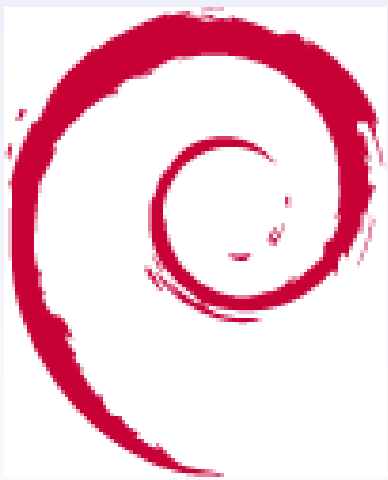
debian-installer internals

Frans Pop

March 4, 2006



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Outline

Outline

Past, Present and Future

Walkthrough

Key components

udebs

Discussion

Past, Present and Future - a short introduction

Walkthrough the installation process

D-I key components

Interesting udebs

Discussion

The present (2004)

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- d-i is nearly release quality (rc1 underway)
- Porting to most architectures almost done
- Bug squashing and fine tuning for release
- No big changes anymore before releasing Sarge

The future (now)

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- Well done graphical front-end
- Custom installers made easy
- Automated or unattended installs
- Install without reboot?
- ...
- (The modular design makes additions easy)

Stage 0: booting

Goal: Get the installer running

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Standard path:

1. Booting of the computer by the BIOS, OpenFirmware, ...
2. Loading of the boot-loader from CD-ROM
3. Loading of the kernel and initial ramdisk
4. Starting the kernel

Additional paths:

- Booting from another OS (loadlin, BootX)
- Network Boot (PXE, TFTP, ...)
- Loading of kernel and initial ramdisk from floppy
- Booting from USB memory stick

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Stage 1: initial ramdisk

Goal: setup access to additional components

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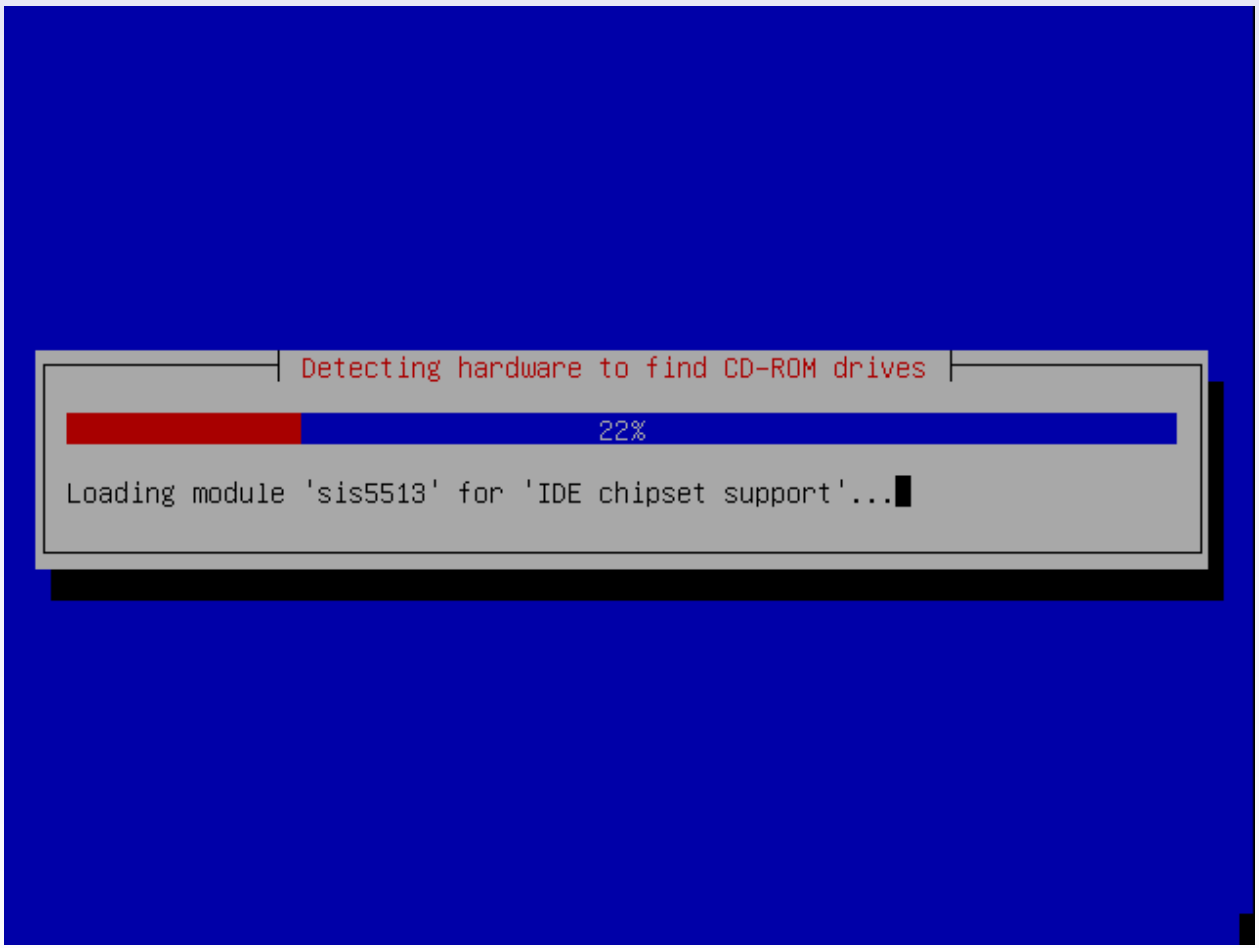

Stage 1: initial ramdisk

Goal: setup access to additional components

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1. Setup shm filesystem, copy initrd content and pivot_root into it
2. Choose installation language, country and keyboard
3. First hardware detection
4. Different paths depending on installation medium
   - Network configuration on netboot and floppy installs
   - CD drive detection on CD-ROM installs
   - Detection of other medias containing installer components
5. Load additional installer components (from cdrom, network or iso-image)

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Stage 2: after loading additional components

Goal: Install the base-system and make it bootable

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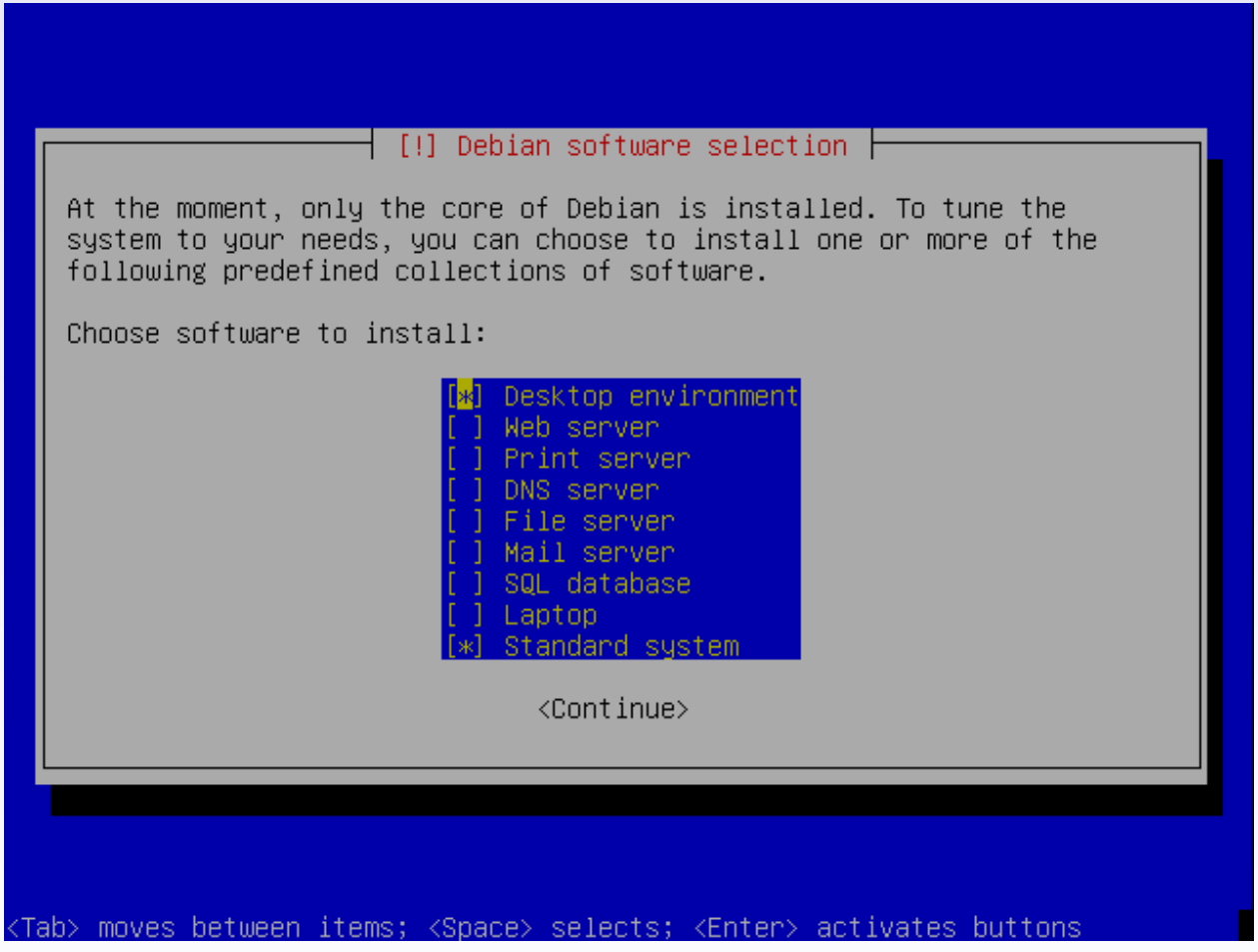

Stage 2: after loading additional components

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1. Partition disks and assign mount points
2. Set up clock (UTC/local), timezone, root password, user
3. Install base system (from cdrom, network or iso-image)
4. Install a few additional packages and kernel
5. Configure apt for target system and install tasks
6. Install boot loader
7. Reboot into installed system

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Summary: advantages and features of d-i

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Discussion

Advantages

- Easy default installs
  - "Wizard style" guided installation
  - Reasonable default options
  - Minimum of questions asked
- Possibility of expert installs for fine tuning
- Modular design makes additions easy

Normal Linux system, but

- Very specific purpose
- Mainly running only one program
- Root filesystem in a RAM disk
- Configured to run on almost any hardware

Summary: advantages and features of d-i

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Minimal Debian packages: udebs

- Normal Debian packages (technically)
- Not policy compliant
  - No documentation and copyright files
  - File ending .udeb
  - Reduced to minimal size

udebs - installer components

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Types of udebs

- Perform an installation step
  - Provide a menu item (Choose language, Install the base system, ...)
  - Postinst script to perform actions
- Contain support files
  - Kernel modules
  - Programs (discover, busybox, ...)
  - Libraries (full libc, libparted, ...)

Companion: udpkg - a stripped down dpkg

cdebconf - user input

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Discussion

Debconf

- All user input uses debconf
- Reimplementation of debconf in C
- Separation of protocol, storage back-end and front-end
  - Preseeding the debconf database for automated installs
  - Different front-ends for different purposes
- Standard debconf tools can be used for i18n
- New developments
  - Plug-ins
  - Pass through

cdebconf - user input

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Discussion

Priority

- Each question has its priority (low, medium, high or critical)
- D-I runs at a given priority (normally at high)
- Questions below the current priority are not shown (default answer)
- The priority is dynamically lowered on error (and raised on subsequent success)
- Priority critical mainly used in combination with preseeding

cdebconf - user input

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Discussion

Front-ends

- Standard newt front-end
- Text front-end
- Graphical GTK front-end (new for Etch)
- ...

main-menu - Choosing the Next Step

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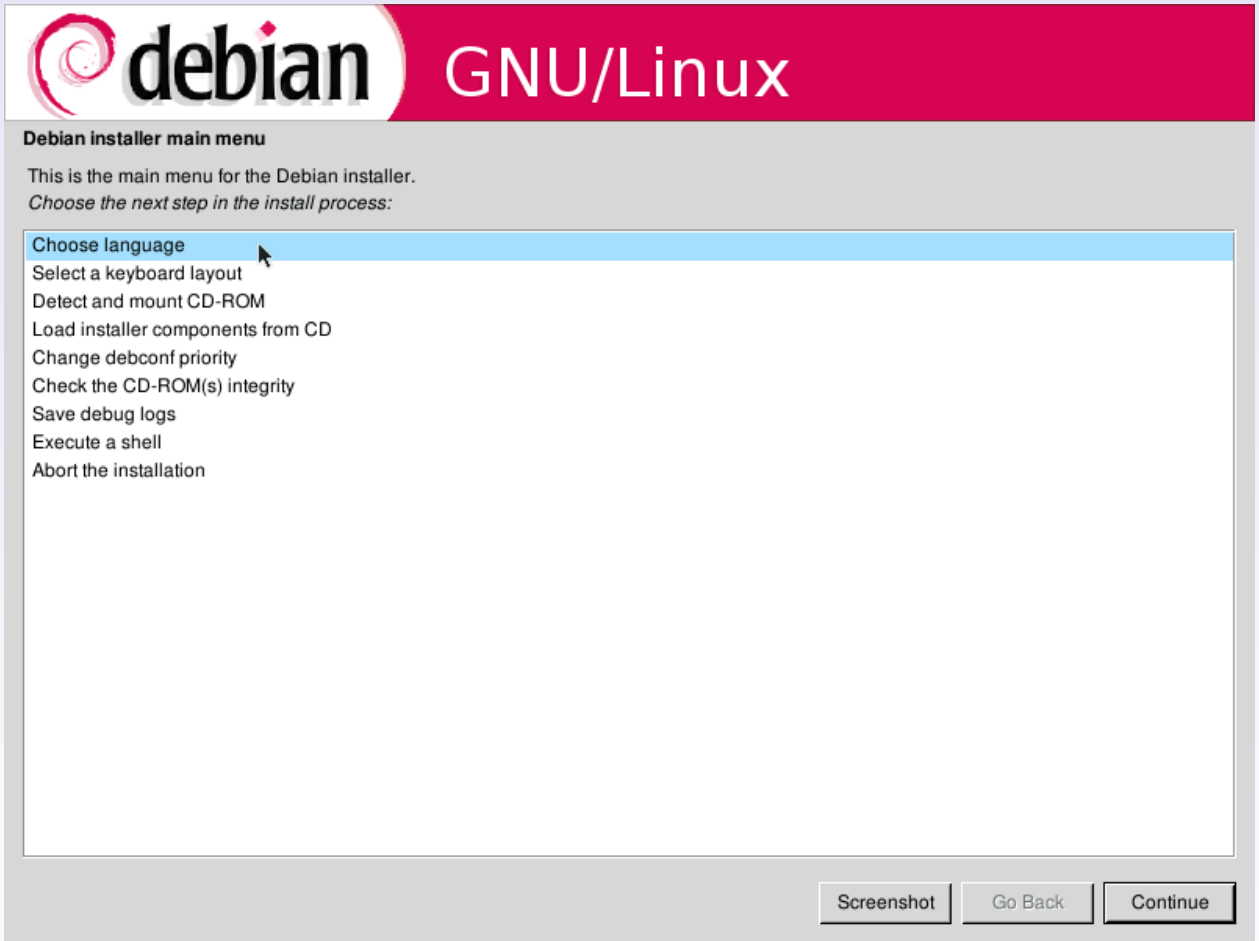

Main-menu after booting the installer

main-menu - Choosing the Next Step

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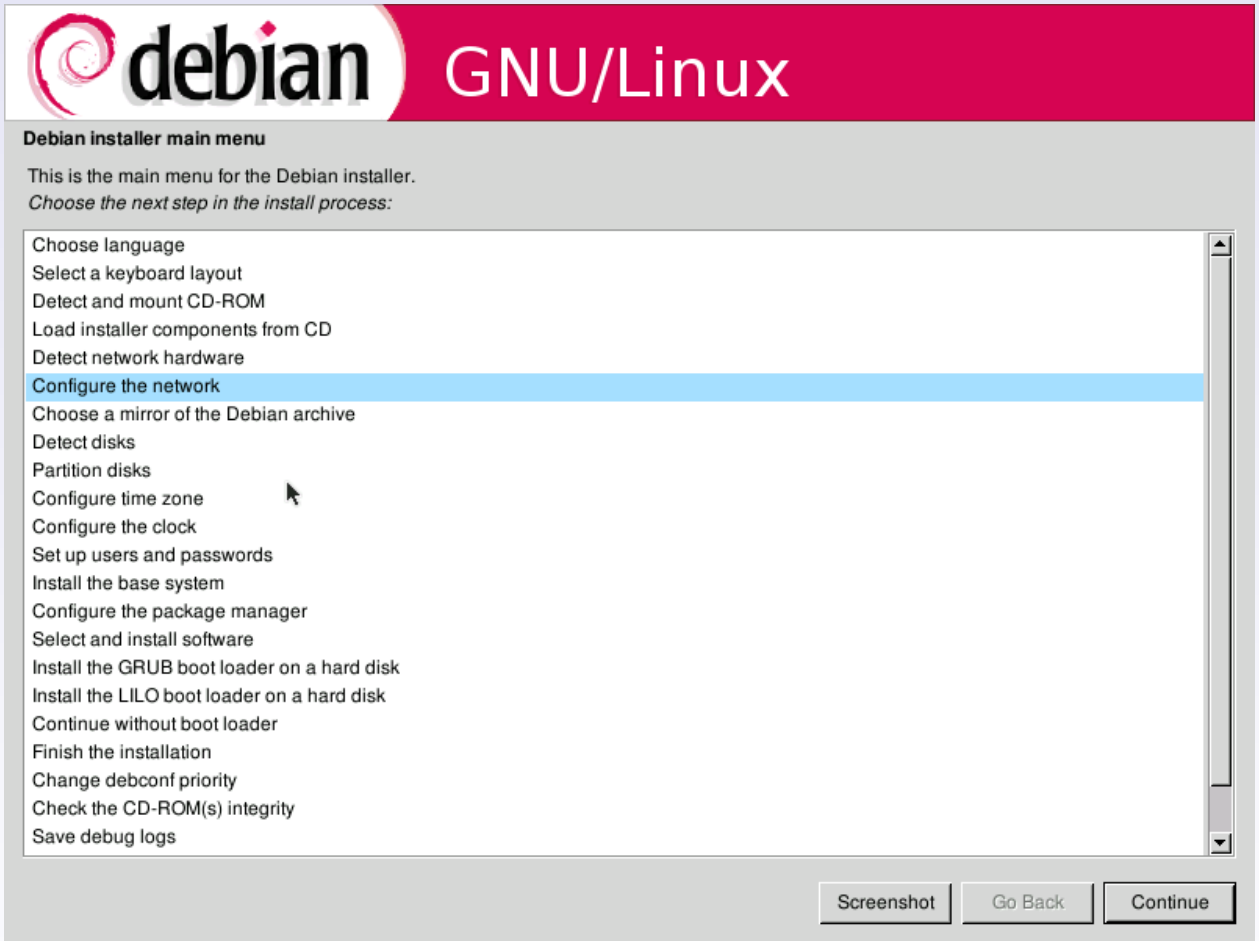

Full main-menu after loading of additional components

main-menu - Choosing the Next Step

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Key components

udebs

Discussion

- Central component controlling the installation process
- A debconf "select" question
- Not shown in default installs
- More than a menu
  - Dynamically adds items as new udebs are installed
  - Chooses next action based on menu item number, provides and dependencies
  - Calls udpkg to run postinst scripts

Shell and C Code only

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Discussion

Space is very limited

- No PERL, no Python, no ... (insert your favourite scripting language)
- d-i should fit on 2 floppies (kernel and initrd)
- d-i should be able to install with minimal RAM (currently approx. 32MB)

Programs either in C or shell (busybox)

- Shell prefered: easier to debug (set -x) and maintain
- Shell prefered: "live changes" possible
- Only stripped down tools from busybox
- nano: editor (and pager)
- C where shell is not feasible (anna, kbd-chooser, ...)

Shell and C Code only

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locale-/kbd-chooser

Packages: localechooser, kbd-chooser

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Discussion

localechooser lists all available translations

- localechooser is the first screen shown on ordinary d-i installs
- Everything shown after this should continue localized
- Language choice affects defaults for country and keyboard selection
- Which languages are available depends on frontend
- Language and country together determine default locale (UTF-8)

Hardware detection

Packages: udev, discover1, ddetect (ethdetect, hw-detect, hw-detect-full)

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Discussion

Hardware detection

- For 2.4 based installs: discover
- For 2.6 based installs: udev

anna and retrievers

Packages: anna, {net,cdrom,floppy}-retriever

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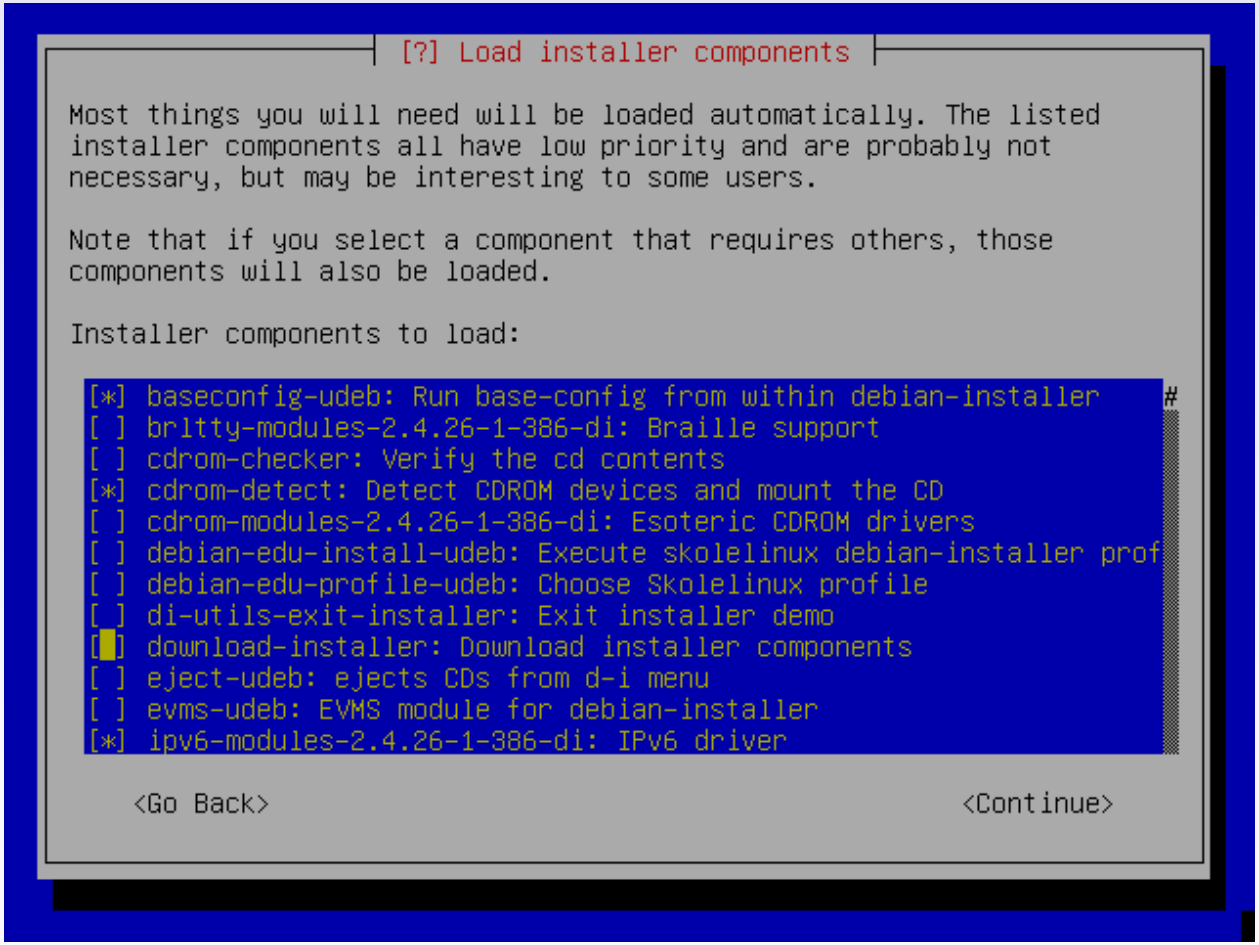

anna's not nearly apt, but for Debian installer, it will do

anna and retrievers

Packages: anna, {net,cdrom,floppy}-retriever

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Discussion

system to download/install additional components

- installs all udebs with priority standard or higher
- resolves dependencies
- changes to the list of selected udebs are possible at debconf priority smaller than medium

udebs are downloaded/installed by retrievers

- net-retriever to download from a Debian mirror
- cdrom-retriever to install from a mounted CD-ROM (or loop mounted iso-image)
- floppy-retriever to install some udebs from floppy and rerun anna afterwards

anna and retrievers

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partman - partitioning and mount points

Packages: partman-*, mdcfg, lvmcfg

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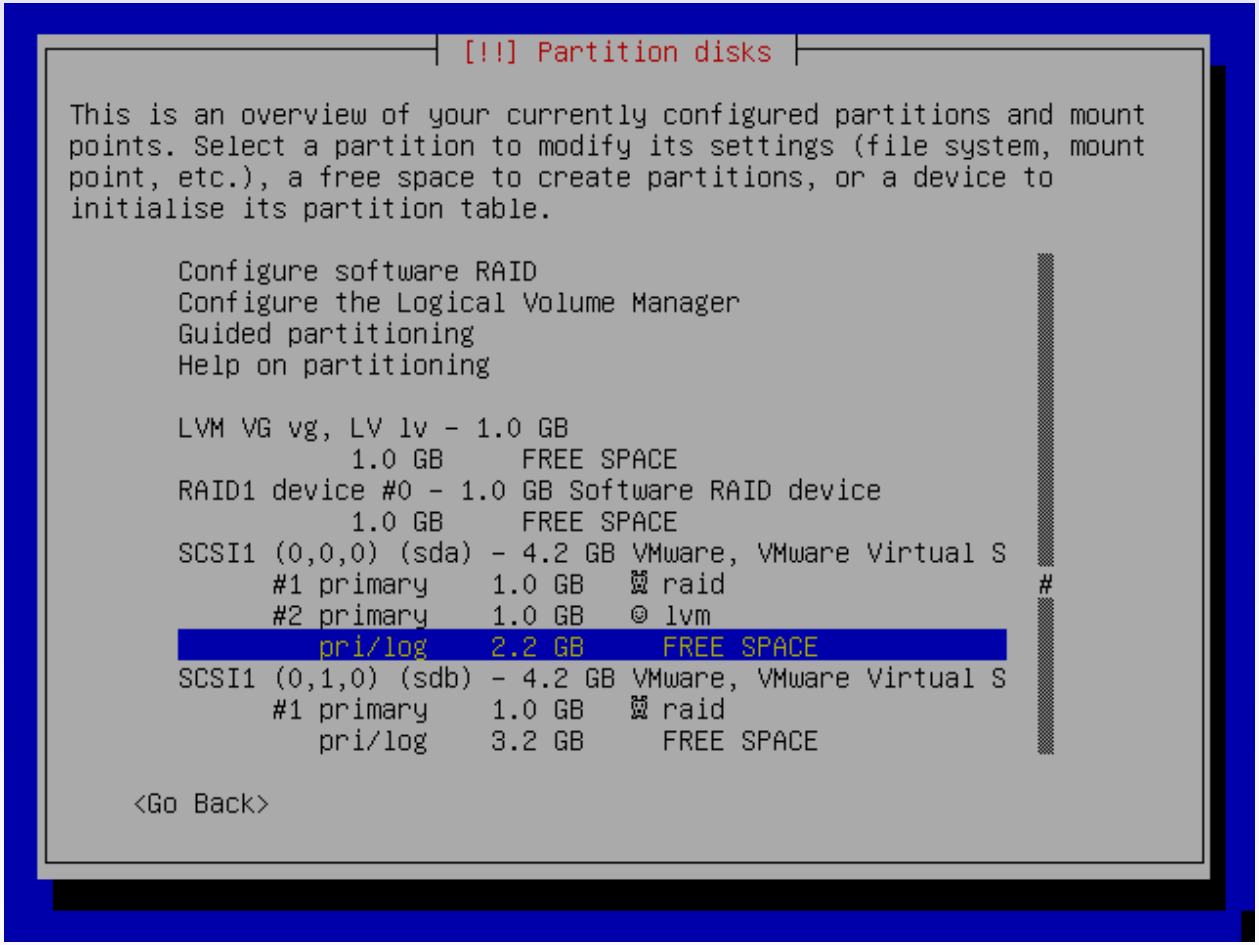

Partman's main screen

partman - partitioning and mount points

Packages: partman-*, mdcfg, lvmcfg

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Features

- Multiple filesystem support:
  - ext2/3
  - reiserfs
  - jfs
  - xfs
- Based on libparted
- Support for LVM and software RAID
- Automatic and manual partitioning
- New: automatic partitioning using LVM

partman - partitioning and mount points

Packages: partman-*, mdcfg, lvmcfg

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Split into several small udebs:

- One for each supported filesystem
- Simple to add support for new filesystems
- Additional udebs for architecture support
- Any addition can be implemented in its own udeb

"Client/Server" architecture

- Server written in C performs actions using libparted
- Clients written in Shell send commands over FIFOs

Partman would be a topic for a talk on its own.

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Packages: {aboot, delo, grub, lilo, palo, yaboot, ...}-installer, os-prober, nobootloader

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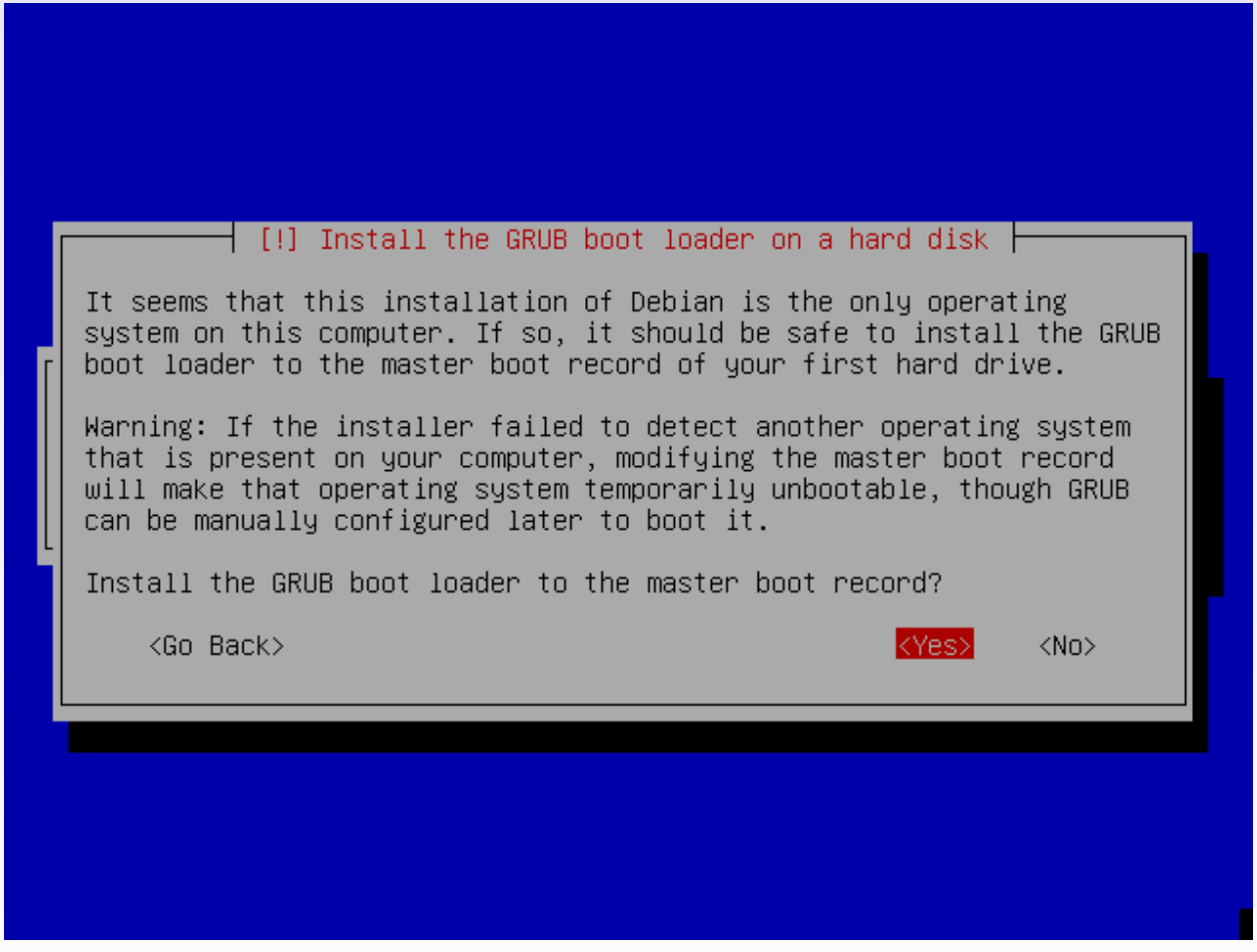

grub-installer asking where to install grub

Boot Loader Installers

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- Separate small udebs to install the boot loader
- Grub currently default on i386
- Special os-prober udeb to detect other operating systems and to offer multiboot
- nobootloader udeb to skip bootloader installation on systems that don't need a boot loader

Discussion

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It's your turn now!