Up to 256 users at 110–4800 baud; synchronous interface to as many as four host processors; additional software charge may apply.	2,150.	1,000

II. USAGE CHARGES

A. Measured Use

1. Access ports (connect time)

	Hourly charges				
Transmission speed (baud)	High density	Low density hours/month	Charge	Foreign exchange	WATS
110–300	$1.00	First 500	$4.00	$5.00	$14.00
		Next 500	2.00		
		Over 1000	1.00		
1200	2.00	First 500	5.00	6.00	15.00
		Next 500	3.00		
		Over 1000	2.00		
2000–4800	5.00	All	8.00	N/A	N/A

2. Characters transmitted

Transmission speed (baud)	Character volume per month	Cost per 1000 characters
110–300	First 40 million	$ 10
110–300	Next 40 million	.08
110–300	Over 80 million	.05
1200	All	.03
2000–4800	All	.03

B. Dedicated Host Ports

In lieu of measured access and characters for 110-1200 baud services, users may elect Dedicated Host Ports. Connections utilizing Tymnet-provided WATS facilities do not qualify and will be charged as indicated above.

Dedicated Host Port	Quantity	Monthly cost	Measured usage, nondedicated ports
110–300 baud	First 1–15	$475	$ 8.00/hour
110–300 baud	16 and over	300.	8.00/hour
1200 baud	First 1–15	650	10.00/hour
1200 baud	16 and over	400.	10.00/hour

Figure 3—Tymnet rate schedule