Pine Technical Notes

Version 3.85, September 1993

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PC-Pine and UNIX Pine are still under active development. The core functionality in Pine has been in testing for many months, but there are also significant new features (e.g. multiple/remote folder collections) which have not yet been extensively tested. Therefore we still consider this an experimental version. New versions will be released as bug fixes and new features become available.

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Section 1 – Introduction

Design Goals

Pine was originally conceived in 1989 as a simple, easy-to-use mailer for administrative staff at the University of Washington in Seattle. The goal was to provide a mailer that naive users could use without fear of making mistakes. We wanted to cater to users who were less interested in using electronic mail than in doing their jobs; users who perhaps had some computer anxiety. We felt the way to do this was to build a system that didn't do surprising things the user didn't understand, a mailer that had limited, well-thought-out functionality. At the time, there was no such UNIX mailer commercially or freely available. Elm seemed closest to the goal, so we started modifying it.

One of the greatest problems with most mailers on UNIX systems is the editor. One can normally choose between *emacs* and *vi*. We experimented with some versions of emacs and settled on a hacked version of micro emacs. Eventually it became heavily modified and tightly integrated with the rest of Pine. One of the main features of having a tightly coupled editor is that it can guide the user through editing the header of the message, and Pine takes great care to do this. A very simple and efficient interface to the UNIX spell command was also added. The emacs-style key bindings were retained, though most of the other wild and wonderful emacs functions were not. The Pine composition editor is also available as a very simple stand alone editor named "pico".

Throughout Pine development, we have had to strike a balance between the need to include features which advanced users require and the need to keep things simple for beginning users. To strike this balance, we have tried to adhere to these design principles:

- The underlying model presented to the user has to be simple and clear. Underlying system operation is hidden as much as possible.

- It's better to have a few easily understood commands that can be repeated than to have some more sophisticated command that will do the job all at once.

- Whenever the user has to select a command, file name, address, etc., the user is given or can get a menu from which to make the selection. Menus are complete, small, organized and well thought out.

- Pine provides immediate feedback for the user with each operation.

- Pine must be very tolerant of user errors. Any time a user is about to perform an irreversible act (send a message, expunge messages from a folder), Pine asks for confirmation.

- Users can learn by exploration without fear of doing anything wrong. This is an important feature so the user can get started quickly without reading any manuals and so fewer manuals are required.

- The size of Pine should be kept to a minimum so users don't feel "lost" in all these commands and concepts.

Just as there were goals relating to the look and feel of Pine, there were equally important goals having to do with Pine's structure–the things that users never see but still rely on every time they use Pine. While Pine can be used as a stand-alone mail user agent, one of its strongest assets is its use of the Interactive Mail Access Protocol (IMAP) for accessing remote email folders. In addition, Pine was one of the first

programs to support the Multipurpose Internet Mail Extensions (MIME) specification. With MIME, Pine users can reliably send any binary file to any other person on the Internet who uses a MIME compliant email program.

The choices to use IMAP and MIME reflect the importance of interoperability, standardization and robustness in Pine. As you work with Pine more, you will see other features which reflect the same values. For example, Pine enforces strict compliance with RFC-822, implements a strong mail folder locking mechanism and verifies a process before overwriting any files (e.g. addressbook, expunging messages).

Pine Components

If you have picked up the Pine distribution, then you already know that Pine comes in a few different pieces. They are:

Pine This main code from which the Pine program is compiled.

Pico Pico is the name for the Pine composer. The Pico code is used in two ways: (1) it is compiled on its own to be a stand-alone editor or (2) compiled as a library for Pine to support composition of messages within Pine. Pico is Pine's internal editor invoked when users need to fill in header lines or type the text of an email message.

Imap An API for IMAP. Includes the C-Client library, which is compiled into Pine, and the IMAP server IMAPd. C-Client implements the IMAP protocol and also negotiates all access between Pine and the mail folders it operates on. The C-Client routines are used for email folder parsing and interpreting MIME messages. IMAPd is a separate server that handles IMAP connections from any IMAP compliant email program. When Pine accesses a remote mailbox, the Pine program is the IMAP client and the IMAPd program is the IMAP server.

Section 2 – Background Details

Domain Names

Domain names are used to uniquely name each host on the Internet. A domain name has a number of parts separated by periods. Each label represents a level in the hierarchy. An example of a name is:

olive.cac.washington.edu

In this domain name the top-level label is *edu*, indicating it is at an educational institution, the second-level label is *washington*, indicating the University of Washington. *cac* is a specific department within the University of Washington, and *olive* is the host name. The top-level names are assigned by Internet organizations, and other names are assigned at the appropriate level. The Domain Name Service, DNS, is the distributed database used to look up these names.

Pine relies on domain names in multiple places. A domain name is embedded into the message-id line generated for each piece of email. A domain name is needed to contact an IMAP server to get access to remote INBOXes and folders. Most importantly, domain names are needed to construct the From: line of your outgoing messages so that people on the Internet will be able to get email back to you.

On UNIX systems, you can set the domain via the *user-domain* variable in the Pine configuration file, or rely on the file /*etc*/*hosts* which usually sets the name of the local host. While Pine can often deliver email without the domain name being properly configured, it is best to have this set right. Problems can usually be solved by adjusting the system's entry in the /*etc*/*hosts* file. The fully-qualified name should be listed before any abbreviations.

128.95.112.99 olive.cac.washington.edu olive

is preferred over

128.95.112.99 olive olive.cac.washington.edu

On PCs, the task of configuring the domain name is a bit different. Often times, PCs do not have domain names–they have IP addresses. IP addresses are the numbers which uniquely identify a computer on the network. The way you configure your IP address depends on the networking software which you use on the PC. You can refer to the documentation which came with your networking software or see the PC specific installation notes for help configuring the IP address with your network software.

With PCs, it is vital that users set the variable *user-domain* in the Pine configuration file (*PINERC*).

Details on configuring Pine with correct domain names can be found in the Domain Settings section of this document.

RFC-822 Compliance

Pine tries to adhere to RFC-822 a little more strongly than some other mailers and uses the "full name <address>" format rather than the "address (full name)" format. The intent of the standard is that parentheses should only be for comments. Pine displays and generates the newer format, but will parse the old format and attempt to turn it into the new one.

As far as outgoing email is concerned, Pine fully-qualifies addresses whenever possible. They are even displayed in fully-qualified form on the terminal as the user composes a message. This makes addresses more clear and gives a hint to the user that the network extends beyond the local organization. Pine implements fully-qualified domain names by tacking on the local domain to all unqualified addresses which a user types in. Any address which does not contain a "@" is considered unqualified.

The newer format for addresses allow for spaces and special characters in the full name of an address. For this reason, commas are required to separate addresses. If any special characters as defined in RFC-822 appear in the full name, quotes are required around the address. Pine will insert the quotes automatically. The common cases where this happens are with periods after initials and parentheses.

Because Pine fully complies with RFC-822, it is sometimes difficult to use non-Internet address formats such as UUCP's *host!user* or DECNet's *USER::HOST* with Pine. People who run Pine on these systems have made local modifications to Pine or to the mail transport agent (e.g. sendmail) to make things work for them. Another special case that Pine does not allow for are the sites in the United Kingdom which require two "local" domains (one in the form *machine.site.ac.uk* for use outside the UK and the other *uk.ac.site.machine* for use inside the UK). This special case requires local modifications to Pine.

Pine expects dates to be in the standard RFC-822 format which is something like:

[www,] dd mmm yy hh:mm[:ss] [timezone]

It will attempt to parse dates that are not in this format. When an unparsable date is encountered it is displayed as *xxx xx* when shown in the FOLDER INDEX screen.

SMTP and Sendmail

Pine is a *user agent* not a *message transfer agent.* In plain English, that means Pine does not know how to interact with other computers on the Internet to deliver or receive email. What Pine does know how to do is help users read, organize and create email. The "dirty work" of delivering and accepting email is handled by other programs.

All outgoing email is delivered to a mail transfer program or to an SMTP server. The most common mail transfer program is *sendmail.* When Pine on a UNIX computer uses the local *sendmail,* it first writes the message to a temporary file in */tmp.* Then Pine runs a shell in the background that runs *sendmail* on the temporary file and then removes it. This is done with a shell in the background so the user doesn't have to wait for *sendmail* to finish. By default, *sendmail* is invoked with the *-t* flag to cause it to read and parse the header to determine the recipients; the *-oem* flag to cause errors to be mailed back; and the *-oi* flag to ignore dots in incoming messages. Systems administrators can choose to configure Pine to use a different mail transfer program or even *sendmail* with different flags. See the section on UNIX Pine Compile-time Options for more details on this.

Pine can also operate as an SMTP client. SMTP stands for *Simple Mail Transfer Protocol;* it specifies the rules by which computers on the Internet pass email to one another. In this case, Pine passes outgoing email messages to a designated SMTP server instead of to a mail transfer program on the local machine. A program on the server then takes care of delivering the message. To make Pine operate as an SMTP client, the *smtp-server* variable must be set to the IP address or host name of the SMTP server within your organization. This variable accepts a comma separated list of servers, so you can specify multiple SMTP servers. PC-Pine only runs as an SMTP client.

Interactive Mail Access Protocol (IMAP)

IMAP is a mail access protocol. Pine uses IMAP to get at messages and folders which reside on remote machines. With IMAP, all messages are kept on the server. An IMAP client (such as Pine) can request specific messages, headers, message structures, etc. The client can also issue commands which delete messages from folders on the server. IMAP's closest kin is POP, the Post Office Protocol, which works by transferring an entire mailbox to the client where all the mail is kept. For a complete comparison of IMAP and POP, see the paper *Comparing Two Approaches to Remote Mailbox Access: IMAP vs. POP* by Terry Gray. The paper can be found as the file doc/imap.vs.pop in the standard Pine distribution.

IMAP Features:

Allows access to mail folders from more than one client computer.

Works well over low-bandwidth lines because information is sent in small pieces as needed by the user.

Email can be delivered and stored on a well-maintained and reliable server which is "always-up".

Folders can be accessed and manipulated from anywhere on the Internet.

Users can get to messages stored on different folders within the same Pine session.

Allows use of IMAP server for searching and parsing.

IMAP2 is defined in RFC-1176. IMAP2bis, the proposed extension to IMAP2, is described in the document imap2bis-draft-XX.txt in the /mail directory of ftp.cac.washington.edu. IMAP2bis will be formally documented in an upcoming RFC. Pine 3.85 is an IMAP2bis client. It takes advantage of the extensions to IMAP2 and should work with any IMAP2bis server software.

Multipurpose Internet Mail Extensions (MIME)

MIME is a way of encoding a multipart message structure into a standard Internet email message. The parts may be nested and may be of seven different types: Text, Audio, Image, Video, Message, Application and Multipart (nested). The MIME specification allows email programs such as Pine to reliably and simply exchange binary data (images, spreadsheets, etc.) MIME includes support for international character sets, tagging each part of a message with the character set it is written in, and providing 7-bit encoding of 8-bit character sets. It also provides a simple rich text format for marking text as bold, underlined, and so on. There is a mechanism for splitting messages into multiple parts and reassembling them at the receiving end.

MIME is still relatively new, but already we are seeing it used widely throughout the Internet. The MIME standard was officially published in June of 1992 as RFC 1341. Pine 3.0 was one of the first email programs to Implement MIME. Now, there are a dozen public MIME email programs and nearly that many commercial MIME email programs. In addition, MIME is being added to newsreaders so MIME messages can be posted and read in USENET newsgroups.

An actual MIME message looks something like this:

```
From lgl@olive.cac.washington.edu Tue Jul 14 17:55:17 1992
Date: Tue, 14 Jul 1992 17:55:17 -0700 (PDT)
From: Laurence Lundblade <lgl@cac.washington.edu>
Subject: Test MIME message
To: Laurence Lundblade <lgl@cac.washington.edu>

--16820115-1435684063-711161753:#2306
Content-Type: TEXT/PLAIN; charset=US-ASCII

The text of the message would go here. It is readable if
one doesn't mind wading around a little bit of the MIME
formatting. After this is a binary file in base 64
encoding. It has been shortened for this example. The
Base 64 stuff looks dorky in PostScript because
troff -me doesn't have a fixed font like courier.

Laurence Lundblade                206-543-5617
  lgl@cac.washington.edu
    Computing and Communications, University of Washington

--16820115-1435684063-711161753:#2306
Content-Type: TEXT/plain; name=login
Content-Transfer-Encoding: BASE64
Content-Description: NeXT login program

AYAAAABAAAAAQAAAAQAAAL4AAAAAQAAAAEAAAJYAAAAAAAAAAAA
AAAAAAAABfsAAADFAAAFswAAAAHAAAABwAAAAgAAAAAX190ZXh0
AAAAF9fVEVYVAAAAAAAAAAAAAAAAAAAAAAAAAQpAAAAxQAAAABAAAA
AAAAAAAAAAAAABfX2Z2bWxpYl9pbml0MAAAX19URVhUAAAAAAAA
KQAAAEwAAATuAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAF9fZnZt
XQxAABfX1RFWFQAAAAAAAAAAAAAAAAAR1AAAAAAAABToAAAAAgAA
AAAAAAAAAAAAAAAX19jc3RyaW5nAAAAAAAAAF9fVEVYVAAAAAAA
BHUAAADQQAAFOgAAAAAAAAAAAAAAAAAAACAAAAAAAAAABfX2Nv
AAAAAAAX19URVhUAAAAAAAAAAAAAAAAFRgAAACsAAAYLAAAAAIA
AAAAAAAAAAAAAAAAF9fZGF0YQAAAAAAAAAAAABfX0RBVEEAAAAA
AAVxAAAAQgAABjYAAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAX19i
AAAAAAAAF9fREFUQQAAAAAAAAAAAAAABbMAAAADAAAAAAAAAAC
AAAAAABAAAAAAAAABfX2NvbW1vbgAAAAAAAAAX19EQVRBAAAA
CAlcwAlZCBMT0dJTiBGQUlMVVJFJXMgT04gJXMsICVzAHN1AGxv
Wxsb2Mgb3V0IG9mIG1lbW9yeQoAJXMgdG9vIGxvbmcNCgAvZXRj
3Vzci9hZG0vd3RtcAAAAABAKCMpUFJPR1JBTTpsb2dpbiAgUFJP
WRzLTQyICBERVZFTE9QRVI6cm9vdCAgQlVJTFQ6U3VuIE5vdiAx
zoyMSBQU1QgMTk5MAoAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAQCgjKSBDb3B5cmlnaHQgKGMp
DE5ODcsIDE5ODggVGhlIFJlZ2VudHMgb2YgdGhlIFVuaXZlcnNp
2FsaWZvcm5pYS4KIEFsbCByaWdodHMgcmVzZXJ2ZWQuCgBAKCMp
wk1LjQwIChCZXJrZWxleSkgNS85Lzg5AAAAABHUAAAR1f//////
wAAEdQAABHUAAAR1AAAEdQAAAEsAxwREwT/GhkSDxcWAAAR2gAA
AAR5gAAEeoAABHuAAAR8gAAEfYAABH6AAAR/gAAEgIAABIGAAAA
AAB
--16820115-1435684063-711161753:#2306--
```

For more information about MIME, see RFC 1341 or the FAQ in the newsgroup comp.mail.mime or the paper *MIME Overview* by Mark Grand. You can find the paper

via ftp on adad.premenos.sf.ca.us as pub/mime.ps or /pub/mime.txt. For details about Pine's implementation of MIME, see the two MIME sections later in this document.

Folder Collections

Folder Collections are Pine's way of dealing with more than a single group of folders. With advent of PC-Pine and the development of tools within IMAP to better manage remote folders, the time was ripe to provide a mechanism for defining a group of remote folders. PC-Pine forced the issue in that many potential PC-Pine users would be migrating from UNIX pine in a time sharing environment and, thus, would have some investment in their archived messages on that host.

Currently, pine has no way to dynamically create or define collections, but there is much work still going on in this area. The hope is to provide a general way to define, display and navigate remote folder collections in a consistent way across platforms and applications. Stay tuned!

For a more complete description of Folder Collections, see the section on "Syntax for Collections".

Section 3 – Building and Installation

The Pine distribution is designed to require as little configuration and effort at compile time as possible. Still, there are some Pine behaviors which are set at the time you compile Pine. For each of these, there is a reasonable (our opinion) default built into the code, so most systems administrators will have no need for these steps.

UNIX Pine Compile-time Options

The files you may need to modify are *./pine/makefile.xxx* and *./pine/osdep/os-xxx.h* where "xxx" is the 3-letter code for your platform. You can give the command *build help* to see the list of ports incorporated into Pine and their associated 3-letter codes. The file *./pine/makefile.xxx* is where you would set your compiler options. By default, Pine will be compiled with debugging on, optimization and profile off. Note that if you compile with DEBUG off, then Pine will not create its normal debug files, no matter how the debug-level and debug command line flag are set.

Most of Pine's behaviors are set in the file *./pine/osdep/os-xxx.h*, which includes comments that explain each setting. Some of these can only be set when you compile. Others, however, can be overridden by command-line flags to Pine or settings in Pine's user or system configuration files. Some of the options which can be set when compiling:

USE_QUOTAS: Determines whether quotas are checked on startup. Default for most systems is to check the quota.

DEFAULT_DEBUG: Sets the level of debugging output create in Pine's debug files.

NEW_MAIL_TIME: Interval between new-mail checks. Default for most systems is 30 seconds.

OVERLAP: Number of lines overlap when user views the next page of a message. Default on most systems is 2.

USE_TERMINFO: Instructs Pine to use the terminfo database instead of termcap. Default varies by system.

SENDMAIL and SENDMAILFLAGS: Sets the name and flags for the local program that will be called to handle outgoing email. Default is */usr/lib/sendmail -oi -oem -t* on most UNIX systems.

SYSTEM_PINERC: The name of the file which holds Pine configuration information for all users on the system. Default on UNIX systems is */usr/local/lib/pine.conf*.

There are a couple of more obscure options which are in the source code because a few people have asked for them or because we changed our minds about them being a good idea in general.

ENCODE_FROMS: Use Quoted-printable encoding so that *From's* at the beginning of lines don't end up being escaped by >'s. Most people seem to dislike the Q-P encoding more than the > escapes.

NO_KEYBOARD_LOCK: Disable the keyboard locking function in the main menu.

Pico Compile-time Options

There are even fewer options needed when compiling Pico. The two interesting ones are for UNIX Pico versions only. The file that may need some changing is *./pico/os_unix.h.* Whatever is set will effect the behavior of the Pico stand-alone program as well as the composer within Pine.

SPELLER: Names the program called to do "normal" spell-checking.

TERMCAP and TERMINFO: Determines which of these terminal databases will be used.

IMAPd Compile-time Options

There are no options or settings required for the version of IMAPd distributed with Pine. If you need to be doing more complex modifications to IMAP, then you should pick up the IMAP development package and work with that code. The developer's version of IMAP is available for anonymous ftp from *ftp.cac.washington.edu* in the directory *mail*. The file is called *imap.tar.Z.*

Building the Pine Programs

You may have already compiled Pine and tried it out. If so, great! If not, you should be able to do it without too much trouble by following these step-by-step instructions:

1. Figure out what platform you're building for. You can give the command *build help* to see the list of ports incorporated into Pine. What you need is the three letter code for the platform. Some examples are *nxt* for a Next operating system and *ult* for Ultrix. If your platform is not in the list of ports, then you might have some work ahead of you. First, check the file *doc/pine-ports.* to see if there are others working on a port for your platform or to see if the port is included in the "contrib" section of the source code. Ports in the *contrib* directory were contributed by Pine administrators from around the world, but the Pine development team has not been able to test the code. If Pine has not yet been ported to your platform at all, read the section on Porting Pine in this document.

2. Make sure you're in the root of the Pine source. When you type *ls* you should see the following files and directories (or something close to it):

README	build	doc	makefile	pine
bin	contrib	imap	pico	

3. Make sure you're getting a clean start by giving the command *build clean.* This should take only a few seconds to run.

4. Give the command *build xxx* where *xxx* is the three letter code you picked in step 1. The compiler should grind away for a few minutes.

5. When the compilation is complete the sizes of the four binaries built (pine, mtest, imapd, pico) will be displayed. The actual binaries are in the various various source directories. In addition, the *bin* directory contains a link to each program compiled. You can just copy them out of *bin* or try them from there.

Installing Pine and Pico on UNIX Platforms

Installing Pine and Pico is remarkably simple. You take the program files which you have just transferred or built and you move them to the correct directory on your system. Most often the binaries go in */usr/local/bin* though sometimes they are placed in */usr/bin.* All the help text is compiled into Pine so there are no **required** auxiliary files.

There are, however, two optional auxiliary files: */usr/local/lib/pine.info* and */usr/local/lib/pine.conf.* The file *pine.info* contains text on how to get further help on the local system. It is presented as the first page of the help text for the main menu and should probably refer to the local help desk or the system administrator. If this file doesn't exist a generic version which suggests ''talking to the computer support staff at your site'' is shown. The file *pine.conf* is used to set system-wide default configurations for Pine. See the section on Pine Configuration later in this document for details about the *pine.conf* file.

Installing PC-Pine

Most of the PC-Pine configuration involves making sure PC-Pine can interact correctly with your networking software. PC-Pine runs on top of whatever TCP/IP networking stack you already have. Currently, PC-Pine operates with FTP's PC/TCP, Novell's LAN Workplace for DOS and WATTCP for packet drivers. Work is underway to develop a version of Pine that works with Sun's PC/NFS as well. PC-Pine needs to be able to interact closely with the stack loaded on your PC. Most of the time, this occurs automatically. However, there are certain modifications that need be made.

LAN Workplace for DOS Version 4.1

Set the environment variable *EXCELAN* in the PC's *AUTOEXEC.BAT* file. This provides the necessary links so that LAN Workplace for DOS 4.1 can translate domain names to IP numbers correctly. It is needed because Pine was developed for LAN Workplace 4.0 and this particular variable is treated differently in 4.1 than in 4.0. The *EXCELAN* variable must point to the directory in which LAN Workplace is installed.

PC/TCP versions before 2.2

You need a file called *PCTCP.INI* which contains a bare-minimum 2-line description of the PC's configuration. It looks like this:

```
[pctcp ifcust 0]
ip-address=xx.xx.xx.xx
```

Where *xx.xx.xx.xx* is the IP address of the PC. Pine also requires an environment variable, *PCTCP,* which points to this file. For example:

```
set PCTCP=C:\PINE\PCTCP.INI
```

Packet Drivers

Pine needs to be made aware of the PC's network configuration file. Simply edit the file *WATTCP.CFG* included in the Pine distribution. The file includes 5 configuration settings—IP-address, gateway, netmask, nameserver(s) and domainslist. If you have a network configuration file for NCSA Telnet then *WATTCP.CFG* is just a pared down version of the *CONFIG.TEL* file you already made. Take a look at *CONFIG.TEL* to find the correct settings for *WATTCP.CFG*. Once the configuration file is made, the DOS environment variable *WATTCP.CFG* needs to point at it. For example:

```
set WATTCP.CFG=C:\PINE
```

In addition to networking software issues, you might need to worry about setting the timezone. PC-Pine includes the timezone as part of outgoing email. There is a generic way for PC applications to get the timezone, but, because PC-Pine is one of a very few applications which requires this information, timezone might not be previously configured.

The trick is to add an environment variable, *TZ,* to your PC's *AUTOEXEC.BAT* file. The format for the *TZ* environment variable is as follows:

ZZZ[+H]H[:MM:SSTTT]

First is the 3-letter code for your standard time, then a "+" or a "-" for direction of offset from GMT, then the amount of offset (hours, minutes, seconds) and finally the 3-letter code for your summer- or daylight savings time. Everything in [] brackets is optional.

The default timezone is "PST-8PDT" (U.S. Pacific Time). Coincidentally, Microsoft is headquartered in that timezone.

As an example, people in the Eastern part of the US should add this line to their *AUTOEXEC.BAT* files:

TZ=EST-5EDT

Installing IMAPd

When the Pine distribution is built on a UNIX station, the IMAP server binary, *imapd,* is compiled. Installing *imapd* requires placing the binary in the appropriate directory, usually /*usr*/*etc,* and adding entries to /*etc*/*services* and /*etc*/*inetd.conf* or their counterparts. The following line is appropriate for /*etc*/*services:*

imap 143/tcp # Mail transfer

and the next line is appropriate for /*etc*/*inetd.conf:*

imap stream tcp nowait root /usr/etc/imapd imapd

The /*etc*/*inetd.conf* file entry may vary on different versions of UNIX. Some have a slightly different set of fields. Also the pathname in /*etc*/*inetd.conf* must match the path where *imapd* is installed.

With this configuration, the IMAP server runs without pre-authentication. Each new IMAP connection requires a correct username and password. IMAP can also be run with pre-authentication based on the standard *rsh* mechanism. To enable this, the user account on the IMAP server must contain a valid file which grants access to the client machine. Enabling *rimap* authentication is done by creating a link called /*etc*/*rimapd* to *imapd.* Basically, what is happening is that Pine is taking advantage of the ability that *rsh* has to use privileged TCP ports so it doesn't have to run in privileged mode. If the *rimap* authentication fails it will drop back to plain password authentication.

PC-Pine cannot take advantage of *rimap* authentication. Also, if your system uses a distributed configuration database, like NIS, Yellow Pages or Netinfo, be sure that appropriate steps are taken to ensure the above mentioned information is updated.

Support Files: UNIX Pine

This section lists the various files which Pine uses which are not email folders. All of these are the default names of files, they may vary based on Pine's configuration.

/usr/local/lib/pine.conf
: Pine's global configuration file.

~/.pinerc
: Personal configuration file for each user.

~/.addressbook
: Personal addressbook

~/.newsrc
: Personal USENET subscription list. This is shared with other newsreading programs.

~/.pine-debugX
: The files created for debugging Pine problems. By default, there are 4 .pine-debug files kept at any time.

~/.signature
: A signature file which will be included in all outgoing email messages.

~/mail/interrupted-mail
: The text of a message which was interrupted by some unexpected error which Pine detected.

~/mail/postponed-mail
: The text of a message which the user chose to postpone.

/etc/imapdrc
: Imapd global configuration file.

~/.imapdrc
: Personal imapd configuration file.

Support Files: PC-Pine

This section lists the various files which PC-Pine uses which are not email folders. All of these are the default names of files, they may vary based on Pine's configuration.

$HOME\PINE\PINERC
: Personal configuration file for each user.

$HOME\PINE\ADDRBOOK
: Personal addressbook

$HOME\PINE\PINE.SIG
: A signature file which will be included in all outgoing email messages.

$HOME\PINE\PINE.HLP
: File containing Pine's internal help text.

$HOME\PINE\PINE.NDX
: Index of Pine's help text used by PC-Pine to locate entries.

$HOME\NEWSRC
: Personal USENET subscription list. This is shared with other newsreading programs.

$HOME\MAIL\INTRUPTD
: The text of a message which was interrupted by some unexpected error which Pine detected.

$HOME\MAIL\POSTPONE

The text of a message which the user chose to postpone.

PC-Pine maintains its files in two different directories by default, all relative to the *HOME* environment variable. When not set, the default is the root of the current working drive. The *PINERC* file's default location can be overridden by the *PINERC* environment variable. This variable defines the path and name of the *PINERC* file used by pine. It also defines where the *PINE.SIG* and *ADDRBOOK* files are to be found, unless fully qualified in the *PINERC* configuration file.

In the absense of environment variables and no *\PINE* directory on the current working drive, the *PINERC* is expected to reside in the same directory as the *PINE.EXE* executable.

PC-Pine's help text and help text index file, are expected to reside in the same directory as the *PINERC* (based on the above rules). If missing, the files are expected to reside in the same directory as the *PINE.EXE* executable. These rules can be overridden with the *PINEHOME* environment variable. This variable should be set to the directory where the *PINE.HLP* and *PINE.NDX* reside.

Section 4 – Command Line Arguments

Pine and PC-Pine can accept quite a few command-line arguments. Many of these arguments overlap with variables in the Pine configuration file. If there is an difference, then a flag set in the command line takes precedence. Both Pine and PC-Pine expect command line arguments to be preceded by the "-" (dash) standardly used by UNIX programs.

-d Debug Level: Sets the level of debugging information written by Pine. debug-level can be set to any integer 0-9. A debug level of 0 turns off debugging for the session.

-f Startup folder: Pine will open this folder in place of the standard INBOX.

-i Initial Keystrokes: Pine will execute this comma-separated sequence of commands upon startup. This allows users to get Pine to start in any of its menus/screens. You cannot include any input into the composer in the initial keystrokes. The key <Return> is represented by a ‘‘CR’’ in the keystroke list; the spacebar is designated by the letters ‘‘SPACE’’. If -i is used with no keystrokes, Pine will start-up in the FOLDER INDEX screen. Configuration equivalent: *initial-keystroke-list*

-k Function-Key Mode: When invoked in this way, Pine expects the input of commands to be function-keys. Otherwise, commands are linked to the regular character keys. Configuration equivalent: *use-function-keys* included in *feature-list*.

-l Folder-List: With "-l" set, Pine will default to an expanded folder list. This means that the FOLDER LIST screen will always show all folders in all collections. Default is to show the folders in the current collection only. Configuration equivalent: *expanded-view-of-folders* in *feature-list*.

-n Message-Number: When specified, Pine starts up in the FOLDER INDEX screen with the current message being the designated message number.

-o Opens the specified folder (or INBOX) readonly.

-p Uses the named file as the personal configuration file instead of ~/*pinerc* or *$HOME\PINE\PINERC*.

-P Uses the named file as the system wide configuration file instead of /*usr*/*local*/*lib*/*pine.conf*. UNIX Pine only.

-r Restricted Mode: For UNIX Pine only. Pine in restricted mode can only send email to itself. Save and export are limited.

-sort Sort-Key: Specifies the order messages will be displayed in for the FOLDER INDEX screen. Key can have the following values: subject, arrival, date, from, size, subject/reverse, arrival/reverse, date/reverse, from/reverse, size/reverse. The default value is "arrival". The key value reverse is equivalent to

arrival/reverse. This option will be expanded in the future to allow sorting on "to" and "cc". Configuration equivalent: *sort-key*.

-z Enable Suspend: When run with this flag, the key sequence ctrl-z will suspend the Pine session. Configuration equivalent: *enable-suspend* included in *feature-list*.

Special Pine Command-Line Modes

[address]
Send-to: If you put an unqualified string (or strings) in the command line, Pine reads them as email address. Pine will startup in the composer with a message started to the person/people specified. Once the message is sent, the Pine session closes.

-h Help: Prints the list of available command-line arguments to the screen.

-conf Configuration: Prints a sample system configuration file to the screen or standard output. UNIX Pine only.

Section 5 – Configuration and Preferences

Pine Configuration

There is very little in Pine which **requires** configuration. In almost every case, the compiled-in preferences will suit users just fine. When running Pine on a UNIX system, the built-in configuration can be changed by setting variables in the system configuration file, */usr/local/lib/pine.conf*. Both Pine and PC-Pine also use personal (user-based) configuration files. On UNIX machines, the personal configuration file is the file ~/*.pinerc*. For PC-Pine systems, the personal configuration file is in *\PINE\PINERC*.

The syntax of a configuration variable is this:

<variable> = <value>

If the value is absent then the variable is unset. To set a variable to the empty value the syntax is "". This is equivalent to an absent value except that it overrides any system-wide value that may be set. Quotes may be used around any value. All values are strings and end at the end of the line or the closing quote. Leading and trailing space is ignored unless it is included in the quotes. For some variables the only appropriate values are *yes* and *no*. There is also a second valid syntax which has been introduced since the last version of Pine. Some variables are now lists. A list is a comma-separated list of values. The syntax for a list is:

<variable> = <value> [, <value> , ...]

A list can be continued on subsequent lines by beginning the line with white-space. Both the per-user and global configuration files may contain comments which are lines beginning with a #.

For UNIX Pine, There are four ways in which a variable can be set. In decreasing order of precedence they are:

(1) a command line argument
(2) the personal configuration file
(3) the system-wide configuration file
(4) default in the source code.

So, command line flags always take precedence over per-user settings, which take precedence over system-wide configuration settings, which take precedence over source code defaults. PC-Pine has the same precedence, but it does not us a system-wide configuration file.

You may get a sample/fresh copy of the system configuration file by running *pine -conf*. The result will be printed on the standard output with comments describing each variable. Pine will automatically create the personal configuration file the first time it is run, so there is no need to generate a sample. Pine reads and writes the personal configuration file occasionally during normal operation. The user may add additional comments to the personal configuration file and they will be retained. Pine always writes this file at least once when running so you can tell when a user last invoked Pine by checking the date on this file.

References to environment variables may be included in the Pine configuration file. The format is *$variable* or *${variable}*. The character ~ will be expanded to the *$HOME* environment variable. Currently, most of these variables have to be set by hand with an editor.

When environment variables are used for Pine settings which take lists (*feature-list, folder-collections*), you must have an environment variable set for each member of the list. Pine won't properly recognize an environment variable set equal to a comma-delimitted list. It is OK to reference unset environment variables in the Pine configuration file.

General Configuration Variables

The following variables can be found in any Pine configuration file–be it UNIX or DOS, system-wide or personal.

user-domain
Sets the domain or host name for the user, overriding the system host or domain name. See the domain name section.

use-only-domain-name
Can be set to *yes* or *no.* At this point anything but *yes* means *no.* If set to *yes* the first label in the host name will be lopped off to get the domain name and the domain name will be used for outgoing mail and such. That is, if the host name is *carson.u.example.edu* and this variable is set to *yes*, then *u.example.edu* will be used on outgoing mail. Only meaningful if *user-domain* is NOT set.

inbox-path
This specifies the name of the folder to use for the INBOX. Normally this is unset so the system's default is used. The most common reason for setting this is to open an IMAP mailbox for the INBOX. For example, {*imap5.u.example.edu*}*inbox* will open the user's standard *INBOX* on the mail server, imap5.

default-fcc
The name of the folder to which all outgoing mail goes is set here. The compiled-in default is *sent-mail* (UNIX) or *sentmail* (DOS). It can be set to "" (two double quotes with nothing between them) to turn off saving copies of outgoing mail. If the default-fcc is a relative filename, then it is relative to your default collection for saves (see *folder-collections*).

smtp-server
One or more SMTP servers (host name or IP address) which Pine will use for outgoing mail. If not set, Pine passes outgoing email to the *sendmail* program on the local machine. PC-Pine users must have this variable set in order to send mail as they have no *sendmail* program.

image-viewer
This variable names the program to call for displaying parts of a MIME message that are of type image. In a future version of Pine this configuration will be replaced by the more general *mailcap.*

signature-file
Names the file to be included as the signature. This defaults to ~/*.signature* on UNIX and *$HOME\PINE\PINE.SIG* on DOS.

mail-directory

This variable was more important in previous versions of Pine. Now it is used only as the directory for storing postponed and interrupted messages temporarily. The default is ~/*mail* on UNIX and *$HOME\MAIL* on DOS.

character-set

This sets the character set used by the terminal. Currently appropriate values are US-ASCII, ISO-8859-1 through ISO-8859-9 and ISO-2022-JP. See the section on international character sets for more details. The default is US-ASCII.

incoming-folders

This is a list of one or more folders other than *INBOX* that may receive new messages. This list is slightly special in that it is always expanded in the folder lister. In the future, it may become more special. For example, it would be nice if Pine would monitor the folders in this list for new mail.

folder-collections

This is a list of one or more collections where saved mail is stored. See the sections describing folder collections and collection syntax for more information. The first collection in this list is the default collection for saves.

news-collections

This is a list of collections where news folders are located. See the section describing collections for more information.

initial-keystroke-list

This is a comma-separated list of keystrokes which Pine executes on startup. Items in the list are usually just characters, but there are some special values. *SPACE* and *CR* mean a space character and a carriage return, respectively. *F1* through *F12* stand for the twelve function keys. *UP*, *DOWN*, *LEFT*, and *RIGHT* stand for the arrow keys. A restriction is that you can't mix function keys and character keys in this list even though you can, in some cases, mix them when running Pine. A user can always use all character keys in the startup list even if he or she is using function keys normally, or vice versa.

feature-list

This is a list of features (options) which should be turned on. Here is the current list of possible features with brief descriptions:

enable-full-header-cmd	*HdrMode* command enabled
enable-unix-pipe-cmd	piping message to Unix enabled (not implemented yet)
enable-bounce-cmd	*Bounce* mail to someone else (not implemented yet)
enable-alternate-editor-cmd	^_ command enabled
enable-suspend	^Z job control enabled
enable-tab-completion	*TAB* completion enabled for folder opening and saving
enable-jump-shortcut	can type just a number to *Jump* in index
quit-without-confirm	won't ask for confirmation when quitting
enable-goto-cmd	*GotoFldr* command enabled
enable-apply-cmd	*Apply* command enabled (not implemented yet)
enable-flag-cmd	*Flag* command enabled (not implemented yet)
enable-zoom-cmd	*Zoom* command enabled
enable-forward-as-MIME	will ask if forwarded message should be attached
expanded-view-of-folders	folder lists pre-expanded in folder lister
use-function-keys	same as *-k* flag

include-header-in-reply	when replying, include header lines from message
signature-at-bottom	signature comes at bottom instead of top
delete-skips-deleted	*Delete* will skip to next undeleted message

sort-key
This variable sets up the default index sorting. The default is to sort by arrival order. It has the same functionality as the *-sort* command line argument and the *$* command in the folder index. If a *sort-key* is set, then all folders open during the session will have that as the default sort order.

saved-msg-name-rule
Determines default folder name when saving. Currently, Pine will accept the values "default-folder" or "by-sender". If set to *default-folder*, then Pine will offer the folder "saved-messages" (UNIX) or "SAVEMAIL" (DOS) for saving messages. If set to *by-sender*, then Pine will offer to save the message in a folder with the same name as the sender. If set to "last-folder-used", then Pine will offer to save in whatever folder you used previously. We expect to expand this list so that Pine can save messages with the rule "by recipient".

read-message-folder
If set, mail in the *INBOX* that has been read but not deleted is moved here, or rather, the user is asked whether or not he or she wants to move it here upon quitting Pine.

Special Configuration Variables

Some configurations only make sense in a system-wide file, others only make sense in a personal configuration file. Also, there are certain settings required in PC-Pine and others which make no sense there. These are the variables you may need to configure, depending on which configuration file you are working with.

user-id
PC-Pine only. Sets the username that is placed on all outgoing messages.

personal-name
Personal configuration file only. User's full personal name. On UNIX systems, the default is taken from the accounts data base (/etc/passwd).

printer
UNIX Pine only. This is the current setting for a user's printer. This variable is set from Pine's printer-setup function. The value must be either

"attached-to-ansi" -or-
the value of *personal-print-command* -or-
the value of *standard-printer* from the system-wide configuration

standard-printer
System-wide configuration file only. Specifies the command for printer selection number 2 on the printer menu.

personal-print-command
UNIX personal configuration file only. This corresponds to item 3 in the printer menu. This variable retains the value of *personal-print-command* when the printer is set to something other than item 3. The *personal-print-command* can be set within Pine using the printer setup menu.

last-time-prune-questioned
Personal configuration file only. This variable records the month the user was last asked if his/her sent-mail folders should be pruned. The format is *yy.mm*. This is automatically updated by Pine when the the pruning is done or declined.

bugs-nickname, bugs-fullname and bugs-address
System-wide configuration file only. This trio specifies an entry for the address book that is always inserted if found absent. It is a way to put the address to send requests for help to in everyone's address book so users can find it easily. There is no default value.

editor
UNIX Pine only. Sets the name of the alternate editor for composing mail (message text only, not headers). It will be invoked with the "^_" command.

last-version-used
Personal configuration file only. This is set automatically by Pine. It is used to keep track of the last version of Pine that was run by the user. Whenever the version changes, a new version message is printed out. If you toggle back and forth between two versions you'll get the message every time, since it just checks for equality.

Retired Variables

Variables that are no longer used by the current Pine version. When an obsolete variable is encountered, its value is applied to any new corresponding setting and a comment is place before it noting that it is no longer in used. Several of the replaced values at the time of this document include:

elm-style-save
Replaced by *saved-msg-name-rule*

header-in-reply
Replaced by *include-header-in-reply* in the *feature-list.*

feature-level
Replaced by *feature-list.*

old-style-reply
Replaced by *signature-at-bottom* in the *feature-list.*

save-by-sender
Replaced by *saved-msg-name-rule.*

Pine in Function Key Mode

The standard Pine uses alphabetic keys for most commands, and control keys in the composer. Despite possible appearances, the current bindings are the result of much discussion and thought. All the commands in the composer are single control characters. This keeps things very neat and simple for users. Two character commands in the composer are a possibility, but we're trying to avoid them because of the added complexity for the user.

Pine can also operate in a function-key mode. To go into this mode invoke *pine -k* or (on some UNIX systems) *pinef.* On a UNIX system, you can link or copy the *pine* executable to *pinef* to install *pinef.* Alternatively, users and systems administrators can set the *use-function-keys* feature in the personal or system-wide Pine configuration file. The command menus at the bottom of the screen will show *F1-F12* instead of the alphabetic commands. In addition, the help screens will be written in terms of function keys and not alphabetic keys.

One of the results of using Pine in function-key mode is that users can only choose from twelve commands at any given time. In alphabetic-key mode, a user can press a key for a command (say, q to quit) and that command can be fulfilled. In function-key mode, the command must be visible on the bottom key-menu in order to be used. There are some screens where 34 commands are operational; function-key users can get to all of them, just not all at once.

Domain Settings

Pine uses the default domain for a few different tasks. First, it is tacked onto the user-id for outgoing email. Second, it is tacked onto all "local" addresses in the "To:" or "Cc:" fields of messages being composed. The domain name is also used to generate message-id lines for each outgoing message and to allow Pine to check if an address is that of the current Pine user.

Pine determines the domain name according to whichever of these it finds. The list here is in decreasing order of precedence.

(1) Value of the variable *user-domain* in a personal configuration file

(2) Value of the variable *user-domain* is a system-wide configuration file

(3) Value from a local configuration database (/*etc*/*hosts*, DNS, NIS) as modified by a personal configuration file if *use-domain-name-only* set to "yes"

(4) Value from a local configuration database (/*etc*/*hosts*, DNS, NIS) as modified by a system configuration file if *use-domain-name-only* set to "yes"

(5) Unmodified value from a local configuration database

The easiest way for this system to work is for PC-Pine users and UNIX Pine system administrators to set the *user-domain* variable. The variable *use-domain-name-only* is helpful if your site supports/requires hostless addressing but for some reason you don't want to use the *user-domain* variable.

Syntax for Collections

In many environments, it is quite common to have collections of archived mail on various hosts around the network. Using the new collections facility within Pine, access to these archives is just as simple as access to folders on Pine's local disk.

"Collection" is the word we use in Pine to describe a set of folders. Folders within a

defined collection can be manipulated (opened, saved-to, etc) using just their simple name. Any number of folder collections can be defined, and pine will adjust its menus and prompts to help navigate them.

The way collections are defined in Pine is with the *folder-collections* variable in the Pine configuration file. *Folder-collections* takes a list of one or more collections, each (optionally) preceded by a user-defined logical name. Once collections are defined, Pine adjusts its menus and behavior to allow choosing files by their simple name within the collection. Collections are always defined in the configuration file; there is no time that Pine will ever ask a question which requires a user to input a collection specifier.

Consider the following:

```
folder-collections=     Local-Mail      C:MAIL[],
                        Remote-Mail     {imap.u.example.edu}mail/[]
```

The example shows two collections defined (a comma separated list; newlines in the list are OK if there's one or more spaces before the next entry), one local and one remote. Each collection is a space-delimited pair of elements–first an optional logical-name and second the collection specifier. The logical-name can have spaces if it has quotes around it (but keeping the logical name short and descriptive works best). Pine will use the logical-name (if provided) to reference all folders in the collection, so the user never has to see the ugliness of the collection specifier.

The collection specifier can be thought of as an extended IMAP format (see the "Remote Folders" section for a description of IMAP format names). Basically, a pair of square-brackets are placed in the fully qualified IMAP path where the simple folder name (the part without the hostname and path) would appear. Like IMAP, the path can be either fully qualified (i.e., with a leading '/') or relative to your home directory.

An advanced feature of this notation is that a pattern within the square brackets allows the user to define a collection to be a subset of a directory. For example, a collection defined with the specifier:

```
M-Mail          C:MAIL[m*]
```

will provide a view in the folder lister of all folders in the PC's "C:MAIL" directory that start with the letter 'm' (case insensitive under DOS, of course). Further, the wildcard matching will honor characters trailing the '*' in the pattern.

From within Pine, the FOLDER LIST display will be adjusted to allow browsing of the folders in any defined collection. Even more, you'll notice in the Goto and Save commands a pair of new sub-commands to toggle through the list of logical collection names, so only a simple name need be used to operate on a folder in any collection.

The first collection specified in the *folder-collections* has special signifigance. That folder is the "default collection for saves". In cases where the user does not specify which collection should be used to save a message, the default collection for saves will be used. Also, if the *default-fcc* is a relative file name, then it is relative to the default collection for saves.

The notion of collections encompasses both email folders and news reading. The current version of Pine supports very basic news reading. The variable *news-collections* uses nearly the same format as *folder-collections*. Newsgroups can be defined for convenient access via either IMAP or NNTP. There are advantages and disadvantages to both access methods. In the IMAP case, your news environment

state is maintained on the server and, thus, will be seen by any client. The downside is that, at the moment, you must have an account on the server. In the NNTP case, server access is mostly anonymous and no state/accounting need be maintained on it. The downside is that each client, for now, must individually maintain news environment state.

An example pinerc entry might be:

```
news-collections=   Remote-State   *{news.u.example.edu}[],
                    Local-State    *{news.u.example.edu/nntp}[]
```

Note that each news collection must be preceded by a '*' to indicate non-mail access. Only newsgroups to which you are subscribed are included in the collection.

The pattern matching facility can be applied so as to define a news collection which is a subset of all the newsgroups you subscribe to. For example, this could be a valid collection:

```
                    Newsfeed-News  *{news.u.example.edu/nntp}[clari.*]
```

We are in the process of fleshing out news reading (subscription management, quasi-threading, etc) and hope to make it available as early as Fall, 1993.

Collection handling is a tough problem to solve in a general way, and the explanation of the syntax is a bit ugly. The upside is, hopefully, that for a little complexity in the Pine configuration file you get simple management of multiple folders in diverse locations.

Syntax for Remote Folders

Remote folders are distinguished from local folders by a leading hostname bracketed by '{' and '}'. The path and folder name immediately following the closing bracket, '}', is interpreted by the IMAP server and is in a form compatible with that server (i.e., path delimiters and naming syntax relative to that server).

Typically, a folder name without any path description is understood to reside in the user's "home directory" (i.e., in some way the user's personal, writable file area), as are incomplete path designations. An example of a remote folder specification would be,

```
{mailhost.cac.washington.edu}mail/saved-messages
```

This example simply specifies a folder named ''saved-messages'' on the imap server ''mailhost.cac.washington.edu'', in the ''mail'' subdirectory of the user's home directory. Easy isn't it?

To confuse things a bit, qualifiers are permited within the brackets following the host name. These qualifiers consist of a slash, '/' character followed by a keyword or keyword and value equality, and have the effect of modifying how the connection is made to the host specified. An example of such a specification might be,

```
*{pine.cac.washington.edu/anonymous}updates
```

Another example might be,

```
*{news.u.washington.edu/nntp}comp.mail.mime
```

Both of these examples illustrate a different qualifier. The first, specifying ''anonymous'' access to the IMAP server on ''pine.cac.washington.edu''. The second is interesting in that it specifies an altogether different access method: ac-

cess via the Network News Transport Protocol (NNTP). Both examples bring to light one remaining subtlety. The leading ‘‘*’’ tells pine to treat the remote folder as a Bulletin-Board (i.e., typically a shared, read-only resource) and to adjusts its behavior accordingly.

Sorting a Folder

The mail index may be sorted by subject, size, sender, date, or arrival order. Each sort order can also be reversed. The *$* command will prompt the user for the sort order. The sort order can also be specified on the command line with the *-sort* flag or (equivalently) with the *sort-key* variable in the *.pinerc* file. When a user changes folders, the sort order will go back to the original sort order. The command line (*-sort*) or configuration file sort specification (*sort-key*) changes the original sort order.

When a folder is sorted and new mail arrives in the folder it will be inserted in its properly sorted place. This can be a little odd when the folder is sorted by something like the subject. It can also be a little slow if you are viewing a large, sorted INBOX, since the INBOX will have to be re-sorted whenever new mail arrives.

The sorts are all independent of case and ignore leading or trailing white space. The subject sort ignores "Re:" at the beginning and "(fwd)" at the end. The sort by sender sorts by the userid, not the full name. The arrival sort is basically no sort at all and the date sort depends on the format of the date. Some dates are in strange formats and are unparsable. The time zone is also taken into account.

Sorting large mail folders can be very slow since it requires fetching all the headers of the mail messages. With UNIX Pine, only the first sort is slow since Pine keeps a copy of all the headers. One exception is sorting in reverse arrival order. This is fast because no headers have to be examined. Pine will show progress as it is sorting.

Alternate Editor

In the Pine composer you can use any text editor, such as *vi* or *emacs*, for composing the message text. The addresses and subject still must be edited using the standard Pine composer. It operates in one of two ways. If you include the feature *enable-alternate-editor-cmd* in your *.pinerc* you can type ^_ while in the composer and be prompted for the editor. If you also set the *editor* variable in your *.pinerc* then ^_ will invoke the configured editor when you type it.

We know that many people would like to use the custom editor to edit the mail header as well. We considered several designs for this and didn’t come up with one that we liked and that was easy to implement. One of the main problems is that you lose access to the address book. We also understand that many people would like an option for the alternate editor to be invoked automatically. There will probably be further discussion on this!

Signatures and Signature Placement

If the file ~/*.signature* (UNIX) or *$HOME\PINE\PINE.SIG* (DOS) exists, it will be included in all outgoing messages. It is included before composition starts so that the user has a chance to edit it out if he or she likes. The file name for the signature can be changed by setting the *signature-file* variable in the *.pinerc*. There is no way to have Pine include different signatures in different outgoing messages automatically. You can do this by hand, however, by having multiple

signature files (.sig1, .sig2, .sig3, etc) and choosing to include (^R in the composer) the correct one for the message being sent.

Pine encourages the user to put his or her contribution before the inclusion of the original text of the message being forwarded or replied to, This is contrary to some conventions, but makes the conversation more readable when a long original message is included in a reply for context. The reader doesn't have to scroll through the original text that he or she has probably already seen to find the new text. If the reader wishes to see the old message(s), the reader can scroll further into the message. Users who perfer to add their input at the end of a messaage should set the *signature-at-bottom* feature in the *feature-list*. The signature will then be appended to the end of the message after any included text.

Feature List Variable

Pine used to have *feature levels* for users with different amounts of experience. We found that this was too restrictive. Pine now has a *feature-list* instead. The old feature *feature-level=old-growth* is still supported as a macro by translating it into a particular set of features, but it is now also possible for each user to pick and choose which features they would like enabled. More features (options) will no doubt continue to be added.

Additional Notes on PC-Pine

Below are a few odds and ends worth mentioning about PC-Pine. They have to do with DOS-specific behavior that is either necessary or useful (and sometimes both!).

As PC-Pine runs in an environment with limited access control, accounting or auditing, either of two additional lines are automatically inserted into the header of mail messages generated by PC-Pine. These lines are

X-Warning: UNAuthenticated Sender

and

X-Sender: <userid>@<imap.host>

Which of the two headers is inserted depends on whether a successful imapd login has been established at the time the message is sent. This feature can only be disabled by recompiling PC-Pine. Also, this should not be considered a rigorous form of authentication. It is extremely lightweight, and is not a replacement for true authentication.

Hand in hand with authentication and accounting is user information. Since PC-Pine has no user database to consult for user-id, personal-name, etc., necessary information must be provided by the user/installer before PC-Pine can properly construct the "From" address required for outbound messages. As required editing of the *PINERC* is somewhat clumsy, PC-Pine will, by default, prompt for the requisite pieces as they are needed. This information corresponds to the *PINERC* variables user-id, personal-name, user-domain, and smtp-server.

The user is then asked whether or not this information should automatically be saved to the *PINERC*. This is useful behavior in general, but can lead to problems in a lab or other shared environment. Hence, these prompts and automatic saving of configuration can be turned off on an entry by entry basis by setting any of the above values in the *PINERC* to the null string (i.e., a pair of double

quotes). This means that the user will be prompted for the information once during each pine session, and no opportunity to save them in the *PINERC* will be offered.

Along similar lines, a feature allowing automatic login to the imap-server containing the user's *INBOX* has also been requested. This feature is not enabled by default, but requires the existance of the file named *PINE.PWD* in the same directory as the *PINERC*. Even with the existance of this file, the user must still acknowledge a prompt before the password is saved to the file.

WARNING! Use this feature with caution! It effectively makes the user's mail no more secure than the physical security of the machine running PC-Pine. What's more, while the password is cloaked by a mild (some might say, feeble) encryption scheme, it is nonetheless sitting in a file on the PC's disk and subject to cracking by anyone with access to it. *BEWARE*!

Another feature of DOS is the lack of standard scratch area for temporary files. During the course of a session, PC-Pine may require numerous temporary files (large message texts, various caches, etc.). Where to create them can be a problem, particularly when running under certain network operating systems. PC-Pine observes the *TMP* and *TEMP* environment variables, and creates temporary files in the directory specified by either. In their absense, PC-Pine creates these files in the root of the current working drive.

Section 6–Behind the Scenes

Many people ask how certain Pine features are implemented. This section outlines some of the more interesting details. For more information, you would have to ask the developers or take a look at the source code.

Address Books

The address book is stored in the user's home directory in the file *.addressbook* (UNIX) or in the *\PINE* directory as the file *ADDRBOOK* (DOS). In either case, the address book is a simple text file. The lines are of the format:

<nickname>TAB<fullname>TAB<address>

If the entry is an address list then <address> is of the format:

(<address>,<address>,<address>,.....)

Normally entries are one per line unless it is a list and then the entry extends until the closing parenthesis.
If lines are encountered in the address book that don't fit the format (they don't have two tabs) they are ignored.
An older format is also supported where the address lists don't have parentheses.
Spaces are not allowed in nick names.

Entries in the address book may refer to other entries in the address book. Lists may be nested. If addresses refer to each other in a loop this is detected and flagged. The address will be changed to "**** address loop ****".

The address book file is rewritten by Pine frequently in the format it thinks proper so comments or other formatting introduced with a text editor will not be maintained.

The address book format is simple, so writing script and programs to modify and/or convert address books should be simple. Some such conversion programs are included in the Pine distribution in the *contrib* directory.

The address book is kept sorted in order by the full name field. In order for this to be sensible the full names should be last name, then comma, then first name. Pine makes an attempt to encourage use of this format. It will reverse the order of any names that have a single comma in them when they are in addresses on outgoing mail so that it will be formatted first name followed by last name. The *TakeAddr* command that captures addresses off incoming messages also attempts to reverse the name as it is inserted, though it doesn't always succeed. The way it works can probably be improved.

When the address book is written out, it is first written to a temporary file and if that write is successful it is renamed correctly. This guards against errors writing the file that might destroy the whole address book. The address book is written after each change.

There are two ''known weaknesses'' in the Pine address book scheme–both of which are being worked on. First, a user can only have 1 address book. There is no way to have a global (system-wide) address book and a personal one. Secondly, the address book must be on the same machine as Pine. You cannot, at the moment, share an address book between Pine and PC-Pine.

Checkpointing

Periodically Pine will save the whole mail folder to disk to prevent loss of any mail or mail status in the case that Pine gets interrupted, disconnected, or crashes. The period of time Pine waits to do the checkpoint is calculated to be minimally intrusive. The timing can be changed (but usually isn't) at compile time. Folder checkpointing happens for both local folders and those being accessed with IMAP. The delays are divided into three categories:

Good Time: This occurs when Pine has been idle for more than 30 seconds. In this case Pine will checkpoint if 12 changes to the file have been made or at least one change has been made and a checkpoint hasn't been done for five minutes.

Bad Time: This occurs just after Pine has executed some command. Pine will checkpoint if there are 36 outstanding changes to the mail file or at least one change and no checkpoint for ten minutes.

Very Bad Time: Done when composing a message. In this case, Pine will only checkpoint if at least 48 changes have been made or one change has been made in the last twenty minutes with no checkpoint.

Debug Files

If UNIX Pine is compiled with the compiler *DEBUG* option on (the current default), then Pine will produce debugging output to a file. The file is normally *.pine-debugX* in the user's home directory where *X* goes from 1 to 4. Number 1 is always the most recent session and 4 the oldest. Four are saved because often the user has gone in and out of Pine a few times after a problem has occurred before the expert actually gets to look at it. The amount of output in the debug files varies with the debug level set when Pine is compiled and/or as a command line flag. The default is level 2. This shows very general things and records errors. Level 9 produces copious amounts of output for each keystroke.

PC-Pine does not produce debug files.

Filters

Pine is not designed to process email messages as they are delivered; rather Pine depends on the fact that some other program (sendmail, etc) will deliver messages and Pine simply reads the email folders which that "other" program creates. For this reason, Pine cannot filter incoming email into different folders. It can, however, work alongside most of the programs available over the Internet which perform this task. Pine is known to operate successfully with the Elm filter program and with Procmail.

Design changes in Pine 3.8x facilitate Pine users filtering email. You still have to get a filtering program and configure it correctly, but Pine now allows users to specify a set of *incoming-folders*. Pine will separate out all the folders listed as *incoming-folders* and offer convenient access to these. We hope that in the future Pine will be able to offer new message counts for all of the incoming folders.

Folder Formats

A folder is a group of messages. The default format used by Pine is the Berkeley mail format. It is also used by the standard *mail* command and by *elm.* Pine also understands folders in other formats. UNIX Pine understands Tenex and netnews as well. PC-Pine reads and writes folders on the PC itself in a special format called MTX. Near as we can tell, PC-Pine is the only program to use the MTX format. Pine has also been used with Carmel, mh, MMDF and mbox format mailboxes. For more information about the carmel format, see the directory *./contrib/carmel* in the Pine distribution.

Berkeley

This format comes to us from the ancient UNIX mail program, */bin/mail.* (Note that this doesn't have anything to do with Berkeley, but we call it the Berkeley mail file format anyway.) This program was actually used to interactively read mail at one time, and is still used on many systems as the local delivery agent. In the Berkely mail format, a folder is a simple text file. Each message (including the first) must start with a separator line which takes approximately the form:

From juser@u.example.edu Wed Aug 11 14:32:33 1993

Each message ends with two blank lines. There are actually several different variations in the date part of the string, twenty at last count. Because of the format of the separators, no lines in the mail message can begin with "From ", space included, so they are modified to be ">From ". You'll see this occasionally in mail messages. The message delivery program (not Pine) enforces this restriction. You can fool Pine into thinking a file is a mail folder by adding a message separator at the beginning of the file and wherever you want message boundaries. The vast majority of INBOXes Pine reads and folders it writes are of this format.

Tenex and MTX Formats

The Tenex format of file uses a single file per folder. Normally, the file name ends with *.txt*. The file format consists of a header line followed by the message text for each message. The header is in one of two forms:

dd-mmm-yy hh:mm:ss-zzz,n;fffffffffff
dd-mmm-yyyy hh:mm:ss sssss,n;fffffffffff

and is immediately followed by a newline (and the message text).

The fields in the formats are:

dd	two-digit day of month (leading space if a single-digit day)
mmm	three-letter English month name (Jan, Feb, etc.)
yy	two-digit year in 20th century (obsolete)
yyyy	four-digit year
hh	two-digit hour in 24-hour clock (leading zero if single-digit)
mm	two-digit minute (leading zero)
ss	two-digit second (leading zero)
zzz	three-letter North American timezone (obsolete)
sssss	signed four-digit international timezone as in RFC 822
n	one or more digits of the size of the following message in bytes
fffffffffff	twelve-digit octal flags value

Punctuation is as given above.

The time in the header is the time that message was written to the folder. The flags are interpreted as follows: the high order 30 bits are used to indicate user flags, the next two bits are reserved for future usage, the low four bits are used for system flags (010 = answered, 04 = flagged urgent, 02 = deleted, 01 = seen). Mail is automatically moved from */usr/spool/mail* into *mail.txt* in the user's home directory if the *mail.txt* file exists.

The MTX format is identical to the tenex format, with two exceptions: the folder name ends with *.MTX* instead of *.txt* (this is a requirement in the MTX format), and DOS-style CR/LF newlines are used instead of UNIX-style LF newlines.

Netnews Format

The netnews format is a read-only format which uses directories under /usr/spool/news as folders. The */usr/spool/news/* prefix is removed and all subsequent ''/'' (slash) characters are changed to ''.'' (period). For example, the netnews folder name *comp.mail.misc* refers to the directory name */usr/spool/news/comp/mail/misc*. In addition, the news folder name must appear in the file /usr/lib/news/active for it to be recognized. Individual messages are stored as files in that directory, with filenames being the ASCII form of a number assigned to that message.

Folder Locking

There are two kinds of locking which Pine has to worry about. The first might be called program-contention locking. This affects the times when a program is performing actual updates on a folder. An update might be a message delivery program appending a message (*sendmail* delivering a message to an INBOX), status changes (checkpoints by Pine every few minutes) or deletion of messages (an expunge in Pine). For moderate sized mail messages, these operations should not last for more than a few seconds. The second kind of locking has to do with user-contention situations. This would be the case when one folder is shared by a group of people or even when one person starts multiple email sessions all of which access the same folders and INBOX.

There are two standard locking mechanisms which handle program-contention locking. To be on the safe side, Pine implements both of them. The older mechanism places a file *xxxx.lock* (where *xxxx* is the name of the file being locked) in the same directory as the file being locked. This makes use of the fact that directory operations are atomic in UNIX and mostly works across NFS. There are involved algorithms used to determine if a lock has been held for an excessive amount of time and should be broken. The second program-contention locking mechanism uses the *flock()* system call on the mailbox. This is much more efficient and the locks can't get stuck because they go away when the process that created them dies. This is usually found on 4BSD and related machines.

In addition to these, Pine—through the c-client library—provides robust locking which prevents several users (or several instances of the same user) having a mail file open (for update) at once. This user-contention lock is held the entire time

that the folder is in use.

With IMAPd 7.3(63) and Pine 3.84 and higher, the second Pine session which attempts to open a folder with Pine will ''win.'' That is to say, the second session will have read/write access to the folder. The first user's folder will become read-only. (Note that this is exactly the opposite of the behavior prior to Pine 3.84 where the second open was read-only. Having the second open be read-write seems to match more closely with what users would like to have happen in this situation.) Pine's additional locking is only effective against multiple uses of Pine or other programs using the c-client library, such as *MailManager, ms, IMAPd* and a few others. Beginning with Pine 3.85, there is an *-o* command line flag to intentionally open a mailbox read-only.

Pine locking on UNIX systems works by creating lock files in */tmp* of the form *\usr\spool\mail\joe.* The system call *flock()* is then used on these files; the existence of the file alone does not constitute a lock. This lock is created when the folder is opened and destroyed when it is closed. When the folder is actually being written, the standard UNIX locks are also created.

If a folder is modified by some other program while Pine has it open, Pine will give up on that mail file, concluding it's best not to do any further reads or writes. This can happen if another mailer that doesn't observe Pine's user-contention locks (e.g. *elm* or *mail)* is run while Pine has the mail folder open. Pine checkpoints files every few minutes, so little data can be lost in these situations.

PC-Pine does not do any folder locking. It depends on IMAP servers to handle locking of remote folders. It is assumed that only one Pine session can be running on the PC at a time, so there is no contention issue around folders on the PC itself.

INBOX and Special Folders

The *INBOX* folder is treated specially. It is normally kept open constantly so that the arrival of new mail can be detected. The name *INBOX* refers to wherever new mail is retrieved on the system. If the *inbox-path* variable is set, then *INBOX* refers to that. IMAP servers understand the concept of *INBOX*, so specifying the folder {*imap.u.example.edu*}*INBOX* is meaningful. The case of the word INBOX is not important, but Pine tends to display it in all capital letters.

The folders for sent mail and saved messages folders are also somewhat special. They are automatically created if they are absent and recreated if they are deleted.

Internal Help Files

The file *pine.hlp* in the *pine* subdirectory contains all the help text for Pine. On UNIX, it is compiled right into the Pine binary as strings. This is done to simplify installation and configuration. The *pine.hlp* file is in a special format that is documented at the beginning of the file. It is divided into sections, each with a name that winds up being referenced as a global variable. Some special formatting rules are used to keep things lined up and to allow for substitutions in the help text depending on whether the Pine session uses function keys or the standard alphabetic/mnemonic keys. This file is processed by two awk scripts and turned into C files that are compiled into Pine.

This scheme can increase efficiency because Pine can be compiled to have the strings as part of shared, read-only text. Rather than each process having to read in the help text from a file, the strings are shared by all executing processes on the machine and demand paged. This works on machines that have separate instruction and data space, but is only fully implemented in the NeXT (tested) and Dynix (not tested) ports.

PC-Pine, which tries to run on machines with as little as 640k of memory, leaves the Pine help text out of the executable. *PINE.EXE*, *PINE.HLP*, and *PINE.NDX* are all needed for PC-Pine's help system.

International Character Sets

While Pine was designed in the U.S. and used mostly for English-language correspondence, it is a goal for Pine to handle email in almost any language. Many sites outside of the U.S. run Pine in their native language. The default character set for Pine is US-ASCII. That can be changed in the personal or system-wide configuration file with the variable *character-set*.

When reading incoming email, Pine allows all character sets to pass through. Pine doesn't actually display the characters but simply passes them through; it is up to the actual display device to show the characters correctly. When composing email, Pine will accept input in any language and tag the message according to the *character-set* variable. Again, it is up to the input device to generate the correct sequences for the character set being used. The outgoing message is checked to see if it is all US-ASCII text (and contains no escape characters). In that case, the text will be labeled as US-ASCII even if the *character-set* variable is set to something else. The theory is that every reasonable character set will have US-ASCII as a subset, and that it makes sense to label the text with the lowest-common-denominator label so that more mailers will be able to display it.

The character sets are:

US-ASCII	Standard 7 bit English characters
ISO-8859-1	8 bit European "latin 1" character set
ISO-8859-2	8 bit European "latin 2" character set
ISO-8859-3	8 bit European "latin 3" character set
ISO-8859-4	8 bit European "latin 4" character set
ISO-8859-5	8 bit Cyrillic
ISO-8859-6	8 bit Arabic
ISO-8859-7	8 bit Greek
ISO-8859-8	8 bit European "latin 5"" character set
ISO-8859-9	8 bit Hebrew
ISO-2022-JP	Japanese

In all of these except Japanese, the lower 7 bits are the same as US-ASCII. Even in Japanese, the character set is the same as US-ASCII unless it has been shifted to an alternate interpretation.

Earlier versions of Pine made use of the character set tags associated with text in MIME to decide if the text should be displayed or not. Depending on the character set tag and the *character-set* variable in Pine, the text was either displayed as is, displayed with some characters filtered out, or not displayed at all. The current version uses a much simpler algorithm in order to maximize the chance that useful contents are readable by the user. It simply displays **all** messages of type text and makes no attempt to filter out characters that may be in the wrong

character set. If the text is tagged as something other than US-ASCII and the tag does not match the character set that the *character-set* variable is set to, then a warning is printed at the start of the message. In that case, it is possible that the text will be displayed incorrectly. For example, if the text is one variant of ISO-8859 and the display device is another variant, some of the characters may show up on the screen as the wrong character. Or if the text is Japanese and the display device is not, some parts of the message may be total gibberish (which will look like ASCII gibberish). On the other hand, the parts of the Japanese message that really are US-ASCII will be readable in the midst of the gibberish.

In the case of PC-Pine, the character values cannot be passed thru to the display device unaltered since MS-DOS uses various non-standard character sets called "Code Pages".

The mapping between DOS Code Page and standard character set is controlled by the "character-set" variable in the PINERC file and the PC's installed Code Page. PC-Pine will automatically map common characters in IBM Code Pages 437, 850, 860, 863, and 865 to ISO-8859-1 and back when the PINERC has "character-set=ISO-8859-1". Pine will also map common characters for IBM Code Page 866 to ISO-8859-5 and back when "character-set=ISO-8859-5". The mappings are bi-directional, and applied to all saved text attachments in the defined character set, messages exported, etc.

Alternatively, the translation tables can be configured externally and applied at run time whenever the "character-set=" variable is set to something other then "US-ASCII" (the default). PC-Pine looks in the text file pointed to by the environment variable "ISO_TO_CP" for the table to use for mapping text matching the type defined by the "character-set=" variable into the local Code Page value. PC-Pine looks in the text file pointed to by the environment variable "CP_TO_ISO" for the table to use for mapping text in the local Code Page into outbound text tagged with the "character-set=" variable's value.

A text file containing a character set mapping table is expected to contain 256 elements where each element is a decimal number separated from the next element by white-space (space, tab or newline, but no commas!). The index of the element is the character's value in the source character set, and the element's value is the corresponding character's value in the destination character set.

Interrrupted and Postponed Messages

If the user is composing mail and is interrupted by being disconnected (SIGHUP, SIGTERM or end of file on the standard input), Pine will save the interrupted composition and allow the user to continue it when he or she resumes Pine. As the next Pine session starts, a message will be given that an interrupted message can be continued To continue the interrupted message, simply go into the composer. To get rid of the interrupted message, go into the composer and then cancel the message with *^C*.

Composition of a half-done message may be postponed to a later time by giving the *^O* command. Other messages can be composed while a postponded message waits, but there can only be one message may be postponed at a time. We would like Pine to be able to have more than one postponed message, but haven't got around to it mostly because some work would have to be done to make the user interface nice. Postponing is a good way to quickly reference other messages while composing.

There are some problems postponing messages that have MIME attachments or characters from non-US-ASCII character sets. With attachments, the postponed

message will only store a reference to the file and not the actual file, so the file should not be deleted or renamed until the message is sent. Non-file attachments, the results of forwarding or replying to a MIME message, will be dropped. Postponded messages with non-US-ASCII characters will not be decoded upon resumption, so some odd things like "=D6" may appear where special characters were.

The interrupted and postponed messages are saved in a special directory on the local machine. You can specify which directory by setting the *mail-directory* variable in the Pine configuration file. Postponed and interrupted messages cannot be kept on an IMAP server.

Message Status

The c-client library allows for several flags or status marks to be set for each message. Pine uses three of these flags: UNSEEN, DELETED, and ANSWERED. The "N" in Pine's FOLDER INDEX means that a message is unseen–it has not been read from this folder yet. The "D" means that a message is marked for deletion. Messages marked with "D" are removed when the user *expunges* the folder (which usually happens when the folder is closed or the user quits Pine). The "A" in Pine's FOLDER INDEX means that the message has bee replied-to. For Berkeley format folders, the message status is written into the email folder itself on the header lines marked *Status:* and *X-Status*. In Tenex and MTX folders, the status goes into the 36-bit octal flags.

MIME–Reading a Message

Pine should be able to handle just about any MIME message. When a MIME message is received, Pine will display a list of all the parts, their types and sizes. It will display the attachments when possible and appropriate and allow users to save all other attachments.

Messages which include rich text in the main body will be displayed in a very limited way (it will show bold and underlining).

If Pine sees a message tagged as "image/gif" or "image/jpeg", it will attempt to send that attachment to an appropriate image viewing program. UNIX Pine will check the environment setting DISPLAY to see if Pine is on an X-terminal (which can handle the images). If so, Pine passes the image to a program such as *xloadimage* to be viewed. You can specify which program should be used by setting the Pine configuration variable *image-viewer*.

If an attachment is just text (tagged with "text/plain" in the MIME header), then Pine will use an internal viewer module to display the attachment. International character sets in attachments are handled in the same way as they are in regular email messages. Some text attachments, specifically those which are just other email messages forwarded as MIME messages, are displayed as part of the main body of the message. This distinction allows easy display when possible (the forward as MIME case) and use of an attachment viewer when that is desirable (the plain text file attachment case).

If the parts of a multipart message are alternate versions of the same thing Pine will select and display the one best suited. For parts of type "message/external-body", the parameters showing the retrieval method will be displayed, but the retrieval process is not yet automated. Messages of type "message/partial" cannot currently be automatically reassembled or sent. Lastly, Pine cannot display any attachments which are of the "application" type; these must be saved to files and

then processed outside of Pine. In a future release, we intend to support the *mailcap* facility to allow automatic processing of display of additional MIME types.

MIME–Sending a Message

There are two important factors when trying to include an attachment in a message: encoding and labeling. Pine has rules for both of these which try to assure that the message goes out in a form that is robust and can be handled by other MIME mail readers.

MIME has two ways of encoding data–Quoted-Printable and Base64. Quoted-Printable leaves the ASCII text alone and only changes 8-bit characters to "=" followed by the hex digits. For example, "=09" is a tab. It has the advantage that it is mostly readable and that it allows for end of line conversions between unlike systems. Base64 encoding is similar to *uuencode* or *btoa* and just encodes a raw bit stream. This encoding is designed to get text and binary files through even the most improperly implemented and configured gateways intact, even those that distort uuencoded data.

Starting with this (3.84) version of Pine we have decided to encode all attachments using Base64 encoding. This is so that the attachment will arrive at the other end looking exactly like it did when it was sent. Since Base64 is completely unreadable except by MIME-capable mailers or programs, there is an obvious tradeoff being made here. We chose to ensure absolutely reliable transport of attachments at the cost of requiring a MIME-capable mailer to read them. If the user doesn't want absolute integrity he or she may always *include* text (with the ^*R* command) in the body of a message instead of attaching it. With this new policy, the only time quoted-printable encoding is used is when the main body of a message includes special foreign language characters.

When an attachment is to be sent, Pine sniffs through it to try to set the right label (content-type and subtype). An attachment with any lines longer than 500 characters in it or more than 10% of the characters are 8-bit it will be considered binary data. Pine will recognize (and correctly label) a few special types including GIF, JPEG, Postscript and some audio formats.

If is not binary data (has only a small proportion of 8-bit characters in it,) the attachment is considered 8-bit text. 8-bit text attachments are labelled "text/plain" with charset set to the value of the user's *character-set* variable. If an attachment is ASCII (no 8-bit characters) and contains no *ESCAPE*, ^*N*, or ^*O* characters (the characters used by some international character sets), then it is considered plain ASCII text. Such attachments are given the MIME label "text/plain; charset=US-ASCII", regardless of the setting of the user's *character-set* variable.

All other attachments are unrecognized and therefore given the generic MIME label "application/octet-stream".

New Mail Notification

Pine checks for new mail in the *INBOX* and in the currently open folder every 30 seconds. It only has to check the time stamp on the mail file, so doing this doesn't place a load on the system. If you really don't want to wait you can force a new mail check by attempting to move the cursor off the end of the message index three times. It'll beep and complain as you do this, but it will check for new mail on the third try.

When there is new mail, the message(s) will appear in the index, the screen will beep, and a notice showing the sender and subject will be displayed. If there has been more than one new message since you last issued a command to Pine, the notice will show the count of new messages and the sender of the most recent one.

Questions have arisen about the interaction between Pine and external mail notification routines (biff, csh, login). Firstly and unfortunately, we have found no PC based program that will check for email on an IMAP server when PC-Pine is not running. If you find one, please tell us.

The UNIX case if more complicated. Pine sets the modification and access time on a file every time it performs a write operation (status change or expunge). You need to see which of these your email notification program is looking at to know how it will behave with Pine.

NFS

It is possible to access *NFS* mounted mail folders with Pine, but there are some drawbacks to doing this. One is that the Pine's user-contention locks don't work because */tmp* is usually not shared, and even if it was, *flock()* doesn't work across *NFS.*

The implementation of the standard UNIX ".lock" file locking has been modified to work with *NFS* as follows. Standard hitching post locking is used so first a uniquely named file is created, usually something like *xxxx.host.time.pid.* Then a link to it is created named *xxxx.lock* where the folder being locked is *xxxx.* This file constitutes the lock. This is a standard UNIX locking scheme. After the link returns, a *stat(2)* is done on the file. If the file has two links, it is concluded that the lock succeeded and it is safe to proceed.

It is mostly safe to access mail via *NFS.* Some problems may occur when two Pine sessions try to access the same mail folder from different hosts without using IMAP. Imagine the scenario: Pine-A performs a write that changes the folder. Pine-B then attempts to perform a write on the same folder. Pine-B will get upset that the file has been changed from underneath it and abort operations on the folder. Pine-B will continue to display mail from the folder that it has in its internal cache, but it will not read or write any further data. The only thing that will be lost out of the Pine-B session when this happens is the last few status changes.

If other mail readers besides Pine are involved, all bets are off. Typically, mailers don't take any precautions against a user opening a mailbox more than once and no special precautions are taken to prevent *NFS* problems.

Printers and Printing

UNIX Pine can print to the standard UNIX line printers or to generic printers attached to ANSI terminals using the escape sequences to turn the printer on and off. The user has a choice of three printers in the configuration.

The first setting, *attached-to-ansi,* makes use of escape sequences on ANSI/VT100 terminals. It uses "<ESC>[5i" to begin directing all output sent to the terminal to the printer and then "<ESC>[6i" to return to normal. Pine will send these escape sequences if the printer is set to *attached-to-ansi.* This works with most ANSI/VT100 emulators on Macs and PCs such as kermit, NCSA telnet, VersaTerm Pro, and WinQVT. Various terminal emulators implement the

print feature differently. For example, NCSA telnet requires "capfile = PRN" in the *config.tel* file. Attached-to-ansi printing doesn't work at all with the telnet provided with PC-NFS.

The second selection is the standard UNIX print command. The default is *lpr*, but it can be changed on a system basis to anything so desired in */usr/local/lib/pine.conf.*

The third selection is the user's personal choice for a UNIX print command. The text to be printed is piped into the command. *Enscript* or *lpr* with options are popular choices. The actual command is retained even if one of the other print selections is used for a while.

If you have a Postscript attached to a PC or Macintosh, then you will need to use a utility called *ansiprt* to get printouts on your printer. *Ansiprt* source code and details can be found in the *./contrib* directory of the Pine distribution.

The three printer choices are for UNIX Pine only. PC-Pine can only print to the locally attached printer. All printing on PC-Pine is done via ROM BIOS Print Pervices (Int 17h). After verifying the existance of a local printer via the BIOS Equipment-List Service (Int 11h), it simply sends the message text, character by character, to the first printer found using ASCII CR and LF at the end of lines and followed by an ASCII FF. Note, some system adjustments using the PC's "MODE" command may be required if the printer is not on the first parallel port. PC-Pine cannot generate Postscript, so printing to exclusively Postscript printers does not work.

Save and Export

Pine users get two options for moving messages in Pine: *save and export*. Save is used when the message should remain ''in the Pine realm.'' Saved messages include the complete header (including header lines normally hidden by Pine), are placed in a Pine folder collection and accumulate in a standard folder format which Pine can read. In contrast, the *export* command is used to write the contents of a message to a file for use outside of Pine. Messages which have been exported are placed in the user's home directory, not in a Pine folder collection. All delivery-oriented headers are stripped from the message. Even with *export*, Pine retains a folder format–that is, multiple messages can accumulate in a single file. On UNIX systems, the *export* command pays attention to the standard *umask* for the setting of the file permissions.

Sent Mail

Pine's default behavior is to keep a copy each outgoing message in a special "sent mail" folder. This folder is also called the fcc for "file carbon copy". The existance, location and name of the sent mail folder are all configurable. Sent mail archiving can be turned off by setting the configuration variable *default-fcc*="". The sent mail folder is assumed to be in the default collection for saves, which is the first collection named in *folder-collections*. The name of the folder can be chosen by entering a name in *default-fcc*. With PC-Pine, this can be a bit complicated. If the default collection for saves is local (DOS), then the *default-fccR needs to be "SENTMAIL", which is syntax for a DOS file. However, if the default collection for saves is remote, then the default-fcc* needs to be "sent-mail" to match the UNIX syntax.

The danger here is that the sent mail could grow without bound. For this reason, we thought it useful to encourage the users to periodically prune their sent mail folder. The first time Pine is used each month it will offer to archive all messages sent from the month before. Pine also offers to delete all the sent mail archive folders which are more than 1 month old. If the user or system has disabled sent mail archiving (by setting the configuration variable *default-fcc*="") or if the fcc folder is a remote/IMAP folder then there will be no pruning question.

It is likely that Pine will be improved so that users can set the time increment for pruning (weekly, monthly, yearly, never) but that has not been implemented yet.

Spell Checker

Spell checking is available for UNIX Pine only. We could not find an appropriate PC based spell checker to hook into PC-Pine. Even UNIX Pine depends on the system for its spell checking and dictionary. Pico, the text editor, uses the same spell checking scheme as Pine.

Lines beginning with ">" (usually messages included in replies) are not checked. The message text to be checked is on the standard input and the incorrect words are expected on the standard output.

The default spell checker is UNIX *spell*. You can replace this at compile time for the whole system. Pine also respects the environment variable *SPELL*. If it is set, Pine will use that as the spelling checker. The spelling checker reads its words from a standard dictionary on the system. Below is a description, contributed by Bob Hurt, of how you can create your own personal dictionary with additional ‘‘correct’’ words.

Step 1:

Make a file with all the words you want to include in your new dictionary. I did mine with one word per line in alphabetical order. Caps don’t matter at all, as far as I know.

Step 2:

At the UNIX prompt, type "cat [word file] | spellin /usr/dict/hlista > [new dict name]" where [word file] is the file you just created and [new dict name] is the name of the new dictionary that Pine will look at instead of the standard */usr/dict/hlista.* I named my word file *.bobwords* and my dictionary *.bobspell* so I don’t have to see them when I do a *ls* command (*ls* doesn’t list "dot" files). I also put the above command into my *.alias* file as the command *makedict* so I can add a word to my word file and easily recreate my dictionary. NOTE: the new dictionary is in something called a "hashed" format, and can’t be read normally.

Step 3:

Check your new dictionary. At the UNIX prompt, type "cat [word file] | spellout [new dict name]" If you did everything correctly, it should just give you another prompt. If it lists any of the words in your file, something is wrong. I can try to help if all else fails.

Step 4:

Now you have to tell UNIX to use your dictionary instead of the standard one by setting the environment variable *SPELL* to access your dictionary. Go into your *.login* or *.cshrc* file in your home directory (it doesn’t seem to make a difference which one you use) and add the line

setenv SPELL "spell -d [new dict name]"

I also created an alias for *SPELL* in my *.alias* file so I can use the UNIX *spell* command to spell-check a file outside of Pine. (The *.alias* line is: alias spell 'spell -d [new dict name]')

Step 5:

Now you need to logoff and log back on to let UNIX look at your *.login* (or *.cshrc*) file.

Terminal Emulation and Key Mapping

Pine has been designed to require as little as possible from the terminal. At the minimum, Pine requires cursor positioning, clear to end of line, and inverse video. Unfortunately, there are terminals that are missing some of these such as a vt52. Pine makes no assumptions as to whether the terminal wraps or doesn't wrap. If the terminal has other capabilities it will use them. Pine won't run well on older terminals that require a space on the screen to change video attributes, such as the Televideo 925. One can get around this on some terminals by using "protected field" mode. The terminal can be made to go into protected mode for reverse video, and then reverse video is assigned to protected mode.

Pine handles screens of most any size and resizing on the fly. It catches SIGWINCH and does the appropriate thing. A screen one line high will display only the new mail notification. Screens that are less than ten columns wide don't format very nicely or work well, but will function fine again once resized to something large. Pine sets an internal maximum screen size (currently 170x200) and decides to use either *termcap* or *terminfo* when it is compiled.

On the input side of things, Pine uses all the standard keys, most of the control keys and (in function-key mode) the function keys. Pine avoids certain control keys, specifically ^S, ^Q, ^H, and ^\ because they have other meanings outside of Pine (they control data flow, etc.) *^H* is treated the same as the *delete* key, so the *backspace* or *delete* keys always works regardless of any configuration. In an upcoming version, there will be an option to have the *delete* key behave like ^D rather than ^H.

When a function key is pressed and Pine is in regular (non-function key) mode, Pine traps escape sequences for a number of common function keys so users don't get an error message or have an unexpected command executed for each character in the function key's escape sequence. Pine expects the following escape sequences from terminals defined as VT100:

	ANSI/VT100
F1:	<ESC>OP
F2:	<ESC>OQ
F3:	<ESC>OR
F4:	<ESC>OS
F5:	<ESC>Op
F6:	<ESC>Oq
F7:	<ESC>Or
F8:	<ESC>Os
F9:	<ESC>Ot
F10:	<ESC>Ou
F11:	<ESC>Ov

Arrow keys are a special case. Pine has the escape sequences for a number of conventions for arrow keys hard coded and does not use *termcap* to discover them. This is because *termcap* is sometimes incorrect, and because many users have PC's running terminal emulators that don't conform exactly to what they claim to emulate. Some arrow keys on old terminals send single control characters like ^*K* (one even sends ^\). These arrow keys will not work with Pine. The most popular escape sequences for arrow keys are:

Up:	<ESC>[A	<ESC>?x	<ESC>A	<ESC>OA
Down:	<ESC>[B	<ESC>?r	<ESC>B	<ESC>OB
Right:	<ESC>[C	<ESC>?v	<ESC>C	<ESC>OC
Left:	<ESC>[D	<ESC>?t	<ESC>D	<ESC>OD

It is possible to configure an NCD X-terminal so that some of the special keys operate. Brad Greer contributes these instructions:

1. In your *.Xdefaults* file, include the following "translations", using lower hex values:

```
Pine*VT100.Translations: #override \n\
<Key>Delete:     string(0x04)     \n\
<Key>End:        string(0x05)     \n\
<Key>Escape:     string(0x03)     \n\
<Key>Home:       string(0x01)     \n\
<Key>Next:       string(0x16)     \n\
<Key>Prior:      string(0x19)     \n\
<Key>KP_Enter: string(0x18)       \n\
```

2. Start up Pine from an *xterm*, and specify a "resource name". This resource name will allow the user to specify resources for Pine (that deviate from the defaults). For example, *xterm -name Pine -e pine &* (the resource name *Pine* corresponds to the translations just added in the *.Xdefaults* file).

Section 7–Notes for Porting and Modification

Porting Pine to Other Platforms

Substantial effort has gone into making Pine/Pico portable. There are still, of course, a number of machine dependencies. Some of the ports are well-tested and some are untested. In particular, the most heavily used ports are the Ultrix, NeXT, DOS, and PTX ports.

Each platform is given a three letter name (see the file *doc/pine-ports*). Make up a new one for your new port. We've attempted to bring all potential platform dependencies into three files: *os-xxx.h, os-xxx.c,* and *makefile.xxx* where *xxx* is the three letter name of the port. Thus any new port will hopefully just result in new versions of these files and some notes for the *pine-ports* file. This is actually nine new files because there is a set of these files in the c-client, Pico, and Pine source directories. (As you can tell by reading this technical note, Pine originated on Unix systems. There are still probably many Unix dependencies built in. There is now a *DOS* port, which is the only non-Unix port. The source code is full of instances of "ifdef DOS". Most of these are due to memory limit problems on *DOS* as opposed to actual system dependencies.) A *VMS* (or other) port would no doubt reveal many remaining Unix dependencies.)

The makefiles are kept as simple and straight-forward as possible, because many previous attempts at automatically figuring out what to do seem to have become complex and ineffective in what they set out to do: which is to make compiling and installing the program easy. Each port is for a specific hardware/software platform, also because past attempts to generalize on versions of Unix or some CPU architecture don't seem to have gained much. Thus, there is a separate makefile for each platform that calls the appropriate compiler and linker with the appropriate flags. Most of these makefiles are pretty similar. The makefile also specifies which of the *os-xxx.c* and *os-xxx.h* files to use. It is the root from which all platform dependencies are selected. In most cases the makefile also defines a symbol named after the platform on which there can be dependencies in the source code, though we've tried to minimize relying on this where reasonable. Pine, Pico, and the C-client don't quite do everything the same (there are at least three separate authors involved). Basically, to build the source in one of the directories, run *make -f makefile.xxx* where *xxx* is the three-letter name of the platform. That's all the *build* script does. When starting a new port in the *pine* directory, there is a generic makefile called *makefile.gen* which is a good starting point.

The file *os-xxx.h* is used for general platform dependent #*include*'s and #*defines*. In the *pine* directory these *.h* files are located in the *osdep* subdirectory. All the include files that have been found to vary from one platform to another are also included here. In the case of Pico, there is only one *os-xxx.h* file called *os-unx.h* for most of the supported Unix ports and inside it are #*ifdefs* based on the platform specific symbol defined in the makefile. On the other hand, Pine now has a separate *os-xxx.h* file for each platform. There are a number of Pine configuration settings that are defined here, as well, such as the place it looks for certain files, defaults for the printer and folder names, the maximum screen size, and so on. For the Pine portion of the port, start by looking at the generic *os-gen.h* file and comparing it to some of the specific *os-xxx.h* files in *osdep.*

The *os-xxx.c* file contains functions that are potentially platform dependent. Again, the idea is to gather all the dependencies in one place. Pico uses the same strategy here as it uses with *os-unx.h.* That is, there is a single *os-unx.c* file for most of the Unix ports. Pine uses a complicated looking method to produce the

os-xxx.c file from a set of included files. Each included file usually contains a single function and we've found that there are usually only a couple different implementations of each function in the ports we've done so far. Hopefully, coming up with an *os-xxx.c* for a new port will usually be a matter of including the right set of these already written functions. This is done by writing a new *os-xxx.ic* file in the *osdep* subdirectory. Start with the generic *os-gen.ic*, as you did with the *os-gen.h* file above.

We strongly encourage that no changes be made to the general source when porting and that all changes be contained in the three/nine system dependent files if possible. The object is to maintain source code integrity and assimilate ports to new platforms rapidly. The more conventional way to do this is with a large collection of #*ifdefs*. The problem with this is that adding a port for a new platform implies changing the source code for all the other platforms and thereby risks breaking them. (We readily admit that there are still too many *ifdefs* in the code, but we haven't had time to devote to fully cleaning that up.)

If you do port Pine to a new platform we hope that you will send us the changes required so that we may attempt to include it in a later release. Thanks!

Test Checklist

The following is a checklist of some things to check when testing a new port:

___ Sending mail, check that full name is correct
___ Sending mail with SMTP server
___ Replying to and forwarding a message
___ Postponing message under composition
___ Make sure local user names are expanded
___ Test spelling checker
___ Catching of SIGHUP while message is being composed
___ Setting of variables in *.pinerc*
___ New mail notification. Should happen with Pine idle to check timeouts
___ Reading mail
___ Deleting and undeleting
___ Expunge to empty folder
___ Make sure that ~ expansion works
___ Save message to folder, check error conditions such as permission denied
___ Export message
___ Checkpointing (make 20 status changes, or 19 and wait 30 sec)
___ Open IMAP and RIMAP folders
___ Default-fcc on remote IMAP server
___ Test opening bogus folders: invalid format, no permission
___ Open a USENET news group, list in folder-lister, read news
___ Command line arguments
___ Change password
___ Lock keyboard
___ Address book operations
___ Take command
___ Send mail with empty address book
___ Make sure that SIGQUIT, ^ confirmation works (check core dump too)
___ Test panic (Give '#' command on main menu with debug level > 8)
___ Make sure SIGSTP, ^Z works

___ Pinef
___ Sent-mail pruning
___ Printing using all three printer configurations
___ View help text & news
___ Folder list operations (rename, create, delete...)
___ Screen redrawing (^L)
___ Window resizing
___ Error messages for incorrect terminal types (try "foo" and "vt52")
___ Reading of /*usr*/*local*/*lib*/*pine.conf*

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