About this tutorial

- Goal: **tell you what you really need to know about Debian packaging**
  - Modify existing packages
  - Create your own packages
  - Interact with the Debian community
  - Become a Debian power-user

- Covers the most important points, but is not complete
  - You will need to read more documentation

- Most of the content also applies to Debian derivative distributions
  - That includes Ubuntu
Outline

1. Introduction
2. Creating source packages
3. Building and testing packages
4. Practical session 1: modifying the grep package
5. Advanced packaging topics
6. Maintaining packages in Debian
7. Conclusions
8. Additional practical sessions
9. Answers to practical sessions
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Debian

- GNU/Linux distribution
- 1st major distro developed “openly in the spirit of GNU”
- Non-commercial, built collaboratively by over 1,000 volunteers
- 3 main features:
  - **Quality** – culture of technical excellence
    *We release when it’s ready*
  - **Freedom** – devs and users bound by the *Social Contract*
    Promoting the culture of Free Software since 1993
  - **Independence** – no (single) company babysitting Debian
    And open decision-making process (*do-ocracy* + *democracy*)
- **Amateur** in the best sense: done for the love of it
Debian packages

- `.deb` files (binary packages)
- A very powerful and convenient way to distribute software to users
- One of the two most common package formats (with RPM)
- Universal:
  - 30,000 binary packages in Debian
    → most of the available free software is packaged in Debian!
  - For 12 ports (architectures), including 2 non-Linux (Hurd; KFreeBSD)
  - Also used by 120 Debian derivative distributions
The Deb package format

- .deb file: an ar archive

```
$ ar tv wget_1.12-2.1_i386.deb
rw-r--r-- 0/0 4 Sep 5 15:43 2010 debian-binary
rw-r--r-- 0/0 2403 Sep 5 15:43 2010 control.tar.gz
rw-r--r-- 0/0 751613 Sep 5 15:43 2010 data.tar.gz
```

- debian-binary: version of the deb file format, "2.0\n"
- control.tar.gz: metadata about the package
  - control, md5sums, (pre|post)(rm|inst), triggers, shlibs,...
- data.tar.gz: data files of the package

- You could create your .deb files manually

- But most people don’t do it that way

This tutorial: create Debian packages, the Debian way
Tools you will need

- A Debian (or Ubuntu) system (with root access)

- Some packages:
  - **build-essential**: has dependencies on the packages that will be assumed to be available on the developer’s machine (no need to specify them in the `Build-Depends: control field of your package`)
    - includes a dependency on **dpkg-dev**, which contains basic Debian-specific tools to create packages
  - **devscripts**: contains many useful scripts for Debian maintainers

Many other tools will also be mentioned later, such as **debhelper**, **cdebs**, **quilt**, **pbuilder**, **sbuild**, **lintian**, **svn-buildpackage**, **git-buildpackage**, . . . Install them when you need them.
General packaging workflow

Debian mirror --> Web --> upstream source

apt-get source  dget  dh_make

source package

where most of the manual work is done

debuild (build and test with lintian)
or dpkg-buildpackage

one or several binary packages

upload (dput)  install (debi)

.deb
Example: rebuilding dash

1. Install packages needed to build dash, and devscripts
   sudo apt-get build-dep dash
   (requires deb-src lines in /etc/apt/sources.list)
   sudo apt-get install --no-install-recommends devscripts fakeroot

2. Create a working directory, and get in it:
   mkdir /tmp/debian-tutorial ; cd /tmp/debian-tutorial

3. Grab the dash source package
   apt-get source dash
   (This needs you to have deb-src lines in your /etc/apt/sources.list)

4. Build the package
   cd dash-
   debuild -us -uc (-us -uc disables signing the package with GPG)

5. Check that it worked
   - There are some new .deb files in the parent directory

6. Look at the debian/ directory
   - That’s where the packaging work is done
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Source package

- One source package can generate several binary packages
e.g. the libtar source generates the libtar0 and libtar-dev binary packages

- Two kinds of packages: (if unsure, use non-native)
  - Native packages: normally for Debian specific software (*dpkg*, *apt*)
  - Non-native packages: software developed outside Debian

- Main file: *.dsc* (meta-data)

- Other files depending on the version of the source format
  - 1.0 or 3.0 (native): *package_version.tar.gz*
  - 1.0 (non-native):
    - *pkg_ver.orig.tar.gz*: upstream source
    - *pkg_debver.diff.gz*: patch to add Debian-specific changes
  - 3.0 (quilt):
    - *pkg_ver.orig.tar.gz*: upstream source
    - *pkg_debver.debian.tar.gz*: tarball with the Debian changes

(See *dpkg-source*(1) for exact details)
Source package example (wget_1.12-2.1.dsc)

Format: 3.0 (quilt)
Source: wget
Binary: wget
Architecture: any
Version: 1.12-2.1
Maintainer: Noel Kothe <noel@debian.org>
Homepage: http://www.gnu.org/software/wget/
Standards-Version: 3.8.4
Build-Depends: debhelper (>> 5.0.0), gettext, texinfo,
   libssl-dev (>= 0.9.8), dpatch, info2man
Checksums-Sha1:
   50d4ed2441e67[...]1ee0e94248 2464747 wget_1.12.orig.tar.gz
d4c1c8bbe431d[...]dd7cef3611 48308 wget_1.12-2.1.debian.tar.gz
Checksums-Sha256:
   7578ed0974e12[...]dcba65b572 2464747 wget_1.12.orig.tar.gz
   1e9b0c4c00eae[...]89c402ad78 48308 wget_1.12-2.1.debian.tar.gz
Files:
   141461b9c04e4[...]9d1f2abf83 2464747 wget_1.12.orig.tar.gz
e93123c934e3c[...]2f380278c2 48308 wget_1.12-2.1.debian.tar.gz
Retrieving an existing source package

- From the Debian archive:
  - `apt-get source package`
  - `apt-get source package=version`
  - `apt-get source package/release`
  (You need `deb-src` lines in `sources.list`)

- From the Internet:
  - `dget url-to.dsc`
  - `dget http://snapshot.debian.org/archive/debian-archive/20090802T004153Z/debian/dists/bo/main/source/web/wget_1.4.4-6.dsc`
  (`snapshot.d.o` provides all packages from Debian since 2005)

- From the (declared) version control system:
  - `debcheckout package`

- Once downloaded, extract with `dpkg-source -x file.dsc`
Creating a basic source package

- Download the upstream source
  \textit{(upstream source = the one from the software’s original developers)}
- Rename to \texttt{<source\_package>\_<upstream\_version>.orig.tar.gz}
  (example: \texttt{simgrid\_3.6.orig.tar.gz})
- Untar it
- Rename the directory to \texttt{<source\_package>-<upstream\_version>}
  (example: \texttt{simgrid-3.6})
- \texttt{cd <source\_package>-<upstream\_version> && dh\_make}
  (from the \texttt{dh-make} package)
- There are some alternatives to \texttt{dh\_make} for specific sets of packages:
  \texttt{dh\_make-perl, dh\_make-php, \ldots }
- \texttt{debian/} directory created, with a lot of files in it
Files in debian/

All the packaging work should be made by modifying files in debian/

- **Main files:**
  - control – meta-data about the package (dependencies, etc.)
  - rules – specifies how to build the package
  - copyright – copyright information for the package
  - changelog – history of the Debian package

- **Other files:**
  - compat
  - watch
  - dh_install* targets
    -*.dirs, *.docs, *.manpages, ...
  - maintainer scripts
    -*.postinst, *.prerm, ...
  - source/format
  - patches/ – if you need to modify the upstream sources

- Several files use a format based on RFC 822 (mail headers)
Debian/changelog

- Lists the Debian packaging changes
- Gives the current version of the package

1.2.1.1-5

Debian revision

Edited manually or with dch
- Create a changelog entry for a new release: dch -i
- Special format to automatically close Debian or Ubuntu bugs
  Debian: Closes: #595268; Ubuntu: LP: #616929
- Installed as /usr/share/doc/package/changelog.Debian.gz

---

mpich2 (1.2.1.1-5) unstable; urgency=low

* Use /usr/bin/python instead of /usr/bin/python2.5. Allow to drop dependency on python2.5. Closes: #595268
* Make /usr/bin/mpdroot setuid. This is the default after the installation of mpich2 from source, too. LP: #616929
  + Add corresponding lintian override.

-- Lucas Nussbaum <lucas@debian.org> Wed, 15 Sep 2010 18:13:44 +0200
debian/control

- Package metadata
  - For the source package itself
  - For each binary package built from this source

- Package name, section, priority, maintainer, uploaders,
  build-dependencies, dependencies, description, homepage, ...

- Documentation: Debian Policy chapter 5

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Source: wget
Section: web
Priority: important
Maintainer: Noel Kothe <noel@debian.org>
Build-Depends: debhelper (>> 5.0.0), gettext, texinfo,
  libssl-dev (>= 0.9.8), dpatch, info2man
Standards-Version: 3.8.4
Homepage: http://www.gnu.org/software/wget/

Package: wget
Architecture: any
Depends: ${shlibs:Depends}, ${misc:Depends}
Description: retrieves files from the web
  Wget is a network utility to retrieve files from the Web
Architecture: all or any

Two kinds of binary packages:

- Packages with different contents on each Debian architecture
  - Example: C program
  - Architecture: any in debian/control
  - Or, if it only works on a subset of architectures:
    Architecture: amd64 i386 ia64 hurd-i386
  - buildd.debian.org: builds all the other architectures for you on upload
  - Named package_version_architecture.deb

- Packages with the same content on all architectures
  - Example: Perl library
  - Architecture: all in debian/control
  - Named package_version_all.deb

A source package can generate a mix of Architecture: any and Architecture: all binary packages
Makefile

Interface used to build Debian packages

Documented in Debian Policy, chapter 4.8
https://www.debian.org/doc/debian-policy/ch-source#s-debianrules

Required targets:
- build, build-arch, build-indep: should perform all the configuration and compilation
- binary, binary-arch, binary-indep: build the binary packages
- dpkg-buildpackage will call binary to build all the packages, or binary-arch to build only the Architecture: any packages
- clean: clean up the source directory
Packaging helpers – debhelper

- You could write shell code in `debian/rules` directly
  - See the `rsync` package for example

- Better practice (used by most packages): use a Packaging helper

- Most popular one: `debhelper` (used by 98% of packages)

- Goals:
  - Factor the common tasks in standard tools used by all packages
  - Fix some packaging bugs once for all packages

    - `dh_installdirs`, `dh_installchangelogs`, `dh_installdocs`, `dh_installexamples`, `dh_install`,
    - `dh_installdebconf`, `dh_installinit`, `dh_link`, `dh_strip`, `dh_compress`, `dh_fixperms`, `dh_perl`,
    - `dh_makeshlibs`, `dh_installdeb`, `dh_shlibdeps`, `dh_gencontrol`, `dh_md5sums`, `dh_builddeb`, ...

  - Called from `debian/rules`
  - Configurable using command parameters or files in `debian/`
    - `package.docs`, `package.examples`, `package.install`, `package.manpages`, ...

- Third-party helpers for sets of packages: `python-support`, `dh_ocaml`, ...

- Gotcha: `debian/compat`: Debhelper compatibility version (use "7")
#!/usr/bin/make -f

# Uncomment this to turn on verbose mode.
#export DH_VERBOSE=1

build:
  $(MAKE)
  #docbook-to-man debian/packagename.sgml > packagename.1

clean:
  dh_testdir
dh_testroot
rm -f build-stamp configure-stamp
$(MAKE) clean
dh_clean

install: build
dh_testdir
dh_testroot
dh_clean -k
dh_installdirs
# Add here commands to install the package into debian/package
$(MAKE) DESTDIR=$(CURDIR)/debian/packagename install
debian/rules using debhelper (2/2)

# Build architecture-independent files here.
binary-indep: build install

# Build architecture-dependent files here.
binary-arch: build install
dh_testdir
dh_testroot
dh_installchangelogs
dh_installdocs
dh_installexamples
dh_install

dh_installman
dh_link
dh_strip
dh_compress
dh_fixperms
dh_installdeb
dh_shlibdeps
dh_gencontrol
dh_md5sums
dh_builddeb

binary: binary-indep binary-arch
.PHONY: build clean binary-indep binary-arch binary-arch binary install configure
CDBS

- With debhelper, still a lot of redundancy between packages
- Second-level helpers that factor common functionality
  - E.g. building with `./configure && make && make install` or CMake

CDBS:
- Introduced in 2005, based on advanced GNU make magic
- Documentation: `/usr/share/doc/cdbs/`
- Support for Perl, Python, Ruby, GNOME, KDE, Java, Haskell, ...
- But some people hate it:
  - Sometimes difficult to customize package builds:
    "twisty maze of makefiles and environment variables"
  - Slower than plain debhelper (many useless calls to `dh_*`)

```bash
#!/usr/bin/make -f
include /usr/share/cdbs/1/rules/debhelper.mk
include /usr/share/cdbs/1/class/autotools.mk

# add an action after the build
build/mypackage::
  /bin/bash debian/scripts/foo.sh
```
Dh (aka Debhelper 7, or dh7)

- Introduced in 2008 as a *CDBS killer*
- **dh** command that calls dh_*
- Simple *debian/rules*, listing only overrides
- Easier to customize than CDBS
- Doc: manpages (*debhelper*(7), dh(1)) + slides from DebConf9 talk

```
#!/usr/bin/make -f
%
  dh $@

override_dh_auto_configure:
  dh_auto_configure -- --with-kitchen-sink

override_dh_auto_build:
  make world
```
Classic debhelper vs CDBS vs dh

- Mind shares:
  - Classic debhelper: 15%
  - CDBS: 15%
  - dh: 68%

- Which one should I learn?
  - Probably a bit of all of them
  - You need to know debhelper to use dh and CDBS
  - You might have to modify CDBS packages

- Which one should I use for a new package?
  - dh (only solution with an increasing mind share)
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Building packages

- **apt-get build-dep mypackage**
  Installs the **build-dependencies** (for a package already in Debian)
  Or **mk-build-deps -ir** (for a package not uploaded yet)

- **debuild**: build, test with **lintian**, sign with GPG

- Also possible to call **dpkg-buildpackage** directly
  - Usually with **dpkg-buildpackage -us -uc**

- It is better to build packages in a clean & minimal environment
  - **pbuilder** – helper to build packages in a **chroot**
    Good documentation: [https://wiki.ubuntu.com/PbuilderHowto](https://wiki.ubuntu.com/PbuilderHowto)
    (optimization: **cowbuilder ccache distcc**)

  - **schroot** and **sbuild**: used on the Debian build daemons
    (not as simple as **pbuilder**, but allows LVM snapshots
    see: [https://help.ubuntu.com/community/SbuildLVMHowto](https://help.ubuntu.com/community/SbuildLVMHowto))

- Generates **.deb** files and a **.changes** file
  - **.changes**: describes what was built; used to upload the package
Installing and testing packages

- Install the package locally: `debi` (will use `.changes` to know what to install)
- List the content of the package: `debc ../mypackage<TAB>.changes`
- Compare the package with a previous version:
  `debdiff ../mypackage_1_* .changes ../mypackage_2_* .changes`
  or to compare the sources:
  `debdiff ../mypackage_1_* .dsc ../mypackage_2_* .dsc`
- Check the package with `lintian` (static analyzer):
  `lintian ../mypackage<TAB>.changes`
  `lintian -i`: gives more information about the errors
  `lintian -EviIL +pedantic`: shows more problems
- Upload the package to Debian (`dput`) (needs configuration)
- Manage a private Debian archive with `reprepro` or `aptly`

Documentation:
https://wiki.debian.org/HowToSetupADebianRepository
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Practical session 1: modifying the grep package

   - If the source package is not unpacked automatically, unpack it with dpkg-source -x grep_*.dsc
2. Look at the files in debian/.
   - How many binary packages are generated by this source package?
   - Which packaging helper does this package use?
3. Build the package
4. We are now going to modify the package. Add a changelog entry and increase the version number.
5. Now disable perl-regexp support (it is a ./configure option)
6. Rebuild the package
7. Compare the original and the new package with debdiff
8. Install the newly built package
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Copyright and license information for the source and the packaging
Traditionally written as a text file
New machine-readable format:

https://www.debian.org/doc/packaging-manuals/copyright-format/1.0/

Format: https://www.debian.org/doc/packaging-manuals/copyright-format/1.0/
Upstream-Name: X Solitaire

Files: *
Copyright: Copyright 1998 John Doe <jdoe@example.com>
License: GPL-2+
This program is free software; you can redistribute it
[...]
On Debian systems, the full text of the GNU General Public
License version 2 can be found in the file
‘/usr/share/common-licenses/GPL-2’.

Files: debian/*
Copyright: Copyright 1998 Jane Smith <jsmith@example.net>
License:
[LICENSE TEXT]
Modifying the upstream source

Often needed:

▶ Fix bugs or add customizations that are specific to Debian
▶ Backport fixes from a newer upstream release

Several methods to do it:

▶ Modifying the files directly
  ▶ Simple
  ▶ But no way to track and document the changes

▶ Using patch systems
  ▶ Eases contributing your changes to upstream
  ▶ Helps sharing the fixes with derivatives
  ▶ Gives more exposure to the changes
    http://patch-tracker.debian.org/ (down currently)
Patch systems

- Principle: changes are stored as patches in `debian/patches/`
- Applied and unapplied during build
- Past: several implementations – `simple-patchsys (c dbs), dpatch, quilt`
  - Each supports two `debian/rules` targets:
    - `debian/rules patch`: apply all patches
    - `debian/rules unpatch`: de-apply all patches
  - More documentation: https://wiki.debian.org/debian/patches

- New source package format with built-in patch system: 3.0 (quilt)
  - Recommended solution
  - You need to learn `quilt`
    http://pkg-perl.alioth.debian.org/howto/quilt.html
  - Patch-system-agnostic tool in `devscripts`: `edit-patch`
Documentation of patches

- Standard headers at the beginning of the patch
- Documented in DEP-3 - Patch Tagging Guidelines
  http://dep.debian.net/deps/dep3/

Description: Fix widget frobnication speeds
Frobnicating widgets too quickly tended to cause explosions.
Forwarded: http://lists.example.com/2010/03/1234.html
Author: John Doe <johndoe-guest@users.alioth.debian.org>
Last-Update: 2010-03-29

--- a/src/widgets.c
+++ b/src/widgets.c
@@ -101,9 +101,6 @@ struct {

Doing things during installation and removal

- Decompressing the package is sometimes not enough
- Create/remove system users, start/stop services, manage *alternatives*
- Done in *maintainer scripts*
  - preinst, postinst, prerm, postrm
  - Snippets for common actions can be generated by debhelper
- Documentation:
  - Debian Policy Manual, chapter 6
    https://www.debian.org/doc/debian-policy/ch-maintainerscripts
  - Debian Developer’s Reference, chapter 6.4
  - https://people.debian.org/~srivasta/MaintainerScripts.html

- Prompting the user
  - Must be done with *debconf*
  - Documentation: *debconf-devel(7)* (*debconf-doc* package)
Monitoring upstream versions

- Specify where to look in debian/watch (see uscan(1))
  
  version=3

  http://tmrc.mit.edu/mirror/twisted/Twisted/(/\d\./\d)/ Twisted-([/d.]*).tar.bz2

- There are automated trackers of new upstream versions, that notify the maintainer on various dashboards including https://tracker.debian.org/ and https://udd.debian.org/dmd/

- uscan: run a manual check

- uupdate: try to update your package to the latest upstream version
Packaging with a Version Control System

- Several tools to help manage branches and tags for your packaging work: `svn-buildpackage`, `git-buildpackage`

- Example: `git-buildpackage`
  - upstream branch to track upstream with `upstream/version` tags
  - master branch tracks the Debian package
  - `debian/version` tags for each upload
  - pristine-tar branch to be able to rebuild the upstream tarball


- `Vcs-*` fields in `debian/control` to locate the repository
  - https://wiki.debian.org/Alioth/Git
  - https://wiki.debian.org/Alioth/Svn

Vcs-Browser: http://anonscm.debian.org/gitweb/?p=collab-maint/devscripts.git
Vcs-Git: git://anonscm.debian.org/collab-maint/devscripts.git

Vcs-Browser: http://svn.debian.org/viewsvn/pkg-perl/trunk/libwww-perl/
Vcs-Svn: svn://svn.debian.org/pkg-perl/trunk/libwww-perl

- VCS-agnostic interface: `debcheckout`, `debcommit`, `debrelease`
  - `debcheckout grep` → checks out the source package from Git
Goal: use a newer version of a package on an older system
e.g. use mutt from Debian unstable on Debian stable

General idea:
- Take the source package from Debian unstable
- Modify it so that it builds and works fine on Debian stable
  - Sometimes trivial (no changes needed)
  - Sometimes difficult
  - Sometimes impossible (many unavailable dependencies)

Some backports are provided and supported by the Debian project
http://backports.debian.org/
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Several ways to contribute to Debian

▶ **Worst** way to contribute:

1. Package your own application
2. Get it into Debian
3. Disappear

▶ **Better** ways to contribute:

▶ Get involved in packaging teams
  ▶ Many teams that focus on set of packages, and need help
  ▶ List available at [https://wiki.debian.org/Teams](https://wiki.debian.org/Teams)
  ▶ An excellent way to learn from more experienced contributors

▶ Adopt existing unmaintained packages (*orphaned packages*)

▶ Bring new software to Debian
  ▶ Only if it’s interesting/useful enough, please
  ▶ Are there alternatives already packaged in Debian?
Adopting orphaned packages

- Many unmaintained packages in Debian
- Full list + process: https://www.debian.org/devel/wnpp/
- Installed on your machine: wnpp-alert
  Or better: how-can-i-help

- Different states:
  - **Orphaned:** the package is unmaintained
    Feel free to adopt it
  - **RFA:** Request For Adopter
    Maintainer looking for adopter, but continues work in the meantime
    Feel free to adopt it. A mail to the current maintainer is polite
  - **ITA:** Intent To Adopt
    Someone intends to adopt the package
    You could propose your help!
  - **RFH:** Request For Help
    The maintainer is looking for help

- Some unmaintained packages not detected $\rightarrow$ not orphaned yet
- When in doubt, ask debian-qa@lists.debian.org
Adopting a package: example

From: You <you@yourdomain>
To: 640454@bugs.debian.org, control@bugs.debian.org
Cc: Francois Marier <francois@debian.org>
Subject: ITA: verbiste -- French conjugator

retitle 640454 ITA: verbiste -- French conjugator
owner 640454 !
thanks

Hi,

I am using verbiste and I am willing to take care of the package.

Cheers,

You

► Polite to contact the previous maintainer (especially if the package was RFAed, not orphaned)
► Very good idea to contact the upstream project
Getting your package in Debian

- You do not need any official status to get your package into Debian
  1. Submit an ITP bug (Intend To Package) using reportbug wnpp
  2. Prepare a source package
  3. Find a Debian Developer that will sponsor your package

- Official status (when you are an experienced package maintainer):
  - **Debian Maintainer (DM):**
    Permission to upload your own packages
    See https://wiki.debian.org/DebianMaintainer
  - **Debian Developer (DD):**
    Debian project member; can vote and upload any package
Things to check before asking for sponsorship

- Debian puts **a lot of focus on quality**
- Generally, **sponsors are hard to find and busy**
  - Make sure your package is ready before asking for sponsorship
- Things to check:
  - Avoid missing build-dependencies: make sure that your package build fine in a clean *sid chroot*
    - Using **pbuilder** is recommended
  - Run **lintian -Evil +pedantic** on your package
    - Errors must be fixed, all other problems should be fixed
  - Do extensive testing of your package, of course
- In doubt, ask for help
Where to find help?

Help you will need:
- Advice and answers to your questions, code reviews
- Sponsorship for your uploads, once your package is ready

You can get help from:
- **Other members of a packaging team**
  - List of teams: https://wiki.debian.org/Teams
- **The Debian Mentors group** (if your package does not fit in a team)
  - https://wiki.debian.org/DebianMentorsFaq
  - Mailing list: debian-mentors@lists.debian.org
    (also a good way to learn by accident)
  - IRC: #debian-mentors on irc.debian.org
  - http://mentors.debian.net/
  - Documentation: http://mentors.debian.net/intro-maintainers
- **Localized mailing lists** (get help in your language)
  - debian-devel-{french,italian,portuguese,spanish}@lists.d.o
  - Full list: https://lists.debian.org/devel.html
  - Or users lists: https://lists.debian.org/users.html
More documentation

▶ Debian Developers’ Corner
https://www.debian.org/devel/
Links to many resources about Debian development

▶ Guide for Debian Maintainers
https://www.debian.org/doc/manuals/debmake-doc/

▶ Debian Developer’s Reference
https://www.debian.org/doc/developers-reference/
Mostly about Debian procedures, but also some best packaging practices (part 6)

▶ Debian Policy
https://www.debian.org/doc/debian-policy/
  ▶ All the requirements that every package must satisfy
  ▶ Specific policies for Perl, Java, Python, …

▶ Ubuntu Packaging Guide
http://developer.ubuntu.com/resources/tools/packaging/
Debian dashboards for maintainers

- **Source package centric:**
  
  https://tracker.debian.org/dpkg

- **Maintainer/team centric:** Developer’s Packages Overview (DDPO)
  
  https://qa.debian.org/developer.php?login=pkg-ruby-extras-maintainers@lists.alioth.debian.org

- **TODO-list oriented:** Debian Maintainer Dashboard (DMD)
  
  https://udd.debian.org/dmd/
Using the Debian Bug Tracking System (BTS)

- A quite unique way to manage bugs
  - Web interface to view bugs
  - Email interface to make changes to bugs

- Adding information to bugs:
  - Write to 123456@bugs.debian.org (does not include the submitter, you need to add 123456-submitter@bugs.debian.org)

- Changing bug status:
  - Send commands to control@bugs.debian.org
  - Command-line interface: bts command in devscripts
  - Documentation: https://www.debian.org/Bugs/server-control

- Reporting bugs: use reportbug
  - Normally used with a local mail server: install ssmtp or nullmailer
  - Or use reportbug --template, then send (manually) to submit@bugs.debian.org
Using the BTS: examples

- Sending an email to the bug and the submitter:
  https://bugs.debian.org/cgi-bin/bugreport.cgi?bug=680822#10

- Tagging and changing the severity:
  https://bugs.debian.org/cgi-bin/bugreport.cgi?bug=680227#10

- Reassigning, changing the severity, retitling ...:
  https://bugs.debian.org/cgi-bin/bugreport.cgi?bug=680822#93
  - notfound, found, notfixed, fixed are for **version-tracking**
    See https://wiki.debian.org/HowtoUseBTS#Version_tracking

- Using usertags: https://
  //bugs.debian.org/cgi-bin/bugreport.cgi?msg=42;bug=642267
  See https://wiki.debian.org/bugs.debian.org/usertags

- BTS Documentation:
  - https://www.debian.org/Bugs/
  - https://wiki.debian.org/HowtoUseBTS
More interested in Ubuntu?

- Ubuntu mainly manages the divergence with Debian
- No real focus on specific packages
  Instead, collaboration with Debian teams
- Usually recommend uploading new packages to Debian first
- Possibly a better plan:
  - Get involved in a Debian team and act as a bridge with Ubuntu
  - Help reduce divergence, triage bugs in Launchpad
  - Many Debian tools can help:
    - Ubuntu column on the Developer’s packages overview
    - Ubuntu box on the Package Tracking System
    - Receive launchpad bugmail via the PTS
Outline

1 Introduction
2 Creating source packages
3 Building and testing packages
4 Practical session 1: modifying the grep package
5 Advanced packaging topics
6 Maintaining packages in Debian
7 Conclusions
8 Additional practical sessions
9 Answers to practical sessions
Conclusions

▶ You now have a full overview of Debian packaging

▶ But you will need to read more documentation

▶ Best practices have evolved over the years
  ▶ If not sure, use the dh packaging helper, and the 3.0 (quilt) format

▶ Things that were not covered in this tutorial:
  ▶ UCF – manage user changes to configuration files when upgrading
  ▶ dpkg triggers – group similar maintainer scripts actions together
  ▶ Debian development organization:
    ▶ Suites: stable, testing, unstable, experimental, security,
      *-updates, backports, . . .
    ▶ Debian Blends – subsets of Debian targeting specific groups

Feedback: packaging-tutorial@packages.debian.org
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- The terms of the Creative Commons Attribution-ShareAlike 3.0 Unported License. http://creativecommons.org/licenses/by-sa/3.0/
Contribute to this tutorial

▶ Contribute:
  ▶ apt-get source packaging-tutorial
  ▶ debcheckout packaging-tutorial
  ▶ git clone
git://git.debian.org/collab-maint/packaging-tutorial.git
  ▶ http://git.debian.org/?p=collab-maint/packaging-tutorial.git
  ▶ Open bugs: bugs.debian.org/src:packaging-tutorial

▶ Provide feedback:
  ▶ mailto:packaging-tutorial@packages.debian.org
    ▶ What should be added to this tutorial?
    ▶ What should be improved?
  ▶ reportbug packaging-tutorial
Outline

1. Introduction
2. Creating source packages
3. Building and testing packages
4. Practical session 1: modifying the grep package
5. Advanced packaging topics
6. Maintaining packages in Debian
7. Conclusions
8. Additional practical sessions
9. Answers to practical sessions
Practical session 2: packaging GNUjump

1. Download GNUjump 1.0.8 from
   http://ftp.gnu.org/gnu/gnujump/gnujump-1.0.8.tar.gz

2. Create a Debian package for it
   - Install build-dependencies so that you can build the package
   - Fix bugs
   - Get a basic working package
   - Finish filling debian/control and other files

3. Enjoy
To get a basic working package, use **dh_make**

To start with, creating a **1.0** source package is easier than **3.0** (*quilt*) (change that in debian/source/format)

To search for missing build-dependencies, find a missing file, and use **apt-file** to find the missing package

If you encounter that error:

```
/usr/bin/ld: SDL_rotozoom.o: undefined reference to symbol 'ceil@GLIBC_2.2.5'
//lib/x86_64-linux-gnu/libm.so.6: error adding symbols: DSO missing from command line
collect2: error: ld returned 1 exit status
Makefile:376: recipe for target 'gnujump' failed
```

You need to add **-lm** to the linker command line:

Edit **src/Makefile.am** and replace

```
gnujump_LDFLAGS = $(all_libraries)
```

by

```
gnujump_LDFLAGS = -Wl,--as-needed
gnujump_LDADD = $(all_libraries) -lm
```

Then run **autoreconf -i**
Practical session 3: packaging a Java library

1. Take a quick look at some documentation about Java packaging:
   - https://wiki.debian.org/Java
   - https://wiki.debian.org/Java/Packaging
   - http://pkg-java.alioth.debian.org/docs/tutorial.html
   - Paper and slides from a Debconf10 talk about javahelper:
     http://pkg-java.alioth.debian.org/docs/debconf10-javahelper-paper.pdf
     http://pkg-java.alioth.debian.org/docs/debconf10-javahelper-slides.pdf

2. Download IRClib from http://moepii.sourceforge.net/

3. Package it
Practical session 4: packaging a Ruby gem

1. Take a quick look at some documentation about Ruby packaging:
   - https://wiki.debian.org/Ruby
   - https://wiki.debian.org/Teams/Ruby
   - https://wiki.debian.org/Teams/Ruby/Packaging
   - `gem2deb(1), dh_ruby(1)` (in the `gem2deb` package)

2. Create a basic Debian source package from the `peach` gem:
   ```bsh
gem2deb peach
   ```

3. Improve it so that it becomes a proper Debian package
Take a quick look at some documentation about Perl packaging:

- `dh-make-perl(1), dpt(1)` (in the `pkg-perl-tools` package)

Create a basic Debian source package from the Acme CPAN distribution:

`dh-make-perl --cpan Acme`

Improve it so that it becomes a proper Debian package
Outline

1. Introduction
2. Creating source packages
3. Building and testing packages
4. Practical session 1: modifying the grep package
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6. Maintaining packages in Debian
7. Conclusions
8. Additional practical sessions
9. Answers to practical sessions
Answers to practical sessions
Practical session 1: modifying the grep package

2. Look at the files in debian/.
   - How many binary packages are generated by this source package?
   - Which packaging helper does this package use?
3. Build the package
4. We are now going to modify the package. Add a changelog entry and increase the version number.
5. Now disable perl-regexp support (it is a ./configure option)
6. Rebuild the package
7. Compare the original and the new package with debdiff
8. Install the newly built package
Fetching the source


   - Use dget to download the .dsc file:
     
     ```
     dget http://cdn.debian.net/debian/pool/main/g/grep/grep_2.12-2.dsc
     ```

   - If you have `deb-src` for a Debian release that has `grep` version 2.12-2 (find out on https://tracker.debian.org/grep), you can use: `apt-get source grep=2.12-2`
     
     or `apt-get source grep/release` (e.g. grep/stable)
     
     or, if you feel lucky: `apt-get source grep`

2. The `grep` source package is composed of three files:
   
   - `grep_2.12-2.dsc`
   - `grep_2.12-2.debian.tar.bz2`
   - `grep_2.12.orig.tar.bz2`

   This is typical of the "3.0 (quilt)" format.

3. If needed, uncompress the source with `dpkg-source -x grep_2.12-2.dsc`
Looking around and building the package

2. Look at the files in `debian/`.
   ▶ How many binary packages are generated by this source package?
   ▶ Which packaging helper does this package use?
   
   ▶ According to `debian/control`, this package only generates one binary package, named `grep`.
   
   ▶ According to `debian/rules`, this package is typical of classic debhelper packaging, without using `CDBS` or `dh`. One can see the various calls to `dh_*` commands in `debian/rules`.

3. Build the package
   
   ▶ Use `apt-get build-dep grep` to fetch the build-dependencies
   ▶ Then `debuild` or `dpkg-buildpackage -us -uc` (Takes about 1 min)
We are now going to modify the package. Add a changelog entry and increase the version number.

- debian/changelog is a text file. You could edit it and add a new entry manually.
- Or you can use \texttt{dch \ -i}, which will add an entry and open the editor.
- The name and email can be defined using the \texttt{DEBFULLNAME} and \texttt{DEBEMAIL} environment variables.
- After that, rebuild the package: a new version of the package is built.
- Package versioning is detailed in section 5.6.12 of the Debian policy https://www.debian.org/doc/debian-policy/ch-controlfields
Disabling Perl regexp support and rebuilding

5. Now disable perl-regexp support (it is a ./configure option)

6. Rebuild the package

- Check with ./configure --help: the option to disable Perl regexp is
  --disable-perl-regexp
- Edit debian/rules and find the ./configure line
- Add --disable-perl-regexp
- Rebuild with debuild or dpkg-buildpackage -us -uc
Comparing and testing the packages

7. Compare the original and the new package with debdiff
8. Install the newly built package

- Compare the binary packages: `debdiff ../*.changes`
- Compare the source packages: `debdiff ../*.dsc`
- Install the newly built package: `debi`
  Or `dpkg -i ../grep_<TAB>`
- `grep -P foo` no longer works!

Reinstall the previous version of the package:

- `apt-get install --reinstall grep=2.6.3-3 (= previous version)`
Practical session 2: packaging GNUjump

1. Download GNUjump 1.0.8 from
   http://ftp.gnu.org/gnu/gnujump/gnujump-1.0.8.tar.gz

2. Create a Debian package for it
   - Install build-dependencies so that you can build the package
   - Get a basic working package
   - Finish filling `debian/control` and other files

3. Enjoy
Step by step...

- wget http://ftp.gnu.org/gnu/gnujump/gnujump-1.0.8.tar.gz
- mv gnujump-1.0.8.tar.gz gnujump_1.0.8.orig.tar.gz
- tar xf gnujump_1.0.8.orig.tar.gz
- cd gnujump-1.0.8/
- dh_make -f ../gnujump-1.0.8.tar.gz

  Type of package: single binary (for now)

chnujump-1.0.8$ ls debian/
changelog gnujump.default.ex preinst.ex
compat gnujump.doc-base.EX prerm.ex
control init.d.ex README.Debian
copyright manpage.1.ex README.source
docs manpage.sgml.ex rules
eemacs installer.ex manpage.xml.ex source
eemacs remove.ex menu.ex watch.ex
eemacs startup.ex postinst.ex
gnujump.cron.d.ex postrm.ex
Step by step...(2)

- Look at debian/changelog, debian/rules, debian/control (auto-filled by dh_make)

- In debian/control:
  
  Build-Depends: debhelper (>= 7.0.50 ), autotools-dev
  Lists the build-dependencies = packages needed to build the package

- Try to build the package as-is with debuild (thanks to dh magic)
  
  - And add build-dependencies, until it builds
  - Hint: use apt-cache search and apt-file to find the packages
  - Example:

    checking for sdl-config... no
    checking for SDL - version >= 1.2.0... no
    [...]
    configure: error: *** SDL version 1.2.0 not found!

    → Add libSDL1.2-dev to Build-Depends and install it.

- Better: use pbuilder to build in a clean environment
Step by step... (3)

- Required build-dependencies are `libsdl1.2-dev`, `libsdl-image1.2-dev`, `libsdl-mixer1.2-dev`.

- Then, you will probably run into another error:

```
/usr/bin/ld: SDL_rotozoom.o: undefined reference to symbol 'ceil@@GLIBC_2.2.5'
/lib/x86_64-linux-gnu/libm.so.6: error adding symbols: DSO missing from command line
collect2: error: ld returned 1 exit status
Makefile:376: recipe for target 'gnujump' failed
```

- This problem is caused by bitrot: gnujump has not been adjusted following linker changes.

- If you are using source format version 1.0, you can directly change upstream sources.
  
  - Edit `src/Makefile.am` and replace
    
    ```
    gnujump_LDFLAGS = $(all_libraries)
    
    gnujump_LDFLAGS = -Wl,--as-needed
    gnujump_LDADD = $(all_libraries) -lm
    
   Then run autoreconf -i
    ```
Step by step...(4)

▶ If you are using source format version 3.0 (quilt), use quilt to prepare a patch. (see https://wiki.debian.org/UsingQuilt)

   ▶ export QUIT PATCHES=debian/patches
   ▶ mkdir debian/patches
      quilt new linker-fixes.patch
      quilt add src/Makefile.am

▶ Edit src/Makefile.am and replace
   
   
gnujump_LDFLAGS = $(all_libraries)
   
   by
   
   gnujump_LDFLAGS = -Wl,--as-needed
   gnujump_LDADD = $(all_libraries) -lm

▶ quilt refresh

▶ Since src/Makefile.am was changed, autoreconf must be called during the build. To do that automatically with dh, change the dh call in debian/rules from: dh $ --with autotools-dev to: dh $ --with autotools-dev --with autoreconf
Step by step... (5)

- The package should now build fine.
- Use `debc` to list the content of the generated package, and `debi` to install it and test it.
- Test the package with `lintian`
  - While not a strict requirement, it is recommended that packages uploaded to Debian are `lintian-clean`
  - More problems can be listed using `lintian -Evil +pedantic`
- Some hints:
  - Remove the files that you don’t need in `debian/`
  - Fill in `debian/control`
  - Install the executable to `/usr/games` by overriding `dh_auto_configure`
  - Use `hardening` compiler flags to increase security. See https://wiki.debian.org/Hardening
Compare your package with the one already packaged in Debian:
  - It splits the data files to a second package, that is the same across all architectures (→ saves space in the Debian archive)
  - It installs a .desktop file (for the GNOME/KDE menus) and also integrates into the Debian menu
  - It fixes a few minor problems using patches
Practical session 3: packaging a Java library

1. Take a quick look at some documentation about Java packaging:
   - https://wiki.debian.org/Java
   - https://wiki.debian.org/Java/Packaging
   - http://pkg-java.alioth.debian.org/docs/tutorial.html
   - Paper and slides from a Debconf10 talk about javahelper:
     http://pkg-java.alioth.debian.org/docs/debconf10-javahelper-paper.pdf
     http://pkg-java.alioth.debian.org/docs/debconf10-javahelper-slides.pdf

2. Download IRClib from http://moepii.sourceforge.net/

3. Package it
Step by step...

- `apt-get install javahelper`

- Create a basic source package: `jh_makepkg`
  - Library
  - None
  - Default Free compiler/runtime

- Look at and fix `debian/*`

- `dpkg-buildpackage -us -uc` or `debuild`

- `lintian`, `debc`, etc.

- Compare your result with the `libirclib-java` source package
Practical session 4: packaging a Ruby gem

1. Take a quick look at some documentation about Ruby packaging:
   - https://wiki.debian.org/Ruby
   - https://wiki.debian.org/Teams/Ruby
   - https://wiki.debian.org/Teams/Ruby/Packaging
   - `gem2deb(1), dh_ruby(1)` (in the `gem2deb` package)

2. Create a basic Debian source package from the `peach` gem:
   ```
gem2deb peach
   ```

3. Improve it so that it becomes a proper Debian package
Step by step...

gem2deb peach:

- Downloads the gem from rubygems.org
- Creates a suitable .orig.tar.gz archive, and untar it
- Initializes a Debian source package based on the gem’s metadata
  - Named ruby-<gemname>
- Tries to build the Debian binary package (this might fail)

dh_ruby (included in gem2deb) does the Ruby-specific tasks:

- Build C extensions for each Ruby version
- Copy files to their destination directory
- Update shebangs in executable scripts
- Run tests defined in debian/ruby-tests.rb, debian/ruby-tests.rake, or debian/ruby-test-files.yaml, as well as various other checks
Step by step... (2)

Improve the generated package:

- Run `debclean` to clean the source tree. Look at `debian/`.
- `changelog` and `compat` should be correct
- Edit `debian/control`: improve `Description`
- Write a proper `copyright` file based on the upstream files
- Build the package
- Compare your package with the `ruby-peach` package in the Debian archive
Practical session 5: packaging a Perl module

1. Take a quick look at some documentation about Perl packaging:
   - http://pkg-perl.alioth.debian.org/
   - https://wiki.debian.org/Teams/DebianPerlGroup
   - dh-make-perl(1), dpt(1) (in the pkg-perl-tools package)

2. Create a basic Debian source package from the Acme CPAN distribution:
   dh-make-perl --cpan Acme

3. Improve it so that it becomes a proper Debian package
dh-make-perl --cpan Acme:

- Downloads the tarball from the CPAN
- Creates a suitable .orig.tar.gz archive, and untars it
- Initializes a Debian source package based on the distribution’s metadata
  - Named lib$distname-perl
Step by step... (2)

Improve the generated package:

- `debian/changelog`, `debian/compat`, `debian/libacme-perl.docs`, and `debian/watch` should be correct

- Edit `debian/control`: improve Description, and remove boilerplate at the bottom

- Edit `debian/copyright`: remove boilerplate paragraph at the top, add years of copyright to the Files: * stanza