



SUSE Linux Enterprise Micro 5.0

AutoYaST Guide

AutoYaST Guide

SUSE Linux Enterprise Micro 5.0

AutoYaST is a system for unattended mass deployment of SUSE Linux Enterprise Micro systems. It uses an AutoYaST profile that contains installation and configuration data. The book guides you through the basic steps of auto-installation: preparation, installation, and configuration.

Publication Date: September 29, 2024

SUSE LLC

1800 South Novell Place

Provo, UT 84606

USA

<https://documentation.suse.com> 

Copyright © 2006– 2024 SUSE LLC and contributors. All rights reserved.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or (at your option) version 1.3; with the Invariant Section being this copyright notice and license. A copy of the license version 1.2 is included in the section entitled “GNU Free Documentation License”.

For SUSE trademarks, see <https://www.suse.com/company/legal/> . All other third-party trademarks are the property of their respective owners. Trademark symbols (®, [™] etc.) denote trademarks of SUSE and its affiliates. Asterisks (*) denote third-party trademarks.

All information found in this book has been compiled with utmost attention to detail. However, this does not guarantee complete accuracy. Neither SUSE LLC, its affiliates, the authors nor the translators shall be held liable for possible errors or the consequences thereof.

Contents

Preface ix

- 1 Available documentation ix
- 2 Improving the documentation ix
- 3 Documentation conventions x

1 Introduction to AutoYaST 1

- 1.1 Motivation 1
- 1.2 Overview and concept 1

I UNDERSTANDING AND CREATING THE AUTOYAST CONTROL FILE 3

2 The AutoYaST control file 4

- 2.1 Introduction 4
- 2.2 Format 4
- 2.3 Structure 5
 - Resources and properties 6 • Nested resources 6 • Attributes 7

3 Creating an AutoYaST control file 8

- 3.1 Collecting information 8
- 3.2 Creating/editing a control file manually 8
- 3.3 Creating a control file via script with XSLT 9
- 3.4 Checking a control file 10
 - Basic checks 11 • Running pre-scripts 11 • Importing the profile 11

II AUTOYAST CONFIGURATION EXAMPLES 13

4 Configuration and installation options 14

4.1 General options 14

The mode section 15 • Configuring the installation settings screen 17 • The semi-automatic section 17 • The signature handling section 18 • Examples for the general section 20

4.2 Reporting 21

4.3 System registration and extension selection 22

4.4 The boot loader 25

Loader type 26 • Globals 26 • Device map 30

4.5 Partitioning 30

Automatic partitioning 30 • Guided partitioning 31 • Expert partitioning 32 • Advanced partitioning features 45 • Logical volume manager (LVM) 50 • Software RAID 52 • Multipath support 55 • bcache configuration 57 • Multi-device Btrfs configuration 59 • NFS configuration 61 • tmpfs configuration 61

4.6 iSCSI initiator overview 62

4.7 Fibre channel over Ethernet configuration (FCoE) 63

4.8 Country settings 64

4.9 Services and targets 65

4.10 Network configuration 66

Configuration Workflow 66 • The Network Resource 67 • Interfaces 69 • Persistent names of network interfaces 74 • Domain name system 74 • Routing 75 • s390 options 76 • Proxy 77

4.11 Security settings 77

Password settings options 78 • Boot settings 78 • Login settings 78 • New user settings (**useradd** settings) 79 • SELinux settings 79

- 4.12 Users and groups 79
 - Users 79 • User defaults 83 • Groups 85 • Login settings 86
- 4.13 Custom user scripts 86
 - Pre-install scripts 87 • Post-partitioning scripts 88 • Chroot environment scripts 88 • Script XML representation 88
- 4.14 Adding complete configurations 91
- 4.15 Ask the user for values during installation 93
 - Default value scripts 98 • Scripts 99
- 4.16 Kernel dumps 103
 - Memory reservation 104 • Dump saving 106 • E-mail notification 108 • Kdump kernel settings 109 • Expert settings 110
- 4.17 Importing SSH keys and configuration 111
- 4.18 Configuration management 111
 - Connecting to a configuration management server 112 • Running in stand-alone mode 114 • SUSE Manager Salt formulas support 115

III MANAGING MASS INSTALLATIONS WITH DYNAMIC PROFILES 116

5 Supported approaches to dynamic profiles 117

6 Rules and classes 118

- 6.1 Rule-based automatic installation 118
 - Rules file explained 119 • Custom rules 122 • Match types for rules 122 • Combine attributes 123 • Rules file structure 123 • Predefined system attributes 124 • Rules with dialogs 126
- 6.2 Classes 129
- 6.3 Mixing rules and classes 130
- 6.4 Merging of rules and classes 130

7 ERB templates 133

- 7.1 What is ERB? 133
- 7.2 Template helpers 133
 - disks 133 • network_cards 134 • os_release 135

8 Combining ERB templates and scripts 137

- 8.1 Embedding ERB in your scripts 137
- 8.2 Accessing ERB helpers from Ruby scripts 137

IV UNDERSTANDING THE AUTO-INSTALLATION PROCESS 139

9 The auto-installation process 140

- 9.1 Introduction 140
 - X11 interface (graphical) 140 • Serial console 140 • Text-based YaST installation 140
- 9.2 Choosing the right boot medium 141
 - Booting from a flash disk (for example, a USB stick) 141 • Booting from the SUSE Linux Enterprise installation medium 142 • Booting via PXE over the network 142
- 9.3 Invoking the auto-installation process 143
 - Command line options 143 • Auto-installing a single system 149 • Combining the **linuxrc** info file with the AutoYaST control file 149

V APPENDICES 151

A Handling rules 152

B AutoYaST FAQ—frequently asked questions 153

C Advanced **linuxrc** options 156

- C.1 Passing parameters to **linuxrc** 156
- C.2 info file format 157

C.3 Advanced network setup 159

D GNU licenses 161

Preface

1 Available documentation

Online documentation

The online documentation for this product is available at [.](#) Browse or download the documentation in various formats.



Note: Latest updates

The latest documentation updates are usually available in the English version of the documentation.

In your system

For offline use, find documentation in your installed system under `/usr/share/doc`. Many commands are also described in detail in their *manual pages*. To view them, run `man`, followed by a specific command name. If the `man` command is not installed on your system, install it with `sudo zypper install man`.

2 Improving the documentation

Your feedback and contributions to this documentation are welcome! Several channels are available:

Bug reports

Report issues with the documentation at [.](#) To simplify this process, you can use the *Report Documentation Bug* links next to headlines in the HTML version of this document. These preselect the right product and category in Bugzilla and add a link to the current section. You can start typing your bug report right away. A Bugzilla account is required.

Contributions

To contribute to this documentation, use the *Edit Source* links next to headlines in the HTML version of this document. They take you to the source code on GitHub, where you can open a pull request. A GitHub account is required.

For more information about the documentation environment used for this documentation, see [the repository's README \(https://github.com/SUSE/doc-sle/blob/master/README.adoc\)](https://github.com/SUSE/doc-sle/blob/master/README.adoc).

Mail

Alternatively, you can report errors and send feedback concerning the documentation to doc-team@suse.com. Make sure to include the document title, the product version and the publication date of the documentation. Refer to the relevant section number and title (or include the URL) and provide a concise description of the problem.

3 Documentation conventions

The following notices and typographical conventions are used in this documentation:

- /etc/passwd: directory names and file names
- PLACEHOLDER: replace PLACEHOLDER with the actual value
- PATH: the environment variable PATH
- ls, --help: commands, options, and parameters
- user: users or groups
- package name: name of a package
- **Alt**, **Alt + F1**: a key to press or a key combination; keys are shown in uppercase as on a keyboard
- *File*, *File > Save As*: menu items, buttons
- *Dancing Penguins* (Chapter *Penguins*, ↑Another Manual): This is a reference to a chapter in another manual.
- Commands that must be run with root privileges. Often you can also prefix these commands with the sudo command to run them as non-privileged user.

```
root # command
tux > sudo command
```

- Commands that can be run by non-privileged users.

- Notices



Warning: Warning notice

Vital information you must be aware of before proceeding. Warns you about security issues, potential loss of data, damage to hardware, or physical hazards.



Important: Important notice

Important information you should be aware of before proceeding.



Note: Note notice

Additional information, for example about differences in software versions.



Tip: Tip notice

Helpful information, like a guideline or a piece of practical advice.

1 Introduction to AutoYaST

1.1 Motivation

Standard installations of SUSE Linux Enterprise Micro are based on a wizard workflow. This is user-friendly and efficient when installing on few machines. However, it becomes repetitive and time-consuming when installing on many machines.

To avoid this, you could do mass deployments by copying the hard disk of the first successful installation. Unfortunately, that leads to the issue that even minute configuration changes between each machine need to later be dealt with individually. For example, when using static IP addresses, these IP addresses would need to be reset for each machine.

A regular installation of SUSE Linux Enterprise Micro is semi-automated by default. The user is prompted to select the necessary information at the beginning of the installation (usually language only). YaST then generates a proposal for the underlying system depending on different factors and system parameters. Usually—and especially for new systems—such a proposal can be used to install the system and provides a usable installation. The steps following the proposal are fully automated.

AutoYaST can be used where no user intervention is required or where customization is required. Using an AutoYaST profile, YaST prepares the system for a custom installation and does not interact with the user, unless specified in the file controlling the installation.

AutoYaST is not an automated GUI system. This means that usually many screens will be skipped—you will never see the language selection interface, for example. AutoYaST will simply pass the language parameter to the sub-system without displaying any language related interface.

1.2 Overview and concept

Using AutoYaST, multiple systems can easily be installed in parallel and quickly. They need to share the same environment and similar, but not necessarily identical, hardware. The installation is defined by an XML configuration file (usually named `autoinst.xml`) called the “AutoYaST profile”. You can create this using existing configuration resources, and easily tailor it for any specific environment.

AutoYaST is fully integrated and provides various options for installing and configuring a system. The main advantage over other auto-installation systems is the possibility to configure a computer by using existing modules and avoiding using custom scripts which are normally executed at the end of the installation.

This document will guide you through the three steps of auto-installation:

- **Preparation:** All relevant information about the target system is collected and turned into the appropriate directives in the profile. The profile is transferred onto the target system where its directives will be parsed and fed into YaST.
- **Installation:** YaST performs the installation and basic configuration (for example, partitioning, networking, firewall) of the target system using the data from the AutoYaST profile.
- **Post-configuration:** After the installation and configuration of the basic system, the system can run a second stage to perform any additional configuration that requires the target system to be already running, such as post-installation scripts, third party modules or even some YaST modules.



Note: Single stage installation

AutoYaST can split the installation process to two stages, where the second stage runs after reboot. AutoYaST then can install additional packages, configure the system and run post-installation scripts. However, that does not apply to SUSE Linux Enterprise Micro as being a read-only file system, all options must be installed in one stage and the second stage needs to be disabled. To do so, set the following:

```
<general>
  <mode>
    <confirm config:type="boolean">false</confirm>
    <second_stage config:type="boolean">false</second_stage>
  </mode>
</general>
```

I Understanding and creating the AutoYaST control file

- 2 The AutoYaST control file 4
- 3 Creating an AutoYaST control file 8

2 The AutoYaST control file

2.1 Introduction

A *control file*, also known as a *profile*, is a configuration description for a single system. It consists of sets of resources with properties including support for complex structures such as lists, records, trees and large embedded or referenced objects.

2.2 Format

The XML configuration format provides a consistent file structure, which is easy to learn and to remember when attempting to configure a new system.

The AutoYaST control file uses XML to describe the system installation and configuration. XML is a commonly used markup, and many users are familiar with the concepts of the language and the tools used to process XML files. If you edit an existing control file or create a control file using an editor from scratch, it is strongly recommended to validate the control file. This can be done using a validating XML parser such as `xmllint` or `jing`, for example (see [Section 3.2, “Creating/editing a control file manually”](#)).

The following example shows a control file in XML format:

EXAMPLE 2.1: AUTOYAST CONTROL FILE (PROFILE)

```
<?xml version="1.0"?>
<!DOCTYPE profile>
<profile
  xmlns="http://www.suse.com/1.0/yast2ns"
  xmlns:config="http://www.suse.com/1.0/configs">
  <partitioning config:type="list">
    <drive>
      <device>/dev/sda</device>
      <partitions config:type="list">
        <partition>
          <filesystem config:type="symbol">btrfs</filesystem>
          <size>10G</size>
          <mount></mount>
        </partition>
        <partition>
          <filesystem config:type="symbol">xfs</filesystem>
```

```

        <size>120G</size>
        <mount>/data</mount>
    </partition>
</partitions>
</drive>
</partitioning>
<scripts>
    <pre-scripts>
        <script>
            <interpreter>shell</interpreter>
            <filename>start.sh</filename>
            <source>
                <![CDATA[
#!/bin/sh
echo "Starting installation"
exit 0

]]>

            </source>
        </script>
    </pre-scripts>
</scripts>
</profile>

```

2.3 Structure

Below is an example of a basic control file container, the actual content of which is explained later on in this chapter.

EXAMPLE 2.2: CONTROL FILE CONTAINER

```

<?xml version="1.0"?>
<!DOCTYPE profile>
<profile
  xmlns="http://www.suse.com/1.0/yast2ns"
  xmlns:config="http://www.suse.com/1.0/configs">
  <!-- RESOURCES -->
</profile>

```

The `<profile>` element (root node) contains one or more distinct resource elements. The permissible resource elements are specified in the schema files

2.3.1 Resources and properties

A resource element either contains multiple and distinct property and resource elements, or multiple instances of the same resource element, or it is empty. The permissible content of a resource element is specified in the schema files.

A property element is either empty or contains a literal value. The permissible property elements and values in each resource element are specified in the schema files

An element can be either a container of other elements (a resource) or it has a literal value (a property); it can never be both. This restriction is specified in the schema files. A configuration component with more than one value must either be represented as an embedded list in a property value or as a nested resource.

An empty element, such as `<foo></foo>` or `<bar/>`, will *not* be in the parsed data model. Usually this is interpreted as wanting a sensible default value. In cases where you need an explicitly empty string instead, use a CDATA section: `<foo><![CDATA[]]></foo>`.

2.3.2 Nested resources

Nested resource elements allow a tree-like structure of configuration components to be built to any level.

There are two kinds of nested resources: maps and lists. Maps, also known as associative arrays, hashes, or dictionaries, contain mixed contents, identified by their tag names. Lists, or arrays, have all items of the same type.

EXAMPLE 2.3: NESTED RESOURCES

```
...
<drive>
  <device>/dev/sda</device>
  <partitions config:type="list">
    <partition>
      <size>10G</size>
      <mount>/</mount>
    </partition>
    <partition>
      <size>1G</size>
      <mount>/tmp</mount>
    </partition>
  </partitions>
</drive>
....
```

In the example above, the `drive` resource is a map consisting of a `device` property and a `partitions` resource. The `partitions` resource is a list containing multiple instances of the `partition` resource. Each `partition` resource is a map containing a `size` and `mount` property. The default type of a nested resource is map. Lists must be marked as such using the `config:type="list"` attribute.

2.3.3 Attributes

Global attributes are used to define metadata on resources and properties. Attributes are used to define context switching. They are also used for naming and typing properties as shown in the previous sections. Attributes are in a separate namespace so they do not need to be treated as reserved words in the default namespace.

The `config:type` attribute determines the type of the resource or property in the parsed data model. For resources, lists need a `list` type whereas a map is the default type that does not need an attribute. For properties, `boolean`, `symbol`, and `integer` can be used, the default being a string.



Tip: Using sorter type annotations

Starting with SUSE Linux Enterprise Micro 5.0, it is possible to use the attribute `t` instead of `config:type` to specify the element type.

```
<mode t="boolean">true</mode>
```

Attributes are not optional. It may appear that attributes are optional, because various parts of the schema are not very consistent in their usage of data types. In some places an enumeration is represented by a symbol, elsewhere a string is required. One resource needs `config:type="integer"`, another will parse the number from a string property. Some resources use `config:type="boolean"`, others want `yes` or even `1`. If in doubt, consult the schema file.

3 Creating an AutoYaST control file

3.1 Collecting information

To create the control file, you need to collect information about the systems you are going to install. This includes hardware data and network information among other things. Make sure you have the following information about the machines you want to install:

- Hard disk types and sizes
- Network interface and MAC address if known (for example, when using DHCP)

3.2 Creating/editing a control file manually

You need to create the control file manually and ensure that it has a valid syntax. To verify if the file has a valid XML structure, you can use the utility `xmllint` available with the `libxml2` package:

```
xmllint <control file>
```

If the control file is not well formed, for example, if a tag is not closed, `xmllint` will report the errors.

To validate the control file, use the tool `jing` from the package with the same name. During validation, misplaced or missing tags and attributes and wrong attribute values are detected.

```
jing /usr/share/YaST2/schema/autoyast/rng/profile.rng <control file>
```

`/usr/share/YaST2/schema/autoyast/rng/profile.rng` is provided by the package `yast2-schema`. This file describes the syntax and classes of an AutoYaST profile.

Before going on with the autoinstallation, fix any errors resulting from such checks. The autoinstallation process cannot be started with an invalid and not well-formed control file.

You can use any XML editor available on your system or any text editor with XML support (for example, Emacs, Vim). .



Tip: Using Emacs as an XML editor

The built-in `nxml-mode` turns Emacs into a fully-fledged XML editor with automatic tag completion and validation. Refer to the Emacs help for instructions on how to set up `nxml-mode`.

3.3 Creating a control file via script with XSLT

If you have a template and want to change a few things via script or command line, use an XSLT processor like `xsltproc`. For example, if you have an AutoYaST control file and want to fill out the host name via script for any reason. (If doing this often, you should consider scripting it.)

First, create an XSL file:

EXAMPLE 3.1: EXAMPLE FILE FOR REPLACING THE HOST NAME/DOMAIN BY SCRIPT

```

<?xml version="1.0" encoding="utf-8"?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:y2="http://www.suse.com/1.0/yast2ns"
  xmlns:config="http://www.suse.com/1.0/configns"
  xmlns="http://www.suse.com/1.0/yast2ns"
  version="1.0">
  <xsl:output method="xml" encoding="UTF-8" indent="yes" omit-xml-declaration="no" cdata-
section-elements="source"/>

  <!-- the parameter names -->
  <xsl:param name="hostname"/>
  <xsl:param name="domain"/>

  <xsl:template match="/">
    <xsl:apply-templates select="@*|node()"/>
  </xsl:template>

  <xsl:template match="y2:dns">
    <xsl:copy>
      <!-- where to copy the parameters -->
      <domain><xsl:value-of select="string($domain)"/></domain>
      <hostname><xsl:value-of select="string($hostname)"/></hostname>
      <xsl:apply-templates select="@*|node()"/>
    </xsl:copy>
  </xsl:template>

  <xsl:template match="@*|node()" >

```

```
<xsl:copy>
  <xsl:apply-templates select="@*|node()" />
</xsl:copy>
</xsl:template>

</xsl:stylesheet>
```

This file expects the host name and the domain name as parameters from the user.

```
<xsl:param name="hostname"/>
<xsl:param name="domain"/>
```

There will be a copy of those parameters in the DNS section of the control file. This means that if there already is a domain element in the DNS section, you will get a second one, which will cause conflicts.

For more information about XSLT, go to the official Web page www.w3.org/TR/xslt (<http://www.w3.org/TR/xslt>) ↗

3.4 Checking a control file

Depending on the use case, creating an AutoYaST profile can be difficult, especially if you build a dynamic profile using rules/classes, ERB templates or pre-scripts. For more information, see *Part III, "Managing mass installations with dynamic profiles"*.

To simplify the testing and debugging process, AutoYaST offers the `check-profile` command, which takes care of fetching, building and, optionally, importing the profile to detect any potential problem.



Note: Results may vary

Although this command uses the same approach as the installation, the results may vary depending on the differences between the current system and installation media: YaST package versions, architecture, etc.



Warning: Use only trusted profiles

You must be careful when running this command because pre-installation scripts and ERB code would run as the `root` user. Use only profiles that you trust.

3.4.1 Basic checks

The simplest way to use this command is just to read and validate the profile:

```
tux > sudo yast2 autoyast check-profile filename=autoinst.xml output=result.xml
```

The `result.xml` file contains the result of evaluating the profile. Bear in mind that, even if you do not use any advanced feature, the content of `autoinst.xml` and `result.xml` may differ. The reason is that AutoYaST does some cleaning up when it processes the profile.

`check-profile` can deal with remote files too:

```
tux > sudo yast2 autoyast check-profile filename=http://192.168.1.100/autoinst.xml  
output=result.xml
```

3.4.2 Running pre-scripts

Optionally, AutoYaST can run the scripts that are included in the profile, reporting any error found during the execution. This is especially relevant if you are using a pre-installation script to modify the profile. To enable this feature, you need to set the `run-scripts` option to `true`.

```
tux > sudo yast2 autoyast check-profile filename=http://192.168.1.100/autoinst.xml  
output=result.xml run-scripts=true
```



Warning: Scripts run as root

You must be careful when enabling the `run-scripts` option, because the scripts will run as root and they may affect the current system.

3.4.3 Importing the profile

It is possible to face some problems when importing a valid profile, even if it is correct. The reason is that AutoYaST does not perform any logic check when fetching, building and validating the profile.

To anticipate such problems, the `check-profile` command imports the profile and reports problems that it has detected. As it may take a while, you can disable this behavior by setting the `import-all` option to `false`.

```
tux > sudo yast2 autoyast check-profile filename=http://192.168.1.100/autoinst.xml  
output=result.xml import-all=false
```

Importing the profile is a safe operation and does not alter the underlying system in any way.

II AutoYaST configuration examples

4 Configuration and installation options 14

4 Configuration and installation options

This section contains configuration examples for services, registration, user and group management, upgrades, partitioning, configuration management, SSH key management, firewall configuration, and other installation options.

This chapter introduces important parts of a control file. YaST will install SLE Micro in a single stage as due to the read-only file system the second stage is not available.

4.1 General options

The general section includes all settings that influence the installation workflow. The overall structure of this section looks like the following:

```
<?xml version="1.0"?>
<!DOCTYPE profile>
<profile xmlns="http://www.suse.com/1.0/yast2ns"
  xmlns:config="http://www.suse.com/1.0/configns">
  <general>
    <ask-list>❶
      ...
    </ask-list>
    <cio_ignore>
      ...
    </cio_ignore>
    <mode>❷
      ...
    </mode>
    <proposals>❸
      ...
    </proposals>

    <semi-automatic config:type="list">❹
      ...
    </semi-automatic>
    <signature-handling>
      ...
    </signature-handling>
    <storage>❺
      ...
    </storage>
```

```
...  
  
</general>  
<profile>
```

- ❶ *Section 4.15, “Ask the user for values during installation”*
- ❷ *Section 4.1.1, “The mode section”*
- ❸ *Section 4.1.2, “Configuring the installation settings screen”*
- ❹ *Section 4.1.3, “The semi-automatic section”*
- ❺ *Section 4.5, “Partitioning”*

4.1.1 The mode section

The mode section configures the behavior of AutoYaST with regard to user confirmations and rebooting. The following elements are allowed in the mode section:

confirm

By default, the installation stops at the *Installation Settings* screen. Up to this point, no changes have been made to the system and settings may be changed on this screen. To proceed and finally start the installation, the user needs to confirm the settings. By setting this value to false the settings are automatically accepted and the installation starts. Only set to false to carry out a fully unattended installation. Setting this value is optional. The default is true.

```
<general>  
  <mode>  
    <confirm config:type="boolean">true</confirm>  
  </mode>  
  ...  
</general>
```

confirm_base_product_license

If you set this to true, the EULA of the base product will be shown. The user needs to accept this license. Otherwise the installation will be canceled. Setting this value is optional. The default is false.

```
<general>  
  <mode>
```

```

    <confirm_base_product_license config:type="boolean">
      false
    </confirm_base_product_license>
  </mode>
  ...
</general>

```

halt

Shuts down the machine after the first stage. All packages and the boot loader have been installed and all your chroot scripts have run. After the installation is complete, the machine is turned off instead of rebooting. Setting this value is optional. The default is false.

```

<general>
  <mode>
    <halt config:type="boolean">false</halt>
  </mode>
  ...
</general>

```

ntp_sync_time_before_installation

Specify the NTP server with which to synchronize time before starting the installation. Time synchronization will only occur if this option is set. Keep in mind that you need a network connection and access to a time server. Setting this value is optional. By default no time synchronization will occur.

```

<general>
  <mode>
    <ntp_sync_time_before_installation>
      &ntpname;
    </max_systemd_wait>
  </mode>
  ...
</general>

```

second_stage

Set the value to false to apply all options of the AutoYaST profile for SLE Micro.

```

<general>
  <mode>
    <second_stage config:type="boolean">false</second_stage>
  </mode>
  ...
</general>

```

4.1.2 Configuring the installation settings screen

AutoYaST allows you to configure the *Installation Settings* screen, which shows a summary of the installation settings. On this screen, the user can change the settings before confirming them to start the installation. Using the `proposal` tag, you can control which settings (“proposals”) are shown in the installation screen. A list of valid proposals for your products is available from the `/control.xml` file on the installation medium. This setting is optional. By default all configuration options will be shown.

```
<proposals config:type="list">
  <proposal>partitions_proposal</proposal>
  <proposal>timezone_proposal</proposal>
  <proposal>software_proposal</proposal>
</proposals>
```

4.1.3 The semi-automatic section

AutoYaST offers to start some YaST modules during the installation. This is useful to give the administrators installing the machine the possibility to manually configure some aspects of the installation while at the same time automating the rest of the installation. Within the semi-automatic section, you can start the following YaST modules:

- The network settings module (`networking`)
- The partitioner (`partitioning`)
- The registration module (`scc`)

The following example starts all three supported YaST modules during the installation:

```
<general>
  <semi-automatic config:type="list">
    <semi-automatic_entry>networking</semi-automatic_entry>
    <semi-automatic_entry>scc</semi-automatic_entry>
    <semi-automatic_entry>partitioning</semi-automatic_entry>
  </semi-automatic>
</general>
```

4.1.4 The signature handling section

By default AutoYaST will only install signed packages from sources with known GPG keys. Use this section to overwrite the default settings.



Warning: Overwriting the signature handling defaults

Installing unsigned packages, packages with failing checksum checks, or packages from sources you do not trust is a major security risk. Packages may have been modified and may install malicious software on your machine. Only overwrite the defaults in this section if you are sure the repository and packages can be trusted. SUSE is not responsible for any problems arising from software installed with integrity checks disabled.

Default values for all options are false. If an option is set to false and a package or repository fails the respective test, it is silently ignored and will not be installed.

accept_unsigned_file

If set to true, AutoYaST will accept unsigned files like the content file.

```
<general>
  <signature-handling>
    <accept_unsigned_file config:type="boolean">
      false
    </accept_unsigned_file>
  </signature-handling>
  ...
</general>
```

accept_file_without_checksum

If set to true, AutoYaST will accept files without a checksum in the content file.

```
<general>
  <signature-handling>
    <accept_file_without_checksum config:type="boolean">
      false
    </accept_file_without_checksum>
  </signature-handling>
  ...
</general>
```

accept_verification_failed

If set to true, AutoYaST will accept signed files even when the signature verification fails.

```

<general>
  <signature-handling>
    <accept_verification_failed config:type="boolean">
      false
    </accept_verification_failed>
  </signature-handling>
  ...
</general>

```

accept_unknown_gpg_key

If set to true, AutoYaST will accept new GPG keys of the installation sources, for example the key used to sign the content file.

```

<general>
  <signature-handling>
    <accept_unknown_gpg_key config:type="boolean">
      false
    </accept_unknown_gpg_key>
  </signature-handling>
  ...
</general>

```

accept_non_trusted_gpg_key

Set this option to true to accept known keys you have not yet trusted.

```

<general>
  <signature-handling>
    <accept_non_trusted_gpg_key config:type="boolean">
      false
    </accept_non_trusted_gpg_key>
  </signature-handling>
  ...
</general>

```

import_gpg_key

If set to true, AutoYaST will accept and import new GPG keys on the installation source in its database.

```

<general>
  <signature-handling>
    <import_gpg_key config:type="boolean">
      false
    </import_gpg_key>
  </signature-handling>
  ...
</general>

```

4.1.5 Examples for the general section

Find examples covering several use cases in this section.

EXAMPLE 4.1: GENERAL OPTIONS

This example shows the most commonly used options in the general section. The scripts in the pre- and post-modules sections are only dummy scripts illustrating the concept.

```
<?xml version="1.0"?>
<!DOCTYPE profile>
<profile xmlns="http://www.suse.com/1.0/yast2ns"
  xmlns:config="http://www.suse.com/1.0/configns">
  <general>
    <!-- Use cio_ignore on &zseries; only -->
    <cio_ignore config:type="boolean">false</cio_ignore>
    <mode>
      <halt config:type="boolean">false</halt>
      <forceboot config:type="boolean">false</forceboot>
      <final_reboot config:type="boolean">false</final_reboot>
      <final_halt config:type="boolean">false</final_halt>
      <confirm_base_product_license config:type="boolean">
        false
      </confirm_base_product_license>
      <confirm config:type="boolean">true</confirm>
      <second_stage config:type="boolean">true</second_stage>
    </mode>
    <proposals config:type="list">
      <proposal>partitions_proposal</proposal>
    </proposals>
    <self_update config:type="boolean">true</self_update>
    <self_update_url>http://example.com/updates/$arch</self_update_url>
    <signature-handling>
      <accept_unsigned_file config:type="boolean">
        true
      </accept_unsigned_file>
      <accept_file_without_checksum config:type="boolean">
        true
      </accept_file_without_checksum>
      <accept_verification_failed config:type="boolean">
        true
      </accept_verification_failed>
      <accept_unknown_gpg_key config:type="boolean">
        true
      </accept_unknown_gpg_key>
      <import_gpg_key config:type="boolean">true</import_gpg_key>
      <accept_non_trusted_gpg_key config:type="boolean">
```

```
    true
  </accept_non_trusted_gpg_key>
</signature-handling>
</general>
</profile>
```

4.2 Reporting

The `report` resource manages three types of pop-ups that may appear during installation:

- message pop-ups (usually non-critical, informative messages),
- warning pop-ups (if something might go wrong),
- error pop-ups (in case an error occurs).

EXAMPLE 4.2: REPORTING BEHAVIOR

```
<report>
  <errors>
    <show config:type="boolean">true</show>
    <timeout config:type="integer">0</timeout>
    <log config:type="boolean">true</log>
  </errors>
  <warnings>
    <show config:type="boolean">true</show>
    <timeout config:type="integer">10</timeout>
    <log config:type="boolean">true</log>
  </warnings>
  <messages>
    <show config:type="boolean">true</show>
    <timeout config:type="integer">10</timeout>
    <log config:type="boolean">true</log>
  </messages>
  <yesno_messages>
    <show config:type="boolean">true</show>
    <timeout config:type="integer">10</timeout>
    <log config:type="boolean">true</log>
  </yesno_messages>
</report>
```

Depending on your experience, you can skip, log and show (with timeout) those messages. It is recommended to show all `messages` with timeout. Warnings can be skipped in some places but should not be ignored.

The default setting in auto-installation mode is to show errors without timeout and to show all warnings/messages with a timeout of 10 seconds.



Warning: Critical system messages

Note that not all messages during installation are controlled by the `report` resource. Some critical messages concerning package installation and partitioning will show up ignoring your settings in the `report` section. Usually those messages will need to be answered with *Yes* or *No*.

4.3 System registration and extension selection

Registering the system with the registration server can be configured within the `suse_register` resource. The following example registers the system with the SUSE Customer Center. In case your organization provides its own registration server, you need to specify the required data with the `reg_server*` properties. Refer to the table below for details.

```
<suse_register>
  <do_registration config:type="boolean">true</do_registration>
  <email>tux@example.com</email>
  <reg_code>MY_SECRET_REGCODE</reg_code>
  <install_updates config:type="boolean">true</install_updates>
  <slp_discovery config:type="boolean">false</slp_discovery>
  <--! optionally register some add-ons -->
  <addons config:type="list">
    <addon>
      <name>sle-module-basesystem</name>
      <version>15.3</version>
      <arch>x86_64</arch>
    </addon>
  </addons>
</suse_register>
```

It is recommended to at least register the Basesystem Module to have access to the updates for the base system (the Linux kernel, the system libraries and services).

As an alternative to the fully automated registration, AutoYaST can also be configured to start the YaST registration module during the installation. This offers the possibility to enter the registration data manually. The following XML code is required:

```
<general>
```

```
<semi-automatic config:type="list">
  <semi-automatic_entry>scc</semi-automatic_entry>
</semi-automatic>
</general>
```

suse_register Values

do_registration

Boolean

```
<do_registration config:type="boolean">true</do_registration>
```

Specify whether the system should be registered or not. If set to false all other options are ignored and the system is not registered.

e-mail

E-mail address

```
<email>tux@example.com</email>
```

Optional. The e-mail address matching the registration code.

reg_code

Text

```
<reg_code>SECRET_REGCODE</reg_code>
```

Required. Registration code.

install_updates

Boolean

```
<install_updates config:type="boolean">true</install_updates>
```

Optional. Determines if updates from the Updates channels should be installed. The default value is to not install them (false).

slp_discovery

Boolean

```
<slp_discovery config:type="boolean">true</slp_discovery>
```

Optional. Search for a registration server via SLP. The default value is false.

Expects to find a single server. If more than one server is found, the installation will fail. In case there is more than one registration server available, you need to specify one with reg_server.

If neither slp_discovery nor reg_server are set, the system is registered with the SUSE Customer Center.

This setting also affects the self-update feature: If it is disabled, no SLP search will be performed.

reg_server

URL

```
<reg_server>https://smt.example.com</reg_server>
```

Optional. RMT server URL. If neither slp_discovery nor reg_server are set, the system is registered with the SUSE Customer Center.

The RMT server is queried for a URL of the self-update repository. So if self_update_url is not set, the RMT server influences where the self-updates are downloaded from. Check the *Deployment Guide* to find further information about this feature.

reg_server_cert_fingerprint_type

SHA1 or SHA256

```
<reg_server_cert_fingerprint_type>SHA1</reg_server_cert_fingerprint_type>
```

Optional. Requires a checksum value provided with reg_server_cert_fingerprint. Using the fingerprint is recommended, since it ensures the SSL certificate is verified. The matching certificate will be automatically imported when the SSL communication fails because of a verification error.

reg_server_cert_fingerprint

Server Certificate Fingerprint value in hexadecimal notion (case-insensitive).

```
<reg_server_cert_fingerprint>01:AB...:EF</reg_server_cert_fingerprint>
```

Optional. Requires a fingerprint type value provided with reg_server_cert_fingerprint_type. Using the fingerprint is recommended, since it ensures the SSL certificate is verified. The matching certificate will be automatically imported when SSL communication fails because of a verification error.

reg_server_cert

URL

```
<reg_server_cert>http://smt.example.com/smt.crt</reg_server_cert>
```

Optional. URL of the SSL certificate on the server. Using this option is not recommended, since the certificate that is downloaded is not verified. Use reg_server_cert_fingerprint instead.



Tip: Obtaining a server certificate fingerprint

To obtain a server certificate fingerprint for use with the `reg_server_cert_fingerprint` entry, run the following command on the SMT server (edit the default path to the `smt.crt` file, if needed):

```
openssl x509 -noout -in /srv/www/htdocs/smt.crt -fingerprint -sha256
```

To retrieve a fingerprint from the SMT server, use the following command:

```
curl --insecure -v https://scc.suse.com/smt.crt 2> /dev/null | openssl  
x509 -noout -fingerprint -sha256
```

Replace `scc.suse.com` with your server.

Note: This can be used in a trusted network only! In a non-trusted network, for example the Internet, you should get the fingerprint directly from the server by other means. Fingerprints can be fetched via SSH, a saved server configuration and other sources. Alternatively, you can verify that the downloaded certificate is identical on the server.

4.4 The boot loader

This documentation is for **yast2-bootloader** and applies to GRUB 2. For older product versions shipping with legacy GRUB, refer to the documentation that comes with your distribution in `/usr/share/doc/packages/autoyast2/`

The general structure of the AutoYaST boot loader part looks like the following:

```
<bootloader>  
  <loader_type>  
    <!-- boot loader type (grub2 or grub2-efi) -->  
  </loader_type>  
  <global>  
    <!--  
      entries defining the installation settings for GRUB 2 and  
      the generic boot code  
    -->  
  </global>  
  <device_map config:type="list">  
    <!-- entries defining the order of devices -->  
  </device_map>  
</bootloader>
```

4.4.1 Loader type

This defines which boot loader (UEFI or BIOS/legacy) to use. Not all architectures support both legacy and EFI variants of the boot loader. The safest (`default`) option is to leave the decision up to the installer.

```
<loader_type>LOADER_TYPE</loader_type>
```

Possible values for `LOADER_TYPE` are:

- `default`: The installer chooses the correct boot loader. This is the default when no option is defined.
- `grub2`: Use the legacy BIOS boot loader.
- `grub2-efi`: Use the EFI boot loader.
- `none`: The boot process is not managed and configured by the installer.

4.4.2 Globals

This is an important if optional part. Define here where to install GRUB 2 and how the boot process will work. Again, `yast2-bootloader` proposes a configuration if you do not define one. Usually the AutoYaST control file includes only this part and all other parts are added automatically during installation by `yast2-bootloader`. Unless you have some special requirements, do not specify the boot loader configuration in the XML file.

```
<global>
  <activate>true</activate>
  <timeout config:type="integer">10</timeout>
  <terminal>gfxterm</terminal>
  <gfxmode>1280x1024x24</gfxmode>
</global>
```

BOOT LOADER GLOBAL OPTIONS

activate

Set the boot flag on the boot partition. The boot partition can be `/` if there is no separate `/boot` partition. If the boot partition is on a logical partition, the boot flag is set to the extended partition.

```
<activate>true</activate>
```

append

Kernel parameters added at the end of boot entries for normal and recovery mode.

```
<append>nomodeset vga=0x317</append>
```

boot_boot

Write GRUB 2 to a separate /boot partition. If no separate /boot partition exists, GRUB 2 will be written to /.

```
<boot_boot>false</boot_boot>
```

boot_custom

Write GRUB 2 to a custom device.

```
<boot_custom>/dev/sda3</boot_custom>
```

boot_extended

Write GRUB 2 to the extended partition (important if you want to use generic boot code and the /boot partition is logical). Note: if the boot partition is logical, you should use boot_mbr (write GRUB 2 to MBR) rather than generic_mbr.

```
<boot_extended>false</boot_extended>
```

boot_mbr

Write GRUB 2 to the MBR of the first disk in the order. (device.map includes the order of the disks.)

```
<boot_mbr>false</boot_mbr>
```

boot_root

Write GRUB 2 to / partition.

```
<boot_root>false</boot_root>
```

generic_mbr

Write generic boot code to the MBR (will be ignored if boot_mbr is set to true).

```
<generic_mbr config:type="boolean">false</generic_mbr>
```

gfxmode

Graphical resolution of the GRUB 2 screen (requires <terminal> to be set to gfxterm). Valid entries are auto, HORIZONTALxVERTICAL, or HORIZONTALxVERTICAL xCOLOR DEPTH. You can see the screen resolutions supported by GRUB 2 on a particular system by using the vbeinfo command at the GRUB 2 command line in the running system.

```
<gfxmode>1280x1024x24</gfxmode>
```

os_prober

If set to `true`, automatically searches for operating systems already installed and generates boot entries for them during the installation.

```
<os_prober>false</os_prober>
```

cpu_mitigations

Allows choosing a default setting of kernel boot command line parameters for CPU mitigation (and at the same time strike a balance between security and performance).

Possible values are:

auto

Enables all mitigations required for your CPU model, but does not protect against cross-CPU thread attacks. This setting may impact performance to some degree, depending on the workload.

nosmt

Provides the full set of available security mitigations. Enables all mitigations required for your CPU model. In addition, it disables Simultaneous Multithreading (SMT) to avoid side-channel attacks across multiple CPU threads. This setting may further impact performance, depending on the workload.

off

Disables all mitigations. Side-channel attacks against your CPU are possible, depending on the CPU model. This setting has no impact on performance.

manual

Does not set any mitigation level. Specify your CPU mitigations manually by using the kernel command line options.

```
<cpu_mitigations>auto</cpu_mitigations>
```

If not set in AutoYaST, the respective settings can be changed via kernel command line. By default, the (product-specific) settings in the `/control.xml` file on the installation medium are used (if nothing else is specified).

suse_btrfs

Obsolete and no longer used. Booting from Btrfs snapshots is automatically enabled.

serial

Command to execute if the GRUB 2 terminal mode is set to `serial`.

```
<serial>serial --speed=115200 --unit=0 --word=8 --parity=no --stop=1</serial>
```

secure_boot

If set to false, then UEFI secure boot is disabled. Works only for grub2-efi boot loader.

```
<secure_boot>>false</secure_boot>
```

terminal

Specify the GRUB 2 terminal mode to use. Valid entries are console, gfxterm, and serial. If set to serial, the serial command needs to be specified with <serial>, too.

```
<terminal>serial</terminal>
```

timeout

The timeout in seconds until the default boot entry is booted automatically.

```
<timeout config:type="integer">10</timeout>
```

trusted_boot

If set to true, then Trusted GRUB is used. Trusted GRUB supports Trusted Platform Module (TPM). Works only for grub2 boot loader.

```
<trusted_boot">true</trusted_boot>
```

update_nvram

If set to true, then AutoYaST adds an NVRAM entry for the boot loader in the firmware. This is the desirable behavior unless you want to preserve some specific setting or you need to work around firmware issues.

```
<update_nvram>true</update_nvram>
```

vgamode

Adds the kernel parameter vga=VALUE to the boot entries.

```
<vgamode>0x317</vgamode>
```

xen_append

Kernel parameters added at the end of boot entries for Xen guests.

```
<xen_append>nomodeset vga=0x317</xen_append>
```

xen_kernel_append

Kernel parameters added at the end of boot entries for Xen kernels on the VM Host Server.

```
<xen_kernel_append>dom0_mem=768M</xen_kernel_append>
```


4.4.3 Device map

GRUB 2 avoids mapping problems between BIOS drives and Linux devices by using device ID strings (UUIDs) or file system labels when generating its configuration files. GRUB 2 utilities create a temporary device map on the fly, which is usually sufficient, particularly on single-disk systems. However, if you need to override the automatic device mapping mechanism, create your custom mapping in this section.

```
<device_map config:type="list">
  <device_map_entry>
    <firmware>hd0</firmware> <!-- order of devices in target map -->
    <linux>/dev/disk/by-id/ata-ST3500418AS_6VM23FX0</linux> <!-- name of device (disk)
-->
  </device_map_entry>
</device_map>
```

4.5 Partitioning

When it comes to partitioning, we can categorize AutoYaST use cases into three different levels:

- Automatic partitioning. The user does not care about the partitioning and trusts in AutoYaST to do the right thing.
- Guided partitioning. The user wants to set some basic settings. For example, a user wants to use LVM but has no idea about how to configure partitions, volume groups, and so on.
- Expert partitioning. The user specifies how the layout should look. However, a complete definition is not required, and AutoYaST should propose reasonable defaults for missing parts.

To some extent, it is like using the regular installer. You can skip the partitioning screen and trust in YaST, use the *Guided Proposal*, or define the partitioning layout through the *Expert Partitioner*.

4.5.1 Automatic partitioning

AutoYaST can come up with a sensible partitioning layout without any user indication. Although it depends on the selected product to install, AutoYaST usually proposes a Btrfs root file system, a separate `/home` using XFS and a swap partition. Additionally, depending on the architecture, it adds any partition that might be needed to boot (like BIOS GRUB partitions).

However, these defaults might change depending on factors like the available disk space. For example, having a separate `/home` depends on the amount of available disk space.

If you want to influence these default values, you can use the approach described in [Section 4.5.2, “Guided partitioning”](#).

4.5.2 Guided partitioning

Although AutoYaST can come up with a partitioning layout without any user indication, sometimes it is useful to set some generic parameters and let AutoYaST do the rest. For example, you may be interested in using LVM or encrypting your file systems without having to deal with the details. It is similar to what you would do when using the guided proposal in a regular installation.

The `storage` section in [Example 4.3, “LVM-based guided partitioning”](#) instructs AutoYaST to set up a partitioning layout using LVM and deleting all Windows partitions, no matter whether they are needed.

EXAMPLE 4.3: LVM-BASED GUIDED PARTITIONING

```
<general>
  <storage>
    <proposal>
      <lvm config:type="boolean">true</lvm>
      <windows_delete_mode config:type="symbol">all</windows_delete_mode>
    </proposal>
  </storage>
</general>
```

lvm

Creates an LVM-based proposal. The default is `false`.

```
<lvm config:type="boolean">true</lvm>
```

resize_windows

When set to `true`, AutoYaST resizes Windows partitions if needed to make room for the installation.

```
<resize_windows config:type="boolean">false</resize_windows>
```

windows_delete_mode

- none does not remove Windows partitions.
- ondemand removes Windows partitions if needed.
- all removes all Windows partitions.

```
<windows_delete_mode config:type="symbol">ondemand</windows_delete_mode>
```

linux_delete_mode

- none does not remove Linux partitions.
- ondemand removes Linux partitions if needed.
- all removes all Linux partitions.

```
<linux_delete_mode config:type="symbol">ondemand</linux_delete_mode>
```

other_delete_mode

- none does not remove other partitions.
- ondemand removes other partitions if needed.
- all removes all other partitions.

```
<other_delete_mode config:type="symbol">ondemand</other_delete_mode>
```

encryption_password

Enables encryption using the specified password. By default, encryption is disabled.

```
<encryption_password>some-secret</encryption_password>
```

4.5.3 Expert partitioning

As an alternative to guided partitioning, AutoYaST allows to describe the partitioning layout through a `partitioning` section. However, AutoYaST does not need to know every single detail and can build a sensible layout from a rather incomplete specification.

The `partitioning` section is a list of `drive` elements. Each of these sections describes an element of the partitioning layout like a disk, an LVM volume group, a RAID, a multi-device Btrfs file system, and so on.

Example 4.4, "Creating /, /home and swap partitions", asks AutoYaST to create a `/`, a `/home` and a `swap` partition using the whole disk. Note that some information is missing, like which file systems each partition should use. However, that is not a problem, and AutoYaST will propose sensible values for them.

EXAMPLE 4.4: CREATING /, /home AND swap PARTITIONS

```
<partitioning config:type="list">
  <drive>
    <use>all</use>
    <partitions config:type="list">
      <partition>
        <mount></mount>
        <size>20GiB</size>
      </partition>
      <partition>
        <mount>/home</mount>
        <size>max</size>
      </partition>
      <partition>
        <mount>swap</mount>
        <size>1GiB</size>
      </partition>
    </partitions>
  </drive>
```



Tip: Proposing a boot partition

AutoYaST checks whether the layout described in the profile is bootable or not. If it is not, it adds the missing partitions. So, if you are unsure about which partitions are needed to boot, you can rely on AutoYaST to make the right decision.

4.5.3.1 Drive configuration

The elements listed below must be placed within the following XML structure:

```
<profile>
  <partitioning config:type="list">
    <drive>
      ...
    </drive>
  </partitioning>
</profile>
```

device

Optional, the device you want to configure. If left out, AutoYaST tries to guess the device. See [Tip: Skipping devices](#) on how to influence guessing.

If set to `ask`, AutoYaST will ask the user which device to use during installation.

You can use persistent device names via ID, like `/dev/disk/by-id/ata-WD-C_WD3200AAKS-75L9` or *by-path*, like `/dev/disk/by-path/pci-0001:00:03.0-sc-si-0:0:0:0`.

```
<device>/dev/sda</device>
```

In case of volume groups, software RAID or `bcache` devices, the name in the installed system may be different (to avoid clashes with existing devices).

See [Section 4.5.7, “Multipath support”](#) for further information about dealing with multipath devices.

initialize

Optional, the default is `false`. If set to `true`, the partition table is wiped out before AutoYaST starts the partition calculation.

```
<initialize config:type="boolean">true</initialize>
```

partitions

Optional, a list of `<partition>` entries (see [Section 4.5.3.2, “Partition configuration”](#)).

```
<partitions config:type="list">
  <partition>...</partition>
  ...
</partitions>
```

If no partitions are specified, AutoYaST will create a reasonable partitioning layout (see [Section 4.5.3.5, “Filling the gaps”](#)).

pesize

Optional, for LVM only. The default is 4M for LVM volume groups.

```
<pesize>8M</pesize>
```

use

Recommended, specifies the strategy AutoYaST will use to partition the hard disk. Choose from:

`all`, uses the whole device while calculating the new partitioning.

`linux`, only existing Linux partitions are used.

free, only unused space on the device is used, no existing partitions are touched.

1,2,3, a list of comma-separated partition numbers to use.

type

Optional, specifies the type of the drive. The default is CT_DISK for a normal physical hard disk. The following is a list of all options:

CT_DISK for physical hard disks (default).

CT_LVM for LVM volume groups.

CT_MD for software RAID devices.

CT_BCACHE for software bcache devices.

CT_BTRFS for multi-device Btrfs file systems.

CT_NFS for NFS.

CT_TMPFS for tmpfs file systems.

```
<type config:type="symbol">CT_LVM</type>
```

disklabel

Optional. By default YaST decides what makes sense. If a partition table of a different type already exists, it will be re-created with the given type only if it does not include any partition that should be kept or reused. To use the disk without creating any partition, set this element to none. The following is a list of all options:

msdos

gpt

none

```
<disklabel>gpt</disklabel>
```

keep_unknown_lv

Optional, the default is false.

This value only makes sense for type = CT_LVM drives. If you are reusing a logical volume group and you set this to true, all existing logical volumes in that group will not be touched unless they are specified in the <partitioning> section. So you can keep existing logical volumes without specifying them.

```
<keep_unknown_lv config:type="boolean">false</keep_unknown_lv>
```

enable_snapshots

Optional, the default is true.

Enables snapshots on Btrfs file systems mounted at / (does not apply to other file systems, or Btrfs file systems not mounted at /).

```
<enable_snapshots config:type="boolean">false</enable_snapshots>
```

quotas

Optional, the default is `false`.

Enables support for Btrfs subvolume quotas. Setting this element to `true` will enable support for quotas for the file system. However, you need to set the limits for each subvolume. Check [Section 4.5.3.3, "Btrfs subvolumes"](#) for further information.

```
<quotas config:type="boolean">true</quotas>
```



Important: Beware of data loss

The value provided in the `use` property determines how existing data and partitions are treated. The value `all` means that the entire disk will be erased. Make backups and use the `confirm` property if you need to keep some partitions with important data. Otherwise, no pop-ups will notify you about partitions being deleted.



Tip: Skipping devices

You can influence AutoYaST's device-guessing for cases where you do not specify a `<device>` entry on your own. Usually AutoYaST would use the first device it can find that looks reasonable but you can configure it to skip some devices like this:

```
<partitioning config:type="list">
  <drive>
    <initialize config:type="boolean">true</initialize>
    <skip_list config:type="list">
      <listentry>
        <!-- skip devices that use the usb-storage driver -->
        <skip_key>driver</skip_key>
        <skip_value>usb-storage</skip_value>
      </listentry>
      <listentry>
        <!-- skip devices that are smaller than 1GB -->
        <skip_key>size_k</skip_key>
        <skip_value>1048576</skip_value>
        <skip_if_less_than config:type="boolean">true</skip_if_less_than>
      </listentry>
      <listentry>
        <!-- skip devices that are larger than 100GB -->
        <skip_key>size_k</skip_key>
        <skip_value>104857600</skip_value>
      </listentry>
    </skip_list>
  </drive>
</partitioning>
```

```

        <skip_if_more_than config:type="boolean">true</skip_if_more_than>
    </listentry>
</skip_list>
</drive>
</partitioning>

```

For a list of all possible `<skip_key>`s, run `yast2 ayast_probe` on a system that has already been installed.

4.5.3.2 Partition configuration

The elements listed below must be placed within the following XML structure:

```

<drive>
  <partitions config:type="list">
    <partition>
      ...
    </partition>
  </partitions>
</drive>

```

create

Specify if this partition or logical volume must be created, or if it already exists. If set to `false`, you also need to set one of `partition_nr`, `lv_name`, `label`, or `uuid` to tell AutoYaST which device to use.

```
<create config:type="boolean">false</create>
```

crypt_method

Optional, the partition will be encrypted using one of these methods:

- `luks1`: regular LUKS1 encryption.
- `pervasive_luks2`: pervasive volume encryption.
- `protected_swap`: encryption with volatile protected key.
- `secure_swap`: encryption with volatile secure key.
- `random_swap`: encryption with volatile random key.

```
<crypt_method config:type="symbol">luks1</crypt_method>
```

See `crypt_key` element to learn how to specify the encryption password if needed.

crypt_fs

Partition will be encrypted, the default is `false`. This element is deprecated. Use `crypt_method` instead.

```
<crypt_fs config:type="boolean">true</crypt_fs>
```

crypt_key

Required if `crypt_method` has been set to a method that requires a password (that is, `luks1` or `pervasive_luks2`).

```
<crypt_key>xxxxxxx</crypt_key>
```

mount

You should have at least a root partition (`/`) and a swap partition.

```
<mount>/</mount><mount>swap</mount>
```

fstop

Mount options for this partition; see `man mount` for available mount options.

```
<fstopt>ro,noatime,user,data=ordered,acl,user_xattr</fstopt>
```

label

The label of the partition. Useful when formatting the device (especially if the `mountby` parameter is set to `label`) and for identifying a device that already exists (see `create` above). See `man e2label` for an example.

```
<label>mydata</label>
```

uuid

The uuid of the partition. Only useful for identifying an existing device (see `create` above). The uuid cannot be enforced for new devices. (See `man uuidgen`.)

```
<uuid>1b4e28ba-2fa1-11d2-883f-b9a761bde3fb</uuid>
```

size

The size of the partition, for example 4G, 4500M, etc. The `/boot` partition and the swap partition can have `auto` as size. Then AutoYaST calculates a reasonable size. One partition can have the value `max` to use all remaining space.

You can also specify the size in percentage. So 10% will use 10% of the size of the hard disk or volume group. You can mix `auto`, `max`, `size`, and percentage as you like.

```
<size>10G</size>
```

You can use all values (including auto and max) or resizing partitions as well.

format

Specify if AutoYaST should format the partition. If you set create to true, then you likely want this option set to true as well.

```
<format config:type="boolean">false</format>
```

file system

Optional. The default is btrfs for the root partition (/) and xfs for data partitions. Specify the file system to use on this partition:

- btrfs
- ext2
- ext3
- ext4
- fat
- xfs
- swap

```
<filesystem config:type="symbol">ext3</filesystem>
```

mkfs_options

Optional, specify an option string for the mkfs. Only use this when you know what you are doing. (See the relevant mkfs man page for the file system you want to use.)

```
<mkfs_options>-I 128</mkfs_options>
```

partition_nr

The number of this partition. If you have set create=false or if you use LVM, then you can specify the partition via partition_nr.

```
<partition_nr config:type="integer">2</partition_nr>
```

partition_id

The partition_id sets the id of the partition. If you want different identifiers than 131 for Linux partition or 130 for swap, configure them with partition_id. The default is 131 for a Linux partition and 130 for swap.

```
<partition_id config:type="integer">131</partition_id>
```

Swap: 130

Linux: 131

LVM: 142

MD RAID: 253

EFI partition: 259

partition_type

Optional. Allowed values are primary (default) and logical. When using an msdos partition table, this element sets the type of the partition. The value can be primary or logical. This value is ignored when using a gpt partition table, because such a distinction does not exist in that case.

```
<partition_type>primary</partition_type>
```

mountby

Instead of a partition number, you can tell AutoYaST to mount a partition by device, label, uuid, path or id, which are the udev path and udev id (see /dev/disk/...). See label and uuid documentation above. The default depends on YaST and usually is id.

```
<mountby config:type="symbol">label</mountby>
```

subvolumes

List of subvolumes to create for a file system of type Btrfs. This key only makes sense for file systems of type Btrfs. (See [Section 4.5.3.3, "Btrfs subvolumes"](#) for more information.)

If no subvolumes section has been defined for a partition description, AutoYaST will create a predefined set of subvolumes for the given mount point.

```
<subvolumes config:type="list">
  <path>tmp</path>
  <path>opt</path>
  <path>srv</path>
  <path>var</path>
  ...
</subvolumes>
```

create_subvolumes

Determine whether Btrfs subvolumes should be created or not. It is set to true by default. When set to false, no subvolumes will be created.

subvolumes_prefix

Set the Btrfs subvolumes prefix name. If no prefix is wanted, it must be set to an empty value:

```
<subvolumes_prefix><![CDATA[]]></subvolumes_prefix>
```

It is set to `@` by default.

lv_name

If this partition is on a logical volume in a volume group, specify the logical volume name here (see the `type` parameter in the drive configuration).

```
<lv_name>opt_lv</lv_name>
```

stripes

An integer that configures LVM striping. Specify across how many devices you want to stripe (spread data).

```
<stripes config:type="integer">2</stripes>
```

stripesize

Specify the size of each block in KB.

```
<stripesize config:type="integer">4</stripesize>
```

lvm_group

If this is a physical partition used by (part of) a volume group (LVM), you need to specify the name of the volume group here.

```
<lvm_group>system</lvm_group>
```

pool

`pool` must be set to `true` if the LVM logical volume should be an LVM thin pool.

```
<pool config:type="boolean">true</pool>
```

used_pool

The name of the LVM thin pool that is used as a data store for this thin logical volume. If this is set to something non-empty, it implies that the volume is a so-called thin logical volume.

```
<used_pool>my_thin_pool</used_pool>
```

raid_name

If this physical volume is part of a RAID array, specify the name of the RAID array.

```
<raid_name>/dev/md/0</raid_name>
```

raid_options

Specify RAID options. Setting the RAID options at the partition level is deprecated. See [Section 4.5.6, “Software RAID”](#).

bcache_backing_for

If this device is used as a bcache *backing device*, specify the name of the bcache device. See [Section 4.5.8, “bcache configuration”](#) for further details.

```
<bcache_backing_for>/dev/bcache0</bcache_backing_for>
```

bcache_caching_for

If this device is used as a bcache *caching device*, specify the names of the bcache devices. See [Section 4.5.8, “bcache configuration”](#) for further details.

```
<bcache_caching_for config:type="list"><listentry>/dev/bcache0</listentry></bcache_caching_for>
```

resize

Resizing works with physical disk partitions and with LVM volumes.

```
<resize config:type="boolean">false</resize>
```

4.5.3.3 Btrfs subvolumes

As mentioned in [Section 4.5.3.2, “Partition configuration”](#), it is possible to define a set of subvolumes for each Btrfs file system. In its simplest form, they are specified using a list of paths:

```
<subvolumes config:type="list">  
  <path>usr/local</path>  
  <path>tmp</path>  
  <path>opt</path>  
  <path>srv</path>  
  <path>var</path>  
</subvolumes>
```

However, it is possible to specify additional settings for each subvolume. For example, we might want to set a quota or to disable the copy-on-write mechanism. For that purpose, it is possible to expand any of the elements of the list as shown in the example below:

```
<subvolumes config:type="list">  
  <listentry>usr/local</listentry>  
  <listentry>
```

```

    <path>tmp</path>
    <referenced_limit>1 GiB</referenced_limit>
  </listentry>
  <listentry>opt</listentry>
  <listentry>srv</listentry>
  <listentry>
    <path>var/lib/pgsql</path>
    <copy_on_write config:type="boolean">false</copy_on_write>
  </listentry>
</subvolumes>

```

path

Mount point for the subvolume.

```
<path>tmp</tmp>
```

Required. AutoYaST will ignore the subvolume if the path is not specified.

copy-on-write

Whether copy-on-write should be enabled for the subvolume.

```
<copy-on-write config:type="boolean">false</copy-on-write>
```

Optional. The default value is false.

referenced_limit

Set a quota for the subvolume.

```
<referenced_limit>1 GiB</referenced_limit>
```

Optional. The default value is unlimited. Btrfs supports two kinds of limits: referenced and exclusive. At this point, only the former is supported.

If there is a default subvolume used for the distribution (for example @ in SUSE Linux Enterprise Micro), the name of this default subvolume is automatically prefixed to the names of the defined subvolumes. This behavior can be disabled by setting the subvolumes_prefix in the [Section 4.5.3.1, “Drive configuration”](#) section.

```
<subvolumes_prefix><![CDATA[]]></subvolumes_prefix>
```

4.5.3.4 Using the whole disk

AutoYaST allows to use a whole disk without creating any partition by setting the disklabel to none as described in [Section 4.5.3.1, “Drive configuration”](#). In such cases, the configuration in the first partition from the drive will be applied to the whole disk.

In the example below, we are using the second disk (`/dev/sdb`) as the `/home` file system.

EXAMPLE 4.5: USING A WHOLE DISK AS A FILE SYSTEM

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <partitions config:type="list">
      <partition>
        <create config:type="boolean">true</create>
        <format config:type="boolean">true</format>
        <mount></mount>
        <size>max</size>
      </partition>
    </partitions>
  </drive>
  <drive>
    <device>/dev/sdb</device>
    <disklabel>none</disklabel>
    <partitions config:type="list">
      <partition>
        <format config:type="boolean">true</format>
        <mount>/home</mount>
      </partition>
    </partitions>
  </drive>
```

In addition, the whole disk can be used as an LVM physical volume or as a software RAID member. See [Section 4.5.5, “Logical volume manager \(LVM\)”](#) and [Section 4.5.6, “Software RAID”](#) for further details about setting up an LVM or a software RAID.

4.5.3.5 Filling the gaps

When using the *Expert Partitioner* approach, AutoYaST can create a partition plan from a rather incomplete profile. The following profiles show how you can describe some details of the partitioning layout and let AutoYaST do the rest.

EXAMPLE 4.6: AUTOMATED PARTITIONING ON SELECTED DRIVES

The following is an example of a single drive system, which is not pre-partitioned and should be automatically partitioned according to the described pre-defined partition plan. If you do not specify the device, it will be automatically detected.

```
<partitioning config:type="list">
```

```
<drive>
  <device>/dev/sda</device>
  <use>all</use>
</drive>
</partitioning>
```

A more detailed example shows how existing partitions and multiple drives are handled.

EXAMPLE 4.7: INSTALLING ON MULTIPLE DRIVES

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <use>all</use>
    <partitions config:type="list">
      <partition>
        <mount>/</mount>
        <size>10G</size>
      </partition>
      <partition>
        <mount>swap</mount>
        <size>1G</size>
      </partition>
    </partitions>
  </drive>
  <drive>
    <device>/dev/sdb</device>
    <use>free</use>
    <partitions config:type="list">
      <partition>
        <filesystem config:type="symbol">ext4</filesystem>
        <mount>/data1</mount>
        <size>15G</size>
      </partition>
      <partition>
        <filesystem config:type="symbol">xfs</filesystem>
        <mount>/data2</mount>
        <size>auto</size>
      </partition>
    </partitions>
  </drive>
</partitioning>
```

4.5.4 Advanced partitioning features

4.5.4.1 Wipe out partition table

Usually this is not needed because AutoYaST can delete partitions one by one automatically. But you need the option to let AutoYaST clear the partition table instead of deleting partitions individually.

Go to the drive section and add:

```
<initialize config:type="boolean">true</initialize>
```

With this setting AutoYaST will delete the partition table before it starts to analyze the actual partitioning and calculates its partition plan. Of course this means, that you cannot keep any of your existing partitions.

4.5.4.2 Mount options

By default a file system to be mounted is identified in /etc/fstab by the device name. This identification can be changed so the file system is found by searching for a UUID or a volume label. Note that not all file systems can be mounted by UUID or a volume label. To specify how a partition is to be mounted, use the mountby property which has the symbol type. Possible options are:

- device (default)
- label
- UUID

If you choose to mount a new partition using a label, use the label property to specify its value. Add any valid mount option in the fourth field of /etc/fstab. Multiple options are separated by commas. Possible fstab options:

Mount read-only (ro)

No write access to the file system. Default is false.

No access time (noatime)

Access times are not updated when a file is read. Default is false.

Mountable by user (user)

The file system can be mounted by a normal user. Default is false.

Data Journaling Mode (ordered, journal, writeback)

journal

All data is committed to the journal prior to being written to the main file system.

ordered

All data is directly written to the main file system before its metadata is committed to the journal.

writeback

Data ordering is not preserved.

Access control list (acl)

Enable access control lists on the file system.

Extended user attributes (user_xattr)

Allow extended user attributes on the file system.

EXAMPLE 4.8: MOUNT OPTIONS

```
<partitions config:type="list">
  <partition>
    <filesystem config:type="symbol">ext4</filesystem>
    <format config:type="boolean">true</format>
    <fstopt>ro,noatime,user,data=ordered,acl,user_xattr</fstopt>
    <mount>/local</mount>
    <mountby config:type="symbol">uuid</mountby>
    <partition_id config:type="integer">131</partition_id>
    <size>10G</size>
  </partition>
</partitions>
```



Note: Check supported file system options

Different file system types support different options. Check the documentation carefully before setting them.

4.5.4.3 Keeping specific partitions

In some cases you should leave partitions untouched and only format specific target partitions, rather than creating them from scratch. For example, if different Linux installations coexist, or you have another operating system installed, likely you do not want to wipe these out. You may also want to leave data partitions untouched.

Such scenarios require specific knowledge about the target systems and hard disks. Depending on the scenario, you might need to know the exact partition table of the target hard disk with partition IDs, sizes and numbers. With this data, you can tell AutoYaST to keep certain partitions, format others and create new partitions if needed.

The following example will keep partitions 1, 2 and 5 and delete partition 6 to create two new partitions. All remaining partitions will only be formatted.

EXAMPLE 4.9: KEEPING PARTITIONS

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sdc</device>
    <partitions config:type="list">
      <partition>
        <create config:type="boolean">false</create>
        <format config:type="boolean">true</format>
        <mount>/</mount>
        <partition_nr config:type="integer">1</partition_nr>
      </partition>
      <partition>
        <create config:type="boolean">false</create>
        <format config:type="boolean">false</format>
        <partition_nr config:type="integer">2</partition_nr>
        <mount>/space</mount>
      </partition>
      <partition>
        <create config:type="boolean">false</create>
        <format config:type="boolean">true</format>
        <filesystem config:type="symbol">swap</filesystem>
        <partition_nr config:type="integer">5</partition_nr>
        <mount>swap</mount>
      </partition>
      <partition>
        <format config:type="boolean">true</format>
        <mount>/space2</mount>
        <size>5G</size>
      </partition>
      <partition>
        <format config:type="boolean">true</format>
        <mount>/space3</mount>
        <size>max</size>
      </partition>
    </partitions>
    <use>6</use>
  </drive>
```

```
</partitioning>
```

The last example requires exact knowledge of the existing partition table and the partition numbers of those partitions that should be kept. In some cases however, such data may not be available, especially in a mixed hardware environment with different hard disk types and configurations. The following scenario is for a system with a non-Linux OS with a designated area for a Linux installation.

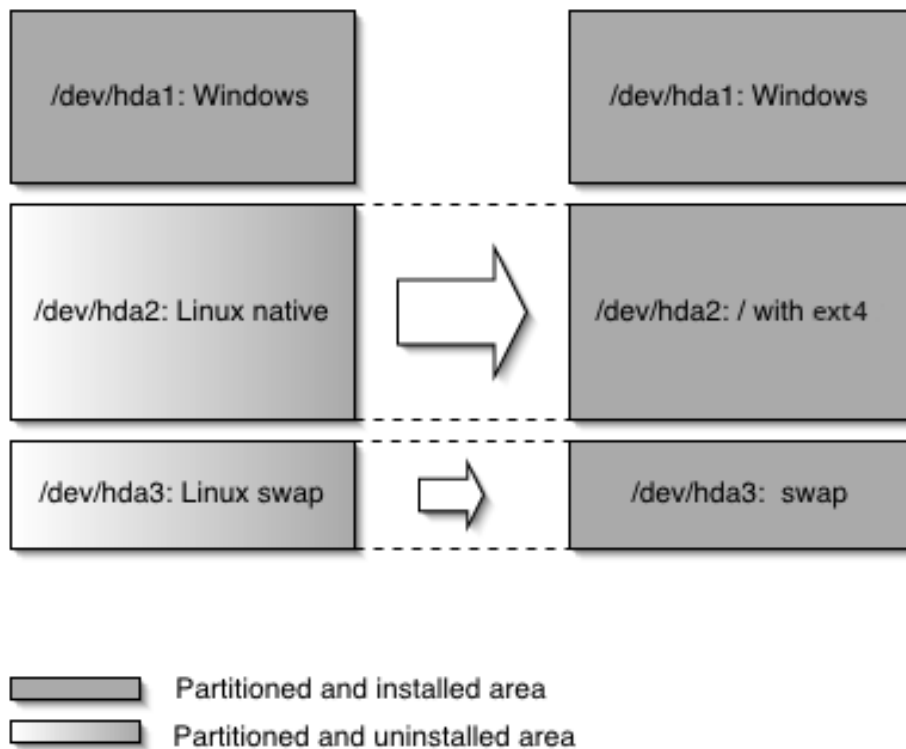


FIGURE 4.1: KEEPING PARTITIONS

In this scenario, shown in figure *Figure 4.1, "Keeping partitions"*, AutoYaST will not create new partitions. Instead it searches for certain partition types on the system and uses them according to the partitioning plan in the control file. No partition numbers are given in this case, only the mount points and the partition types (additional configuration data can be provided, for example file system options, encryption and file system type).

EXAMPLE 4.10: AUTO-DETECTION OF PARTITIONS TO BE KEPT.

```
<partitioning config:type="list">  
  <drive>
```

```

<partitions config:type="list">
  <partition>
    <create config:type="boolean">false</create>
    <format config:type="boolean">true</format>
    <mount></mount>
    <partition_id config:type="integer">131</partition_id>
  </partition>
  <partition>
    <create config:type="boolean">false</create>
    <format config:type="boolean">true</format>
    <filesystem config:type="symbol">swap</filesystem>
    <partition_id config:type="integer">130</partition_id>
    <mount>swap</mount>
  </partition>
</partitions>
</drive>
</partitioning>

```



Note: Keeping encrypted devices

When AutoYaST is probing the storage devices, the partitioning section from the profile is not yet analyzed. In some scenarios, it is not clear which key should be used to unlock a device. For example, this can happen when more than one encryption key is defined. To solve this problem, AutoYaST will try all defined keys on all encrypted devices until a working key is found.

4.5.5 Logical volume manager (LVM)

To configure LVM, first create a physical volume using the normal partitioning method described above.

EXAMPLE 4.11: CREATE LVM PHYSICAL VOLUME

The following example shows how to prepare for LVM in the `partitioning` resource. A non-formatted partition is created on device `/dev/sda1` of the type `LVM` and with the volume group `system`. This partition will use all space available on the drive.

```

<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <partitions config:type="list">
      <partition>

```

```

    <create config:type="boolean">true</create>
    <lvm_group>system</lvm_group>
    <partition_type>primary</partition_type>
    <partition_id config:type="integer">142</partition_id>
    <partition_nr config:type="integer">1</partition_nr>
    <size>max</size>
  </partition>
</partitions>
<use>all</use>
</drive>
</partitioning>

```

EXAMPLE 4.12: LVM LOGICAL VOLUMES

```

<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <partitions config:type="list">
      <partition>
        <lvm_group>system</lvm_group>
        <partition_type>primary</partition_type>
        <size>max</size>
      </partition>
    </partitions>
    <use>all</use>
  </drive>
  <drive>
    <device>/dev/system</device>
    <type config:type="symbol">CT_LVM</type>
    <partitions config:type="list">
      <partition>
        <filesystem config:type="symbol">ext4</filesystem>
        <lv_name>user_lv</lv_name>
        <mount>/usr</mount>
        <size>15G</size>
      </partition>
      <partition>
        <filesystem config:type="symbol">ext4</filesystem>
        <lv_name>opt_lv</lv_name>
        <mount>/opt</mount>
        <size>10G</size>
      </partition>
      <partition>
        <filesystem config:type="symbol">ext4</filesystem>
        <lv_name>var_lv</lv_name>
        <mount>/var</mount>
        <size>1G</size>
      </partition>
    </partitions>
  </drive>
</partitioning>

```

```
</partition>
</partitions>
<pesize>4M</pesize>
<use>all</use>
</drive>
</partitioning>
```

It is possible to set the size to max for the logical volumes. Of course, you can only use max for one(!) logical volume. You cannot set two logical volumes in one volume group to max.

4.5.6 Software RAID

Using AutoYaST, you can create and assemble software RAID devices. The supported RAID levels are the following:

RAID 0

This level increases your disk performance. There is *no* redundancy in this mode. If one of the drives crashes, data recovery will not be possible.

RAID 1

This mode offers the best redundancy. It can be used with two or more disks. An exact copy of all data is maintained on all disks. As long as at least one disk is still working, no data is lost. The partitions used for this type of RAID should have approximately the same size.

RAID 5

This mode combines management of a larger number of disks and still maintains some redundancy. This mode can be used on three disks or more. If one disk fails, all data is still intact. If two disks fail simultaneously, all data is lost.

Multipath

This mode allows access to the same physical device via multiple controllers for redundancy against a fault in a controller card. This mode can be used with at least two devices.

Similar to LVM, a software RAID definition in an AutoYaST profile is composed of two different parts:

- Determining which disks or partitions are going to be used as RAID members. To do that, you need to set the raid_name element in such devices.
- Defining the RAID itself by using a dedicated drive section.

The following example shows a RAID1 configuration that uses a partition from the first disk and another one from the second disk as RAID members:

EXAMPLE 4.13: RAID1 CONFIGURATION

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <partitions config:type="list">
      <partition>
        <mount>/</mount>
        <size>20G</size>
      </partition>
      <partition>
        <raid_name>/dev/md/0</raid_name>
        <size>max</size>
      </partition>
    </partitions>
    <use>all</use>
  </drive>
  <drive>
    <device>/dev/sdb</device>
    <disklabel>none</disklabel>
    <partitions config:type="list">
      <partition>
        <raid_name>/dev/md/0</raid_name>
      </partition>
    </partitions>
    <use>all</use>
  </drive>
  <drive>
    <device>/dev/md/0</device>
    <partitions config:type="list">
      <partition>
        <mount>/home</mount>
        <size>40G</size>
      </partition>
      <partition>
        <mount>/srv</mount>
        <size>10G</size>
      </partition>
    </partitions>
    <raid_options>
      <chunk_size>4</chunk_size>
      <parity_algorithm>left_asymmetric</parity_algorithm>
      <raid_type>raid1</raid_type>
    </raid_options>
```



```
<use>all</use>
</drive>
</partitioning>
```

If you do not want to create partitions in the software RAID, set the `disklabel` to `none` as you would do for a regular disk. In the example below, only the RAID `drive` section is shown for simplicity's sake:

EXAMPLE 4.14: RAID1 WITHOUT PARTITIONS

```
<drive>
  <device>/dev/md/0</device>
  <disklabel>none</disklabel>
  <partitions config:type="list">
    <partition>
      <mount>/home</mount>
      <size>40G</size>
    </partition>
  </partitions>
  <raid_options>
    <chunk_size>4</chunk_size>
    <parity_algorithm>left_asymmetric</parity_algorithm>
    <raid_type>raid1</raid_type>
  </raid_options>
  <use>all</use>
</drive>
```

4.5.6.1 RAID options

The following elements must be placed within the following XML structure:

```
<partition>
  <raid_options>
    ...
  </raid_options>
</partition>
```

`chunk_size`

```
<chunk_size>4</chunk_size>
```

`parity_algorithm`

Possible values are:

`left_asymmetric`, `left_symmetric`, `right_asymmetric`, or `right_symmetric`.

For RAID6 and RAID10, the following values can be used:

parity_first, parity_last, left_asymmetric_6, left_symmetric_6,
right_asymmetric_6, right_symmetric_6, parity_first_6, n2, o2, f2, n3, o3,
or f3.

```
<parity_algorithm>left_asymmetric</parity_algorithm>
```

raid_type

Possible values are: raid0, raid1, raid5, raid6 and raid10.

```
<raid_type>raid1</raid_type>
```

The default is raid1.

device_order

This list contains the order of the physical devices:

```
<device_order config:type="list"><device>/dev/sdb2</device><device>/dev/sda1</  
device>...</device_order>
```

This is optional, and the default is alphabetical order.

4.5.7 Multipath support

AutoYaST can handle multipath devices. To take advantage of them, you need to enable multipath support, as shown in *Example 4.15, "Using multipath devices"*. Alternatively, you can use the following parameter on the Kernel command line: LIBSTORAGE_MULTIPATH_AUTOSTART=ON.

EXAMPLE 4.15: USING MULTIPATH DEVICES

```
<general>  
  <storage>  
    <start_multipath config:type="boolean">true</start_multipath>  
  </storage>  
</general>  
<partitioning>  
  <drive>  
    <partitions config:type="list">  
      <partition>  
        <size>20G</size>  
        <mount>/</mount>  
        <filesystem config:type="symbol">ext4</filesystem>  
      </partition>  
    </partitions>  
  </drive>  
</partitioning>
```

```

    </partition>
    <partition>
      <size>auto</size>
      <mount>swap</mount>
    </partition>
  </partitions>
  <type config:type="symbol">CT_DISK</type>
  <use>all</use>
</drive>
</partitioning>

```

If you want to specify the device, you could use the World Wide Identifier (WWID), its device name (for example, `/dev/dm-0`), any other path under `/dev/disk` that refers to the multipath device or any of its paths.

For example, given the `multipath` listing from [Example 4.16, “Listing multipath devices”](#), you could use `/dev/mapper/14945540000000000f86756dce9286158be4c6e3567e75ba5`, `/dev/dm-3`, any other corresponding path under `/dev/disk` (as shown in [Example 4.17, “Using the WWID to identify a multipath device”](#)), or any of its paths (`/dev/sda` or `/dev/sdb`).

EXAMPLE 4.16: LISTING MULTIPATH DEVICES

```

# multipath -l
14945540000000000f86756dce9286158be4c6e3567e75ba5 dm-3 ATA,VIRTUAL-DISK
size=40G features='0' hwhandler='0' wp=rw
|+- policy='service-time 0' prio=1 status=active
|  `-- 2:0:0:0 sda 8:0 active ready running
`+- policy='service-time 0' prio=1 status=enabled
   `-- 3:0:0:0 sdb 8:16 active ready running

```

EXAMPLE 4.17: USING THE WWID TO IDENTIFY A MULTIPATH DEVICE

```

<drive>
  <partitions config:type="list">
    <device>/dev/mapper/14945540000000000f86756dce9286158be4c6e3567e75ba5</device>
    <partition>
      <size>20G</size>
      <mount></mount>
      <filesystem config:type="symbol">ext4</filesystem>
    </partition>
  </partitions>
  <type config:type="symbol">CT_DISK</type>
  <use>all</use>
</drive>

```

4.5.8 bcache configuration

bcache is a caching system which allows the use of multiple fast drives to speed up the access to one or more slower drives. For example, you can improve the performance of a large (but slow) drive by using a fast one as a cache.

For more information about bcache on SUSE Linux Enterprise Micro, also see the blog post at <https://www.suse.com/c/combine-the-performance-of-solid-state-drive-with-the-capacity-of-a-hard-drive-with-bcache-and-yast/>.

To set up a bcache device, AutoYaST needs a profile that specifies the following:

- To set a (slow) block device as *backing device*, use the bcache_backing_for element.
- To set a (fast) block device as *caching device*, use the bcache_caching_for element. You can use the same device to speed up the access to several drives.
- To specify the layout of the bcache device, use a drive section and set the type element to CT_BCACHE. The layout of the bcache device may contain partitions.

EXAMPLE 4.18: bcache DEFINITION

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <type config:type="symbol">CT_DISK</type>
    <use>all</use>
    <enable_snapshots config:type="boolean">true</enable_snapshots>
    <partitions config:type="list">
      <partition>
        <filesystem config:type="symbol">btrfs</filesystem>
        <mount>/</mount>
        <create config:type="boolean">true</create>
        <size>max</size>
      </partition>
      <partition>
        <filesystem config:type="symbol">swap</filesystem>
        <mount>swap</mount>
        <create config:type="boolean">true</create>
        <size>2GiB</size>
      </partition>
    </partitions>
  </drive>

  <drive>
    <type config:type="symbol">CT_DISK</type>
    <device>/dev/sdb</device>
```

```

<disklabel>msdos</disklabel>
<use>all</use>
<partitions config:type="list">
  <partition>
    <!-- It can serve as caching device for several bcachees -->
    <bcache_caching_for config:type="list">
      <listentry>/dev/bcache0</listentry>
    </bcache_caching_for>
    <size>max</size>
  </partition>
</partitions>
</drive>

<drive>
  <type config:type="symbol">CT_DISK</type>
  <device>/dev/sdc</device>
  <use>all</use>
  <disklabel>msdos</disklabel>
  <partitions config:type="list">
    <partition>
      <!-- It can serve as backing device for one bcache -->
      <bcache_backing_for>/dev/bcache0</bcache_backing_for>
    </partition>
  </partitions>
</drive>

<drive>
  <type config:type="symbol">CT_BCACHE</type>
  <device>/dev/bcache0</device>
  <bcache_options>
    <cache_mode>writethrough</cache_mode>
  </bcache_options>
  <use>all</use>
  <partitions config:type="list">
    <partition>
      <mount>/data</mount>
      <size>20GiB</size>
    </partition>
    <partition>
      <mount>swap</mount>
      <filesystem config:type="symbol">swap</filesystem>
      <size>1GiB</size>
    </partition>
  </partitions>
</drive>
</partitioning>

```

For the time being, the only supported option in the `bcache_options` section is `cache_mode`, described below.

cache_mode

Cache mode for `bcache`. Possible values are:

- `writethrough`
- `writeback`
- `writearound`
- `none`

```
<cache_mode>writethrough</cache_mode>
```

4.5.9 Multi-device Btrfs configuration

Btrfs supports creating a single volume that spans more than one storage device, offering similar features to software RAID implementations such as the Linux kernel's built-in `mdraid` subsystem. *Multi-device Btrfs* offers advantages over some other RAID implementations. For example, you can dynamically migrate a multi-device Btrfs volume from one RAID level to another, RAID levels can be set on a per-file basis, and more. However, not all of these features are fully supported yet in SUSE Linux Enterprise Micro 15 SP3.

With AutoYaST, a multi-device Btrfs can be configured by specifying a drive with the `CT_BTRFS` type. The `device` property is used as an arbitrary name to identify each multi-device Btrfs.

As with RAID, you need to create all block devices first (for example, partitions, LVM logical volumes, etc.) and assign them to the Btrfs file system you want to create over such block devices.

The following example shows a simple multi-device Btrfs configuration:

EXAMPLE 4.19: MULTI-DEVICE BTRFS CONFIGURATION

```
<partitioning config:type="list">
  <drive>
    <device>/dev/sda</device>
    <disklabel>none</disklabel>
    <partitions>
      <partition>
        <btrfs_name>root_fs</btrfs_name>
```

```

    </partition>
  </partitions>
  <use>all</use>
</drive>
<drive>
  <device>/dev/sdb</device>
  <disklabel>gpt</disklabel>
  <partitions>
    <partition>
      <partition_nr>1</partition_nr>
      <size>4gb</size>
      <filesystem>ext4</filesystem>
      <btrfs_name>root_fs</btrfs_name>
    </partition>
  </partitions>
  <use>all</use>
</drive>
<drive>
  <device>root_fs</device>
  <type config:type="symbol">CT_BTRFS</type>
  <partitions>
    <partition config:type="list">
      <mount></mount>
    </partition>
  </partitions>
  <btrfs_options>
    <raid_level>raid1</raid_level>
    <metadata_raid_level>raid1</metadata_raid_level>
  </btrfs_options>
</drive>
</partitioning>

```

The supported data and metadata RAID levels are: default, single, dup, raid0, raid1, and raid10. By default, file system metadata is mirrored across two devices and data is striped across all of the devices. If only one device is present, metadata will be duplicated on that one device.

Keep the following in mind when configuring a multi-device Btrfs file system:

- Devices need to indicate the btrfs_name property to be included into a multi-device Btrfs file system.
- All Btrfs-specific options are contained in the btrfs_options resource of a CT_BTRFS drive.

4.5.10 NFS configuration

AutoYaST allows to install SUSE Linux Enterprise Micro onto *Network File System* (NFS) shares. To do so, you must create a drive with the `CT_NFS` type and provide the NFS share name (`SERVER:PATH`) as device name. The information relative to the mount point is included as part of its first partition section. Note that for an NFS drive, only the first partition is taken into account.

EXAMPLE 4.20: NFS SHARE DEFINITION

```
<partitioning config:type="list">
  <drive>
    <device>192.168.1.1:/exports/root_fs</device>
    <type config:type="symbol">CT_NFS</type>
    <use>all</use>
    <partitions config:type="list">
      <partition>
        <mount>/</mount>
        <fstopt>nolock</fstopt>
      </partition>
    </partitions>
  </drive>
</partitioning>
```

4.5.11 tmpfs configuration

AutoYaST supports the definition of `tmpfs` virtual file systems by setting the `type` element to `CT_TMPFS`. Each `partition` section represents a `tmpfs` file system.

EXAMPLE 4.21: tmpfs DEFINITION

```
<partitioning config:type="list">
  <drive>
    <type config:type="symbol">CT_TMPFS</type>
    <partitions config:type="list">
      <partition>
        <mount>/srv</mount>
        <fstopt>size=512M</fstopt>
      </partition>
      <partition>
        <mount>/temp</mount>
      </partition>
    </partitions>
  </drive>
</partitioning>
```


tmpfs devices are different from regular file systems like Ext4 or Btrfs. Therefore, the only relevant elements are mount, which is mandatory, and fstop. The latter is used to set file system attributes like its size limit, mode, and so on. You can find additional information about the known options in the tmpfs man page.

4.6 iSCSI initiator overview

Using the iscsi-client resource, you can configure the target machine as an iSCSI client.

EXAMPLE 4.22: ISCSI CLIENT

```
<iscsi-client>
  <initiatorname>iqn.2013-02.de.suse:01:e229358d2dea</initiatorname>
  <targets config:type="list">
    <listentry>
      <authmethod>None</authmethod>
      <portal>192.168.1.1:3260</portal>
      <startup>onboot</startup>
      <target>iqn.2001-05.com.doe:test</target>
      <iface>default</iface>
    </listentry>
  </targets>
  <version>1.0</version>
</iscsi-client>
```

ISCSI INITIATOR CONFIGURATION SETTINGS

initiatorname

InitiatorName is a value from /etc/iscsi/initiatorname.iscsi. In case you have iBFT, this value will be added from there and you are only able to change it in the BIOS setup.

version

Version of the YaST module. Default: 1.0

targets

List of targets. Each entry contains:

authmethod

Authentication method: None/CHAP

portal

Portal address

startup

Value: manual/onboot

target

Target name

iface

Interface name

4.7 Fibre channel over Ethernet configuration (FCoE)

Using the `fcoe_cfg` resource, you can configure a Fibre Channel over Ethernet (FCoE).

EXAMPLE 4.23: FCOE CONFIGURATION

```
<fcoe-client>
  <fcoe_cfg>
    <DEBUG>no</DEBUG>
    <USE_SYSLOG>yes</USE_SYSLOG>
  </fcoe_cfg>
  <interfaces config:type="list">
    <listentry>
      <dev_name>eth3</dev_name>
      <mac_addr>01:000:000:000:42:42</mac_addr>
      <device>Gigabit 1313</device>
      <vlan_interface>200</vlan_interface>
      <fcoe_vlan>eth3.200</fcoe_vlan>
      <fcoe_enable>yes</fcoe_enable>
      <dc_b_required>yes</dc_b_required>
      <auto_vlan>no</auto_vlan>
      <dc_b_capable>no</dc_b_capable>
      <cfg_device>eth3.200</cfg_device>
    </listentry>
  </interfaces>
  <service_start>
    <fcoe config:type="boolean">true</fcoe>
    <lldpad config:type="boolean">true</lldpad>
  </service_start>
</fcoe-client>
```

fcoe_cfg

Values: yes / no

DEBUG is used to enable or disable debugging messages from the fcoe service script and fcoemon.

USE_SYSLOG messages are sent to the system log if set to yes.

interfaces

List of network cards including the status of VLAN and FCoE configuration.

service_start

Values: yes / no

Enable or disable the start of the services fcoe and lldpad boot time.

Starting the fcoe service means starting the Fibre Channel over Ethernet service daemon fcoemon which controls the FCoE interfaces and establishes a connection with the lldpad daemon.

The lldpad service provides the Link Layer Discovery Protocol agent daemon lldpad, which informs fcoemon about DCB (Data Center Bridging) features and configuration of the interfaces.

4.8 Country settings

Language, time zone, and keyboard settings.

EXAMPLE 4.24: LANGUAGE

```
<language>
  <language>en_GB</language>
  <languages>de_DE,en_US</languages>
</language>
```

language

Primary language

languages

Secondary languages separated by commas

A list of available languages can be found under /usr/share/YaST2/data/languages.

If the configured value for the primary language is unknown, it will be reset to the default, en_US.

EXAMPLE 4.25: TIME ZONE

```
<timezone>
  <hwclock>UTC</hwclock>
```

```
<timezone>Europe/Berlin</timezone>
</timezone>
```

hwclock

Whether the hardware clock uses local time or UTC.

Values: localtime/UTC.

timezone

Time zone.

A list of available time zones can be found under /usr/share/YaST2/data/time-zone_raw.ycp

EXAMPLE 4.26: KEYBOARD

```
<keyboard>
  <keymap>german</keymap>
</keyboard>
```

keymap

Keyboard layout

Keymap-code values or keymap-alias values are valid. A list of available entries can be found in /usr/share/YaST2/data/keyboards.rb. For example, english-us, us, english-uk, uk.

4.9 Services and targets

With the services-manager resource you can set the default systemd target and specify in detail which system services you want to start or deactivate and how to start them.

The default-target property specifies the default systemd target into which the system boots. Valid options are graphical for a graphical login, or multi-user for a console login.

To specify the set of services that should be started on boot, use the enable and disable lists. To start a service, add its name to the enable list. To make sure that the service is not started on boot, add it to the disable list.

If a service is not listed as enabled or disabled, a default setting is used. The default setting may be either disabled or enabled.

Finally, some services like cups support on-demand activation (socket activated services). If you want to take advantage of such a feature, list the names of those services in the on_demand list instead of enable.

```

<services-manager>
  <default_target>multi-user</default_target>
  <services>
    <disable config:type="list">
      <service>libvirtd</service>
    </disable>
    <enable config:type="list">
      <service>sshd</service>
    </enable>
    <on_demand config:type="list">
      <service>cups</service>
    </on_demand>
  </services>
</services-manager>

```

4.10 Network configuration

4.10.1 Configuration Workflow

Network configuration is mainly used to connect a single workstation to an Ethernet-based LAN. It is commonly configured before AutoYaST starts, to fetch the profile from a network location. This network configuration is usually done through **linuxrc**



Note: The **linuxrc** program

For a detailed description of how **linuxrc** works and its keywords, see [Appendix C, Advanced **linuxrc** options](#).

By default, YaST copies the network settings that were used during the installation into the final, installed system. This configuration is merged with the one defined in the AutoYaST profile.

AutoYaST settings have higher priority than any existing configuration files. YaST will write `ifcfg-*` files based on the entries in the profile without removing old ones. If the DNS and routing section is empty or missing, YaST will keep any pre-existing values. Otherwise, it applies the settings from the profile file.

Network settings and service activation are defined under the `profile networking` global resource.

4.10.2 The Network Resource

EXAMPLE 4.28: NETWORK CONFIGURATION

```
<networking>
  <dns>
    <dhcp_hostname config:type="boolean">true</dhcp_hostname>
    <hostname>linux-bqua</hostname>
    <nameservers config:type="list">
      <nameserver>192.168.1.116</nameserver>
      <nameserver>192.168.1.117</nameserver>
      <nameserver>192.168.1.118</nameserver>
    </nameservers>
    <resolv_conf_policy>auto</resolv_conf_policy>
    <searchlist config:type="list">
      <search>example.com</search>
      <search>example.net</search>
    </searchlist>
  </dns>
  <interfaces config:type="list">
    <interface>
      <bootproto>dhcp</bootproto>
      <name>eth0</name>
      <startmode>auto</startmode>
    </interface>
  </interfaces>
  <ipv6 config:type="boolean">true</ipv6>
  <keep_install_network config:type="boolean">false</keep_install_network>
  #false means use Wicked, true means use NetworkManager
  <managed config:type="boolean">false</managed>
  <net-udev config:type="list">
    <rule>
      <name>eth0</name>
      <rule>ATTR{address}</rule>
      <value>00:30:6E:08:EC:80</value>
    </rule>
  </net-udev>
  <s390-devices config:type="list">
    <listentry>
      <chanids>0.0.0800:0.0.0801:0.0.0802</chanids>
      <type>qeth</type>
    </listentry>
  </s390-devices>
  <routing>
    <ipv4_forward config:type="boolean">false</ipv4_forward>
    <ipv6_forward config:type="boolean">false</ipv6_forward>
    <routes config:type="list">
```

```

<route>
  <destination>192.168.2.1/24</destination>
  <name>eth0</name>
  <extrapara>foo</extrapara>
  <gateway>-</gateway>
</route>
<route>
  <destination>default</destination>
  <name>eth0</name>
  <gateway>192.168.1.1</gateway>
</route>
<route>
  <destination>default</destination>
  <name>lo</name>
  <gateway>192.168.5.1</gateway>
</route>
</routes>
</routing>
</networking>

```

As shown in the example above, the `<networking>` section can be composed of a few subsections:

- `interfaces` describes the configuration of the network interfaces, including their IP addresses, how they are started, etc.
- `dns` specifies DNS related settings, such as the host name, the list of name servers, etc.
- `routing` defines the routing rules.
- `s390-devices` covers z Systems-specific device settings.
- `net-udev` enumerates the udev rules used to set persistent names.

Additionally, there are a few elements that allow modifying how the network configuration is applied:

`keep_install_network`

As described in [Section 4.10.1, "Configuration Workflow"](#), by default, AutoYaST merges the network configuration from the running system with the one defined in the profile. If you want to use only the configuration from the profile, set this element to `false`. The value is `true` by default.

```
<keep_install_network config:type="boolean">false</keep_install_network>
```

managed

Determines whether to use NetworkManager instead of Wicked.

```
<managed config:type="boolean">true</managed>
```

start_immediately

Forces AutoYaST to restart the network just after writing the configuration.

```
<start_immediately config:type="boolean">true</start_immediately>
```

setup_before_proposal

Use the network configuration defined in the profile during the installation process. Otherwise, AutoYaST relies on the configuration set by linuxrc.

```
<setup_before_proposal config:type="boolean">true</setup_before_proposal>
```

strict_IP_check_timeout

After setting up the network, AutoYaST checks whether the assigned IP address is duplicated. In that case, it shows a warning whose timeout in seconds is controlled by this element. If it is set to 0, the installation is stopped.

```
<strict_IP_check_timeout config:type="integer">5</strict_IP_check_timeout>
```

virt_bridge_proposal

AutoYaST configures a bridge when a virtualization package is selected to be installed (e.g., Xen, QEMU or KVM). You can disable such a behaviour by setting this element to false.

```
<virt_bridge_proposal config:type="boolean">>false</virt_bridge_proposal>
```



Tip: IPv6 address support

Using IPv6 addresses in AutoYaST is fully supported. To disable IPv6 Address Support, set `<ipv6 config:type="boolean">false</ipv6>`

4.10.3 Interfaces

The interfaces section allows the user to define the configuration of interfaces, including how they are started, their IP addresses, networks, and more. The following elements must be enclosed in <interfaces>...</interfaces> tags.

bootproto

Boot protocol used by the interface. Possible values:

- static for statically assigned addresses. It is required to specify the IP using the ipaddr element.
- dhcp4, dhcp6 or dhcp for setting the IP address with DHCP (IPv4, IPv6 or any).
- dhcp+autoip to get the IPv4 configuration from *Zeroconf* and get IPv6 from DHCP.
- autoip to get the IPv4 configuration from *Zeroconf*.
- ibft to get the IP address using the iBFT protocol.
- none to skip setting an address. This value is used for bridges and bonding slaves.

Required.

broadcast

Broadcast IP address.

Used only with static boot protocol.

device

Device name.

Deprecated. Use name instead.

name

Device name, for example: eth0.

Required.

lladdr

Link layer address (MAC address).

Optional.

ipaddr

IP address assigned to the interface.

Used only with static boot protocol. It can include a network prefix, for example: 192.168.1.1/24.

remote_ipaddr

Remote IP address for point-to-point connections.

Used only with static boot protocol.

prefixlen

Network prefix, for example: 24.

Used only with static boot protocol.

startmode

When to bring up an interface. Possible values are:

- hotplug when the device is plugged in. Useful for USB network cards, for example.
- auto when the system boots. onboot is a deprecated alias.
- ifplugd when the device is managed by the ifplugd daemon.
- manual when the device is supposed to be started manually.
- nfsroot when the device is needed to mount the root file system, for example, when / is on an NFS volume.
- off to never start the device.

ifplugd_priority

Priority for ifplugd daemon. It determines in which order the devices are activated.

Used only with ifplugd start mode.

bonding_slaveX

Name of the bonding device.

Required for bonding devices. X is replaced by a number starting from 0, for example bonding_slave0. Each slave needs to have a unique number.

bonding_module_opts

Options for bonding device.

Used only with bond device.

mtu

Maximum transmission unit for the interface.

Optional.

ethtool_options

Ethtool options during device activation.

Optional.

zone

Firewall zone name which the interface is assigned to.

Optional.

vlan_id

Identifier used for this VLAN.

Used only with a vlan device.

etherdevice

Device to which VLAN is attached.

Used only with a vlan device and required for it.

bridge_ports

Space-separated list of bridge ports, for example, eth0 eth1.

Used only with a bridge device and required for it.

bridge_stp

Spanning tree protocol. Possible values are on (when enabled) and off (when disabled).

Used only with a bridge device.

bridge_forward_delay

Forward delay for bridge, for example: 15.

Used only with bridge devices. Valid values are between 4 and 30.

EXAMPLE 4.29: BONDING INTERFACE CONFIGURATION

```
<networking>
<setup_before_proposal config:type="boolean">false</setup_before_proposal>
<keep_install_network config:type="boolean">false</keep_install_network>
<interfaces config:type="list">
  <interface>
    <bonding_master>yes</bonding_master>
    <bonding_module_opts>mode=active-backup miimon=100</bonding_module_opts>
    <bonding_slave0>eth1</bonding_slave0>
    <bonding_slave0>eth2</bonding_slave0>
    <bondoption>mode=balance-rr miimon=100</bondoption>
    <bootproto>static</bootproto>
    <name>bond0</name>
    <ipaddr>192.168.1.61</ipaddr>
    <prefixlen>24</prefixlen>
    <startmode>auto</startmode>
  </interface>
  <interface>
    <bootproto>none</bootproto>
    <name>eth1</name>
    <startmode>auto</startmode>
```

```

</interface>
<interface>
  <bootproto>none</bootproto>
  <name>eth2</name>
  <startmode>auto</startmode>
</interface>
</interfaces>
<net-udev config:type="list">
  <rule>
    <name>eth1</name>
    <rule>ATTR{address}</rule>
    <value>dc:e4:cc:27:94:c7</value>
  </rule>
  <rule>
    <name>eth2</name>
    <rule>ATTR{address}</rule>
    <value>dc:e4:cc:27:94:c8</value>
  </rule>
</net-udev>
</networking>

```

EXAMPLE 4.30: BRIDGE INTERFACE CONFIGURATION

```

<interfaces config:type="list">
  <interface>
    <name>br0</name>
    <bootproto>static</bootproto>
    <bridge>yes</bridge>
    <bridge_forwarddelay>0</bridge_forwarddelay>
    <bridge_ports>eth0 eth1</bridge_ports>
    <bridge_stp>off</bridge_stp>
    <ipaddr>192.168.1.100</ipaddr>
    <prefixlen>24</prefixlen>
    <startmode>auto</startmode>
  </interface>
  <interface>
    <name>eth0</name>
    <bootproto>none</bootproto>
    <startmode>hotplug</startmode>
  </interface>
  <interface>
    <name>eth1</name>
    <bootproto>none</bootproto>
    <startmode>hotplug</startmode>
  </interface>
</interfaces>

```

4.10.4 Persistent names of network interfaces

The `net-udev` element allows to specify a set of udev rules that can be used to assign persistent names to interfaces.

name

Network interface name, for example `eth3`. (Required.)

rule

`ATTR{address}` for a MAC-based rule, `KERNELS` for a bus-ID-based rule. (Required.)

value

For example: `f0:de:f1:6b:da:69` for a MAC rule, `0000:00:1c:1` or `0.0.0700` for a bus ID rule. (Required.)



Tip: Handling collisions in device names

When creating an incomplete *udev* rule set, the chosen device name can collide with existing device names. For example, when renaming a network interface to `eth0`, a collision with a device automatically generated by the kernel can occur. AutoYaST tries to handle such cases in a best effort manner and renames colliding devices.

EXAMPLE 4.31: ASSIGNING A PERSISTENT NAME USING THE MAC ADDRESS

```
<net-udev config:type="list">
  <rule>
    <name>eth1</name>
    <rule>ATTR{address}</rule>
    <value>52:54:00:68:54:fb</value>
  </rule>
</net-udev>
```

4.10.5 Domain name system

The `dns` section is used to define name-service related settings, such as the host name or name servers.

hostname

Host name, excluding the domain name part. For example: `foo` (instead of `foo.bar`).

If a host name is not specified and is not taken from a DHCP server (see `dhcp_hostname`), AutoYaST will generate a random one.

nameservers

List of name servers. Example:

```
<nameservers config:type="list">
  <nameserver>192.168.1.116</nameserver>
  <nameserver>192.168.1.117</nameserver>
</nameservers>
```

searchlist

Search list for host name lookup.

```
<searchlist config:type="list">
  <search>example.com</search>
</searchlist>
```

Optional.

dhcp_hostname

Specifies whether the host name must be taken from DHCP or not.

```
<dhcp_hostname config:type="boolean">true</dhcp_hostname>
```

4.10.6 Routing

The routing table allows specification of a list of routes and the packet-forwarding settings for IPv4 and IPv6.

ipv4_forward

Optional: Whether IP forwarding must be enabled for IPv4.

ipv6_forward

Optional: Whether IP forwarding must be enabled for IPv6.

routes

Optional: List of routes.

The following settings describe how routes are defined.

destination

Required: Route destination. An address prefix can be specified, for example: 192.168.122.0/24.

device

Required: Interface associated to the route.

gateway

Optional: Gateway's IP address.

4.10.7 s390 options

The following elements must be between the `< s390-devices >... </ s390-devices >` tags.

type

qeth, ctc or iucv.

chanids

channel IDs, separated by a colon (preferred) or a space

```
<chanids>0.0.0700:0.0.0701:0.0.0702</chanids>
```

layer2

```
<layer2 config:type="boolean">true</layer2>
```

boolean; default: false

protocol

Optional: CTC / LCS protocol, a small number (as a string)

```
<protocol>1</protocol>
```

router

IUCV router/user

In addition to the options mentioned above, AutoYaST also supports IBM Z-specific options in other sections of the configuration file. In particular, you can define the logical link address, or LLADDR (in the case of Ethernet, that is the MAC address). To do so, use the option LLADDR in the device definition.



Tip: LLADDR for VLANs

VLAN devices inherit their LLADDR from the underlying physical devices. To set a particular address for a VLAN device, set the LLADDR option for the underlying physical device.

4.10.8 Proxy

Configure your Internet proxy (caching) settings.

Configure proxies for HTTP, HTTPS, and FTP with `http_proxy`, `https_proxy` and `ftp_proxy`, respectively. Addresses or names that should be directly accessible need to be specified with `no_proxy` (space separated values). If you are using a proxy server with authorization, fill in `proxy_user` and `proxy_password`,

EXAMPLE 4.32: NETWORK CONFIGURATION: PROXY

```
<proxy>
  <enabled config:type="boolean">true</enabled>
  <ftp_proxy>http://192.168.1.240:3128</ftp_proxy>
  <http_proxy>http://192.168.1.240:3128</http_proxy>
  <no_proxy>www.example.com .example.org localhost</no_proxy>
  <proxy_password>testpw</proxy_password>
  <proxy_user>testuser</proxy_user>
</proxy>
```

4.11 Security settings

Using the features of this module, you can change the local security settings on the target system. The local security settings include the boot configuration, login settings, password settings, user addition settings, and file permissions.

EXAMPLE 4.33: SECURITY CONFIGURATION

See the reference for the meaning and the possible values of the settings in the following example.

```
<security>
  <console_shutdown>ignore</console_shutdown>
  <displaymanager_remote_access>no</displaymanager_remote_access>
  <fail_delay>3</fail_delay>
  <faillog_enab>yes</faillog_enab>
  <gid_max>60000</gid_max>
  <gid_min>101</gid_min>
  <gdm_shutdown>root</gdm_shutdown>
  <lastlog_enab>yes</lastlog_enab>
  <encryption>md5</encryption>
  <obscure_checks_enab>no</obscure_checks_enab>
  <pass_max_days>99999</pass_max_days>
  <pass_max_len>8</pass_max_len>
  <pass_min_days>1</pass_min_days>
```



```
<pass_min_len>6</pass_min_len>
<pass_warn_age>14</pass_warn_age>
<passwd_use_cracklib>yes</passwd_use_cracklib>
<permission_security>secure</permission_security>
<run_updatedb_as>nobody</run_updatedb_as>
<uid_max>60000</uid_max>
<uid_min>500</uid_min>
<selinux_mode>permissive</selinux_mode>
</security>
```

4.11.1 Password settings options

Change various password settings. These settings are mainly stored in the /etc/login.defs file.

Use this resource to activate one of the encryption methods currently supported. If not set, DES is configured.

DES, the Linux default method, works in all network environments, but it restricts you to passwords no longer than eight characters. MD5 allows longer passwords, thus provides more security, but some network protocols do not support this, and you may have problems with NIS. Blowfish is also supported.

Additionally, you can set up the system to check for password plausibility and length etc.

4.11.2 Boot settings

Use the security resource, to change various boot settings.

How to interpret **Ctrl - Alt - Del** ?

When someone at the console has pressed the **Ctrl - Alt - Del** key combination, the system usually reboots. Sometimes it is desirable to ignore this event, for example, when the system serves as both workstation and server.

Shutdown behavior of GDM

Configure a list of users allowed to shut down the machine from GDM.

4.11.3 Login settings

Change various login settings. These settings are mainly stored in the /etc/login.defs file.

4.11.4 New user settings (**useradd** settings)

Set the minimum and maximum possible user and group IDs.

4.11.5 SELinux settings

Configuring SELinux mode. Possible values are permissive, enforcing and disabled.

4.12 Users and groups

4.12.1 Users

A list of users can be defined in the <users> section. To be able to log in, make sure that either the root users are set up or rootpassword is specified as a linuxrc option.

EXAMPLE 4.34: MINIMAL USER CONFIGURATION

```
<users config:type="list">
  <user>
    <username>root</username>
    <user_password>password</user_password>
    <encrypted config:type="boolean">false</encrypted>
  </user>
  <user>
    <username>tux</username>
    <user_password>password</user_password>
    <encrypted config:type="boolean">false</encrypted>
  </user>
</users>
```

The following example shows a more complex scenario. System-wide default settings from /etc/default/useradd, such as the shell or the parent directory for the home directory, are applied.

EXAMPLE 4.35: COMPLEX USER CONFIGURATION

```
<users config:type="list">
```

```

<user>
  <username>root</username>
  <user_password>password</user_password>
  <uid>1001</uid>
  <gid>100</gid>
  <encrypted config:type="boolean">false</encrypted>
  <fullname>Root User</fullname>
  <authorized_keys config:type="list">
    <listentry>command="/opt/login.sh" ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAQDKLt1vnW2vTJpBp3VK91rFsBvpY97NljsVLdgUr1PbZ/
L51FerQQ+djQ/ivDASQj0+567nMGqfYGFA/De1EGMMEoeShza67qjNi14L1HBGgVojaNajMR/
NI2d1kDyvsgRy7D7FT5UGGUNT0dlcSD3b85zWgHeYLidgcGIoKeRi7HpVD00TyhwUv4sq3ubrPCWARgPe0LdVFa9clC8PTZdxSeKp4j
PvMDa96DpxH1VlzJlAIHQsMkMHbsCazPNC0++Kp5ZVERiH root@example.net</listentry>
  </authorized_keys>
</user>
<user>
  <username>tux</username>
  <user_password>password</user_password>
  <uid>1002</uid>
  <gid>100</gid>
  <encrypted config:type="boolean">false</encrypted>
  <fullname>Plain User</fullname>
  <home>/Users/plain</home>
  <password_settings>
    <max>120</max>
    <inact>5</inact>
  </password_settings>
</user>
</users>

```



Note: `authorized_keys` file will be overwritten

If the profile defines a set of SSH authorized keys for a user in the `authorized_keys` section, an existing `$HOME/.ssh/authorized_keys` file will be overwritten. If not existing, the file will be created with the content specified. Avoid overwriting an existing `authorized_keys` file by not specifying the respective section in the AutoYaST control file.



Note: Combine `rootpassword` and `root user` options

It is possible to specify `rootpassword` in `linuxrc` and have a user section for the `root` user. If this section is missing the password, then the password from `linuxrc` will be used. Passwords in profiles take precedence over `linuxrc` passwords.



Note: Specifying a user ID (uid)

Each user on a Linux system has a numeric user ID. You can either specify such a user ID within the AutoYaST control file manually by using `uid`, or let the system automatically choose a user ID by not using `uid`.

User IDs should be unique throughout the system. If not, some applications such as the login manager `gdm` may no longer work as expected.

When adding users with the AutoYaST control file, it is strongly recommended not to mix user-defined IDs and automatically provided IDs. When doing so, unique IDs cannot be guaranteed. Either specify IDs for all users added with the AutoYaST control file or let the system choose the ID for all users.

ATTRIBUTE, VALUES, DESCRIPTION

username

Text

```
<username>luke</username>
```

Required. It should be a valid user name. Check `man 8 useradd` if you are not sure.

fullname

Text

```
<fullname>Tux Torvalds</fullname>
```

Optional. User's full name.

forename

Text

```
<forename>Tux</forename>
```

Optional. User's forename.

surname

Text

```
<surname>Skywalker</surname>
```

Optional. User's surname.

uid

Number

```
<uid>1001</uid>
```

Optional. User ID. It should be a unique and must be a non-negative number. If not specified, AutoYaST will automatically choose a user ID. Also refer to *Note: Specifying a user ID (uid)* for additional information.

gid

Number

```
<gid>100</gid>
```

Optional. Initial group ID. It must be a unique and non-negative number. Moreover it must refer to an existing group.

home

Path

```
<home>/home/luke</home>
```

Optional. Absolute path to the user's home directory. By default, /home/username will be used (for example, alice's home directory will be /home/alice).

home_btrfs_subvolume

Boolean

```
<home_btrfs_subvolume config:type="boolean">true</home_btrfs_subvolume>
```

Optional. Generates the home directory in a Btrfs subvolume. Disabled by default.

shell

Path

```
<shell>/usr/bin/zsh</shell>
```

Optional. /bin/bash is the default value. If you choose another one, make sure that it is installed (adding the corresponding package to the software section).

user_password

Text

```
<user_password>some-password</user_password>
```

Optional. If you enter an exclamation mark (!), a random password will be generated. A user's password can be written in plain text (not recommended) or in encrypted form. To create an encrypted password, use mkpasswd. Enter the password as written in /etc/shadow (second column). To enable or disable the use of encrypted passwords in the profile, see the encrypted parameter.

encrypted

Boolean

```
<encrypted config:type="boolean">true</encrypted>
```

Optional. Considered false if not present. Indicates if the user's password in the profile is encrypted or not. AutoYaST supports standard encryption algorithms (see man 3 crypt).

password_settings

Password settings

```
<password_settings>
  <expire/>
  <max>60</max>
  <warn>7</warn>
</password_settings>
```

Optional. Some password settings can be customized: expire (account expiration date in format YYYY-MM-DD), flag (/etc/shadow flag), inact (number of days after password expiration that account is disabled), max (maximum number of days a password is valid), min (grace period in days until which a user can change password after it has expired) and warn (number of days before expiration when the password change reminder starts).

authorized_keys

List of authorized keys

```
<authorized_keys config:type="list">
  <listentry>ssh-rsa ...</listentry>
</authorized_keys>
```

A list of authorized keys to be written to \$HOME/.ssh/authorized_keys. See example below.

4.12.2 User defaults

The profile can specify a set of default values for new users like password expiration, initial group, home directory prefix, etc. Besides using them as default values for the users that are defined in the profile, AutoYaST will write those settings to /etc/default/useradd to be read for useradd.

ATTRIBUTE, VALUES, DESCRIPTION

group

Text

```
<group>100</group>
```

Optional. Default initial login group.

groups

Text

```
<groups>users</groups>
```

Optional. List of additional groups.

home

Path

```
<home>/home</home>
```

Optional. User's home directory prefix.

expire

Date

```
<expire>2017-12-31</expire>
```

Optional. Default password expiration date in YYYY-MM-DD format.

inactive

Number

```
<inactive>3</inactive>
```

Optional. Number of days after which an expired account is disabled.

no_groups

Boolean

```
<no_groups config:type="boolean">true</no_groups>
```

Optional. Do not use secondary groups.

shell

Path

```
<shell>/usr/bin/fish</shell>
```

Default login shell. /bin/bash is the default value. If you choose another one, make sure that it is installed (adding the corresponding package to the software section).

skel

Path

```
<skel>/etc/skel</skel>
```

Optional. Location of the files to be used as skeleton when adding a new user. You can find more information in [man 8 useradd](#).

umask

File creation mode mask

```
<umask>022</umask>
```

Set the file creation mode mask for the home directory. By default [useradd](#) will use [022](#). Check [man 8 useradd](#) and [man 1 umask](#) for further information.

4.12.3 Groups

A list of groups can be defined in [<groups>](#) as shown in the example.

EXAMPLE 4.36: GROUP CONFIGURATION

```
<groups config:type="list">
  <group>
    <gid>100</gid>
    <groupname>users</groupname>
    <userlist>bob,alice</userlist>
  </group>
</groups>
```

ATTRIBUTE, VALUES, DESCRIPTION

groupname

Text

```
<groupname>users</groupname>
```

Required. It should be a valid group name. Check [man 8 groupadd](#) if you are not sure.

gid

Number

```
<gid>100</gid>
```

Optional. Group ID. It must be a unique and non-negative number.

group_password

Text

```
<group_password>password</group_password>
```


Optional. The group's password can be written in plain text (not recommended) or in encrypted form. Check the [encrypted](#) to select the desired behavior.

encrypted

Boolean

```
<encrypted config:type="boolean">true</encrypted>
```

Optional. Indicates if the group's password in the profile is encrypted or not.

userlist

Users list

```
<userlist>bob,alice</userlist>
```

Optional. A list of users who belong to the group. User names must be separated by commas.

4.12.4 Login settings

Two special login settings can be enabled through an AutoYaST profile: autologin and password-less login. Both of them are disabled by default.

EXAMPLE 4.37: ENABLING AUTOLOGIN AND PASSWORD-LESS LOGIN

```
<login_settings>
  <autologin_user>vagrant</autologin_user>
  <password_less_login config:type="boolean">true</password_less_login>
</login_settings>
```

ATTRIBUTE, VALUES, DESCRIPTION

autologin_user

Text

```
<autologin_user>alice</autologin_user>
```

Optional. Enables autologin for the given user.

4.13 Custom user scripts

By adding scripts to the auto-installation process you can customize the installation according to your needs and take control in different stages of the installation.

In the auto-installation process, three types of scripts can be executed at different points in time during the installation:

All scripts need to be in the `<scripts>` section.

- pre-scripts (very early, before anything else really happens)
- postpartitioning-scripts (after partitioning and mounting to /mnt but before RPM installation)
- chroot-scripts (after the package installation, before the first boot)

4.13.1 Pre-install scripts

Executed before YaST does any real change to the system (before partitioning and package installation but after the hardware detection).

You can use a pre-script to modify your control file and let AutoYaST reread it. Find your control file in /tmp/profile/autoinst.xml. Adjust the file and store the modified version in /tmp/profile/modified.xml. AutoYaST will read the modified file after the pre-script finishes.

It is also possible to modify the storage devices in your pre-scripts. For example, you can create new partitions or change the configuration of certain technologies like multipath. AutoYaST always inspects the storage devices again after executing all the pre-install scripts.



Note: Pre-install scripts with confirmation

Pre-scripts are executed at an early stage of the installation. This means if you have requested to confirm the installation, the pre-scripts will be executed before the confirmation screen shows up (profile/install/general/mode/confirm).



Note: Pre-install and Zypper

To call *Zypper* in the pre-install script you will need to set the environment variable `ZYPP_LOCKFILE_ROOT="/var/run/autoyast"` to prevent conflicts with the running YaST process.

Pre-Install Script elements must be placed as follows:

```
<scripts>
  <pre-scripts config:type="list">
```

```
<script>
...
</script>
</pre-scripts>
</scripts>
```

4.13.2 Post-partitioning scripts

Executed after YaST has done the partitioning and written /etc/fstab. The empty system is already mounted to /mnt.

Post-partitioning script elements must be placed as follows:

```
<scripts>
  <postpartitioning-scripts config:type="list">
    <script>
      ...
    </script>
  </postpartitioning-scripts>
</scripts>
```

4.13.3 Chroot environment scripts

Chroot scripts are executed before the machine reboots for the first time. You can execute chroot scripts before the installation chroots into the installed system and configures the boot loader or you can execute a script after the chroot into the installed system has happened (look at the chrooted parameter for that).

Chroot Environment script elements must be placed as follows:

```
<scripts>
  <chroot-scripts config:type="list">
    <script>
      ...
    </script>
  </chroot-scripts>
</scripts>
```

4.13.4 Script XML representation

Most of the XML elements described below can be used for all the script types described above.

location

Define a location from where the script gets fetched. Locations can be the same as for the control file (HTTP, FTP, NFS, etc.). Additionally a relative URL can be used that defines a path relative to the directory with the control file, using the syntax `relurl://script.sh`.

```
<location>http://10.10.0.1/myPreScript.sh</location>
```

Either location or source must be defined.

source

The script itself (source code), encapsulated in a CDATA tag. If you do not want to put the whole shell script into the XML control file, refer to the location parameter.

```
<source>
<![CDATA[
echo "Testing the pre script" > /tmp/pre-script_out.txt
]]>
</source>
```

Either location or source must be defined.

interpreter

Specify the interpreter that must be used for the script. Any interpreter available in the given environment can be specified. It is possible to provide a full path to the interpreter, including parameters. There are also deprecated keywords interpreter "shell", "perl" and "python" that are supported by the debug flag.

```
<interpreter>/bin/bash -x</interpreter>
```

Optional; default is shell.

file name

The file name of the script. It will be stored in a temporary directory under /tmp.

```
<filename>myPreScript5.sh</filename>
```

Optional; default is the type of the script (pre-scripts in this case). If you have more than one script, you should define different names for each script. If filename is not defined and location is defined, the file name from the location path will be used.

feedback

If this boolean is true, output and error messages of the script (STDOUT and STDERR) will be shown in a pop-up. The user needs to confirm them via the OK button.

```
<feedback config:type="boolean">true</feedback>
```

Optional; default is false.

feedback_type

This can be message, warning or error. Set the timeout for these pop-ups in the `<report>` section.

```
<feedback_type>warning</feedback_type>
```

Optional; if missing, an always-blocking pop-up is used.

debug

If this is true, every single line of a shell script is logged. Perl scripts are run with warnings turned on. This only works for the deprecated keyword `interpreter`. For other languages, give the path to the interpreter as a parameter in the interpreter value, for example `"<interpreter> ruby -w </interpreter>"`.

```
<debug config:type="boolean">true</debug>
```

Optional; default is true.

notification

This text will be shown in a pop-up for the time the script is running in the background.

```
<notification>Please wait while script is running...</notification>
```

Optional; if not configured, no notification pop-up will be shown.

param-list

It is possible to specify parameters given to the script being called. You may have more than one param entry. They are concatenated by a single space character on the script command line. If any shell quoting should be necessary (for example to protect embedded spaces) you need to include this.

```
<param-list config:type="list">
  <param>par1</param>
  <param>par2 par3</param>
  <param>"par4.1 par4.2"</param>
</param-list>
```

Optional; if not configured, no parameters get passed to script.

rerun

A script is only run once. Even if you use ayast_setup to run an XML file multiple times, the script is only run once. Change this default behavior by setting this boolean to true.

```
<rerun config:type="boolean">true</rerun>
```

Optional; default is false, meaning that scripts only run once.

chrooted

During installation, the new system is mounted at /mnt. If this parameter is set to false, AutoYaST does not run **chroot** and does not install the boot loader at this stage. If the parameter is set to true, AutoYaST performs a **chroot** into /mnt and installs the boot loader. The result is that to change anything in the newly-installed system, you no longer need to use the /mnt prefix.

```
<chrooted config:type="boolean">true</chrooted>
```

Optional; default is false. This option is only available for chroot environment scripts.

4.14 Adding complete configurations

For many applications and services you may have a configuration file which should be copied to the appropriate location on the installed system. For example, if you are installing a Web server, you may have a server configuration file (httpd.conf).

Using this resource, you can embed the file into the control file by specifying the final path on the installed system. YaST will copy this file to the specified location.

This feature requires the autoyast2 package to be installed. If the package is missing, AutoYaST will automatically install the package if it is missing.

You can specify the file_location where the file should be retrieved from. This can also be a location on the network such as an HTTP server: <file_location>http://my.server.site/issue</file_location>.

It is also possible to specify a local file using the relurl:// prefix, for example: <file_location>relurl://path/to/file.conf</file_location>.

You can create directories by specifying a file_path that ends with a slash.

EXAMPLE 4.38: DUMPING FILES INTO THE INSTALLED SYSTEM

```
<files config:type="list">
  <file>
    <file_path>/etc/apache2/httpd.conf</file_path>
    <file_contents>

<![CDATA[
```

```

some content
]]>

    </file_contents>
</file>
<file>
    <file_path>/mydir/a/b/c/</file_path> <!-- create directory -->
</file>
</files>

```

A more advanced example is shown below. This configuration will create a file using the content supplied in `file_contents` and change the permissions and ownership of the file. After the file has been copied to the system, a script is executed. This can be used to modify the file and prepare it for the client's environment.

EXAMPLE 4.39: DUMPING FILES INTO THE INSTALLED SYSTEM

```

<files config:type="list">
  <file>
    <file_path>/etc/someconf.conf</file_path>
    <file_contents>

<![CDATA[
some content
]]>

    </file_contents>
    <file_owner>tux.users</file_owner>
    <file_permissions>444</file_permissions>
    <file_script>
      <interpreter>shell</interpreter>
      <source>

<![CDATA[
#!/bin/sh

echo "Testing file scripts" >> /etc/someconf.conf
df
cd /mnt
ls
]]>

      </source>
    </file_script>
  </file>
</files>

```

4.15 Ask the user for values during installation

You have the option to let the user decide the values of specific parts of the control file during the installation. If you use this feature, a pop-up will ask the user to enter a specific part of the control file during installation. If you want a full auto installation, but the user should set the password of the local account, you can do this via the ask directive in the control file.

The elements listed below must be placed within the following XML structure:

```
<general>
  <ask-list config:type="list">
    <ask>
      ...
    </ask>
  </ask-list>
</general>
```

ASK THE USER FOR VALUES: XML REPRESENTATION

question

The question you want to ask the user.

```
<question>Enter the LDAP server</question>
```

The default value is the path to the element (the path often looks strange, so we recommend entering a question).

default

Set a preselection for the user. A text entry will be filled out with this value. A check box will be true or false and a selection will have the given value preselected.

```
<default>dc=suse,dc=de</default>
```

Optional.

help

An optional help text that is shown on the left side of the question.

```
<help>Enter the LDAP server address.</help>
```

Optional.

title

An optional title that is shown above the questions.


```
<title>LDAP server</title>
```

Optional.

type

The type of the element you want to change. Possible values are symbol, boolean, string and integer. The file system in the partition section is a symbol, while the encrypted element in the user configuration is a boolean. You can see the type of that element if you look in your control file at the config:type="..." attribute. You can also use static_text as type. A static_text is a text that does not require any user input and can show information not included in the help text.

```
<type>symbol</type>
```

Optional. The default is string. If type is symbol, you must provide the selection element too (see below).

password

If this boolean is set to true, a password dialog pops up instead of a simple text entry. Setting this to true only makes sense if type is string.

```
<password config:type="boolean">true</password>
```

Optional. The default is false.

pathlist

A list of path elements. A path is a comma separated list of elements that describes the path to the element you want to change. For example, the LDAP server element can be found in the control file in the <ldap><ldap_server> section. So to change that value, you need to set the path to ldap,ldap_server.

```
<pathlist config:type="list">
  <path>networking,dns,hostname</path>
  <path>...</path>
</pathlist>
```

To change the password of the first user in the control file, you need to set the path to user-s,0,user_password. The 0 indicates the first user in the <users config:type="list"> list of users in the control file. 1 would be the second one, and so on.

```
<users config:type="list">
  <user>
    <username>root</username>
```

```

    <user_password>password to change</user_password>
    <encrypted config:type="boolean">false</encrypted>
  </user>
  <user>
    <username>tux</username>
    <user_password>password to change</user_password>
    <encrypted config:type="boolean">false</encrypted>
  </user>
</users>

```

This information is optional but you should at least provide path or file.

file

You can store the answer to a question in a file, to use it in one of your scripts later. If you ask during stage=initial and you want to use the answer in stage 2, then you need to copy the answer-file in a chroot script that is running as chrooted=false. Use the command: **cp /tmp/my_answer /mnt/tmp/**. The reason is that /tmp in stage 1 is in the RAM disk and will be lost after the reboot, but the installed system is already mounted at /mnt/.

```
<file>/tmp/answer_hostname</file>
```

This information is optional, but you should at least provide path or file.

stage

```
<stage>cont</stage>
```

Optional. The default is initial.

Stage configures the installation stage in which the question pops up. As SUSE Linux Enterprise Micro is installed in a single stage, use the value initial, other values cannot be applied. The question pops up after pre-scripts have run, before the installation is complete.

selection

The selection element contains a list of entry elements. Each entry represents a possible option for the user to choose. The user cannot enter a value in a text box, but they can choose from a list of values.

```

<selection config:type="list">
  <entry>
    <value>
      btrfs
    </value>
    <label>

```

```

        Btrfs File System
    </label>
</entry>
<entry>
    <value>
        ext3
    </value>
    <label>
        Extended3 File System
    </label>
</entry>
</selection>

```

Optional for type=string, not possible for type=boolean and mandatory for type=symbol.

dialog

You can ask more than one question per dialog. To do so, specify the dialog-id with an integer. All questions with the same dialog-id belong to the same dialog. The dialogs are sorted by the id too.

```
<dialog config:type="integer">3</dialog>
```

Optional.

element

You can have more than one question per dialog. To make that possible you need to specify the element-id with an integer. The questions in a dialog are sorted by ID.

```
<element config:type="integer">1</element>
```

Optional (see dialog).

width

You can increase the default width of the dialog. If there are multiple width specifications per dialog, the largest one is used. The number is roughly equivalent to the number of characters.

```
<width config:type="integer">50</width>
```

Optional.

height

You can increase the default height of the dialog. If there are multiple height specifications per dialog, the largest one is used. The number is roughly equivalent to the number of lines.

```
<height config:type="integer">15</height>
```

Optional.

frametitle

You can have more than one question per dialog. Each question on a dialog has a frame that can have a frame title, a small caption for each question. You can put multiple elements into one frame. They need to have the same frame title.

```
<frametitle>User data</frametitle>
```

Optional; default is no frame title.

script

You can run scripts after a question has been answered. See the table below for detailed instructions about scripts.

```
<script>...</script>
```

Optional; default is no script.

ok_label

You can change the label on the *Ok* button. The last element that specifies the label for a dialog wins.

```
<ok_label>Finish</ok_label>
```

Optional.

back_label

You can change the label on the *Back* button. The last element that specifies the label for a dialog wins.

```
<back_label>change values</back_label>
```

Optional.

timeout

You can specify an integer here that is used as timeout in seconds. If the user does not answer the question before the timeout, the default value is taken as answer. When the user touches or changes any widget in the dialog, the timeout is turned off and the dialog needs to be confirmed via *Ok*.

```
<timeout config:type="integer">30</timeout>
```

Optional; a missing value is interpreted as 0, which means that there is no timeout.

default_value_script

You can run scripts to set the default value for a question (see [Section 4.15.1, “Default value scripts”](#) for detailed instructions about default value scripts). This feature is useful if you can calculate a default value, especially in combination with the timeout option.

```
<default_value_script>...</default_value_script>
```

Optional; default is no script.

4.15.1 Default value scripts

You can run scripts to set the default value for a question. This feature is useful if you can calculate a default value, especially in combination with the timeout option.

The elements listed below must be placed within the following XML structure:

```
<general>
  <ask-list config:type="list">
    <ask>
      <default_value_script>
        ...
      </default_value_script>
    </ask>
  </ask-list>
</general>
```

DEFAULT VALUE SCRIPTS: XML REPRESENTATION

source

The source code of the script. Whatever you echo to STDOUT will be used as default value for the ask-dialog. If your script has an exit code other than 0, the normal default element is used. Take care you use echo -n to suppress the \n and that you echo reasonable values and not “okay” for a boolean

```
<source>...</source>
```

This value is required, otherwise nothing would be executed.

interpreter

The interpreter to use.

```
<interpreter>perl</interpreter>
```

The default value is `shell`. You can also set `/bin/myinterpreter` as value.

4.15.2 Scripts

You can run scripts after a question has been answered.

The elements listed below must be placed within the following XML structure:

```
<general>
  <ask-list config:type="list">
    <ask>
      <script>
        ...
      </script>
    </ask>
  </ask-list>
</general>
```

SCRIPTS: XML REPRESENTATION

file name

The file name of the script.

```
<filename>my_ask_script.sh</filename>
```

The default is `ask_script.sh`

source

The source code of the script. Together with `rerun_on_error` activated, you check the value that was entered for sanity. Your script can create a file `/tmp/next_dialog` with a dialog id specifying the next dialog AutoYaST will raise. A value of -1 terminates the ask sequence. If that file is not created, AutoYaST will run the dialogs in the normal order (since 11.0 only).

```
<source>...</source>
```

This value is required, otherwise nothing would be executed.

environment

A boolean that passes the value of the answer to the question as an environment variable to the script. The variable is named `VAL`.

```
<environment config:type="boolean">true</environment>
```

Optional. Default is false.

feedback

A boolean that turns on feedback for the script execution. STDOUT will be displayed in a pop-up window that must be confirmed after the script execution.

```
<feedback config:type="boolean">true</feedback>
```

Optional, default is false.

debug

A boolean that turns on debugging for the script execution.

```
<debug config:type="boolean">true</debug>
```

Optional, default is true. This value needs feedback to be turned on, too.

rerun_on_error

A boolean that keeps the dialog open until the script has an exit code of 0 (zero). So you can parse and check the answers the user gave in the script and display an error with the feedback option.

```
<rerun_on_error config:type="boolean">true</rerun_on_error>
```

Optional, default is false. This value should be used together with the feedback option.

Below you can see an example of the usage of the ask feature.

```
<general>
<ask-list config:type="list">
  <ask>
    <pathlist config:type="list">
      <path>ldap,ldap_server</path>
    </pathlist>
    <stage>cont</stage>
    <help>Choose your server depending on your department</help>
    <selection config:type="list">
      <entry>
        <value>ldap1.mydom.de</value>
        <label>LDAP for development</label>
      </entry>
      <entry>
        <value>ldap2.mydom.de</value>
        <label>LDAP for sales</label>
      </entry>
    </selection>
  </ask>
</ask-list>
</general>
```

```

        </entry>
    </selection>
    <default>ldap2.mydom.de</default>
    <default_value_script>
        <source> <![CDATA[
echo -n "ldap1.mydom.de"
]]>
        </source>
    </default_value_script>
</ask>
<ask>
    <pathlist config:type="list">
        <path>networking,dns,hostname</path>
    </pathlist>
    <question>Enter Hostname</question>
    <stage>initial</stage>
    <default>enter your hostname here</default>
</ask>
<ask>
    <pathlist config:type="list">
        <path>partitioning,0,partitions,0,filesystem</path>
    </pathlist>
    <question>File System</question>
    <type>symbol</type>
    <selection config:type="list">
        <entry>
            <value config:type="symbol">ext4</value>
            <label>default File System (recommended)</label>
        </entry>
        <entry>
            <value config:type="symbol">ext3</value>
            <label>Fallback File System</label>
        </entry>
    </selection>
</ask>
</ask-list>
</general>

```

The following example shows a to choose between AutoYaST control files. AutoYaST will read the modified.xml file again after the ask-dialogs are done. This way you can fetch a complete new control file.

```

<general>
    <ask-list config:type="list">
        <ask>
            <selection config:type="list">
                <entry>

```



```

        <value>part1.xml</value>
        <label>Simple partitioning</label>
    </entry>
    <entry>
        <value>part2.xml</value>
        <label>encrypted /tmp</label>
    </entry>
    <entry>
        <value>part3.xml</value>
        <label>LVM</label>
    </entry>
</selection>
<title>XML Profile</title>
<question>Choose a profile</question>
<stage>initial</stage>
<default>part1.xml</default>
<script>
    <filename>fetch.sh</filename>
    <environment config:type="boolean">true</environment>
    <source>
<![CDATA[
wget http://10.10.0.162/$VAL -O /tmp/profile/modified.xml 2>/dev/null
]]>
        </source>
        <debug config:type="boolean">false</debug>
        <feedback config:type="boolean">false</feedback>
    </script>
</ask>tion>
</ask-list>
</general>

```

You can verify the answer of a question with a script like this:

```

<general>
  <ask-list config:type="list">
    <ask>
      <script>
        <filename>my.sh</filename>
        <rerun_on_error config:type="boolean">true</rerun_on_error>
        <environment config:type="boolean">true</environment>
        <source><![CDATA[
if [ "$VAL" = "myhost" ]; then
  echo "Illegal Hostname!";
  exit 1;
fi
exit 0
]]>
          </source>

```

```

        <debug config:type="boolean">false</debug>
        <feedback config:type="boolean">true</feedback>
    </script>
    <dialog config:type="integer">0</dialog>
    <element config:type="integer">0</element>
    <pathlist config:type="list">
        <path>networking,dns,hostname</path>
    </pathlist>
    <question>Enter Hostname</question>
    <default>enter your hostname here</default>
</ask>
</ask-list>
</general>

```

4.16 Kernel dumps



Note: Availability

This feature is not available on AArch64, or on systems with less than 1 GB of RAM.

With Kdump the system can create crashdump files if the whole kernel crashes. Crash dump files contain the memory contents while the system crashed. Such core files can be analyzed later by support or a (kernel) developer to find the reason for the system crash. Kdump is mostly useful for servers where you cannot easily reproduce such crashes but it is important to get the problem fixed.

There is a downside to this. Enabling Kdump requires between 64 MB and 128 MB of additional system RAM reserved for Kdump in case the system crashes and the dump needs to be generated. This section only describes how to set up Kdump with AutoYaST. It does not describe how Kdump works. For details, refer to the `kdump(7)` manual page.

The following example shows a general Kdump configuration.

EXAMPLE 4.40: KDUMP CONFIGURATION

```

<kdump>
  <!-- memory reservation -->
  <add_crash_kernel config:type="boolean">true</add_crash_kernel>
  <crash_kernel>256M-:64M</crash_kernel>
</general>

  <!-- dump target settings -->

```

```

<KDUMP_SAVEDIR>ftp://stravinsky.suse.de/incoming/dumps</KDUMP_SAVEDIR>
<KDUMP_COPY_KERNEL>true</KDUMP_COPY_KERNEL>
<KDUMP_FREE_DISK_SIZE>64</KDUMP_FREE_DISK_SIZE>
<KDUMP_KEEP_OLD_DUMPS>5</KDUMP_KEEP_OLD_DUMPS>

<!-- filtering and compression -->
<KDUMP_DUMPFORMAT>compressed</KDUMP_DUMPFORMAT>
<KDUMP_DUMPLEVEL>1</KDUMP_DUMPLEVEL>

<!-- notification -->
<KDUMP_NOTIFICATION_TO>tux@example.com</KDUMP_NOTIFICATION_TO>
<KDUMP_NOTIFICATION_CC>spam@example.com devnull@example.com</KDUMP_NOTIFICATION_CC>
<KDUMP_SMTP_SERVER>mail.example.com</KDUMP_SMTP_SERVER>
<KDUMP_SMTP_USER></KDUMP_SMTP_USER>
<KDUMP_SMTP_PASSWORD></KDUMP_SMTP_PASSWORD>

<!-- kdump kernel -->
<KDUMP_KERNELVER></KDUMP_KERNELVER>
<KDUMP_COMMANDLINE></KDUMP_COMMANDLINE>
<KDUMP_COMMANDLINE_APPEND></KDUMP_COMMANDLINE_APPEND>

<!-- expert settings -->
<KDUMP_IMMEDIATE_REBOOT>yes</KDUMP_IMMEDIATE_REBOOT>
<KDUMP_VERBOSE>15</KDUMP_VERBOSE>
<KEXEC_OPTIONS></KEXEC_OPTIONS>
</general>
</kdump>

```

Kdump is enabled by default. The following configuration shows how to disable it.

EXAMPLE 4.41: DISABLED KDUMP CONFIGURATION

```

<kdump>
  <add_crash_kernel config:type="boolean">false</add_crash_kernel>
</kdump>

```

4.16.1 Memory reservation

The first step is to reserve memory for Kdump at boot-up. Because the memory must be reserved very early during the boot process, the configuration is done via a kernel command line parameter called `crashkernel`. The reserved memory will be used to load a second kernel which will be executed without rebooting if the first kernel crashes. This second kernel has a special `initrd`, which contains all programs necessary to save the dump over the network or to disk, send a notification e-mail, and finally reboot.

To reserve memory for Kdump, specify the amount (such as 64M to reserve 64 MB of memory from the RAM) and the offset. The syntax is crashkernel=AMOUNT@OFFSET. The kernel can auto-detect the right offset (except for the Xen hypervisor, where you need to specify 16M as offset). The amount of memory that needs to be reserved depends on architecture and main memory.

You can also use the extended command line syntax to specify the amount of reserved memory depending on the System RAM. That is useful if you share one AutoYaST control file for multiple installations or if you often remove or install memory on one machine. The syntax is:

```
BEGIN_RANGE_1-END_RANGE_1:AMOUNT_1,BEGIN_RANGE_2-END_RANGE_2:AMOUNT_2@OFFSET
```

BEGIN_RANGE_1 is the start of the first memory range (for example: 0M) and END_RANGE_1 is the end of the first memory range (can be empty in case infinity should be assumed) and so on. For example, 256M-2G:64M,2G-:128M reserves 64 MB of crashkernel memory if the system has between 256 MB and 2 GB RAM and reserves 128 MB of crashkernel memory if the system has more than 2 GB RAM.

On the other hand, it is possible to specify multiple values for the crashkernel parameter. For example, when you need to reserve different segments of low and high memory, use values like 72M,low and 256M,high:

EXAMPLE 4.42: KDUMP MEMORY RESERVATION WITH MULTIPLE VALUES

```
<kdump>
  <!-- memory reservation (high and low) -->
  <add_crash_kernel config:type="boolean">true</add_crash_kernel>
  <crash_kernel config:type="list">
    <listentry>72M,low</listentry>
    <listentry>256M,high</listentry>
  </crash_kernel>
</kdump>
```

The following table shows the settings necessary to reserve memory:

KDUMP MEMORY RESERVATION SETTINGS:XML REPRESENTATION

add_crash_kernel

Set to true if memory should be reserved and Kdump enabled.

```
<add_crash_kernel config:type="boolean">true</add_crash_kernel>
```

required

crash_kernel

Use the syntax of the crashkernel command line as discussed above.

```
<crash_kernel>256M:64M</crash_kernel>
```

A list of values is also supported.

```
<crash_kernel config:type="list">  
  <listentry>72M,low</listentry>  
  <listentry>256M,high</listentry>  
</crash_kernel>
```

required

4.16.2 Dump saving

This section describes where and how crash dumps will be stored.

4.16.2.1 Target

The element KDUMP_SAVEDIR specifies the URL to where the dump is saved. The following methods are possible:

- file to save to the local disk,
- ftp to save to an FTP server (without encryption),
- sftp to save to an SSH2 SFTP server,
- nfs to save to an NFS location and
- cifs to save the dump to a CIFS/SMP export from Samba or Microsoft Windows.

For details see the kdump(5) manual page. Two examples are: file:///var/crash (which is the default location according to FHS) and ftp://user:password@host:port/incoming/dumps. A subdirectory, with the time stamp contained in the name, will be created and the dumps saved there.

When the dump is saved to the local disk, KDUMP_KEEP_OLD_DUMPS can be used to delete old dumps automatically. Set it to the number of old dumps that should be kept. If the target partition would end up with less free disk space than specified in KDUMP_FREE_DISK_SIZE, the dump is not saved.

To save the whole kernel and the debug information (if installed) to the same directory, set `KDUMP_COPY_KERNEL` to `true`. You will have everything you need to analyze the dump in one directory (except kernel modules and their debugging information).

4.16.2.2 Filtering and compression

The kernel dump is uncompressed and unfiltered. It can get as large as your system RAM. To get smaller files, compress the dump file afterward. The dump needs to be decompressed before opening.

To use page compression, which compresses every page and allows dynamic decompression with the `crash(8)` debugging tool, set `KDUMP_DUMPFORMAT` to `compressed` (default).

You may not want to save all memory pages, for example those filled with zeroes. To filter the dump, set the `KDUMP_DUMPLEVEL`. 0 produces a full dump and 31 is the smallest dump. The manual pages `kdump(5)` and `makedumpfile(8)` list for each value which pages will be saved.

4.16.2.3 Summary

DUMP TARGET SETTINGS: XML REPRESENTATION

`KDUMP_SAVEDIR`

A URL that specifies the target to which the dump and related files will be saved.

```
<KDUMP_SAVEDIR>file:///var/crash/</KDUMP_SAVEDIR>
```

required

`KDUMP_COPY_KERNEL`

Set to `true`, if not only the dump should be saved to `KDUMP_SAVEDIR` but also the kernel and its debugging information (if installed).

```
<KDUMP_COPY_KERNEL>false</KDUMP_COPY_KERNEL>
```

optional

`KDUMP_FREE_DISK_SIZE`

Disk space in megabytes that must remain free after saving the dump. If not enough space is available, the dump will not be saved.

```
<KDUMP_FREE_DISK_SIZE>64</KDUMP_FREE_DISK_SIZE>
```

optional

KDUMP_KEEP_OLD_DUMPS

The number of dumps that are kept (not deleted) if KDUMP_SAVEDIR points to a local directory. Specify 0 if you do not want any dumps to be automatically deleted, specify -1 if all dumps except the current one should be deleted.

```
<KDUMP_KEEP_OLD_DUMPS>4</KDUMP_KEEP_OLD_DUMPS>
```

optional

4.16.3 E-mail notification

Configure e-mail notification to be informed when a machine crashes and a dump is saved.

Because Kdump runs in the initrd, a local mail server cannot send the notification e-mail. An SMTP server needs to be specified (see below).

You need to provide exactly one address in KDUMP_NOTIFICATION_TO. More addresses can be specified in KDUMP_NOTIFICATION_CC. Only use e-mail addresses in both cases, not a real name. Specify KDUMP_SMTP_SERVER and (if the server needs authentication) KDUMP_SMTP_USER and KDUMP_SMTP_PASSWORD. Support for TLS/SSL is not available but may be added in the future.

E-MAIL NOTIFICATION SETTINGS: XML REPRESENTATION

KDUMP_NOTIFICATION_TO

Exactly one e-mail address to which the e-mail should be sent. Additional recipients can be specified in KDUMP_NOTIFICATION_CC.

```
<KDUMP_NOTIFICATION_TO  
>tux@example.com</KDUMP_NOTIFICATION_TO>
```

optional (notification disabled if empty)

KDUMP_NOTIFICATION_CC

Zero, one or more recipients that are in the cc line of the notification e-mail.

```
<KDUMP_NOTIFICATION_CC  
>wilber@example.com geeko@example.com</KDUMP_NOTIFICATION_CC>
```

optional

KDUMP_SMTP_SERVER

Host name of the SMTP server used for mail delivery. SMTP authentication is supported (see KDUMP_SMTP_USER and KDUMP_SMTP_PASSWORD) but TLS/SSL are not.

```
<KDUMP_SMTP_SERVER>email.suse.de</KDUMP_SMTP_SERVER>
```

optional (notification disabled if empty)

KDUMP_SMTP_USER

User name used together with KDUMP_SMTP_PASSWORD for SMTP authentication.

```
<KDUMP_SMTP_USER>bwalke</KDUMP_SMTP_USER>
```

optional

KDUMP_SMTP_PASSWORD

Password used together with KDUMP_SMTP_USER for SMTP authentication.

```
<KDUMP_SMTP_PASSWORD>geheim</KDUMP_SMTP_PASSWORD>
```

optional

4.16.4 Kdump kernel settings

As already mentioned, a special kernel is booted to save the dump. If you do not want to use the auto-detection mechanism to find out which kernel is used (see the `kdump(5)` manual page that describes the algorithm which is used to find the kernel), you can specify the version of a custom kernel in KDUMP_KERNELVER. If you set it to `foo`, then the kernel located in `/boot/vmlinuz-foo` or `/boot/vmlinux-foo` (in that order on platforms that have a `vmlinuz` file) will be used.

You can specify the command line used to boot the Kdump kernel. Normally the boot command line is used, minus settings that are not relevant for Kdump (like the `crashkernel` parameter) plus some settings needed by Kdump (see the manual page `kdump(5)`). To specify additional parameters, use KDUMP_COMMANDLINE_APPEND. If you know what you are doing and you want to specify the entire command line, set KDUMP_COMMANDLINE.

KERNEL SETTINGS: XML REPRESENTATION

KDUMP_KERNELVER

Version string for the kernel used for Kdump. Leave it empty to use the auto-detection mechanism (strongly recommended).

```
<KDUMP_KERNELVER  
>2.6.27-default</KDUMP_KERNELVER>
```

optional (auto-detection if empty)

KDUMP_COMMANDLINE_APPEND

Additional command line parameters for the Kdump kernel.

```
<KDUMP_COMMANDLINE_APPEND  
>console=ttyS0,57600</KDUMP_COMMANDLINE_APPEND>
```

optional

KDUMP_Command Line

Overwrite the automatically generated Kdump command line. Use with care. Usually, KDUMP_COMMANDLINE_APPEND should suffice.

```
<KDUMP_COMMANDLINE_APPEND  
>root=/dev/sda5 maxcpus=1 irqpoll</KDUMP_COMMANDLINE>
```

optional

4.16.5 Expert settings

EXPERT SETTINGS: XML REPRESENTATIONS

KDUMP_IMMEDIATE_REBOOT

true if the system should be rebooted automatically after the dump has been saved, false otherwise. The default is to reboot the system automatically.

```
<KDUMP_IMMEDIATE_REBOOT  
>true</KDUMP_IMMEDIATE_REBOOT>
```

optional

KDUMP_VERBOSE

Bitmask that specifies how verbose the Kdump process should be. Read `kdump(5)` for details.

```
<KDUMP_VERBOSE>3</KDUMP_VERBOSE>
```

optional

KEXEC_OPTIONS

Additional options that are passed to `kexec` when loading the Kdump kernel. Normally empty.

```
<KEXEC_OPTIONS>--noio</KEXEC_OPTIONS>
```

optional

4.17 Importing SSH keys and configuration

YaST allows SSH keys and server configuration to be imported from previous installations. The behavior of this feature can also be controlled through an AutoYaST profile.

EXAMPLE 4.43: IMPORTING SSH KEYS AND CONFIGURATION FROM /DEV/SDA2

```
<ssh_import>
  <import config:type="boolean">true</import>
  <copy_config config:type="boolean">true</copy_config>
  <device>/dev/sda2</device>
</ssh_import>
```

Attributes	Value	Description
<u>import</u>	true / false	SSH keys will be imported. If set to <u>false</u> , nothing will be imported.
<u>copy_config</u>	true / false	Additionally, SSH server configuration will be imported. This setting will not have effect if <u>import</u> is set to <u>false</u> .
<u>device</u>	Partition	Partition to import keys and configuration from. If it is not set, the partition which contains the most recently accessed key is used.

4.18 Configuration management

AutoYaST allows delegating part of the configuration to a *configuration management tool* like Salt. AutoYaST takes care of the basic system installation (partitioning, network setup, etc.) and the remaining configuration tasks can be delegated.



Note: Only Salt is officially supported

Although Puppet is mentioned in this document, only Salt is officially supported. Nevertheless, feel free to report any problems you might find with Puppet.

AutoYaST supports two different approaches:

- Using a configuration management server. In this case, AutoYaST sets up a configuration management tool. It connects to a master server to get the instructions to configure the system.
- Getting the configuration from elsewhere (for example, an HTTP server or a flash disk like a USB stick) and running the configuration management tool in stand-alone mode.

4.18.1 Connecting to a configuration management server

This approach is especially useful when a configuration management server (a *master* in Salt and Puppet jargon) is already in place. In this case, the hardest part might be to set up a proper authentication mechanism.

Both Salt and Puppet support the following authentication methods:

- Manual authentication on the fly. When AutoYaST starts the client, a new authentication request is generated. The administrator can manually accept this request on the server. AutoYaST will retry the connection. If the key was accepted meanwhile, AutoYaST continues the installation.
- Using a preseed key. Refer to the documentation of your configuration management system of choice to find out how to generate them. Use the `keys_url` option to tell AutoYaST where to look for them.

With the configuration example below, AutoYaST will launch the client to generate the authentication request. It will try to connect up to three times, waiting 15 seconds between each try.

EXAMPLE 4.44: CLIENT/SERVER WITH MANUAL AUTHENTICATION

```
<configuration_management>
  <type>salt</type>
  <master>my-salt-server.example.net</master>
```

```
<auth_attempts config:type="integer">3</auth_attempts>
<auth_time_out config:type="integer">15</auth_time_out>
</configuration_management>
```

However, with the following example, AutoYaST will retrieve the keys from a flash disk (for example, a USB stick) and will use them to connect to the master server.

EXAMPLE 4.45: CLIENT/SERVER WITH PRESEED KEYS

```
<configuration_management>
  <type>salt</type>
  <master>my-salt-server.example.net</master>
  <keys_url>usb:/</keys_url>
</configuration_management>
```

The table below summarizes the supported options for these scenarios.

Attributes	Value	Description
<u>type</u>	String	Configuration management name. Currently only <u>salt</u> is officially supported.
<u>master</u>	String	Host name or IP address of the configuration management server.
<u>auth_attempts</u>	Integer	Maximum attempts to connect to the server. The default is three attempts.
<u>auth_time_out</u>	Integer	Time (in seconds) between attempts to connect to the server. The default is 15 seconds.
<u>keys_url</u>	URL of used key	Path to an HTTP server, hard disk, flash drive or similar with the files <u>default.key</u>

Attributes	Value	Description
		and <code>default.pub</code> . This key must be known to the configuration management master.
<code>enable_services</code>	True/False	Enables the configuration management services on the client side after the installation. The default is <code>true</code> .

4.18.2 Running in stand-alone mode

For simple scenarios, deploying a configuration management server is unnecessary. Instead, use Salt or Puppet in *stand-alone* (or *masterless*) mode.

As there is no server, AutoYaST needs to know where to get the configuration from. Put the configuration into a TAR archive and store it anywhere (for example, on a flash drive, an HTTP/HTTPS server, an NFS/SMB share).

The TAR archive must have the same layout that is expected under `/srv` in a Salt server. This means that you need to place your Salt states in a `salt` directory and your formulas in a separate `formulas` directory.

Additionally, you can have a `pillar` directory containing the pillar data. Alternatively, you can provide that data in a separate TAR archive by using the `pillar_url` option.

EXAMPLE 4.46: STAND-ALONE MODE

```
<configuration_management>
  <type>salt</type>
  <states_url>my-salt-server.example.net</states_url>
  <pillar_url>my-salt-server.example.net</pillar_url>
</configuration_management>
```

Attributes	Value	Description
<code>type</code>	String	Configuration management name. Currently only <code>salt</code> is officially supported.

Attributes	Value	Description
<u>states_url</u>	URL	Location of the Salt states TAR archive. It may include formulas and pillars. Files must be located in a <u>salt</u> directory.
<u>pillar_url</u>	URL	Location of the TAR archive that contains the pillars.
<u>modules_url</u>	URL	Location of Puppet modules.

4.18.3 SUSE Manager Salt formulas support

AutoYaST offers support for SUSE Manager Salt formulas when running in stand-alone mode. In case a formula is found in the states TAR archive, AutoYaST displays a screen which allows the user to select and configure the formulas to apply.

Bear in mind that this feature defeats the AutoYaST purpose of performing an unattended installation, as AutoYaST will wait for the user's input.

III Managing mass installations with dynamic profiles

- 5 Supported approaches to dynamic profiles **117**
- 6 Rules and classes **118**
- 7 ERB templates **133**
- 8 Combining ERB templates and scripts **137**

5 Supported approaches to dynamic profiles

When dealing with the installation of multiple systems, it might be useful to use a single profile (or a reduced set of them) that adapts automatically to each system. In this regard, AutoYaST offers three different mechanisms to modify the profile at installation time.

Rules and classes

Rules and classes offer the possibility to configure a system by merging multiple control files during installation. You can read more about this feature in the [Chapter 6, Rules and classes](#) section.

ERB templates

AutoYaST supports Embedded Ruby (ERB) templates syntax to modify the profile's content during installation. The [Chapter 7, ERB templates](#) section describes how to use them.

Pre-installation scripts

You can use a pre-installation script to modify or even create a brand new profile during installation. [Section 4.13.1, "Pre-install scripts"](#) describes how to benefit from them.

Asking the user during installation

As an alternative, AutoYaST can ask the user for values to use in the profile at runtime. The installation is not fully unattended in that case, but it can be rather useful to set user names, passwords, IP addresses and so on. You can find more information about this feature in the [Section 4.15, "Ask the user for values during installation"](#) section.

6 Rules and classes

Rules and classes allow customizing installations for sets of machines in different ways:

- Rules allow configuring a system depending on its attributes.
- Classes represent configurations for groups of target systems. Classes can be assigned to systems.



Note: Use `autoyast` boot option only

Rules and classes are only supported by the boot parameter `autoyast=URL`.

`autoyast2=URL` is not supported, because this option downloads a single AutoYaST control file only.

6.1 Rule-based automatic installation

Rules offer the possibility to configure a system depending on system attributes by merging multiple control files during installation. The rule-based installation is controlled by a rules file.

For example, this could be useful to install systems in two departments in one go. Assume a scenario where machines in department A need to be installed as office desktops, whereas machines in department B need to be installed as developer workstations. You would create a rules file with two different rules. For each rule, you could use different system parameters to distinguish the installations from one another. Each rule would also contain a link to an appropriate profile for each department.

The rules file is an XML file containing rules for each group of systems (or single systems) that you want to automatically install. A set of rules distinguish a group of systems based on one or more system attributes. After passing all rules, each group of systems is linked to a control file. Both the rules file and the control files must be located in a pre-defined and accessible location. The rules file is retrieved only if no specific control file is supplied using the `autoyast` keyword. For example, if the following is used, the rules file will not be evaluated:

```
autoyast=http://10.10.0.1/profile/myprofile.xml
autoyast=http://10.10.0.1/profile/rules/rules.xml
```

Instead use:

```
autoyast=http://10.10.0.1/profile/
```

which will load `http://10.10.0.1/profile/rules/rules.xml` (the slash at the end of the directory name is important).

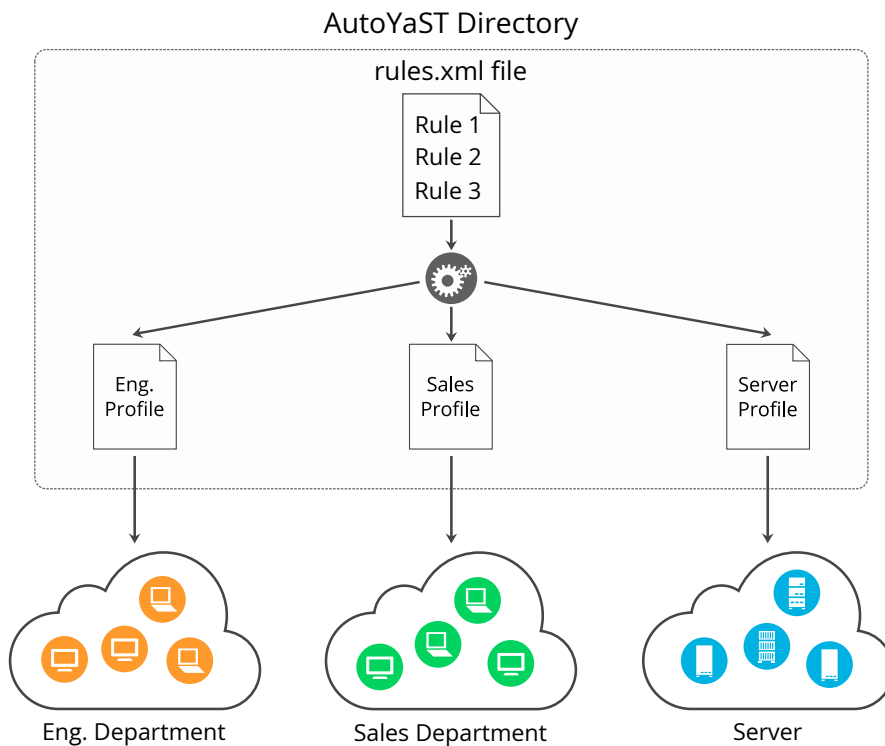


FIGURE 6.1: RULES

If more than one rule applies, the final control file for each group is generated on the fly using a merge script. The merging process is based on the order of the rules and later rules override configuration data in earlier rules. Note that the names of the top sections in the merged XML files need to be in alphabetical order for the merge to succeed.

The use of a rules file is optional. If the rules file is not found, system installation proceeds in the standard way by using the supplied control file or by searching for the control file depending on the MAC or the IP address of the system.

6.1.1 Rules file explained

EXAMPLE 6.1: SIMPLE RULES FILE

The following simple example illustrates how the rules file is used to retrieve the configuration for a client with known hardware.

```

<?xml version="1.0"?>
<!DOCTYPE autoinstall>
<autoinstall xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://
www.suse.com/1.0/configns">
  <rules config:type="list">
    <rule>
      <disksize>
        <match>/dev/sdc 1000</match>
        <match_type>greater</match_type>
      </disksize>
      <result>
        <profile>department_a.xml</profile>
        <continue config:type="boolean">>false</continue>
      </result>
    </rule>
    <rule>
      <disksize>
        <match>/dev/sda 1000</match>
        <match_type>greater</match_type>
      </disksize>
      <result>
        <profile>department_b.xml</profile>
        <continue config:type="boolean">>false</continue>
      </result>
    </rule>
  </rules>
</autoinstall>

```

The last example defines two rules and provides a different control file for every rule. The rule used in this case is disksize. After parsing the rules file, YaST attempts to match the target system with the rules in the rules.xml file. A rule match occurs when the target system matches all system attributes defined in the rule. When the system matches a rule, the respective resource is added to the stack of control files AutoYaST will use to create the final control file. The continue property tells AutoYaST whether it should continue with other rules after a match has been found.

If the first rule does not match, the next rule in the list is examined until a match is found.

Using the disksize attribute, you can provide different configurations for systems with hard disks of different sizes. The first rule checks if the device /dev/sdc is available and if it is greater than 1 GB in size using the match property.

A rule must have at least one attribute to be matched. If you need to check more attributes, such as memory or architectures, you can add more attributes in the rule resource as shown in the next example.

EXAMPLE 6.2: SIMPLE RULES FILE

The following example illustrates how the rules file is used to retrieve the configuration for a client with known hardware.

```
<?xml version="1.0"?>
<!DOCTYPE autoinstall>
<autoinstall xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://
www.suse.com/1.0/configs">
  <rules config:type="list">
    <rule>
      <disksize>
        <match>/dev/sdc 1000</match>
        <match_type>greater</match_type>
      </disksize>
      <memsize>
        <match>1000</match>
        <match_type>greater</match_type>
      </memsize>
      <result>
        <profile>department_a.xml</profile>
        <continue config:type="boolean">false</continue>
      </result>
    </rule>
    <rule>
      <disksize>
        <match>/dev/shda 1000</match>
        <match_type>greater</match_type>
      </disksize>
      <memsize>
        <match>256</match>
        <match_type>greater</match_type>
      </memsize>
      <result>
        <profile>department_b.xml</profile>
        <continue config:type="boolean">false</continue>
      </result>
    </rule>
  </rules>
</autoinstall>
```

The rules directory must be located in the same directory specified via the `autoyast` keyword at boot time. If the client was booted using `autoyast=http://10.10.0.1/profiles/`, AutoYaST will search for the rules file at `http://10.10.0.1/profiles/rules/rules.xml`.

6.1.2 Custom rules

If the attributes AutoYaST provides for rules are not enough for your purposes, use custom rules. Custom rules contain a shell script. The output of the script (STDOUT, STDERR is ignored) can be evaluated.

Here is an example for the use of custom rules:

```
<rule>
  <custom1>
    <script>
if grep -i intel /proc/cpuinfo > /dev/null; then
echo -n "intel"
else
echo -n "non_intel"
fi;
    </script>
    <match>*</match>
    <match_type>exact</match_type>
  </custom1>
  <result>
    <profile>@custom1.xml</profile>
    <continue config:type="boolean">true</continue>
  </result>
</rule>
```

The script in this rule can echo either intel or non_intel to STDOUT (the output of the grep command must be directed to /dev/null in this case). The output of the rule script will be filled between the two '@' characters, to determine the file name of the control file to fetch. AutoYaST will read the output and fetch a file with the name intel.xml or non_intel.xml. This file can contain the AutoYaST profile part for the software selection; for example, in case you want a different software selection on Intel hardware than on others.

The number of custom rules is limited to five. So you can use custom1 to custom5.

6.1.3 Match types for rules

You can use five different match_types:

- exact (default)
- greater
- lower

- range
- regex (a simple == operator like in Bash)

If using exact, the string must match exactly as specified. regex can be used to match substrings like ntel will match Intel, intel and intelligent. greater and lower can be used for memsize or totaldisk for example. They can match only with rules that return an integer value. A range is only possible for integer values too and has the form of value1-value2, for example 512-1024.

6.1.4 Combine attributes

Multiple attributes can be combined via a logical operator. It is possible to let a rule match if disksize is greater than 1GB or memsize is exactly 512MB.

You can do this with the operator element in the rules.xml file. and and or are possible operators, and being the default. Here is an example:

```
<rule>
  <disksize>
    <match>/dev/sda 1000</match>
    <match_type>greater</match_type>
  </disksize>
  <memsize>
    <match>256</match>
    <match_type>greater</match_type>
  </memsize>
  <result>
    <profile>machine2.xml</profile>
    <continue config:type="boolean">false</continue>
  </result>
  <operator>or</operator>
</rule>
```

6.1.5 Rules file structure

The rules.xml file needs to:

- have at least one rule,
- have the name rules.xml,

- be located in the directory `rules` in the profile repository,
- have at least one attribute to match in the rule.

6.1.6 Predefined system attributes

The following table lists the predefined system attributes you can match in the rules file.

If you are unsure about a value on your system, run `/usr/lib/YaST2/bin/y2base ayast_probe ncurses`. The text box displaying the detected values can be scrolled. Note that this command will not work while another YaST process that requires a lock (for example the installer) is running. Therefore you cannot run it during the installation.

TABLE 6.1: SYSTEM ATTRIBUTES

Attribute	Values	Description
<code>hostaddress</code>	IP address of the host	This attribute must always match exactly.
<code>host name</code>	The name of the host	This attribute must always match exactly.
<code>domain</code>	Domain name of host	This attribute must always match exactly.
<code>installed_product</code>	The name of the product to be installed.	This attribute must always match exactly.
<code>installed_product_version</code>	The version of the product to be installed.	This attribute must always match exactly.
<code>network</code>	network address of host	This attribute must always match exactly.
<code>mac</code>	MAC address of host	This attribute must always match exactly (the MAC addresses should have the form <code>0080c8f6484c</code>).

Attribute	Values	Description
<u>linux</u>	Number of installed Linux partitions on the system	This attribute can be 0 or more.
<u>others</u>	Number of installed non-Linux partitions on the system	This attribute can be 0 or more.
<u>xserver</u>	X Server needed for graphic adapter	This attribute must always match exactly.
<u>memsize</u>	Memory available on host in megabytes	All match types are available.
<u>totaldisk</u>	Total disk space available on host in megabytes	All match types are available.
<u>hostid</u>	Hex representation of the IP address	Exact match required
<u>arch</u>	Architecture of host	Exact match required
<u>karch</u>	Kernel Architecture of host (for example SMP kernel, Xen kernel)	Exact match required
<u>disksize</u>	Drive device and size	All match types are available.
<u>product</u>	The hardware product name as specified in SMBIOS	Exact match required
<u>product_vendor</u>	The hardware vendor as specified in SMBIOS	Exact match required
<u>board</u>	The system board name as specified in SMBIOS	Exact match required
<u>board_vendor</u>	The system board vendor as specified in SMBIOS	Exact match required

Attribute	Values	Description
<u>custom1-5</u>	Custom rules using shell scripts	All match types are available.

6.1.7 Rules with dialogs

You can use dialog pop-ups with check boxes to select rules you want matched.

The elements listed below must be placed within the following XML structure in the rules.xml file:

```
<rules config:type="list">
  <rule>
    <dialog>
      ...
    </dialog>
  </rule>
</rules>
```

ATTRIBUTE, VALUES, DESCRIPTION

dialog_nr

All rules with the same dialog_nr are presented in the same pop-up dialog. The same dialog_nr can appear in multiple rules.

```
<dialog_nr config:type="integer">3</dialog_nr>
```

This element is optional and the default for a missing dialog_nr is always 0. To use one pop-up for all rules, you do not need to specify the dialog_nr.

element

Specify a unique ID. Even if you have more than one dialog, you must not use the same id twice. Using id 1 on dialog 1 and id 1 on dialog 2 is not supported. (This behavior is contrary to the ask dialog, where you can have the same ID for multiple dialogs.)

```
<element config:type="integer">3</element>
```

Optional. If omitted, AutoYaST adds its own IDs internally. Then you cannot specify conflicting rules (see below).

title

Caption of the pop-up dialog

```
<title>Desktop Selection</title>
```

Optional

question

Question shown in the pop-up behind the check box.

```
<question>GNOME Desktop</question>
```

Optional. If you do not configure a text here, the name of the XML file that is triggered by this rule will be shown instead.

timeout

Timeout in seconds after which the dialog will automatically “press” the okay button. Useful for a non-blocking installation in combination with rules dialogs.

```
<timeout config:type="integer">30</timeout>
```

Optional. A missing timeout will stop the installation process until the dialog is confirmed by the user.

conflicts

A list of element ids (rules) that conflict with this rule. If this rule matches or is selected by the user, all conflicting rules are deselected and disabled in the pop-up. Take care that you do not create deadlocks.

```
<conflicts config:type="list">
  <element config:type="integer">1</element>
  <element config:type="integer">5</element>
  ...
</conflicts>
```

Optional

Here is an example of how to use dialogs with rules:

```
<rules config:type="list">
  <rule>
    <custom1>
      <script>
echo -n 100
      </script>
      <match>100</match>
      <match_type>exact</match_type>
    </custom1>
    <result>
      <profile>rules/gnome.xml</profile>
    </result>
  </rule>
</rules>
```

```

        <continue config:type="boolean">true</continue>
    </result>
    <dialog>
        <element config:type="integer">0</element>
        <question>GNOME Desktop</question>
        <title>Desktop Selection</title>
        <conflicts config:type="list">
            <element config:type="integer">1</element>
        </conflicts>
        <dialog_nr config:type="integer">0</dialog_nr>
    </dialog>
</rule>
<rule>
    <custom1>
        <script>
echo -n 100
        </script>
        <match>101</match>
        <match_type>exact</match_type>
    </custom1>
    <result>
        <profile>rules/gnome.xml</profile>
        <continue config:type="boolean">true</continue>
    </result>
    <dialog>
        <element config:type="integer">1</element>
        <dialog_nr config:type="integer">0</dialog_nr>
        <question>Gnome Desktop</question>
        <conflicts config:type="list">
            <element config:type="integer">0</element>
        </conflicts>
    </dialog>
</rule>
<rule>
    <custom1>
        <script>
echo -n 100
        </script>
        <match>100</match>
        <match_type>exact</match_type>
    </custom1>
    <result>
        <profile>rules/all_the_rest.xml</profile>
        <continue config:type="boolean">false</continue>
    </result>
</rule>
</rules>

```

6.2 Classes

Classes represent configurations for groups of target systems. Unlike rules, classes need to be configured in the control file. Then classes can be assigned to target systems.

Here is an example of a class definition:

```
<classes config:type="list">
  <class>
    <class_name>TrainingRoom</class_name>
    <configuration>Software.xml</configuration>
  </class>
</classes>
```

In the example above, the file `Software.xml` must be placed in the subdirectory `classes/TrainingRoom/`. It will be fetched from the same place the AutoYaST control file and rules were fetched from.

If you have multiple control files and those control files share parts, better use classes for common parts. You can also use XIncludes.

Using the configuration management system, you can define a set of classes. A class definition consists of the following variables:

- Name: class name
- Description:
- Order: order (or priority) of the class in the stack of migration

You can create as many classes as you need, however it is recommended to keep the set of classes as small as possible to keep the configuration system concise. For example, the following sets of classes can be used:

- site: classes describing a physical location or site,
- machine: classes describing a type of machine,
- role: classes describing the function of the machine,
- group: classes describing a department or a group within a site or a location.

A file saved in a class directory can have the same syntax and format as a regular control file but represents a subset of the configuration. For example, to create a new control file for a computer with a specific network interface, you only need the control file resource that controls

the configuration of the network. Having multiple network types, you can merge the one needed for a special type of hardware with other class files and create a new control file which suits the system being installed.

6.3 Mixing rules and classes

It is possible to mix rules and classes during an auto-installation session. For example you can identify a system using rules which contain class definitions in them. The process is described in the figure *Figure A.1, "Rules retrieval process"*.

After retrieving the rules and merging them, the generated control file is parsed and checked for class definitions. If classes are defined, then the class files are retrieved from the original repository and a new merge process is initiated.

6.4 Merging of rules and classes

With classes and with rules, multiple XML files get merged into one resulting XML file. This merging process is often confusing for people, because it behaves different than one would expect. First of all, it is important to note that the names of the top sections in the merged XML files must be in alphabetical order for the merge to succeed.

For example, the following two XML parts should be merged:

```
<partitioning config:type="list">
  <drive>
    <partitions config:type="list">
      <partition>
        <filesystem config:type="symbol">swap</filesystem>
        <format config:type="boolean">true</format>
        <mount>swap</mount>
        <partition_id config:type="integer">130</partition_id>
        <size>2000mb</size>
      </partition>
      <partition>
        <filesystem config:type="symbol">xfs</filesystem>
        <partition_type>primary</partition_type>
        <size>4Gb</size>
        <mount>/data</mount>
      </partition>
    </partitions>
  </drive>
```

```
</partitioning>
```

```
<partitioning config:type="list">
  <drive>
    <initialize config:type="boolean">false</initialize>
    <partitions config:type="list">
      <partition>
        <format config:type="boolean">true</format>
        <filesystem config:type="symbol">xfs</filesystem>
        <mount>/</mount>
        <partition_id config:type="integer">131</partition_id>
        <partition_type>primary</partition_type>
        <size>max</size>
      </partition>
    </partitions>
    <use>all</use>
  </drive>
</partitioning>
```

You might expect the control file to contain three partitions. This is not the case. You will end up with two partitions and the first partition is a mix up of the swap and the root partition. Settings configured in both partitions, like mount or size, will be used from the second file. Settings that only exist in the first or second partition, will be copied to the merged partition too.

In this example, you do not want a second drive. The two drives should be merged into one. With regard to partitions, three separate ones should be defined. Using the dont_merge method solves the merging problem:

```
<classes config:type="list">
  <class>
    <class_name>swap</class_name>
    <configuration>largeswap.xml</configuration>
    <dont_merge config:type="list">
      <element>partition</element>
    </dont_merge>
  </class>
</classes>
```

```
<rule>
  <board_vendor>
    <match>ntel</match>
    <match_type>regex</match_type>
  </board_vendor>
  <result>
    <profile>classes/largeswap.xml</profile>
    <continue config:type="boolean">true</continue>
  </result>
</rule>
```

```
<dont_merge config:type="list">
  <element>partition</element>
</dont_merge>
</result>
<board_vendor>
  <match>PowerEdge [12]850</match>
  <match_type>regex</match_type>
</board_vendor>
<result>
  <profile>classes/smallswap.xml</profile>
  <continue config:type="boolean">true</continue>
  <dont_merge config:type="list">
    <element>partition</element>
  </dont_merge>
</result>
</rule>
```

7 ERB templates

ERB templates allow embedding some Ruby code within the profile to modify it during the installation. With this approach, you can inspect the system and adjust the profile by setting values, adding or skipping sections, etc.

To activate the ERB processing, the profile must have the extension `.erb` (for example, `autoyast.xml.erb`). Hence, it is not possible to combine rules/classes and ERB templates.

7.1 What is ERB?

ERB stands for *Embedded Ruby* and allows using the power of the Ruby programming language to generate different kind of contents. With ERB, you can include some Ruby code in your profiles to adapt them at runtime depending on the installation system.

When using ERB, the Ruby code is enclosed between `<%` and `>` signs. If you want the output of the command to be included in the resulting profile, you simply need to add an equal sign (`=`).

EXAMPLE 7.1: INCLUDING A FILE USING ERB

```
<bootloader>
  <% require "open-uri" %>
  <%= URI.open("http://192.168.1.1/profiles/bootloader-common.xml").read %>
</bootloader>
```

AutoYaST offers a small set of *helper functions* to retrieve information from the underlying system, like `disks` or `network_cards`. You can check the list of helpers and their values in the [Section 7.2, "Template helpers"](#) section.

7.2 Template helpers

Template helpers are sets of Ruby methods that can be used in the profiles to retrieve information about the installation system.

7.2.1 disks

The `disks` helper returns a list of the detected disks. Each element of the list contains some basic information like the device name or the size.

Key	Type	Value
<u>:device</u>	String	Device kernel name (for example, <u>sda</u>).
<u>:model</u>	String	Disk model
<u>:serial</u>	String	Serial number
<u>:size</u>	Integer	Disk size (in bytes)
<u>:udev_names</u>	Array<String>	List of disk udev names. You can use any of them to refer to the device.
<u>:vendor</u>	String	Disk vendor's name

The profile in the example below installs the system on the largest disk. It sorts the list of existing disks by size and takes the last one. Then it uses the :device key as value for the device element.

EXAMPLE 7.2: USING THE LARGEST DISK

```
<partitioning t="list">
  <drive>
    <% disk = disks.sort_by { |d| d[:size] }.last %> <!-- find the largest disk -->
    <device><%= disk[:device] %></device> <!-- print the disk device name -->
    <initialize t="boolean">true</initialize>
    <use>all</use>
  </drive>
</partitioning>
```

7.2.2 network_cards

The network_cards helper returns a list of network cards, including their names, status information (for example, if they are connected or not).

Key	Type	Value
<u>:device</u>	String	Device name (for example, <u>eth0</u> or <u>enp3s0</u>)

Key	Type	Value
<u>:mac</u>	String	MAC address
<u>:active</u>	Boolean	Whether the device is active or not
<u>:link</u>	Boolean	Whether the device is connected or not
<u>:vendor</u>	String	Disk vendor's name

The following example finds the first network card that is connected to the network and configures it to use DHCP.

EXAMPLE 7.3: CONFIGURE THE CONNECTED NETWORK CARDS

```
<interfaces t="list">
  <% with_link = network_cards.sort_by { |n| n[:name] }.find { |n| n[:link] } %>
  <% if with_link %>
    <interface>
      <device><%= with_link[:device] %></device>
      <startmode>auto</startmode>
      <bootproto>dhcp</bootproto>
    </interface>
  <% end %>
</interfaces>
```

7.2.3 os_release

The os_release helper returns the operating system information, which is included in the /etc/os-release file.

Key	Type	Value
<u>:id</u>	String	Distribution ID (for example, <u>sles</u> , <u>opensuse-tumbleweed</u>)

Key	Type	Value
<u>:name</u>	String	Distribution name (for example, <u>SLES</u> or <u>openSUSE Tumbleweed</u>)
<u>:version</u>	String	Distribution version (for example, <u>15.2</u>)

You might use this information to decide which product to install, using pretty much the same profile for all of them (SLE or openSUSE distributions).

EXAMPLE 7.4: REUSING THE SAME PROFILE FOR DIFFERENT DISTRIBUTIONS

```
<products t="list">
  <% if os_release[:id] == 'sle' %>
    <product>SLES</product>
  <% else %>
    <product>openSUSE</product>
  <% end %>
</products>
```

8 Combining ERB templates and scripts

[Section 4.13.1, “Pre-install scripts”](#) already describes how to use a pre-script to modify the current profile. In a nutshell, if the script creates a `/tmp/profile/modified.xml` file, AutoYaST imports that profile and forgets about the initial one.

This is a pretty flexible approach and the only limitation is that you need to rely on the languages and libraries that are available in the installation media.

8.1 Embedding ERB in your scripts

Unlike with *rules*, it is possible to combine ERB templates with scripts. AutoYaST will evaluate any ERB tag that you include in your script before running it. This behavior only applies to the scripts defined inside the profile and not to the external ones.

The script in the example below downloads a profile whose name is based on the MAC address. Saving the file as `/tmp/profile/modified.xml` will cause AutoYaST to load and use the downloaded profile.

EXAMPLE 8.1: USING THE MAC ADDRESS TO GET THE PROFILE

```
<scripts>
  <pre-scripts config:type="list">
    <script>
      <interpreter>shell</interpreter>
      <filename>load_profile.sh</filename>
      <% mac = network_cards.first >
      <source><![CDATA[#!/bin/bash
wget -O /tmp/profile/modified.xml http://myserver/<%= network_cards.first[:mac] %>.xml
]]></source>
    </script>
  </pre-scripts>
</scripts>
```

8.2 Accessing ERB helpers from Ruby scripts

It is possible to use the ERB helpers in Ruby scripts. To use those helpers, you need to *require* the `yast` and `autoinstall/y2erb` libraries and use the `Y2Autoinstall::Y2ERB::TemplateEnvironment` class to access them.

EXAMPLE 8.2: ACCESSING ERB HELPERS FROM A RUBY SCRIPT

```
<scripts>
  <pre-scripts config:type="list">
    <script>
      <interpreter>/usr/bin/ruby</interpreter>
      <filename>load_profile.sh</filename>
      <source><![CDATA[#!/bin/bash
require "yast"
require "autoinstall/y2erb"
helpers = Y2Autoinstallation::Y2ERB::TemplateEnvironment.new
# Now you can use the TemplateEnvironment instance to call the helpers
disk_devices = helpers.disks.map { |d| d[:device] }
File.write("/root/disks.txt", disk_devices.join("\n"))
]]></source>
    </script>
  </pre-scripts>
</scripts>
```

IV Understanding the auto-installation process

9	The auto-installation process	140
---	-------------------------------	-----

9 The auto-installation process

9.1 Introduction

After the system has booted into an automatic installation and the control file has been retrieved, YaST configures the system according to the information provided in the control file. All configuration settings are summarized in a window that is shown by default and should be deactivated if a fully automatic installation is needed.

By the time YaST displays the summary of the configuration, YaST has only probed hardware and prepared the system for auto-installation. Nothing has been changed in the system yet. In case of any error, you can still abort the process.

A system should be automatically installable without the need to have any graphic adapter or monitor. Having a monitor attached to the client machine is nevertheless recommended so you can supervise the process and to get feedback in case of errors. Choose between the graphical and the text-based Ncurses interfaces. For headless clients, system messages can be monitored using the serial console.

9.1.1 X11 interface (graphical)

This is the default interface while auto-installing. No special variables are required to activate it.

9.1.2 Serial console

Start installing a system using the serial console by adding the keyword `console` (for example `console=ttyS0`) to the command line of the kernel. This starts **linuxrc** in console mode and later YaST in serial console mode.

9.1.3 Text-based YaST installation

This option can also be activated on the command line. To start YaST in text mode, add `textmode=1` on the command line.

Starting YaST in the text mode is recommended when installing a client with less than 64 MB or when X11 should not be configured, especially on headless machines.

9.2 Choosing the right boot medium

There are different methods for booting the client. The computer can boot from its network interface card (NIC) to receive the boot images via DHCP or TFTP. Alternatively a suitable kernel and initrd image can be loaded from a flash disk (for example, a USB stick) or a bootable DVD-ROM.

YaST will check for `autoinst.xml` in the root directory of the boot medium or the initrd upon start-up and switch to an automated installation if it was found. In case the control file is named differently or located elsewhere, specify its location on the kernel command line with the parameter `AutoYaST=URL`.

9.2.1 Booting from a flash disk (for example, a USB stick)

For testing/rescue purposes or because the NIC does not have a PROM or PXE, you can build a bootable flash disk to use with AutoYaST. Flash disks can also store the control file.



Tip: Copying the installation medium image to a removable flash disk

Use the following command to copy the contents of the installation image to a removable flash disk.

```
tux > sudo dd if=IMAGE of=FLASH_DISK bs=4M && sync
```

`IMAGE` needs to be replaced with the path to the `SLE-15-SP3-Online-ARCH-GM-media1.iso` or `SLE-15-SP3-Full-ARCH-GM-media1.iso` image file. `FLASH_DISK` needs to be replaced with the flash device. To identify the device, insert it and run:

```
root # grep -Ff <(hwinfo --disk --short) <(hwinfo --usb --short)
disk:
/dev/sdc          General USB Flash Disk
```

Make sure the size of the device is sufficient for the desired image. You can check the size of the device with:

```
root # fdisk -l /dev/sdc | grep -e "^/dev"
/dev/sdc1  *      2048 31490047 31488000  15G 83 Linux
```


In this example, the device has a capacity of 15 GB. The command to use for the SLE-15-SP3-Full-ARCH-GM-media1.iso would be:

```
dd if=SLE-15-SP3-Full-ARCH-GM-media1.iso of=/dev/sdc1 bs=4M && sync
```

The device must not be mounted when running the **dd** command. Note that all data on the partition will be erased!

9.2.2 Booting from the SUSE Linux Enterprise installation medium

You can use the SUSE Linux Enterprise installation medium (SLE-15-SP3-Online-ARCH-GM-media1.iso or SLE-15-SP3-Full-ARCH-GM-media1.iso) in combination with other media. For example, the control file can be provided via a flash disk or a specified location on the network. Alternatively, create a customized installation media that includes the control file.

9.2.3 Booting via PXE over the network

Booting via PXE requires a DHCP and a TFTP server in your network. The computer will then boot without a physical medium.

If you install via PXE, the installation will run in an endless loop. This happens because after the first reboot, the machine performs the PXE boot again and restarts the installation instead of booting from the hard disk.

There are several ways to solve this problem. You can use an HTTP server to provide the AutoYaST control file. Alternatively, instead of a static control file, run a CGI script on the Web server that provides the control file and changes the TFTP server configuration for your target host. This way, the next PXE boot of the machine will be from the hard disk by default.

Another way is to use AutoYaST to upload a new PXE boot configuration for the target host via the control file:

```
<pxe>
  <pxe_localboot config:type="boolean">true</pxe_localboot>
</pxelinux-config>
  DEFAULT linux
  LABEL linux
  localboot 0
</pxelinux-config>
<tftp-server>192.168.1.115</tftp-server>
```

```
<pxelinux-dir>/pxelinux.cfg</pxelinux-dir>
<filename>__MAC__</filename>
</pxe>
```

This entry will upload a new configuration for the target host to the TFTP server shortly before the first reboot happens. In most installations the TFTP daemon runs as user `nobody`. You need to make sure this user has write permissions to the `pxelinux.cfg` directory. You can also configure the file name that will be uploaded. If you use the “magic” `__MAC__` file name, the file name will be the MAC address of your machine like, for example `01-08-00-27-79-49-ee`. If the file name setting is missing, the IP address will be used for the file name.

To do another auto-installation on the same machine, you need to remove the file from the TFTP server.

9.3 Invoking the auto-installation process

9.3.1 Command line options

Adding the command line variable `autoyast` causes `linuxrc` to start in automated mode. The `linuxrc` program searches for a configuration file, which should be distinguished from the main control file, in the following places:

- in the root directory of the initial RAM disk used for booting the system;
- in the root directory of the boot medium.

The `linuxrc` configuration file supports multiple keywords. For a detailed description of how `linuxrc` works and other keywords, see [Appendix C, Advanced linuxrc options](#). Some of the more common ones are:

`autoyast`

Location of the control file for automatic installation; see [AutoYaST control file locations](#) for details.

`ifcfg`

Configure and start the network. Required if the AutoYaST is to be fetched from a remote location. See [Section C.3, “Advanced network setup”](#) for details.

`insmod`

Kernel modules to load

install

Location of the installation directory, for example `install=nfs://192.168.2.1/CDs/`.

instmode

Installation mode, for example `nfs`, `http` etc. (not needed if `install` is set).

rootpassword

Password for root user if not specified in AutoYaST profile

server

Server (NFS) to contact for source directory

serverdir

Directory on NFS Server

y2confirm

Even with `<confirm>no</confirm>` in the control file, the confirm proposal comes up.

These variables and keywords will bring the system up to the point where YaST can take over with the main control file. Currently, the source medium is automatically discovered, which in some cases makes it possible to initiate the auto-install process without giving any instructions to `linuxrc`.

The traditional `linuxrc` configuration file (`info`) has the function of giving the client enough information about the installation server and the location of the sources. Usually, this file is not required, but it is needed in special network environments where DHCP and BOOTP are not used or when special kernel modules need to be loaded.

You can pass keywords to `linuxrc` using the kernel command line. This can be done in several ways. You can specify `linuxrc` keywords along with other kernel parameters interactively at boot time, in the usual way. You can also insert kernel parameters into custom network-bootable disk images. It is also possible to configure a DHCP server to pass kernel parameters in combination with Etherboot or PXE.



Note: Using `autoyast2` boot option instead of `autoyast`

The `autoyast2` option is similar to the `autoyast` option, but `linuxrc` parses the provided value and, for example, tries to configure a network when needed. This option is not described in this documentation. For information about differences between the AutoYaST and `linuxrc` URI syntax, see the `linuxrc` appendix: [Appendix C, Advanced `linuxrc` options](#). AutoYaST's rules and classes are *not* supported.

The command line variable `autoyast` can be used in the format described in the following list.

AUTOYAST CONTROL FILE LOCATIONS

Format of URIs

The `autoyast` syntax for the URIs for your control file locations can be confusing. The format is `SCHEMA://HOST/PATH-TO-FILE`. The number of forward slashes to use varies. For remote locations of your control file, the URI looks like this example for an NFS server, with two slashes: `autoyast=nfs://SERVER/PATH`.

It is different when your control file is on a local file system. For example, `autoyast=usb:///profile.xml` is the same as `autoyast=usb://localhost/profile.xml`. You may omit the local host name, but you must keep the third slash. `autoyast=usb://profile.xml` will fail because `profile.xml` is interpreted as the host name.

When no control file specification is needed

For new installations, `autoyast` will be started if a file named `autoinst.xml` is in one of the following three locations:

1. The root directory of the installation flash disk (for example, a USB stick)
2. The root directory of the installation medium
3. The root directory of the initial RAM disk used to boot the system

`autoyast=file:///PATH`

Looks for control file in the specified path, relative to the source root directory, for example `file:///autoinst.xml` when the control file is in the top-level directory of any local file system, including mounted external devices such as a CD or USB drive. (This is the same as `file://localhost/autoinst.xml`.)

`autoyast=device://DEVICE/FILENAME`

Looks for the control file on a storage device. Do not specify the full path to the device, but the device name only (for example, `device://vda1/autoyast.xml`). You may also omit specifying the device and trigger `autoyast` to search all devices, for example, `autoyast=device://localhost/autoinst.xml`, or `autoyast=device:///autoinst.xml`.

`autoyast=nfs://SERVER/PATH`

Looks for the control file on an NFS server.

`autoyast=http://[user:password@]SERVER/PATH`

Retrieves the control file from a Web server using the HTTP protocol. Specifying a user name and a password is optional.

autoyast=https://[user:password@]SERVER/PATH

Retrieves the control file from a Web server using HTTPS. Specifying a user name and a password is optional.

autoyast=tftp://SERVER/PATH

Retrieve the control file via TFTP.

autoyast=ftp://[user:password@]SERVER/PATH

Retrieve the control file via FTP. Specifying a user name and a password is optional.

autoyast=usb:///PATH

Retrieve the control file from USB devices (autoyast will search all connected USB devices).

autoyast=relurl://PATH

Retrieve the control file from the installation source: either from the default installation source or from the installation source defined in install=INSTALLATION_SOURCE_PATH.

autoyast=cifs://SERVER/PATH

Looks for the control file on a CIFS server.

autoyast=label://LABEL/PATH

Searches for a control file on a device with the specified label.

Several scenarios for auto-installation are possible using different types of infrastructure and source media. The simplest way is to use the appropriate installation media of SUSE Linux Enterprise Micro (SLE-15-SP3-Online-ARCH-GM-media1.iso or SLE-15-SP3-Full-ARCH-GM-media1.iso). But to initiate the auto-installation process, the auto-installation command line variable should be entered at system boot-up and the control file should be accessible for YaST.

In a scripting context, you can use a serial console for your virtual machine, that allows you to work in text mode. Then you can pass the required parameters from an expect script or equivalent.

The following list of scenarios explains how the control file can be supplied:

Using the SUSE Linux Enterprise Micro installation media

When using the original installation media (SLE-15-SP3-Online-ARCH-GM-media1.iso or SLE-15-SP3-Full-ARCH-GM-media1.iso is needed), the control file needs to be accessible via flash disk (for example, a USB stick) or network:

Flash disk (for example, a USB stick). Access the control file via the autoyast=usb:///PATH option.

Network. Access the control file via the following commands: autoyast=nfs://..., autoyast=ftp://..., autoyast=http://..., autoyast=https://..., autoyast=tftp://..., or autoyast=cifs://.... Network access needs to be defined using the boot options in `linuxrc`. This can be done via DHCP: **netsetup=dhcp autoyast=http://163.122.3.5/autoyast.xml**

Using a custom installation media

In this case, you can include the control file directly on the installation media. When placing it in the root directory and naming it autoinst.xml, it will automatically be found and used for the installation. Otherwise use autoyast=file:///PATH to specify the path to the control file.

Using a network installation source

This option is the most important one because installations of multiple machines are usually done using SLP or NFS servers and other network services like BOOTP and DHCP. The easiest way to make the control file available is to place it in the root directory of the installation source, naming it autoinst.xml. In this case, it will automatically be found and used for the installation. The control file can also reside in the following places:

Flash disk (for example, a USB stick). Access the control file via the autoyast=usb:///PATH option.

Network. Access the control file via the following commands: autoyast=nfs://..., autoyast=ftp://..., autoyast=http://..., autoyast=https://..., autoyast=tftp://..., or autoyast=cifs://....



Note: Disabling network and DHCP

To disable the network during installations where it is not needed or unavailable, for example when auto-installing from DVD-ROMs, use the **linuxrc** option netsetup=0 to disable the network setup.

With all AutoYaST invocation options it is possible to specify the location of the control file in the following ways:

1. Specify the exact location of the control file:

```
autoyast=http://192.168.1.1/control-files/client01.xml
```

2. Specify a directory where several control files are located:

```
autoyast=http://192.168.1.1/control-files/
```

In this case the relevant control file is retrieved using the hex digit representation of the IP as described below.

The path of this directory needs to end with a `/`.

The files in the directory must not have any extension, for example `.xml`. So the file name needs to be the IP or MAC address only.

```
tux > ls -r control-files  
C00002 0080C8F6484C default
```

If only the path prefix variable is defined, YaST will fetch the control file from the specified location in the following way:

1. First, it will search for the control file using its own IP address in uppercase hexadecimal, for example `192.0.2.91 -> C000025B`.
2. If this file is not found, YaST will remove one hex digit and try again. This action is repeated until the file with the correct name is found. Ultimately, it will try looking for a file with the MAC address of the client as the file name (mac should have the following syntax: `0080C8F6484C`) and if not found a file named `default` (in lowercase).

As an example, for 192.0.2.91, the HTTP client will try:

```
C000025B  
C000025  
C00002  
C0000  
C000  
C00  
C0  
C  
0080C8F6484C  
default
```

in that order.

To determine the hex representation of the IP address of the client, use the utility called `/usr/bin/gethostip` available with the `syslinux` package.

EXAMPLE 9.1: DETERMINE HEX CODE FOR AN IP ADDRESS

```
tux > /usr/bin/gethostip 10.10.0.1
10.10.0.1 10.10.0.1 0A0A0001
```

9.3.2 Auto-installing a single system

The easiest way to auto-install a system without any network connection is to use the original SUSE Linux Enterprise Micro DVD-ROMs and a flash disk (for example, a USB stick). You do not need to set up an installation server nor the network environment.

Create the control file and name it `autoinst.xml`. Copy the file `autoinst.xml` to the flash disk.

9.3.3 Combining the `linuxrc` info file with the AutoYaST control file

If you choose to pass information to `linuxrc` using the `info` file or as boot options, you may integrate the keywords into the AutoYaST control file. Add an `info_file` section as shown in the example below. This section contains keyword—value pairs, separated by colons, one pair per line.

EXAMPLE 9.2: `linuxrc` OPTIONS IN THE AUTOYAST CONTROL FILE

```
....
<install>
....
  <init>
    <info_file>

install: nfs://192.168.1.1/CDs/full-x86_64
dud: https://example.com/driver_updates/filename.dud
upgrade: 1
textmode: 1
    </info_file>
  </init>
.....
</install>
```


....

Note that the autoyast2 keyword must point to the same file. If it is on a flash disk (for example, a USB stick), then the option usb:// needs to be used. If the info file is stored in the initial RAM disk, the file:/// option needs to be used.

V Appendixes

- A Handling rules 152
- B AutoYaST FAQ—frequently asked questions 153
- C Advanced **linuxrc** options 156
- D GNU licenses 161

A Handling rules

The following figure illustrates how rules are handled and the processes of retrieval and merge.

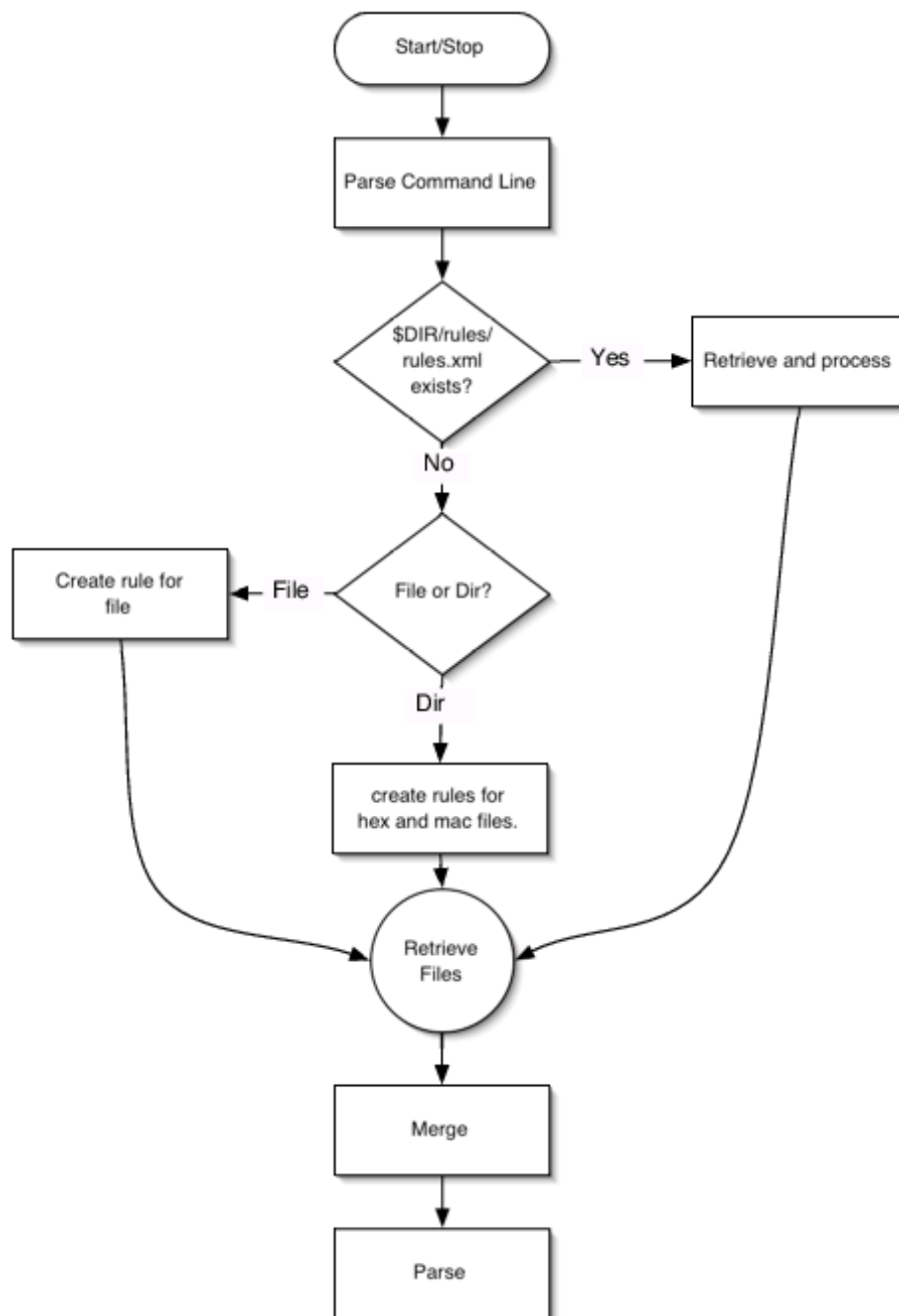


FIGURE A.1: RULES RETRIEVAL PROCESS

B AutoYaST FAQ—frequently asked questions

Q: 1. *How do I invoke an AutoYaST installation?*

On all SUSE Linux Enterprise Micro versions, the automatic installation gets invoked by adding `autoyast=<PATH_TO_PROFILE>` to the kernel parameter list. So for example adding `autoyast=http://MYSERVER/MYCONFIG.xml` will start an automatic installation where the profile with the AutoYaST configuration gets fetched from the Web server `my-server`. See [Section 9.3, “Invoking the auto-installation process”](#) for more information.

Q: 2. *What is an AutoYaST profile?*

A profile is the AutoYaST configuration file. The content of the AutoYaST profile determines how the system will be configured and which packages will get installed. This includes partitioning, network setup, and software sources, to name but a few. Almost everything that can be configured with YaST in a running system can also be configured in an AutoYaST profile. The profile format is an ASCII XML file.

Q: 3. *How do I create an AutoYaST profile?*

You have to create the AutoYaST profile manually. For details refer to [Section 3.2, “Creating/editing a control file manually”](#).

Q: 4. *How can I check the syntax of a created AutoYaST profile?*

The most efficient way to check your created AutoYaST profile is by using `jing` or `xmllint`.

See [Section 3.2, “Creating/editing a control file manually”](#) for details.

Q: 5. *What is smallest AutoYaST profile that makes sense?*

If a section has not been defined in the AutoYaST profile the settings of the general YaST installation proposal will be used. However, you need to specify at least the `root` password to be able to log in to the machine after the installation.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE profile>
<profile xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://
www.suse.com/1.0/configs">
  <users config:type="list">
    <user>
      <encrypted config:type="boolean">false</encrypted>
      <user_password>linux</user_password>
      <username>root</username>
```

```
</user>
</users>
</profile>
```

Q: 6. *How do I do an automatic installation with autodetection of my sound card?*

Use the following `<sound>` section in your profile:

```
<sound>
  <autoinstall config:type="boolean">true</autoinstall>
  <configure_detected config:type="boolean">true</configure_detected>
</sound>
```

Q: 7. *I want to install from DVD only. Where do I put the AutoYaST profile?*

Put the profile in the root of the DVD. Refer to it with `file:///PROFILE.xml`.

Q: 8. *How can I test a merging process on the command line?*

To merge two profiles, `a.xml` with `base.xml`, run the following command:

```
tux > /usr/bin/xsltproc --novalid --param replace "'false'" \
--param dontmerge1 "'package'" --param with "'a.xml'" --output out.xml \
/usr/share/autoinstall/xslt/merge.xslt base.xml
```

This requires sections in both profiles to be in alphabetical order (`<software>`, for example, needs to be listed after `<add-on>`). If you have created the profile with YaST, profiles are automatically sorted correctly.

The `<dontmerge1>` parameter is optional and an example of what to do when you use the `<dont_merge>` element in your profile. See [Section 6.4, "Merging of rules and classes"](#) for more information.

Q: 9. *Is the order of sections in an AutoYaST profile important?*

Actually the order is not important. The order of sections in the profile has no influence on the AutoYaST workflow. However, to *merge* different profiles, sections need to be in alphabetical order.


Q: 10. **linuxrc** blocks the installation with `File not signed`. I need to manually interact.

linuxrc found an unsigned file, such as a driver update. To use an unsigned file, you can suppress that message by passing `insecure=1` to the **linuxrc** parameter list (together with the `autoyast=...` parameter).

Q: 11. *I want to install from DVD/USB/HD but fetch the XML file from the network.*

You need to pass `ifcfg` to `linuxrc`. This is required to set up the network, otherwise AutoYaST cannot download the profile from the remote host. See [Section C.3, “Advanced network setup”](#) for more information.

Q: 12. *Where can I ask questions which have not been answered here?*

There is an AutoYaST mailing list where you can post your questions. Join us at <http://lists.opensuse.org/opensuse-autoinstall/> .

C Advanced **linuxrc** options

linuxrc is a small program that runs after the kernel has loaded, but before AutoYaST or other stages. It prepares the system for installation. It allows the user to load modules, start an installed system or a rescue system, and to guide the operation of YaST.



Note: AutoYaST and **linuxrc** settings are not identical

Some **linuxrc** settings coincidentally have the same names as settings used by AutoYaST in its `autoyast.xml` file. This does *not* mean that they take the same parameters or function in the same way. For example, AutoYaST takes a **self_update** setting. If this value is set to `1`, another setting, **self_update_url** will be read and followed. Although **linuxrc** also has a **self_update** setting, **linuxrc**'s setting takes values of either `0` or a URL.

Do not pass AutoYaST parameters to **linuxrc**, as this will almost certainly not give the desired results.

If **linuxrc** is installed on a machine, information about it can be found in the directory `/usr/share/doc/packages/linuxrc/`. Alternatively, its documentation can be found online at: <https://en.opensuse.org/SDB:Linuxrc>.



Note: Running **linuxrc** on an installed system

If you run **linuxrc** on an installed system, it will work slightly differently so as not to destroy your installation. As a consequence, you cannot test all features this way.

To keep the **linuxrc** binary file as small as possible, all its libraries and other supplemental files are linked directly into the main program binary file. This means that there is no need for any shared libraries in the initial RAM disk, `initrd`.

C.1 Passing parameters to **linuxrc**

Unless **linuxrc** is in manual mode, it will look for an `info` file in these locations: first `/info` on the flash disk (for example, a USB stick) and if that does not exist, for `/info` in the `initrd`. After that, it parses the kernel command line for parameters. You may change the `info` file

linuxrc reads by setting the `info` command line parameter. If you do not want **linuxrc** to read the kernel command line (for example, because you need to specify a kernel parameter that **linuxrc** recognizes as well), use `linuxrc=nocmdline`.

linuxrc will always look for and parse a file called `/linuxrc.config`. Use this file to change default values if you need to. In general, it is better to use the `info` file instead. Note that `/linuxrc.config` is read before any `info` file, even in manual mode.

C.2 info file format

Lines starting with `#` are comments. Valid entries are of the form:

```
key: value
```

Note that `value` extends to the end of the line and therefore may contain spaces. The matching of `key` is on a case-insensitive basis.

You can use the same key-value pairs on the kernel command line using the syntax `key=value`. Lines that do not have the form described above will be ignored.

The table below lists important keys and example values. For a complete list of **linuxrc** parameters, refer to <https://en.opensuse.org/SDB:Linuxrc>.

TABLE C.1: ADVANCED **linuxrc** KEYWORDS

Keyword: Example Value	Description
<code>addswap: 0 3 /dev/sda5</code>	If 0, never ask for swap; if the argument is a positive number <code>n</code> , activate the swap partition; if the argument is a partition name, activate this swap partition.
<code>autoyast: ftp://AU-TOYASTFILE</code>	Location of the auto installation file; activates auto installation mode. See AutoYaST control file locations for details.
<code>bootptimeout: 10</code>	10 seconds timeout for BOOTP requests.
<code>bootpwait: 5</code>	Sleep 5 seconds between network activation and starting bootp.
<code>display: color mono alt</code>	Set the menu color scheme.

Keyword: Example Value	Description
<code>exec: <i>COMMAND</i></code>	Run <i>command</i> .
<code>forceinsmod: 0 1</code>	Use the <code>-f</code> option (force) when running <code>insmod</code> commands.
<code>forcerootime: 0 1</code>	Load the installation system into RAM disk.
<code>ifcfg: <i>NETWORK_CONFIGURATION</i></code>	Set up and start the network. See Section C.3, “Advanced network setup” for more information.
<code>insmod: <i>MODULE</i></code>	Load <i>MODULE</i> .
<code>install: <i>URL</i></code>	Install from the repository specified with <i>URL</i> . For the syntax of <i>URL</i> refer to https://en.opensuse.org/SDB:Linuxrc#url_descr .
<code>keytable: de-lat1-nd</code>	Virtual console keyboard map to load.
<code>language: de_DE</code>	Language preselected for the installation.
<code>loghost: 10.10.0.22</code>	Enable remote logging via syslog via UDP port 514
<code>loghost: @10.10.0.22</code>	Enable remote logging via syslog via TCP port 514
<code>memloadimage: 50000</code>	Load installation system into RAM disk if free memory is above 50000 KB.
<code>memlimit: 10000</code>	Ask for swap if free memory drops below 10000 KB.
<code>memYaST: 20000</code>	Run YaST in text mode if free memory is below 20000 KB.
<code>memYaSTText: 10000</code>	Ask for swap before starting YaST if free memory is below 10000 KB.
<code>proxy: http://10.10.0.1:3128</code>	Defines an HTTP proxy server. For the full parameter syntax, refer to https://en.opensuse.org/SDB:Linuxrc#p_proxy .
<code>rescue: 1 nfs://server/dir</code>	Load the rescue system; the URL variant specifies the location of the rescue image explicitly.

Keyword: Example Value	Description
<code>rescueimage: /suse/images/rescue</code>	Location of the rescue system image.
<code>rootimage: /suse/images/root</code>	Location of the installation system image.
<code>textmode: 1</code>	Start YaST in text mode.
<code>usbwait: 4</code>	Wait four seconds after loading the USB modules.
<code>y2confirm</code>	Overrides the confirm parameter in a control file and requests confirmation of installation proposal.

C.3 Advanced network setup

Even if parameters like `hostip`, `nameserver`, and `gateway` are passed to `linuxrc`, the network is only started when it is needed (for example, when installing via SSH or VNC). Because `autoyast` is not a `linuxrc` parameter (this parameter is ignored by `linuxrc` and is only passed to YaST), the network will *not* be started automatically when specifying a remote location for the AutoYaST profile.

Therefore, the network needs to be started explicitly. This used to be done with the `linuxrc` parameter `netsetup`. Also you can use the parameter `ifcfg`. It offers more configuration options, for example configuring more than one interface. `ifcfg` directly controls the content of the `/etc/sysconfig/network/ifcfg-*` files.

DHCP network configuration

The general syntax to configure DHCP is

```
ifcfg=INTERFACE=DHCP*,OPTION1=VALUE1,OPTION2=VALUE2
```

where `INTERFACE` is the interface name, for example `eth0`, or `eth*` for all interfaces. `DHCP*` can either be `dhcp` (IPv4 and IPv6), `dhcp4`, or `dhcp6`.

To set up DHCP for `eth0` use:

```
ifcfg=eth0=dhcp
```

To set up DHCP on all interfaces use:

```
ifcfg=eth*=dhcp
```

Static network configuration

The general syntax to configure a static network is

```
ifcfg=INTERFACE=IP_LIST,GATEWAY_LIST,NAMESERVER_LIST,DOMAINSEARCH_LIST,\
OPTION1=value1,...
```

where *INTERFACE* is the interface name, for example *eth0*. If using *eth**, the first device available will be used. The other parameters need to be replaced with the respective values in the given order. Example:

```
ifcfg=eth0=192.168.2.100/24,192.168.5.1,192.168.1.116,example.com
```

When specifying multiple addresses for a parameter, use spaces to separate them and quote the complete string. The following example uses two name servers and a search list containing two domains.

```
ifcfg="eth0=192.168.2.100/24,192.168.5.1,192.168.1.116 192.168.1.117,example.com
example.net"
```

For more information refer to https://en.opensuse.org/SDB:Linuxrc#Network_Configuration.

D GNU licenses

This appendix contains the GNU Free Documentation License version 1.2.

GNU free documentation license

Copyright (C) 2000, 2001, 2002 Free Software Foundation, Inc. 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA. Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or non-commercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary

formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

A section "Entitled XYZ" means a named sub-unit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or non-commercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
- O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <http://www.gnu.org/copyleft/>.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

ADDENDUM: How to use this License for your documents

```
Copyright (c) YEAR YOUR NAME.
Permission is granted to copy, distribute and/or modify this document
under the terms of the GNU Free Documentation License, Version 1.2
or any later version published by the Free Software Foundation;
with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts.
A copy of the license is included in the section entitled "GNU
Free Documentation License".
```

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with...Texts." line with this:

```
with the Invariant Sections being LIST THEIR TITLES, with the
Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.