Software Management

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Introduction

- Distribution alternatives:
  - **Proprietary** software
    - Usually employs its own installation tools (automatized)
  - **Free** Software
    - From its source code (always)
    - From packages (usually)
    - From repository (Depends on the distribution)
- Two simple advices about software installation:
  - Check before commit (**testing** and more testing). A twin system machine (virtual or real) could be an interesting option...
  - Security patches. Try to be always updated, especially in network-exposed systems.

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Installation from Source Code

- The source code of any Free Software is publicly available
  - Mandatory for Free software licensing : GPL, BSD, etc.
- Advantages:
  - Optimize software to our hardware (compilation options).
  - Have more freedom concerning versions or software to install.
- Disadvantages:
  - Tough installation process (building and dependencies).
  - Easier to disorganize our system installation.
    - The installed software is not labeled in any database.
    - Recommended to make use of special directories. /usr/local/, /opt/, /usr/src/.
- Available formats:
  - pre-built packages (tar.gz, tar.bz2, …)
  - Software repositories (git, hg, …)

Installation from Source Code

- Installation Steps:
  - **[previous-1]** Install **compilation**/building tools.
    - gcc, g++, autotools, cmake, scons, …
  - **[previous-2]** Install **dependencies**.
    - External libraries (.so, .a) and other tools.
  - **[1] Download** the software (format .tar.gz, .tar.bz2).
    - cd /opt/prebuilds && wget http://www.python.org/ftp/python/2.7.6/Python-2.7.6.tgz
  - **[2] Uncompress**.
    - tar –xzvf Python-2.7.6.tgz
  - **[3]** read README/INSTALL. Pre-configure the Makefiles (paths) and **resolve** the possible **dependencies** (previous software).
    - cd /opt/prebuilds/Python-2.7.6/ && ./configure –prefix=/usr/local/
  - **[4] Compile** the packet and install it in a different directory (/usr/local/).
    - make –j <num cores> && make install

Installation from Source Code

- Not all the free software is available through .tar.gz packages.
- **DCVS** systems (Distributed Concurrent Versioning Systems) are becoming the standard for this labor.
  - Distributed versioning systems (avoid the dependency from the server). Employed for **collaborative software** projects (like the linux kernel).
  - Software versions (code modifications/fixing/improvements) maintained through a revision tree.
  - Examples: **git**, **mercurial** (A nice starting point: https://try.github.io/)
  - ¿How is download performed? (Example with Xen, virtualization sw)
    - apt-get update && apt-get install git
    - git clone git://xenbits.xen.org/xen.git

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Installation from Packages

- A software package contains:
  - The source code or compiled binaries
  - Scripts for pre and post-installation (location control, dependencies,…)
- Advantages:
  - Unified and organized administration of installed software (Database)
  - Simplifies installation process (no compiler required, pre/post install,…)
- Source (who provides the package?):
  - If the developers of a UNIX/Linux distribution support the software, they usually provide it pre-packaged.
  - The developer can also provide the package.
- Each distribution has its own format:
  - RedHat and derivatives (Suse, Centos, Fedora…): .rpm
  - Debian and derivatives (Ubuntu): .deb

Installation from Packages

- .deb packages (Debian)
  - Binary package: binary, configuration file, man pages, copyright,…
  - Source package:
    - File .dsc: package descriptor
    - File .orig.tar.gz: original code, no modification
    - File .diff.gz: Modifications performed by Debian to the original code.
  - Naming: [name]_[version-code]_[Debian-revision]_[arch].deb
  - More info:
    - https://debian.org/doc/manuals/debian-faq/ch-pkg_basics.en.html
- Associated files and directories:
  - /etc/dpkg/: Configuration file (dpkg.cfg).
  - /var/lib/dpkg/: information about available/installed packages (package “database”).

Installation from Packages

- Command **dpkg**: packet management in Debian:
  - Format: dpkg --<options> [packet]
    - Option **–i** (**--install**): install a downloaded package.
    - Option **–r** (**-P** purge): Uninstall a package (purge removes also configuration files)
    - Option **–c**: Shows the content of the package.
    - Option **–b** (**--build**): Compile a package if it's source code.
    - Option **–l**(**--list**): List all the packages available. The second character shows the status of the package: [i-installed], [n-not installed], [c-only configuration files]…
  - Example: Installation of python2.7 for Debian Wheezy (precompiled amd64)
    - `wget http://ftp.us.debian.org/debian/pool/main/p/python2.7/python2.7_2.7.3-6_amd64.deb`
    - `dpkg -i python2.7_2.7.3-6_amd64.deb`
  - In most cases it is not so easy (example GDM3)
    - `wget http://ftp.us.debian.org/debian/pool/main/g/gdm3/gdm3_3.4.1-8_amd64.deb`
    - `dpkg: dependency problems prevent configuration of gdm3:`
    - `gdm3 depends on libaccountsservice0 (>= 0.6.8); however:`
    - `Package libaccountsservice0 is not installed.`
    - …

More than 30 dependencies that must be resolved manually

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Installation from Repository

- Debian introduced the use of an automatized tool to simplify installation process.
  - Automatic connection with remote .deb repositories
  - Automatic maintenance of versions.
  - Automatic resolution of package dependencies.
- **APT: Advanced Packaging Tool**
  - Connects transparently the package management tool (dpkg) with external repositories.
  - Searches in the repositories, downloads the package, manages and resolves dependencies, installs and finally configures (all made transparent to the used).
- Other distributions have their own package management tools
  - Yum (Red-Hat), Yast2 (Suse).

Installation from Repository

- Command **apt-get**: command-line interface for APT
  - Format: apt-get <option> [package]
    - Option **update**: update the list of known packages. (recommended its regular use).
    - Option **upgrade**: update all the packages in the system.
    - Option **install**: install a package and all the dependencies.
    - Option **remove** (purge): remove a package (purge: + configuration files)
    - Option **clean**: remove the .deb files downloaded for installation.
- Cache of contents:
  - A copy of installed packages is kept in /var/cache/apt
- Command **apt-cache**: tool for package searching.
  - Format: apt-cache <option> [word/package]
    - Option **search**: (apt-cache search wrd) find all the packages with the word "wrd"
    - Option **show**: shows information about a package
    - Option **depends**: shows the dependencies of a package.

Installation from Repository

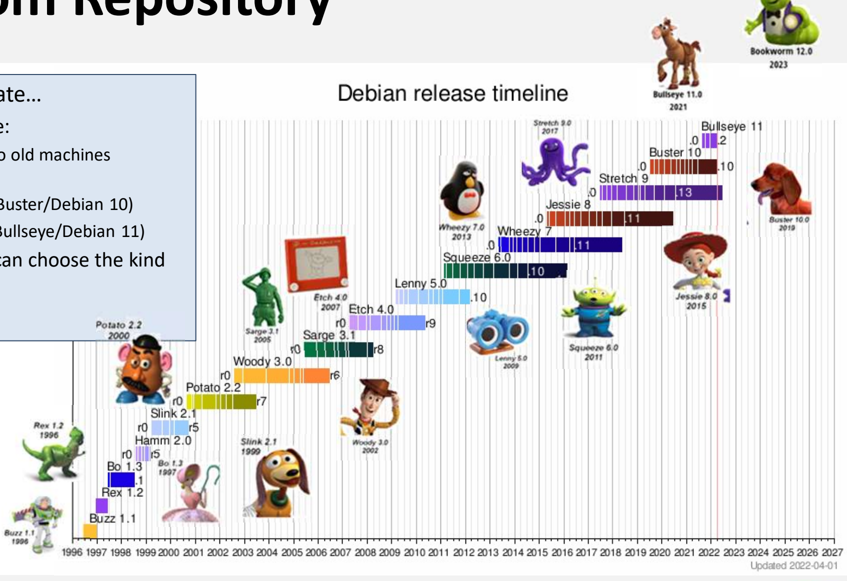
- ¿What about the repository?: configuration in /etc/apt/**sources.lst**
  - Syntax: [file_type] [URL] [distribution] [components]
    - File type: can be deb or deb-src. deb indicates that the repository contains binary packages, deb-src indicates source-code packages.
    - URL: link to the repository from where packages are downloaded. (mirrors)
    - Distribution: name (alias) of the distribution (squeeze, wheezy, jessie, stretch) or kind of distribution (oldstable, stable, testing, unstable).
    - Components: 3 kind of packages: main, contrib, non-free.
      - main: packages that meet Debian requirements (OpenSource)
      - contrib: Contains OpenSource software but some dependencies are not.
      - non-free: non-OpenSource software.
    - Example:

```
deb http://cdn.debian.net/debian/ wheezy main non-free contrib
deb-src http://cdn.debian.net/debian wheezy main non-free contrib

deb http://security.debian.org/ wheezy/updates main contrib non-free
deb-src http://security.debian.org/ wheezy/updates main contrib non-free
```

Installation from Repository

- Keeping the distribution up-to-date…
  - Debian keeps 3 OS versions alive:
    - oldstable: old, corresponding to old machines (Stretch/Debian 9)
    - stable: current stable version (Buster/Debian 10)
    - testing: future stable version (Bullseye/Debian 11)
  - Through the file sources.lst we can choose the kind of distribution.
  - Updating: **next slide**



Debian Upgrade (Basic steps)

- No system upgrade is bulletproof
  - discuss, prepare and test any proper fail-over or recovery process.
- Fully upgrade current distribution:
  - apt-get update; apt-get upgrade; apt-get dist-upgrade
- Look for possible sources of inconsistences:
  - Database sanity and consistency check (dpkg -C)
  - Check which packages are held back, not upgraded (apt-mark showhold).
- Update package repository
  - edit /etc/apt/sources.lst to include new package repositories.
- Update to new system
  - apt-get update; apt-get upgrade; apt-get dist-upgrade
- Check your new system before putting it in production.

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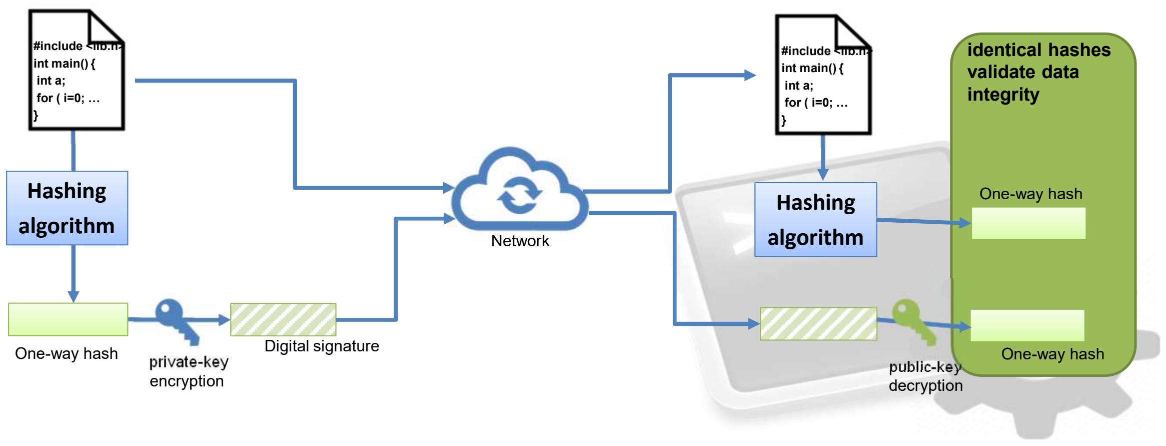
Security

- Data validation process through public-private key signature



Security

- Never trust blindly in an APT repository.
  - Do not apply automatic updates (not supervised)
  - Read always before updating
  - **Verify software authenticity.**
- Debian keeps software authenticity through asymmetric cryptography.
  - Each repository has a pair of keys. The private remains in the repository, the public is spread to everybody.
  - All distribution packages are signed (private signature).
  - Any package illegally modified violates its authenticity, because signing key is not known by the attacker.
  - Locally, a “keyring” with public keys is maintained to authenticate the origin of the packages.

Security

- Command **apt-key**: APT keys management.
  - Format: apt-key <--keyring file> [action]
    - Option **keyring**: indicates the key file where action is performed. Default: /etc/apt/trusted.gpg
    - action **add filename**: add a new key to the keyring file. The key is read form filename.
    - action **list**: list all trusted keys.
    - action **del keyid**: remove the keyid key from the keyring file.
- Adding a new repository:
  - Example: VirtualBox repository (http://www.virtualbox.org)
    - Look for the public key(https://www.virtualbox.org/download/oracle_vbox.asc)
    - Download it and add to our keyring: apt-key add oracle_vbox.asc
    - Check it is in the list of trusted keys: apt-key list
    - Add the repository to the file sources.list:
      - echo "deb http://download.virtualbox.org/virtualbox/debian wheezy contrib" >> /etc/apt/sources.list
    - Now we can install VirtualBox: apt-get install virtualbox-4.3