Installing the Plan 9 Distribution

System requirements

You need an x86-based PC with 32MB of RAM, a supported video card, and a hard disk with at least 300MB of unpartitioned space and a free primary partition slot. (These are requirements for the installation procedure. A machine with 16MB of memory and no free disk space at all will work as a terminal.)

If you wish to install from local media, you need an extant FAT or EXT2 file system, or a CD-ROM drive (and a CD writer or some other way to get the distribution archive on a CD). If you wish to install over the internet, you need a supported Ethernet card or a PPP dial-up account using a modem (not a Winmodem).

Overview

The Plan 9 installation takes a number of steps. First, you must read and agree to the license and then download a floppy disk image. You can optionally download the distribution archive to a local file system at this time. Once downloaded, the disk image is written to a disk that you then boot. The disk boots into an install program, which lets you create and format the disk partition on which you will install Plan 9. If you did not download the distribution archive, it will be downloaded for you via an Ethernet or a dialup PPP internet connection, and then installed. After configuring a way to boot your system, you're finished.

These instructions are intended to be complete enough to carry out a typical install, without needing any of the manual pages for the commands involved. Of course, the manual pages are still a more complete reference; in particular, see *prep*(8) for information on more complex ways to manipulate the disk partitions.

Before you begin

Back up anything you care about on your hard disk! We have taken great pains to ensure that installing Plan 9 will not cause the loss of other data on your disk, but as with any operating system installation, there are times when you will be editing disk partition tables, and you might make a mistake, or there might be a bug somewhere in our install software. You are installing this software at your own risk.

Obtaining the boot disk

Go to the web page http://plan9.bell-labs.com/plan9dist and read and agree to the license terms.

Describe your machine. You need to select the monitor, video resolution, and mouse type that will be used during the installation. If you want to install over an Ethernet connection, you need to select an Ethernet card. If you do not find your monitor in the list, one of the multisyncs running at 640x480x8 or 800x600x8 is likely to work if you are not using an LCD. If you find you cannot boot the resulting boot disk, your hardware is likely not supported.

Download and write the disk. After you have described your machine, download the boot disk (called `9disk.9fd`) from the web page. At this point, if you wish to install off local media, you can also download the distribution archive to a local FAT (DOS, Windows) or EXT2 (Linux) file system. Remember where you put it, and don't change its

name (`plan9.9gz`).

Using a utility such as `rawrite` under DOS (or `cat` under a Unix variant), write the boot disk image (the file `9disk.9fd`) to a formatted floppy disk. Do *not* write-protect the floppy disk.

Cold boot your machine from the floppy disk. That is, power down, and power it back up rather than restarting from inside Windows or using the reset button. In a few cases (especially on laptops) the drivers get cranky when not starting from a cold boot. At the `root is from` prompt, press enter. Booting may take a few minutes, depending on the speed of your floppy drive. If you find yourself at a `boot from:` prompt, it is likely that the bootstrap program has not detected your floppy drive; note the devices listed on the `boot devices:` line (which should be just above the `boot from:` line), and jump to the troubleshooting section.

Your screen should switch into graphics mode shortly after the floppy light goes off. If it does not, or you find yourself at a % prompt, jump to the troubleshooting section at the end of this document.

The installation process

Once you have booted from the floppy disk, you should find yourself looking at a grey screen with some windows. Interaction with the installation program is textual. The large upper window contains the install process itself. The window under it is a running log of what has happened. A statistics graph is in the bottom corner; if you're curious, the graphs, from top to bottom, show system load, memory usage, interrupt rate, system call rate, context switch rate, and ethernet packet rate.

You are running the new Plan 9 window system, `rio`. Unless you have prior experience with Unix's `mux` or Plan 9's 8½, the window system is likely to be unfamiliar. For the purposes of the install process, you need not interact with the window system proper, so ***simply do not touch the mouse.*** On systems with very small screens, you may find it necessary to use the keyboard's arrow keys to scroll the window up and down.

Installation is short. First, you select a disk and create and initialize a Plan 9 partition. Then the distribution archives are located (or downloaded if necessary) and installed. Finally, you create a boot disk or prepare some other way to boot the system.

At many points, you will be prompted to provide some information (say, an IP address) or select from a list of choices (say, the disk to use). The prompts will be of the form

```
Your choice (foo, bar, baz, quux)[quux]:
```

When there are a small fixed list of possible answers, they will be listed in parentheses as in `(foo, bar, baz, quux)`. If there is a default choice, it will be in square brackets as in `[quux]`. Simply pressing enter at such a prompt selects the default.

The installation is broken down into a number of things to do (select a disk, download the archives, etc.), some of which depend on others. The heart of the installation program is a screen listing which parts you have accomplished, and which parts you can do next. For example:

```
The following tasks are done:
  pickdisk    - select disk to use for plan 9 file system
  partdisk    - create plan 9 partition
  prepdisk    - subdivide plan 9 partition
  reamfs      - initialize plan 9 file system
  mountfs     - mount the plan 9 file system

The following unfinished tasks are ready to be done:
  configarch  - configure source of distribution archives
  stop        - save current state of install, to be resumed later

Task to do [configarch]:
```

A default will be provided, so pressing enter at the prompt will move the installation along. At the same time, you can select to repeat a task to change your choices (for example, to select a different disk). Typing <control-d> at any prompt will abort the current task and return you to the main screen.

If you wish to stop the install process at any time, you can choose `stop`, which will save the state of the current installation to the boot floppy. When you are ready to continue, you can simply boot the floppy again.

Choosing a disk (pickdisk)

You need to select a disk on which to install Plan 9. The current partitioning scheme is incompatible with the scheme used by the 1995 and earlier releases, so you should not try to use an extant old Plan 9 disk as your install disk, unless you don't mind trashing your current installation. (While the installation creates a new-style disk, the old disk format is recognized by the boot program and kernels, and the `kfs` file system format has not changed, so old disks are still legible in the new system. If you have an old Plan 9 disk with data you want to save, we suggest you install to a clean disk and then copy the data over.)

The install process will scan your disk devices and give you a list of them, along with manufacturer identification strings and disk partition tables. For example, you might see:

```
The following disk devices were found.

sdC0 - WDC AC36400L
 * p1                  63 4096575    (4096512 sectors, 1.95 GB) FATHUGE
   p3             8193150 12594960   (4401810 sectors, 2.09 GB) LINUX
empty partitions:  p2 p4

sdD0 - IDE-CD ReWritable-2x2x63.014VO07982013140700210

Disk to use (sdC0, sdD0):
```

The Plan 9 names for storage devices are of the form `sdXX`. The names `sdC0` and `sdC1` are the master and slave on the primary ATA controller, `sdD0` and `sdD1` are on the secondary, and `sdE0`, `sdE1`, `sdF0`, and `sdF1` are on additional ATA cards. SCSI devices are named `sd`*NT*, where *N* is the SCSI controller number, and *T* the SCSI target number.

Choose a disk on which to install Plan 9. It should have at least 300MB of empty disk space. If you will be installing TeX on the system (see end) you'll need another 100MB. In order to have enough room for a swap partition and some room to play, at least 500MB to a gigabyte is suggested. The disk on which you install also needs a spare entry for the Plan 9 partition in the primary partition table. That is, if the disk description says "`empty partitions: none`", you cannot install Plan 9 on it (unless you delete an extant partition).

Creating a Plan 9 partition (partdisk)

Once you have chosen the disk, you will need to create a Plan 9 partition. To do this, the install process will run the Plan 9 `fdisk` program and let you partition the disk. If the disk does not already have a Plan 9 partition, `fdisk` will suggest one by creating (but not writing) a partition in the largest contiguous empty space it can find. For example, you might see:

```
    mbr                  0 63         (63 sectors, 31.25 KB) EMPTY
  * p1                  63 4096575    (4096512 sectors, 1.95 GB) FATHUGE
  '  p2            4096575 8193150    (4096575 sectors, 1.95 GB) PLAN9
    p3            8193150 12594960   (4401810 sectors, 2.09 GB) LINUX
>>>
```

Each line contains a partition name (`p1`, `p2`, `p3`, and `p4` are the only valid names), the starting and ending sector, the size of the partition, and the type of partition. Note that partitions include the starting sector but not the ending sector. `>>>` is the prompt. The `mbr` ''partition'' is not really a partition, but a placeholder to keep from partitioning the track in use by the master boot record. In this example, the `*` next to `p1` means that `p1` is the active partition (i.e. the one used when booting from the disk), and the `'` next to `p2` means that the partition table entry for `p2` is different from what is on the disk; that is, changes have been made but not written. In this example, `fdisk` has created `p2` in what was previously unpartitioned space.

Create the Plan 9 partition and quit fdisk. If you agree with `fdisk`'s proposal, you need only type `w` to write the changes and then `q` to quit `fdisk`. Otherwise, you can edit the table yourself, using the `a` p*N* and `d` p*N* commands to add and delete partitions.

Partitioning the Plan 9 partition (prepdisk)

The Plan 9 partition you just created is typically further subdivided into a small FAT configuration partition (`9fat`), a Plan 9 file system partition (`fs`), a swap partition (`swap`), and sometimes a network disk cache partition (`cfs`). Once you have created the Plan 9 partition, the install process will run `prep`, which is used to partition the Plan 9 partition. The interface is very similar to `fdisk`'s; the main differences are unrestricted names and the lack of an active partition and partition types. Just as `fdisk` did, `prep` will, if there are no partitions already in place, create a suggested layout.

Create 9fat, fs, and swap partitions and quit prep. The `9fat` partition must be located first within the Plan 9 partition. You do not need a lot of swap space — in normal usage Plan 9 terminals do not swap. A swap partition half the size of your main memory is probably more than enough. As with `fdisk`, if you find the layout satisfactory you can simply write it and quit; otherwise you can edit it yourself.

Intializing the kfs file system (reamfs, mountfs)

Once you have partitioned your disk, the install process will initialize and mount a new `kfs` file system in the newly created `fs` partition.

Locating the distribution on local disk (configarch)

At this point, you need to tell the install process where to find the distribution archives. If you downloaded the archives earlier, you will need to specify the disk partition on which they reside, along with the path name.

Choose the partition containing the archives. You will be shown a list of disk partitions that the install process can read.

Choose the directory containing plan9.9gz. Once you have chosen a partition, you will need to give the name of the directory on that partition which contains the distribution archives. If you type `browse` instead of a directory name, you will be dropped into a minimal shell that you can use to find the files. Specifically, the shell has three

commands: `cw` *dir* changes directories, `lc` prints a columned list of files in the current directory, and `exit` exits. Once you are in the directory containing the archive (or if you give up the search), simply exit the shell.

If you have found the distribution on local disk, you may skip the next section and go to ''Unpacking the distribution''.

Locating the distribution on the network (configarch)

Configure your internet connection. The install process will scan for devices: if both a serial port and an Ethernet card are found, you will be prompted whether to use Ethernet or PPP; otherwise the device that is found will be used.

If you are using Ethernet, you can enter your IP configuration manually or via DHCP. If you choose to enter the configuration manually, be sure to have your IP address, network mask, and gateway IP address.

If you are using PPP, you will have to choose a serial device and connection method. You can choose to dial and log yourself in or to have Plan 9 dial and use CHAP to log in (this is how the stock Windows PPP client connects, for example).

If you choose to log yourself in, you will be dropped into a conversation with the modem. Dial, log in, and once PPP has started, type <control-d>. You may need to type <control-m> rather than <enter> to get a response from the modem.

If you use CHAP, the install process will prompt for a phone number (exactly as you would dial it yourself, with any necessary prefixes; numbers only), user name, and password. It will then dial and initialize the connection.

Fetching the distribution from the network (download)

Once the network is started, you can begin (or continue) downloading the distribution archive. If the last download was interrupted (e.g., the network connection was lost or you pressed the Delete key), it will begin where it left off.

Once the download is complete, you may wish to run the task `stopppp` to hang up your PPP connection. Similarly, `stopether` will deactivate your Ethernet connection (but seems less useful).

Unpacking the distribution

Once the archive has been located or downloaded, selecting `unpack` will extract the distribution archive to the newly created `kfs` file system. The log window will display the name and size of each file as it is extracted. This takes about 45 minutes when installing from a local disk.

Preparing to boot the new installation (bootsetup)

The first time you run `bootsetup`, it initializes the `9fat` configuration partition with appropriate bootstrap code as well as a modified version of your `plan9.ini` from the boot floppy, and a `9pcdisk` kernel.

In order to boot into Plan 9, another bootstrap program must locate this partition, read `plan9.ini`, and boot the kernel. There are a number of ways to make this happen, all selectable from the `bootsetup` menu. If you wish to use more than one method, simply run `bootsetup` multiple times.

`floppy` Create a boot floppy. In addition to a bootstrap program, the floppy will contain a kernel and a backup of your `plan9.ini` file named `plan9ini.bak`, but will not use them. Instead, the floppy will load `plan9.ini` and the kernel from your `9fat` partition. To boot the kernel on the floppy (useful as a rescue mechanism if you trash your `9fat` partition), copy `plan9ini.bak` to `plan9.ini` and change the line `bootfile=sdXX!9fat!9pcdisk` to

`bootfile=fd0!9pcdisk.gz`.

`win9x` Edit the Windows startup menu to list Plan 9 as an option. Your `c:\config.sys` and `c:\autoexec.bat` files will be saved as `config.p9` and `autoexec.p9`, and then edited. A bootstrap program as well as `plan9ini.bak` and a kernel will be copied to the directory `c:\plan9` (created if necessary). The procedure described above for rescue works here too, but the bootfile should become `sdC0!dos!plan9/9pcdisk`.

`winnt` Edit the Windows NT boot menu to list Plan 9 as an option. This is only possible when your "c:" drive is a FAT partition, since the boot configuration must be accessible. Your `c:\boot.ini` file will be saved as `boot.p9`, and then edited. This will also create the file `c:\bootsect.p9`, which the NT boot manager will use to load Plan 9.

`plan9` Set the Plan 9 partition to be the active one (i.e. the partition booted by default). This is only useful if you have installed Plan 9 on your first hard disk. You can always set another partition active later by using `disk/fdisk`.

Pausing and resuming the installation (stop)

If you need to stop the installation process and come back to it later, you can run the `stop` task, which will save the state of the installation to the file `9inst.cnf` on the boot floppy and then let you turn off your system. Booting again from this floppy will pick up where you left off, with two exceptions.

First, if you have already initialized the destination file system, you will have to run the `mountfs` task to remount it.

Second, if you have chosen to use Ethernet or PPP to obtain the archives but have not completed the download, you will need to explicitly run the `startether` or `startppp` task to reestablish the connection.

The end (finish)

Choosing the `finish` task will halt the `kfs` file system and print a message saying it is safe to reboot your computer.

Note: If your hard disk has a copy of the 1995 Plan 9 distribution, before booting the new distribution, rename or hide the old plan9.ini to avoid confusing the new installation.

Setting up

The first time you bring up the new system, log in as `glenda`. You don't need to type a password, just type enter.

Once the system's up you'll need to set up a few things. First, have a look at *Getting Started With Plan 9*, in `/sys/doc/start.ms` or `http://plan9.bell-labs.com/sys/doc/start.html`. This will tell you how to do some things, such as adding the real users.

Many aspects of the system are configured by environment variables. Very early, you will want to make changes to `/rc/bin/termrc` and `/rc/bin/cpurc` to set up appropriate values for `$site` (the local mail domain), `$fileserver` (the local domain name of your networked file server, if you have one; it's shipped with value `kfs`, which points to the local disk-resident file system), `$cpu` (the local domain name of your main CPU server), and `$facedom` (the special name used in the faces database to identify your colleagues). You will also want to test that VGA hardware acceleration works, and if so comment out the line in `/rc/bin/termrc` that disables it:

```
# turn off hardware acceleration until you know it's ok.
echo -n 'hwaccel off' >'#v/vgactl' >[2]/dev/null
```

If you edited vgadb on the floppy disk or used a different aux/vga to get the install program going, you'll have to copy them over manually to the new distribution. Once it boots and rio fails, put the install disk in and copy them over:

```
a:
disk/kfscmd allow
cp /n/a:/vgadb /lib/vgadb
cp /n/a:/vga /386/bin/aux/vga  # if you used a new vga
disk/kfscmd disallow
disk/kfscmd halt
```

And reboot by typing Ctl-Alt-Del. Rebooting isn't strictly necessary, but it's the surest way to test that the system will come up right the next time you boot.

When shutting down your system, you should first have the *kfs* file system sync and halt the disk, by typing

```
disk/kfscmd halt
```

and then waiting for the message "kfs: file system halted". For more such information, see the *Getting Started* document.

Troubleshooting

The initial bootstrap of a new operating system on new hardware is often problematic. Here follow some suggestions that might help you clear some hurdles. We have set up a trouble line—mail to 9trouble@plan9.bell-labs.com— but please try the following ideas before contacting us. Also the Plan 9 Usenet group, comp.os.plan9, may be a source of help.

A up-to-date list of encountered problems and their solutions can be found at http://plan9.bell-labs.com/plan9dist/errata.html.

The most common problems will be in the connection between hardware and software. First, make sure that the hardware you're running is supported by the drivers in the distribution. Check the list in http://plan9.bell-labs.com/plan9dist/pchardware.html.

Your plan9.ini file must be an accurate description of the machine. The first line of defense is therefore to look at the plan9.ini file and edit it. The floppy is a DOS floppy, so you should be able to edit plan9.ini from a Windows machine or other system.

9load (see *9load*(8)) is the program that loads and starts the kernel. It needs to find the kernel, based on plan9.ini and the hardware it can discover, and copy it into memory. If 9load has trouble, you can turn on debugging by typing a control-R at any time while it's running. Even if the debugging output doesn't help you, what's printed might help others, so make notes.

If the kernel hangs after printing time..., something in the startup scripts has failed. To see each command before it is executed, add the line debug=1 to the file plan9.ini in the root directory of the boot floppy. If the kernel reboots before you get a chance to read what is on the screen, you might try attaching a serial console and adding the line console=0 or console=1 to send kernel output to DOS's COM1 or COM2 as well as the screen.

If the kernel gets running but the VGA doesn't turn on you may need to play with the settings. If the screen goes black and you see nothing, aux/vga thinks it recognizes your video card, but either the monitor settings being used are incorrect or aux/vga doesn't really know everything it needs to program your card. In this case you might try a smaller screen resolution, starting at 640x480x8 and working up. A 640x480 screen is perfectly adequate for the installation. If you are using an LCD, you should use the exact size of the LCD; aux/vga sometimes has problems stretching

smaller resolutions on LCDs. If the kernel doesn't switch into VGA mode but continues to run in CGA mode, along with a complaint about `rio` panicking and a shell prompt (%), the system doesn't recognize your video card at all. `Aux/vga` will have left a hex dump of your VGA BIOS memory on the screen. The problem might be as simple as adding a line to `/lib/vgadb`, or the card might not be supported. Look through the strings in the memory for a chipset type and check the hardware list. Beware, though, that if you don't know exactly what sort of chip you have, editing `/lib/vgadb` could be dangerous. If you can find out the exact chip type—such as by looking in the hardware manual, the Display Properties in Windows 95, 98, or NT, or the configuration information used by a Unix-like system—see if `/lib/vgadb` supports it. If not, you may need to go the last resort mentioned at the end of this section.

If you have other video cards, it can't hurt to try a different one.

Before invoking `aux/vga` to start the VGA, the floppy boot script writes the output of `aux/vga -vip` to the file `vgainfo.txt` in the root directory of the floppy disk. The boot disk uses the `vgadb` file from the root directory of the floppy disk as `/lib/vgadb`, to make it possible to edit on other systems.

See *vga*(3), *vgadb*(6), and *vga*(8) for more information. Sometimes it suffices to add some information to `/lib/vgadb`; if you find this to be true, please let us know so we can update our master database.

One note: the Plan 9 kernel now depends on 8 or more bits per pixel on the display, which means the standard VGA modes can't be relied on. The system really does need to know how to turn on some special settings in the VGA controller.

As a last resort, ask the experts in `comp.os.plan9` or mail `9trouble@plan9.bell-labs.com`. If you mail `9trouble`, please include the contents of both `plan9.ini` and `vgainfo.txt` from the boot floppy, as well as any hardware information gleaned from other sources.