

FAI 使用教程

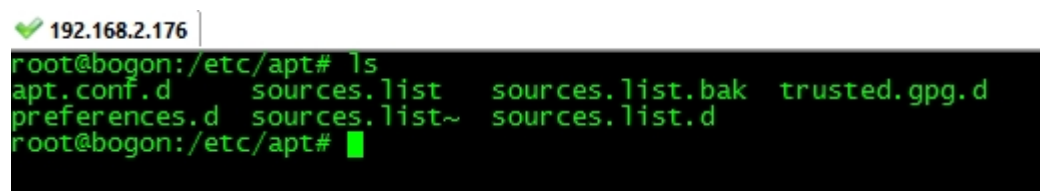
FAI 全称 Fully Automatic Installation，是一种基于 Debian GNU/Linux 平台的全自动安装集群结点机的软件包，它为构建集群提供了方便快捷的安装方式，可以在几十分钟内实现全部节点机的自动安装。

一. 准备工作

1. 配置系统源

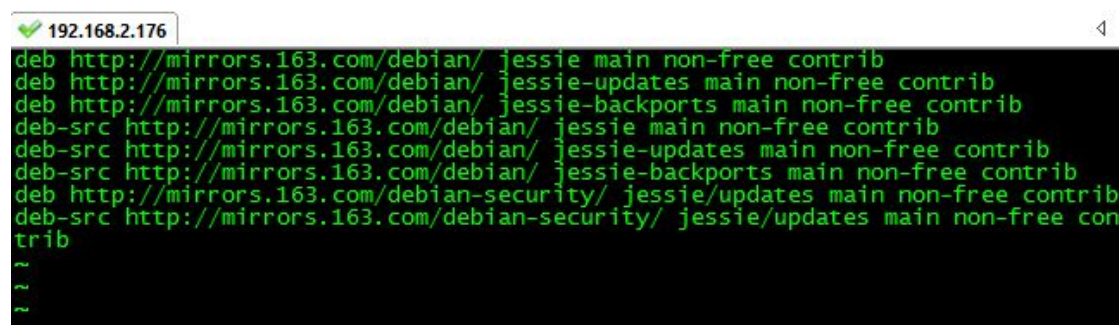
先备份下系统的源文件，然后将源列表粘贴到源文件中（这里用的是 163 的源），源文件路径见下图

```
cp source.list source.list.bak
```



A terminal window with a title bar showing IP 192.168.2.176. The prompt is root@bogon:/etc/apt#. The command 'ls' is entered, and the output shows: apt.conf.d, sources.list, sources.list.bak, trusted.gpg.d, preferences.d, and sources.list~. The cursor is on the next line.

```
nano source.list
```



A terminal window with a title bar showing IP 192.168.2.176. The prompt is root@bogon:/etc/apt#. The command 'nano source.list' has been executed. The content of source.list is displayed in green text on a black background. It lists several mirrors from 163.com for Debian Jessie, including main, non-free, contrib, updates, backports, and security repositories. The list ends with '~' indicating it continues.

保存，运行一下 apt-get update 更新一下系统的源。

二. 安装 FAI.

```
apt-get install fai-quickstart
```

安装完检查下是否安装成功

```
root@bogon:~# dpkg -l|grep fai
ii fai-client 4.3.1+deb8u1 all Full
y Automatic Installation client package
ii fai-doc 4.3.1+deb8u1 all Docu
mentation for FAI
ii fai-quickstart 4.3.1+deb8u1 all Full
y Automatic Installation quickstart package
ii fai-server 4.3.1+deb8u1 all Full
y Automatic Installation server package
root@bogon:~#
```

安装成功 FAI 会默认生成配置文件在/etc/fai 下，我们只需要修改其中的参数就可以了

```
192.168.1.176
root@bogon:~# cd /etc/fai/
root@bogon:/etc/fai# ls
apt fai.conf grub.cfg live.conf NFSROOT nfsroot.conf
root@bogon:/etc/fai#
```

1. 打开 apt 目录修改源文件（方法同第一步）。

2. 修改 fai.conf 文件

```
# See fai.conf(5) for detailed information.

# Account for saving log files and calling fai-chboot.
#LOGUSER=fai

# URL to access the fai config space
#FAI_CONFIG_SRC=nfs://yourservername/path/to/config/space
LOGUSER=fai
FAI_CONFIG_SRC=nfs://192.168.1.176$FAI_CONFIGDIR
FAI_LOGPROTO=ssh
```

3. 修改 nfsroot.conf 文件

```
# For a detailed description see nfsroot.conf(5)

# "<suite> <mirror>" for debootstrap
FAI_DEBOOTSTRAP="jessie http://mirrors.163.com/debian"
FAI_ROOTPW='$1$kBnWCO.E$djxB128U7dMkrltJHPf6d1'

NFSROOT=/srv/fai/nfsroot
TFTPBOOT=/srv/tftp/fai
NFSROOT_HOOKS=/etc/fai/nfsroot-hooks/
FAI_DEBOOTSTRAP_OPTS="--exclude=dhcp-client,info --include=aptitude"
NFSROOT_ETC_HOSTS="192.168.2.176"

# Configuration space
FAI_CONFIGDIR=/srv/fai/config
~
~
```

NFSROOT #NFS-Root 目录路径

TFTPROOT#指定 TFTP 服务根目录路径

NFSROOT_ETC_HOSTS#指定 NFS 服务器地址

#使用 fai-setup 命令创建 NFSROOT 目录时下载软件包的地址

FAI_DEBOOTSTRAP

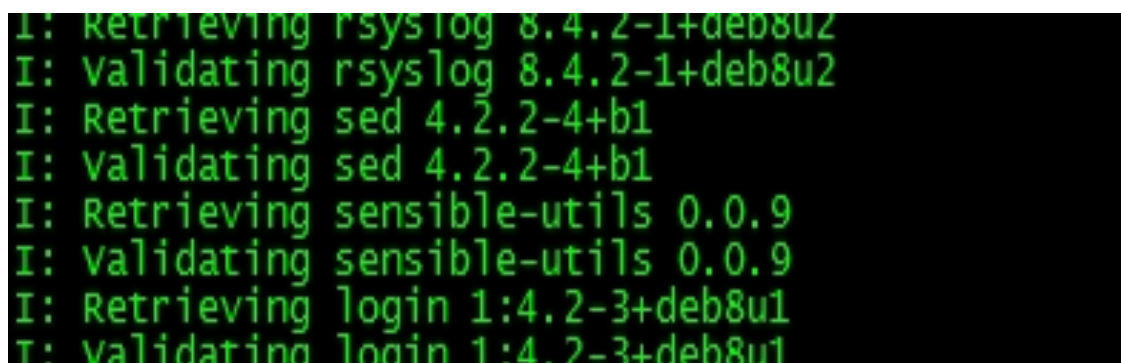
NFS_HOOKS

FAI_DEBOOTSTRAP_OPTS(如果是 32 位系统参数里加--arch i386)

FAI_DEBOOTSTRAP_OPTS="--arch i386 --exclude=dhcp-client,info
--include=aptitude"

三. 生成 NFSROOT 目录并拷贝自定义配置文件

1. 使用 fai-setup -v 命令生成 NFSROOT 目录，生成过程如下图所示，生成比较慢耐心等待就可以了



```
I: Retrieving rsyslog 8.4.2-1+deb8u2
I: validating rsyslog 8.4.2-1+deb8u2
I: Retrieving sed 4.2.2-4+b1
I: validating sed 4.2.2-4+b1
I: Retrieving sensible-utils 0.0.9
I: validating sensible-utils 0.0.9
I: Retrieving login 1:4.2-3+deb8u1
I: validating login 1:4.2-3+deb8u1
```

生成结束

```

dracut                040+1-1
dracut-network        040+1-1
waiting for background jobs to finish
[1]+  Done                  nice gzip $NFSROOT/var/tmp/base.tar (wd: /srv/fai
/nfsroot)
fai-make-nfsroot finished properly.
Log file written to /var/log/fai/fai-make-nfsroot.log
Adding line to /etc/exports: /srv/fai/config 192.168.1.176/24(async,ro,no_subt
e_check)
Adding line to /etc/exports: /srv/fai/nfsroot 192.168.1.176/24(async,ro,no_subt
ee_check,no_root_squash)
Reloading nfs-kernel-server configuration (via systemctl): nfs-kernel-server.s
vice.

    You have no FAI configuration space yet. Copy the simple examples with:
    cp -a /usr/share/doc/fai-doc/examples/simple/* /srv/fai/config
    Then change the configuration files to meet your local needs.
    Please don't forget to fill out the FAI questionnaire after you've finished your
    project with FAI.

FAI setup finished.
Log file written to /var/log/fai/fai-setup.log

```

2. 使用命令 `cp -a /usr/share/doc/fai-doc/examples/simple/* /srv/fai/config/` 拷贝安装系统配置信息。

3. 使用如下命令创建支持 PXE 服务器所需的启动、配置文件。

```

root@bogon:~# fai-chboot -IFv default
Booting kernel vmlinuz-3.16.0-4-amd64
append initrd=initrd.img-3.16.0-4-amd64 ip=dhcp
FAI_FLAGS=verbose,sshd,createvt

default has no IP in hex default
writing file /srv/tftp/fai/pxelinux.cfg/default for default
root@bogon:~#

```

创建完后到 `/srv/tftp/fai/pxelinux.cfg/default` 添加自定义配置路径

```
FAI_CONFIG_SRC=nfs://192.168.2.176/srv/fai/config
```

四. 其他配置

FAI 需要依赖下列服务完成自动化安装, 安装 FAI 时下列服务已经自动安装我们只需要修改配置文件即可。

1. DHCP

安装 DHCP 服务是为了给需要安装操作系统的客户端分配 IP 地址。

```
nano /etc/dhcp/dhcpd.conf
```

```
filename "/pxelinux.0";
allow booting;
allow bootp;
default-lease-time 600;
max-lease-time 7200;
subnet 192.168.2.0 netmask 255.255.255.0{
    range 192.168.2.101 192.168.2.190;
    option subnet-mask 255.255.255.0;
    option broadcast-address 192.168.2.255;
    option routers 192.168.2.1;
    next-server 192.168.2.176;
    option domain-name-servers 192.168.2.1;
}
```

配置完后重启下服务 `/etc/init.d/isc-dhcp-server restart`

一般正常的话没有提示

可以用 `/etc/init.d/isc-dhcp-server status` 命令查看服务是否启动

动

```
root@bogon:~# /etc/init.d/isc-dhcp-server status
● isc-dhcp-server.service - LSB: DHCP server
   Loaded: loaded (/etc/init.d/isc-dhcp-server)
   Active: active (running) since Fri 2016-11-11 17:24:46 EST; 21min ago
   Process: 1137 ExecStop=/etc/init.d/isc-dhcp-server stop (code=exited, status=0/SUCCESS)
   Process: 1144 ExecStart=/etc/init.d/isc-dhcp-server start (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/isc-dhcp-server.service
           └─1153 /usr/sbin/dhcpd -q -cf /etc/dhcp/dhcpd.conf -pf /var/run/dhcpd.pid

Nov 11 17:30:17 bogon dhcpd[1153]: DHCPDISCOVER from 00:0c:29:44:c3:37 via eth0
Nov 11 17:30:18 bogon dhcpd[1153]: DHCPOFFER on 192.168.2.155 to 00:0c:29:44:c3:37 (none) via eth0
Nov 11 17:33:00 bogon dhcpd[1153]: DHCPINFORM from 192.168.2.128 via eth0: not authoritative for subnet 192.168.2.0
Nov 11 17:35:00 bogon dhcpd[1153]: DHCPREQUEST for 192.168.2.130 from 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
Nov 11 17:35:00 bogon dhcpd[1153]: DHCPACK on 192.168.2.130 to 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
Nov 11 17:35:58 bogon dhcpd[1153]: DHCPINFORM from 192.168.2.128 via eth0: not authoritative for subnet 192.168.2.0
Nov 11 17:39:59 bogon dhcpd[1153]: DHCPREQUEST for 192.168.2.130 from 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
Nov 11 17:39:59 bogon dhcpd[1153]: DHCPACK on 192.168.2.130 to 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
Nov 11 17:44:59 bogon dhcpd[1153]: DHCPREQUEST for 192.168.2.130 from 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
Nov 11 17:44:59 bogon dhcpd[1153]: DHCPACK on 192.168.2.130 to 84:4b:f5:b4:c7:cd (BIH-L-1513) via eth0
root@bogon:~#
```

2. TFTP

TFTP 服务是为了让需要安装操作系统的客户端可以下载支持 PXE 的启动文件。

nano /etc/default/tftpd-hpa 修改下 TFTP 路径

```
# /etc/default/tftpd-hpa
TFTP_USERNAME="tftp"
TFTP_DIRECTORY="/srv/tftp/fai"
TFTP_ADDRESS="0.0.0.0:69"
TFTP_OPTIONS="--secure"
~
```

3. NFS

FAI 服务通过 NFS 共享必要的启动及安装文件给 FAI 客户端。

nano /etc/exports 检查下服务端 ip 是否正确，此处一般不需要改，自动生成的。

```
/srv/fai/config 192.168.2.176/24(async,ro,no_subtree_check)
/srv/fai/nfsroot 192.168.2.176/24(async,ro,no_subtree_check,no_root_squash)
~
```

4. nano /srv/fai/config/disk_config/FAIBASE 配置一下硬盘分区信息。

五. Pxe 安装系统

到此 FAI 服务器配置完成，将客户端 BIOS 设置为从网络启动即可全自动安装 Debian 系统。客户端 root 用户的默认密码是 fai。

常见错误：

1.

```
CLIENT MAC ADDR: 00 0C 29 44 C3 37  G
CLIENT IP: 192.168.2.155  MASK: 255.25
GATEWAY IP: 192.168.2.1
TFTP.
PXE-T01: File not found
PXE-E3B: TFTP Error - File Not found
PXE-M0F: Exiting Intel PXE ROM.
Operating System not found
```

客户端未找到 pxelinux.0 启动文件，检查 TFTP 配置文件中 tftp 目录是否正确。

2.

```
Generating "/run/initramfs/rdsosreport.txt"
You might want to save "/run/initramfs/rdsosreport.txt"
after mounting them and attach it to a bug report.

To get more debug information in the report,
reboot with "rd.debug" added to the kernel command line.

Dropping to debug shell.

dracut:/# _
```

检查 nfs 配置文件

六. 添加新系统

添加新的 debian 系统只需要

```
cp -r /etc/fai /etc/fai-wheezy
```

然后修改 fai-wheezy 下的 apt 源、nfsroot.conf 中的 FAI_DEBOOTSTRAP 和 NFSROOT

```
# For a detailed description see nfsroot.conf(5)
# "<suite> <mirror>" for debootstrap
FAI_DEBOOTSTRAP="wheezy http://mirrors.163.com/debian"
FAI_ROOTPW=' $1$kBnWcO.E$djxB128U7dMkr1tJHPf6d1'

NFSROOT=/srv/fai/nfsroot-wheezy
TFTPROOT=/srv/tftp/fai
NFSROOT_HOOKS=/etc/fai/nfsroot-hooks/
FAI_DEBOOTSTRAP_OPTS="--exclude=dhcp-client,info --include=aptitude"
NFSROOT_ETC_HOSTS="192.168.2.176"

# Configuration space
FAI_CONFIGDIR=/srv/fai/config
~
~
```

然后用命令

```
fai-make-nfsroot -v -C/etc/fai-wheezy 重新生产 nfsroot-wheezy
```

然后再/srv/tftp/fai/pxelinux.cfg/default 文件中复制一下，把 root 路径改一下。

```
label d864
kernel vmlinuz-3.16.0-4-amd64
append initrd=initrd.img-3.16.0-4-amd64 ip=dhcp root=/srv/fai/nfsroot aufs FAI_FLAGS=verbose,sshd,createvt,reboot FAI_CONFIG_SRC=nfs://
FAI_ACTION=install
label d764
kernel vmlinuz-3.16.0-4-amd64
append initrd=initrd.img-3.16.0-4-amd64 ip=dhcp root=/srv/fai/nfsroot-wheezy aufs FAI_FLAGS=verbose,sshd,createvt,reboot FAI_CONFIG_SRC=
onfig FAI_ACTION=install
~
```

七. 添加本地镜像

以上都是通过 163 镜像站安装，如果要本地安装，需要先把系统镜像下载下来。

放到例如 debian8 64 位： /media/d8_64

1. 用 apache 来生成本地镜像源

```
apt-get install apache2
```

然后进入到 /etc/apache2/apache2.conf 将 /var/www/ 这行改为 /media/


```

</Directory>
<Directory /usr/share>
    AllowOverride None
    Require all granted
</Directory>
<Directory /media/>
    Options Indexes FollowSymLinks
    AllowOverride None
    Require all granted
</Directory>
#<Directory /srv/>
#
#    Options Indexes FollowSymLinks
#    AllowOverride None
#    Require all granted
#</Directory>

```

再 进 到 /etc/apache2/sites-enabled/000-default.conf 将
/var/www/html 改为/media/

```

# However, you must set it for any
#ServerName www.example.com

ServerAdmin webmaster@localhost
DocumentRoot /media/

# Available loglevels: trace8, ...

```

重启 apache2 服务，在浏览器输入服务器地址可以看到 media 目录。

2. 有了本地的镜像源，现在到/srv/fai/nfsroot/etc/apt/source.list 中
将网络源注释，添加我们自己建的本地源。

```

deb http://192.168.2.176/d8_64/ jessie main non-free contrib
#deb http://mirrors.163.com/debian/ jessie main non-free contrib
#deb http://mirrors.163.com/debian/ jessie-updates main non-free contrib
#deb http://mirrors.163.com/debian/ jessie-backports main non-free contrib
#deb-src http://mirrors.163.com/debian/ jessie main non-free contrib
#deb-src http://mirrors.163.com/debian/ jessie-updates main non-free contrib
#deb-src http://mirrors.163.com/debian/ jessie-backports main non-free contrib
#deb http://mirrors.163.com/debian-security/ jessie/updates main non-free contrib
#deb-src http://mirrors.163.com/debian-security/ jessie/updates main non-free contrib
~
~
~

```

这样就可以用本地镜像源来安装系统了。

三个容易混淆的源路径

服务端的源路径

`/etc/apt/source.list`

配置 FAI 生成 nfsroot 目录的源路径

`/etc/fai/apt/source.list`

要 nfs 共享到客户端的源路径（即我们真正要安装的源）

`/srv/fai/nfsroot/etc/apt/source.list`