Mach[386] Mach 3.0 and DUI Package
13 November 1992

Contents and Sizes

Component	Extraction Directory	Size(Mb)
New Utilities	/usr/bin/md, /etc/fsck, /etc/diskutil, /bin/make /etc/dump, /etc/rdump, /etc/restore, /etc/rrestore	.1
New Man Pages	/usr/man	.1
Kernel and Servers	mach_servers	1.3
DUI Binaries	mach3/mdos/(bin,conf,lib)	1.6
DUI Man Pages	mach3/mdos/man	.4
Other Binaries	mach3/(bin,etc,include,lib)	3.9
Other Man Pages	mach3/man	.6
Kernel Sources	mach3/src/mk	9.9
DUI Sources	mach3/mdos/src	.9
Poe Sources	mach3/src/poe	.7
User Sources	mach3/src/user	4.8
Total		24.3

Introduction

- Mach[386]/Mach 3.0 is a snapshot of research software developed at Carnegie Mellon University (CMU). Although it does a decent job of emulating /vmunix at decent speed, MT XINU does not guarantee it. MT XINU provides Mach 3.0 for people who want to experiment with a "microkernel" and work with sources. We do not consider it to be a production substitute for the /vmunix kernel provided with Mach[386]. You must have at least 8 Mb of memory in order to run Mach[386]/Mach 3.0.
- If you are not running a current version of the Mach[386] kernel (October) from AutoSupport, you should not make symbolic links when running UX38, because the symbolic links will not be handled correctly when you try to go back to the Mach[386] kernel.
- The new versions of md, fsck, diskutil, make, dump, and restore are required for Mach 3.0, and you will need to load the the *Kernel and Servers*. We also recommend that you load the *Other Binaries*.
- POE is included in this distribution so that you will have source for an example of an operating system server that runs on top of Mach 3.0. Please note that MT XINU *DOES NOT SUPPORT POE* in any way. Although POE reads files from the UN*X file system and might execute some of the UN*X utilities, it is not UN*X: it does not run "multiuser," there is no documentation, there is no network, the binaries that work with the UN*X server are not

guaranteed to work.

Installation

- Run *sysload*(8) to install the software.

  This package requires new versions of *md*(1), *fsck*(8), *make*(1), *diskutil*(8), *dump*(8), and *restore*(8), which will be installed in their usual locations. It is easiest if you put the *Kernel and Servers* in "/", but you have the option of initially putting them elsewhere. When you boot Mach 3.0, the directory of *Kernel and Servers* must be /mach_servers. The other parts are all relative archives, and you will be prompted for the installation directory (referred to as *MACHDIR* later in this document). For example, if you specify the directory `/usr`, the files will end up in `/usr/mach3`. The `/usr` directory, or whatever directory you specify, must be created before extracting the package.

- NOTE: If you have an older system (serial number beginning MB9103) and do not have AutoSupport, your version of *sysload*(8) does not support the relative archive feature, and the files will be installed in `/mach3`. Create a symbolic link in `/` for `mach3` to an existing directory where you have more space before running *sysload*(8). For example:

```
mkdir /usr/mach3; ln -s /usr/mach3 /
```

Running Mach 3.0

The following section describes how to start using Mach 3.0. For important information regarding differences between Mach 3.0 and the Mach[386] kernel, and for a more detailed description of this distribution, please see the README file in the `mach_servers` directory.

The files necessary to run Mach 3.0 + a UN*X emulator that runs in user mode are in the `mach_servers` directory. In particular, the file contains binaries for MK78 and UX38.

UX38 is (almost) binary compatible with the /vmunix kernel provided with Mach[386]: most of the utilities that come with Mach[386] execute correctly when Mach 3.0 is running.

Before you attempt to boot Mach 3.0, you should read this material carefully. However, it is a fairly simple procedure.

1) Since Mach 3.0 does not page in the filesystem like Mach[386] does, you will need to create a paging file. To avoid using large amounts of space on the root partition, this is usually a symbolic link to a file on another partition. For example if `/usr1` is mounted on `/dev/hd0f` and has enough free space you could make `paging_file` a symbolic link to `/dev/hd0f/my_paging_file`. Then cd to `usr1` and create a `my_paging_file` of sufficient size to handle your paging needs, e.g., 4–20M. The system will not increase the size of this file dynamically, so you must set it up in advance as a big file. An easy way to setup the space is to create the *n* Meg file with *dd*(1), then create the link:

```
dd if=/dev/rhd0f of=/usr1/my_paging_file bs=1024k count=n
ln -s /dev/hd0f/my_paging_file /mach_servers/paging_file
```

2) `cat /mach_servers/rc.local >>/etc/rc.local` — edit this file to make the *MACH-*

DIR variable match your installation directory.

3)

```
mv /vmunix /vmunix.mach386
rm /mach
ln /mach_servers/mach /mach
ln /mach_servers/startup /vmunix
```

4) Reboot your system, using a command such as, `/etc/shutdown -r now`

Notes

- You can switch back to standard Mach[386] by moving `/vmunix.mach386` to `/vmunix.reboot` and rebooting.
- When the Mach 3.0 kernel is booted, it looks in `/mach_servers` for the associated emulator code, paging file, and other miscellany that it needs.
- Some modified utilities are contained in `MACHDIR/mach3/bin`. These include such utilities as *ps*(1). `/bin/ps` will not work properly when Mach 3.0 is running. A convenient way to access these is by executing

  ```
  setpath -i0 MACHDIR/mach3
  ```

  This will give you access to manual pages in `MACHDIR/mach3/man` which describe some new utilities as well as the Mach 3.0 system calls.
- Mach 3.0 comes up with datasize limit = 32 Meg. If you set it lower, DUI will not run.
- If you have not remade your floppies to indicate their format, you will need to remove the floppy device files, and remake them for use with Mach 3.0 as follows:

  ```
  rm -f /dev/*fd*
  rm -f /dev/*floppy*
  cd /dev;
  MAKEDEV fd<unit.format>
  ```

  where *unit* is either 0 or 1, and *format* corresponds to the desired format from the *format*(8) man page. Do this for each floppy device you have. This creates `/dev/[r]fd`*unit*, and `/dev/[r]floppy`*unit*. Be sure to set the permission on the files:

  ```
  chmod 666 /dev/*fd*
  chmod 666 /dev/*floppy*
  ```

Introduction to DUI

- Mach[386]/DUI is a DOS server which runs as an application on top of the UX server. It is a snapshot of research software developed at Carnegie Mellon University (CMU). You must load the *DUI Binaries* in order to run the DOS server.
- DUI supports DOS versions 3.1 to 5.0 and runs Windows 3.0 in real-mode. Users of this software have successfully run over 100 DOS applications ranging from business software such as Lotus 123 and Microsoft Word to entertainment software such as Wing Commander, Space Quest IV, King's Quest V, Populous, and the Microsoft Flight Simulator. Many of these applications are extremely demanding in terms of both graphics performance for VGA displays and sound generated by commercial monaural and stereo sound boards. Note, only

real-mode DOS software will execute successfully with the DUI software. Protected Mode DOS software such as Windows 3.1 currently will not work.

- A key feature of the integration between the DUI and the UX server is the ability to access files in the UX File System (UFS) from within the DUI environment. Using this ability you can store, transfer and execute files from either the normal DOS C: partition or the UFS D: partition. The UFS features include access to NFS as well.
- In order to run DUI, you must have a bootable version of DOS, either on floppy or the machine's hard disk partition. MT XINU *DOES NOT SUPPLY DOS*, you must purchase it. You must use a version of DOS between 3.1 and 5.0.

Running DUI

This section describes how to get started running DUI (also referred to as mdos). DUI must be executed from the console. For more information about DUI, please refer to the on-line document *MACHDIR*`/mach3/mdos/src/setup/mdos.install.doc` in the *DUI Sources* Component.

2) Make sure that you have a `/dev/iopl`, and that it is a character device with major 16 and minor 0, and read/writeable by any user. If this file does not exist, create it using:

```
MAKEDEV iopl
chmod 666 /dev/iopl
```

1) Create a DOS boot floppy.

Make a freshly formatted DOS boot floppy. This new disk should be written as a high density disk. This step ensures that your boot floppy will only have the DOS system files (which are invisible) and a COMMAND.COM file in the root directory. (Under no circumstances should the boot floppy contain an `autoexec.bat`, or `config.sys` file on it.) If you know enough about DOS to create a floppy in this manner, you will want to skip the detailed instructions which follow.

Your DOS A: floppy can be either 3.5" or 5.25"; it doesn't matter.

a) Boot DOS on your i386/486 machine.

b) Once DOS has booted and you have a prompt, execute the format command as follows:

```
format a: /s
```

When you are asked, place the new floppy to be formatted into the drive, close the door, and press a key.

c) When the format command has finished, remove your new DOS boot floppy from the A: drive. This newly formatted floppy will be referred to as the DOS boot floppy in the rest of this document.

Do not put either an `autoexec.bat`, or a `config.sys` file on this floppy. These will be added to your floppy in the next stage.

d) Remove the newly formatted DOS boot floppy, and reboot Mach 3.0 and the UX38 server, and log in.

2) Copying DOS Boot Floppy into UFS

By default, the DUI software looks for a file called `ms.dos` on your LPATH at invocation. To generate this file, follow these instructions:

a) Create a `lib` directory in your home directory if you do not already have one, and change directory into it.

b) Insert the new DOS boot floppy in the A: drive and close the door.

c) Execute the following command:

```
cp /dev/rfloppy ms.dos
```

This will take a couple of minutes. At this point, you may remove the floppy, and set it aside.

3) Copying DUI Files onto Floppy Image

The file `MACHDIR/mach3/mdos/lib/dos.floppy` is an image of a DOS floppy that contains several important DUI files. In order for the DUI software to execute correctly, and to enable access to the UNIX file system, you must copy the files from this floppy image onto your DOS boot image (`ms.dos`).

These DOS files must be present on any DOS media from which you wish to boot, including your DOS hard disk partition. For further information on the files contained in the `dos.floppy` image, refer to the *mdos.install.doc* document.

In order to copy the files from the `dos.floppy` file to your `ms.dos` file, follow these instructions:

a) Put the `mdos` area, and HOME on your path, using a commands such as

```
setpath -i0 MACHDIR/mach3/mdos
setpath -i ~
```

b) Start the DUI software by executing the following:

```
mdos -f -db dos.floppy
```

This will begin DUI execution.

c) Once the A> prompt is displayed enter:

```
b:cpbatch
```

And press return. This will copy the setup files onto your `ms.dos` floppy image.

d) Simultaneously press the Control, Alt, and Delete keys. This exits DUI.

You've completed DUI installation. You only need to type

```
mdos -f
```

to begin DUI execution. If you plan to use a DOS hard disk partition with DUI, make sure that the `autoexec.bat` and `config.sys` files don't include any drivers that adversely affect execution (see the *mdos.install.doc* document). You will probably want to edit the `autoexec.bat` and `config.sys` files in the `ms.dos` floppy image to customize your

environment.

4) For more information, refer to the man page in `mach3/mdos/man`.

5) Setting up to use a DOS Hard Disk Partition — ***highly recommended***

If you didn't leave room on your machine's hard disk for DOS and clobbered all of the hard disk's space, your machine doesn't have a DOS hard disk partition and you should skip this part of the installation. If you left room during the Mach installation and have a DOS partition on your machine's hard disk, you can use it with the DUI software. Make sure that you can boot DOS native from your DOS hard disk partition before you try to set up the the partition for use with DUI.

In order for the DUI emulator to access the DOS hard disk partition, you must create an entry in the `disklabel` or `vtoc` (Volume Table of Contents) which points to the correct area on the disk. To do this, you must use the program *diskutil*(8) which lives in the `/etc` directory. You should read the new man page for *diskutil*(8) and become familiar with its operation.

a) To associate a partition from vtoc with your DOS partition, use:

```
diskutil dos
```

The *diskutil* (8) program will choose a partition make the correct entry into the vtoc for you and will ask if it should save the changes permanently. Unless you have strong reservations, say `yes`.

b) Change the permissions so that the partition is read/writeable by everyone:

```
chmod 666 /dev/*hd0partition  (or /dev/*sd0partition)
```

c) Make a soft link in the `/dev` directory from the raw partition file to the name dos-disk in the `/dev` directory.

```
ln -s /dev/rhd0partition /dev/dosdisk
```

Your DOS hard disk partition is ready for use with the MDOS emulation software.

Running POE

Instructions for running POE can be found in the mach_servers/README file.

To Rebuild the Microkernel, the Mach 3.0 User Utilities, the POE server, and DUI

1) Load sources for the section you want to build.

2) `setpath -i` ***MACHDIR***`/mach3` (so that you will get the Mach 3.0 binaries, which are necessary for building mk, user, poe, and DUI).

3)

```
cd MACHDIR/mach3/src/{mk,poe,user}
make
```

or

```
cd MACHDIR/mach3/mdos/src
make
make install
```

For build information, see the following documents:

mach_servers/README
MACHDIR/mach3/src/mk/mach3_build.doc

The file *MACHDIR*`/mach3/src/{mk,user,poe}/build.notes` is superceded by *mach3_build.doc*, and is retained for historical interest.