apt install YOUR-NEIGHBORHOOD

Automatic Installation of Debian GNU/Linux

Andreas B. Mundt
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YOUR-NEIGHBORHOOD is now sitting in the NEW-queue, waiting for ftp-masters’ approval . . .

Just kidding ;-)
Your neighborhood . . .

YOUR-NEIGHBORHOOD is now sitting in the NEW-queue, waiting for ftp-masters’ approval . . .

Just kidding ;-)
Every fortnight in the local pub . . .

- GNU/Linux meeting, workshop, helpdesk, . . .
- everybody is invited to drop by and help, get help, chat, . . .
- . . . or bring a laptop/computer ready to install Debian.
How to install and configure Debian GNU/Linux?

- fetch installer media
- run the installation
- boot the system
- manual configuration
Install Party

Debian GNU/Linux
Install-Party

Sonntag, 1. Juni 2014, ab 17h
"Zum fröhlichen Nix"
Blaubeuren

Eintritt frei!
... what about more and more installations ...???
Idea:

Installer
amd64
debian

Installer
i386
debian

InstallBox
The InstallBox in real hardware . . .

. . . or just use a virtual machine on your laptop\(^1\) . . .

\(^1\)Use the host’s wlan NATed as external interface and bridge the internal LAN interface to the hardware interface.
The InstallBox

- **(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
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

4. Debian-LAN: Fully Automatic Installation with FAI

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
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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
```
TFTP and Netboot Installer: di-netboot-assistant

Install and prepare di-netboot-assistant:
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:
-#dhcp-boot=pxelinux.0
+dhcp-boot=debian-installer/pxelinux.0

-#enable-tftp
+enable-tftp

-#tftp-root=/var/ftpd
+tftp-root=/var/lib/tftpboot
So far ...

Restart dnsmasq:

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

- DHCP IP address
- DNS resolution
- PXE installer boot
- ✗ web access
- ✗ package cache
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/
```

2 Alternative 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>-loc</td>
<td>net</td>
<td>ACCEPT</td>
<td></td>
</tr>
<tr>
<td>+loc</td>
<td>all</td>
<td>ACCEPT</td>
<td></td>
</tr>
<tr>
<td>+$FW</td>
<td>all</td>
<td>ACCEPT</td>
<td></td>
</tr>
</tbody>
</table>

Modify `/etc/shorewall/rules`:

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

- 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)(\.|\.|\.)$ \ 0 0% 0 refresh-ims
+refresh_pattern \//Release(\.|\.|\.)$ 0 0% 0 refresh-ims
+refresh_pattern \//InRelease$ 0 0% 0 refresh-ims

---

3 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.\(^4\)

### /etc/shorewall/rules

<table>
<thead>
<tr>
<th>Command</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCEPT</td>
<td>$FW</td>
<td>net</td>
<td>icmp</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+REDIRECT</td>
<td>loc</td>
<td>3129</td>
<td>tcp</td>
<td>www</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 ...
```

\(^4\) Without explicitly telling clients to do so.
Done!

* DHCP IP address
* DNS resolution
* PXE installer boot
* web access
* package cache
... PXE Booting the Client ...
... 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.

https://www.debian.org/releases/jessie/amd64/apbs01.html.en

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How is it done?

- Prepare a preconfiguration file\(^6\)
- Make it available (http, tftp, \ldots )
- 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
```

\(^6\)https://www.debian.org/releases/jessie/example-preseed.txt
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-127.0.1.1 installbox
+127.0.1.1 localhost
+192.168.0.10 installbox
```

⁶https://www.debian.org/releases/jessie/example-preseed.txt
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-adblocK-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/initrd.gz url=tftp://installbox_
Installer Boot Parameter

Jun 10 16:51:52 netcfg[1526]: DEBUG: Success!
Jun 10 16:51:52 netcfg[1526]: DEBUG: Writing DHCP stanza for eth0
Jun 10 16:51:52 netcfg[1526]: INFO: Detected eth0 as a hotpluggable device
Jun 10 16:51:52 netcfg[1526]: DEBUG: Success!
Jun 10 16:51:53 main-menu[162]: (process:1525): udhpc (v1.22.1) started
Jun 10 16:51:53 main-menu[162]: (process:1525): Sending discover...
Jun 10 16:51:53 main-menu[162]: (process:1525): Sending select for 192.168.0.71...
Jun 10 16:51:53 main-menu[162]: (process:1525): Lease of 192.168.0.71 obtained, lease time 3600
Jun 10 16:51:53 main-menu[162]: DEBUG: resolver (libc6-udeb): package doesn’t exist (ignored)
Jun 10 16:51:53 main-menu[162]: INFO: Menu item 'network-preseed' selected
Jun 10 16:51:53 main-menu[162]: DEBUG: resolver (libc6-udeb): package doesn’t exist (ignored)
Jun 10 16:51:53 main-menu[162]: INFO: Menu item 'choose-mirror' selected
Jun 10 16:51:53 anna-install: Queueing udeb apt-mirror-setup for later installation

> /::debian-installer/jessie-installer/libc6-udeb_788_i686.ipk
> initrd=::debian-installer/jessie/amd64/initrd.gz url=tftp://installbox_

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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 preseed: successfully loaded preseed file from tftp://installbox/d-i/jessie./preseed.d.cfg
Jun 10 16:51:53 main-menu[162]: (process:1525): Sending discover...
Jun 10 16:51:53 main-menu[162]: (process:1525): Sending select for 192.168.0.71...
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Jul 10 16:51:53 anna-install: Queueing udeb apt-mirror-setup for later installation
```

```
$ ::/debian-installer/jessie/amd64/initrd.gz
::/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\(^7\).
- Boot parameters can also be used to preseed questions\(^8\).
- Use the boot parameter “DEBCONF_DEBUG=5” to find variables that need to be preseeded.
- Default values can be modified as well\(^9\).
- 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)\(^10\).

---

\(^7\) https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-dhcp
\(^8\) https://www.debian.org/releases/jessie/amd64/apbs02.html.en#preseed-bootparms
\(^9\) https://www.debian.org/releases/jessie/amd64/apbs05.html.en#preseed-seenflag
\(^10\) 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`:

```plaintext
+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**

<table>
<thead>
<tr>
<th>Debian Installer (Jessie : amd64 + Preseed)</th>
</tr>
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Press [Tab] to edit options

Automatic boot in 7 seconds...
Done!

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<td>SUB-MENU</td>
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```bash
 الخيام /debian-installer/jessie/amd64/linux initrd=خيام /debian-installer/jessie/amd64/initrd.gz auto=true priority=critical url=tftp://installbox_
```

Press [Tab] to edit options

Automatic boot in 7 seconds...
Limitations

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

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

Solution:

Use a configuration management utility\(^\text{11}\) like puppet, chef, ansible, cfengine, ... , or FAI.

\(^{10}\)https://en.wikipedia.org/wiki/Comparison_of_open-source_configuration_management_software

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4. Debian-LAN: Fully Automatic Installation with FAI
   - 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
- flexibility to implement local modifications and extensions
- only use Debian stable repositories

12https://wiki.debian.org/DebianLAN
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\textsuperscript{12}https://wiki.debian.org/DebianLAN
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
- ...
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- skripts
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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 space¹³ (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)
```

¹³The config space is a certain directory structure with text files.
Fully Automatic Installation (FAI): Class Concept

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```

\(^{13}\)The config space is a certain directory structure with text files.
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

---

14 https://sources.debian.net/src/debian-lan-config/0.21/fai/config/package_config/FIREWALL/
15 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\(^\text{16}\) in the Debian-LAN FAI config space:

| 1  | FAIBASE              | 8  | LOG_SERVER  |
| 2  | DEBIAN               | 9  | PROXY       |
| 3  | FAISERVER            | 10 | NTP_SERVER  |
| 4  | LVM8_A               | 11 | DNS_SERVER  |
| 5  | DISKLESS_SERVER      | 12 | NFS_SERVER  |
| 6  | FIREWALL             | 13 | MAIL_SERVER |
| 7  | CUPS_SERVER          | 14 | LDAP_CLIENT |
| 15 | LDAP_SERVER          |
| 16 | KERBEROS_CLIENT      |
| 17 | KERBEROS_KDC         |
| 18 | KDC_LDAP             |
| 19 | SERVER_A             |
| 20 | GOSA                 |

Workstations map onto:

| 1  | FAIBASE              | 5  | CUPS_CLIENT  |
| 2  | DEBIAN               | 6  | LOG_CLIENT   |
| 3  | DHCPC                | 7  | LDAP_CLIENT  |
| 4  | LVM5_A               | 8  | NFS_CLIENT   |
| 9  | KERBEROS_CLIENT      |
| 10 | CLIENT_A             |
| 11 | XORG                 |
| 12 | DESKTOP              |

---

\(^{16}\) [https://sources.debian.net/src/debian-lan-config/0.21/fai/config/class/50-host-classes/](https://sources.debian.net/src/debian-lan-config/0.21/fai/config/class/50-host-classes/)
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10. NTP_SERVER
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2. DEBIAN
3. DHCPC
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---

16. https://sources.debian.net/src/debian-lan-config/0.21/fai/config/class/50-host-classes/
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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- dependent on the associated classes:
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Summary and Conclusions

- 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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- For more complex installations: Take a look at FAI and Debian-LAN.
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!