Using Debian From Scratch

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by John Goerzen

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Chapter 1. Introduction to DFS

Welcome to Debian From Scratch (DFS). DFS is really two systems: 1) a bootable CD for repairing Linux systems or installing Debian; and 2) the program that generates the CDs that are used for #1. Most of this manual focuses on #1. A wide variety of DFS CDs can be made using the DFS build tools. This manual will refer to CDs made using the default configuration.

DFS Features

You can expect the following from your DFS CD:

- Bootable CD featuring the GNU Grub bootloader. Can be used to boot hard disk partitions even if no hard disk bootloader is present.
- Kernel and userland support for all major filesystems, including ext2, ext3, JFS, XFS, ReiserFS, FAT, VFAT, NTFS, ISO9660, CramFS, tmpfs, and more. Userland support for Reiser4.
- Kernel and userland support for different disk layout schemes including standard partitioning, Logical Volume Manager 2 (LVM2), software RAID, etc.
- Full recovery tools runnable directly from CD, including:
  - Filesystem utilities for all major filesystems, including undeletion tools for ext2
  - Partition editors (fdisk, cfdisk, parted)
  - Text editors (nano, joe, vim, emacs)
  - C, Perl, Python, and OCaml development environments. Enough to configure and compile a new kernel and build basic .debs. Kernel 2.6.6 sources included on CD.
  - Full networking support, including PPP and various Ethernet cards and DHCP
  - Network tools including FTP clients, Web client, ssh, telnet, NFS, smbclient, tcpdump, netcat, etc.
  - Backup restoration tools such as rdiff-backup, dump/restore, tar, cpio, amanda client, afbackup client, etc.
  - CD and DVD burning tools
  - Basic printing tools (cat for local printers, rlpr for remote ones, and netcat for Jetdirect, plus unix2dos for text files and Ghostscript for emergency conversions)
  - Mail reader (mutt)

- Base systems for multiple versions of Debian installable directly from CD, including: sarge, etch, and sid (stable, testing, and unstable).
- Hybrid amd64 support: A single i386/amd64 hybrid CD provides enough to install or fix either an i386 or an AMD64 system. Includes 64-bit kernel with 32-bit emulation (to run the 32-bit userland on the CD). Also includes 64-bit packages for bootstrapping a new AMD64 support. In short, you can boot a 64-bit kernel and be treated as a first-class citizen in almost all respects.
- Easy porting to other architectures. Existing ports to Alpha and PowerPC.

- i386 or x86_64 (amd64) kernels bootable directly from initial boot menu.

- DFS generation scripts support custom kernels, packages, mirrors, compressed ISO images, and a high degree of flexibility.

Getting DFS

You may download ISO images for DFS from John Goerzen's DFS site[1]. The dfsbuild program is available from within Debian itself, or you may find it on the Debian package page[2].

For more resources, please visit Appendix B>.

History of DFS

DFS begain as the first installer for the amd64 port of Debian. I also wanted to have a handy rescue disk for systems that use LVM, Reiser4, etc. At the time, the Debian installers didn't support any of this.

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1. http://people.debian.org/~jgoerzen/dfs/
2. http://packages.debian.org/dfsbuild

Chapter 2. Booting DFS

Booting procedures vary by architecture. Here are some basics:

Booting on i386 (PC)

Booting DFS usually is as simple as inserting a CD into the drive. DFS can boot from an IDE or SCSI CD-ROM. On some systems, you may need to access your BIOS to enable booting from CD. When you have successfully booted DFS the CD, you'll see a blue Grub selection screen.

Booting on Alpha

The DFS images for Alpha support the SRM console only at this time. If your system uses AlphaBIOS or some other BIOS, you may need to convert to SRM. If you need the SRM firmware, you may be able to find it on the Alpha firmware updates[1] page.

Details about SRM can be found at the SRM HOWTO. If you are reading this manual directly from the DFS CD-ROM, you can find the HOWTO at file:///usr/share/doc/aboot-base/SRM-HOWTO/index.html. If you are reading this on the Web, the SRM HOWTO can be found at http://www.tldp.org/HOWTO/SRM-HOWTO/ or http://www.alphalinux.org/faq/srm.html.

Booting the DFS CD generally involves these steps:

1. Boot to an SRM prompt. If your system is set to automatically boot an operating system, Ctrl-C at the appropriate time may accomplish this.

2. Set the operating system type with: **set os_type Unix**.

3. Find the device that represents your CD-ROM drive. Typing **show dev** will help you out. IDE users may often find dqa2 as their CD-ROM device. Please consult **show dev** to discover the proper value for your system.

4. Boot the aboot bootloader. Run: **boot *device* -fl i**. Replace *device* with your particular CD-ROM device.

5. You should now see an aboot prompt. You can press "l" (lower-case "L") to see a list of available kernels. Press zero through 9 to boot one of them; the default should be set to 0. If you don't know what to do, just press 0.

6. Linux should now start.

Booting on PowerPC

The DFS images for PowerPC support booting from OpenFirmware (OF) into yaboot.

Booting the DFS CD generally involves these steps:

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1. http://ftp.digital.com/pub/DEC/Alpha/firmware/

1. Boot into yaboot. On newer PowerPC (NewWorld) you can press "c" (or "Command-Option-Shift-Delete") during boot until you reach the yaboot bootprompt. If this does not work, you have to boot into OpenFirmware first. This can be done by pressing "Option-Command-o-f" (all four at the same time) during boot. The Option key might also be labeled "Alt" and the Command key with the Apple sign on your keyboard. Once you have reached the OpenFirmware prompt, type **boot cd:,\boot\yaboot** to boot into yaboot.

2. You should now see an yaboot prompt. You can press "TAB" to see a list of available kernels. Enter the kernel's name to boot it. The *-safe options use "video=ofonly" which is needed if your machine has a framebuffer that is not well supported and booting would give flickering lines on the screen. "ofonly" relies on the OpenFirmware console.

3. Linux should now start.

Booting a Kernel

Depending on how your CD was built, you'll see options for one or more different kernel images. Select one appropriate for your system. If a given image says "amd64", this should only be used on amd64 systems such as Opteron or Athlon64 system. *Note: if you intend to install a 64-bit amd64 system, you MUST boot from the 64-bit amd64 kernel.*

Selecting CD-ROM device

In most cases, DFS can automatically detect which drive holds your DFS CD. However, if that check is time-consuming or fails, you can manually specify your CD with the **dfscd** parameter. To use it, select the kernel you wish, press e to edit the command and edit the "kernel" line. Insert something such as **dfscd=/dev/hdc**, press Enter, then b to boot.

Detecting Hardware

Some hardware will automatically be configured. You can attempt to autodetect more hardware by running **/etc/init.d/discover start**. If you want to use USB devices, try **/etc/init.d/hotplug start**. Otherwise, you will likely need to manually load kernel modules. You can find them under /lib/modules/*kernelversion*. Tools such as **lspci** can help you find out what hardware you have that needs to be loaded.

If you have PCMCIA devices, run **/etc/init.d/pcmcia start**.

Enabling Ethernet

If your network hardware was detected and your LAN uses DHCP, you can simply say **ifup eth0**. Your network will be activated.

If your LAN does not use DHCP, you will need to edit /etc/networking/interfaces. You should delete the eth0 line and replace it with something along these lines:

```
iface eth0 inet static
    address 192.168.0.4
    netmask 255.255.255.0
    gateway 192.168.0.1
```

Then run **ifup eth0**. You'll also need to edit /etc/resolv.conf and add a line such as **nameserver 192.168.0.1** to specify your nameserver. (If you run DHCP, this is usually taken care of for you, but you may occasionally need to do it anyway.)

Wireless Networking

If you are using wireless networking, first make sure that your hardware is detected. Sometimes the device name is not eth0; if so, figure out what your device is called. If your network is open -- has no encryption -- you should be able to enable your wireless device the same as a wired device. Otherwise, you will need to modify /etc/network/interfaces as described in the file /usr/share/doc/wireless-tools/README.Debian on the live DFS system.

Dialup with PPP

To dial-up with ppp, first run **pppconfig** to set up your access. Name your connection "provider". Now, you can use **pon** to connect and **poff** to disconnect.

Chapter 3. Installation

Installation from DFS involves the following general steps:

1. Partitioning

2. Initialize and mount swap

3. Formatting and Mounting Filesystems

4. Installing Base System

   You can do this (assuming you have mounted your new partitions at /mnt) with: **cdebootstrap sid /mnt file:///opt/packages**. (amd64: add **-a amd64** before "sid". Also, I recommend using the amd64 mirror directly, since things change frequently and the data available when the CD was made may or may not be usable for you.

5. Configuring Base System

   You should copy your `/etc/resolv.conf` to the new system. Then, configure its `/etc/apt/sources.list`, `/etc/fstab`, and `/etc/network/interfaces`. Then, `chroot /mnt` and:

   a. **apt-get update**

   b. i386: **apt-get install module-init-tools grub ppp**

      alpha: **apt-get install module-init-tools aboot ppp**

      powerpc: **apt-get install module-init-tools yaboot ppp**

   c. **apt-get install** appropriate filesystem tools for your chosen filesystem

   d. i386: **mkdir /boot/grub; cp /lib/grub/i386-pc/* /boot/grub**

      If your /boot is its own partition, also run **cd /boot; ln -s . boot**.

      > **Note:** amd64 did not have a grub package as of the last check. However, you can simulate it; just **mkdir /mnt/boot/grub** and copy the files from `/lib/grub/i386-pc` on the live CD image to `/boot/grub` on your new system.

      alpha: see aboot docs

      powerpc: see yaboot docs

6. Installing Kernel

   If you like the kernel on the DFS CD, you can do this: **cd /mnt/root; dpkg-repack linunx-image-2.6.16.4**. Then, **chroot /mnt** and **dpkg -i /root/linux-image-***.

7. Installing Grub

   ```
   # grub
   grub> root (hd0,0)
   grub> setup (hd0)
   grub> quit
   ```

```
# update-grub
```

amd64 users: if this doesn't work, try rebooting the DFS cd. Press "c" when you see the blue Grub menu to get a command line. Then run the above.

8. Rebooting into new system

Appendix A. Command Reference

dfsbuild

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Name

dfsbuild — Generate custom Debian From Scratch CD images

Synopsis

dfsbuild [-a *arch*] [-R] [-v | -V] -c *config_file* -w *working_dir*

Description

dfsbuild is a program to generate Debian From Scratch (DFS) CD images. It is highly configurable and can generate images far different from the standard DFS image.

The output from dfsbuild is an ISO image that is bootable on i386 and amd64, powerpc, or alpha systems. It uses Grub for the bootloader (on i386/amd64), and in the default configuration, generates DFS ISOs that are bootable and can be used to repair a Linux system or install a new one.

dfsbuild requires about twice the eventual size of the ISO image to run. That is, if you are building a 600MB ISO image, you will need approximately 1.2GB free on the disk that holds *working_dir*.

Configuration is accomplished through the config file given with -c. An example is available in /etc/dfsbuild/dfs.cfg. That example is commented and shows all the available options.

dfsbuild must be run as root.

Options

These are the command-line options for dfsbuild. Please note that you must always specify at least -c and -w.

-a *architecture*

> Specify the Debian architecture of the destination image. Normally, this defaults to the architecture of the host system. This option may be useful to, for instance, build an i386 image from your amd64 host.

-c *configfile*

> Specifies the path for the configuration file to use.

-R

> Resume an existing build. If your build failed, you may be able to restart it from where it left off by using this option. Resuming is not supported from every point, so do not be surprised if this option doesn't work for you everywhere. This option is still experimental and may disappear in future versions of dfsbuild.

-v

> Enable verbose mode for dfsbuild messages only.

-V

> Enable verbose mode for both dfsbuild messages and messages from external programs when possible.

-w *directory*

> Specifies a directory for dfsbuild to use as its "work" directory. It will create its temporary files, and place the resulting ISO9660 image, in this directory.

> It is an error if this directory already exists, unless -R is given, in which case it is an error if this directory does not exist.

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dfsbuild, its modules, documentation, executables, and all included files, except where noted, was written by John Goerzen <jgoerzen@complete.org> and copyright is held as stated in the COPYRIGHT section.

See Also

Other related references include: DFS Manual at `/usr/share/doc/dfsbuild`, mkisofs(1), cdebootstrap(1). Pre-build DFS ISOs for various architectures are available from John Goerzen's DFS page at http://people.debian.org/~jgoerzen/dfs/.

Appendix B. Links to Related Resources

Here are some links to websites where you may find DFS-related resources:

- DFS pre-built ISO images[1]

- NewsForge article: Installing Debian From Scratch[2]

- Article by Suramya Tomar: How to Install Debian From Scratch[3]

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1. http://people.debian.org/~jgoerzen/dfs
2. http://www.newsforge.com/article.pl?sid=05/01/10/1727246
3. http://linux.suramya.com/tutorials/Install_DFS/