Fully Automatic Installation of Debian GNU/Linux

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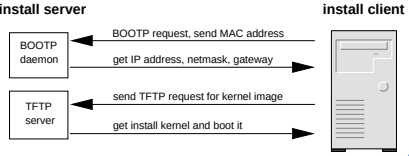
Boot methods

Booting from floppy

Create the common boot floppy with the command `make-fai-bootfloppy`. Then you can boot each install client using this common boot floppy.

Booting from network card

Set up the network card to boot via BOOTP, DHCP or PXE method.



What is FAI ?

- FAI does everything a system administrator has to do, before a user can log in a brand new computer
- It is a collection of scripts and config files for a fully automated installation
- It can install and configure the whole OS and all applications
- **Easy to handle install tool for Beowulf clusters**

Motivation

- Manual installation takes long time (several hours)
- You have to answers many questions
- Equal configuration data must be entered again and again
- Repeating work leads to errors
- A fully automatic installation takes only a few minutes. Why not save time ?
- Quick reinstallation after replacement of defective hard disk with same configuration as before
- An automatic installation guarantees multiple identical installations
- I'm too lazy for manual installations

Requirements

A computer called install client:

- with network interface card
- with local hard disk (diskless client is also possible)
- No floppy disk, CD–ROM, keyboard or graphic card is needed

BOOTP/DHCP server: Install client receives boot and config data from this server.

TFTP server: Used for transferring the kernel to the clients when booting from network card with a boot PROM.

Client nfsroot: A directory which contains the whole file system for an install client during installation. All clients share the same nfsroot.
This consumes only constant disk space.

Debian mirror: Access to a Debian mirror is needed. NFS, FTP and HTTP access is supported. A local Debian mirror needs about 3GB disk space.

Install kernel: A kernel image that supports the network card and mounts its root filesystem via NFS.

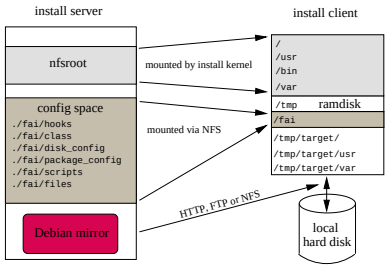
Configuration space: A directory which contains the configuration data.

All these services can be spread over several computers.

Sequence of an installation

- install client boots linux using the nfsroot file system, without using the local hard disks
- define classes and variables and load kernel modules
- partition local hard disk and create file systems
- Debian command `apt-get` installs the software
- configure operating systems and applications
- save log files to install server, then reboot newly installed system

Mounting filesystems



Installation time

- Time for one installation (without booting) on Dual Pentium II 400 MHz, 128 MB RAM, 10Mbit LAN
  - 90 MB software : 2 minutes
  - 520 MB software : 11 minutes
- The time for installation remains unchanged for 100Mbit LAN.
- **The amount of software determines the installation time.**

Availability

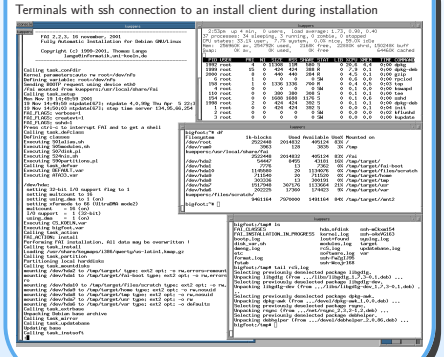
- FAI homepage: **http://www.informatik.uni-koeln.de/fai**
- Open source under GPL license
- CVS tree at `http://cvs.debian.org/fai`
- Active mailing list: `linux-fai@uni-koeln.de`
- Send bug reports to: `fai@informatik.uni-koeln.de`
- Get Debian package from the FAI homepage, from an official Debian mirror, or from `http://sourceforge.net/projects/fai/`
- Size of package is about 400 Kbytes including scripts, examples and manual
- Separate package for install kernels called fai-kernels (about 10 Mbytes)

FAI

debian

FAI at work

Terminals with ssh connection to an install client during installation



Class concept

- For each host many system files must be installed
- For each system file several templates are available
- A class specifies which template to use
- Classes are defined as follows:
  predefined classes: DEFAULT, LAST and the hostname
  stored in a file: Classes are listed in a text file
  dynamically generated: Scripts can define classes depending on detected hardware and write them to stdout
- Each host belongs to several classes
- The configuration is composed of classes
- Each class defines a part of the configuration
- A class also choose which configuration scripts to use
- The configuration for a host is easily expanded by adding classes
- Examples of classes: COMPILER, FAI_BOOTPART, NIS, 4GB, SPARC, DATALESS, NOTEBOOK, DEBIAN_DEVEL, NOGETTY, BEOWULF, DISKLESS, KERNEL_SOFT, BOOTP_SERVER
- `fcopy` copies template files depending on defined classes to new system

```
# fcopy /etc/host.conf /etc/nsswitch.conf
'- etc
    '- host.conf
    |   |-- NIS
    |   '-- NONIS
    |-- hosts.equiv
    |   |-- BEOWULF
    |   |-- NET_9
    |   '-- file-modes
    '- nsswitch.conf
        |-- NIS
        '-- NONIS
```

Features

- **Scalable method for installing hundreds of install clients**
- The installation kernel can use modules
- Remote login via ssh during installation process possible
- All similar configurations are shared among all install clients
- Log files are saved on both the client and the installation server
- `Shell`, `perl`, `expect` and `cfengine` script support during configuration
- Access to a Debian mirror via NFS, FTP or HTTP
- Easy creation of the common boot floppy
- Can be used as a rescue system
- Tested on SUN SPARC hardware
- Diskless client support
- Easily add your own functions or change the default behavior via hooks
- Support for lilo, grub, and reiserfs
- Central configuration repository for all install clients
- Install server needs constant disk space
- Ready to go configuration for a Beowulf cluster