apt install YOUR-NEIGHBORHOOD

Automatic Installation of Debian GNU/Linux

Andreas B. Mundt
andi@debian.org
How to install and configure Debian GNU/Linux?

- fetch installer media
- run the installation
- boot the system
- manual configuration
... what about more and more installations ...???
Idea:
Overview

1. Introduction and Motivation
2. The InstallBox: Installation and Configuration
3. Preseeding
4. Debian-LAN: Fully Automatic Installation with FAI
5. Summary and Conclusions
(Virtual) Hardware
- 2 NICs
- ~ 10 GiB disk space

Network Configuration
- external network (WAN): DHCP
- internal network (LAN): 192.168.0.0/24

Debian Netboot Installer
- PXE boot, netinstall
- boot menu: amd64, i386, ...

Services (LAN)
- DHCP, DNS and TFTP
- package cache
The InstallBox

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Overview

1. Introduction and Motivation

2. The InstallBox: Installation and Configuration
   - DHCP and DNS: dnsmasq
   - TFTP and Netboot Installer: di-netboot-assistant
   - IP-Forwarding: shorewall
   - Redirection and Package Cache: squid

3. Preseeding

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5. Summary and Conclusions
DHCP and DNS: preparations

Start with a standard jessie installation (ssh-server but no desktop):

- eth0 is connected to the internet (DHCP)
- eth1 is not yet connected

After first boot:

**Install etckeeper:**

```
apt install etckeeper
```

**Append static configuration for internal (LAN) interface:**

```
cat >> /etc/network/interfaces <<EOF
allow-hotplug eth1
iface eth1 inet static
  address 192.168.0.10
  netmask 255.255.255.0
EOF
```
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  address 192.168.0.10
  netmask 255.255.255.0
EOF
```
DHCP and DNS: install and configure dnsmasq

Install dnsmasq:

```
apt install dnsmasq
```

Modifications in `/etc/dnsmasq.conf`:

```
-#interface=
+interface=eth1

-#dhcp-range=192.168.0.50,192.168.0.150,12h
+dhcp-range=192.168.0.50,192.168.0.150,2h
```
Install and prepare di-netboot-assistant:

```bash
apt install di-netboot-assistant
mkdir /var/lib/tftpboot
di-netboot-assistant install jessie
di-netboot-assistant install jessie --arch=i386
```

Configure dnsmasq’ built-in tftp server in /etc/dnsmasq.conf:

```conf
-dhcp-boot=pxelinux.0
+dhcp-boot=debian-installer/pxelinux.0

-enable-tftp
+enable-tftp

-enable-tftp
+enable-tftp
```

- `#enable-tftp`: Enable the TFTP server.
- `tftp-root=/var/lib/tftpboot`: Set the TFTP root directory to `/var/lib/tftpboot`.
**Summary: Effective /etc/dnsmasq.conf**

```bash
grep -vE "^(#|$)" /etc/dnsmasq.conf

interface=eth1
dhcp-range=192.168.0.50,192.168.0.150,1h
dhcp-boot=debian-installer/pxelinux.0
enable-tftp
tftp-root=/var/lib/tftpboot
```

**Restart dnsmasq:**

```bash
systemctl restart dnsmasq.service
```

---

- **DHCP IP address**
- **DNS resolution**
- **PXE installer boot**
- **web access**
- **package cache**

---

Andreas B. Mundt

Tübix, 13. Juni 2015
IP-Forwarding with shorewall

Install shorewall

```
apt install shorewall
```

/etc/default/shorewall

```
-startup=0
+startup=1
```

/etc/shorewall/shorewall.conf

```
-IP_FORWARDING=Keep
+IP_FORWARDING=Yes
```

Fetch two-interfaces example configuration:

```
cd /usr/share/doc/shorewall/examples/two-interfaces/
cp interfaces masq policy rules stoppedrules zones \ /etc/shorewall/
```

¹Alternative approach: Enable packet forwarding for IPv4 by uncommenting
#net.ipv4.ip_forward=1 in /etc/sysctl.conf.
IP-Forwarding with shorewall

Modify `/etc/shorewall/policy`:

<table>
<thead>
<tr>
<th>Rule</th>
<th>Source</th>
<th>Destination</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-loc</code></td>
<td>net</td>
<td>ACCEPT</td>
<td></td>
</tr>
<tr>
<td><code>+loc</code></td>
<td>all</td>
<td>ACCEPT</td>
<td></td>
</tr>
<tr>
<td><code>+$FW</code></td>
<td>all</td>
<td>ACCEPT</td>
<td></td>
</tr>
</tbody>
</table>

Modify `/etc/shorewall/rules`:

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<td>loc</td>
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</tr>
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</tr>
</tbody>
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- DHCP IP address
- DNS resolution
- PXE installer boot
- web access
- package cache
Package Cache: squid

Install squid3

apt install squid3

/etc/squid3/squid3.conf

#acl localnet src 192.168.0.0/16  # RFC1918 possible internal network
+acl localnet src 192.168.0.0/16  # RFC1918 possible internal network

-#http_access allow localnet
+http_access allow localnet
  http_access allow localhost

  # maximum_object_size_in_memory 512 KB
+maximum_object_size_in_memory 10240 KB

  # maximum_object_size 4 MB
+maximum_object_size 512 MB

  #cache_dir ufs /var/spool/squid3 100 16 256
+cache_dir aufs /var/spool/squid3 10000 16 256
# Add any of your own refresh_pattern entries above these.
#
+## refresh pattern for debs and udebs
+refresh_pattern deb$ 129600 100% 129600
+refresh_pattern udeb$ 129600 100% 129600
+refresh_pattern tar.gz$ 129600 100% 129600
+refresh_pattern tar.xz$ 129600 100% 129600
+refresh_pattern tar.bz2$ 129600 100% 129600
+
+## always refresh Packages and Release files
+refresh_pattern /(Packages|Sources)(|\.bz2|\.gz|\.xz)$ 0 0% 0 refresh-ims
+refresh_pattern /Release(\.gpg)$ 0 0% 0 refresh-ims
+refresh_pattern /InRelease$ 0 0% 0 refresh-ims

---

2 https://sources.debian.net/src/squid-deb-proxy/0.8.11/squid-deb-proxy.conf/
### Intercepting Package Cache

We want the clients to use the package cache transparently.³

#### /etc/shorewall/rules

<table>
<thead>
<tr>
<th>ACCEPT</th>
<th>$FW</th>
<th>net</th>
<th>icmp</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+REDIRECT</td>
<td>loc</td>
<td>3129</td>
<td>tcp</td>
</tr>
</tbody>
</table>

#### /etc/squid3/squid3.conf

- # Squid normally listens to port 3128
- http_port 3128
- +http_port 3129 intercept

#### Test with: tailf /var/log/squid3/access.log

- ... TCP_MISS/200 ... GET http://.../debian-lan-config_0.21_all.deb ...
- ... TCP_MEM_HIT/200 ... GET http://.../debian-lan-config_0.21_all.deb ...

³Without explicitly telling clients to do so.
DHCP IP address
DNS resolution
PXE installer boot
web access
package cache
### Debian-Installer netboot overview menu

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<tr>
<th>Debian Installer (jessie, amd64)</th>
<th>[SUB-MENU]</th>
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**Press [Tab] to edit options**
PXE Booting the Client...
... PXE Booting the Client ...
Overview

1. Introduction and Motivation

2. The InstallBox: Installation and Configuration

3. Preseeding
   - Answering Questions
   - Providing the Preconfiguration
   - Example preseed.cfg
   - Boot Parameters
   - Completely Automatic Installation

4. Debian-LAN: Fully Automatic Installation with FAI

5. Summary and Conclusions
What is “preseeding”? – Answering Questions!

A way to set answers to questions asked during the installation process.

4https://www.debian.org/releases/jessie/amd64/apbs01.html.en
How is it done?

- Prepare a preconfiguration file
- Make it available (http, tftp, ...)
- Tell the installer where and how to fetch the file

Use the InstallBox’ TFTP server:

```
cd /var/lib/tftpboot
mkdir -p d-i/jessie/
cp /path/to/preseed.cfg /var/lib/tftpboot/d-i/jessie/
```

Make “installbox” resolvable for the clients:

Modify `/etc/hosts`:

```
127.0.0.1   localhost
-127.0.1.1  installbox
+127.0.1.1  localhost
+192.168.0.10  installbox
```

---

5[https://www.debian.org/releases/jessie/example-preseed.txt](https://www.debian.org/releases/jessie/example-preseed.txt)
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The Preseed File

/var/www/html/d-i/jessie/preseed.cfg

## Skip root account:
d-i passwd/root-login boolean false

## Apt setup:
d-i apt-setup/non-free boolean true
d-i apt-setup-contrib boolean true
d-i mirror/http/mirror string ftp-stud.hs-esslingen.de
d-i mirror/http/mirror seen false

## Package selection:
tasksel tasksel/desktop multiselect kde

## Individual additional packages to install:
d-i pkgsel/include string firmware-linux xul-ext-ADBblock-plus

## This command is run just before the install finishes:
d-i preseed/late_command string in-target \
   systemctl enable systemd-timesyncd.service
Installer Boot Parameter

Debian GNU/Linux installer boot menu

Install
Advanced options
Help
Install with speech synthesis

> ::/debian-installer/jessie/amd64/linux-args.788 initrd=::/debian-installer/jessie/amd64/initrd.gz url=tftp://installbox_
Installer Boot Parameter

Jun 10 16:51:52 netcfg: DEBUG: Success!
Jun 10 16:51:52 netcfg: DEBUG: Writing DHCP stanza for eth0
Jun 10 16:51:52 netcfg: INFO: Detected eth0 as a hotpluggable device
Jun 10 16:51:52 netcfg: DEBUG: Success!
Jun 10 16:51:53 main-menu: (process=1525): udhcpc (v1.22.1) started
Jun 10 16:51:53 main-menu: (process=1525): Sending discover...
Jun 10 16:51:53 main-menu: (process=1525): Sending select for 192.168.0.71...
Jun 10 16:51:53 main-menu: (process=1525): Lease of 192.168.0.71 obtained, lease time 3600
Jun 10 16:51:53 main-menu: DEBUG: resolver (libc6-udeb): package doesn't exist (ignored)
Jun 10 16:51:53 main-menu: INFO: Menu item 'network-preseed' selected
Jun 10 16:51:53 main-menu: DEBUG: resolver (libc6-udeb): package doesn't exist (ignored)
Jun 10 16:51:53 main-menu: INFO: Menu item 'choose-mirror' selected
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Jun 10 16:51:53 anna-install: Queueing udeb apt-mirror-setup for later installation

> :/debian-installer/jessie-amd64/images/788 instrd=:/debian-installer/jessie/amd64/initrd.gz url=tftp://installbox_
Installer Boot Parameter

Please press Enter to activate this console.

BusyBox v1.22.1 (Debian 1:1.22.0-9+deb8u1) built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ # grep preseed /var/log/syslog
Jun 10 16:51:53 main-menu[162]: INFO: Menu item 'network-preseed' selected
Jun 10 16:51:53 main-menu[162]: (process:1525): Sending discover...
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> ::/debian-installer/jessie/amd64/initrd.gz 788 initrd=::/debian-installer/jessie/amd64/initrd.gz url=tftp://installbox_
Further Notes

- Preconfiguration files may be specified by the DHCP server\(^6\).
- Boot parameters can also be used to preseed questions\(^7\).
- Use the boot parameter "DEBCONF_DEBUG=5" to find variables that need to be preseeded.
- Default values can be modified as well\(^8\).
- The boot parameters "auto=true priority=critical" delays the locale and keyboard questions until after there has been a chance to preseed them (i.e. until the network is up)\(^9\).

---

\(^6\) [https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-dhcp](https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-dhcp)

\(^7\) [https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-bootparms](https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-bootparms)

\(^8\) [https://www.debian.org/releases/jessie/amd64/apbs05.html.en#preseed-seenflag](https://www.debian.org/releases/jessie/amd64/apbs05.html.en#preseed-seenflag)

\(^9\) [https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-auto](https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-auto)
Completely Automatic Installation

- Add necessary boot parameters to di-netboot-assistant
- Preseed all questions asked
- Boot preseeded installer entry automatically by default

Modify `/etc/di-netboot-assistant/pxelinux.HEAD`:

+LABEL quick
+ MENU LABEL Debian Installer (Jessie ; amd64 + Preseed)
+ kernel ::/debian-installer/jessie/amd64/linux
+ append initrd=::/debian-installer/jessie/amd64/initrd.gz \  
  auto=true priority=critical url=tftp://installbox
+TIMEOUT 100

Execute:

di-netboot-assistant rebuild-menu
Debian-Installer netboot overview menu

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Automatic boot in 7 seconds...
Done!

```
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Automatic boot in 7 seconds...
Limitations

Preseeding is fine for more or less standard installations. For more complex configurations, limits are reached:

- Complicated preconfiguration file
- Not very structured, fragile
- Limited logging capabilities
- Inefficient testing
- ...

Solution:

Use a configuration management utility\(^{10}\) like puppet, chef, ansible, cfengine, ..., or FAI.

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   - The Debian-LAN Project
   - A short Introduction to FAI
   - Debian-LAN FAI Classes
   - Installation Procedure

5. Summary and Conclusions
The goal of the "Debian Local Area Network Project is to make setting up a local network as easy as possible in Debian.

Challenges:
- simple installation/setup, maintenance and upgrade
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- only use Debian stable repositories

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https://wiki.debian.org/DebianLAN

Andreas B. Mundt
The Debian-LAN System

- **gateway:**
  - firewall, masquerading

- **mainserver (provides all services):**
  - authentication (Kerberos)
  - directory service (LDAP)
  - kerberized NFSv4 homes
  - email: SMTP/IMAP Server
  - ...

- **workstation (desktop):**
  - Gnome, KDE, Xfce, LXDE, ...
  - customized package selection

- **diskless (workstation):**
  - root-FS mounted from mainserver, PXE-boot

- **roaming (workstation):**
  - credentials cached for off-line use
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Implemented Services

- DNS and DHCP
- Kerberos KDC
- LDAP
- home directories distributed via kerberized NFSv4
- GOsa for user management
- kerberized local email: exim, dovecot
- intranet (users’ homepages)
- ICINGA and Munin system monitoring

- disk quota
- proxy (Squid)
- APT package cache
- local APT repository
- firewall (shorewall)
- etckeeper
- system backup (dirvish)
- network installation / FAI server (PXE)
- ...
Fully Automatic Installation (FAI): Class Concept

**FAI Classes**
- FAibase
- Debian
- FAIServer
- Diskless_Server
- Firewall
- CUPS_Server
- Proxy
- NTP_Server
- DNS_Server
- NFS_Server
- Mail_Server
- LDAP_Client
- LDAP_Server
- Kerberos_Client
- Kerberos_KDC
- KDC_LDAP

**Implementation**
- skripts
- packages
- debconf (preseeding)
- files
- ...
Fully Automatic Installation (FAI): Class Concept

FAI Classes
- FAIBASE
- DEBIAN
- FAISERVER
- DISKLESS_SERVER
- FIREWALL
- CUPS_SERVER
- PROXY
- NTP_SERVER
- DNS_SERVER
- NFS_SERVER
- MAIL_SERVER
- LDAP_CLIENT
- LDAP_SERVER
- KERBEROS_CLIENT
- KERBEROS_KDC
- KDC_LDAP

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Fully Automatic Installation (FAI): Class Concept

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Tübix, 13. Juni 2015
Fully Automatic Installation (FAI): Class Concept

FAI Classes
- FAI_BASE
- DEBIAN
- FAI_SERVER
- DISKLESS_SERVER
- FIREWALL
- CUPS_SERVER
- PROXY
- NTP_SERVER
- DNS_SERVER
- NFS_SERVER
- MAIL_SERVER
- LDAP_CLIENT
- LDAP_SERVER
- KERBEROS_CLIENT
- KERBEROS_KDC
- KDC_LDAP

Implementation
- skripts
- packages
- debconf (preseeding)
- files
- ...

Andreas B. Mundt
Fully Automatic Installation (FAI): Class Concept

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Fully Automatic Installation (FAI): Class Concept

FAI’s class concept:
- every hostname is mapped on a set of classes
- classes define the complete setup:
  - actions (partitioning, package selection, ...)
  - configuration (debconf, scripts, ...)
- classes are defined in the FAI config space

FAI config space\(^{12}\) (top level):
```
  -- config
    |--- class/  (map hostname to classes, define variables)
    |--- debconf/ (populate debconf database, preseeding)
    |--- disk_config/ (define the hard disk setup)
    |--- files/  (files to be copied to the target machine)
    |--- hooks/  (hooks to be run during installation)
    |--- package_config/ (package selection to be installed)
    |--- scripts/ (scripts to be run after installation)
    `-- tests/  (final test, verbose logging of actions)
```

\(^{12}\)The config space is a certain directory structure with text files.
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**FAI config space**

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12 The config space is a certain directory structure with text files.

Andreas B. Mundt  
Tübix, 13. Juni 2015 33 / 39
Fully Automatic Installation (FAI): Examples

**Example:** The host 'gateway' is associated with the following classes:

- FAIBASE DEBIAN DHCPC FIREWALL GATEWAY_A

All packages defined in these classes will be installed and configured accordingly.

**Example:** What happens to hosts associated with the FIREWALL class?

```
$ find config/ -name FIREWALL
```

- config/package_config/FIREWALL
- config/scripts/FIREWALL

- package 'shorewall' will be installed
- the firewall will be configured

[13] https://sources.debian.net/src/debian-lan-config/0.21/fai/config/package_config/FIREWALL/
[14] https://sources.debian.net/src/debian-lan-config/0.21/fai/config/scripts/FIREWALL/
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The Debian-LAN FAI Classes

The **mainserver** maps onto the following classes\(^ {15} \) in the Debian-LAN FAI config space:

<table>
<thead>
<tr>
<th></th>
<th>FAIBASE</th>
<th></th>
<th>LOG_SERVER</th>
<th></th>
<th>LDAP_SERVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>8</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DEBIAN</td>
<td>9</td>
<td>PROXY</td>
<td>16</td>
<td>KERBEROS_CLIENT</td>
</tr>
<tr>
<td>3</td>
<td>FAISERVER</td>
<td>10</td>
<td>NTP_SERVER</td>
<td>17</td>
<td>KERBEROS_KDC</td>
</tr>
<tr>
<td>4</td>
<td>LVM8_A</td>
<td>11</td>
<td>DNS_SERVER</td>
<td>18</td>
<td>KDC_LDAP</td>
</tr>
<tr>
<td>5</td>
<td>DISKLESS_SERVER</td>
<td>12</td>
<td>NFS_SERVER</td>
<td>19</td>
<td>SERVER_A</td>
</tr>
<tr>
<td>6</td>
<td>FIREWALL</td>
<td>13</td>
<td>MAIL_SERVER</td>
<td>20</td>
<td>GOSA</td>
</tr>
<tr>
<td>7</td>
<td>CUPS_SERVER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Workstations map onto:

<table>
<thead>
<tr>
<th></th>
<th>FAIBASE</th>
<th></th>
<th>CUPS_CLIENT</th>
<th></th>
<th>KERBEROS_CLIENT</th>
</tr>
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<td>LDAP_CLIENT</td>
<td>11</td>
<td>XORG</td>
</tr>
<tr>
<td>4</td>
<td>LVM5_A</td>
<td>8</td>
<td>NFS_CLIENT</td>
<td>12</td>
<td>DESKTOP</td>
</tr>
</tbody>
</table>

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Workstations map onto:

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FAI: install and softupdate Procedure

FAI install
- boot FAI live system (CD/USB or PXE) on the target machine
- mount FAI config space on the live system
- map hostname to set of classes
- install the target machine dependent on its classes:
  ▶ partition local hard disk
  ▶ configure packages (debconf database)
  ▶ install packages
  ▶ configure target system (run scripts)
- reboot from the local hard disk

FAI softupdate (already installed machine)
- mount FAI config space on the system
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Set up your own **InstallBox** with:

dnsmasq, di-netboot-assistant, shorewall, squid

and a few lines of configuration.

Add **preseeding** to get rid of boring questions.

For more complex installations: Take a look at FAI and Debian-LAN.
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Further Reading and Resources

- **di-netboot-assistant package:**
  http://packages.debian.org/di-netboot-assistant

- **Debian Documentation “Preseeding”:**
  https://www.debian.org/releases/jessie/amd64/apb.html.en

- **Debian-LAN Wiki:**
  https://wiki.debian.org/DebianLAN

- **Debian-LAN presentation:**

Illustrations remixed from: https://openclipart.org/
Questions?

1. Introduction and Motivation
2. The InstallBox: Installation and Configuration
3. Preseeding
4. Debian-LAN: Fully Automatic Installation with FAI
5. Summary and Conclusions

Thank you very much!