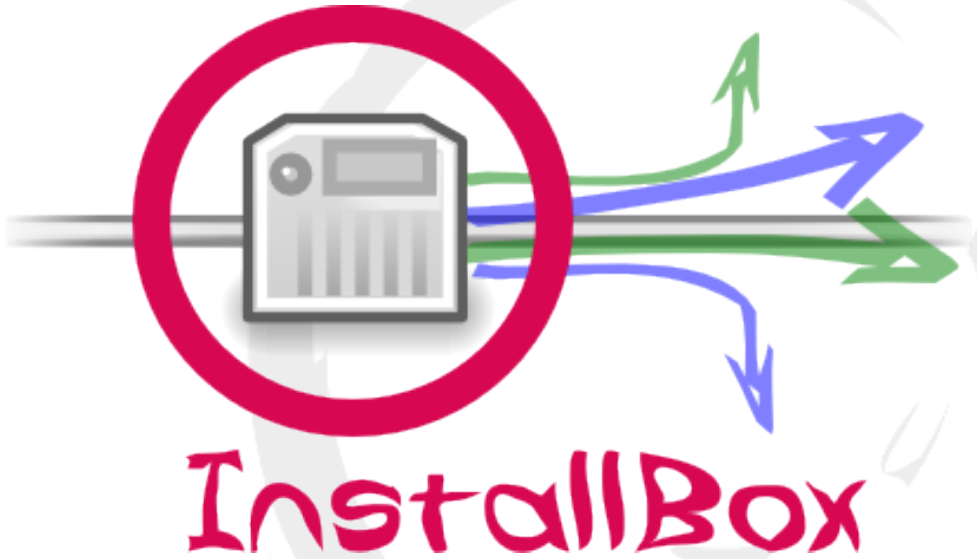
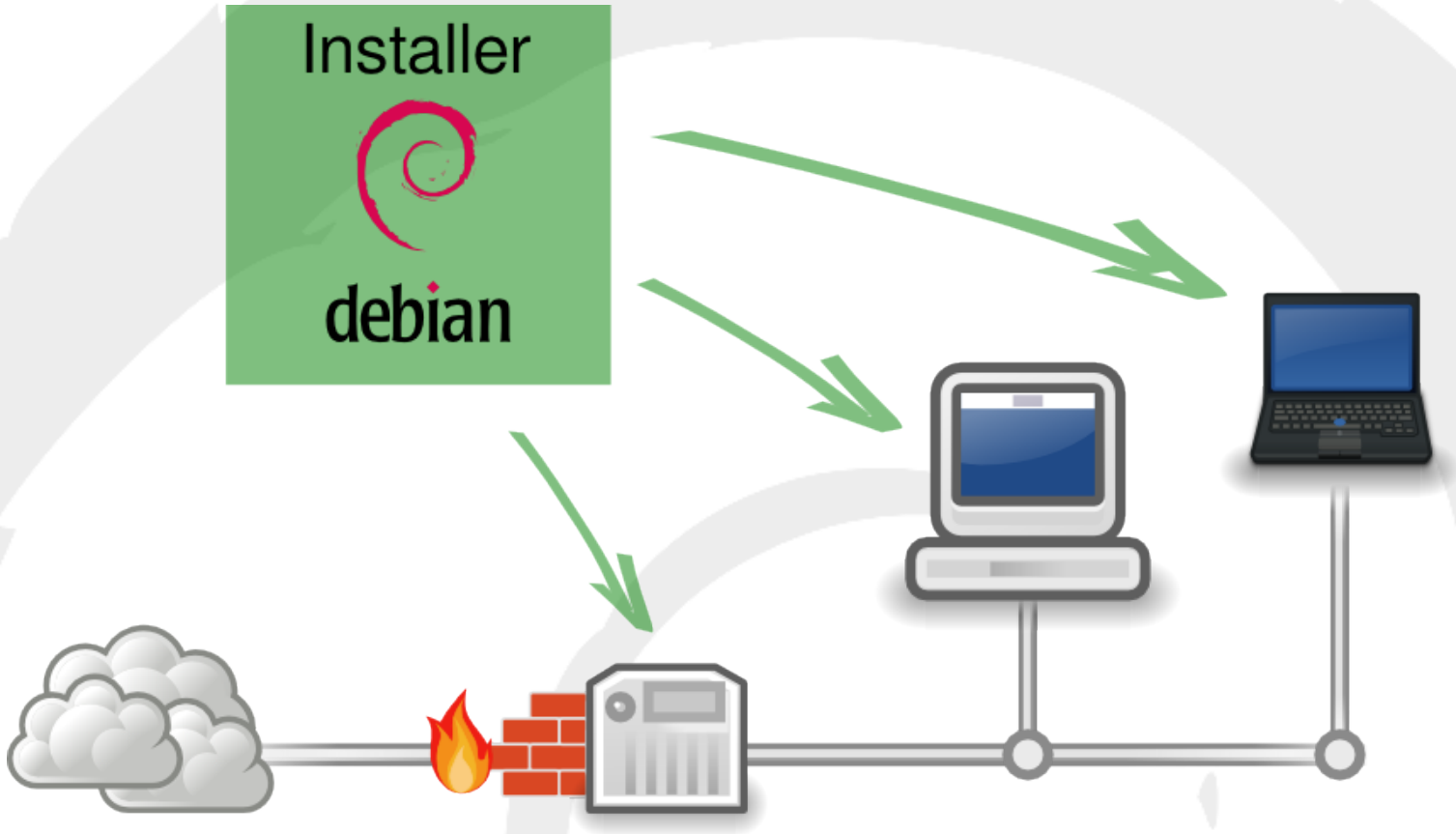
apt install YOUR-NEIGHBORHOOD

Automatic Installation of Debian GNU/Linux

Andreas B. Mundt
andi@debian.org

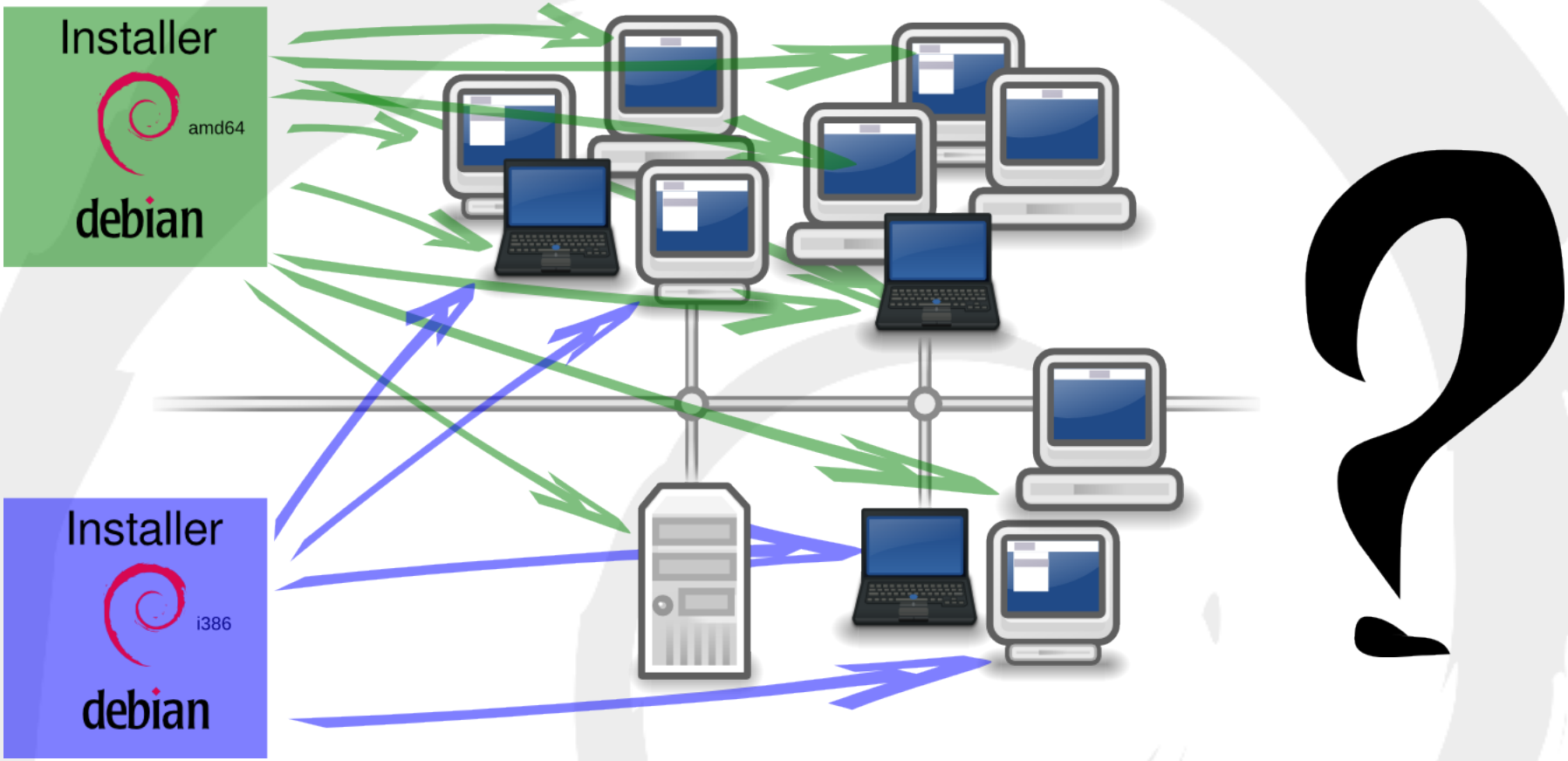


How to install and configure Debian GNU/Linux?

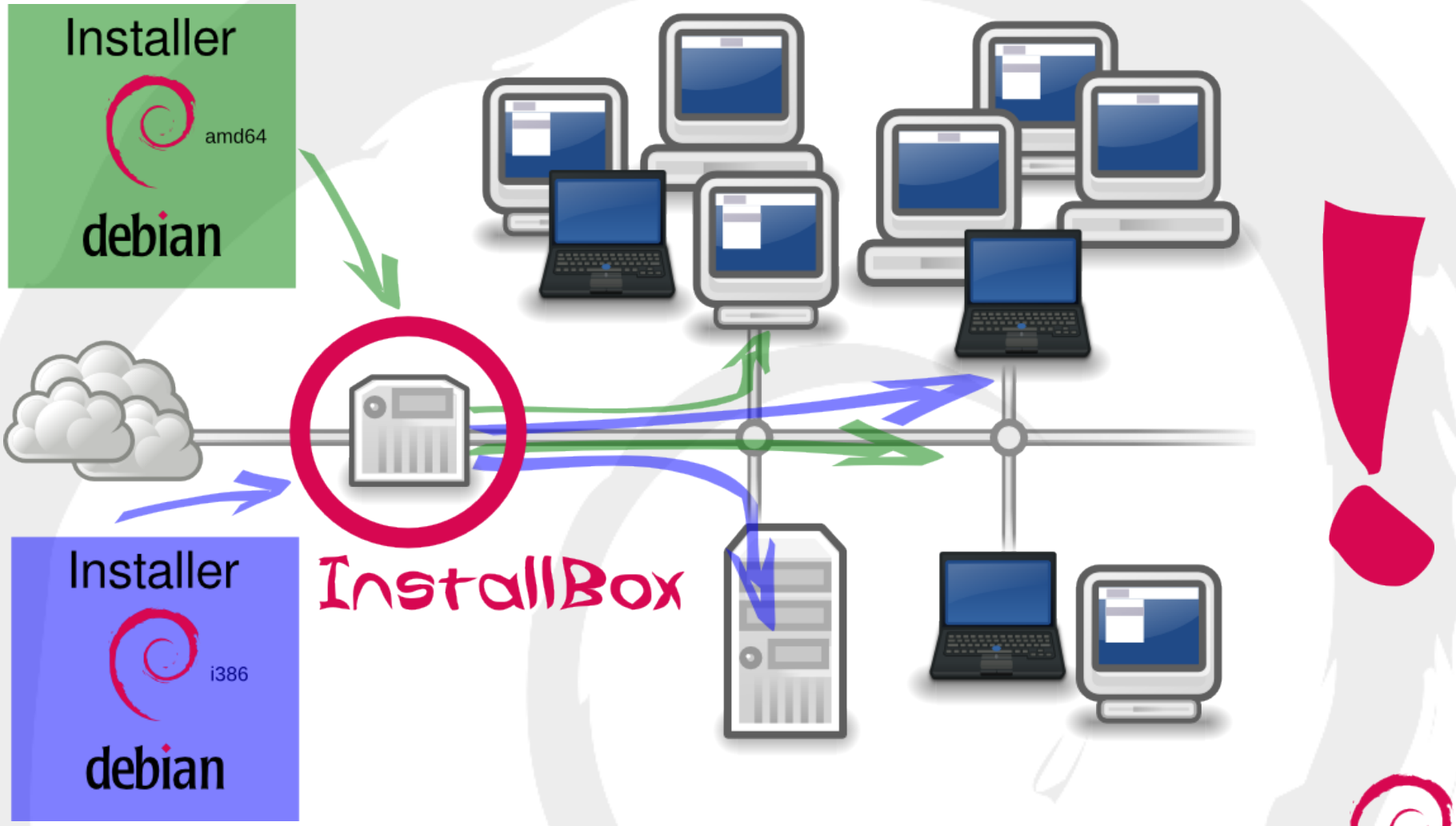


- fetch installer media
- run the installation
- boot the system
- manual configuration

. . . what about more and more installations . . . ???



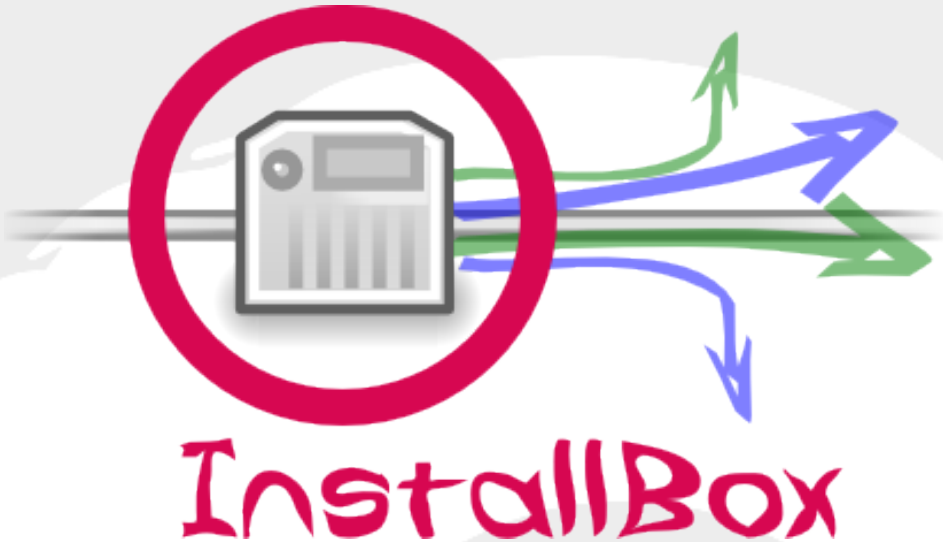
Idea:



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

The InstallBox



- **(Virtual) Hardware**
  - 2 NICs
  - $\sim$ 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

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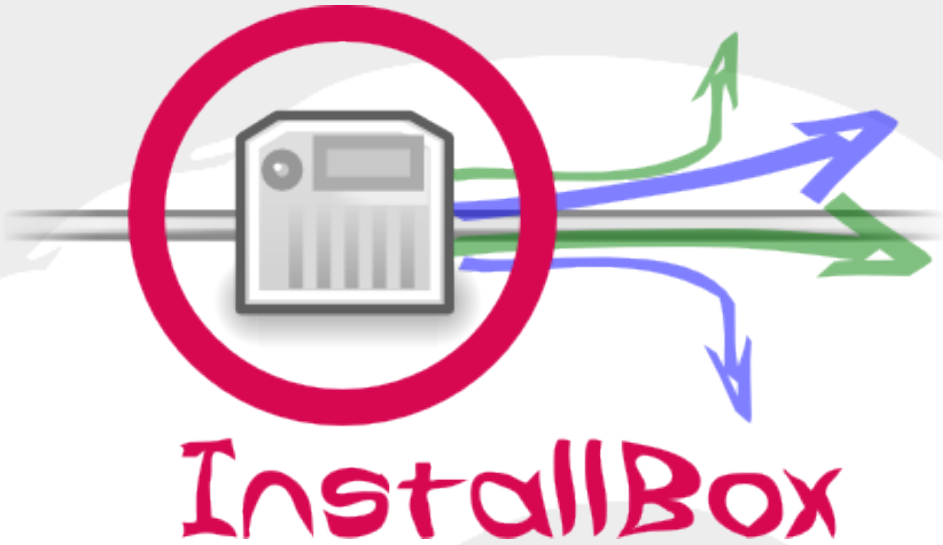

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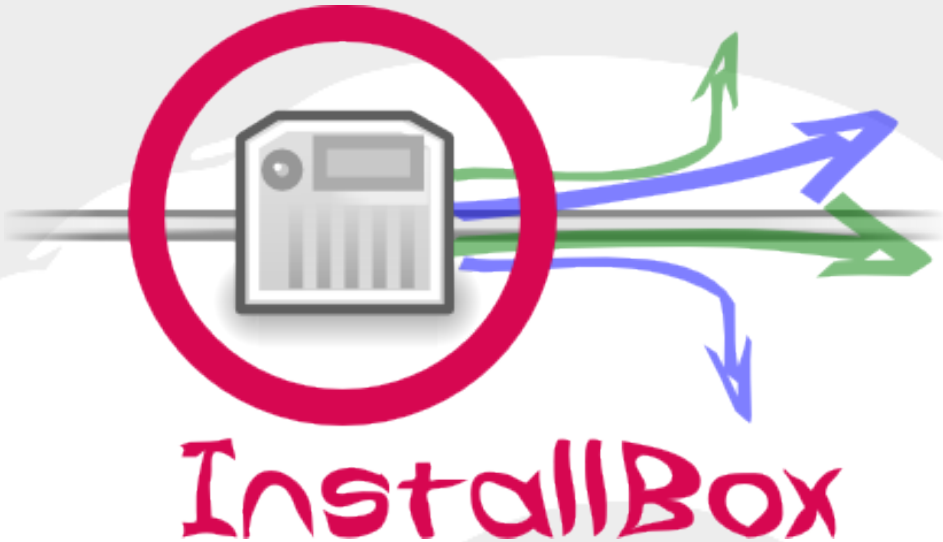

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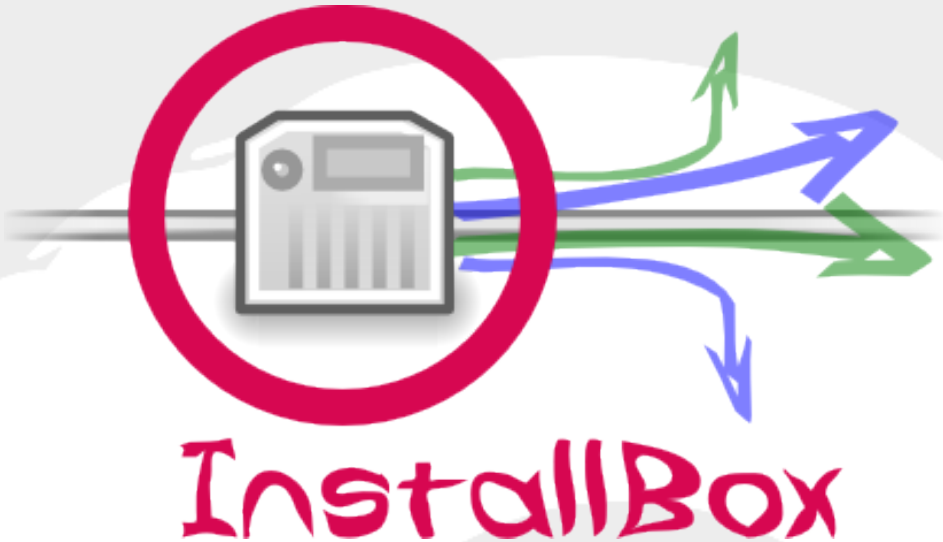

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2. The InstallBox: Installation and Configuration
   - DHCP and DNS: dnsmasq
   - TFTP and Netboot Installer: di-netboot-assistant
   - IP-Forwarding: shorewall
   - Redirection and Package Cache: squid
3. Preseeding
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DHCP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

Summary: Effective /etc/dnsmasq.conf

```
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:

```
systemctl restart dnsmasq.service
```

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

IP-Forwarding with shorewall[1]

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/
```

[1] 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:

```
-loc            net             ACCEPT
+loc            all             ACCEPT
+$FW            all             ACCEPT
```

Modify /etc/shorewall/rules:

```
-SSH(ACCEPT)    loc             $FW
+SSH(ACCEPT)    all             $FW
```

- ✔ 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
+acl localnet src 192.168.0.0/16         # RFC1918 possible internal

-#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
```

Package Cache: squid

Package cache[2]/etc/squid3/squid3.conf

```
 # 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

```
 ACCEPT          $FW         net         icmp
 #
+REDIRECT        loc         3129        tcp         www
```

/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

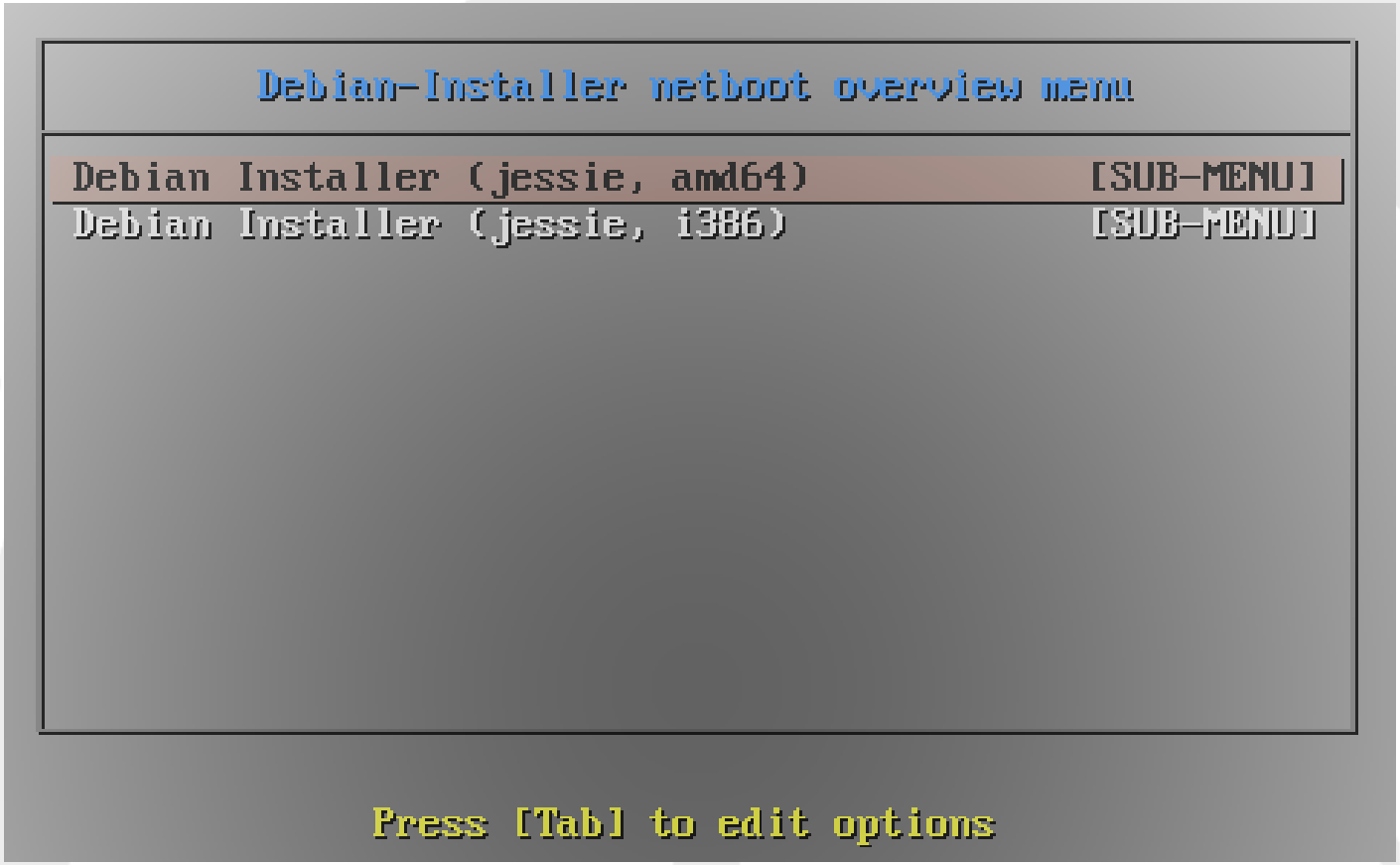
```
... TCP_MISS/200 ... GET http://.../debian-lan-config_0.21_all.deb ...
... TCP_MEM_HIT/200 ... GET http://.../debian-lan-config_0.21_all.deb ...
```

[3] Without explicitly telling clients to do so.

Done!

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

. . . PXE Booting the Client . . .



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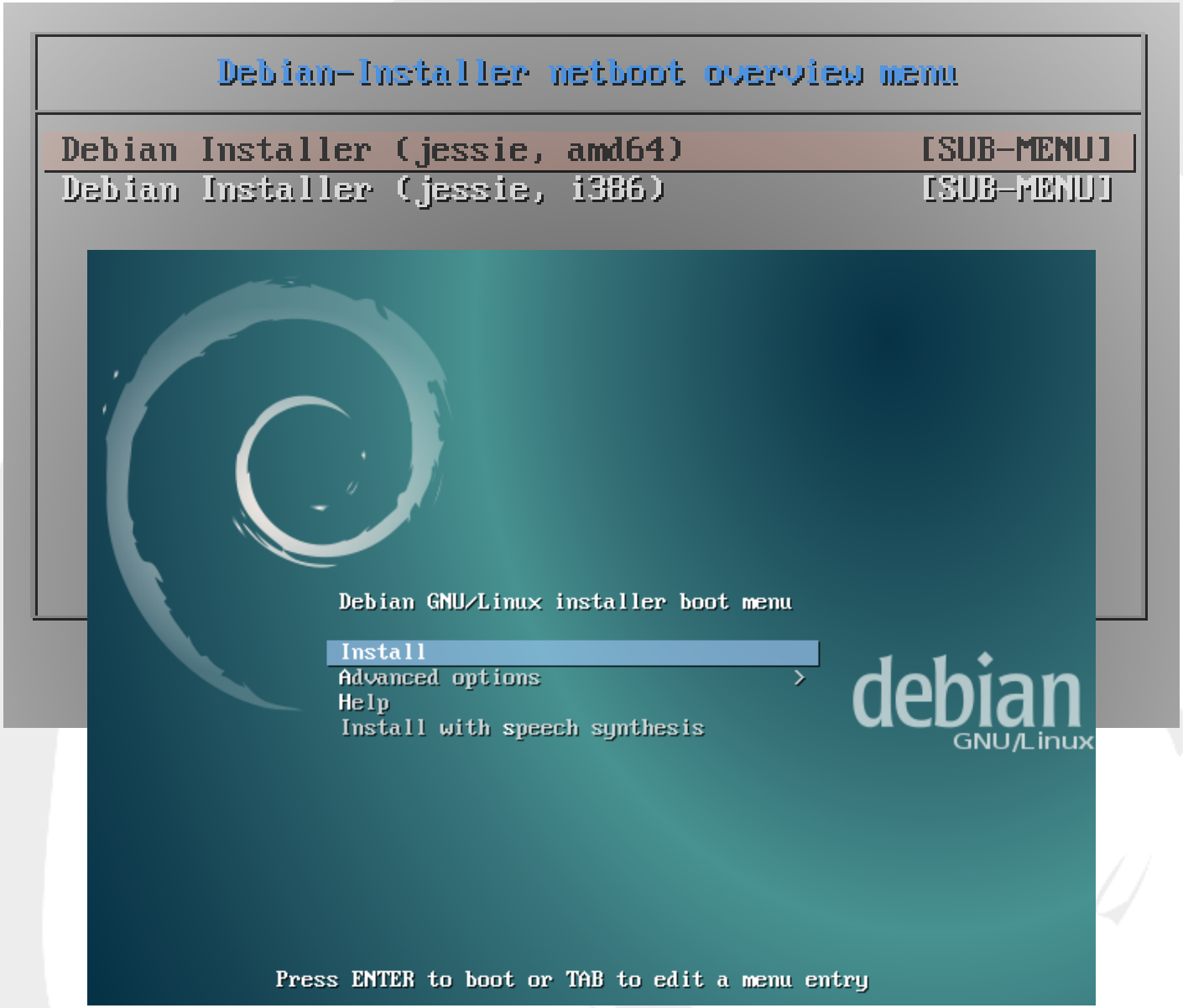

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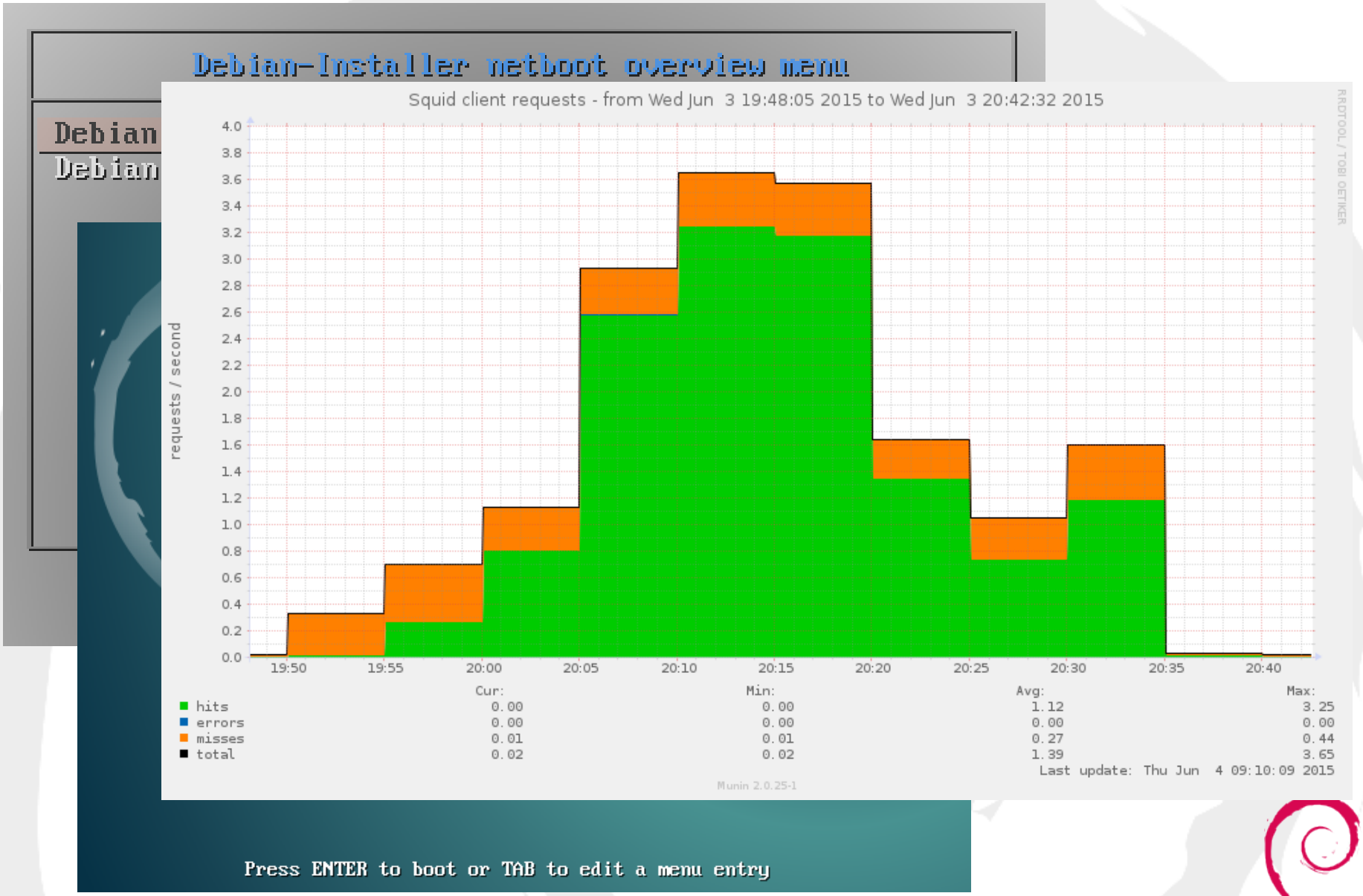
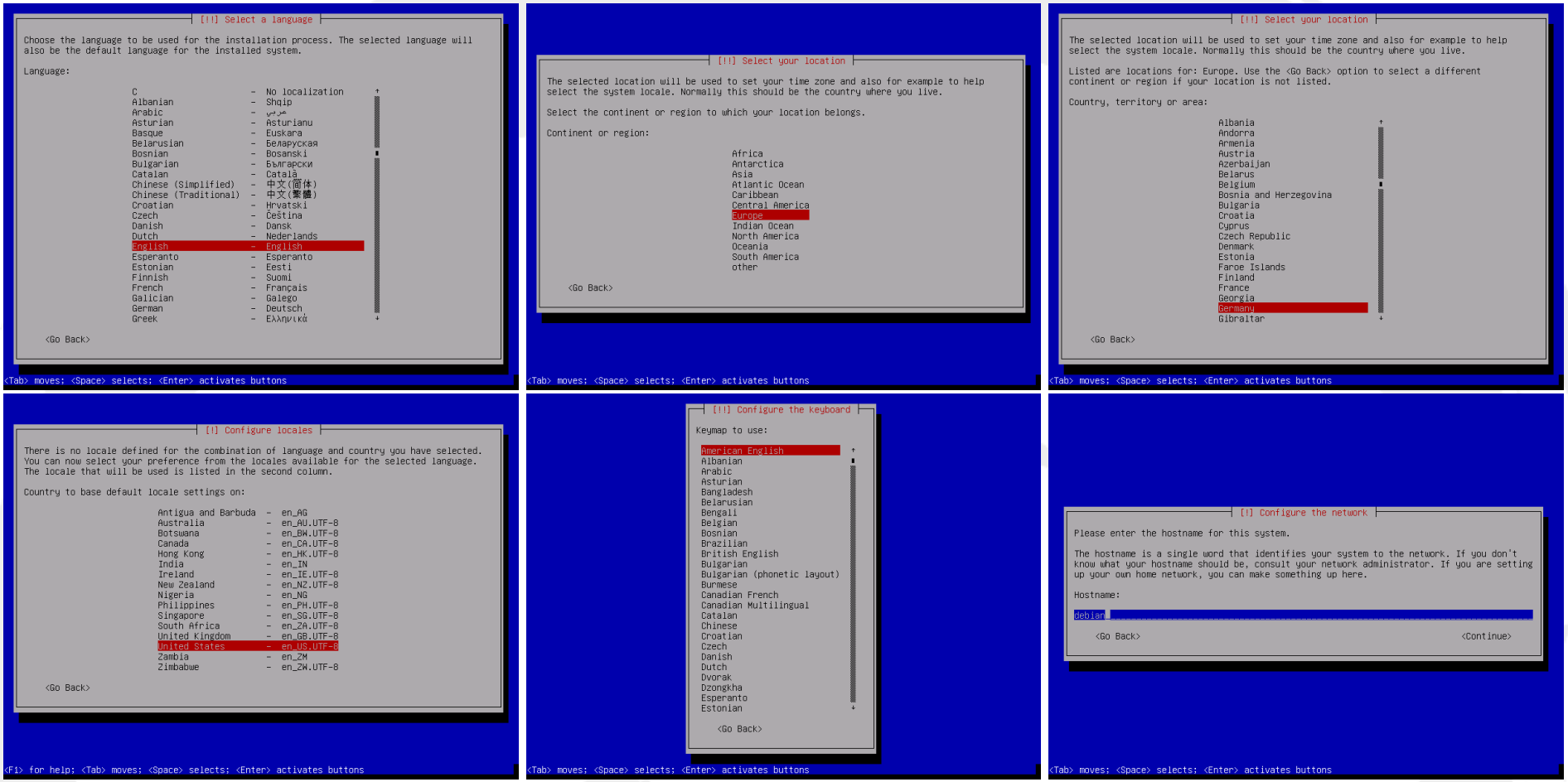


Overview

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.[4]

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

How is it done?

- Prepare a preconfiguration file[5]
- 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

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[5] 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

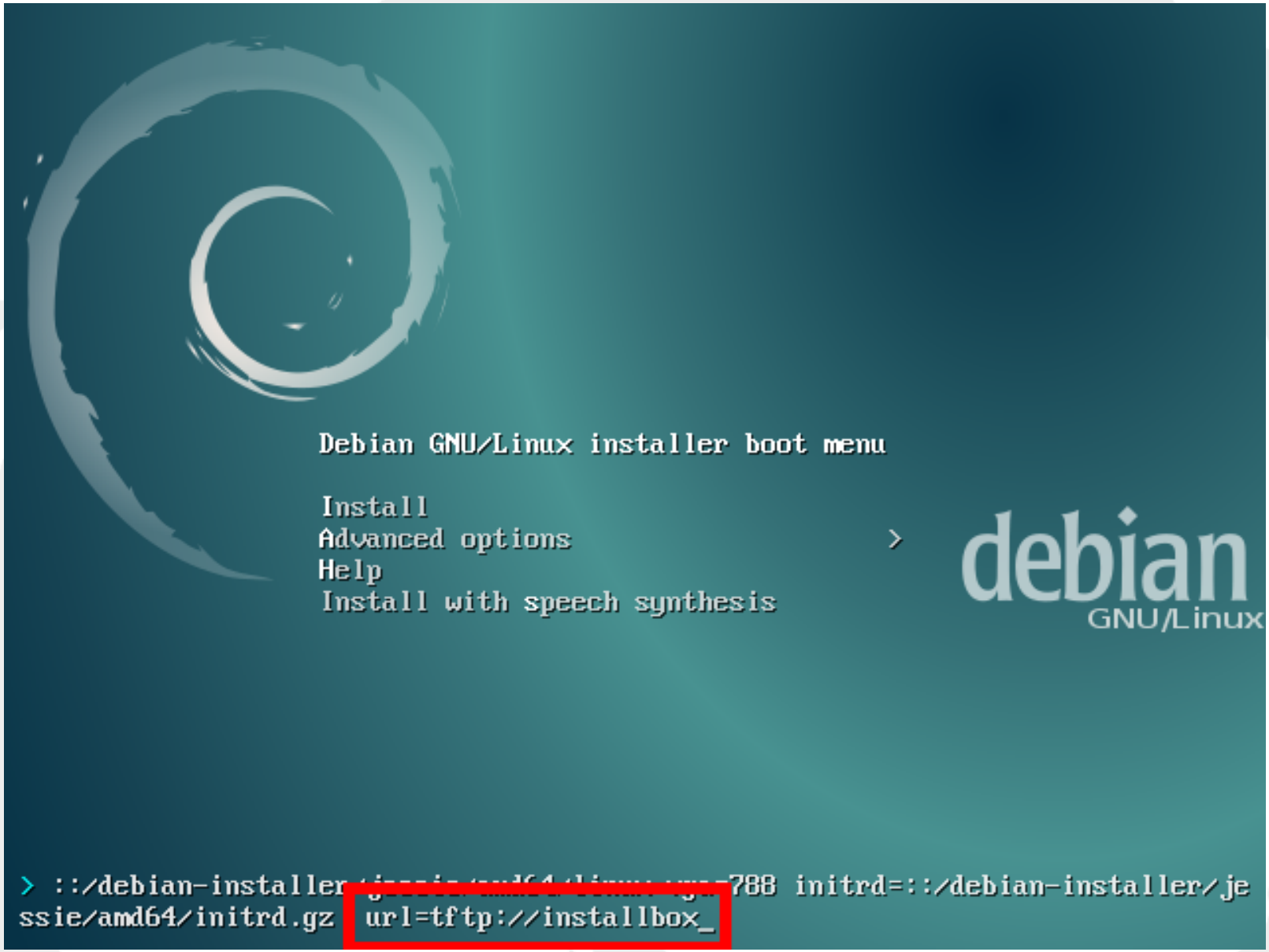
## Apt setup:
d-i apt-setup/non-free boolean true
d-i apt-setup/contrib boolean true
d-i mirror/http/mirror string ftp-stud.hs-esslingen.de
d-i mirror/http/mirror seen false

## 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



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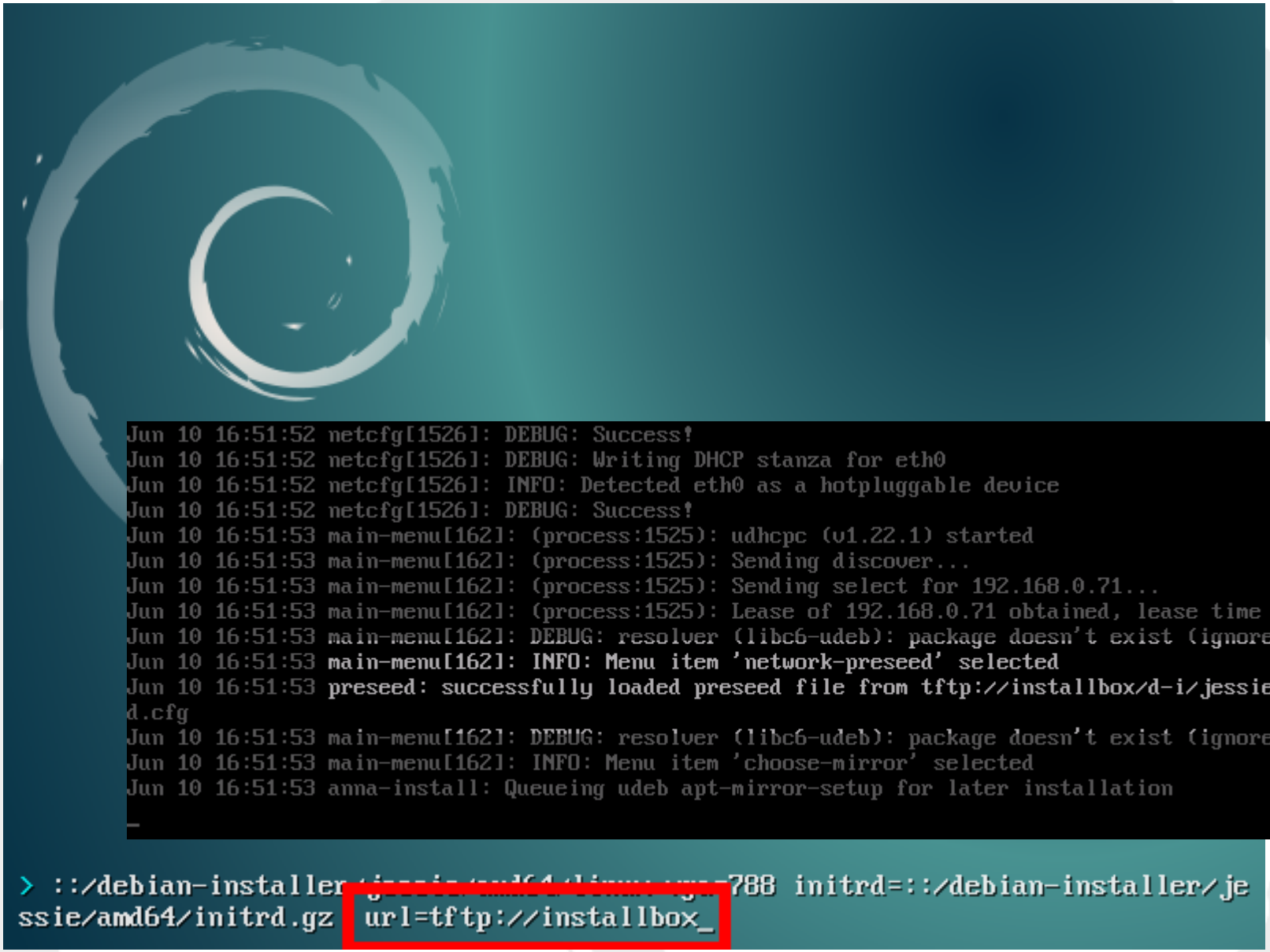

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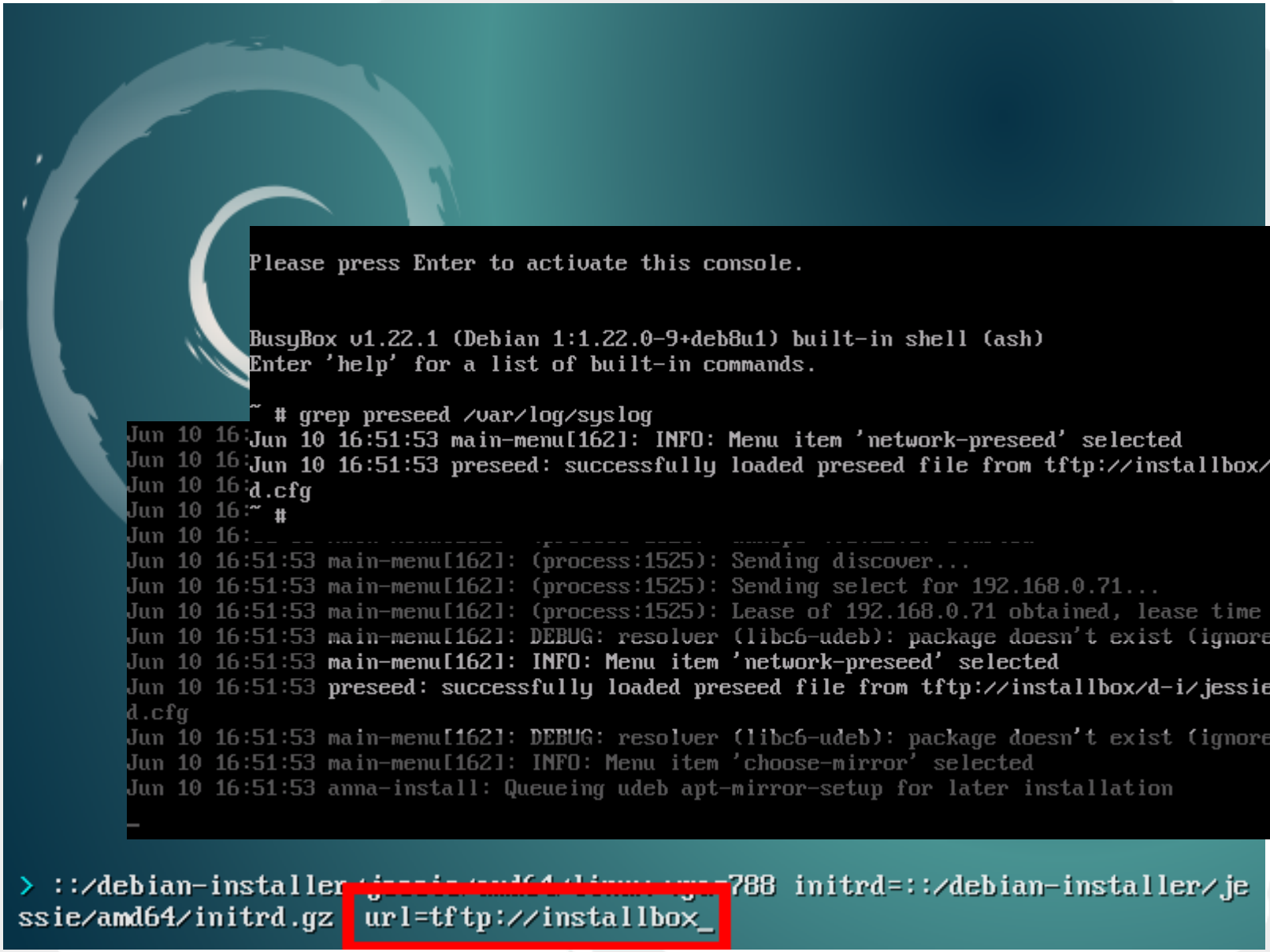
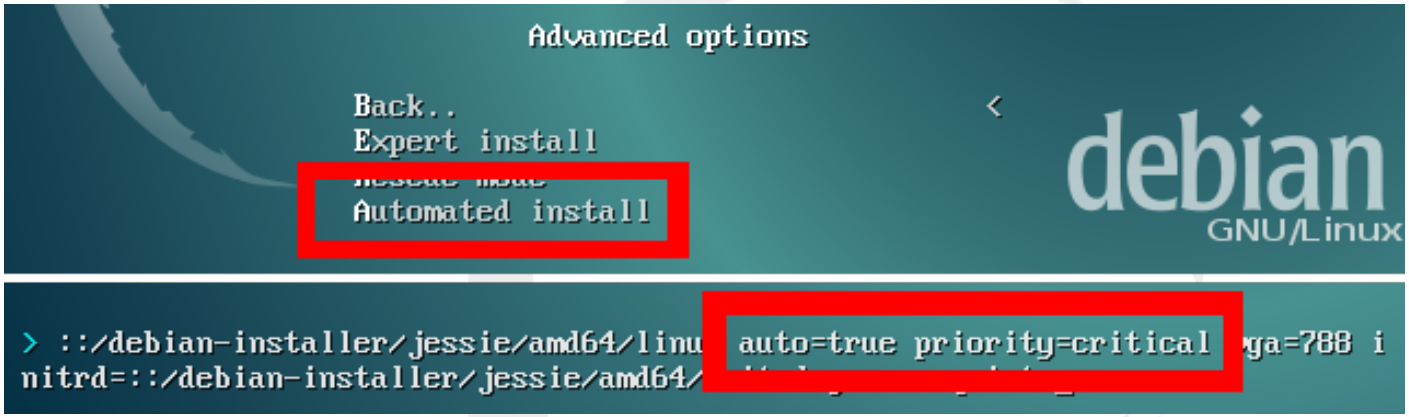


Further Notes

- 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

[7] 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

[9] 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

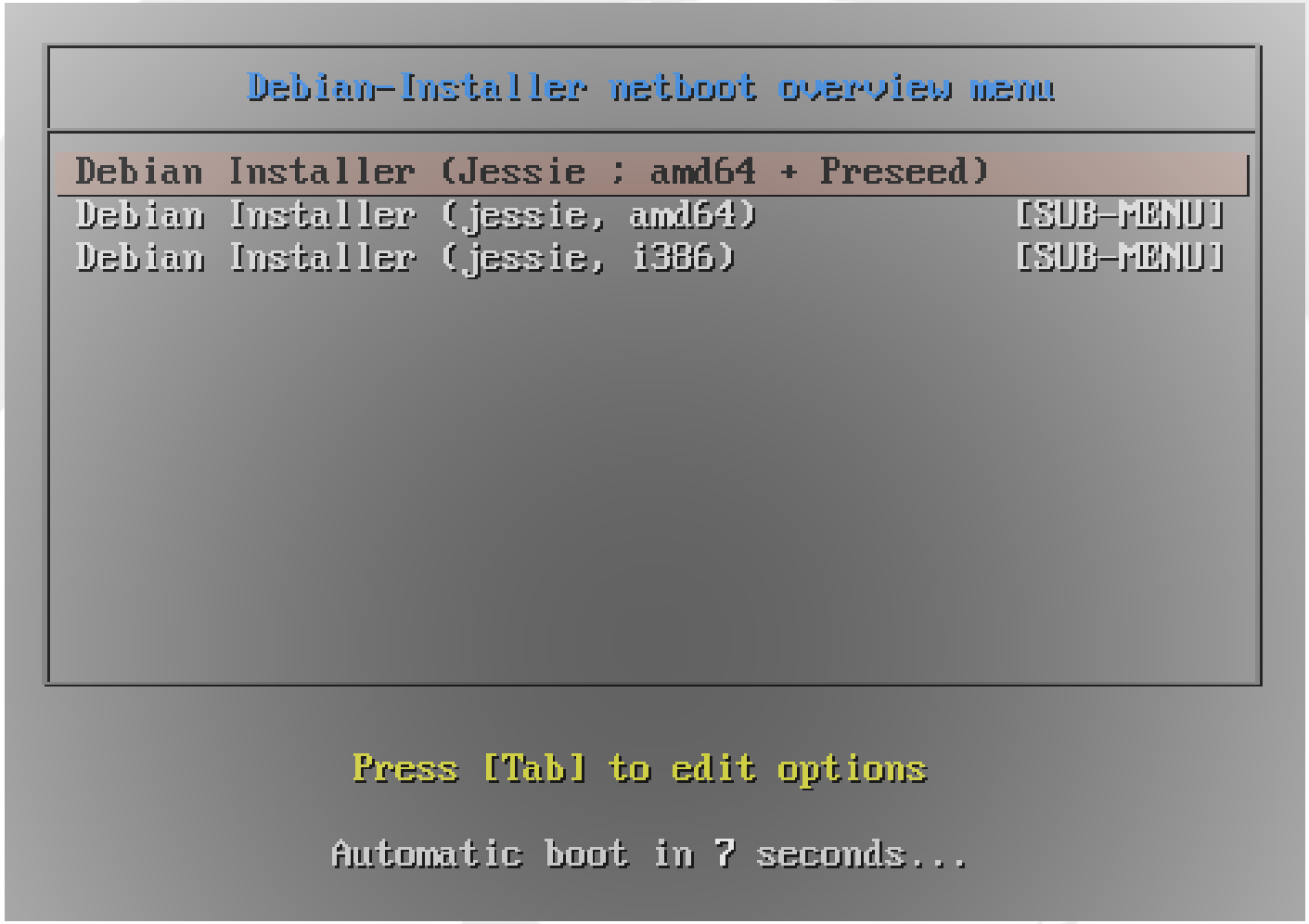
Modify /etc/di-netboot-assistant/pxelinux.HEAD:

```
+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
```

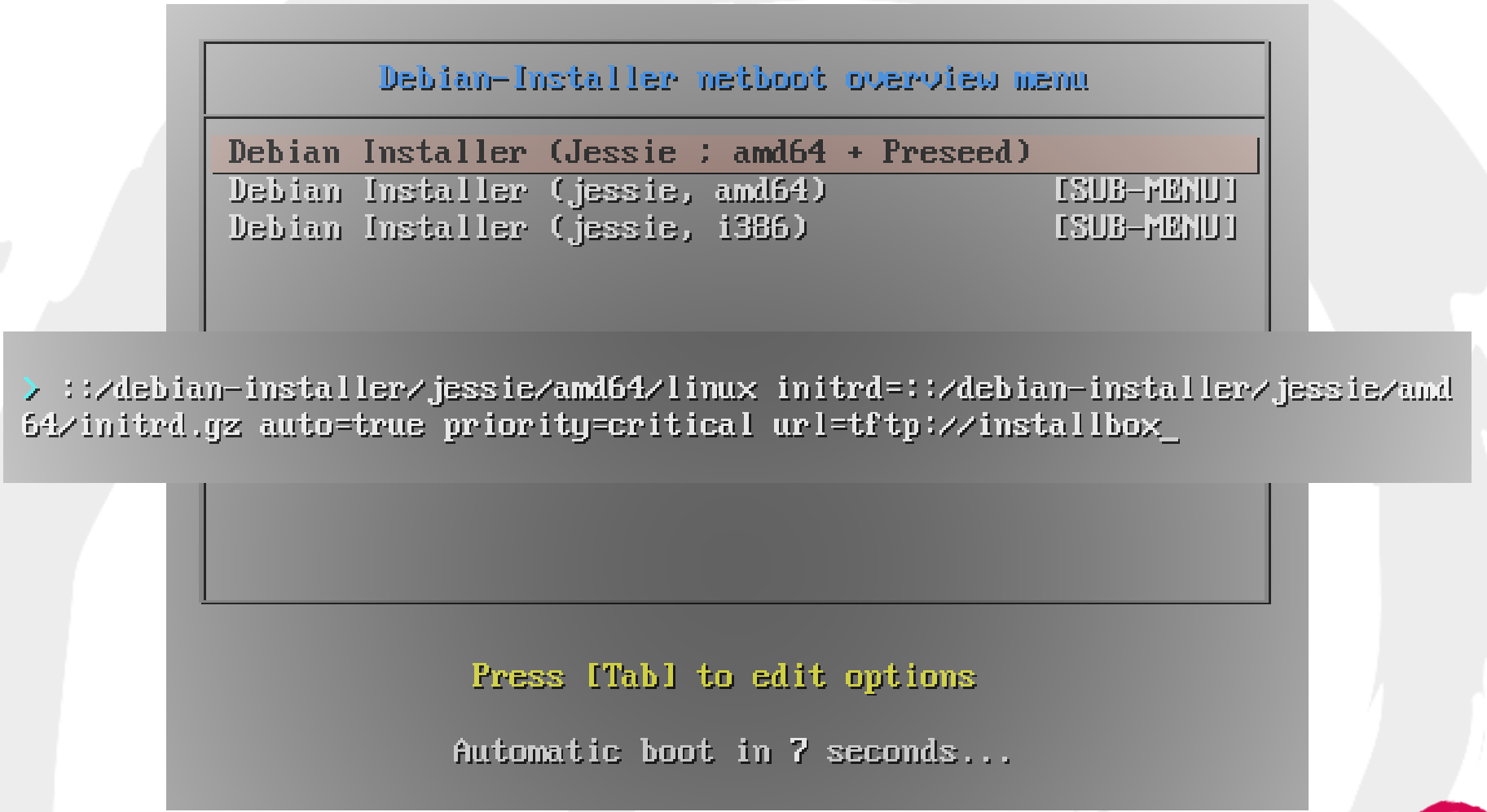
Execute:

```
di-netboot-assistant rebuild-menu
```

Done!


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...

Done!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Debian Installer (jessie, amd64) [SUB-MENU]
Debian Installer (jessie, i386) [SUB-MENU]
> ::/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, 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.

[10] https://en.wikipedia.org/wiki/Comparison_of_open-source_configuration_management_software

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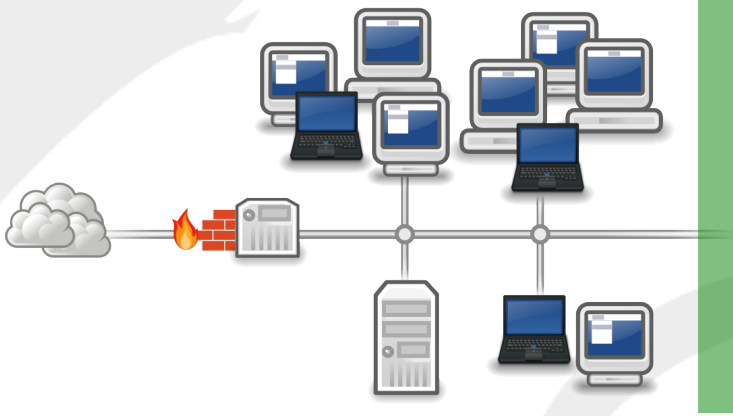
4. Debian-LAN: Fully Automatic Installation with FAI
   - The Debian-LAN Project
   - A short Introduction to FAI
   - Debian-LAN FAI Classes
   - Installation Procedure
5. Summary and Conclusions

The Debian-LAN Project[11]

The goal of the "Debian Local Area NetworkProject is to make setting up a local network as easy as possible in Debian.



debian LAN

Challenges:

- simple installation/setup, maintenance and upgrade
- flexibility to implement local modifications and extensions
- only use Debian stable repositories

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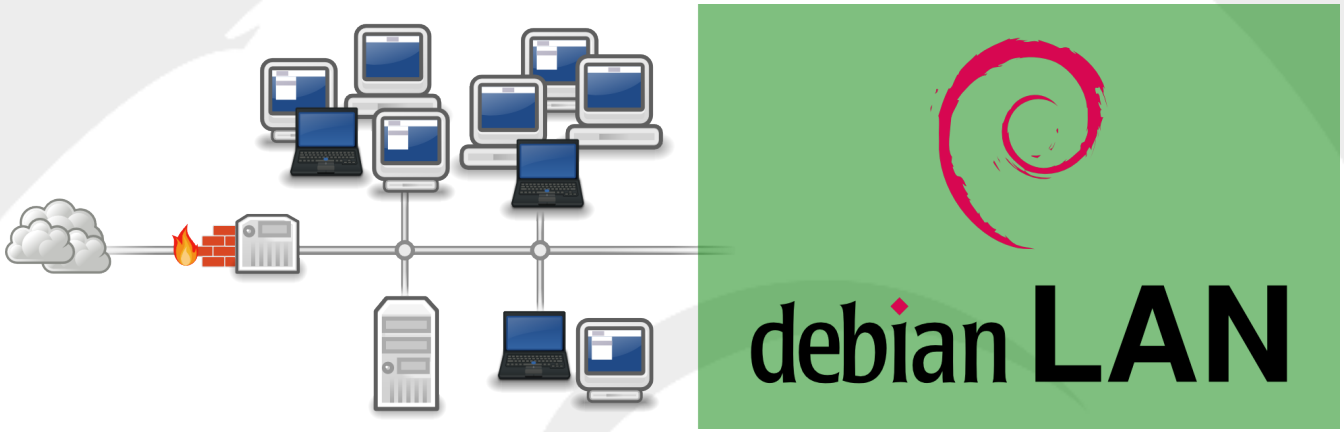

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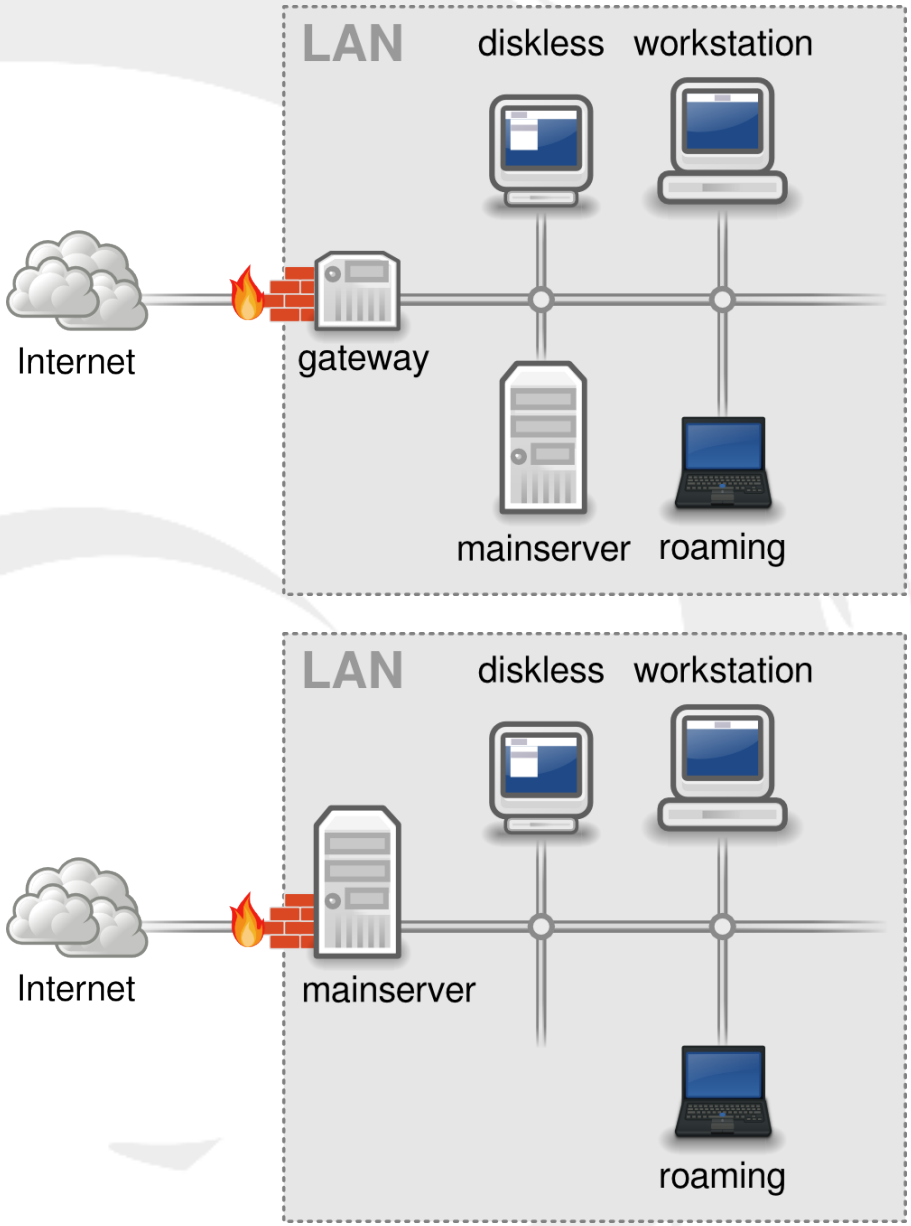
The Debian-LAN System

- **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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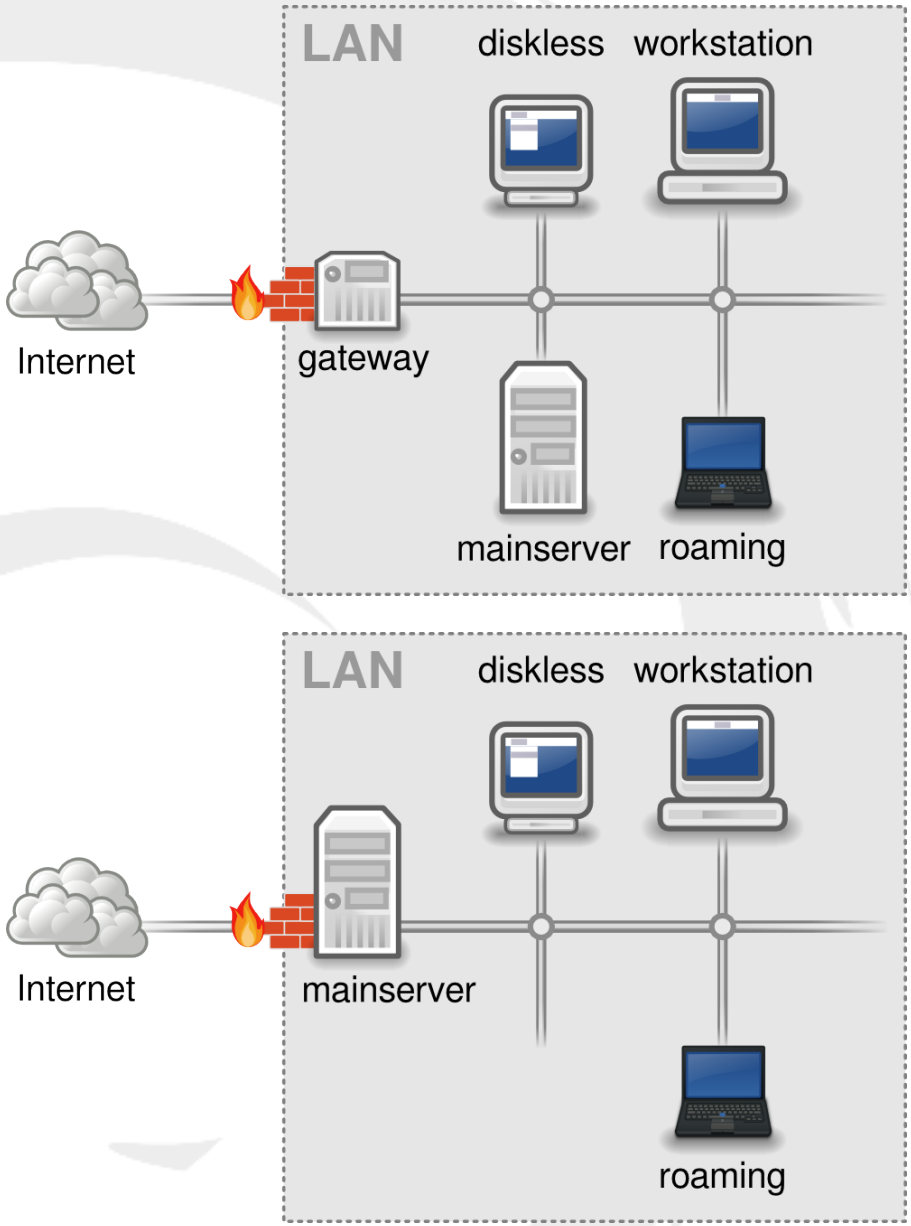

The Debian-LAN System

- **gateway:**
  - firewall, masquerading
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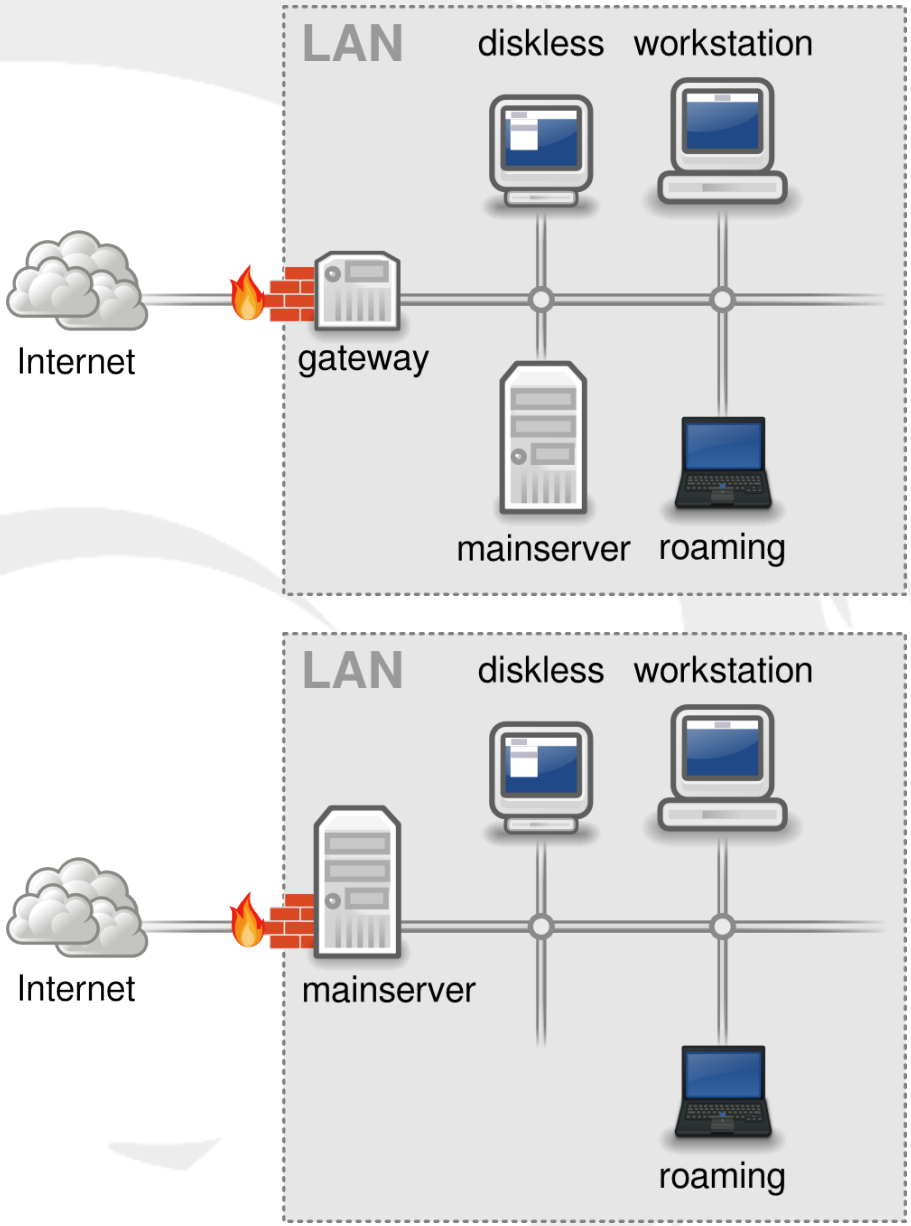

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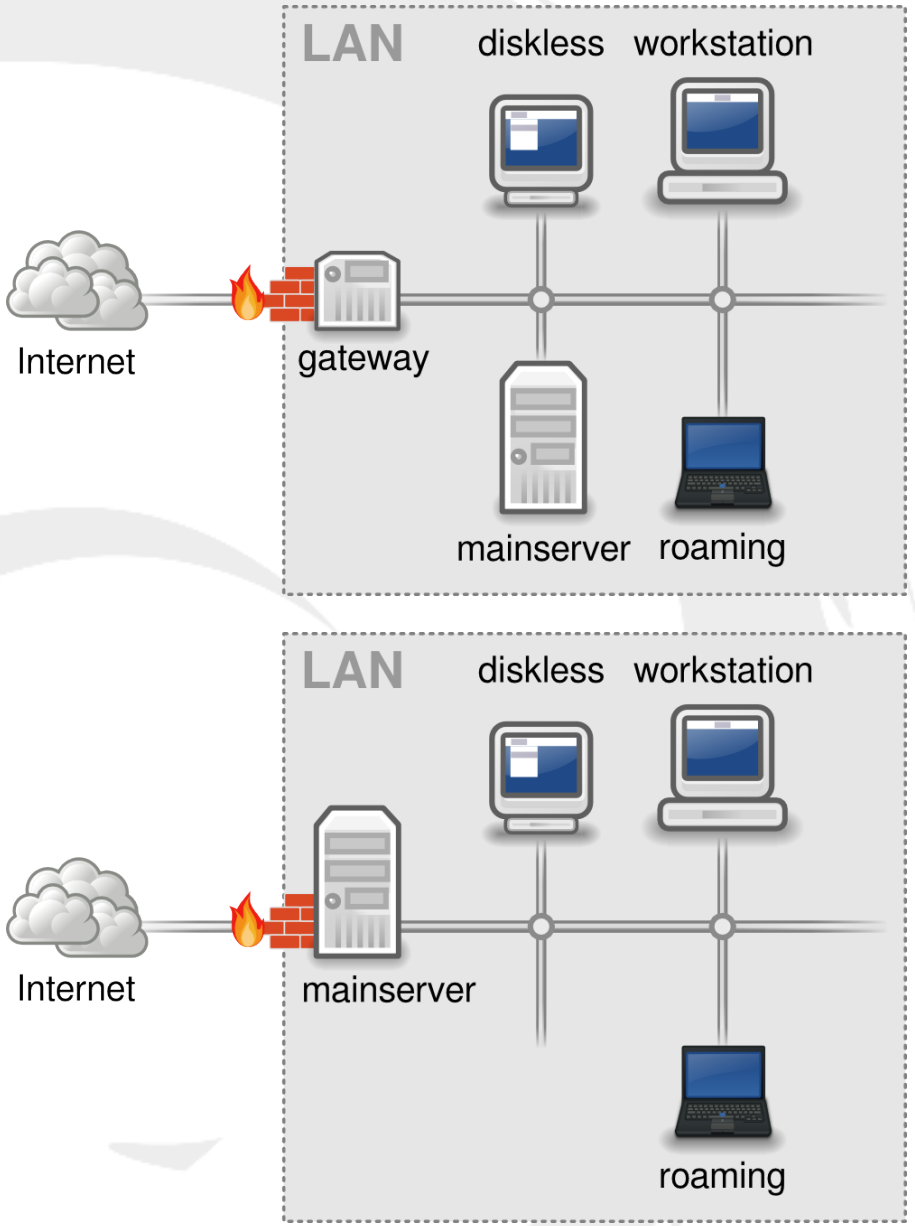

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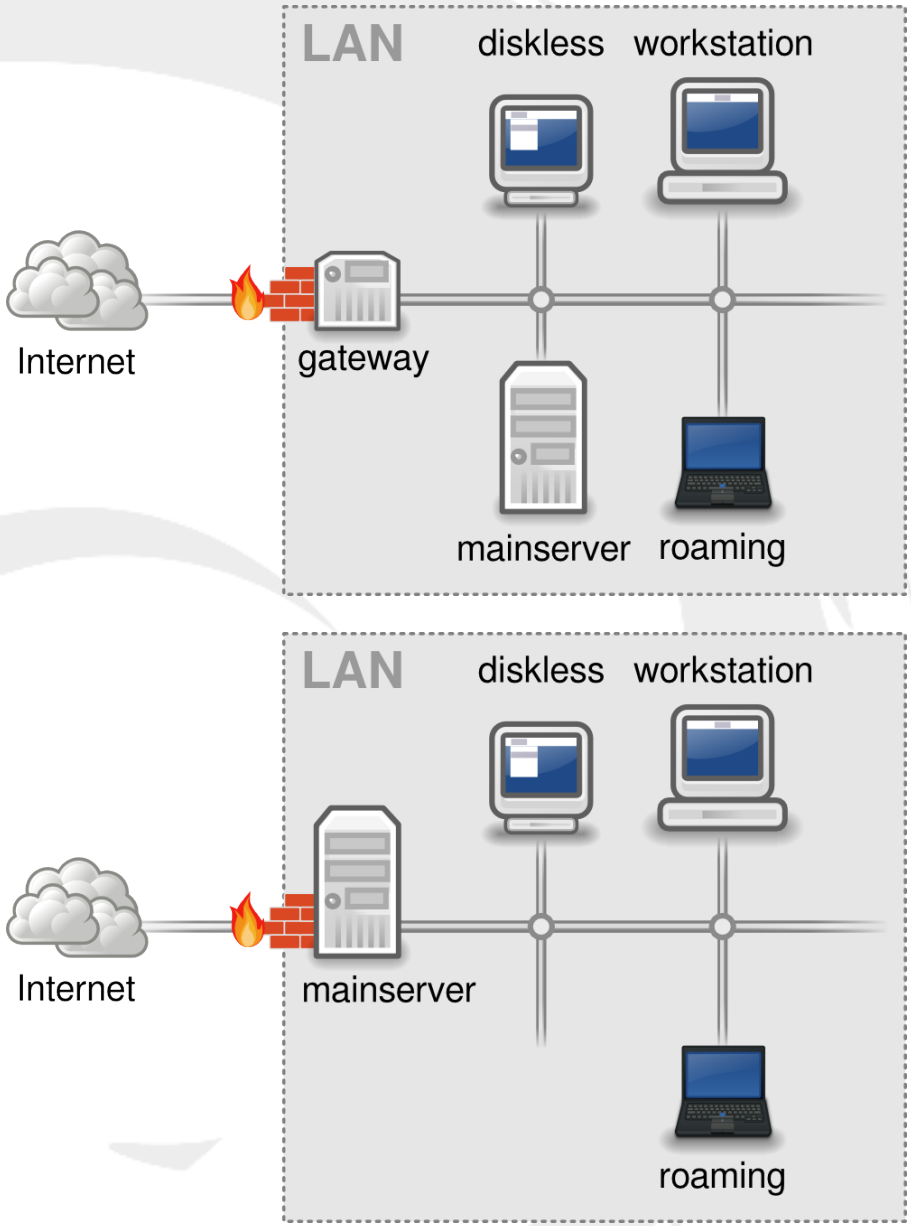

Implemented Services

- 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
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KERBEROS_CLIENT
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KDC_LDAP

Implementation

- skripts
- packages
- debconf (preseeding)
- files
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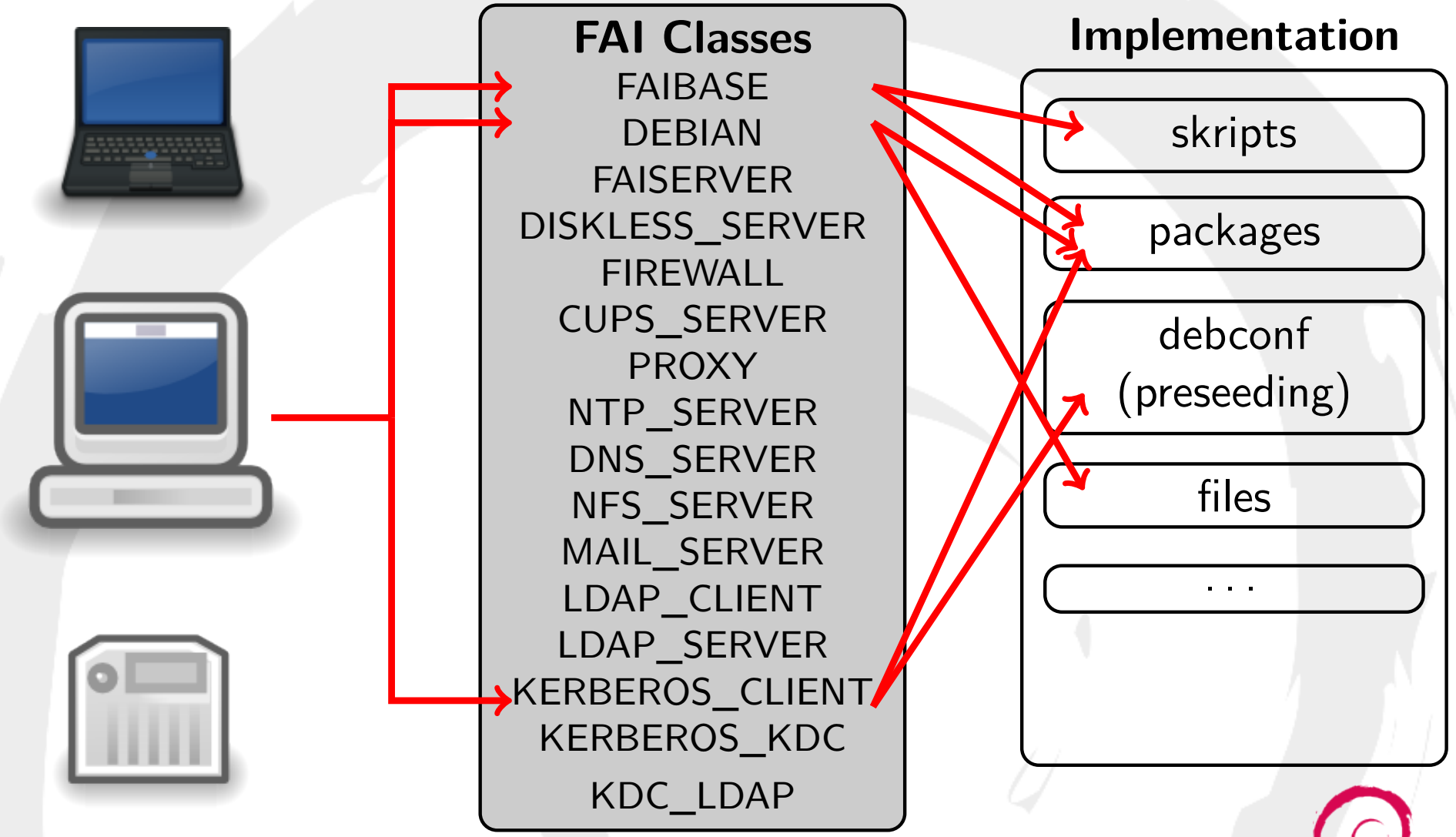

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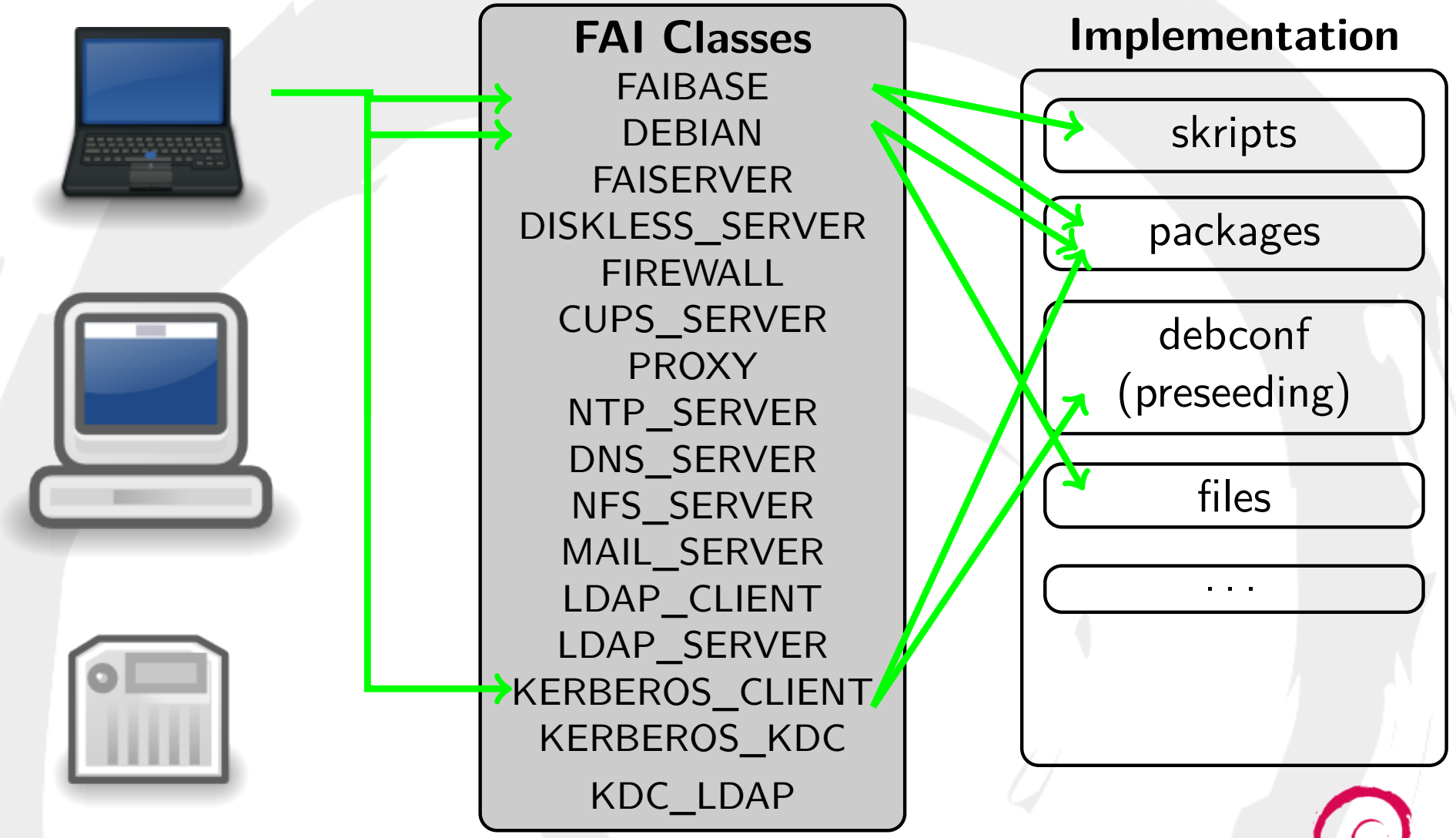

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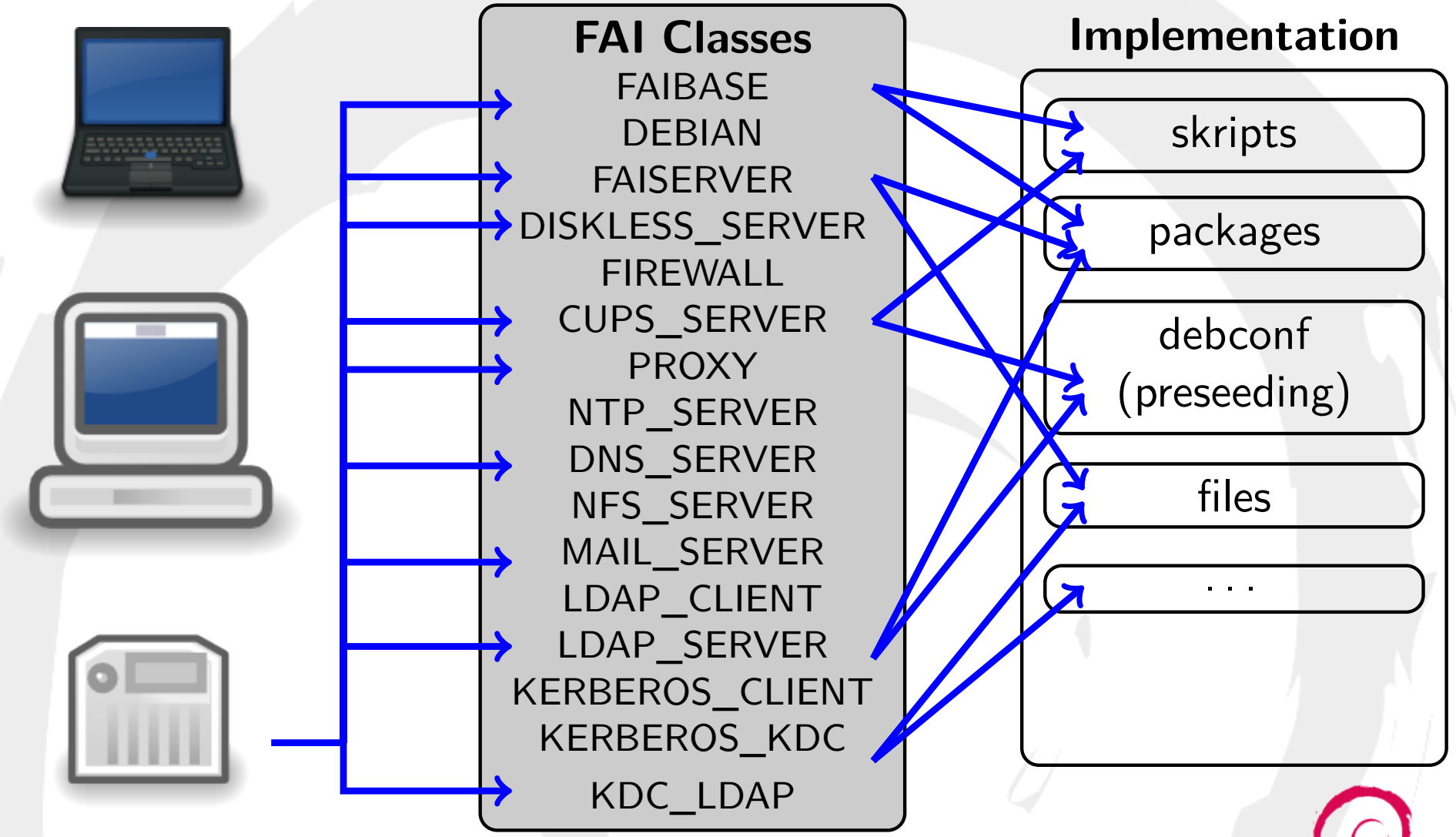

Fully Automatic Installation (FAI): Class Concept

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)
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Fully Automatic Installation (FAI): Examples

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

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FAIBASE DEBIAN DHCPC FIREWALL GATEWAY_A
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All packages defined in these classes will be installed and configured accordingly.

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

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$ find config/ -name FIREWALL
        config/package_config/FIREWALL
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- package 'shorewall' will be installed[13]
- the firewall will be configured[14]

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The mainserver maps onto the following classes[15] in the Debian-LAN FAI config space:

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7. CUPS_SERVER
8. LOG_SERVER
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13. MAIL_SERVER
14. LDAP_CLIENT
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16. KERBEROS_CLIENT
17. KERBEROS_KDC
18. KDC_LDAP
19. SERVER_A
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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
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- 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)

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- Set up your own **InstallBox** with:

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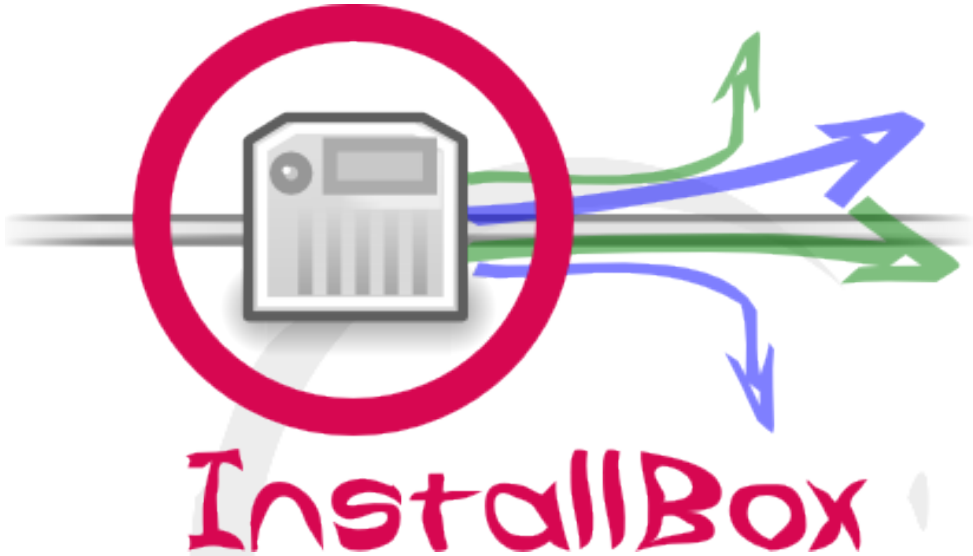

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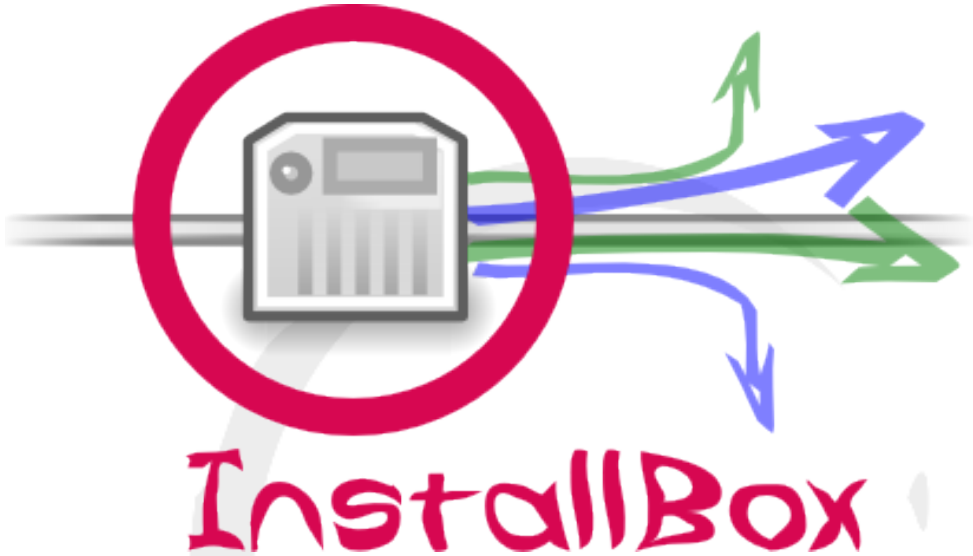

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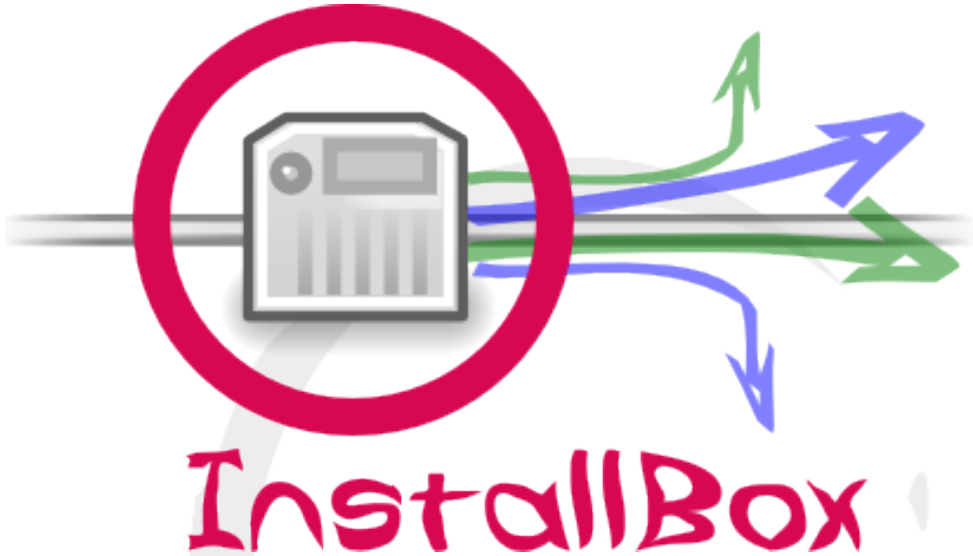

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Further Reading and Resources

- `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:

  `https://people.debian.org/~andi/Chemnitz2014.pdf`

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!