apt install YOUR-NEIGHBORHOOD

Automatic Installation of Debian GNU/Linux

Andreas B. Mundt
andi@debian.org

InstallBox
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

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

12:00h bis 14:00h, Raum W1

Debian GNU/Linux
Install-Party

Laptop/Rechner mitbringen
Debian ausprobieren und installieren (Dual Boot*)

Eintritt frei!

Debian ist ein komplettes Betriebssystem, bestehend aus freier Software:
Web-Browser, Office-Programme, E-Mail, Bildbearbeitung, Multimedia...

Freie Software sind Programme, deren Lizenz die Freiheit der
Benutzer in den Mittelpunkt stellt. Dazu gehört die Kontrolle der
Software (durch Verfügbarkeit der Quellcodes für Analyse und
Änderungen) sowie die Erlaubnis, diese Programme samt Ver-
besserungen zu vertreiben.

Andreas B. Mundt
... what about more and more installations ...???
Idea:
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.
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
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
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
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:**

```bash
apt install etckeeper
```

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

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

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iface eth1 inet static
    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=eth1
+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:

```bash
-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:

```
systemctl restart dnsmasq.service
```

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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-loc</td>
<td>net</td>
<td>ACCEPT</td>
</tr>
<tr>
<td>+loc</td>
<td>all</td>
<td>ACCEPT</td>
</tr>
<tr>
<td>+$FW</td>
<td>all</td>
<td>ACCEPT</td>
</tr>
</tbody>
</table>

Modify `/etc/shorewall/rules`:

<p>| | | |</p>
<table>
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<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-SSH(ACCEPT)</td>
<td>loc</td>
<td>$FW</td>
</tr>
<tr>
<td>+SSH(ACCEPT)</td>
<td>all</td>
<td>$FW</td>
</tr>
</tbody>
</table>

- DHCP IP address
- DNS resolution
- PXE installer boot
- web access
- package cache
Package Cache: squid

Install squid3

```bash
apt install squid3
```

/etc/squid3/squid3.conf

```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)(|\.z2|\.gz|\.xz)$  \\
0 0% 0 refresh-ims
+refresh_pattern \\
/Release(\.|\gp$ 0 0% 0 refresh-ims
+refresh_pattern \\
/InRelease$ 0 0% 0 refresh-ims

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>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>#</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 ...
```

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

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

<table>
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<tr>
<th>Debian Installer (jessie, amd64)</th>
<th>[SUB-MENU]</th>
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</table>

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.

---

https://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
```

6https://www.debian.org/releases/jessie/example-preseed.txt

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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/tftproot
mkdir -p d-i/jessie/
cp /path/to/preseed.cfg /var/lib/tftproot/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](https://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/initramfs-788 initrd=::/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[1621]: (process:1525): udhcpc (v1.22.1) started
Jun 10 16:51:53 main-menu[1621]: (process:1525): Sending discover...
Jun 10 16:51:53 main-menu[1621]: (process:1525): Sending select for 192.168.0.71...
Jun 10 16:51:53 main-menu[1621]: (process:1525): Lease of 192.168.0.71 obtained, lease time 3600
Jun 10 16:51:53 main-menu[1621]: DEBUG: resolver (libc6-udeb): package doesn’t exist (ignored)
Jun 10 16:51:53 main-menu[1621]: INFO: Menu item ‘network-preseed’ selected
Jun 10 16:51:53 main-menu[1621]: DEBUG: resolver (libc6-udeb): package doesn’t exist (ignored)
Jun 10 16:51:53 main-menu[1621]: 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-amd64/images/788 initrd=::/debian-installer/jessie/amd64/initrd.gz url=tftp://installbox_
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.

```
> /usr/bin/bash
```

Jun 10 16:51:53 main-menu[162]: INFO: Menu item 'network-preseed' selected
Jun 10 16:
Jun 10 16:
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
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Jun 10 16:51:53 main-menu[162]: INFO: Menu item 'choose-mirror' selected
Jun 10 16:51:53 anaconda: Queueing udeb apt-mirror-setup for later installation

```
> ::/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](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](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](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](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

Debian Installer (Jessie : amd64 + Preseed)

Debian Installer (jessie, amd64) [SUB-MENU]
Debian Installer (jessie, i386) [SUB-MENU]

Press [Tab] to edit options

Automatic boot in 7 seconds...
Debian-Installer netboot overview menu

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```
.:debian-installer/jessie/amd64/linux initrd=.: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\(^{11}\) like puppet, chef, ansible, cfengine, ..., or FAI.

\(^{11}\)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 Debian-LAN Project\textsuperscript{12}

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

\textsuperscript{12}\url{https://wiki.debian.org/DebianLAN}
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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
- ...
Fully Automatic Installation (FAI): Class Concept

**FAI Classes**
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- MAIL_SERVER
- LDAP_CLIENT
- LDAP_SERVER
- KERBEROS_CLIENT
- KERBEROS_KDC
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**Implementation**
- skripts
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Andreas B. Mundt
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Andreas B. Mundt
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Dornbirn, Nov 2015
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- 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’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 (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)
```

13 The config space is a certain directory structure with text files.
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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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\(^{15}\) https://sources.debian.net/src/debian-lan-config/0.21/fai/config/scripts/FIREWALL/
The Debian-LAN FAI Classes

The **mainserver** maps onto the following classes\(^\text{16}\) in the Debian-LAN FAI config space:

1. FAIBASE
2. DEBIAN
3. FAISERVER
4. LVM8_A
5. DISKLESS_SERVER
6. FIREWALL
7. CUPS_SERVER
8. LOG_SERVER
9. PROXY
10. NTP_SERVER
11. DNS_SERVER
12. NFS_SERVER
13. MAIL_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
2. DEBIAN
3. DHCP
4. LVM5_A
5. CUPS_CLIENT
6. LOG_CLIENT
7. LDAP_CLIENT
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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<td>9</td>
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<tr>
<td>3</td>
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<td>LVM8_A</td>
<td>11</td>
</tr>
<tr>
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<td>7</td>
<td>CUPS_SERVER</td>
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</tbody>
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---

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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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!