Deploy Debian in your Network the Easy and Flexible Way

Andreas B. Mundt
andi@debian.org

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Debian, the Universal Operating System

The Universal Operating System ??!!
Installing Individual Machines with the Debian Installer

The installation and configuration of a single, individual machine has been made easy by the Debian-Installer:

![Diagram showing the Debian Installer connecting to individual machines over a network.]
Debian in Enterprises

The deployment of a whole system environment with centralized user and machine management, intranet, etc. is more involved. It is usually the realm of professional full-time system administration:

Enterprise
What, if you need something in between?

A system setup for:
- schools
- work groups
- small enterprises
- NGOs
- associations
- home network
- test environments
- ...
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Debian Local Area Network

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⇒ Debian Local Area Network
Debian, the Universal Operating System!

Deploy Debian in your LAN
Outline

1. Debian, the Universal Operating System
2. Goals, Challenges and Status of Debian-LAN
3. How is it done? The Debian-LAN Installation
4. The Debian-LAN FAI Classes
5. Summary and Conclusions
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- simple installation/setup, maintenance and upgrade
- flexibility to implement local modifications and extensions
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- **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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- 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-cacher-ng
- local APT repository
- firewall (shorewall)
- etckeeper
- system backup (dirvish)
- network installation / FAI server (PXE)
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3. How is it done? The Debian-LAN Installation
   - Fully Automatic Installation (FAI)
     - Class Concept
     - Installation Procedure
   - Using FAI to Install the Debian-LAN System

4. The Debian-LAN FAI Classes

5. Summary and Conclusions
What Information is needed to install a machine?

What is the information needed to install any arbitrary machine?

1. set up software storage media → disk partitions
2. package selection
3. configure system:
   - debconf preseeding
   - edit/manipulate configurations

This information should be provided in a well-structured and flexible way. ⇒ Use FAI (Fully Automatic Installation)!

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⇒ Use FAI (Fully Automatic Installation)!
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 space¹ (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)
```

¹The 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
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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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FAn: install and softupdate Procedure

**FAn install**
- boot FAn 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

**FAn softupdate** (already installed machine)
- mount FAn config space on the system
- map hostname to set of classes
  - dependent on the associated classes:
    - configure packages (debconf database)
    - install packages
    - configure target system (run scripts)
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)
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Overview

1. Debian, the Universal Operating System

2. Goals, Challenges and Status of Debian-LAN

3. How is it done? The Debian-LAN Installation
   - Fully Automatic Installation (FAI)
     - Class Concept
     - Installation Procedure
   - Using FAI to Install the Debian-LAN System

4. The Debian-LAN FAI Classes

5. Summary and Conclusions
Using FAI to Install the Debian-LAN System

The debian-lan-config package provides the **complete FAI config space** and instructions on how to deploy all machines of the system:

\[2\text{http://sources.debian.net/src/debian-lan-config}\]
Installing the Debian-LAN from its config space

To get started (cf. Debian-LAN Wiki\(^3\)):

1. Prepare/install the mainserver (and optionally the gateway):
   - Prepare or download a Debian-LAN net-install FAI CD and install the mainserver.
   - Alternatively, install a minimal Debian system and convert it to the Debian-LAN mainserver with FAI softupdate.

2. Deploy all other machines by PXE-booting in the network:

\(^3\)https://wiki.debian.org/DebianLAN/bootstrap
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³https://wiki.debian.org/DebianLAN/bootstrap
Using FAI to Install the Debian-LAN System

Machines known to the DHCP server will be installed unattended:

...
Overview

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The Debian-LAN FAI Classes

The **mainserver** maps onto the following classes:

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<thead>
<tr>
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<tbody>
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<td>1</td>
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<tr>
<td>2</td>
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<td>9</td>
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<tr>
<td>3</td>
<td>FAISERVER</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>LVM8_A</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>DISKLESS_SERVER</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>FIREWALL</td>
<td>13</td>
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<tr>
<td>7</td>
<td>CUPS_SERVER</td>
<td>14</td>
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<tbody>
<tr>
<td>15</td>
<td>LDAP_SERVER</td>
<td>16</td>
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<td>KERBEROS_KDC</td>
<td>18</td>
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<tr>
<td>19</td>
<td>SERVER_A</td>
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Workstations map onto:

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<td>DEBIAN</td>
<td>6</td>
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<tr>
<td>3</td>
<td>DHCPC</td>
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<tr>
<td>4</td>
<td>LVM5_A</td>
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<tbody>
<tr>
<td>9</td>
<td>KERBEROS_CLIENT</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>XORG</td>
<td>12</td>
</tr>
</tbody>
</table>

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4 Cf. class/50-host-classes in the Debian-LAN FAI config space.
The Debian-LAN FAI Classes

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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. DHCPC
4. LVM5_A
5. CUPS_CLIENT
6. LOG_CLIENT
7. LDAP_CLIENT
8. NFS_CLIENT

\(^4\) Cf. class/50-host-classes in the Debian-LAN FAI config space.
Philosophy of the Debian-LAN FAI Classes

The Debian-LAN config space has been set up with the following in mind:

- For every service and/or feature, use a separate class.
- Try to make every class as general as possible: Use SERVER_A and CLIENT_A for setup-specific stuff.
- Use extra classes for local and site-specific modifications, i.e. the classes: EDU, DEVEL, GERMAN, FR_BELGIAN, MYCLASS, ...

This leads to very nice development and maintenance features:

- If a service and/or a feature fails, it is clear where to look in the config space.\(^5\)
- Reusable classes lead to a modular system: New setups may be composed of available modules.
- Users can provide extra classes to implement special features.

\(^5\) In addition, the FAI built-in log- and debug-features help a great deal.
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Example: You prefer to have a gateway including the proxy.

⇒

1️⃣ Move the association of the PROXY-class to the gateway.

2️⃣ Check the classes SERVER_A and GATEWAY_A for necessary adaptations.

Example: You would like to split services onto two servers.

⇒

1️⃣ Add a new hostname for the second server to the config space.

2️⃣ Move all associations to classes you want to serve on that machine to the host.

3️⃣ Implement the setup-specific classes SERVER_B and CLIENT_B.
Classes Reuse Example

**Example:** You prefer to have a gateway including the proxy.

1. Move the association of the PROXY-class to the gateway.
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**Example:** You would like to split services onto two servers.

1. Add a new hostname for the second server to the config space.
2. Move all associations to classes you want to serve on that machine to the host.
3. Implement the setup-specific classes SERVER_B and CLIENT_B.
Resources

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

- **Debian-LAN package debian-lan-config:**
  http://packages.debian.org/debian-lan-config

- **Debian-LAN Git-Repository:**
  http://anonscm.debian.org/gitweb/?p=collab-maint/debian-lan.git

- **Debian-LAN mailing list:**
  http://lists.alioth.debian.org/mailman/listinfo/debian-lan-devel/

Illustrations remixed from: https://openclipart.org/
Summary and Conclusions

- Debian-LAN provides a way to install a complete Debian based network out of the box including kerberized services, central user management, diskless clients and roaming machines.
- The whole system is defined in the structured FAI configuration space. FAI is used to install the machines.
- FAI’s class concept provides a transparent, very flexible and clean way to define and configure the system.
- You are invited to use Debian-LAN and provide additional classes to make it work the way you want (if it does not already).
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