



debian

Leitfaden für Debian-Betreuer

Osamu Aoki

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Leitfaden für Debian-Betreuer

by Osamu Aoki

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Diese Anleitung wurde mit den nachfolgenden Dokumenten als Referenz erstellt:

- »Making a Debian Package (AKA the Debmake Manual)«, Copyright © 1997 Jaldhar Vyas.
- »The New-Maintainer's Debian Packaging Howto«, Copyright © 1997 Will Lowe.
- »Debian-Leitfaden für Neue Paketbetreuer«, Copyright © 1998-2002 Josip Rodin, 2005-2017 Osamu Aoki, 2010 Craig Small und 2010 Raphaël Hertzog.

Die neuste Version dieser Anleitung sollte

- im Paket [debmake-doc](#) und
- auf der [Debian-Dokumentations-Website](#) verfügbar sein.

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Zusammenfassung

Dieser Anleitung »Leitfaden für Debian-Betreuer« (2020-12-12) beschreibt gewöhnlichen Debian-Benutzern und angehenden Entwicklern den Bau des Debian-Pakets mittels des Befehls **debmake**.

Diese Anleitung konzentriert sich auf die moderne Paketierart und enthält viele einfache Beispiele.

- POSIX-Shell-Skript-Paketierung
- Python3-Skript-Paketierung
- C mit Makefile/Autotools/CMake
- mehrere Binärpakete mit Laufzeitbibliotheken usw.

Diese »Anleitung für Debian-Betreuer« kann als Nachfolger des »Debian-Leitfaden für Neue Paketbetreuer« angesehen werden.

Vorwort

Falls Sie ein etwas erfahrener Debian-Benutzer¹ sind, könnten Ihnen die folgende Situationen bekannt vorkommen:

- Sie möchten ein bestimmtes, noch nicht im Debian-Archiv verfügbares Softwarepaket installieren.
- Sie möchten ein Debian-Paket mit einer neueren Version der Originalautoren aktualisieren.
- Sie möchten Fehler in einem Debian-Paket mit Patches korrigieren.

Falls Sie ein Debian-Paket erstellen möchten, um diese Wünsche zu erfüllen und Ihre Arbeit der Debian-Gemeinschaft zur Verfügung stellen wollen, dann sind Sie die Zielgruppe dieser Anleitung als angehender Debian-Betreuer.² Willkommen in der Debian-Gemeinschaft.

Debian muss vielen sozialen und technischen Regeln und Konventionen folgen, da es eine große Organisation Freiwilliger mit einer Geschichte ist. Debian hat auch eine große Anzahl an Paketierungswerkzeugen und Archivverwaltungswerkzeugen entwickelt, um eine konsistente Menge an Binärpaketen zu bauen, die viele technische Ziele adressieren:

- Paketbau unter vielen Architekturen (Abschnitt 5.4.4)
- reproduzierbarer Bau (Abschnitt 5.4.5)
- sauberer Bau unter klar festgelegten Paketabhängigkeiten und -Patches (Abschnitt 5.5, Abschnitt 5.8, Abschnitt 7.10)
- optimale Trennung in mehrere Binärpakete (Abschnitt 5.5.1)
- reibungslose Bibliotheksübergänge (Abschnitt 5.18.2)
- interaktive Anpassung der Installation (Abschnitt 5.19)
- Multiarch-Unterstützung (Abschnitt 5.20)
- Sicherheitserweiterung mittels bestimmter Compiler-Schalter (Abschnitt 5.21)
- kontinuierliche Integration (Abschnitt 5.22)
- Systemstarteinrichtung (Abschnitt 5.23)
- ...

Dies ist für viele angehende Debian-Entwickler beim Einstieg in Debian etwas überwältigend. Diese Anleitung versucht, für ihren Start Einstiegspunkte bereitzustellen. Sie beschreibt folgendes:

- Was Sie wissen sollten, bevor Sie als angehender Betreuer bei Debian mitmachen.
- Wie es aussieht, ein einfaches Debian-Paket zu erstellen.
- Welche Art von Regeln für das Erstellen des Debian-Pakets existieren.
- Tipps zur Erstellung des Debian-Pakets.
- Beispiele für das Erstellen von Debian-Paketen für mehrere typische Szenarien.

¹Sie müssen ein bisschen über Unix-Programmierung wissen, aber Sie müssen definitiv kein Meister sein. Über den grundlegenden Umgang mit einem Debian-System können Sie in [Debian-Referenz](#) mehr erfahren. Es enthält auch einige Hinweise zum Lernen der Unix-Programmierung.

²Falls Sie nicht daran interessiert sind, das Debian-Paket anderen zugänglich zu machen, können Sie natürlich Ihre lokale Situation auch dadurch beheben, dass Sie die korrigierten Quellen der Originalautoren übersetzen und in `/usr/local/` installieren.

Der Autor bemerkte Einschränkungen beim Aktualisieren des ursprünglichen »New Maintainers' Guide« mit dem Paket **dh-make** und entschied sich, ein alternatives Werkzeug und die dazugehörige Dokumentation zu erstellen, um moderne Anforderungen zu adressieren. Das Ergebnis ist das Paket **debmake** (version: 4.3.2) und dieser aktualisierte »Guide for Debian Maintainers« in dem Paket **debmake-doc** (Version: 1.15-1).

Viele Aufgaben und Tipps sind im Befehl **debmake** integriert. Daher ist die Anleitung einfach. Diese Anleitung bietet auch viele Paketierbeispiele.

Achtung



Es bedarf vieler Stunden, um Debian-Pakete zu erstellen und zu betreuen. Der Debian-Betreuer muss **sowohl technisch kompetent als auch sorgfältig** sein, um diese Herausforderung zu meistern.

Einige wichtige Themen sind im Detail erklärt. Einige mögen Ihnen unwichtig erscheinen. Seien Sie geduldig. Einige Sonderfälle werden nur durch Referenzen auf externe Dokumente berücksichtigt. Dies passiert absichtlich, um diese Anleitung einfach und wartbar zu halten.

Kapitel 1

Überblick

Das Debian-Paket für *package-1.0.tar.gz*, das eine einzige, einfache C-Quelle enthält, die [GNU-Programmier-Standard](#) and [FHS](#) folgt, kann mit dem Befehl **debmake** wie folgt erstellt werden:

```
$ tar -xvzf package-1.0.tar.gz
$ cd package-1.0
$ debmake
... Make manual adjustments of generated configuration files
$ debuild
```

Falls die manuellen Anpassungen der erstellten Konfigurationsdateien übersprungen werden, fehlt dem erstellten Binärpaket eine sinnvolle Paketbeschreibung. Es funktioniert aber dennoch unter dem Befehl **dpkg** gut für Ihren lokalen Einsatz.

Achtung



Der Befehl **debmake** stellt nur gute Vorlagendateien bereit. Diese Vorlagendateien müssen durch manuelle Anpassungen perfektioniert werden, um den strengen Qualitätsanforderungen des Debian-Archivs zu genügen, falls das Paket für die allgemeine Verwendung gedacht ist.

Falls Sie beim Debian-Paketieren neu sind, machen Sie sich keine Kopf über die Details und erkennen Sie nur das große Ganze.

Falls Sie schon Berührungen mit der Debian-Paketierung hatten, sieht dies dem Befehl **dh_make** sehr ähnlich. Dies kommt daher, dass der Befehl **debmake** dazu gedacht ist, die historisch von dem Befehl **dh_make** angebotenen Funktionen zu ersetzen.¹

Der Befehl **debmake** wurde mit den folgenden Funktionalitäten gestaltet:

- moderner Paketierstil
 - **debian/copyright**: **DEP-5**-konform
 - **debian/control**: **substvar**-Unterstützung, **multiarch**-Unterstützung, mehrere Binärpakete, ...
 - **debian/rules**: **dh**-Syntax, Compiler-Härtungsoptionen, ...
- Flexibilität
 - viele Optionen (Abschnitt [5.5.1.1](#), Kapitel [6](#), Anhang [A](#))
- vernünftige Standardaktionen
 - Ausführung ohne Unterbrechung mit sauberen Ergebnissen
 - Erstellung des Multiarch-Pakets, außer die Option **-m** wird explizit angegeben
 - Erstellung des nicht-nativen Debian-Pakets im Format »**3.0 (quilt)**«, außer die Option **-n** wird explizit angegeben

¹Der Befehl **deb-make** war vor dem Befehl **dh_make** beliebt. Das aktuelle Paket **debmake** beginnt seine Version bei **4.0**, um Überlappungen mit dem veralteten Paket **debmake**, das den Befehl **deb-make** bereitstellte, zu vermeiden.

- zusätzliche Nützlichkeiten
 - Überprüfung der Datei **debian/copyright** mit den aktuellen Quellen (Abschnitt 6.4)

Der Befehl **debmake** delegiert den größten Teil der eigentlichen Arbeit an seine Backend-Pakete: **debhelper**, **dpkg-dev**, **devscripts**, **pbuilder** usw.

Tipp



Stellen Sie sicher, dass die Argumente **-b**, **-f**, **-l** und **-w** durch Maskieren vor dem Einfluss der Shell geschützt sind.

Tipp



Das nicht-native Debian-Paket ist das normale Debian-Paket.

Tipp



Das detaillierte Protokoll aller Paketbaubeispiele in diesem Dokument kann durch Folgen der Anweisungen in Abschnitt 8.14 erhalten werden.

Anmerkung



Die Erstellung der Datei **debian/copyright** und die Ausgabe der Optionen **-c** (Abschnitt 6.3) und **-k** (Abschnitt 6.4) beinhalten heuristische Aktionen bezüglich der Copyright- und Lizenzinformationen. Sie können fehlerhafte Ausgaben erstellen.

Kapitel 2

Voraussetzungen

Hier sind die Voraussetzungen, die Sie verstehen müssen, um bei Debian mitzumachen.

2.1 Leute bei Debian

Es nehmen verschiedene Arten von Leuten mit verschiedenen Rollen rund um Debian teil:

- **Originalautor:** die Person, die das ursprüngliche Programm erstellte.
- **Originalbetreuer:** Die Person, die derzeit das Programm betreut.
- **Betreuer:** Die Person, die das Debian-Paket des Programms erstellt.
- **Sponsor:** Eine Person, die den Betreuern beim Hochladen (nach Prüfen des Inhalts) des Pakets in das offizielle Debian-Paketarchiv hilft.
- **Mentor:** Eine Person, die neuen Betreuern beim Paketieren usw. hilft.
- **Debian-Entwickler (DD):** ein Mitglied des Debian-Projekts mit vollen Hochlade-Rechten in das offizielle Debian-Paketarchiv.
- **Debian-Betreuer (DM):** Eine Person, mit begrenzten Hochladerechten in das offizielle Debian-Paketarchiv.

Bitte beachten Sie, dass Sie nicht über Nacht ein offizieller **Debian-Entwickler (DD)** werden können, da es mehr als technischer Fähigkeit bedarf. Seien Sie davon nicht entmutigt. Falls es für andere nützlich ist, können Sie dennoch Ihre Pakete hochladen, entweder als **Betreuer** durch einen **Sponsor** oder als ein **Debian-Betreuer**.

Bitte beachten Sie, dass Sie keine neuen Pakete erstellen müssen, um ein offizieller Debian-Entwickler zu werden. Auch Beiträge zu bestehenden Paketen können ein Weg sein, ein offizieller Debian-Entwickler zu werden. Es gibt viele Pakete, die auf gute Betreuer warten (siehe Abschnitt 2.8).

2.2 Wie Sie beitragen können

Bitte lesen Sie die folgenden Dokumenten, um zu verstehen, wie Sie zu Debian beitragen können:

- [Wie können Sie Debian helfen?](#) (offiziell)
- [The Debian GNU/Linux FAQ, Chapter 13 - "Contributing to the Debian Project"](#) (semi-offiziell)
- [Debian Wiki, HelpDebian](#) (ergänzend)
- [Debian New Member site](#) (offiziell)
- [Debian Mentors FAQ](#) (ergänzend)

2.3 Soziale Dynamik von Debian

Bitte verstehen Sie die soziale Dynamik, um sich für die Wechselwirkungen mit Debian vorzubereiten:

- Wir sind alle Freiwillige.
 - Sie können anderen nicht vorschreiben, was getan werden soll.
 - Sie sollten motiviert sein, die Dinge selbst zu tun.
- Freundliche Zusammenarbeit ist der Motor.
 - Ihr Beitrag sollte Andere nicht überlasten.
 - Ihr Beitrag hat nur Wert, wenn ihn andere wertschätzen.
- Debian ist nicht Ihre Schule, bei der die Lehrer sich automatisch um Sie kümmern.
 - Sie sollten vieles selbst lernen können.
 - Aufmerksamkeit von anderen Freiwilligen ist ein rares Gut.
- Debian verbessert sich ständig.
 - Es wird erwartet, dass Sie hochqualitative Pakete erstellen.
 - Sie sollten sich Änderungen anpassen.

Da in der restlichen Anleitung nur auf die technischen Aspekte der Paketierung fokussiert wird, wird auf folgendes zum Verständnis der sozialen Dynamik von Debian verwiesen:

- [Debian: 17 years of Free Software, “do-ocracy”, and democracy](#) (Einleitende Folien vom ehemaligen DPL)

2.4 Technische Erinnerungen

Es folgen ein paar technische Erinnerungen, die anderen Betreuern bei der Arbeit an Ihrem Paket helfen und das Ergebnis von Debian insgesamt effektiv maximieren.

- Ermöglichen Sie in Ihrem Paket eine leichte Fehlersuche.
 - Halten Sie Ihr Paket einfach.
 - Machen Sie Ihr Paket nicht zu komplex.
- Halten Sie Ihr Paket gut dokumentiert.
 - Verwenden Sie einen lesbaren Code-Stil.
 - Fügen Sie in den Code Kommentare ein.
 - Formatieren Sie Code konsistent.
 - Verwalten Sie das Git-Depot ¹ des Pakets.

Anmerkung



Die Fehlersuche in Software kann mehr Zeit verbrauchen, als die eigentliche Erstellung.

¹Die überwältigende Mehrheit der Debian-Betreuer verwenden **git** statt anderer VCS-Systeme wie **hg**, **bzr**, usw.

2.5 Debian-Dokumentation

Bitte lesen Sie nach Bedarf den einschlägigen Anteil der offiziellen Debian-Dokumentation zusammen mit dieser Anleitung, um perfekte Debian-Pakete zu erstellen:

- Debian-Policy Handbuch (englisch)
 - Regeln, den Sie folgen müssen (<https://www.debian.org/doc/devel-manuals#policy>)
- Debian-Entwickler-Referenz
 - Dokument zur »Besten Vorgehensweise« (<https://www.debian.org/doc/devel-manuals#devref>)

Falls dieser Leitfaden der offiziellen Debian-Dokumentation widerspricht, dann ist die offizielle Debian-Dokumentation korrekt. Bitte reichen Sie mittels des Befehls **reportbug** (auf englisch) einen Fehlerbericht gegen das Paket **debmake-doc** ein.

Hier sind alternative Anleitungen, die Sie zusammen mit diesem Leitfaden lesen können:

- »Debian-Leitfaden für Neue Paketbetreuer« (älter)
 - <https://www.debian.org/doc/devel-manuals#maint-guide>
 - <https://packages.qa.debian.org/m/maint-guide.html>
- Leitfaden zum Debian-Paketieren
 - <https://www.debian.org/doc/devel-manuals#packaging-tutorial>
 - <https://packages.qa.debian.org/p/packaging-tutorial.html>
- »Ubuntu Packaging Guide« (Ubuntu basiert auf Debian.) (englisch)
 - <http://packaging.ubuntu.com/html/>

Tipp



Wenn Sie diese Anleitungen lesen, sollten Sie in Erwägung ziehen, den Befehl **debmake** an Stelle des Befehls **dh_make** für bessere Vorlagendateien zu verwenden.

2.6 Hilfequellen

Bevor Sie Ihre Fragen an einem öffentlichen Ort stellen, bemühen Sie sich vorher, die Antwort zu ermitteln, z.B. lesen Sie die gute Dokumentation:

- Paketierinformationen, die über die Befehle **aptitude**, **apt-cache** und **dpkg** verfügbar sind.
- Dateien in **/usr/share/doc/Paket** für alle einschlägigen Pakete.
- Inhalte von **man Befehl** für alle einschlägigen Befehle.
- Inhalte von **info Befehl** für alle einschlägigen Befehle.
- Inhalte von debian-mentors@lists.debian.org-Mailinglist-Archiv.
- Inhalte von debian-devel@lists.debian.org-Mailinglist-Archiv.

Ihre gewünschten Informationen können effektiv gefunden werden, indem Sie einen wohlgeformten Suchbegriff wie das Schlüsselwort **site:lists.debian.org** verwenden, um den Suchbereich der Web-Suchmaschine einzuschränken.

Die Herstellung eines kleinen Testpaketes ist eine gute Möglichkeit, Details des Paketierens zu erfahren. Bestehende, gut gewartete Debian-Pakete zu inspizieren ist der beste Weg, um zu lernen, wie andere Menschen Debian-Pakete erstellen.

Falls Sie immer noch Fragen über das Paketieren haben, können Sie die Fragen direkt stellen (auf Englisch):

- debian-mentors@lists.debian.org Mailingliste. (Diese Mailingliste ist für die Anfänger.)
- debian-devel@lists.debian.org Mailingliste. (Diese Mailingliste ist für die Experten.)
- IRC wie #debian-mentors.
- Teams, die sich auf eine bestimmte Reihe von Paketen konzentrieren. (Vollständige Liste unter <https://wiki.debian.org/Teams>)
- Sprachspezifische Mailinglisten
 - debian-devel-{french,italian,portuguese,spanish}@lists.debian.org
 - debian-chinese-gb@lists.debian.org (Diese Mailingliste ist für allgemeine Diskussion auf (vereinfachtem) Chinesisch.)
 - debian-devel@debian.or.jp

Die erfahreneren Debian-Entwickler werden Ihnen gerne helfen, wenn Sie nach den erforderlichen Vorarbeiten richtig fragen.

Achtung



Die Debian-Entwicklung ist ein sich entwickelndes Projekt. Einige Informationen, die im Web gefunden werden, könnten veraltet, falsch und nicht (mehr) zutreffend sein. Bitte benutzen Sie sie sorgfältig.

2.7 Archivsituation

Bitte begreifen Sie die Situation des Debian-Archivs.

- Debian hat bereits Pakete für die meisten Programmarten.
- Die Anzahl an Paketen im Debian-Archiv ist mehrere zehnmal so groß wie die Anzahl der aktiven Betreuer.
- Bei einigen Paketen fehlt leider die entsprechende Aufmerksamkeit des Betreuers.

Daher werden Beiträge zu Paketen, die sich bereits im Archiv befinden, von anderen Betreuern weitaus mehr geschätzt (und erhalten eher Sponsoring für das Hochladen).

Tipp



Der Befehl **wnpp-alert** aus dem Paket **devscripts** kann prüfen, ob installierte Pakete zur Adoption freigegeben oder verwaist sind.

2.8 Wege, beizutragen

Hier ist Pseudo-Python-Code für Ihre Wege, zu Debian mit einem **Programm** beizutragen:

```
if exist_in_debian(program):
    if is_team_maintained(program):
        join_team(program)
    if is_orphaned(program) # maintainer: Debian QA Group
        adopt_it(program)
    elif is_RFA(program) # Request for Adoption
        adopt_it(program)
    else:
        if need_help(program):
            contact_maintainer(program)
```

```

    triaging_bugs(program)
    preparing_QA_or_NMU_uploads(program)
else:
    leave_it(program)
else: # new packages
    if not is_good_program(program):
        give_up_packaging(program)
    elif not is_distributable(program):
        give_up_packaging(program)
    else: # worth packaging
        if is_ITPed_by_others(program):
            if need_help(program):
                contact_ITPer_for_collaboration(program)
            else:
                leave_it_to_ITPer(program)
        else: # really new
            if is_applicable_team(program):
                join_team(program)
            if is_DFSG(program) and is_DFSG(dependency(program)):
                file_ITP(program, area="main") # This is Debian
            elif is_DFSG(program):
                file_ITP(program, area="contrib") # This is not Debian
            else: # non-DFSG
                file_ITP(program, area="non-free") # This is not Debian
            package_it_and_close_ITP(program)

```

Hier:

- Für das Prüfen von `exist_in_debian()` und `is_team_maintained()`:
 - der Befehl **aptitude**
 - [Debian-Pakete](#)-Webseite
 - [Teams](#)
- Für das Prüfen von `is_orphaned()`, `is_RFA()` und `is_ITPed_by_others()`:
 - Die Ausgabe des Befehls **wnpp-alert**.
 - [Arbeit-bedürfende und voraussichtliche Pakete](#)
 - [Debian-Fehlerberichtsprotokolle: Fehler im Pseudo-Paket wnpp in Unstable](#)
 - [Debian-Pakete, die liebgewonnen werden müssen](#)
 - [Durchsuchen Sie wnpp Fehlerberichte basierend auf Debtags](#)
- Für das Prüfen von `is_good_program()`:
 - Das Programm sollte nützlich sein.
 - Das Programm sollte keine Sicherheits- und Wartungsbedenken in das Debian-System einbringen.
 - Das Programm sollte gut dokumentiert sein und sein Code muss verständlich (d.h. nicht verschleiert) sein.
 - Die Autoren des Programms stimmen mit der Paketierung überein und sind mit Debian einvernehmlich.²
- Für die Prüfung von `is_it_DFSG()` und `is_its_dependency_DFSG()`:
 - [Debian Richtlinien für Freie Software](#) (DFSG).
- Für die Prüfung von `is_it_distributable()`:
 - Die Software muss eine Lizenz haben und sie sollte ihre Verbreitung erlauben.

²Das ist nicht die absolute Voraussetzung. Die ablehnende Einstellung der Originalautoren kann für uns alle zu einem großen Ressourcenproblem werden. Die freundlichen Originalautoren können konsultiert werden, um alle Probleme mit dem Programm zu lösen.

Sie müssen entweder einen **ITP** einreichen oder ein Paket adoptieren, um mit der Arbeit daran zu beginnen. Siehe die »Debian-Entwickler-Referenz«:

- [5.1. New packages.](#)
- [5.9. Moving, removing, renaming, orphaning, adopting, and reintroducing packages.](#)

2.9 Novice contributor and maintainer

The novice contributor and maintainer may wonder what to learn to start your contribution to Debian. Here are my suggestions depending on your focus:

- Packaging
 - Basics of the **POSIX shell** and **make**.
 - Some rudimentary knowledge of **Perl** and **Python**.
- Translation
 - Basics of how the PO based translation system works.
- Documentation
 - Basics of text markups (XML, ReST, Wiki, ...).

The novice contributor and maintainer may wonder where to start your contribution to Debian. Here are my suggestions depending on your skills:

- **POSIX shell**, **Perl**, and **Python** skills:
 - Send patches to the Debian Installer.
 - Send patches to the Debian packaging helper scripts such as **devscripts**, **pbuilder**, etc. mentioned in this document.
- **C** and **C++** skills:
 - Send patches to the packages with the **required** and **important** priorities.
- Non-English skills:
 - Send patches to the PO file of the Debian Installer.
 - Send patches to the PO file of the packages with the **required** and **important** priorities.
- Documentation skills:
 - Update contents on [Debian Wiki](#).
 - Send patches to the existing [Debian Documentation](#).

These activities should give you good exposure to the other Debian people to establish your credibility. The novice maintainer should avoid packaging programs with the high security exposure:

- **setuid** or **setgid** program
- **daemon** program
- program installed in the **/sbin/** or **/usr/sbin/** directories

When you gain more experience in packaging, you'll be able to package such programs.

Kapitel 3

Tool Setups

The **build-essential** package must be installed in the build environment.

The **devscripts** package should be installed in the maintainer environment.

Although this is not necessarily an absolute requirement, it is a good idea to install and set up all of the popular set of packages mentioned in this chapter in the maintainer environment. This enables us to share the common baseline working environment.

Please install the tools mentioned in the [Overview of Debian Maintainer Tools](#) in the “Debian Developer’s Reference”, as needed, too.

Achtung



Tool setups presented here are only meant as an example and may not be up-to-date with the latest packages on the system. Debian development is a moving target. Please make sure to read the pertinent documentation and update the configuration as needed.

3.1 Email address

Various Debian maintenance tools recognize your email address and name to use by the shell environment variables **\$DEBEMAIL** and **\$DEBFULLNAME**.

Let’s setup these packages by adding the following lines to **~/.bashrc** ¹.

Add to the ~/.bashrc file

```
DEBEMAIL="your.email.address@example.org"
DEBFULLNAME="Firstname Lastname"
export DEBEMAIL DEBFULLNAME
```

3.2 mc

The **mc** command offers very easy ways to manage files. It can open the binary **deb** file to check its content by pressing the Enter key over the binary **deb** file. It uses the **dpkg-deb** command as its back-end. Let’s set it up to support easy **chdir** as follows.

Add to the ~/.bashrc file

```
# mc related
export HISTCONTROL=ignoreboth
. /usr/lib/mc/mc.sh
```

¹This assumes you are using Bash as your login shell. If you use some other login shell such as Z shell, use their corresponding configuration files instead of **~/.bashrc**.

3.3 git

Nowadays, the **git** command is the essential tool to manage the source tree with history.

The global user configuration for the **git** command such as your name and email address can be set in `~/.gitconfig` as follows.

```
$ git config --global user.name "Name Surname"
$ git config --global user.email yourname@example.com
```

If you are too accustomed to the CVS or Subversion commands, you may wish to set several command aliases as follows.

```
$ git config --global alias.ci "commit -a"
$ git config --global alias.co checkout
```

You can check your global configuration as follows.

```
$ git config --global --list
```

Tipp



It is essential to use some GUI git tools like **gitk** or **gitg** to work effectively with the history of the git repository.

3.4 quilt

The **quilt** command offers a basic method for recording modifications. For the Debian packaging, it should be customized to record modifications in the **debian/patches/** directory instead of its default **patches/** directory.

In order to avoid changing the behavior of the **quilt** command itself, let's create an alias **dquilt** for the Debian packaging by adding the following lines to the `~/.bashrc` file. The second line provides the same shell completion feature of the **quilt** command to the **dquilt** command.

Add to the `~/.bashrc` file

```
alias dquilt="quilt --quiltrc=${HOME}/.quiltrc-dpkg"
complete -F _quilt_completion $ _quilt_complete_opt dquilt
```

Then let's create `~/.quiltrc-dpkg` as follows.

```
d=.
while [ ! -d $d/debian -a `readlink -e $d` != / ];
do d=$d/..; done
if [ -d $d/debian ] && [ -z $QUILT_PATCHES ]; then
# if in Debian packaging tree with unset $QUILT_PATCHES
QUILT_PATCHES="debian/patches"
QUILT_PATCH_OPTS="--reject-format=unified"
QUILT_DIFF_ARGS="-p ab --no-timestamps --no-index --color=auto"
QUILT_REFRESH_ARGS="-p ab --no-timestamps --no-index"
QUILT_COLORS="diff_hdr=1;32:diff_add=1;34:" + \
"diff_rem=1;31:diff_hunk=1;33:diff_ctx=35:diff_cctx=33"
if ! [ -d $d/debian/patches ]; then mkdir $d/debian/patches; fi
fi
```

See **quilt(1)** and [How To Survive With Many Patches or Introduction to Quilt](#) on how to use the **quilt** command. See Abschnitt 4.8 for example usages.

3.5 devscripts

The **debsign** command, included in the **devscripts** package, is used to sign the Debian package with your private GPG key.

The **debbuild** command, included in the **devscripts** package, builds the binary package and checks it with the **lintian** command. It is useful to have verbose outputs from the **lintian** command.

You can set these up in `~/.devscripts` as follows.

```
DEBUILD_DPKG_BUILDPACKAGE_OPTS="-i -I -us -uc"
DEBUILD_LINTIAN_OPTS="-i -I --show-overrides"
DEBSIGN_KEYID="Your_GPG_keyID"
```

The **-i** and **-I** options in **DEBUILD_DPKG_BUILDPACKAGE_OPTS** for the **dpkg-source** command help rebuilding of Debian packages without extraneous contents (see Abschnitt 5.15).

Currently, an RSA key with 4096 bits is a good idea. See [Creating a new GPG key](#).

3.6 pbuilder

The **pbuilder** package provides a clean room (**chroot**) build environment.²

Let's customize it with several helper packages.

- The **cowbuilder** package to boost the chroot creation speed.
- The **lintian** package to find bugs in the package.
- The **bash**, **mc**, and **vim** packages in case build fails.
- The **ccache** package to boost the **gcc** speed. (optional)
- The **libeatmydata1** package to boost the **dpkg** speed. (optional)
- The parallel **make** to boost the build speed. (optional)

Warnung



The optional customization may cause negative effects. In case of doubts, disable them.

Let's create `~/.pbuilderrc` as follows (all optional features are disabled).

```
AUTO_DEBSIGN="${AUTO_DEBSIGN:-no}"
SOURCE_ONLY_CHANGES="${SOURCE_ONLY_CHANGES:-yes}"
PDEBUILD_PBUILDER=cowbuilder
HOOKDIR="/var/cache/pbuilder/hooks"
MIRROR_SITE="http://deb.debian.org/debian/"
#APT_CACHE=/var/cache/pbuilder/aptcache
APT_CACHE=/var/cache/apt/archives
#BUILDRESULT=/var/cache/pbuilder/result/
BUILDRESULT=./
EXTRA_PACKAGES="lintian"
#EXTRA_PACKAGES="ccache lintian libeatmydata1"

# enable to use libeatmydata1 for pbuilder
#export LD_PRELOAD=${LD_PRELOAD+$LD_PRELOAD:}libeatmydata.so

# enable ccache for pbuilder
#export PATH="/usr/lib/ccache${PATH:+$PATH}"
#export CCACHE_DIR="/var/cache/pbuilder/ccache"
#BINDMOUNTS="${CCACHE_DIR}"

# parallel make
#DEB_BUILD_OPTS=-j8
```

²The **sbuild** package provides an alternative chroot platform.

Anmerkung



A symlink from `/root/.pbuilderrc` to `/home/<user>/.pbuilderrc` may help for the consistent experience.

Anmerkung



Due to [Bug #606542](#), you may need to manually install packages listed in **EXTRAPACKAGES** into the chroot. See Abschnitt [7.10](#).

Anmerkung



Install **libeatmydata1** ($\geq 82-2$) both inside and outside of the chroot or disable to use **libeatmydata1**. This may cause a race condition with some build systems.

Anmerkung



The parallel **make** may fail for some existing packages and may make the build log difficult to read.

Let's create a hook scripts as follows.

```
/var/cache/pbuilder/hooks/A10ccache
```

```
#!/bin/sh
set -e
# increase the ccache caching size
ccache -M 4G
# output the current statistics
ccache -s
```

/var/cache/pbuilder/hooks/B90lintian

```
#!/bin/sh
set -e
apt-get -y --allow-downgrades install lintian
echo "+++ lintian output +++"
su -c "lintian -i -I --show-overrides /tmp/builddd/*.changes; :" -l pbuilder
echo "+++ end of lintian output +++"
```

/var/cache/pbuilder/hooks/C10shell

```
#!/bin/sh
set -e
apt-get -y --allow-downgrades install vim bash mc
# invoke shell if build fails
cd /tmp/builddd/*/debian/.
/bin/bash < /dev/tty > /dev/tty 2> /dev/tty
```

Anmerkung



All these scripts need to be set world executable: “**-rwxr-xr-x 1 root root**”.

Anmerkung



The **ccache** cache directory **/var/cache/pbuilder/ccache** needs to be set world writable: “**-rwxrwxrwx 1 root root**” for the **pbuilder** command. You should be aware of associated security concerns.

3.7 git-buildpackage

You may wish to set several global configurations in **~/gbp.conf**

```
# Configuration file for "gbp <command>"

[DEFAULT]
# the default build command:
builder = git-pbuilder -i -I -us -uc
# use pristine-tar:
pristine-tar = True
# Use color when on a terminal, alternatives: on/true, off/false or auto
color = auto
```

Tipp



The **gbp** command is the alias of the **git-buildpackage** command.

3.8 HTTP proxy

You should set up a local HTTP caching proxy to save the bandwidth for the Debian package repository access. There are several choices:

- Simple HTTP caching proxy using the **squid** package.
- Specialized HTTP caching proxy using the **apt-cacher-ng** package.

3.9 Private Debian repository

You can set up a private Debian package repository with the **reprepro** package.

Kapitel 4

Simple Example

There is an old Latin saying: “**Longum iter est per praecepta, breve et efficax per exempla**” (“It’s a long way by the rules, but short and efficient with examples”).

Here is an example of creating a simple Debian package from a simple C source using the **Makefile** as its build system.

Let’s assume this upstream tarball to be **debhello-0.0.tar.gz**.

This type of source is meant to be installed as a non-system file as:

```
$ tar -xzmf debhello-0.0.tar.gz
$ cd debhello-0.0
$ make
$ make install
```

Debian packaging requires changing this “**make install**” process to install files to the target system image location instead of the normal location under **/usr/local**.

Anmerkung



Examples of creating a Debian package from other complicated build systems are described in Kapitel [8](#).

4.1 Big picture

The big picture for building a single non-native Debian package from the upstream tarball **debhello-0.0.tar.gz** can be summarized as:

- The maintainer obtains the upstream tarball **debhello-0.0.tar.gz** and untars its contents to the **debhello-0.0** directory.
- The **debmake** command debianizes the upstream source tree by adding template files only in the **debian** directory.
 - The **debhello_0.0.orig.tar.gz** symlink is created pointing to the **debhello-0.0.tar.gz** file.
 - The maintainer customizes template files.
- The **debbuild** command builds the binary package from the debianized source tree.
 - **debhello-0.0-1.debian.tar.xz** is created containing the **debian** directory.

Big picture of package building

```
$ tar -xzmf debhello-0.0.tar.gz
$ cd debhello-0.0
$ debmake
... manual customization
```

```
$ debuild
...
```

Tipp



The **debuild** command in this and following examples may be substituted by equivalent commands such as the **pdebuild** command.

Tipp



If the upstream tarball in the **.tar.xz** format is available, use it instead of the one in the **.tar.gz** and **.tar.bz2** formats. The **xz** compression format offers the better compression than the **gzip** and **bzip2** compressions.

4.2 What is debmake?

The **debmake** command is the helper script for the Debian packaging.

- It always sets most of the obvious option states and values to reasonable defaults.
- It generates the upstream tarball and its required symlink if they are missing.
- It doesn't overwrite the existing configuration files in the **debian/** directory.
- It supports the **multiarch** package.
- It creates good template files such as the **debian/copyright** file compliant with **DEP-5**.

These features make Debian packaging with **debmake** simple and modern.

Anmerkung



The **debmake** command isn't the only way to make a Debian package. Many packages are packaged using only a text editor while imitating how other similar packages are packaged.

4.3 What is debuild?

Here is a summary of commands similar to the **debuild** command.

- The **debian/rules** file defines how the Debian binary package is built.
- The **dpkg-buildpackage** command is the official command to build the Debian binary package. For normal binary build, it executes roughly:
 - “**dpkg-source --before-build**” (apply Debian patches, unless they are already applied)
 - “**fakeroot debian/rules clean**”
 - “**dpkg-source --build**” (build the Debian source package)
 - “**fakeroot debian/rules build**”
 - “**fakeroot debian/rules binary**”

- “**dpkg-genbuildinfo**” (generate a ***.buildinfo** file)
 - “**dpkg-genchanges**” (generate a ***.changes** file)
 - “**fakeroot debian/rules clean**”
 - “**dpkg-source --after-build**” (unapply Debian patches, if they are applied during **--before-build**)
 - “**debsign**” (sign the ***.dsc** and ***.changes** files)
 - * If you followed Abschnitt 3.5 to set the **-us** and **-uc** options, this step is skipped and you must run the **debsign** command manually.
- The **debuild** command is a wrapper script of the **dpkg-buildpackage** command to build the Debian binary package under the proper environment variables.
 - The **pdebuild** command is a wrapper script to build the Debian binary package under the proper chroot environment with the proper environment variables.
 - The **git-pbuilder** command is another wrapper script to build the Debian binary package under the proper chroot environment with the proper environment variables. This provides an easier command line UI to switch among different build environments.

Anmerkung



See **dpkg-buildpackage(1)** for exact details.

4.4 Step 1: Get the upstream source

Let’s get the upstream source.

Download debhello-0.0.tar.gz

```
$ wget http://www.example.org/download/debhello-0.0.tar.gz
...
$ tar -xzf debhello-0.0.tar.gz
$ tree
.
├── debhello-0.0
│   ├── LICENSE
│   ├── Makefile
│   ├── src
│   └── hello.c
└── debhello-0.0.tar.gz
```

2 directories, 4 files

Here, the C source **hello.c** is a very simple one.

hello.c

```
$ cat debhello-0.0/src/hello.c
#include <stdio.h>
int
main()
{
    printf("Hello, world!\n");
    return 0;
}
```

Here, the **Makefile** supports [GNU Coding Standards](#) and [FHS](#). Notably:

- build binaries honoring **\$(CPPFLAGS)**, **\$(CFLAGS)**, **\$(LDFLAGS)**, etc.

- install files with **\$(DESTDIR)** defined to the target system image
- install files with **\$(prefix)** defined, which can be overridden to be **/usr**

Makefile

```
$ cat debhello-0.0/Makefile
prefix = /usr/local

all: src/hello

src/hello: src/hello.c
    @echo "CFLAGS=$(CFLAGS)" | \
        fold -s -w 70 | \
        sed -e 's/^/# /'
    $(CC) $(CPPFLAGS) $(CFLAGS) $(LDCFLAGS) -o $@ $^

install: src/hello
    install -D src/hello \
        $(DESTDIR)$(prefix)/bin/hello

clean:
    -rm -f src/hello

distclean: clean

uninstall:
    -rm -f $(DESTDIR)$(prefix)/bin/hello

.PHONY: all install clean distclean uninstall
```

Anmerkung



The **echo** of the **\$(CFLAGS)** variable is used to verify the proper setting of the build flag in the following example.

4.5 Step 2: Generate template files with debmake

Tipp



If the **debmake** command is invoked with the **-T** option, more verbose comments are generated for the template files.

The output from the **debmake** command is very verbose and explains what it does as follows.

```
$ cd debhello-0.0
$ debmake
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="0.0", rev="1"
I: *** start packaging in "debhello-0.0". ***
I: provide debhello_0.0.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-0.0.tar.gz debhello_0.0.orig.tar.gz
I: pwd = "/path/to/debhello-0.0"
```

```

I: parse binary package settings:
I: binary package=debhhello Type=bin / Arch=any M-A=foreign
I: analyze the source tree
I: build_type = make
I: scan source for copyright+license text and file extensions
I: 100 %, ext = c
I: check_all_licenses
I: ..
I: check_all_licenses completed for 2 files.
I: bunch_all_licenses
I: format_all_licenses
I: make debian/* template files
I: single binary package
I: debmake -x "1" ...
I: creating => debian/control
I: creating => debian/copyright
I: substituting => /usr/share/debmake/extra0/changelog
I: creating => debian/changelog
I: substituting => /usr/share/debmake/extra0/rules
I: creating => debian/rules
I: substituting => /usr/share/debmake/extra1/watch
I: creating => debian/watch
I: substituting => /usr/share/debmake/extra1/README.Debian
I: creating => debian/README.Debian
I: substituting => /usr/share/debmake/extra1source/format
I: creating => debian/source/format
I: substituting => /usr/share/debmake/extra1source/local-options
I: creating => debian/source/local-options
I: substituting => /usr/share/debmake/extra1patches/series
I: creating => debian/patches/series
I: run "debmake -x2" to get more template files
I: $ wrap-and-sort

```

The **debmake** command generates all these template files based on command line options. Since no options are specified, the **debmake** command chooses reasonable default values for you:

- The source package name: **debhhello**
- The upstream version: **0.0**
- The binary package name: **debhhello**
- The Debian revision: **1**
- The package type: **bin** (the ELF binary executable package)
- The **-x** option: **-x1** (default for the single binary package)

Let's inspect generated template files.

The source tree after the basic debmake execution.

```

$ cd ..
$ tree
.
├── debhello-0.0
│   ├── LICENSE
│   ├── Makefile
│   └── debian
│       ├── README.Debian
│       ├── changelog
│       ├── control
│       ├── copyright
│       ├── patches
│       └── series
├── rules
└── source

```

```

b''|b''    b''|b''    b''|b''    b''|b''b''-b''b''-b'' format
b''|b''    b''|b''    b''|b''    b''|b''b''-b''b''-b'' local-options
b''|b''    b''|b''    b''|b''b''-b''b''-b'' watch
b''|b''    b''|b''b''-b''b''-b'' src
b''|b''    b''|b''b''-b''b''-b'' hello.c
b''|b''b''-b''b''-b'' debhello-0.0.tar.gz
b''|b''b''-b''b''-b'' debhello_0.0.orig.tar.gz -> debhello-0.0.tar.gz

```

5 directories, 14 files

The **debian/rules** file is the build script provided by the package maintainer. Here is its template file generated by the **debmake** command.

debian/rules (template file):

```

$ cat debhello-0.0/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@

#override_dh_auto_install:
#    dh_auto_install -- prefix=/usr

#override_dh_install:
#    dh_install --list-missing -X.pyc -X.pyo

```

This is essentially the standard **debian/rules** file with the **dh** command. (There are some commented out contents for you to customize it.)

The **debian/control** file provides the main meta data for the Debian package. Here is its template file generated by the **debmake** command.

debian/control (template file):

```

$ cat debhello-0.0/debian/control
Source: debhello
Section: unknown
Priority: optional
Maintainer: "Firstname Lastname" <email.address@example.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.5.0
Homepage: <insert the upstream URL, if relevant>

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: auto-generated package by debmake
    This Debian binary package was auto-generated by the
    debmake(1) command provided by the debmake package.

```

Warnung



If you leave “**Section: unknown**” in the template **debian/control** file unchanged, the **lintian** error may cause the build to fail.

Since this is the ELF binary executable package, the **debmake** command sets “**Architecture: any**” and “**Multi-Arch: foreign**”. Also, it sets required **substvar** parameters as “**Depends: \${shlibs:Depends}, \${misc:Depends}**”.

These are explained in Kapitel 5.

Anmerkung



Please note this **debian/control** file uses the RFC-822 style as documented in [5.2 Source package control files — debian/control](#) of the “Debian Policy Manual”. The use of the empty line and the leading space are significant.

The **debian/copyright** file provides the copyright summary data of the Debian package. Here is its template file generated by the **debmake** command.

debian/copyright (template file):

```
$ cat debhello-0.0/debian/copyright
Format: https://www.debian.org/doc/packaging-manuals/copyright-format/1.0/
Upstream-Name: debhello
Upstream-Contact: <preferred name and address to reach the upstream project>
Source: <url://example.com>
#
# Please double check copyright with the licensecheck(1) command.

Files:      Makefile
           src/hello.c
Copyright:  __NO_COPYRIGHT_NOR_LICENSE__
License:    __NO_COPYRIGHT_NOR_LICENSE__

#-----
# Files marked as NO_LICENSE_TEXT_FOUND may be covered by the following
# license/copyright files.

#-----
# License file: LICENSE
License:
.
All files in this archive are licensed under the MIT License as below.
.
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Permission is hereby granted, free of charge, to any person obtaining a
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to deal in the Software without restriction, including without limitation
the rights to use, copy, modify, merge, publish, distribute, sublicense,
and/or sell copies of the Software, and to permit persons to whom the
Software is furnished to do so, subject to the following conditions:
.
The above copyright notice and this permission notice shall be included
in all copies or substantial portions of the Software.
.
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY
CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT,
TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

4.6 Step 3: Modification to the template files

Some manual modification is required to make the proper Debian package as a maintainer.

In order to install files as a part of the system files, the **\$(prefix)** value of **/usr/local** in the **Makefile** should be overridden to be **/usr**. This can be accommodated by the following the **debian/rules** file with the **overri-**

de_dh_auto_install target setting “**prefix=/usr**”.

debian/rules (maintainer version):

```
$ vim debhello-0.0/debian/rules
... hack, hack, hack, ...
$ cat debhello-0.0/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@

override_dh_auto_install:
    dh_auto_install -- prefix=/usr
```

Exporting the **DH_VERBOSE** environment variable in the **debian/rules** file as above forces the **debhelper** tool to make a fine grained build report.

Exporting **DEB_BUILD_MAINT_OPTION** as above sets the hardening options as described in the “FEATURE AREAS/ENVIRONMENT” in **dpkg-buildflags(1)**.¹

Exporting **DEB_CFLAGS_MAINT_APPEND** as above forces the C compiler to emit all the warnings.

Exporting **DEB_LDFLAGS_MAINT_APPEND** as above forces the linker to link only when the library is actually needed.²

The **dh_auto_install** command for the Makefile based build system essentially runs “**\$(MAKE) install DESTDIR=debian/debhello**”. The creation of this **override_dh_auto_install** target changes its behavior to “**\$(MAKE) install DESTDIR=debian/debhello prefix=/usr**”.

Here are the maintainer versions of the **debian/control** and **debian/copyright** files.

debian/control (maintainer version):

```
$ vim debhello-0.0/debian/control
... hack, hack, hack, ...
$ cat debhello-0.0/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: example package in the debmake-doc package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
```

debian/copyright (maintainer version):

```
$ vim debhello-0.0/debian/copyright
... hack, hack, hack, ...
$ cat debhello-0.0/debian/copyright
Format: https://www.debian.org/doc/packaging-manuals/copyright-format/1.0/
```

¹This is a cliché to force a read-only relocation link for the hardening and to prevent the lintian warning “**W: debhello: hardening-no-relro usr/bin/hello**”. This is not really needed for this example but should be harmless. The lintian tool seems to produce a false positive warning for this case which has no linked library.

²This is a cliché to prevent overlinking for the complex library dependency case such as Gnome programs. This is not really needed for this simple example but should be harmless.

```

Upstream-Name: debhello
Upstream-Contact: Osamu Aoki <osamu@debian.org>
Source: https://salsa.debian.org/debian/debmake-doc

Files:      *
Copyright:  2015 Osamu Aoki <osamu@debian.org>
License:     Expat

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```

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=0.0):

```
$ tree debhello-0.0/debian
debhello-0.0/debian
b'' |b''b''-b''b''-b'' README.Debian
b'' |b''b''-b''b''-b'' changelog
b'' |b''b''-b''b''-b'' control
b'' |b''b''-b''b''-b'' copyright
b'' |b''b''-b''b''-b'' patches
b'' |b''      b''|b''b''-b''b''-b'' series
b'' |b''b''-b''b''-b'' rules
b'' |b''b''-b''b''-b'' source
b'' |b''      b''|b''b''-b''b''-b'' format
b'' |b''      b''|b''b''-b''b''-b'' local-options
b'' |b''b''-b''b''-b'' watch

2 directories, 9 files
```

Tipp



Configuration files used by the **dh_*** commands from the **debhelper** package usually treat **#** as the start of a comment line.

4.7 Step 4: Building package with debuild

You can create a non-native Debian package using the **debbuild** command or its equivalents (see [Abschnitt 4.3](#)) in this source tree. The command output is very verbose and explains what it does as follows.

```
$ cd debhello-0.0
$ debuild
dpkg-buildpackage -us -uc -ui -i -i
...
fakeroot debian/rules clean
```

```
dh clean
...
debian/rules build
dh build
dh_update_autotools_config
dh_autoreconf
dh_auto_configure
    install -d /path/to/debhello-0.0/debian/.debhelper/generated/_source/...
dh_auto_build
    make -j4 "INSTALL=install --strip-program=true"
make[1]: Entering directory '/path/to/debhello-0.0'
# CFLAGS=-g -O2
# -fdebug-prefix-map=/home/osamu/pub/salsa/debmake/debmake-doc/debhello-
...
fakeroot debian/rules binary
dh binary
...
Now running lintian -i -I --show-overrides debhello_0.0-1_amd64.changes ...
...
W: debhello: binary-without-manpage usr/bin/hello
N:
N:     Each binary in /usr/bin, /usr/sbin, /bin, /sbin or /usr/games should
N:     have a manual page
...
```

You can verify that **CFLAGS** is updated properly with **-Wall** and **-pedantic** by the **DEB_CFLAGS_MAINT_APPEND** variable.

The manpage should be added to the package as reported by the **lintian** package, as shown in later examples (see Kapitel 8). Let's move on for now.

Let's inspect the result.

The generated files of debhello version 0.0 by the debuild command:

```
$ cd ..
$ tree -FL 1
.
|
+--- debhello-0.0/
+--- debhello-0.0.tar.gz
+--- debhello-dbgsym_0.0-1_amd64.deb
+--- debhello_0.0-1.debian.tar.xz
+--- debhello_0.0-1.dsc
+--- debhello_0.0-1_amd64.build
+--- debhello_0.0-1_amd64.buildinfo
+--- debhello_0.0-1_amd64.changes
+--- debhello_0.0-1_amd64.deb
+--- debhello_0.0.orig.tar.gz -> debhello-0.0.tar.gz

1 directory, 9 files
```

You see all the generated files.

- The **debhello_0.0.orig.tar.gz** is a symlink to the upstream tarball.
- The **debhello_0.0-1.debian.tar.xz** contains the maintainer generated contents.
- The **debhello_0.0-1.dsc** is the meta data file for the Debian source package.
- The **debhello_0.0-1_amd64.deb** is the Debian binary package.
- The **debhello-dbgsym_0.0-1_amd64.deb** is the Debian debug symbol binary package. See Abschnitt [5.17.1](#).
- The **debhello_0.0-1_amd64.build** file is the build log file.
- The **debhello_0.0-1_amd64.buildinfo** file is the meta data file generated by **dpkg-genbuildinfo(1)**.
- The **debhello_0.0-1_amd64.changes** is the meta data file for the Debian binary package.

The **debhello_0.0-1.debian.tar.xz** contains the Debian changes to the upstream source as follows.

The compressed archive contents of debhello_0.0-1.debian.tar.xz:

```
$ tar -tzf debhello-0.0.tar.gz
debhello-0.0/
debhello-0.0/LICENSE
debhello-0.0/Makefile
debhello-0.0/src/
debhello-0.0/src/hello.c
$ tar --xz -tf debhello_0.0-1.debian.tar.xz
debian/
debian/README.Debian
debian/changelog
debian/control
debian/copyright
debian/patches/
debian/patches/series
debian/rules
debian/source/
debian/source/format
debian/watch
```

The **debhello_0.0-1_amd64.deb** contains the binary files to be installed to the target system.

The **debhello-dbgsym_0.0-1_amd64.deb** contains the debug symbol files to be installed to the target system..

The binary package contents of all binary packages:

```
$ dpkg -c debhello-dbgsym_0.0-1_amd64.deb
drwxr-xr-x root/root ... ./
drwxr-xr-x root/root ... ./usr/
drwxr-xr-x root/root ... ./usr/lib/
drwxr-xr-x root/root ... ./usr/lib/debug/
drwxr-xr-x root/root ... ./usr/lib/debug/.build-id/
drwxr-xr-x root/root ... ./usr/lib/debug/.build-id/66/
-rw-r--r-- root/root ... ./usr/lib/debug/.build-id/66/73e0826b1e8bd84f511bac...
drwxr-xr-x root/root ... ./usr/share/
drwxr-xr-x root/root ... ./usr/share/doc/
lrwxrwxrwx root/root ... ./usr/share/doc/debhello-dbgsym -> debhello
$ dpkg -c debhello_0.0-1_amd64.deb
drwxr-xr-x root/root ... ./
drwxr-xr-x root/root ... ./usr/
drwxr-xr-x root/root ... ./usr/bin/
-rwxr-xr-x root/root ... ./usr/bin/hello
drwxr-xr-x root/root ... ./usr/share/
drwxr-xr-x root/root ... ./usr/share/doc/
drwxr-xr-x root/root ... ./usr/share/doc/debhello/
-rw-r--r-- root/root ... ./usr/share/doc/debhello/README.Debian
-rw-r--r-- root/root ... ./usr/share/doc/debhello/changelog.Debian.gz
-rw-r--r-- root/root ... ./usr/share/doc/debhello/copyright
```

The generated dependency list of all binary packages.

The generated dependency list of all binary packages (v=0.0):

```
$ dpkg -f debhello-dbgsym_0.0-1_amd64.deb pre-depends \
    depends recommends conflicts breaks
Depends: debhello (= 0.0-1)
$ dpkg -f debhello_0.0-1_amd64.deb pre-depends \
    depends recommends conflicts breaks
Depends: libc6 (>= 2.2.5)
```

Achtung

Many more details need to be addressed before uploading the package to the Debian archive.

Anmerkung

If manual adjustments of auto-generated configuration files by the **debmake** command are skipped, the generated binary package may lack meaningful package description and some of the policy requirements may be missed. This sloppy package functions well under the **dpkg** command, and may be good enough for your local deployment.

4.8 Step 3 (alternative): Modification to the upstream source

The above example did not touch the upstream source to make the proper Debian package.

An alternative approach as the maintainer is to change the upstream source by modifying the upstream **Makefile** to set the \$(prefix) value to **/usr**.

The packaging is practically the same as the above step-by-step example except for two points in Abschnitt 4.6:

- Store the maintainer modifications to the upstream source as the corresponding patch files in the **debian/patches/** directory and list their filenames in the **debian/patches/series** file as indicated in Abschnitt 5.8. There are several ways to generate patch files. A few examples are given in these sections:
 - Abschnitt 4.8.1
 - Abschnitt 4.8.2
 - Abschnitt 4.8.3
- The maintainer modification to the **debian/rules** file doesn't have the **override_dh_auto_install** target as follows:

debian/rules (alternative maintainer version):

```
$ cd debhello-0.0
$ vim debian/rules
... hack, hack, hack, ...
$ cat debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@
```

This alternative approach to Debian packaging using a series of patch files may be less robust for future upstream changes but more flexible coping with the difficult upstream source. (See Abschnitt 7.13.)

Anmerkung

For this particular packaging case, the above Abschnitt 4.6 using the **debian/rules** file is the better approach. But let's keep on with this approach as a leaning process.

Tipp



For more complicated packaging cases, both Abschnitt 4.6 and Abschnitt 4.8 approaches need to be deployed.

4.8.1 Patch by diff -u

Here is an example to create **000-prefix-usr.patch** by the **diff** command.

```
$ cp -a debhello-0.0 debhello-0.0.orig
$ vim debhello-0.0/Makefile
... hack, hack, hack, ...
$ diff -Nru debhello-0.0.orig debhello-0.0 >000-prefix-usr.patch
$ cat 000-prefix-usr.patch
diff -Nru debhello-0.0.orig/Makefile debhello-0.0/Makefile
--- debhello-0.0.orig/Makefile    2020-07-13 00:38:01.407949320 +0900
+++ debhello-0.0/Makefile        2020-07-13 00:38:01.479947950 +0900
@@ -1,4 +1,4 @@
-prefix = /usr/local
+prefix = /usr

all: src/hello

$ rm -rf debhello-0.0
$ mv -f debhello-0.0.orig debhello-0.0
```

Please note that the upstream source tree is restored to the original state and the patch file is available as **000-prefix-usr.patch**.

This **000-prefix-usr.patch** is edited to be [DEP-3](#) conformant and moved to the right location as below.

```
$ cd debhello-0.0
$ echo '000-prefix-usr.patch' >debian/patches/series
$ vim ../000-prefix-usr.patch
... hack, hack, hack, ...
$ mv -f ../000-prefix-usr.patch debian/patches/000-prefix-usr.patch
$ cat debian/patches/000-prefix-usr.patch
From: Osamu Aoki <osamu@debian.org>
Description: set prefix=/usr patch
diff -Nru debhello-0.0.orig/Makefile debhello-0.0/Makefile
--- debhello-0.0.orig/Makefile
+++ debhello-0.0/Makefile
@@ -1,4 +1,4 @@
-prefix = /usr/local
+prefix = /usr

all: src/hello
```

4.8.2 Patch by dquilt

Here is an example to create **000-prefix-usr.patch** by the **dquilt** command which is a simple wrapper of the **quilt** program. The syntax and function of the **dquilt** command is the same as the **quilt(1)** command, except for the fact that the patch is stored in the **debian/patches/** directory.

```
$ cd debhello-0.0
$ dquilt new 000-prefix-usr.patch
Patch debian/patches/000-prefix-usr.patch is now on top
$ dquilt add Makefile
File Makefile added to patch debian/patches/000-prefix-usr.patch
```

```

... hack, hack, hack, ...
$ head -1 Makefile
prefix = /usr
$ dquilt refresh
Refreshed patch debian/patches/000-prefix-usr.patch
$ dquilt header -e --dep3
... edit the DEP-3 patch header with editor
$ tree -a
.
├── b''b''-b''b''-b'' .pc
├── b''b'' b''b''b''b''b''b'' .quilt_patches
├── b''b'' b''b''b''b''b''b'' .quilt_series
├── b''b'' b''b''b''b''b''b'' .version
├── b''b'' b''b''b''b''b''b'' 000-prefix-usr.patch
├── b''b'' b''b'' b''b''b''b''b''b'' .timestamp
├── b''b'' b''b'' b''b''b''b''b''b'' Makefile
├── b''b'' b''b''b''b''b''b'' applied-patches
├── b''b''b''b''b''b'' LICENSE
├── b''b''b''b''b''b'' Makefile
├── b''b''b''b''b''b'' debian
├── b''b'' b''b''b''b''b''b'' README.Debian
├── b''b'' b''b''b''b''b''b'' changelog
├── b''b'' b''b''b''b''b''b'' control
├── b''b'' b''b''b''b''b''b'' copyright
├── b''b'' b''b''b''b''b''b'' patches
├── b''b'' b''b'' b''b''b''b''b''b'' 000-prefix-usr.patch
├── b''b'' b''b'' b''b''b''b''b''b'' series
├── b''b'' b''b''b''b''b''b'' rules
├── b''b'' b''b''b''b''b''b'' source
├── b''b'' b''b'' b''b''b''b''b''b'' format
├── b''b'' b''b'' b''b''b''b''b''b'' local-options
├── b''b'' b''b''b''b''b''b'' watch
├── b''b''b''b''b''b'' src
│   └── b''b''b''b''b''b''b'' hello.c
└── 6 directories, 19 files
$ cat debian/patches/series
000-prefix-usr.patch
$ cat debian/patches/000-prefix-usr.patch
Description: set prefix=/usr patch
Author: Osamu Aoki <osamu@debian.org>
Index: debhello-0.0/Makefile
=====
--- debhello-0.0.orig/Makefile
+++ debhello-0.0/Makefile
@@ -1,4 +1,4 @@
-prefix = /usr/local
+prefix = /usr

all: src/hello

```

Here, **Makefile** in the upstream source tree doesn't need to be restored to the original state. The **dpkg-source** command invoked by the Debian packaging procedure in Abschnitt 4.7, understands the patch application state recorded by the **dquilt** program in the **.pc/** directory. As long as all the changes are committed by the **dquilt** command, the Debian source package can be built from the modified source tree.

Anmerkung



If the **.pc/** directory is missing, the **dpkg-source** command assumes that no patch was applied. That's why the more primitive patch generation methods like in Abschnitt 4.8.1 without generating the **.pc/** directory require the upstream source tree to be restored.

4.8.3 Patch by dpkg-source --commit

Here is an example to create **000-prefix-usr.patch** by the “**dpkg-source --commit**” command.

Let’s edit the upstream source.

```
$ cd debhello-0.0
$ vim Makefile
... hack, hack, hack, ...
$ head -n1 Makefile
prefix = /usr
```

Let’s commit it.

```
$ dpkg-source --commit . 000-prefix-usr.patch
... editor to edit the DEP-3 patch header
...
```

Let’s see the result.

```
$ cat debian/patches/series
000-prefix-usr.patch
$ cat debian/patches/000-prefix-usr.patch
Description: set prefix=/usr patch
Author: Osamu Aoki <osamu@debian.org>
Index: debhello-0.0/Makefile

--- debhello-0.0.orig/Makefile
+++ debhello-0.0/Makefile
@@ -1,4 +1,4 @@
-prefix = /usr/local
+prefix = /usr

all: src/hello

$ tree -a
.
├── .pc
├── .quilt_patches
├── .quilt_series
├── .version
├── 000-prefix-usr.patch
├── .timestamp
├── Makefile
├── applied-patches
├── LICENSE
├── Makefile
├── debian
├── README.Debian
├── changelog
├── control
├── copyright
├── patches
├── 000-prefix-usr.patch
├── series
├── rules
├── source
├── format
├── local-options
├── watch
├── src
└── hello.c

6 directories, 19 files
```

Here, the **dpkg-source** command performs exactly the same as what the sequences of the **dquilt** command did in Abschnitt 4.8.2.

Kapitel 5

Basics

A broad overview is presented here for the basic rules of Debian packaging focusing on the non-native Debian package in the “3.0 (quilt)” format.

Anmerkung



Some details are intentionally skipped for clarity. Please read the manpages of the **dpkg-source(1)**, **dpkg-buildpackage(1)**, **dpkg(1)**, **dpkg-deb(1)**, **deb(5)**, etc.

The Debian source package is a set of input files used to build the Debian binary package and is not a single file.

The Debian binary package is a special archive file which holds a set of installable binary data with its associated information.

A single Debian source package may generate multiple Debian binary packages defined in the **debian/control** file.

The non-native Debian package in the “3.0 (quilt)” format is the most normal Debian source package format.

Anmerkung



There are many wrapper scripts. Use them to streamline your workflow but make sure to understand the basics of their internals.

5.1 Packaging workflow

The Debian packaging workflow to create a Debian binary package involves generating several specifically named files (see Abschnitt 5.2) as defined in the “Debian Policy Manual”.

The oversimplified method for the Debian packaging workflow can be summarized in 10 steps as follows.

1. The upstream tarball is downloaded as the *package-version.tar.gz* file.
2. The upstream tarball is untarred to create many files under the *package-version/* directory.
3. The upstream tarball is copied (or symlinked) to the particular filename *packagename_version.orig.tar.gz*.
 - the character separating *package* and *version* is changed from - (hyphen) to _ (underscore)
 - **.orig** is added in the file extension.
4. The Debian package specification files are added to the upstream source under the *package-version/debian/* directory.
 - Required specification files under the **debian/** directory:

- debian/rules** The executable script for building the Debian package (see Abschnitt 5.4)
 - debian/control** The package configuration file containing the source package name, the source build dependencies, the binary package name, the binary dependencies, etc. (see Abschnitt 5.5)
 - debian/changelog** The Debian package history file defining the upstream package version and the Debian revision in its first line (see Abschnitt 5.6)
 - debian/copyright** The copyright and license summary (see Abschnitt 5.7)
 - Optional specification files under the **debian/*** (see Abschnitt 5.11):
 - The **debmake** command invoked in the *package-version/* directory provides the initial set of these template configuration files.
 - Required specification files are generated even with the **-x0** option.
 - The **debmake** command does not overwrite any existing configuration files.
 - These files must be manually edited to their perfection according to the “Debian Policy Manual” and “Debian Developer’s Reference”.
5. The **dpkg-buildpackage** command (usually from its wrapper **debuild** or **pdebuild**) is invoked in the *package-version/* directory to make the Debian source and binary packages by invoking the **debian/rules** script.
- The current directory is set as: **\$(CURDIR)=/path/to/package-version/**
 - Create the Debian source package in the “3.0 (quilt)” format using **dpkg-source(1)**
 - *package_version.orig.tar.gz* (copy or symlink of *package-version.tar.gz*)
 - *package_version-revision.debian.tar.xz* (tarball of *package-version/debian/**)
 - *package_version-revision.dsc*
 - Build the source using “**debian/rules build**” into **\$(DESTDIR)**
 - **DESTDIR=debian/binarypackage/** (single binary package)
 - **DESTDIR=debian/tmp/** (multi binary package)
 - Create the Debian binary package using **dpkg-deb(1)**, **dpkg-genbuildinfo(1)**, and **dpkg-genchanges(1)**.
 - *binarypackage_version-revision_arch.deb*
 - ... (There may be multiple Debian binary package files.)
 - *package_version-revision_arch.changes*
 - *package_version-revision_arch.buildinfo*
6. Check the quality of the Debian package with the **lintian** command. (recommended)
- Follow the rejection guidelines from [ftp-master](#).
 - [REJECT-FAQ](#)
 - [NEW checklist](#)
 - [Lintian Autorejects \(lintian tag list\)](#)
7. Test the goodness of the generated Debian binary package manually by installing it and running its programs.
8. After confirming the goodness, prepare files for normal source-only uploads to the Debian archive.
- Remove the source tree under */path/to/package-version/* which may contain artifacts from the build process.
 - Regenerate the clean source tree using “**dpkg-source -x package_version-revision.dsc**”.
 - Remove *package_version-revision.debian.tar.xz*.
 - Generate following files using “**dpkg-buildpackage -S -d**” in the clean source tree.
 - *package_version-revision.debian.tar.xz*
 - ‘package_version-revision’_*.source.changes*
 - ‘package_version-revision’_*.source.buildinfo*
9. Sign the *package_version-revision.dsc* and ‘package_version-revision’_*.source.changes* files with the **deb-sign** command using your private GPG key.

10. Upload the set of the Debian source package files with the **dput** command to the Debian archive.

Under some exceptional situation such as NEW uploads, uploads to the Debian archive may need to include Debian binary package files. For such situation, skip the step 8, sign *package_version-revision_arch.changes* instead of 'package_version-revision' *_source.changes* in the step 9, and upload the set of the Debian source and binary package files in the step 10.

Here, please replace each part of the filename as:

- the *package* part with the Debian source package name
- the *binarypackage* part with the Debian binary package name
- the *version* part with the upstream version
- the *revision* part with the Debian revision
- the *arch* part with the package architecture

See also [Source-only uploads](#).

Tipp



Many patch management and VCS usage strategies for the Debian packaging are practiced. You don't need to use all of them.

Tipp



There is very extensive documentation in [Chapter 6. Best Packaging Practices](#) in the “Debian Developer's Reference”. Please read it.

5.1.1 The debhelper package

Although a Debian package can be made by writing a **debian/rules** script without using the **debhelper** package, it is impractical to do so. There are too many modern “Policy” required features to be addressed, such as application of the proper file permissions, use of the proper architecture dependent library installation path, insertion of the installation hook scripts, generation of the debug symbol package, generation of package dependency information, generation of the package information files, application of the proper timestamp for reproducible build, etc.

Debhelper package provides a set of useful scripts in order to simplify Debian's packaging workflow and reduce the burden of package maintainers. When properly used, they will help packagers handle and implement “Policy” required features automatically.

The modern Debian packaging workflow can be organized into a simple modular workflow by:

- using the **dh** command to invoke many utility scripts automatically from the **debhelper** package, and
- configuring their behavior with declarative configuration files in the **debian/** directory.

You should almost always use **debhelper** as your package's build dependency. This document also assumes that you are using a fairly contemporary version of **debhelper** to handle packaging works in the following contents.

5.2 Package name and version

If the upstream source comes as **hello-0.9.12.tar.gz**, you can take **hello** as the upstream source package name and **0.9.12** as the upstream version.

debmake is meant to provide template files for the package maintainer to work on. Comment lines started by **#** contain the tutorial text. You must remove or edit such comment lines before uploading to the Debian archive.

The license extraction and assignment process involves a lot of heuristics; it may fail in some cases. It is highly recommended to use other tools such as **licensecheck** from the **devscripts** package in conjunction with **debmake**.

There are some limitations for what characters may be used as a part of the Debian package. The most notable limitation is the prohibition of uppercase letters in the package name. Here is a summary as a set of regular expressions:

- Upstream package name (**-p**): `[-+.a-z0-9]{2,}`
- Binary package name (**-b**): `[-+.a-z0-9]{2,}`
- Upstream version (**-u**): `[0-9][-+.:~a-z0-9A-Z]*`
- Debian revision (**-r**): `[0-9][+~a-z0-9A-Z]*`

See the exact definition in [Chapter 5 - Control files and their fields](#) in the “Debian Policy Manual”.

debmake assumes relatively simple packaging cases. So all programs related to the interpreter are assumed to be “**Architecture: all**”. This is not always true.

You must adjust the package name and upstream version accordingly for the Debian packaging.

In order to manage the package name and version information effectively under popular tools such as the **aptitude** command, it is a good idea to keep the length of package name to be equal or less than 30 characters; and the total length of version and revision to be equal or less than 14 characters. ¹

In order to avoid name collisions, the user visible binary package name should not be chosen from any generic words.

If upstream does not use a normal versioning scheme such as **2.30.32** but uses some kind of date such as **11Apr29**, a random codename string, or a VCS hash value as part of the version, make sure to remove them from the upstream version. Such information can be recorded in the **debian/changelog** file. If you need to invent a version string, use the **YYMMDD** format such as **20110429** as upstream version. This ensures that the **dpkg** command interprets later versions correctly as upgrades. If you need to ensure a smooth transition to a normal version scheme such as **0.1** in the future, use the **0~YYMMDD** format such as **0~110429** as upstream version, instead.

Version strings can be compared using the **dpkg** command as follows.

```
$ dpkg --compare-versions ver1 op ver2
```

The version comparison rule can be summarized as:

- Strings are compared from the head to the tail.
- Letters are larger than digits.
- Numbers are compared as integers.
- Letters are compared in ASCII code order.

There are special rules for period (**.**), plus (**+**), and tilde (**~**) characters, as follows.

```
0.0 < 0.5 < 0.10 < 0.99 < 1 < 1.0~rc1 < 1.0 < 1.0+b1 < 1.0+nmU1 < 1.1 < 2.0
```

One tricky case occurs when the upstream releases **hello-0.9.12-ReleaseCandidate-99.tar.gz** as the pre-release of **hello-0.9.12.tar.gz**. You can ensure the Debian package upgrade to work properly by renaming the upstream source to **hello-0.9.12~rc99.tar.gz**.

5.3 Native Debian package

The non-native Debian package in the “**3.0 (quilt)**” format is the most normal Debian source package format. The **debian/source/format** file should have “**3.0 (quilt)**” in it as described in **dpkg-source(1)**. The above workflow and the following packaging examples always use this format.

A native Debian package is the rare Debian binary package format. It may be used only when the package is useful and valuable only for Debian. Thus, its use is generally discouraged.

¹For more than 90% of packages, the package name is equal or less than 24 characters; the upstream version is equal or less than 10 characters and the Debian revision is equal or less than 3 characters.

Achtung



A native Debian package is often accidentally built when its upstream tarball is not accessible from the **dpkg-buildpackage** command with its correct name *package_version.orig.tar.gz*. This is a typical newbie mistake caused by making a symlink name with “-” instead of the correct one with “_”.

A native Debian package has no separation between the **upstream code** and the **Debian changes** and consists only of the following:

- *package_version.tar.gz* (copy or symlink of *package-version.tar.gz* with **debian/*** files.)
- *package_version.dsc*

If you need to create a native Debian package, create it in the “**3.0 (native)**” format using **dpkg-source(1)**.

Tipp



Some people promote packaging even programs that have been written only for Debian in the non-native package format. The required tarball without **debian/*** files needs to be manually generated in advance before the standard workflow in Abschnitt 5.1.^a They claim that the use of non-native package format eases communication with the downstream distributions.

^aUse of the “**debmake -t ...**” command can help this workflow. See Abschnitt 6.2.

Tipp



There is no need to create the tarball in advance if the native package format is used. The native Debian package can be created by setting the **debian/source/format** file to “**3.0 (native)**”, setting the **debian/changelog** file to have the version without the Debian revision (**1.0** instead of **1.0-1**), and invoking the “**dpkg-source -b .**” command within the source tree. The tarball containing the source is generated by this.

5.4 debian/rules

The **debian/rules** script is the executable script to build the Debian package.

- The **debian/rules** script re-targets the upstream build system (see Abschnitt 5.16) to install files in the **\$(DESTDIR)** and creates the archive file of the generated files as the **deb** file.
 - The **deb** file is used for the binary distribution and installed to the system using the **dpkg** command.
- The **dh** command is normally used as the front-end to the build system inside the **debian/rules** script.
- **\$(DESTDIR)** path depends on the build type.
 - **\$(DESTDIR)=debian/binarypackage** (single binary package)
 - **\$(DESTDIR)=debian/tmp** (multiple binary package)

5.4.1 dh

The **dh** command from the **debhelper** package with help from its associated packages functions as the wrapper to the typical upstream build systems and offers us uniform access to them by supporting all the Debian policy stipulated targets of the **debian/rules** file.

- **dh clean** : clean files in the source tree.
- **dh build** : build the source tree
- **dh build-arch** : build the source tree for architecture dependent packages
- **dh build-indep** : build the source tree for architecture independent packages
- **dh install** : install the binary files to **\$(DESTDIR)**
- **dh install-arch** : install the binary files to **\$(DESTDIR)** for architecture dependent packages
- **dh install-indep** : install the binary files to **\$(DESTDIR)** for architecture independent packages
- **dh binary** : generate the **deb** file
- **dh binary-arch** : generate the **deb** file for architecture dependent packages
- **dh binary-indep** : generate the **deb** file for architecture independent packages

Anmerkung



For **debhelper** “compat >= 9”, the **dh** command exports compiler flags (**CFLAGS**, **CXXFLAGS**, **FFLAGS**, **CPPFLAGS** and **LDFLAGS**) with values as returned by **dpkg-buildflags** if they are not set previously. (The **dh** command calls **set_buildflags** defined in the **Debian::Debhelper::Dh_Lib** module.)

5.4.2 Simple debian/rules

Thanks to this abstraction of the **dh** command², the Debian policy compliant **debian/rules** file supporting all the required targets can be written as simple as³:

Simple debian/rules:

```
#!/usr/bin/make -f
#export DH_VERBOSE = 1

%:
    dh $@
```

Essentially, this **dh** command functions as the sequencer to call all required **dh_*** commands at the right moment.

Tipp



Setting “**export DH_VERBOSE = 1**” outputs every command that modifies files on the build system. Also it enables verbose build logs for some build systems.

²This simplicity is available since version 7 of the **debhelper** package. This guide assumes the use of **debhelper** version 13 or newer.

³The **debmake** command generates a bit more complicated **debian/rules** file. But this is the core part.

5.4.3 Customized debian/rules

Flexible customization of the **debian/rules** script is realized by adding appropriate **override_dh_*** targets and their rules.

Whenever some special operation is required for a certain **dh_foo** command invoked by the **dh** command, any automatic execution of it can be overridden by adding the makefile target **override_dh_foo** in the **debian/rules** file.

The build process may be customized via the upstream provided interface such as arguments to the standard source build system commands, such as:

- **configure**,
- **Makefile**,
- **setup.py**, or
- **Build.PL**.

If this is the case, you should add the **override_dh_auto_build** target and executing the “**dh_auto_build --arguments**” command. This ensures passing *arguments* to the such build system after the default parameters that **dh_auto_build** usually passes.

Tipp



Please try not to execute the above build system commands directly if they are supported by the **dh_auto_build** command.

The **debmake** command creates the initial template file taking advantage of the above simple **debian/rules** file example while adding some extra customizations for package hardening, etc. You need to know how underlying build systems work under the hood (see Abschnitt 5.16) to address their irregularities using package customization.

- See Abschnitt 4.6 for basic customization of the template **debian/rules** file generated by the **debmake** command.
- See Abschnitt 5.20 for multiarch customization.
- See Abschnitt 5.21 for hardening customization.

5.4.4 Variables for debian/rules

Some variable definitions useful for customizing **debian/rules** can be found in files under **/usr/share/dpkg/**. Notably:

pkg-info.mk **DEB_SOURCE**, **DEB_VERSION**, **DEB_VERSION_EPOCH_UPSTREAM**, **DEB_VERSION_UPSTREAM**, and **DEB_DISTRIBUTION** variables. These are useful for backport support etc..

vendor.mk **DEB_VENDOR** and **DEB_PARENT_VENDOR** variables; and **dpkg_vendor_derives_from** macro. These are useful for vendor support (Debian, Ubuntu, ...).

architecture.mk Set **DEB_HOST_*** and **DEB_BUILD_*** variables. An alternative method of retrieving those variables is to invoke **dpkg-architecture** directly and query the value of a single variable. With explicit invocation of **dpkg-architecture** to retrieve necessary variables, there is no need to include **architecture.mk** in **debian/rules**, which would import all architecture-related variables.

buildflags.mk Set **CFLAGS**, **CPPFLAGS**, **CXXFLAGS**, **OBJCFLAGS**, **OBJCXXFLAGS**, **GCJFLAGS**, **FFLAGS**, **FCFLAGS**, and **LDFLAGS** build flags.

If you wish to use some of these useful variables in **debian/rules**, copy relevant code to **debian/rules** or write a simpler alternative in it. Please keep **debian/rules** simple.

For example, you can add an extra option to **CONFIGURE_FLAGS** for **linux-any** target architectures by adding the followings to **debian/rules**:

```
DEB_HOST_ARCH_OS ?= $(shell dpkg-architecture -qDEB_HOST_ARCH_OS)
...
ifeq ($(DEB_HOST_ARCH_OS),linux)
CONFIGURE_FLAGS += --enable-wayland
endif
```

Tipp



It was useful to include **buildflags.mk** in **debian/rules** to set the build flags such as **CPPFLAGS**, **CFLAGS**, **LDFLAGS**, etc. properly while honoring **DEB_CFLAGS_MAINT_APPEND**, **DEB_BUILD_MAINT_OPTIONS**, etc. for the **debhelper** “compat <= 8”. Now you should use the **debhelper** “compat >= 9”, should not include **buildflags.mk** without specific reasons, and should let the **dh** command set these build flags.

See Abschnitt 5.20, **dpkg-architecture**(1) and **dpkg-buildflags**(1).

5.4.5 Reproducible build

Here are some recommendations to attain a reproducible build result.

- Don’t embed the timestamp based on the system time.
- Use “**dh \$@**” in the **debian/rules** to access the latest **debhelper** features.
- Export the build environment as “**LC_ALL=C.UTF-8**” (see Abschnitt 7.15).
- Set the timestamp used in the upstream source from the value of the debhelper-provided environment variable **\$SOURCE_DATE_EPOCH**.
- Read more at [ReproducibleBuilds](#).
 - [ReproducibleBuilds Howto](#).
 - [ReproducibleBuilds TimestampsProposal](#).

The control file **source-name_source-version_arch.buildinfo** generated by **dpkg-genbuildinfo**(1) records the build environment. See **deb-buildinfo**(5)

5.5 debian/control

The **debian/control** file consists of blocks of meta data separated by a blank line. Each block of meta data defines the following in this order:

- meta data for the Debian source package
- meta data for the Debian binary packages

See [Chapter 5 - Control files and their fields](#) of the “Debian Policy Manual” for the definition of each meta data.

Anmerkung



The **debmake** command sets the **debian/control** file with “**Build-Depends: debhelper-compat (= 13)**” to set the **debhelper** compatibility level.

5.5.1 Split of a Debian binary package

For well behaving build systems, the split of a Debian binary package into small ones can be realized as follows.

- Create binary package entries for all binary packages in the **debian/control** file.
- List all file paths (relative to **debian/tmp**) in the corresponding **debian/binarypackage.install** files.

Please check examples in this guide:

- Abschnitt 8.11 (Autotools based)
- Abschnitt 8.12 (CMake based)

5.5.1.1 debmake -b

The **debmake** command with the **-b** option provides an intuitive and flexible method to create the initial template **debian/control** file defining the split of the Debian binary packages with following stanzas:

- **Package:**
- **Architecture:**
- **Multi-Arch:**
- **Depends:**
- **Pre-Depends:**

The **debmake** command also sets an appropriate set of substvars used in each pertinent dependency stanza. Let's quote the pertinent part from the **debmake** manpage here.

-b "binarypackage[:type],...", --binaryspec "binarypackage[:type],..." set the binary package specs by a comma separated list of *binarypackage:type* pairs, e.g., in the full form "**foo:bin,foo-doc:doc,libfoo1:lib,libfoo-dev:dev**" or in the short form, "**-doc,libfoo1,libfoo-dev**".

Here, *binarypackage* is the binary package name, and the optional *type* is chosen from the following *type* values:

- **bin**: C/C++ compiled ELF binary code package (any, foreign) (default, alias: **""**, i.e., *null-string*)
- **data**: Data (fonts, graphics, ...) package (all, foreign) (alias: **da**)
- **dev**: Library development package (any, same) (alias: **de**)
- **doc**: Documentation package (all, foreign) (alias: **do**)
- **lib**: Library package (any, same) (alias: **l**)
- **perl**: Perl script package (all, foreign) (alias: **pl**)
- **python3**: Python (version 3) script package (all, foreign) (alias: **py3**)
- **ruby**: Ruby script package (all, foreign) (alias: **rb**)
- **nodejs**: Node.js based JavaScript package (all, foreign) (alias: **js**)
- **script**: Shell script package (all, foreign) (alias: **sh**)

The pair values in the parentheses, such as (any, foreign), are the **Architecture** and **Multi-Arch** stanza values set in the **debian/control** file.

In many cases, the **debmake** command makes good guesses for *type* from *binarypackage*. If *type* is not obvious, *type* is set to **bin**. For example, **libfoo** sets *type* to **lib**, and **font-bar** sets *type* to **data**, ...

If the source tree contents do not match settings for *type*, the **debmake** command warns you.

5.5.1.2 Package split scenario and examples

Here are some typical multiarch package split scenarios for the following upstream source examples using the **debmake** command:

- a library source *libfoo-1.0.tar.gz*
- a tool source *bar-1.0.tar.gz* written in a compiled language
- a tool source *baz-1.0.tar.gz* written in an interpreted language

<i>binarypackage</i>	<i>type</i>	Architecture:	Multi-Arch:	Package content
libfoo1	lib*	any	same	the shared library, co-installable
libfoo-dev	dev*	any	same	the shared library header files etc., co-installable
libfoo-tools	bin*	any	foreign	the run-time support programs, not co-installable
libfoo-doc	doc*	all	foreign	the shared library documentation files
<i>bar</i>	bin*	any	foreign	the compiled program files, not co-installable
<i>bar-doc</i>	doc*	all	foreign	the documentation files for the program
<i>baz</i>	script	all	foreign	the interpreted program files

5.5.1.3 The library package name

Let's consider that the upstream source tarball of the **libfoo** library is updated from **libfoo-7.0.tar.gz** to **libfoo-8.0.tar.gz** with a new SONAME major version which affects other packages.

The binary library package must be renamed from **libfoo7** to **libfoo8** to keep the **unstable** suite system working for all dependent packages after the upload of the package based on the **libfoo-8.0.tar.gz**.

Warnung



If the binary library package isn't renamed, many dependent packages in the **unstable** suite become broken just after the library upload even if a binNMU upload is requested. The binNMU may not happen immediately after the upload due to several reasons.

The **-dev** package must follow one of the following naming rules:

- Use the **unversioned -dev** package name: **libfoo-dev**
 - This is the typical one for leaf library packages.
 - Only one version of the library source package is allowed in the archive.
 - * The associated library package needs to be renamed from **libfoo7** to **libfoo8** to prevent dependency breakage in the **unstable** archive during the library transition.
 - This approach should be used if the simple binNMU resolves the library dependency quickly for all affected packages. (**ABI** change by dropping the deprecated **API** while keeping the active API unchanged.)
 - This approach may still be a good idea if manual code updates, etc. can be coordinated and manageable within limited packages. (**API** change)
- Use the **versioned -dev** package names: **libfoo7-dev** and **libfoo8-dev**
 - This is typical for many major library packages.
 - Two versions of the library source packages are allowed simultaneously in the archive.
 - * Make all dependent packages depend on **libfoo-dev**.
 - * Make both **libfoo7-dev** and **libfoo8-dev** provide **libfoo-dev**.
 - * The source package needs to be renamed as **libfoo7-7.0.tar.gz** and **libfoo8-8.0.tar.gz** respectively from **libfoo-?.0.tar.gz**.
 - * The package specific install file path including **libfoo7** and **libfoo8** respectively for header files etc. needs to be chosen to make them co-installable.
 - Do not use this heavy handed approach, if possible.
 - This approach should be used if the update of multiple dependent packages require manual code updates, etc. (**API** change) Otherwise, the affected packages become RC buggy with FTBFS.

Tipp



If the data encoding scheme changes (e.g., latin1 to utf-8), the same care as the API change needs to be taken.

See Abschnitt [5.18](#).

5.5.2 Substvar

The **debian/control** file also defines the package dependency in which the [variable substitutions mechanism](#) (substvar) may be used to free package maintainers from chores of tracking most of the simple package dependency cases. See **deb-substvars(5)**.

The **debmake** command supports the following substvars:

- **\${misc:Depends}** for all binary packages
- **\${misc:Pre-Depends}** for all multiarch packages
- **\${shlibs:Depends}** for all binary executable and library packages
- **\${python:Depends}** for all Python packages
- **\${python3:Depends}** for all Python3 packages
- **\${perl:Depends}** for all Perl packages
- **\${ruby:Depends}** for all Ruby packages

For the shared library, required libraries found simply by **objdump -p /path/to/program | grep NEEDED** are covered by the **shlib** substvar.

For Python and other interpreters, required modules found simply looking for lines with **“import”**, **“use”**, **“require”**, etc., are covered by the corresponding substvars.

For other programs which do not deploy their own substvars, the **misc** substvar covers their dependency.

For POSIX shell programs, there is no easy way to identify the dependency and no substvar covers their dependency.

For libraries and modules required via the dynamic loading mechanism including the [GObject introspection](#) mechanism, there is no easy way to identify the dependency and no substvar covers their dependency.

5.5.3 binNMU safe

A [binNMU](#) is a binary-only non-maintainer upload performed for library transitions etc. In a binNMU upload, only the **“Architecture: any”** packages are rebuilt with a suffixed version number (e.g. version 2.3.4-3 will become 2.3.4-3+b1). The **“Architecture: all”** packages are not built.

The dependency defined in the **debian/control** file among binary packages from the same source package should be safe for the binNMU. This needs attention if there are both **“Architecture: any”** and **“Architecture: all”** packages involved in it.

- **“Architecture: any”** package: depends on **“Architecture: any”** *foo* package
 - **Depends:** *foo* (= **\${binary:Version}**)
- **“Architecture: any”** package: depends on **“Architecture: all”** *bar* package
 - **Depends:** *bar* (= **\${source:Version}**)
- **“Architecture: all”** package: depends on **“Architecture: any”** *baz* package
 - **Depends:** *baz* (>= **\${source:Version}**), *baz* (<< **\${source:Version}.0~**)

5.6 debian/changelog

The **debian/changelog** file records the Debian package history and defines the upstream package version and the Debian revision in its first line. The changes need to be documented in the specific, formal, and concise style.

- Even if you are uploading your package by yourself, you must document all non-trivial user-visible changes such as:
 - the security related bug fixes.
 - the user interface changes.
- If you are asking your sponsor to upload it, you should document changes more comprehensively, including all packaging related ones, to help reviewing your package.
 - The sponsor shouldn't second guess your thought behind your package.
 - The sponsor's time is more valuable than yours.

The **debmake** command creates the initial template file with the upstream package version and the Debian revision. The distribution is set to **UNRELEASED** to prevent accidental upload to the Debian archive.

The **debchange** command (alias **dch**) is commonly used to edit this.

Tipp



You can edit the **debian/changelog** file manually with any text editor as long as you follow the formatting convention used by the **debchange** command.

Tipp



The date string used in the **debian/changelog** file can be manually generated by the "**LC_ALL=C date -R**" command.

This is installed in the **/usr/share/doc/binarypackage** directory as **changelog.Debian.gz** by the **dh_installchangelogs** command.

The upstream changelog is installed in the **/usr/share/doc/binarypackage** directory as **changelog.gz**.

The upstream changelog is automatically found by the **dh_installchangelogs** using the case insensitive match of its file name to **changelog**, **changes**, **changelog.txt**, **changes.txt**, **history**, **history.txt**, or **changelog.md** and searched in the **./ doc/** or **docs/** directories.

After finishing your packaging and verifying its quality, please execute the "**dch -r**" command and save the finalized **debian/changelog** file with the distribution normally set to **unstable**.⁴ If you are packaging for backports, security updates, LTS, etc., please use the appropriate distribution names instead.

5.7 debian/copyright

Debian takes the copyright and license matters very seriously. The "Debian Policy Manual" enforces having a summary of them in the **debian/copyright** file in the package.

You should format it as a [machine-readable debian/copyright file](#) (DEP-5).

Achtung



The **debian/copyright** file should be sorted to keep the generic file patterns at the top of the list. See Abschnitt 6.4.

⁴If you are using the **vim** editor, make sure to save this with the "**:wq**" command.

The **debmake** command creates the initial DEP-5 compatible template file by scanning the entire source tree. It uses an internal license checker to classify each license text.⁵

Unless specifically requested to be pedantic with the **-P** option, the **debmake** command skips reporting for auto-generated files with permissive licenses to be practical.

Anmerkung



If you find issues with this license checker, please file a bug report to the **debmake** package with the problematic part of text containing the copyright and license.

Anmerkung



The **debmake** command focuses on bunching up same copyright and license claims in detail to create template for **debian/copyright**. In order to do this within reasonable time, it only picks the first section which looks like copyright and license claims. So its license assignment may not be optimal. Please also use other tools such as **licensecheck**.

Tipp



You are highly encouraged to check the license status with the **licensecheck(1)** command and, as needed, with your manual code review.

5.8 debian/patches/*

The **-p1** patches in the **debian/patches/** directory are applied in the sequence defined in the **debian/patches/series** file to the upstream source tree before the **build** process.

Anmerkung



The native Debian package (see Abschnitt 5.3) doesn't use these files.

There are several methods to prepare a series of **-p1** patches.

- The **diff** command
 - See Abschnitt 4.8.1
 - Primitive but versatile method
 - * Patches may come from other distros, mailing list postings, or cherry-picked patches from the upstream **git** repository with the “**git format-patches**” command
 - Missing the **.pc/** directory
 - Unmodified upstream source tree
 - Manually update the **debian/patches/series** file
- The **dquilt** command

⁵The **licensecheck** command from the **devscripts** package was referenced to make this internal checker. Now the **licensecheck** command is provided in an independent **licensecheck** package with a lot of improvements.

- See Abschnitt 3.4
- Basic convenient method
- Proper generation of the **.pc/** directory data
- Modified upstream source tree
- The “**dpkg-source --commit**” command
 - See Abschnitt 4.8.3
 - Newer elegant method
 - Proper generation of the **.pc/** directory data
 - Modified upstream source tree
- The automatic patch generation by the **dpkg-buildpackage**
 - See Abschnitt 5.14
 - Add **single-debian-patch** in the **debian/source/local-options** file
 - Set the **debian/source/local-patch-header** file
 - Missing the **.pc/** directory
 - Modified upstream source tree in the Debian branch (**master**)
- The **gbp-pq** command
 - basic **git** work flow with the **git-buildpackage** package
 - Missing the **.pc/** directory
 - Modified upstream source tree in the throw-away branch (**patch-queue/master**)
 - Unmodified upstream source tree in the Debian branch (**master**)
- The **gbp-dpm** command
 - more elaborate **git** work flow with the **git-dpm** package
 - Missing the **.pc/** directory
 - Modified upstream source tree in the patched branch (**patched/whatever**)
 - Unmodified upstream source tree in the Debian branch (**master/whatever**)

Wherever these patches come from, it is a good idea to tag them with a [DEP-3](#) compatible header.

Tipp



The **dggit** package offers an alternative git integration tool with the Debian package archive.

5.8.1 dpkg-source -x

The “**dpkg-source -x**” command unpacks the Debian source package.

It normally applies the patches in the **debian/patches/** directory to the source tree and records the patch state in the **.pc/** directory.

If you wish to keep the source tree unmodified (for example, for use in Abschnitt 5.13), please use the **--skip-patches** option.

5.8.2 dquilt and dpkg-source

The **quilt** command (or its wrapped **dquilt** command) was needed to manage the **-p1** patches in the **debian/patches/** directory before the **--commit** feature was added to the **dpkg-source** command in 1.16.1.

The patches should apply cleanly when using the **dpkg-source** command. Thus you can't just copy the patches to the new packaging of the new upstream release if there are patch offsets, etc.

The **dquilt** command (see Abschnitt 3.4) is more forgiving. You can normalize the patches by the **dquilt** command.

```
$ while dquilt push; do dquilt refresh ; done
$ dquilt pop -a
```

There is one advantage of using the **dpkg-source** command over the **dquilt** command. While the **dquilt** command cannot handle modified binary files automatically, the **dpkg-source** command detects modified binary files and lists them in the **debian/source/include-binaries** file to include them in the Debian tarball.

5.9 debian/upstream/signing-key.asc

Some packages are signed by a GPG key.

For example, **GNU hello** can be downloaded via HTTP from <https://ftp.gnu.org/gnu/hello/>. There are sets of files:

- **hello-version.tar.gz** (upstream source)
- **hello-version.tar.gz.sig** (detached signature)

Let's pick the latest version set.

```
$ wget https://ftp.gnu.org/gnu/hello/hello-2.9.tar.gz
...
$ wget https://ftp.gnu.org/gnu/hello/hello-2.9.tar.gz.sig
...
$ gpg --verify hello-2.9.tar.gz.sig
gpg: Signature made Thu 10 Oct 2013 08:49:23 AM JST using DSA key ID 80EE4A00
gpg: Can't check signature: public key not found
```

If you know the public GPG key of the upstream maintainer from the mailing list, use it as the **debian/upstream/signing-key.asc** file. Otherwise, use the hkp keyserver and check it via your [web of trust](#).

```
$ gpg --keyserver hkp://keys.gnupg.net --recv-key 80EE4A00
gpg: requesting key 80EE4A00 from hkp server keys.gnupg.net
gpg: key 80EE4A00: public key "Reuben Thomas <rtr@sc3d.org>" imported
gpg: no ultimately trusted keys found
gpg: Total number processed: 1
gpg:      imported: 1
$ gpg --verify hello-2.9.tar.gz.sig
gpg: Signature made Thu 10 Oct 2013 08:49:23 AM JST using DSA key ID 80EE4A00
gpg: Good signature from "Reuben Thomas <rtr@sc3d.org>"
...
Primary key fingerprint: 9297 8852 A62F A5E2 85B2 A174 6808 9F73 80EE 4A00
```

Tipp



If your network environment blocks access to the HKP port **11371**, use **"hkp://keyserver.ubuntu.com:80"** instead.

After confirming the key ID **80EE4A00** is a trustworthy one, download its public key into the **debian/upstream/signing-key.asc** file.

```
$ gpg --armor --export 80EE4A00 >debian/upstream/signing-key.asc
```

Then set the corresponding **debian/watch** file as follows.

```
version=4
pgpsigurlmangle=s/$/.sig/ https://ftp.gnu.org/gnu/hello/ hello-(\d[\d.]*)\.tar ↵
\.(?:gz|bz2|xz)
```

Now the **uscan** command will check the authenticity of the package using the GPG signature.

5.10 debian/watch and DFSG

Debian takes software freedom seriously and follows the [DFSG](#).

The non-[DFSG](#) components in the upstream source tarball can be easily removed when the **uscan** command is used to update the Debian package.

- List the files to be removed in the **Files-Excluded** stanza of the **debian/copyright** file.
- List the URL to download the upstream tarball in the **debian/watch** file.
- Run the **uscan** command to download the new upstream tarball.
 - Alternatively, use the “**gbp import-orig --uscan --pristine-tar**” command.
- The resulting tarball has the version number with an additional suffix **+dfsg**.

5.11 Other debian/* Files

Optional configuration files may be added under the **debian/** directory. Most of them are to control **dh_*** commands offered by the **debhelper** package but there are some for **dpkg-source**, **lintian** and **gbp** commands.

Tipp



Check **debhelper(7)** for the latest available set of the **dh_*** commands.

These **debian/binarypackage.*** files provide very powerful means to set the installation path of files. Even an upstream source without its build system can be packaged just by using these files. See Abschnitt 8.2 as an example.

The “^{x[1234]}” superscript notation that appears in the following list indicates the minimum value for the **debmake -x** option that will generate the associated template file. See Abschnitt 6.6 or **debmake(1)** for details.

Here is the alphabetical list of notable optional configuration files.

binarypackage.bug-control^{-x3} installed as **usr/share/bug/binarypackage/control** in *binarypackage*. See Abschnitt 5.24.

binarypackage.bug-presubj^{-x3} installed as **usr/share/bug/binarypackage/presubj** in *binarypackage*. See Abschnitt 5.24.

binarypackage.bug-script^{-x3} installed as **usr/share/bug/binarypackage** or **usr/share/bug/binarypackage/script** in *binarypackage*. See Abschnitt 5.24.

binarypackage.bash-completion List bash completion scripts to be installed.

The **bash-completion** package is required for both build and user environments.

See **dh_bash-completion(1)**.

clean^{-x2} List files that should be removed but are not cleaned by the **dh_auto_clean** command.

See **dh_auto_clean(1)** and **dh_clean(1)**.

compat^{-x3} Precisely, this set the **debhelper** compatibility level.

Now, use **Build-Depends: debhelper-compat (= 13)** in **debian/control** to specify the compatibility level.

See “COMPATIBILITY LEVELS” in **debhelper(8)**.

binarypackage.conf No need for this file under “compat ≥ 3 ” since all files in the **etc/** directory are conffiles.

If the program you’re packaging requires every user to modify the configuration files in the **/etc** directory, there are two popular ways to arrange for them not to be conffiles, keeping the **dpkg** command happy and quiet.

- Create a symlink under the **/etc** directory pointing to a file under the **/var** directory generated by the maintainer scripts.
- Create a file generated by the maintainer scripts under the **/etc** directory.

See **dh_installdeb(1)**.

binarypackage.config This is the **debconf config** script used for asking any questions necessary to configure the package. See Abschnitt [5.19](#).

binarypackage.cron.hourly ^{-x3} Installed into the **etc/cron/hourly/binarypackage** file in *binarypackage*.

See **dh_installcron(1)** and **cron(8)**.

binarypackage.cron.daily ^{-x3} Installed into the **etc/cron/daily/binarypackage** file in *binarypackage*.

See **dh_installcron(1)** and **cron(8)**.

binarypackage.cron.weekly ^{-x3} Installed into the **etc/cron/weekly/binarypackage** file in *binarypackage*.

See **dh_installcron(1)** and **cron(8)**.

binarypackage.cron.monthly ^{-x3} Installed into the **etc/cron/monthly/binarypackage** file in *binarypackage*.

See **dh_installcron(1)** and **cron(8)**.

binarypackage.cron.d ^{-x3} Installed into the **etc/cron.d/binarypackage** file in *binarypackage*.

See **dh_installcron(1)**, **cron(8)**, and **crontab(5)**.

binarypackage.default ^{-x3} If this exists, it is installed into **etc/default/binarypackage** in *binarypackage*.

See **dh_installinit(1)**.

binarypackage.dirs ^{-x3} List directories to be created in *binarypackage*.

See **dh_installdirs(1)**.

Usually, this is not needed since all **dh_install*** commands create required directories automatically. Use this only when you run into trouble.

binarypackage.doc-base ^{-x2} Installed as the **doc-base** control file in *binarypackage*.

See **dh_installdocs(1)** and [Debian doc-base Manual](#) provided by the **doc-base** package.

binarypackage.docs ^{-x2} List documentation files to be installed in *binarypackage*.

See **dh_installdocs(1)**.

binarypackage.emacsen-compat ^{-x3} Installed into **usr/lib/emacsen-common/packages/compat/binarypackage** in *binarypackage*.

See **dh_installemacsen(1)**.

binarypackage.emacsen-install ^{-x3} Installed into **usr/lib/emacsen-common/packages/install/binarypackage** in *binarypackage*.

See **dh_installemacsen(1)**.

binarypackage.emacsen-remove ^{-x3} Installed into **usr/lib/emacsen-common/packages/remove/binarypackage** in *binarypackage*.

See **dh_installemacsen(1)**.

binarypackage.emacsen-startup ^{-x3} Installed into **usr/lib/emacsen-common/packages/startup/binarypackage** in *binarypackage*.

See **dh_installemacsen(1)**.

binarypackage.examples ^{-x2} List example files or directories to be installed into **usr/share/doc/binarypackage/examples/** in *binarypackage*.

See **dh_installexamples(1)**.

gbp.conf If this exists, it functions as the configuration file for the **gbp** command.

See **gbp.conf(5)**, **gbp(1)**, and **git-buildpackage(1)**.

binarypackage.info ^{-x2} List info files to be installed in *binarypackage*.

See **dh_installinfo(1)**.

binarypackage.init ^{-x3} Installed into **etc/init.d/binarypackage** in *binarypackage*.

See **dh_installinit(1)**.

binarypackage.install ^{-x2} List files which should be installed but are not installed by the **dh_auto_install** command.

See **dh_install(1)** and **dh_auto_install(1)**.

license-examples/* ^{-x4} These are copyright file examples generated by the **debmake** command. Use these as the reference for making the **copyright** file.

Please make sure to erase these files.

binarypackage.links ^{-x2} List pairs of source and destination files to be symlinked. Each pair should be put on its own line, with the source and destination separated by whitespace.

See **dh_link(1)**.

binarypackage.lintian-overrides ^{-x3} Installed into **usr/share/lintian/overrides/binarypackage** in the package build directory. This file is used to suppress erroneous **lintian** diagnostics.

See **dh_lintian(1)**, **lintian(1)** and [Lintian User's Manual](#).

manpage.* ^{-x3} These are manpage template files generated by the **debmake** command. Please rename these to appropriate file names and update their contents.

Debian Policy requires that each program, utility, and function should have an associated manual page included in the same package. Manual pages are written in **nroff(1)**.

If you are new to making a manpage, use **manpage.asciidoc** or **manpage.1** as the starting point.

binarypackage.manpages ^{-x2} List man pages to be installed.

See **dh_installman(1)**.

binarypackage.menu (deprecated, no more installed) [tech-ctte #741573](#) decided "Debian should use **.desktop** files as appropriate".

Debian menu file installed into **usr/share/menu/binarypackage** in *binarypackage*.

See **menufile(5)** for its format. See **dh_installmenu(1)**.

NEWS Installed into **usr/share/doc/binarypackage/NEWS.Debian**.

See **dh_installchangelogs(1)**.

patches/* Collection of **-p1** patch files which are applied to the upstream source before building the source.

See **dpkg-source(1)**, [Abschnitt 3.4](#) and [Abschnitt 4.8](#).

No patch files are generated by the **debmake** command.

patches/series ^{-x1} The application sequence of the **patches/*** patch files.

binarypackage.preinst ^{-x2}, **binarypackage.postinst** ^{-x2}, **binarypackage.prerm** ^{-x2}, **binarypackage.postrm** ^{-x2} These maintainer scripts are installed into the **DEBIAN** directory.

Inside the scripts, the token **#DEBHELPER#** is replaced with shell script snippets generated by other **debhelper** commands.

See **dh_installdeb(1)** and [Chapter 6 - Package maintainer scripts and installation procedure](#) in the "Debian Policy Manual".

See also **debconf-devel(7)** and [3.9.1 Prompting in maintainer scripts](#) in the "Debian Policy Manual".

README.Debian ^{-x1} Installed into the first binary package listed in the **debian/control** file as **usr/share/doc/binarypackage/README.Debian**.

See **dh_installdocs(1)**.

This file provides the information specific to the Debian package.

binarypackage.service ^{-x3} If this exists, it is installed into **lib/systemd/system/binarypackage.service** in *binarypackage*.

See **dh_systemd_enable(1)**, **dh_systemd_start(1)**, and **dh_installinit(1)**.

source/format ^{-x1} The Debian package format.

- Use “**3.0 (quilt)**” to make this non-native package (recommended)
- Use “**3.0 (native)**” to make this native package

See “SOURCE PACKAGE FORMATS” in **dpkg-source(1)**.

source/lintian-overrides or **source.lintian-overrides** ^{-x3} These files are not installed, but will be scanned by the **lintian** command to provide overrides for the source package.

See **dh_lintian(1)** and **lintian(1)**.

source/local-options ^{-x1} The **dpkg-source** command uses this content as its options. Notable options are:

- **unapply-patches**
- **abort-on-upstream-changes**
- **auto-commit**
- **single-debian-patch**

This is not included in the generated source package and is meant to be committed to the VCS of the maintainer.

See “FILE FORMATS” in **dpkg-source(1)**.

source/local-patch-header Free form text that is put on top of the automatic patch generated.

This is not included in the generated source package and is meant to be committed to the VCS of the maintainer.

+ See “FILE FORMATS” in **dpkg-source(1)**.

binarypackage.symbols ^{-x2} The symbols files, if present, are passed to the **dpkg-gensymbols** command to be processed and installed.

See **dh_makeshlibs(1)** and Abschnitt 5.18.1..

binarypackage.templates This is the **debconf templates** file used for asking any questions necessary to configure the package. See Abschnitt 5.19.

tests/control This is the RFC822-style test meta data file defined in DEP-8. See **autopkgtest(1)** and Abschnitt 5.22.

TODO Installed into the first binary package listed in the **debian/control** file as **usr/share/doc/binarypackage/TODO.Debian**.

See **dh_installdocs(1)**.

binarypackage.tmpfile ^{-x3} If this exists, it is installed into **usr/lib/tmpfiles.d/binarypackage.conf** in *binarypackage*.

See **dh_systemd_enable(1)**, **dh_systemd_start(1)**, and **dh_installinit(1)**.

binarypackage.upstart ^{-x3} If this exists, it is installed into **etc/init/package.conf** in the package build directory. (deprecated)

See **dh_installinit(1)** and Abschnitt 8.1.

watch ^{-x1} The control file for the **uscan** command to download the latest upstream version.

This control file may be configured to verify the authenticity of the tarball using its GPG signature (see Abschnitt 5.9).

See Abschnitt 5.10 and **uscan(1)**.

Here are a few reminders for the above list.

- For a single binary package, the *binarypackage.* part of the filename in the list may be removed.
- For a multi binary package, a configuration file missing the *binarypackage.* part of the filename is applied to the first binary package listed in the **debian/control**.
- When there are many binary packages, their configurations can be specified independently by prefixing their name to their configuration filenames such as *package-1.install*, *package-2.install*, etc.
- Some template configuration files may not be created by the **debmake** command. In such cases, you need to create them with an editor.
- Unusual configuration template files generated by the **debmake** command with an extra **.ex** suffix need to be activated by removing that suffix.
- Unused configuration template files generated by the **debmake** command should be removed.
- Copy configuration template files as needed to the filenames matching their pertinent binary package names.

5.12 Customization of the Debian packaging

Let's recap the customization of the Debian packaging.

All customization data for the Debian package resides in the **debian/** directory. A simple example is given in Abschnitt 4.6. Normally, this customization involves a combination of the following:

- The Debian package build system can be customized through the **debian/rules** file (see Abschnitt 5.4.3).
- The Debian package installation path etc. can be customized through the addition of configuration files such as *package.install* and *package.docs* in the **debian/** directory for the **dh_*** commands from the **debhelper** package (see Abschnitt 5.11).

When these are not sufficient to make a good Debian package, modifications to the upstream source recorded as the **-p1** patches in the **debian/patches/** directory is deployed. These patches are applied in the sequence defined in the **debian/patches/series** file before building the package (see Abschnitt 5.8). Simple examples are given in Abschnitt 4.8.

You should address the root cause of the Debian packaging problem by the least invasive way. The generated package shall be more robust for future upgrades in this way.

Anmerkung



Send the patch addressing the root cause to the upstream maintainer if it is useful to the upstream.

5.13 Recording in VCS (standard)

Typically, **Git** is used as the **VCS** to record the Debian packaging activity with the following branches.

- **master** branch
 - Record the source tree used for the Debian packaging.
 - The upstream portion of the source tree is recorded unmodified.
 - The upstream modifications for the Debian packaging are recorded in the **debian/patches/** directory as the **-p1** patches.
- **upstream** branch
 - Record the upstream source tree untarred from the released upstream tarball.

Tipp



It's a good idea to add to the **.gitignore** file the listing **.pc**.

Tipp



Add **unapply-patches** and **abort-on-upstream-changes** lines to the **debian/source/local-options** file to keep the upstream portion unmodified.

Tipp



You may also track the upstream VCS data with a branch different from the **upstream** branch to ease cherry-picking of patches.

5.14 Recording in VCS (alternative)

You may not wish to keep up with creating the **-p1** patch files for all upstream changes needed. You can record the Debian packaging activity with the following branches.

- **master** branch
 - Record the source tree used for the Debian packaging.
 - The upstream portion of the source tree is recorded with modifications for the Debian packaging.
- **upstream** branch
 - Record the upstream source tree untarred from the released upstream tarball.

Adding a few extra files in the **debian/** directory enables you to do this.

```
$ tar -xvzf <package-version>.tar.gz
$ ln -sf <package_version>.orig.tar.gz
$ cd <package-version>/
... hack...hack...
$ echo "single-debian-patch" >> debian/source/local-options
$ cat >debian/source/local-patch-header <<END
This patch contains all the Debian-specific changes mixed
together. To review them separately, please inspect the VCS
history at https://git.debian.org/?=collab-maint/foo.git.
```

Let the **dpkg-source** command invoked by the Debian package build process (**dpkg-buildpackage**, **debuild**, ...) generate the **-p1** patch file **debian/patches/debian-changes** automatically.

Tipp



This approach can be adopted for any VCS tools. Since this approach merges all changes into a merged patch, it is desirable to keep the VCS data publicly accessible.

Tipp



The **debian/source/local-options** and **debian/source/local-patch-header** files are meant to be recorded in the VCS. These aren't included in the Debian source package.

5.15 Building package without extraneous contents

There are a few cases which cause the inclusion of undesirable contents in the generated Debian source package.

- The upstream source tree may be placed under the version control system. When the package is rebuilt from this source tree, the generated Debian source package contains extraneous contents from the version control system files.
- The upstream source tree may contain some auto-generated files. When the package is rebuilt from this source tree, the generated Debian source package contains extraneous contents from the auto-generated files.

Normally, the **-i** and **-I** options set in Abschnitt 3.5 for the **dpkg-source** command should avoid these. Here, the **-i** option is aimed at the non-native package while the **-I** is aimed at the native package. See **dpkg-source(1)** and the “**dpkg-source --help**” output.

There are several methods to avoid inclusion of undesirable contents.

5.15.1 Fix by **debian/rules clean**

The problem of extraneous contents can be fixed by removing such files in the “**debian/rules clean**” target. This is also useful for auto-generated files.

Anmerkung



The “**debian/rules clean**” target is called before the “**dpkg-source --build**” command by the **dpkg-buildpackage** command and the “**dpkg-source --build**” command ignores removed files.

5.15.2 Fix using VCS

The problem of extraneous contents can be fixed by restoring the source tree by committing the source tree to the VCS before the first build.

You can restore the source tree before the second package build. For example:

```
$ git reset --hard
$ git clean -dfx
$ debuild
```

This works because the **dpkg-source** command ignores the contents of the typical VCS files in the source tree with the **DEBUILD_DPKG_BUILDPACKAGE_OPTS** setting in Abschnitt 3.5.

Tipp



If the source tree is not managed by a VCS, you should run “**git init; git add -A .; git commit**” before the first build.

5.15.3 Fix by extend-diff-ignore

This is for a non-native package.

The problem of extraneous diffs can be fixed by ignoring changes made to parts of the source tree by adding the “**extend-diff-ignore=...**” line in the **debian/source/options** file.

For excluding the **config.sub**, **config.guess** and **Makefile** files:

```
# Don't store changes on autogenerated files
extend-diff-ignore = "(^|/)(config\.sub|config\.guess|Makefile)$"
```

Anmerkung



This approach always works, even when you can't remove the file. So it saves you having to make a backup of the unmodified file just to be able to restore it before the next build.

Tipp



If the **debian/source/local-options** file is used instead, you can hide this setting from the generated source package. This may be useful when the local non-standard VCS files interfere with your packaging.

5.15.4 Fix by tar-ignore

This is for a native package.

You can exclude some files in the source tree from the generated tarball by tweaking the file glob by adding the “**tar-ignore=...**” lines in the **debian/source/options** or **debian/source/local-options** files.

Anmerkung



If, for example, the source package of a native package needs files with the file extension **.o** as a part of the test data, the setting in Abschnitt 3.5 is too aggressive. You can work around this problem by dropping the **-I** option for **DEB_BUILD_DPKG_BUILDPACKAGE_OPTS** in Abschnitt 3.5 while adding the “**tar-ignore=...**” lines in the **debian/source/local-options** file for each package.

5.16 Upstream build systems

Upstream build systems are designed to go through several steps to install generated binary files to the system from the source distribution.

Tipp



Before attempting to make a Debian package, you should become familiar with the upstream build system of the upstream source code and try to build it.

5.16.1 Autotools

Autotools (**autoconf** + **automake**) has 4 steps.

1. set up the build system (“**vim configure.ac Makefile.am**” and “**autoreconf -ivf**”)
2. configure the build system (“**./configure**”)
3. build the source tree (“**make**”)
4. install the binary files (“**make install**”)

The upstream maintainer usually performs step 1 and builds the upstream tarball for distribution using the “**make dist**” command. (The generated tarball contains not only the pristine upstream VCS contents but also other generated files.)

The package maintainer needs to take care of steps 2 to 4 at least. This is realized by the “**dh \$@ --with autotools-dev**” command used in the **debian/rules** file.

The package maintainer may wish to take care all steps 1 to 4. This is realized by the “**dh \$@ --with autoreconf**” command used in the **debian/rules** file. This rebuilds all auto-generated files to the latest version and provides better support for porting to the newer architectures.

For **compat** level **10** or newer, the simple “**dh \$@**” command without “**--with autoreconf**” option can take care all steps 1 to 4, too.

If you wish to learn more on Autotools, please see:

- [GNU Automake documentation](#)
- [GNU Autoconf documentation](#)
- [Autotools Tutorial](#)
- [Introduction to the autotools \(autoconf, automake, and libtool\)](#)
- [Autotools Mythbuster](#)

5.16.2 CMake

CMake has 4 steps.

1. set up the build system (“**vim CMakeLists.txt config.h.in**”)
2. configure the build system (“**cmake**”)
3. build the source tree (“**make**”)
4. install the binary files (“**make install**”)

The upstream tarball contains no auto-generated files and is generated by the **tar** command after step 1.

The package maintainer needs to take care of steps 2 to 4.

If you wish to learn more on the CMake, please see:

- [CMake](#)
- [CMake tutorial](#)

5.16.3 Python distutils

Python distutils has 3 steps.

1. set up and configure the build system (“**vim setup.py**”)
2. build the source tree (“**python setup.py build**”)
3. install the binary files (“**python setup.py install**”)

The upstream maintainer usually performs step 1 and builds the upstream tarball for distribution using the “**python setup.py sdist**” command.

The package maintainer needs to take care of step 2. This is realized simply by the “**dh \$@**” command used in the **debian/rules** file, after **jessie**.

The situation of other build systems, such as CMake, are very similar to this Python one.

If you wish to learn more on Python3 and **distutils**, please see:

- [Python3](#)
- [distutils](#)

5.17 Debugging information

The Debian package is built with the debugging information but packaged into the binary package after stripping the debugging information as required by [Chapter 10 - Files](#) of the “Debian Policy Manual”.

See

- [6.7.9. Best practices for debug packages](#) of the “Debian Developer’s Reference”.
- [18.2 Debugging Information in Separate Files](#) of the “Debugging with gdb”
- **dh_strip(1)**
- **strip(1)**
- **readelf(1)**
- **objcopy(1)**
- Debian wiki [DebugPackage](#)
- Debian wiki [AutomaticDebugPackages](#)
- Debian debian-devel post: [Status on automatic debug packages](#) (2015-08-15)

5.17.1 New -dbgsym package (Stretch 9.0 and after)

The debugging information is automatically packaged separately as the debug package using the **dh_strip** command with its default behavior. The name of such a debug package normally has the **-dbgsym** suffix.

If there were no **-dbg** packages defined in the **debian/control** file, no special care is needed for updating the package after the Stretch 9.0 release.

- The **debian/rules** file shouldn’t explicitly contain **dh_strip**.
- Remove **debian/compat**.
- Set the **Build-Depends** to **debhelper-compat (>=13)** while removing **Build-Depends** to **debhelper** in **debian/control**.

If there were **-dbg** packages defined in the **debian/control** file, following care is needed for updating the old package after the Stretch 9.0 release.

- Drop definition entries of such **-dbg** packages in the **debian/control** file.
- Replace “**dh_strip --dbg-package=package**” with “**dh_strip --dbgsym-migration=package**” in the **debian/rules** file to avoid file conflicts with the (now obsolete) **-dbg** package. See **dh_strip(1)**.
- Remove **debian/compat**.
- Set the **Build-Depends** to **debhelper-compat (>=13)** while removing **Build-Depends** to **debhelper** in **debian/control**.

5.18 Library package

Packaging library software requires you to perform much more work than usual. Here are some reminders for packaging library software:

- The library binary package must be named as in Abschnitt 5.5.1.3.
- Debian ships shared libraries such as `/usr/lib/<triplet>/libfoo-0.1.so.1.0.0` (see Abschnitt 5.20).
- Debian encourages using versioned symbols in the shared library (see Abschnitt 5.18.1).
- Debian doesn't ship `*.la` libtool library archive files.
- Debian discourages using and shipping `*.a` static library files.

Before packaging shared library software, see:

- [Chapter 8 - Shared libraries](#) of the “Debian Policy Manual”
- [10.2 Libraries](#) of the “Debian Policy Manual”
- [6.7.2. Libraries](#) of the “Debian Developer's Reference”

For the historic background study, see:

- [Escaping the Dependency Hell](#) ⁶
 - This encourages having versioned symbols in the shared library.
- [Debian Library Packaging guide](#) ⁷
 - Please read the discussion thread following [its announcement](#), too.

5.18.1 Library symbols

The symbols support in **dpkg** introduced in Debian **lenny** (5.0, May 2009) helps us to manage the backward ABI compatibility of the library package with the same package name. The **DEBIAN/symbols** file in the binary package provides the minimal version associated with each symbol.

An oversimplified method for the library packaging is as follows.

- Extract the old **DEBIAN/symbols** file of the immediate previous binary package with the “**dpkg-deb -e**” command.
 - Alternatively, the **mc** command may be used to extract the **DEBIAN/symbols** file.
- Copy it to the **debian/binarypackage.symbols** file.
 - If this is the first package, use an empty content file instead.
- Build the binary package.
 - If the **dpkg-gensymbols** command warns about some new symbols:
 - * Extract the updated **DEBIAN/symbols** file with the “**dpkg-deb -e**” command.
 - * Trim the Debian revision such as **-1** in it.
 - * Copy it to the **debian/binarypackage.symbols** file.
 - * Re-build the binary package.
 - If the **dpkg-gensymbols** command does not warn about new symbols:
 - * You are done with the library packaging.

For the details, you should read the following primary references.

⁶This document was written before the introduction of the **symbols** file.

⁷The strong preference is to use the SONAME versioned **-dev** package names over the single **-dev** package name in [Chapter 6. Development \(-DEV\) packages](#), which does not seem to be shared by the former ftp-master (Steve Langasek). This document was written before the introduction of the **multiarch** system and the **symbols** file.

- [8.6.3 The symbols system](#) of the “Debian Policy Manual”
- **dh_makeshlibs**(1)
- **dpkg-gensymbols**(1)
- **dpkg-shlibdeps**(1)
- **deb-symbols**(5)

You should also check:

- Debian wiki [UsingSymbolsFiles](#)
- Debian wiki [Projects/ImprovedDpkgShlibdeps](#)
- Debian kde team [Working with symbols files](#)
- Abschnitt [8.11](#)
- Abschnitt [8.12](#)

Tipp



For C++ libraries and other cases where the tracking of symbols is problematic, follow [8.6.4 The shlibs system](#) of the “Debian Policy Manual”, instead. Please make sure to erase the empty **debian/binarypackage.symbols** file generated by the **debmake** command. For this case, the **DEBIAN/shlibs** file is used.

5.18.2 Library transition

When you package a new library package version which affects other packages, you must file a transition bug report against the **release.debian.org** pseudo package using the **reportbug** command with the [ben file](#) and wait for the approval for its upload from the [Release Team](#).

Release team has the [transition tracker](#). See [Transitions](#).

Achtung



Please make sure to rename binary packages as in Abschnitt [5.5.1.3](#).

5.19 debconf

The **debconf** package enables us to configure packages during their installation in 2 main ways:

- non-interactively from the **debian-installer** pre-seeding.
- interactively from the menu interface (**dialog**, **gnome**, **kde**, ...)
- the package installation: invoked by the **dpkg** command
- the installed package: invoked by the **dpkg-reconfigure** command

All user interactions for the package installation must be handled by this **debconf** system using the following files.

- **debian/binarypackage.config**
 - This is the **debconf config** script used for asking any questions necessary to configure the package.

- **debian/binarypackage.template**

- This is the **debconf templates** file used for asking any questions necessary to configure the package.

- package configuration scripts

- **debian/binarypackage.preinst**
- **debian/binarypackage.prerm**
- **debian/binarypackage.postinst**
- **debian/binarypackage.postrm**

See **dh_installdebconf(1)**, **debconf(7)**, **debconf-devel(7)** and [3.9.1 Prompting in maintainer scripts](#) in the “Debian Policy Manual”.

5.20 Multiarch

Multiarch support for cross-architecture installation of binary packages (particularly **i386** and **amd64**, but also other combinations) in the **dpkg** and **apt** packages introduced in Debian **wheezy** (7.0, May 2013), demands that we pay extra attention to packaging.

You should read the following references in detail.

- Ubuntu wiki (upstream)
 - [MultiarchSpec](#)
- Debian wiki (Debian situation)
 - [Debian multiarch support](#)
 - [Multiarch/Implementation](#)

The multiarch is enabled by using the **<triplet>** value such as **i386-linux-gnu** and **x86_64-linux-gnu** in the install path of shared libraries as **/usr/lib/<triplet>/**, etc..

- The **<triplet>** value required internally by **debhelper** scripts is implicitly set in themselves. The maintainer doesn’t need to worry.
- The **<triplet>** value used in **override_dh_*** target scripts must be explicitly set in the **debian/rules** file by the maintainer. The **<triplet>** value is stored in the **\$(DEB_HOST_MULTIARCH)** variable in the following **debian/rules** snippet example:

```
DEB_HOST_MULTIARCH = $(shell dpkg-architecture -qDEB_HOST_MULTIARCH)
...
override_dh_install:
    mkdir -p package1/lib/$(DEB_HOST_MULTIARCH)
    cp -dR tmp/lib/. package1/lib/$(DEB_HOST_MULTIARCH)
```

See:

- Abschnitt [5.4.4](#)
- **dpkg-architecture(1)**
- Abschnitt [5.5.1.1](#)
- Abschnitt [5.5.1.2](#)

Tabelle 5.1 The multiarch library path options

Classic path	i386 multiarch path	amd64 multiarch path
/lib/	/lib/i386-linux-gnu/	/lib/x86_64-linux-gnu/
/usr/lib/	/usr/lib/i386-linux-gnu/	/usr/lib/x86_64-linux-gnu/

5.20.1 The multiarch library path

Debian policy requires following [Filesystem Hierarchy Standard](#). Its [/usr/lib : Libraries for programming and packages](#) states “**/usr/lib** includes object files, libraries, and internal binaries that are not intended to be executed directly by users or shell scripts.”

Debian policy makes an exception to the [Filesystem Hierarchy Standard](#) to use **/usr/lib/<triplet>/** instead of **/usr/lib<qual>/** (e.g., **/lib32/** and **/lib64/**) to support a multiarch library.

For Autotools based packages under the **debhelper** package (compat>=9), this path setting is automatically taken care by the **dh_auto_configure** command.

For other packages with non-supported build systems, you need to manually adjust the install path as follows.

- If “**./configure**” is used in the **override_dh_auto_configure** target in **debian/rules**, make sure to replace it with “**dh_auto_configure --**” while re-targeting the install path from **/usr/lib/** to **/usr/lib/\$(DEB_HOST_MULTIARCH)/**.
- Replace all occurrences of **/usr/lib/** with **/usr/lib/*/** in **debian/foo.install** files.

All files installed simultaneously as the multiarch package to the same file path should have exactly the same file content. You must be careful with differences generated by the data byte order and by the compression algorithm.

Anmerkung



The **--libexecdir** option of the **./configure** command specifies the default path to install executable programs run by other programs rather than by users. Its Autotools default is **/usr/libexec/** but its Debian non-multi-arch default is **/usr/lib/**. If such executables are a part of a “Multi-arch: foreign” package, a path such as **/usr/lib/** or **/usr/lib/package-name** may be more desirable than **/usr/lib/<triplet>/**, which **dh_auto_configure** uses. The [GNU Coding Standards: 7.2.5 Variables for Installation Directories](#) has a description for **libexecdir** as “The definition of **libexecdir** is the same for all packages, so you should install your data in a sub-directory thereof. Most packages install their data under **\$(libexecdir)/package-name/ ...**”. (It is always a good idea to follow GNU unless it conflicts with the Debian policy.)

The shared library files in the default path **/usr/lib/** and **/usr/lib/<triplet>/** are loaded automatically.

For shared library files in another path, the GCC option **-l** must be set by the **pkg-config** command to make them load properly.

5.20.2 The multiarch header file path

GCC includes both **/usr/include/** and **/usr/include/<triplet>/** by default on the multiarch Debian system.

If the header file is not in those paths, the GCC option **-I** must be set by the **pkg-config** command to make “**#include <foo.h>**” work properly.

Tabelle 5.2 The multiarch header file path options

Classic path	i386 multiarch path	amd64 multiarch path
/usr/include/	/usr/include/i386-linux-gnu/	/usr/include/x86_64-linux-gnu/
/usr/include/package-name/	/usr/include/i386-linux-gnu/package-name/	/usr/include/x86_64-linux-gnu/package-name/
	/usr/lib/i386-linux-gnu/package-name/	/usr/lib/x86_64-linux-gnu/package-name/

The use of the `/usr/lib/<triplet>/packagename/` path for the library files allows the upstream maintainer to use the same install script for the multiarch system with `/usr/lib/<triplet>` and the biarch system with `/usr/lib<qual>/`.⁸

The use of the file path containing *packagename* enables having more than 2 development libraries simultaneously installed on a system.

5.20.3 The multiarch *.pc file path

The **pkg-config** program is used to retrieve information about installed libraries in the system. It stores its configuration parameters in the ***.pc** file and is used for setting the **-I** and **-L** options for GCC.

Tabelle 5.3 The ***.pc** file path options

Classic path	i386 multiarch path	amd64 multiarch path
<code>/usr/lib/pkgconfig/</code>	<code>/usr/lib/i386-linux-gnu/pkgconfig/</code>	<code>/usr/lib/x86_64-linux-gnu/pkgconfig/</code>

5.21 Compiler hardening

The compiler hardening support spreading for Debian **jessie** (8.0, TBA) demands that we pay extra attention to the packaging.

You should read the following references in detail.

- Debian wiki [Hardening](#)
- Debian wiki [Hardening Walkthrough](#)

The **debmake** command adds template comments to the **debian/rules** file as needed for **DEB_BUILD_MAINT_OPTIONS**, **DEB_CFLAGS_MAINT_APPEND**, and **DEB_LDFLAGS_MAINT_APPEND** (see Kapitel 4 and **dpkg-buildflags(1)**).

5.22 Continuous integration

DEP-8 defines the **debian/tests/control** file as the RFC822-style test metadata file for [continuous integration](#) (CI) of the Debian package.

It is used after building the binary packages from the source package containing this **debian/tests/control** file. When the **autopkgtest** command is run, the generated binary packages are installed and tested in the virtual environment according to this file.

See documents in the `/usr/share/doc/autopkgtest/` directory and [3. autopkgtest: Automatic testing for packages](#) of the “Ubuntu Packaging Guide”.

There are several other CI tools on Debian for you to explore.

- The **debci** package: CI platform on top of the **autopkgtest** package
- The **jenkins** package: generic CI platform

5.23 Bootstrapping

Debian cares about supporting new ports or flavours. The new ports or flavours require [bootstrapping](#) operation for the cross-build of the initial minimal native-building system. In order to avoid build-dependency loops during bootstrapping, the build-dependency needs to be reduced using the [profile](#) builds feature.

⁸This path is compliant with the FHS. [Filesystem Hierarchy Standard: /usr/lib : Libraries for programming and packages](#) states “Applications may use a single subdirectory under **/usr/lib**. If an application uses a subdirectory, all architecture-dependent data exclusively used by the application must be placed within that subdirectory.”

Tipp



If a core package `foo` build depends on a package `bar` with deep build dependency chains but `bar` is only used in the **test** target in `foo`, you can safely mark the `bar` with **<!nocheck>** in the **Build-depends** of `foo` to avoid build loops.

5.24 Bug reports

The **reportbug** command used for the bug report of *binarypackage* can be customized by the files in **usr/share/-bug/binarypackage/**.

The **dh_bugfiles** command installs these files from the template files in the **debian/** directory.

- **debian/binarypackage.bug-control** → **usr/share/bug/binarypackage/control**
 - This file contains some directions such as redirecting the bug report to another package.
- **debian/binarypackage.bug-presubj** → **usr/share/bug/binarypackage/presubj**
 - This file is displayed to the user by the **reportbug** command.
- **debian/binarypackage.bug-script** → **usr/share/bug/binarypackage** or **usr/share/bug/binarypackage/script**
 - The **reportbug** command runs this script to generate a template file for the bug report.

See **dh_bugfiles(1)** and [reportbug's Features for Developers](#)

Tipp



If you always remind the bug reporter of something or ask them about their situation, use these files to automate it.

Kapitel 6

debmake options

Here are some notable options for the **debmake** command.

6.1 Shortcut options (-a, -i)

The **debmake** command offers 2 shortcut options.

- **-a** : open the upstream tarball
- **-i** : execute script to build the binary package

The example in the above Kapitel 4 can be done simply as follows.

```
$ debmake -a package-1.0.tar.gz -i debuild
```

Tipp



A URL such as “<https://www.example.org/DL/package-1.0.tar.gz>” may be used for the **-a** option.

Tipp



A URL such as “<https://arm.koji.fedoraproject.org/packages/ibus/1.5.7/3.fc21/src/ibus-1.5.7-3.fc21.src.rpm>” may be used for the **-a** option, too.

6.1.1 Python module

You can generate a functioning single binary Debian package with a reasonable package description directly from the Python module package offered as a tarball, *pythonmodule-1.0.tar.gz*. The **-b** option specifying the package type **python** and the **-s** option to copy the package description from the upstream package need to be specified.

```
$ debmake -s -b':python' -a pythonmodule-1.0.tar.gz -i debuild
```

For other interpreted languages that support the **-b** option, specify the pertinent *type* for the **-b** option.

For interpreted languages without the **-b** option support, specify the **script** type instead and add the interpreter package as a dependency of the resulting binary package by adjusting the **debian/control** file.

6.2 Upstream snapshot (-d, -t)

The upstream snapshot from the upstream source tree in the VCS can be made with the **-d** option if the upstream package supports the “**make dist**” equivalence.

```
$ cd /path/to/upstream-vcs
$ debmake -d -i debuild
```

Alternatively, the same can be made with the **-t** option if the upstream tarball can be made with the **tar** command.

```
$ cd /path/to/upstream-vcs
$ debmake -p package -t -i debuild
```

Unless you provide the upstream version with the **-u** option or with the **debian/changelog** file, a snapshot upstream version is generated in the **0~%y%m%d%H%M** format, e.g., **0~1403012359**, from the UTC date and time.

If the upstream VCS is hosted in the *package/* directory instead of the *upstream-vcs/* directory, the “**-p package**” can be skipped.

If the upstream source tree in the VCS contains the **debian/*** files, the **debmake** command with either the **-d** option or the **-t** option combined with the **-i** option automates the making of a non-native Debian package from the VCS snapshot while using these **debian/*** files.

```
$ cp -r /path/to/package-0~1403012359/debian/. /path/to/upstream-vcs/debian
$ dch
... update debian/changelog
$ git add -A .; git commit -m "vcs with debian/*"
$ debmake -t -p package -i debuild
```

This **non-native** Debian binary package building scheme using the “**debmake -t -i debuild**” command may be considered as the **quasi-native** Debian package scheme since the packaging situation resembles the **native** Debian binary package building case using the **debuild** command without the upstream tarball.

Use of a **non-native** Debian package helps to ease communication with the downstream distros such as Ubuntu for bug fixes etc.

6.3 debmake -cc

The **debmake** command with the **-cc** option can make a summary of the copyright and license for the entire source tree to standard output.

```
$ tar -xvzf package-1.0.tar.gz
$ cd package-1.0
$ debmake -cc | less
```

With the **-c** option, this provides shorter report.

6.4 debmake -k

When updating a package for the new upstream release, the **debmake** command can verify the content of the existing **debian/copyright** file against the copyright and license situation of the entire updated source tree.

```
$ cd package-vcs
$ gbp import-orig --uscan --pristine-tar
... update source with the new upstream release
$ debmake -k | less
```

The “**debmake -k**” command parses the **debian/copyright** file from the top to the bottom and compares the license of all the non-binary files in the current package with the license described in the last matching file pattern entry of the **debian/copyright** file.

When editing the auto-generated **debian/copyright** file, please make sure to keep the generic file patterns at the top of the list.

Tipp



For all new upstream releases, run the “**debmake -k**” command to ensure that the **debian/copyright** file is current.

6.5 debmake -j

The generation of a functioning multi-binary package always requires more manual work than that of a functioning single binary package. The test build of the source package is the essential part of it.

For example, let’s package the same *package-1.0.tar.gz* (see Kapitel 4) into a multi binary package.

- Invoke the **debmake** command with the **-j** option for the test building and the report generation.

```
$ debmake -j -a package-1.0.tar.gz
```

- Check the last lines of the *package.build-dep.log* file to judge build dependencies for **Build-Depends**. (You do not need to list packages used by **debhelper**, **perl**, or **fakeroot** explicitly in **Build-Depends**. This technique is useful for the generation of a single binary package, too.)
- Check the contents of the *package.install.log* file to identify the install paths for files to decide how you split them into multiple packages.
- Start packaging with the **debmake** command.

```
$ rm -rf package-1.0
$ tar -xvzf package-1.0.tar.gz
$ cd package-1.0
$ debmake -b"package1:type1, ..."
```

- Update **debian/control** and **debian/binarypackage.install** files using the above information.
- Update other **debian/*** files as needed.
- Build the Debian package with the **debuild** command or its equivalent.

```
$ debuild
```

- All binary package entries specified in the **debian/binarypackage.install** file are generated as *binarypackage_version-revision_arch.deb*.

Anmerkung



The **-j** option for the **debmake** command invokes **dpkg-depcheck(1)** to run **debian/rules** under **strace(1)** to obtain library dependencies. Unfortunately, this is very slow. If you know the library package dependencies from other sources such as the SPEC file in the source, you may just run the “**debmake ...**” command without the **-j** option and run the “**debian/rules install**” command to check the install paths of the generated files.

6.6 debmake -x

The amount of template files generated by the **debmake** command depends on the **-x[01234]** option.

- See Abschnitt [8.1](#) for cherry-picking of the template files.

Anmerkung



None of the existing configuration files are modified by the **debmake** command.

6.7 debmake -P

The **debmake** command invoked with the **-P** option pedantically checks auto-generated files for copyright+license text even if they are with permissive license.

This option affects not only the content of the **debian/copyright** file generated by normal execution, but also the output by the execution with the **-k**, **-c**, **-cc**, and **-ccc** options.

6.8 debmake -T

The **debmake** command invoked with the **-T** option additionally prints verbose tutorial comment lines. The lines marked with **###** in the template files are part of the verbose tutorial comment lines.

Kapitel 7

Tips

Here are some notable tips about Debian packaging.

7.1 debdiff

You can compare file contents in two source Debian packages with the **debdiff** command.

```
$ debdiff old-package.dsc new-package.dsc
```

You can also compare file lists in two sets of binary Debian packages with the **debdiff** command.

```
$ debdiff old-package.changes new-package.changes
```

These are useful to identify what has been changed in the source packages and to check for inadvertent changes made when updating binary packages, such as unintentionally misplacing or removing files.

7.2 dget

You can download the set of files for the Debian source package with the **dget** command.

```
$ dget https://www.example.org/path/to/package_version-rev.dsc
```

7.3 debc

You should install generated packages with the **debc** command to test it locally.

```
$ debc package_version-rev_arch.changes
```

7.4 piuparts

You should install generated packages with the **piuparts** command to test it automatically.

```
$ sudo piuparts package_version-rev_arch.changes
```

Anmerkung



This is a very slow process with remote APT package repository access.

7.5 debsign

After completing the test of the package, you can sign it with the **debsign** command.

```
$ debsign package_version-rev_arch.changes
```

7.6 dput

After signing the package with the **debsign** command, you can upload the set of files for the Debian source and binary packages with the **dput** command.

```
$ dput package_version-rev_arch.changes
```

7.7 bts

After uploading the package, you will receive bug reports. It is an important duty of a package maintainer to manage these bugs properly as described in [5.8. Handling bugs](#) of the “Debian Developer’s Reference”.

The **bts** command is a handy tool to manage bugs on the [Debian Bug Tracking System](#).

```
$ bts severity 123123 wishlist , tags -1 pending
```

7.8 git-buildpackage

The **git-buildpackage** package offers many commands to automate packaging activities using the git repository.

- **gbp import-dsc**: import the previous Debian source package to the git repository.
- **gbp import-orig**: import the new upstream tar to the git repository.
 - The **--pristine-tar** option for the **git import-orig** command enables storing the upstream tarball in the same git repository.
 - The **--uscan** option as the last argument of the **gbp import-orig** command enables downloading and committing the new upstream tarball into the git repository.
- **gbp dch**: generate the Debian changelog from the git commit messages.
- **gbp buildpackage**: build the Debian binary package from the git repository.
- **gbp pull**: update the **debian**, **upstream** and **pristine-tar** branches safely from the remote repository.
- **git-pbuilder**: build the Debian binary package from the git repository using the **pbuilder** package.
 - The **cowbuilder** package is used as its backend.
- The **gbp pq**, **git-dpm** or **quilt** (or alias **dquilt**) commands are used to manage quilt patches.
 - The **dquilt** command is the simplest to learn and requires you to commit the resulting files manually with the **git** command to the **master** branch.
 - The “**gbp pq**” command provides the equivalent functionality of patch set management without using **dquilt** and eases including upstream git repository changes by cherry-picking.
 - The “**git dpm**” command provides more enhanced functionality than that of the “**gbp pq**” command.

Package history management with the **git-buildpackage** package is becoming the standard practice for most Debian maintainers.

See:

- [Building Debian Packages with git-buildpackage](#)
- <https://wiki.debian.org/GitPackagingWorkflow>

- <https://wiki.debian.org/GitPackagingWorkflow/DebConf11BOF>
- <https://raphaelhertzog.com/2010/11/18/4-tips-to-maintain-a-3-0-quilt-debian-source-package-in-a-vcs/>
- The **systemd** packaging practice documentation on [Building from source](#).

Tipp



Relax. You don't need to use all the wrapper tools. Use only ones which match your needs.

7.8.1 gbp import-dscs --debsnap

For Debian source packages named `<source-package>` recorded in the snapshot.debian.org archive, an initial git repository with all of the Debian version history can be generated as follows.

```
$ gbp import-dscs --debsnap --pristine-tar '<source-package>'
```

7.9 Upstream git repository

For Debian packaging with the **git-buildpackage** package, the **upstream** branch on the remote repository **origin** is normally used to track the content of the released upstream tarball.

The upstream git repository can also be tracked by naming its remote repository as **upstream** instead of the default **origin**. Then you can easily cherry-pick recent upstream changes into the Debian revision by cherry-picking with the **gitk** command and using the **gbp-pq** command.

Tipp



The “**gbp import-orig --upstream-vcs-tag**” command can create a nice packaging history by making a merge commit into the **upstream** branch from the specified tag on the upstream git repository.

Achtung



The content of the released upstream tarball may not match exactly with the corresponding content of the upstream git repository. It may contain some auto-generated files or miss some files. (Autotools, distutils, ...)

7.10 chroot

The **chroot** for a clean package build environment can be created and managed using the tools described in Kapitel [3](#).¹

Here is a quick summary of available package build commands. There are many ways to do the same thing.

- **dpkg-buildpackage** = core of package building tool
- **debuild** = **dpkg-buildpackage** + **lintian** (build under the sanitized environment variables)

¹The **git-pbuilder** style organization is deployed here. See <https://wiki.debian.org/git-pbuilder>. Be careful since many HOWTOs use different organization.

- **pbuilder** = core of the Debian chroot environment tool
- **pdebuild** = **pbuilder** + **dpkg-buildpackage** (build in the chroot)
- **cowbuilder** = speed up the **pbuilder** execution
- **git-pbuilder** = the easy-to-use command line syntax for **pdebuild** (used by **gbp buildpackage**)
- **gbp** = manage the Debian source under git
- **gbp buildpackage** = **pbuilder** + **dpkg-buildpackage** + **gbp**

A clean **sid** distribution chroot environment can be used as follows.

- The chroot filesystem creation command for the **sid** distribution
 - **pbuilder create**
 - **git-pbuilder create**
- The master chroot filesystem path for the **sid** distribution chroot filesystem
 - **/var/cache/pbuilder/base.cow**
- The package build command for the **sid** distribution chroot
 - **pdebuild**
 - **git-pbuilder**
 - **gbp buildpackage**
- The command to update the **sid** chroot
 - **pbuilder --update**
 - **git-pbuilder update**
- The command to login to the **sid** chroot filesystem to modify it
 - **git-pbuilder login --save-after-login**

An arbitrary *dist* distribution environment can be used as follows.

- The chroot filesystem creation command for the *dist* distribution
 - **pbuilder create --distribution dist**
 - **DIST=dist git-pbuilder create**
- The master chroot filesystem path for the *dist* distribution chroot
 - path: **/var/cache/pbuilder/base-dist.cow**
- The package build command for the *dist* distribution chroot
 - **pdebuild --basepath=/var/cache/pbuilder/base-dist.cow**
 - **DIST=dist git-pbuilder**
 - **gbp buildpackage --git-dist=dist**
- The command to update the *dist* chroot
 - **pbuilder update --basepath=/var/cache/pbuilder/base-dist.cow**
 - **DIST=dist git-pbuilder update**
- The command to login to the **dist** chroot to modify it
 - **pbuilder --login --basepath=/var/cache/pbuilder/base-dist.cow --save-after-login**

– **DIST=dist git-pbuilder login --save-after-login**

Tipp



A custom environment with some pre-loaded packages needed for the new experimental packages, this “**git-pbuilder login --save-after-login**” command is quite handy.

Tipp



If your old chroot filesystem is missing packages such as **libeatmydata1**, **ccache**, and **lintian**, you may want to install these with the “**git-pbuilder login --save-after-login**” command.

Tipp



The chroot filesystem can be cloned simply by copying with the “**cp -a base-dist.cow base-customdist.cow**” command. The new chroot filesystem can be accessed as “**gbp buildpackage --git-dist=customdist**” and “**DIST=customdist git-pbuilder ...**”.

Tipp



When the **orig.tar.gz** file needs to be uploaded for a Debian revision other than **0** or **1** (e.g., for a security upload), add the **-sa** option to the end of **dpkg-buildpackage**, **debuild**, **pdebuild**, and **git-pbuilder** commands. For the “**gbp buildpackage**” command, temporarily modify the **builder** setting of **~/l.gbp.conf**.

Anmerkung



The description in this section is too terse to be useful for most of the prospective maintainers. This is the intentional choice of the author. You are highly encouraged to search and read all the pertinent documents associated with the commands used.

7.11 New Debian revision

Let’s assume that a bug report *#bug_number* was filed against your package, and it describes a problem that you can solve by editing the **buggy** file in the upstream source. Here’s what you need to do to create a new Debian revision of the package with the **bugname.patch** file recording the fix.

New Debian revision with the **dquilt** command

```
$ dquilt push -a
$ dquilt new bugname.patch
```

```
$ dquilt add buggy
$ vim buggy
...
$ dquilt refresh
$ dquilt header -e
$ dquilt pop -a
$ dch -i
```

Alternatively if the package is managed in the git repository using the **git-buildpackage** command with its default configuration:

New Debian revision with the gbp-pq command

```
$ git checkout master
$ gbp pq import
$ vim buggy
$ git add buggy
$ git commit
$ git tag pq/<newrev>
$ gbp pq export
$ gbp pq drop
$ git add debian/patches/*
$ dch -i
$ git commit -a -m "Closes: #<bug_number>"
```

Please make sure to describe concisely the changes that fix reported bugs and close those bugs by adding “**Closes: #<bug_number>**” in the **debian/changelog** file.

Tipp



Use a **debian/changelog** entry with a version string such as **1.0.1-1-rc1** when you experiment. Then, unclutter such **changelog** entries into a single entry for the official package.

7.12 New upstream release

If a package **foo** is properly packaged in the modern “**3.0 (native)**” or “**3.0 (quilt)**” formats, packaging a new upstream release is essentially moving the old **debian/** directory to the new source. This can be done by running the “**tar -xvzf /path/to/foo_oldversion.debian.tar.gz**” command in the new extracted source.² Of course, you need to do some obvious chores.

There are several tools to handle this situation. After updating to the new upstream release with these tools, please make sure to describe concisely the changes in the new upstream release that fix reported bugs and close those bugs by adding “**Closes: #bug_number**” in the **debian/changelog** file.

7.12.1 uupdate + tarball

You can automatically update to the new upstream source with the **uupdate** command from the **devscripts** package. It requires having the old Debian source package and the new upstream tarball.

```
$ wget https://example.org/foo/foo-newversion.tar.gz
$ cd foo-oldversion
$ uupdate -v newversion ../foo-newversion.tar.gz
...
$ cd ../foo-newversion
$ while dquilt push; do dquilt refresh; done
$ dch
```

²If a package **foo** is packaged in the old **1.0** format, this can be done by running the “**zcat /path/to/foo_oldversion.diff.gz|patch -p1**” command in the new extracted source, instead.

7.12.2 uscan

You can automatically update to the new upstream source with the **uscan** command from the **devscripts** package. It requires having the old Debian source package and the **debian/watch** file in it.

```
$ cd foo-oldversion
$ uscan
...
$ while dquilt push; do dquilt refresh; done
$ dch
```

7.12.3 gbp

You can automatically update to the new upstream source with the “**gbp import-orig --pristine-tar**” command from the **git-buildpackage** package. It requires having the old Debian source in the git repository and the new upstream tarball.

```
$ ln -sf foo-newversion.tar.gz foo_newversion.orig.tar.gz
$ cd foo-vcs
$ git checkout master
$ gbp pq import
$ git checkout master
$ gbp import-orig --pristine-tar ../foo_newversion.orig.tar.gz
...
$ gbp pq rebase
$ git checkout master
$ gbp pq export
$ gbp pq drop
$ git add debian/patches
$ dch -v <newversion>
$ git commit -a -m "Refresh patches"
```

Tipp



If upstream uses a git repository, please also use the **--upstream-vcs-tag** option for the **gbp import-orig** command.

7.12.4 gbp + uscan

You can automatically update to the new upstream source with the “**gbp import-orig --pristine-tar --uscan**” command from the **git-buildpackage** package. It requires having the old Debian source in the git repository and the **debian/watch** file in it.

```
$ cd foo-vcs
$ git checkout master
$ gbp pq import
$ git checkout master
$ gbp import-orig --pristine-tar --uscan
...
$ gbp pq rebase
$ git checkout master
$ gbp pq export
$ gbp pq drop
$ git add debian/patches
$ dch -v <newversion>
$ git commit -a -m "Refresh patches"
```

Tipp



If upstream uses a git repository, please also use the **--upstream-vcs-tag** option for the **gbp import-orig** command.

7.13 3.0 source format

Updating the package style is not a required activity for the update of a package. However, doing so lets you use the full capabilities of the modern **debhelper** system and the **3.0** source format.

- If you need to recreate deleted template files for any reason, you can run **debmake** again in the same Debian package source tree. Then edit them appropriately.
- If the package has not been updated to use the **dh** command for the **debian/rules** file, update it to use it (see Abschnitt 5.4.2). Update the **debian/control** file accordingly.
- If you have a **1.0** source package with the **foo.diff.gz** file, you can update it to the newer “**3.0 (quilt)**” source format by creating **debian/source/format** with “**3.0 (quilt)**”. The rest of the **debian/*** files can just be copied. Import the **big.diff** file generated by the “**filterdiff -z -x /debian/ foo.diff.gz > big.diff**” command to your quilt system, if needed.³
- If it was packaged using another patch system such as **dpatch**, **dbfs**, or **cdbfs** with **-p0**, **-p1**, or **-p2**, convert it to the quilt command using the **deb3** script in the **quilt** package.
- If it was packaged with the **dh** command with the “**--with quilt**” option or with the **dh_quilt_patch** and **dh_quilt_unpatch** commands, remove these and make it use the newer “**3.0 (quilt)**” source format.
- If you have a **1.0** source package without the **foo.diff.gz** file, you can update it to the newer “**3.0 (native)**” source format by creating **debian/source/format** with “**3.0 (native)**”. The rest of the **debian/*** files can just be copied.

You should check [DEP - Debian Enhancement Proposals](#) and adopt ACCEPTED proposals.

See [ProjectsDebSrc3.0](#) to check the support status of the new Debian source formats by the Debian tool chains.

7.14 CDBS

The Common Debian Build System (**CDBS**) is a wrapper system over the **debhelper** package. The **CDBS** is based on the Makefile inclusion mechanism and configured by the **DEB_*** configuration variables set in the **debian/rules** file.

Before the introduction of the **dh** command to the **debhelper** package at the version 7, the **CDBS** was the only approach to create a simple and clean **debian/rules** file.

For many simple packages, the **dh** command alone allows us to make a simple and clean **debian/rules** file now. It is desirable to keep the build system simple and clean by not using the superfluous **CDBS**.

Anmerkung



Neither “the **CDBS** magically does the job for me with less typing” nor “I don’t understand the new **dh** syntax” can be an excuse to keep using the **CDBS** system.

For some complicated packages such as GNOME related ones, the **CDBS** is leveraged to automate their uniform packaging by the current maintainers with justification. If this is the case, please do not bother converting from the **CDBS** to the **dh** syntax.

³You can split the **big.diff** file into many small incremental patch files using the **splitdiff** command.

Anmerkung



If you are working with a [team](#) of maintainers, please follow the established practice of the team.

When converting packages from the **CDBS** to the **dh** syntax, please use the following as your reference:

- [CDBS Documentation](#)
- [The Common Debian Build System \(CDBS\), FOSDEM 2009](#)

7.15 Build under UTF-8

The default locale of the build environment is **C**.

Some programs such as the **read** function of Python3 change their behavior depending on the locale.

Adding the following code to the **debian/rules** file ensures building the program under the **C.UTF-8** locale.

```
LC_ALL := C.UTF-8
export LC_ALL
```

7.16 UTF-8 conversion

If upstream documents are encoded in old encoding schemes, converting them to **UTF-8** is a good idea.

Use the **iconv** command in the **libc-bin** package to convert encodings of plain text files.

```
$ iconv -f latin1 -t utf8 foo_in.txt > foo_out.txt
```

Use **w3m(1)** to convert from HTML files to UTF-8 plain text files. When you do this, make sure to execute it under UTF-8 locale.

```
$ LC_ALL=C.UTF-8 w3m -o display_charset=UTF-8 \
  -cols 70 -dump -no-graph -T text/html \
  < foo_in.html > foo_out.txt
```

Run these scripts in the **override_dh_*** target of the **debian/rules** file.

7.17 Upload orig.tar.gz

When you first upload the package to the archive, you need to include the original **orig.tar.gz** source, too.

If the Debian revision number of the package is either **1** or **0**, this is the default. Otherwise, you must provide the **dpkg-buildpackage** option **-sa** to the **dpkg-buildpackage** command.

- **dpkg-buildpackage -sa**
- **debuild -sa**
- **pdebuild --debbuildopts -sa**
- **git-pbuilder -sa**
- For **gbp buildpackage**, edit the **~/gbp.conf** file.

Tipp



On the other hand, the **-sd** option will force the exclusion of the original **orig.tar.gz** source.

Tipp



Security uploads require including the **orig.tar.gz** file.

7.18 Skipped uploads

If you created multiple entries in the **debian/changelog** while skipping uploads, you must create a proper ***_changes** file which includes all changes since the last upload. This can be done by specifying the **dpkg-buildpackage** option **-v** with the last uploaded version, e.g., **1.2**.

- **dpkg-buildpackage -v1.2**
- **debuild -v1.2**
- **pdebuild --debbuildopts -v1.2**
- **git-pbuilder -v1.2**
- For **gbp buildpackage**, edit the **~/gbp.conf** file.

7.19 Advanced packaging

Hints for the following can be found in the **debhelper(7)** manpage:

- differences of the **debhelper** tool behavior under “**compat** <= 8”
- building several binary packages with several different build conditions
 - making multiple copies of the upstream source
 - invoking multiple “**dh_auto_configure -S ...**” commands in the **override_dh_auto_configure** target
 - invoking multiple “**dh_auto_build -S ...**” commands in the **override_dh_auto_build** target
 - invoking multiple “**dh_auto_install -S ...**” commands in the **override_dh_auto_install** target
- building **udeb** packages with “**Package-Type: udeb**” in **debian/control** (see [Package-Type](#))
- excluding some packages for the bootstrapping process (see also [BuildProfileSpec](#))
 - adding the **Build-Profiles** fields in binary package stanzas in **debian/control**
 - building packages with the **DEB_BUILD_PROFILES** environment variable set to the pertinent profile name

Hints for the following can be found in the **dpkg-source(1)** manpage:

- naming convention for multiple upstream source tarballs
 - **packagename_version.orig.tar.gz**
 - **packagename_version.orig-componentname.tar.gz**
- recording the Debian changes to the upstream source package
 - **dpkg-source --commit**

7.20 Other distros

Although the upstream tarball has all the information to build the Debian package, it is not always easy to figure out which combination of options to use.

Also, the upstream package may be more focused on feature enhancements and may be less eager about backward compatibilities etc., which are an important aspect of Debian packaging practice.

The leveraging of information from other distributions is an option to address the above issues.

If the other distribution of interest is a Debian derivative one, it is trivial to reuse it.

If the other distribution of interest is an [RPM](#) based distribution, see [Repackage src.rpm](#).

Downloading and opening of the **src.rpm** file can be done with the **rget** command. (Place the **rget** script in your PATH.)

rget script

```
#!/bin/sh
FCSRPM=$(basename $1)
mkdir ${FCSRPM}; cd ${FCSRPM}/
wget $1
rpm2cpio ${FCSRPM} | cpio -dium
```

Many upstream tarballs contain the SPEC file named as *packagename.spec* or *packagename.spec.in* used by the RPM system. This can be used as the baseline for the Debian package, too.

7.21 Debug

When you face build problems or core dumps of generated binary programs, you need to resolve them yourself. That's **debug**.

This is too deep a topic to describe here. So, let me just list few pointers and hints for some typical debug tools.

- [core dump](#)
 - “**man core**”
 - Update the “**/etc/security/limits.conf**” file to include the following:

```
* soft core unlimited
```
 - “**ulimit -c unlimited**” in **~/.bashrc**
 - “**ulimit -a**” to check
 - Press **Ctrl-** or “**kill -ABRT PID**” to make a core dump file
- **gdb** - The GNU Debugger
 - “**info gdb**”
 - “Debugging with GDB” in **/usr/share/doc/gdb-doc/html/gdb/index.html**
- **strace** - Trace system calls and signals
 - Use **strace-graph** script found in **/usr/share/doc/strace/examples/** to make a nice tree view
 - “**man strace**”
- **ltrace** - Trace library calls
 - “**man ltrace**”
- “**sh -n script.sh**” - Syntax check of a Shell script
- “**sh -x script.sh**” - Trace a Shell script
- “**python -m py_compile script.py**” - Syntax check of a Python script
- “**python -mtrace --trace script.py**” - Trace a Python script
- “**perl -I ../libpath -c script.pl**” - Syntax check of a Perl script

- “**perl -d:Trace script.pl**” - Trace a Perl script
 - Install the **libterm-readline-gnu-perl** package or its equivalent to add input line editing capability with history support.
- **lsuf** - List open files by processes
 - “**man lsuf**”

Tipp

The **script** command records console outputs.

Tipp

The **screen** and **tmux** commands used with the **ssh** command offer secure and robust remote connection terminals.

Tipp

A Python- and Shell-like REPL (=READ + EVAL + PRINT + LOOP) environment for Perl is offered by the **reply** command from the **libreply-perl** (new) package and the **re.pl** command from the **libdevel-repl-perl** (old) package.

Tipp

The **rlwrap** and **rlfe** commands add input line editing capability with history support to any interactive commands. E.g. “**rlwrap dash -i**” .

Kapitel 8

More Examples

There is an old Latin saying: “**fabricando fit faber**” (“practice makes perfect”).

It is highly recommended to practice and experiment with all the steps of Debian packaging with simple packages. This chapter provides you with many upstream cases for your practice.

This should also serve as introductory examples for many programming topics.

- Programming in the POSIX shell, Python3, and C.
- Method to create a desktop GUI program launcher with icon graphics.
- Conversion of a command from [CLI](#) to [GUI](#).
- Conversion of a program to use **gettext** for [internationalization and localization](#): POSIX shell, Python3, and C sources.
- Overview of many build systems: Makefile, Python distutils, Autotools, and CMake.

Please note that Debian takes a few things seriously:

- Free software (a.k.a. Libre software)
- Stability and security of OS
- Universal OS realized via:
 - free choice for upstream sources,
 - free choice of CPU architectures, and
 - free choice of UI languages.

The typical packaging example presented in Kapitel 4 is the prerequisite for this chapter.

Some details are intentionally left vague in the following sections. Please try to read the pertinent documentation and practice yourself to find them out.

Tipp



The best source of a packaging example is the current Debian archive itself. Please use the “[Debian Code Search](#)” service to find pertinent examples.

8.1 Cherry-pick templates

Here is an example of creating a simple Debian package from a zero content source on an empty directory.

This is a good platform to get all the template files without making a mess in the upstream source tree you are working on.

Let’s assume this empty directory to be **debhello-0.1**.

```
$ mkdir debhello-0.1
$ tree
.
├── debhello-0.1
└──
1 directory, 0 files
```

Let's generate the maximum amount of template files by specifying the **-x4** option.

Let's also use the "**-p debhello -t -u 0.1 -r 1**" options to make the missing upstream tarball.

```
$ debmake -t -p debhello -u 0.1 -r 1 -x4
I: set parameters
...
I: debmake -x "4" ...
I: creating => debian/control
I: creating => debian/copyright
I: substituting => /usr/share/debmake/extra0/changelog
...
I: creating => debian/license-examples/Expat
I: substituting => /usr/share/debmake/extra4/BSD-3-Clause
I: creating => debian/license-examples/BSD-3-Clause
I: substituting => /usr/share/debmake/extra4/LGPL-3.0+
I: creating => debian/license-examples/LGPL-3.0+
I: $ wrap-and-sort
```

Let's inspect generated template files.

```
$ cd ..
$ tree
.
├── debhello-0.1
├── debian
│   ├── README.Debian
│   ├── changelog
│   ├── clean
│   ├── compat.ex
│   ├── control
│   ├── copyright
│   ├── debhello.bug-control.ex
│   ├── debhello.bug-presubj.ex
│   ├── debhello.bug-script.ex
│   └── debhello.conf-files.ex
├── watch
├── debhello-0.1.tar.gz
└── debhello_0.1.orig.tar.gz -> debhello-0.1.tar.gz
5 directories, 51 files
```

Now you can copy any of these generated template files in the *debhello-0.1/debian/* directory to your package as needed while renaming them as needed.

Tipp



The generated template files can be made more verbose by invoking the **debmake** command with the **-T** option (tutorial mode).

8.2 No Makefile (shell, CLI)

Here is an example of creating a simple Debian package from a POSIX shell CLI program without its build system.

Let's assume this upstream tarball to be **debhello-0.2.tar.gz**.

This type of source has no automated means and files must be installed manually.

```
$ tar -xzmf debhello-0.2.tar.gz
$ cd debhello-0.2
$ sudo cp scripts/hello /bin/hello
...
```

Let's get the source and make the Debian package.

Download debhello-0.2.tar.gz

```
$ wget http://www.example.org/download/debhello-0.2.tar.gz
...
$ tar -xzmf debhello-0.2.tar.gz
$ tree
.
├── debhello-0.2
├── LICENSE
├── data
├── hello.desktop
├── hello.png
├── man
├── hello.1
├── scripts
├── hello
└── debhello-0.2.tar.gz

4 directories, 6 files
```

Here, the POSIX shell script **hello** is a very simple one.

hello (v=0.2)

```
$ cat debhello-0.2/scripts/hello
#!/bin/sh -e
echo "Hello from the shell!"
echo ""
echo -n "Type Enter to exit this program: "
read X
```

Here, **hello.desktop** supports the [Desktop Entry Specification](#).

hello.desktop (v=0.2)

```
$ cat debhello-0.2/data/hello.desktop
[Desktop Entry]
Name=Hello
Name[fr]=Bonjour
Comment=Greetings
Comment[fr]=Salutations
Type=Application
Keywords=hello
Exec=hello
Terminal=true
Icon=hello.png
Categories=Utility;
```

Here, **hello.png** is the icon graphics file.

Let's package this with the **debmake** command. Here, the **-b':sh'** option is used to specify that the generated binary package is a shell script.

```
$ cd debhello-0.2
$ debmake -b':sh'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="0.2", rev="1"
I: *** start packaging in "debhello-0.2". ***
I: provide debhello_0.2.orig.tar.gz for non-native Debian package
```

```
I: pwd = "/path/to"
I: $ ln -sf debhello-0.2.tar.gz debhello_0.2.orig.tar.gz
I: pwd = "/path/to/debhello-0.2"
I: parse binary package settings: :sh
I: binary package=debhello Type=script / Arch=all M-A=foreign
...
```

Let's inspect notable template files generated.

The source tree after the basic debmake execution. (v=0.2)

```
$ cd ..
$ tree
.
|_ debhello-0.2
|_ LICENSE
|_ data
|_ hello.desktop
|_ hello.png
|_ debian
|_ README.Debian
|_ changelog
|_ control
|_ copyright
|_ patches
|_ series
|_ rules
|_ source
|_ format
|_ local-options
|_ watch
|_ man
|_ hello.1
|_ scripts
|_ hello
|_ debhello-0.2.tar.gz
|_ debhello_0.2.orig.tar.gz -> debhello-0.2.tar.gz

7 directories, 16 files
```

debian/rules (template file, v=0.2):

```
$ cat debhello-0.2/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1

%:
    dh $@
```

This is essentially the standard **debian/rules** file with the **dh** command. Since this is the script package, this template **debian/rules** file has no build flag related contents.

debian/control (template file, v=0.2):

```
$ cat debhello-0.2/debian/control
Source: debhello
Section: unknown
Priority: optional
Maintainer: "Firstname Lastname" <email.address@example.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.5.0
Homepage: <insert the upstream URL, if relevant>

Package: debhello
Architecture: all
Multi-Arch: foreign
```



```
Depends: ${misc:Depends}
Description: auto-generated package by debmake
 This Debian binary package was auto-generated by the
 debmake(1) command provided by the debmake package.
```

Since this is the shell script package, the **debmake** command sets “**Architecture: all**” and “**Multi-Arch: foreign**”. Also, it sets required **substvar** parameters as “**Depends: \${misc:Depends}**”. These are explained in Kapitel 5.

Since this upstream source lacks the upstream **Makefile**, that functionality needs to be provided by the maintainer. This upstream source contains only a script file and data files and no C source files; the **build** process can be skipped but the **install** process needs to be implemented. For this case, this is achieved cleanly by adding the **debian/install** and **debian/manpages** files without complicating the **debian/rules** file.

Let’s make this Debian package better as the maintainer.

debian/rules (maintainer version, v=0.2):

```
$ vim debhello-0.2/debian/rules
... hack, hack, hack, ...
$ cat debhello-0.2/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1

%:
    dh $@
```

debian/control (maintainer version, v=0.2):

```
$ vim debhello-0.2/debian/control
... hack, hack, hack, ...
$ cat debhello-0.2/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: ${misc:Depends}
Description: example package in the debmake-doc package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
```

Warnung



If you leave “**Section: unknown**” in the template **debian/control** file unchanged, the **lintian** error may cause a build failure.

debian/install (maintainer version, v=0.2):

```
$ vim debhello-0.2/debian/install
... hack, hack, hack, ...
$ cat debhello-0.2/debian/install
data/hello.desktop usr/share/applications
data/hello.png usr/share/pixmaps
scripts/hello usr/bin
```

debian/manpages (maintainer version, v=0.2):

```
$ vim debhello-0.2/debian/manpages
... hack, hack, hack, ...
$ cat debhello-0.2/debian/manpages
man/hello.1
```

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=0.2):

```
$ tree debhello-0.2/debian
debhello-0.2/debian
b'''|b'''b'''-b'''b'''-b''' README.Debian
b'''|b'''b'''-b'''b'''-b''' changelog
b'''|b'''b'''-b'''b'''-b''' control
b'''|b'''b'''-b'''b'''-b''' copyright
b'''|b'''b'''-b'''b'''-b''' install
b'''|b'''b'''-b'''b'''-b''' manpages
b'''|b'''b'''-b'''b'''-b''' patches
b'''|b'''      b'''|b'''b'''-b'''b'''-b''' series
b'''|b'''b'''-b'''b'''-b''' rules
b'''|b'''b'''-b'''b'''-b''' source
b'''|b'''      b'''|b'''b'''-b'''b'''-b''' format
b'''|b'''      b'''|b'''b'''-b'''b'''-b''' local-options
b'''|b'''b'''-b'''b'''-b''' watch

2 directories, 11 files
```

You can create a non-native Debian package using the **debbuild** command (or its equivalents) in this source tree. The command output is very verbose and explains what it does as follows.

```
$ cd debhello-0.2
$ debuild
dpkg-buildpackage -us -uc -ui -i -i
...
fakeroot debian/rules clean
dh clean
...
debian/rules build
dh build
    dh_update_autotools_config
    dh_autoreconf
    create-stamp debian/debhelper-build-stamp
fakeroot debian/rules binary
dh binary
    dh_testroot
    dh_prep
        rm -f -- debian/debhello.substvars
        rm -fr -- debian/.debhelper/generated/debhello/ debian/debhello/ debi...
    ...
fakeroot debian/rules binary
dh binary
...
```

Let's inspect the result.

The generated files of debhello version 0.2 by the debuild command:

```
$ cd ..
$ tree -FL 1
.
b'''|b'''b'''-b'''b'''-b''' debhello-0.2/
b'''|b'''b'''-b'''b'''-b''' debhello-0.2.tar.gz
b'''|b'''b'''-b'''b'''-b''' debhello_0.2-1.debian.tar.xz
b'''|b'''b'''-b'''b'''-b''' debhello_0.2-1.dsc
b'''|b'''b'''-b'''b'''-b''' debhello_0.2-1_all.deb
b'''|b'''b'''-b'''b'''-b''' debhello_0.2-1_amd64.build
```

```

b''|b''b''-b''b''-b'' debhello_0.2-1_amd64.buildinfo
b''|b''b''-b''b''-b'' debhello_0.2-1_amd64.changes
b''|b''b''-b''b''-b'' debhello_0.2.orig.tar.gz -> debhello-0.2.tar.gz

```

1 directory, 8 files

You see all the generated files.

- The **debhello_0.2.orig.tar.gz** file is a symlink to the upstream tarball.
- The **debhello_0.2-1.debian.tar.xz** file contains the maintainer generated contents.
- The **debhello_0.2-1.dsc** file is the meta data file for the Debian source package.
- The **debhello_0.2-1_all.deb** file is the Debian binary package.
- The **debhello_0.2-1_amd64.build** file is the build log file.
- The **debhello_0.2-1_amd64.buildinfo** file is the meta data file generated by **dpkg-genbuildinfo(1)**.
- The **debhello_0.2-1_amd64.changes** file is the meta data file for the Debian binary package.

The **debhello_0.2-1.debian.tar.xz** file contains the Debian changes to the upstream source as follows.

The compressed archive contents of debhello_0.2-1.debian.tar.xz:

```

$ tar -tzf debhello-0.2.tar.gz
debhello-0.2/
debhello-0.2/LICENSE
debhello-0.2/data/
debhello-0.2/data/hello.desktop
debhello-0.2/data/hello.png
debhello-0.2/man/
debhello-0.2/man/hello.1
debhello-0.2/scripts/
debhello-0.2/scripts/hello
$ tar --xz -tf debhello_0.2-1.debian.tar.xz
debian/
debian/README.Debian
debian/changelog
debian/control
debian/copyright
debian/install
debian/manpages
debian/patches/
debian/patches/series
debian/rules
debian/source/
debian/source/format
debian/watch

```

The **debhello_0.2-1_amd64.deb** file contains the files to be installed as follows.

The binary package contents of debhello_0.2-1_all.deb:

```

$ dpkg -c debhello_0.2-1_all.deb
drwxr-xr-x root/root ... ./
drwxr-xr-x root/root ... ./usr/
drwxr-xr-x root/root ... ./usr/bin/
-rwxr-xr-x root/root ... ./usr/bin/hello
drwxr-xr-x root/root ... ./usr/share/
drwxr-xr-x root/root ... ./usr/share/applications/
-rw-r--r-- root/root ... ./usr/share/applications/hello.desktop
drwxr-xr-x root/root ... ./usr/share/doc/
drwxr-xr-x root/root ... ./usr/share/doc/debhello/
-rw-r--r-- root/root ... ./usr/share/doc/debhello/README.Debian
-rw-r--r-- root/root ... ./usr/share/doc/debhello/changelog.Debian.gz
-rw-r--r-- root/root ... ./usr/share/doc/debhello/copyright

```

```
drwxr-xr-x root/root ... ./usr/share/man/
drwxr-xr-x root/root ... ./usr/share/man/man1/
-rw-r--r-- root/root ... ./usr/share/man/man1/hello.1.gz
drwxr-xr-x root/root ... ./usr/share/pixmaps/
-rw-r--r-- root/root ... ./usr/share/pixmaps/hello.png
```

Here is the generated dependency list of **debhello_0.2-1_all.deb**.

The generated dependency list of debhello_0.2-1_all.deb:

```
$ dpkg -f debhello_0.2-1_all.deb pre-depends depends recommends conflicts br...
```

8.3 Makefile (shell, CLI)

Here is an example of creating a simple Debian package from a POSIX shell CLI program using the **Makefile** as its build system.

Let's assume its upstream tarball to be **debhello-1.0.tar.gz**.

This type of source is meant to be installed as a non-system file as:

```
$ tar -xzmf debhello-1.0.tar.gz
$ cd debhello-1.0
$ make install
```

Debian packaging requires changing this “**make install**” process to install files to the target system image location instead of the normal location under **/usr/local**.

Let's get the source and make the Debian package.

Download debhello-1.0.tar.gz

```
$ wget http://www.example.org/download/debhello-1.0.tar.gz
...
$ tar -xzmf debhello-1.0.tar.gz
$ tree
.
├── debhello-1.0
│   ├── LICENSE
│   ├── Makefile
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── man
│   ├── hello.1
│   ├── scripts
│   └── hello
└── debhello-1.0.tar.gz
```

4 directories, 7 files

Here, the **Makefile** uses **\$(DESTDIR)** and **\$(prefix)** properly. All other files are the same as in Abschnitt 8.2 and most of the packaging activities are the same.

Makefile (v=1.0)

```
$ cat debhello-1.0/Makefile
prefix = /usr/local

all:
    : # do nothing

install:
    install -D scripts/hello \
        $(DESTDIR)$(prefix)/bin/hello
    install -m 644 -D data/hello.desktop \
        $(DESTDIR)$(prefix)/share/applications/hello.desktop
    install -m 644 -D data/hello.png \
        $(DESTDIR)$(prefix)/share/pixmaps/hello.png
```

```

        install -m 644 -D man/hello.1 \
                $(DESTDIR)$(prefix)/share/man/man1/hello.1

clean:
    : # do nothing

distclean: clean

uninstall:
    -rm -f $(DESTDIR)$(prefix)/bin/hello
    -rm -f $(DESTDIR)$(prefix)/share/applications/hello.desktop
    -rm -f $(DESTDIR)$(prefix)/share/pixmaps/hello.png
    -rm -f $(DESTDIR)$(prefix)/share/man/man1/hello.1

.PHONY: all install clean distclean uninstall

```

Let's package this with the **debmake** command. Here, the **-b':sh'** option is used to specify that the generated binary package is a shell script.

```

$ cd debhello-1.0
$ debmake -b':sh'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.0", rev="1"
I: *** start packaging in "debhello-1.0". ***
I: provide debhello_1.0.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.0.tar.gz debhello_1.0.orig.tar.gz
I: pwd = "/path/to/debhello-1.0"
I: parse binary package settings: :sh
I: binary package=debhello Type=script / Arch=all M-A=foreign
...

```

Let's inspect the notable template files generated.

debian/rules (template file, v=1.0):

```

$ cat debhello-1.0/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1

%:
    dh $@

#override_dh_auto_install:
#    dh_auto_install -- prefix=/usr

#override_dh_install:
#    dh_install --list-missing -X.pyc -X.pyo

```

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.0):

```

$ vim debhello-1.0/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.0/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1

%:
    dh $@

override_dh_auto_install:
    dh_auto_install -- prefix=/usr

```

Since this upstream source has the proper upstream **Makefile**, there is no need to create **debian/install** and **debian/manpages** files.

The **debian/control** file is exactly the same as the one in Abschnitt 8.2.

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=1.0):

```
$ tree debhello-1.0/debian
debhello-1.0/debian
b'|-b'|-b'|-b'|-b' README.Debian
b'|-b'|-b'|-b'|-b' changelog
b'|-b'|-b'|-b'|-b' control
b'|-b'|-b'|-b'|-b' copyright
b'|-b'|-b'|-b'|-b' patches
b'|-b'|-b'|-b'|-b' series
b'|-b'|-b'|-b'|-b' rules
b'|-b'|-b'|-b'|-b' source
b'|-b'|-b'|-b'|-b' format
b'|-b'|-b'|-b'|-b' local-options
b'|-b'|-b'|-b'|-b' watch

2 directories, 9 files
```

The rest of the packaging activities are practically the same as the ones in Abschnitt 8.2.

8.4 setup.py (Python3, CLI)

Here is an example of creating a simple Debian package from a Python3 CLI program using **setup.py** as its build system.

Let's assume its upstream tarball to be **debhello-1.1.tar.gz**.

This type of source is meant to be installed as a non-system file as:

```
$ tar -xzf debhello-1.1.tar.gz
$ cd debhello-1.1
$ python3 setup.py install
```

Debian packaging requires changing the last line to “**python3 setup.py install --install-layout=deb**” to install files into the target system image location. This issue is automatically addressed when using the **dh** command for Debian packaging.

Let's get the source and make the Debian package.

Download debhello-1.1.tar.gz

```
$ wget http://www.example.org/download/debhello-1.1.tar.gz
...
$ tar -xzf debhello-1.1.tar.gz
$ tree
.
b'|-b'|-b'|-b'|-b' debhello-1.1
b'|-b'|-b'|-b'|-b' LICENSE
b'|-b'|-b'|-b'|-b' MANIFEST.in
b'|-b'|-b'|-b'|-b' PKG-INFO
b'|-b'|-b'|-b'|-b' hello_py
b'|-b'|-b'|-b'|-b' __init__.py
b'|-b'|-b'|-b'|-b' scripts
b'|-b'|-b'|-b'|-b' hello
b'|-b'|-b'|-b'|-b' setup.py
b'|-b'|-b'|-b'|-b' debhello-1.1.tar.gz

3 directories, 7 files
```

Here, the **hello** script and its associated **hello_py** module are as follows.

hello (v=1.1)

```
$ cat debhello-1.1/scripts/hello
#!/usr/bin/python3
```

```
import hello_py

if __name__ == '__main__':
    hello_py.main()
```

hello_py/__init__.py (v=1.1)

```
$ cat debhello-1.1/hello_py/__init__.py
#!/usr/bin/python3
def main():
    print('Hello Python3!')
    input("Press Enter to continue...")
    return

if __name__ == '__main__':
    main()
```

These are packaged using the Python [distutils](#) with the **setup.py** and **MANIFEST.in** files.

setup.py (v=1.1)

```
$ cat debhello-1.1/setup.py
#!/usr/bin/python3
# vi:se ts=4 sts=4 et ai:
from distutils.core import setup

setup(name='debhello',
      version='4.0',
      description='Hello Python',
      long_description='Hello Python program.',
      author='Osamu Aoki',
      author_email='osamu@debian.org',
      url='http://people.debian.org/~osamu/',
      packages=['hello_py'],
      package_dir={'hello_py': 'hello_py'},
      scripts=['scripts/hello'],
      classifiers = ['Development Status :: 3 - Alpha',
                    'Environment :: Console',
                    'Intended Audience :: Developers',
                    'License :: OSI Approved :: MIT License',
                    'Natural Language :: English',
                    'Operating System :: POSIX :: Linux',
                    'Programming Language :: Python :: 3',
                    'Topic :: Utilities',
                    ],
      platforms = 'POSIX',
      license = 'MIT License'
)
```

MANIFEST.in (v=1.1)

```
$ cat debhello-1.1/MANIFEST.in
include MANIFEST.in
include LICENSE
```

Tipp



Many modern Python packages are distributed using [setuptools](#). Since setuptools is an enhanced alternative to distutils, this example is useful for them.

Let's package this with the **debmake** command. Here, the **-b:py3** option is used to specify the generated binary package containing Python3 script and module files.

```
$ cd debhello-1.1
$ debmake -b':py3'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.1", rev="1"
I: *** start packaging in "debhello-1.1". ***
I: provide debhello_1.1.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.1.tar.gz debhello_1.1.orig.tar.gz
I: pwd = "/path/to/debhello-1.1"
I: parse binary package settings: :py3
I: binary package=debhello Type=python3 / Arch=all M-A=foreign
...
```

Let's inspect the notable template files generated.

debian/rules (template file, v=1.1):

```
$ cat debhello-1.1/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1

%:
    dh $@ --with python3 --buildsystem=pybuild
```

This is essentially the standard **debian/rules** file with the **dh** command.

The use of the “**--with python3**” option invokes **dh_python3** to calculate Python dependencies, add maintainer scripts to byte compiled files, etc. See **dh_python3(1)**.

The use of the “**--buildsystem=pybuild**” option invokes various build systems for requested Python versions in order to build modules and extensions. See **pybuild(1)**.

debian/control (template file, v=1.1):

```
$ cat debhello-1.1/debian/control
Source: debhello
Section: unknown
Priority: optional
Maintainer: "Firstname Lastname" <email.address@example.org>
Build-Depends: debhelper-compat (= 13), dh-python, python3-all
Standards-Version: 4.5.0
Homepage: <insert the upstream URL, if relevant>
X-Python3-Version: >= 3.2

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: ${misc:Depends}, ${python3:Depends}
Description: auto-generated package by debmake
 This Debian binary package was auto-generated by the
 debmake(1) command provided by the debmake package.
```

Since this is the Python3 package, the **debmake** command sets “**Architecture: all**” and “**Multi-Arch: foreign**”. Also, it sets required **substvar** parameters as “**Depends: \${python3:Depends}, \${misc:Depends}**”. These are explained in Kapitel 5.

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.1):

```
$ vim debhello-1.1/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.1/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1

%:
    dh $@ --with python3 --buildsystem=pybuild
```


debian/control (maintainer version, v=1.1):

```
$ vim debhello-1.1/debian/control
... hack, hack, hack, ...
$ cat debhello-1.1/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13), dh-python, python3-all
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc
X-Python3-Version: >= 3.2

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: ${misc:Depends}, ${python3:Depends}
Description: example package in the debmake-doc package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
The generated Debian package uses the dh command offered by the
debhelper package and the dpkg source format `3.0 (quilt)'.
```

The **hello** command does not come with the upstream-provided manpage; let's add it as the maintainer.
debian/manpages etc. (maintainer version, v=1.1):

```
$ vim debhello-1.1/debian/hello.1
... hack, hack, hack, ...
$ vim debhello-1.1/debian/manpages
... hack, hack, hack, ...
$ cat debhello-1.1/debian/manpages
debian/hello.1
```

There are several other template files under the **debian/** directory. These also need to be updated.
The rest of the packaging activities are practically the same as the ones in Abschnitt 8.3.

Template files under debian/. (v=1.1):

```
$ tree debhello-1.1/debian
debhello-1.1/debian
b' | b' | b' | b' | b' | README.Debian
b' | b' | b' | b' | b' | changelog
b' | b' | b' | b' | b' | control
b' | b' | b' | b' | b' | copyright
b' | b' | b' | b' | b' | hello.1
b' | b' | b' | b' | b' | manpages
b' | b' | b' | b' | b' | patches
b' | b' | b' | b' | b' | series
b' | b' | b' | b' | b' | rules
b' | b' | b' | b' | b' | source
b' | b' | b' | b' | b' | format
b' | b' | b' | b' | b' | local-options
b' | b' | b' | b' | b' | watch

2 directories, 11 files
```

Here is the generated dependency list of **debhello_1.1-1_all.deb**.

The generated dependency list of debhello_1.1-1_all.deb:

```
$ dpkg -f debhello_1.1-1_all.deb pre-depends depends recommends conflicts br...
Depends: python3:any (>= 3.2~)
```

8.5 Makefile (shell, GUI)

Here is an example of creating a simple Debian package from a POSIX shell GUI program using the **Makefile** as its build system.

This upstream is based on Abschnitt 8.3 with enhanced GUI support.

Let's assume its upstream tarball to be **debhello-1.2.tar.gz**.

Let's get the source and make the Debian package.

Download debhello-1.2.tar.gz

```
$ wget http://www.example.org/download/debhello-1.2.tar.gz
...
$ tar -xzmf debhello-1.2.tar.gz
$ tree
.
├── debhello-1.2
│   ├── LICENSE
│   ├── Makefile
│   ├── data
│   │   ├── hello.desktop
│   │   ├── hello.png
│   │   ├── man
│   │   └── hello.1
│   ├── scripts
│   └── hello
└── debhello-1.2.tar.gz

4 directories, 7 files
```

Here, the **hello** has been re-written to use the **zenity** command to make this a GTK+ GUI program.

hello (v=1.2)

```
$ cat debhello-1.2/scripts/hello
#!/bin/sh -e
zenity --info --title "hello" --text "Hello from the shell!"
```

Here, the desktop file is updated to be **Terminal=false** as a GUI program.

hello.desktop (v=1.2)

```
$ cat debhello-1.2/data/hello.desktop
[Desktop Entry]
Name=Hello
Name[fr]=Bonjour
Comment=Greetings
Comment[fr]=Salutations
Type=Application
Keywords=hello
Exec=hello
Terminal=false
Icon=hello.png
Categories=Utility;
```

All other files are the same as in Abschnitt 8.3.

Let's package this with the **debmake** command. Here, the **-b':sh'** option is used to specify that the generated binary package is a shell script.

```
$ cd debhello-1.2
$ debmake -b':sh'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.2", rev="1"
I: *** start packaging in "debhello-1.2". ***
I: provide debhello_1.2.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.2.tar.gz debhello_1.2.orig.tar.gz
I: pwd = "/path/to/debhello-1.2"
```

```
I: parse binary package settings: :sh
I: binary package=debhello Type=script / Arch=all M-A=foreign
...
```

Let's inspect the notable template files generated.

debian/control (template file, v=1.2):

```
$ cat debhello-1.2/debian/control
Source: debhello
Section: unknown
Priority: optional
Maintainer: "Firstname Lastname" <email.address@example.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.5.0
Homepage: <insert the upstream URL, if relevant>

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: ${misc:Depends}
Description: auto-generated package by debmake
 This Debian binary package was auto-generated by the
 debmake(1) command provided by the debmake package.
```

Let's make this Debian package better as the maintainer.

debian/control (maintainer version, v=1.2):

```
$ vim debhello-1.2/debian/control
... hack, hack, hack, ...
$ cat debhello-1.2/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13)
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: zenity, ${misc:Depends}
Description: example package in the debmake-doc package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
```

Please note the manually added **zenity** dependency.

The **debian/rules** file is exactly the same as the one in Abschnitt 8.3.

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=1.2):

```
$ tree debhello-1.2/debian
debhello-1.2/debian
├── README.Debian
├── changelog
├── control
├── copyright
├── patches
├── series
├── rules
├── source
└── format
```

```
b''|b''    b''Lb''b''-b''b''-b'' local-options
b''Lb''b''-b''b''-b'' watch
```

```
2 directories, 9 files
```

The rest of the packaging activities are practically the same as in Abschnitt 8.3.

Here is the generated dependency list of **debhello_1.2-1_all.deb**.

The generated dependency list of debhello_1.2-1_all.deb:

```
$ dpkg -f debhello_1.2-1_all.deb pre-depends depends recommends conflicts br...
Depends: zenity
```

8.6 setup.py (Python3, GUI)

Here is an example of creating a simple Debian package from a Python3 GUI program using the **setup.py** as its build system.

This upstream is based on Abschnitt 8.4 with enhanced GUI, desktop icon, and manpage support.

Let's assume this upstream tarball to be **debhello-1.3.tar.gz**.

Let's get the source and make the Debian package.

Download debhello-1.3.tar.gz

```
$ wget http://www.example.org/download/debhello-1.3.tar.gz
...
$ tar -xzmf debhello-1.3.tar.gz
$ tree

.
├── debhello-1.3
│   ├── LICENSE
│   ├── MANIFEST.in
│   ├── PKG-INFO
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── hello_py
│   ├── __init__.py
│   ├── man
│   ├── hello.1
│   ├── scripts
│   ├── hello
│   └── setup.py
└── debhello-1.3.tar.gz
```

```
5 directories, 10 files
```

Here are the upstream sources.

hello (v=1.3)

```
$ cat debhello-1.3/scripts/hello
#!/usr/bin/python3
import hello_py

if __name__ == '__main__':
    hello_py.main()
```

hello_py/__init__.py (v=1.3)

```
$ cat debhello-1.3/hello_py/__init__.py
#!/usr/bin/python3
from gi.repository import Gtk

class TopWindow(Gtk.Window):

    def __init__(self):
```

```

    Gtk.Window.__init__(self)
    self.title = "Hello World!"
    self.counter = 0
    self.border_width = 10
    self.set_default_size(400, 100)
    self.set_position(Gtk.WindowPosition.CENTER)
    self.button = Gtk.Button(label="Click me!")
    self.button.connect("clicked", self.on_button_clicked)
    self.add(self.button)
    self.connect("delete-event", self.on_window_destroy)

    def on_window_destroy(self, *args):
        Gtk.main_quit(*args)

    def on_button_clicked(self, widget):
        self.counter += 1
        widget.set_label("Hello, World!\nClick count = %i" % self.counter)

def main():
    window = TopWindow()
    window.show_all()
    Gtk.main()

if __name__ == '__main__':
    main()

```

setup.py (v=1.3)

```

$ cat debhello-1.3/setup.py
#!/usr/bin/python3
# vi:se ts=4 sts=4 et ai:
from distutils.core import setup

setup(name='debhello',
      version='4.1',
      description='Hello Python',
      long_description='Hello Python program.',
      author='Osamu Aoki',
      author_email='osamu@debian.org',
      url='http://people.debian.org/~osamu/',
      packages=['hello_py'],
      package_dir={'hello_py': 'hello_py'},
      scripts=['scripts/hello'],
      data_files=[
          ('share/applications', ['data/hello.desktop']),
          ('share/pixmaps', ['data/hello.png']),
          ('share/man/man1', ['man/hello.1']),
      ],
      classifiers = ['Development Status :: 3 - Alpha',
                    'Environment :: Console',
                    'Intended Audience :: Developers',
                    'License :: OSI Approved :: MIT License',
                    'Natural Language :: English',
                    'Operating System :: POSIX :: Linux',
                    'Programming Language :: Python :: 3',
                    'Topic :: Utilities',
      ],
      platforms = 'POSIX',
      license = 'MIT License'
)

```

MANIFEST.in (v=1.3)

```

$ cat debhello-1.3/MANIFEST.in
include MANIFEST.in

```

```
include LICENSE
include data/hello.deskto
include data/hello.png
include man/hello.1
```

Let's package this with the **debmake** command. Here, the **-b':py3'** option is used to specify that the generated binary package contains Python3 script and module files.

```
$ cd debhello-1.3
$ debmake -b':py3'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.3", rev="1"
I: *** start packaging in "debhello-1.3". ***
I: provide debhello_1.3.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.3.tar.gz debhello_1.3.orig.tar.gz
I: pwd = "/path/to/debhello-1.3"
I: parse binary package settings: :py3
I: binary package=debhello Type=python3 / Arch=all M-A=foreign
...
```

The result is practically the same as in Abschnitt 8.4.

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.3):

```
$ vim debhello-1.3/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.3/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1

%:
    dh $@ --with python3 --buildsystem=pybuild
```

debian/control (maintainer version, v=1.3):

```
$ vim debhello-1.3/debian/control
... hack, hack, hack, ...
$ cat debhello-1.3/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13), dh-python, python3-all
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc
X-Python3-Version: >= 3.2

Package: debhello
Architecture: all
Multi-Arch: foreign
Depends: gir1.2-gtk-3.0, python3-gi, ${misc:Depends}, ${python3:Depends}
Description: example package in the debmake-doc package
    This is an example package to demonstrate Debian packaging using
    the debmake command.
.
The generated Debian package uses the dh command offered by the
debhelper package and the dpkg source format `3.0 (quilt)'.
```

Please note the manually added **python3-gi** and **gir1.2-gtk-3.0** dependencies.

Since this upstream source has a manpage and other files with matching entries in the **setup.py** file, there is no need to create them and add the **debian/install** and **debian/manpages** files that were required in Abschnitt 8.4.

The rest of the packaging activities are practically the same as in Abschnitt 8.4.

Here is the generated dependency list of **debhello_1.3-1_all.deb**.

The generated dependency list of debhello_1.3-1_all.deb:

```
$ dpkg -f debhello_1.3-1_all.deb pre-depends depends recommends conflicts br...
Depends: gir1.2-gtk-3.0, python3-gi, python3:any (>= 3.2~)
```

8.7 Makefile (single-binary package)

Here is an example of creating a simple Debian package from a simple C source program using the **Makefile** as its build system.

This is an enhanced upstream source example for Kapitel 4. This comes with the manpage, the desktop file, and the desktop icon. This also links to an external library **libm** to be a more practical example.

Let's assume this upstream tarball to be **debhello-1.4.tar.gz**.

This type of source is meant to be installed as a non-system file as:

```
$ tar -xzmfb debhello-1.4.tar.gz
$ cd debhello-1.4
$ make
$ make install
```

Debian packaging requires changing this “**make install**” process to install files into the target system image location instead of the normal location under `/usr/local`.

Let's get the source and make the Debian package.

Download debhello-1.4.tar.gz

```
$ wget http://www.example.org/download/debhello-1.4.tar.gz
...
$ tar -xzmf debhello-1.4.tar.gz
$ tree
.
├── debhello-1.4
│   ├── LICENSE
│   ├── Makefile
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── man
│   ├── hello.1
│   └── src
└── config.h
    hello.c
debhello-1.4.tar.gz
```

Here, the contents of this source are as follows.

src/hello.c (v=1.4):

```
$ cat debhello-1.4/src/hello.c
#include "config.h"
#include <math.h>
#include <stdio.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
    printf("4.0 * atan(1.0) = %10f8\n", 4.0*atan(1.0));
    return 0;
}
```

src/config.h (v=1.4):

```
$ cat debhello-1.4/src/config.h
#define PACKAGE_AUTHOR "Osamu Aoki"
```

Makefile (v=1.4):

```

$ cat debhello-1.4/Makefile
prefix = /usr/local

all: src/hello

src/hello: src/hello.c
    $(CC) $(CPPFLAGS) $(CFLAGS) $(LDFLAGS) -o $@ $^ -lm

install: src/hello
    install -D src/hello \
        $(DESTDIR)$(prefix)/bin/hello
    install -m 644 -D data/hello.desktop \
        $(DESTDIR)$(prefix)/share/applications/hello.desktop
    install -m 644 -D data/hello.png \
        $(DESTDIR)$(prefix)/share/pixmaps/hello.png
    install -m 644 -D man/hello.1 \
        $(DESTDIR)$(prefix)/share/man/man1/hello.1

clean:
    -rm -f src/hello

distclean: clean

uninstall:
    -rm -f $(DESTDIR)$(prefix)/bin/hello
    -rm -f $(DESTDIR)$(prefix)/share/applications/hello.desktop
    -rm -f $(DESTDIR)$(prefix)/share/pixmaps/hello.png
    -rm -f $(DESTDIR)$(prefix)/share/man/man1/hello.1

.PHONY: all install clean distclean uninstall

```

Please note that this **Makefile** has the proper **install** target for the manpage, the desktop file, and the desktop icon.

Let's package this with the **debmake** command.

```

$ cd debhello-1.4
$ debmake
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.4", rev="1"
I: *** start packaging in "debhello-1.4". ***
I: provide debhello_1.4.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.4.tar.gz debhello_1.4.orig.tar.gz
I: pwd = "/path/to/debhello-1.4"
I: parse binary package settings:
I: binary package=debhello Type=bin / Arch=any M-A=foreign
...

```

The result is practically the same as in Abschnitt 4.5.

Let's make this Debian package, which is practically the same as in Abschnitt 4.6, better as the maintainer.

If the **DEB_BUILD_MAINT_OPTIONS** environment variable is not exported in **debian/rules**, lintian warns "W: debhello: hardening-no-relro usr/bin/hello" for the linking of **libm**.

The **debian/control** file makes it exactly the same as the one in Abschnitt 4.6, since the **libm** library is always available as a part of **libc6** (Priority: required).

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=1.4):

```

$ tree debhello-1.4/debian
debhello-1.4/debian
b' |b'b'-'b'b'-'b' README.Debian
b' |b'b'-'b'b'-'b' changelog
b' |b'b'-'b'b'-'b' control
b' |b'b'-'b'b'-'b' copyright

```



```

b''|b''b''-b''b''-b'' patches
b''|b''  b''|b''b''-b''b''-b'' series
b''|b''b''-b''b''-b'' rules
b''|b''b''-b''b''-b'' source
b''|b''  b''|b''b''-b''b''-b'' format
b''|b''  b''|b''b''-b''b''-b'' local-options
b''|b''b''-b''b''-b'' watch

```

2 directories, 9 files

The rest of the packaging activities are practically the same as the one in Abschnitt 4.7.

Here is the generated dependency list of all binary packages.

The generated dependency list of all binary packages (v=1.4):

```

$ dpkg -f debhello-dbgSYM_1.4-1_amd64.deb pre-depends depends recommends con...
Depends: debhello (= 1.4-1)
$ dpkg -f debhello_1.4-1_amd64.deb pre-depends depends recommends conflicts ...
Depends: libc6 (>= 2.3.4)

```

8.8 Makefile.in + configure (single-binary package)

Here is an example of creating a simple Debian package from a simple C source program using **Makefile.in** and **configure** as its build system.

This is an enhanced upstream source example for Abschnitt 8.7. This also links to an external library, **libm**, and this source is configurable using arguments to the **configure** script, which generates the **Makefile** and **src/config.h** files.

Let's assume this upstream tarball to be **debhello-1.5.tar.gz**.

This type of source is meant to be installed as a non-system file, for example, as:

```

$ tar -xzf debhello-1.5.tar.gz
$ cd debhello-1.5
$ ./configure --with-math
$ make
$ make install

```

Let's get the source and make the Debian package.

Download debhello-1.5.tar.gz

```

$ wget http://www.example.org/download/debhello-1.5.tar.gz
...
$ tar -xzf debhello-1.5.tar.gz
$ tree

```

```

.
b''|b''b''-b''b''-b'' debhello-1.5
b''|b''  b''|b''b''-b''b''-b'' LICENSE
b''|b''  b''|b''b''-b''b''-b'' Makefile.in
b''|b''  b''|b''b''-b''b''-b'' configure
b''|b''  b''|b''b''-b''b''-b'' data
b''|b''  b''|b''  b''|b''b''-b''b''-b'' hello.desktop
b''|b''  b''|b''  b''|b''b''-b''b''-b'' hello.png
b''|b''  b''|b''b''-b''b''-b'' man
b''|b''  b''|b''  b''|b''b''-b''b''-b'' hello.1
b''|b''  b''|b''b''-b''b''-b'' src
b''|b''  b''|b''b''-b''b''-b'' hello.c
b''|b''b''-b''b''-b'' debhello-1.5.tar.gz

```

4 directories, 8 files

Here, the contents of this source are as follows.

src/hello.c (v=1.5):

```

$ cat debhello-1.5/src/hello.c
#include "config.h"

```

```

#ifdef WITH_MATH
# include <math.h>
#endif
#include <stdio.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
#ifdef WITH_MATH
    printf("4.0 * atan(1.0) = %10f8\n", 4.0*atan(1.0));
#else
    printf("I can't do MATH!\n");
#endif
    return 0;
}

```

Makefile.in (v=1.5):

```

$ cat debhello-1.5/Makefile.in
prefix = @prefix@

all: src/hello

src/hello: src/hello.c
    $(CC) @VERBOSE@ \
        $(CPPFLAGS) \
        $(CFLAGS) \
        $(LDFLAGS) \
        -o $@ $^ \
        @LINKLIB@

install: src/hello
    install -D src/hello \
        $(DESTDIR)$(prefix)/bin/hello
    install -m 644 -D data/hello.desktop \
        $(DESTDIR)$(prefix)/share/applications/hello.desktop
    install -m 644 -D data/hello.png \
        $(DESTDIR)$(prefix)/share/pixmaps/hello.png
    install -m 644 -D man/hello.1 \
        $(DESTDIR)$(prefix)/share/man/man1/hello.1

clean:
    -rm -f src/hello

distclean: clean

uninstall:
    -rm -f $(DESTDIR)$(prefix)/bin/hello
    -rm -f $(DESTDIR)$(prefix)/share/applications/hello.desktop
    -rm -f $(DESTDIR)$(prefix)/share/pixmaps/hello.png
    -rm -f $(DESTDIR)$(prefix)/share/man/man1/hello.1

.PHONY: all install clean distclean uninstall

```

configure (v=1.5):

```

$ cat debhello-1.5/configure
#!/bin/sh -e
# default values
PREFIX="/usr/local"
VERBOSE=""
WITH_MATH="0"
LINKLIB=""
PACKAGE_AUTHOR="John Doe"

```

```

# parse arguments
while [ "${1}" != "" ]; do
  VAR="${1%=*}" # Drop suffix =*
  VAL="${1#*=}" # Drop prefix *=
  case "${VAR}" in
    --prefix)
      PREFIX="${VAL}"
      ;;
    --verbose|-v)
      VERBOSE="-v"
      ;;
    --with-math)
      WITH_MATH="1"
      LINKLIB="-lm"
      ;;
    --author)
      PACKAGE_AUTHOR="${VAL}"
      ;;
    *)
      echo "W: Unknown argument: ${1}"
      esac
      shift
  done

# setup configured Makefile and src/config.h
sed -e "s,@prefix@,{PREFIX}," \
    -e "s,@VERBOSE@,{VERBOSE}," \
    -e "s,@LINKLIB@,{LINKLIB}," \
    <Makefile.in >Makefile
if [ "${WITH_MATH}" = 1 ]; then
  echo "#define WITH_MATH" >src/config.h
else
  echo "/* not defined: WITH_MATH */" >src/config.h
fi
echo "#define PACKAGE_AUTHOR \"${PACKAGE_AUTHOR}\"" >>src/config.h

```

Please note that the **configure** command replaces strings with **@...@** in **Makefile.in** to produce **Makefile** and creates **src/config.h**.

Let's package this with the **debmake** command.

```

$ cd debhello-1.5
$ debmake
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.5", rev="1"
I: *** start packaging in "debhello-1.5". ***
I: provide debhello_1.5.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.5.tar.gz debhello_1.5.orig.tar.gz
I: pwd = "/path/to/debhello-1.5"
I: parse binary package settings:
I: binary package=debhello Type=bin / Arch=any M-A=foreign
...

```

The result is similar to Abschnitt 4.5 but not exactly the same.

Let's inspect the notable template files generated.

debian/rules (template file, v=1.5):

```

$ cat debhello-1.5/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

```

```
%:
```

```
dh $@
```

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.5):

```
$ vim debhello-1.5/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.5/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed
```

```
%:
```

```
dh $@
```

```
override_dh_auto_configure:
dh_auto_configure -- \
    --with-math \
    --author="Osamu Aoki"
```

There are several other template files under the **debian/** directory. These also need to be updated.

The rest of the packaging activities are practically the same as the one in Abschnitt 4.7.

8.9 Autotools (single-binary package)

Here is an example of creating a simple Debian package from a simple C source program using Autotools = Autoconf and Automake (**Makefile.am** and **configure.ac**) as its build system. See Abschnitt 5.16.1.

This source usually comes with the upstream auto-generated **Makefile.in** and **configure** files, too. This source can be packaged using these files as in Abschnitt 8.8 with the help of the **autotools-dev** package.

The better alternative is to regenerate these files using the latest Autoconf and Automake packages if the upstream provided **Makefile.am** and **configure.ac** are compatible with the latest version. This is advantageous for porting to new CPU architectures, etc. This can be automated by using the “**--with autoreconf**” option for the **dh** command.

Let's assume this upstream tarball to be **debhello-1.6.tar.gz**.

This type of source is meant to be installed as a non-system file, for example, as:

```
$ tar -xzmf debhello-1.6.tar.gz
$ cd debhello-1.6
$ autoreconf -ivf # optional
$ ./configure --with-math
$ make
$ make install
```

Let's get the source and make the Debian package.

Download debhello-1.6.tar.gz

```
$ wget http://www.example.org/download/debhello-1.6.tar.gz
...
$ tar -xzmf debhello-1.6.tar.gz
$ tree
.
|__ debhello-1.6
|   |__ Makefile.am
|   |__ configure.ac
|   |__ data
|   |__ hello.desktop
|   |__ hello.png
|   |__ man
|   |__ Makefile.am
```

```

b''|b''    b''|b''    b''|b''b''-b''b''-b'' hello.1
b''|b''    b''|b''b''-b''b''-b'' src
b''|b''    b''|b''b''-b''b''-b'' Makefile.am
b''|b''    b''|b''b''-b''b''-b'' hello.c
b''|b''b''-b''b''-b'' debhello-1.6.tar.gz

```

4 directories, 9 files

Here, the contents of this source are as follows.

src/hello.c (v=1.6):

```

$ cat debhello-1.6/src/hello.c
#include "config.h"
#ifdef WITH_MATH
# include <math.h>
#endif
#include <stdio.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
#ifdef WITH_MATH
    printf("4.0 * atan(1.0) = %10f8\n", 4.0*atan(1.0));
#else
    printf("I can't do MATH!\n");
#endif
    return 0;
}

```

Makefile.am (v=1.6):

```

$ cat debhello-1.6/Makefile.am
SUBDIRS = src man
$ cat debhello-1.6/man/Makefile.am
dist_man_MANS = hello.1
$ cat debhello-1.6/src/Makefile.am
bin_PROGRAMS = hello
hello_SOURCES = hello.c

```

configure.ac (v=1.6):

```

$ cat debhello-1.6/configure.ac
#                                     -*- Autoconf -*-
# Process this file with autoconf to produce a configure script.
AC_PREREQ([2.69])
AC_INIT([debhello],[2.1],[foo@example.org])
AC_CONFIG_SRCDIR([src/hello.c])
AC_CONFIG_HEADERS([config.h])
echo "Standard customization chores"
AC_CONFIG_AUX_DIR([build-aux])
AM_INIT_AUTOMAKE([foreign])
# Add #define PACKAGE_AUTHOR ... in config.h with a comment
AC_DEFINE(PACKAGE_AUTHOR, ["Osamu Aoki"], [Define PACKAGE_AUTHOR])
echo "Add --with-math option functionality to ./configure"
AC_ARG_WITH([math],
    [AS_HELP_STRING([--with-math],
        [compile with math library @<:@default=yes@:>@])],
    [],
    [with_math="yes"])
echo "==== withval    := \"\$withval\""
echo "==== with_math := \"\$with_math\""
# m4sh if-else construct
AS_IF([test "x$with_math" != "xno"],[
    echo "==== Check include: math.h"
    AC_CHECK_HEADER(math.h,[],[

```

```

    AC_MSG_ERROR([Couldn't find math.h.] )
  ])
  echo "==== Check library: libm"
  AC_SEARCH_LIBS(atan, [m])
  #AC_CHECK_LIB(m, atan)
  echo "==== Build with LIBS := \"$LIBS\""
  AC_DEFINE(WITH_MATH, [1], [Build with the math library])
], [
  echo "==== Skip building with math.h."
  AH_TEMPLATE(WITH_MATH, [Build without the math library])
])
# Checks for programs.
AC_PROG_CC
AC_CONFIG_FILES([Makefile
                  man/Makefile
                  src/Makefile])
AC_OUTPUT

```

Tipp



Without “**foreign**” strictness level specified in **AM_INIT_AUTOMAKE()** as above, **automake** defaults to “**gnu**” strictness level requiring several files in the top-level directory. See “3.2 Strictness” in the **automake** document.

Let’s package this with the **debmake** command.

```

$ cd debhello-1.6
$ debmake
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.6", rev="1"
I: *** start packaging in "debhello-1.6". ***
I: provide debhello_1.6.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-1.6.tar.gz debhello_1.6.orig.tar.gz
I: pwd = "/path/to/debhello-1.6"
I: parse binary package settings:
I: binary package=debhello Type=bin / Arch=any M-A=foreign
...

```

The result is similar to Abschnitt 8.8 but not exactly the same.

Let’s inspect the notable template files generated.

debian/rules (template file, v=1.6):

```

$ cat debhello-1.6/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@ --with autoreconf

#override_dh_install:
#    dh_install --list-missing -X.la -X.pyc -X.pyo

```

Let’s make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.6):

```
$ vim debhello-1.6/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.6/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@ --with autoreconf

override_dh_auto_configure:
    dh_auto_configure -- \
        --with-math
```

There are several other template files under the **debian/** directory. These also need to be updated.
The rest of the packaging activities are practically the same as the one in Abschnitt 4.7.

8.10 CMake (single-binary package)

Here is an example of creating a simple Debian package from a simple C source program using CMake (**CMakeLists.txt** and some files such as **config.h.in**) as its build system. See Abschnitt 5.16.2.

The **cmake** command generates the **Makefile** file based on the **CMakeLists.txt** file and its **-D** option. It also configures the file as specified in its **configure_file(...)** by replacing strings with **@...@** and changing the **#cmakedefine ...** line.

Let's assume this upstream tarball to be **debhello-1.7.tar.gz**.

This type of source is meant to be installed as a non-system file, for example, as:

```
$ tar -xzf debhello-1.7.tar.gz
$ cd debhello-1.7
$ mkdir obj-x86_64-linux-gnu # for out-of-tree build
$ cd obj-x86_64-linux-gnu
$ cmake ..
$ make
$ make install
```

Let's get the source and make the Debian package.

Download debhello-1.7.tar.gz

```
$ wget http://www.example.org/download/debhello-1.7.tar.gz
...
$ tar -xzf debhello-1.7.tar.gz
$ tree
.
├── debhello-1.7
│   ├── CMakeLists.txt
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── man
│   ├── CMakeLists.txt
│   ├── hello.1
│   ├── src
│   ├── CMakeLists.txt
│   ├── config.h.in
│   ├── hello.c
│   └── debhello-1.7.tar.gz
4 directories, 9 files
```

Here, the contents of this source are as follows.

src/hello.c (v=1.7):

```
$ cat debhello-1.7/src/hello.c
#include "config.h"
#ifdef WITH_MATH
# include <math.h>
#endif
#include <stdio.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
#ifdef WITH_MATH
    printf("4.0 * atan(1.0) = %10f8\n", 4.0*atan(1.0));
#else
    printf("I can't do MATH!\n");
#endif
    return 0;
}
```

src/config.h.in (v=1.7):

```
$ cat debhello-1.7/src/config.h.in
/* name of the package author */
#define PACKAGE_AUTHOR "@PACKAGE_AUTHOR@"
/* math library support */
#cmakedefine WITH_MATH
```

CMakeLists.txt (v=1.7):

```
$ cat debhello-1.7/CMakeLists.txt
cmake_minimum_required(VERSION 2.8)
project(debhello)
set(PACKAGE_AUTHOR "Osamu Aoki")
add_subdirectory(src)
add_subdirectory(man)
$ cat debhello-1.7/man/CMakeLists.txt
install(
    FILES ${CMAKE_CURRENT_SOURCE_DIR}/hello.1
    DESTINATION share/man/man1
)
$ cat debhello-1.7/src/CMakeLists.txt
# Always define HAVE_CONFIG_H
add_definitions(-DHAVE_CONFIG_H)
# Interactively define WITH_MATH
option(WITH_MATH "Build with math support" OFF)
#variable_watch(WITH_MATH)
# Generate config.h from config.h.in
configure_file(
    "${CMAKE_CURRENT_SOURCE_DIR}/config.h.in"
    "${CMAKE_CURRENT_BINARY_DIR}/config.h"
)
include_directories("${CMAKE_CURRENT_BINARY_DIR}")
add_executable(hello hello.c)
install(TARGETS hello
    RUNTIME DESTINATION bin
)
```

Let's package this with the **debmake** command.

```
$ cd debhello-1.7
$ debmake
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="1.7", rev="1"
I: *** start packaging in "debhello-1.7". ***
I: provide debhello_1.7.orig.tar.gz for non-native Debian package
```



```
I: pwd = "/path/to"
I: $ ln -sf debhello-1.7.tar.gz debhello_1.7.orig.tar.gz
I: pwd = "/path/to/debhello-1.7"
I: parse binary package settings:
I: binary package=debhello Type=bin / Arch=any M-A=foreign
...
```

The result is similar to Abschnitt 8.8 but not exactly the same.

Let's inspect the notable template files generated.

debian/rules (template file, v=1.7):

```
$ cat debhello-1.7/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@

#override_dh_auto_configure:
#    dh_auto_configure -- \
#        -DCMAKE_LIBRARY_ARCHITECTURE="$(DEB_TARGET_MULTIARCH)"
```

debian/control (template file, v=1.7):

```
$ cat debhello-1.7/debian/control
Source: debhello
Section: unknown
Priority: optional
Maintainer: "Firstname Lastname" <email.address@example.org>
Build-Depends: cmake, debhelper-compat (= 13)
Standards-Version: 4.5.0
Homepage: <insert the upstream URL, if relevant>

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: auto-generated package by debmake
 This Debian binary package was auto-generated by the
 debmake(1) command provided by the debmake package.
```

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=1.7):

```
$ vim debhello-1.7/debian/rules
... hack, hack, hack, ...
$ cat debhello-1.7/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@

override_dh_auto_configure:
    dh_auto_configure -- -DWITH-MATH=1
```

debian/control (maintainer version, v=1.7):

```
$ vim debhello-1.7/debian/control
... hack, hack, hack, ...
$ cat debhello-1.7/debian/control

Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: cmake, debhelper-compat (= 13)
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: example package in the debmake-doc package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
The generated Debian package uses the dh command offered by the
debhelper package and the dpkg source format `3.0 (quilt)'.
```

There are several other template files under the **debian/** directory. These also need to be updated. The rest of the packaging activities are practically the same as the one in Abschnitt 8.8.

8.11 Autotools (multi-binary package)

Here is an example of creating a set of Debian binary packages including the executable package, the shared library package, the development file package, and the debug symbol package from a simple C source program using Autotools = Autoconf and Automake (which use **Makefile.am** and **configure.ac** as their input files) as its build system. See Abschnitt 5.16.1.

Let's package this in the same way as in Abschnitt 8.9.

Let's assume this upstream tarball to be **debhello-2.0.tar.gz**.

This type of source is meant to be installed as a non-system file, for example, as:

```
$ tar -xzmf debhello-2.0.tar.gz
$ cd debhello-2.0
$ autoreconf -ivf # optional
$ ./configure --with-math
$ make
$ make install
```

Let's get the source and make the Debian package.

Download debhello-2.0.tar.gz

```
$ wget http://www.example.org/download/debhello-2.0.tar.gz
...
$ tar -xzmf debhello-2.0.tar.gz
$ tree
.
├── debhello-2.0
│   ├── Makefile.am
│   ├── configure.ac
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── lib
│   ├── Makefile.am
│   ├── sharedlib.c
│   ├── sharedlib.h
│   ├── man
│   └── Makefile.am
```

```

b''|b''    b''|b''    b''|b''b''-b''b''-b'' hello.1
b''|b''    b''|b''b''-b''b''-b'' src
b''|b''    b''|b''b''-b''b''-b'' Makefile.am
b''|b''    b''|b''b''-b''b''-b'' hello.c
b''|b''b''-b''b''-b'' debhello-2.0.tar.gz

```

5 directories, 12 files

Here, the contents of this source are as follows.

src/hello.c (v=2.0):

```

$ cat debhello-2.0/src/hello.c
#include "config.h"
#include <stdio.h>
#include <sharedlib.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
    sharedlib();
    return 0;
}

```

lib/sharedlib.h and lib/sharedlib.c (v=1.6):

```

$ cat debhello-2.0/lib/sharedlib.h
int sharedlib();
$ cat debhello-2.0/lib/sharedlib.c
#include <stdio.h>
int
sharedlib()
{
    printf("This is a shared library!\n");
    return 0;
}

```

Makefile.am (v=2.0):

```

$ cat debhello-2.0/Makefile.am
# recursively process `Makefile.am` in SUBDIRS
SUBDIRS = lib src man
$ cat debhello-2.0/man/Makefile.am
# manpages (distributed in the source package)
dist_man_MANS = hello.1
$ cat debhello-2.0/lib/Makefile.am
# libtool libraries to be produced
lib_LTLIBRARIES = libsharedlib.la

# source files used for lib_LTLIBRARIES
libsharedlib_la_SOURCES = sharedlib.c

# C pre-processor flags used for lib_LTLIBRARIES
#libsharedlib_la_CPPFLAGS =

# Headers files to be installed in <prefix>/include
include_HEADERS = sharedlib.h

# Versioning Libtool Libraries with version triplets
libsharedlib_la_LDFLAGS = -version-info 1:0:0
$ cat debhello-2.0/src/Makefile.am
# program executables to be produced
bin_PROGRAMS = hello

# source files used for bin_PROGRAMS
hello_SOURCES = hello.c

```

```
# C pre-processor flags used for bin_PROGRAMS
AM_CPPFLAGS = -I$(srcdir) -I$(top_srcdir)/lib

# Extra options for the linker for hello
# hello_LDFLAGS =

# Libraries the `hello` binary to be linked
hello_LDADD = $(top_srcdir)/lib/libsharedlib.la
```

configure.ac (v=2.0):

```
$ cat debhello-2.0/configure.ac
#                                     -*- Autoconf -*-
# Process this file with autoconf to produce a configure script.
AC_PREREQ([2.69])
AC_INIT([debhello],[2.2],[foo@example.org])
AC_CONFIG_SRCDIR([src/hello.c])
AC_CONFIG_HEADERS([config.h])
echo "Standard customization chores"
AC_CONFIG_AUX_DIR([build-aux])

AM_INIT_AUTOMAKE([foreign])

# Set default to --enable-shared --disable-static
LT_INIT([shared disable-static])

# find the libltdl sources in the libltdl sub-directory
LT_CONFIG_LTDL_DIR([libltdl])

# choose one
LTDL_INIT([recursive])
#LTDL_INIT([subproject])
#LTDL_INIT([nonrecursive])

# Add #define PACKAGE_AUTHOR ... in config.h with a comment
AC_DEFINE(PACKAGE_AUTHOR, ["Osamu Aoki"], [Define PACKAGE_AUTHOR])
# Checks for programs.
AC_PROG_CC

# only for the recursive case
AC_CONFIG_FILES([Makefile
                 lib/Makefile
                 man/Makefile
                 src/Makefile])
AC_OUTPUT
```

Let's package this with the **debmake** command into multiple packages:

- **debhello**: type = **bin**
- **libsharedlib1**: type = **lib**
- **libsharedlib-dev**: type = **dev**

Here, the **-b',libsharedlib1,libsharedlib-dev'** option is used to specify the generated binary packages.

```
$ cd debhello-2.0
$ debmake -b',libsharedlib1,libsharedlib-dev'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="2.0", rev="1"
I: *** start packaging in "debhello-2.0". ***
I: provide debhello_2.0.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-2.0.tar.gz debhello_2.0.orig.tar.gz
I: pwd = "/path/to/debhello-2.0"
```

```
I: parse binary package settings: ,libsharedlib1,libsharedlib-dev
I: binary package=debhhello Type=bin / Arch=any M-A=foreign
I: binary package=libsharedlib1 Type=lib / Arch=any M-A=same
I: binary package=libsharedlib-dev Type=dev / Arch=any M-A=same
I: analyze the source tree
I: build_type = Autotools with autoreconf
...
```

The result is similar to Abschnitt 8.8 but with more template files.

Let's inspect the notable template files generated.

debian/rules (template file, v=2.0):

```
$ cat debhello-2.0/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@ --with autoreconf

#override_dh_install:
#    dh_install --list-missing -X.la -X.pyc -X.pyo
```

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=2.0):

```
$ vim debhello-2.0/debian/rules
... hack, hack, hack, ...
$ cat debhello-2.0/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@ --with autoreconf

override_dh_missing:
    dh_missing -X.la
```

debian/control (maintainer version, v=2.0):

```
$ vim debhello-2.0/debian/control
... hack, hack, hack, ...
$ cat debhello-2.0/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: debhelper-compat (= 13), dh-autoreconf
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: libsharedlib1 (= ${binary:Version}),
        ${misc:Depends},
        ${shlibs:Depends}
Description: example executable package
    This is an example package to demonstrate Debian packaging using
```

the debmake command.

The generated Debian package uses the dh command offered by the debhelper package and the dpkg source format `3.0 (quilt)'.

This package provides the executable program.

```
Package: libsharedlib1
Section: libs
Architecture: any
Multi-Arch: same
Pre-Depends: ${misc:Pre-Depends}
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: example shared library package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
```

The generated Debian package uses the dh command offered by the debhelper package and the dpkg source format '3.0 (quilt)'.

This package contains the shared library.

```
Package: libsharedlib-dev
Section: libdevel
Architecture: any
Multi-Arch: same
Depends: libsharedlib1 (= ${binary:Version}), ${misc:Depends}
Description: example development package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
```

The generated Debian package uses the dh command offered by the debhelper package and the dpkg source format '3.0 (quilt)'.

This package contains the development files.

debian/*.install (maintainer version, v=2.0):

```
$ vim debhello-2.0/debian/debhello.install
... hack, hack, hack, ...
$ cat debhello-2.0/debian/debhello.install
usr/bin/*
usr/share/*
$ vim debhello-2.0/debian/libsharedlib1.install
... hack, hack, hack, ...
$ cat debhello-2.0/debian/libsharedlib1.install
usr/lib/*/*.so.*
$ vim debhello-2.0/debian/libsharedlib-dev.install
... hack, hack, hack, ...
$ cat debhello-2.0/debian/libsharedlib-dev.install
###usr/lib/*/*pkgconfig/*.pc
usr/include
usr/lib/*/*.so
```

Since this upstream source creates the proper auto-generated **Makefile**, there is no need to create **debian/install** and **debian/manpages** files.

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=2.0):

```
$ tree debhello-2.0/debian
debhello-2.0/debian
b' | b' b' b' b' b' b' b' | README.Debian
b' | b' b' b' b' b' b' b' | changelog
b' | b' b' b' b' b' b' b' | control
b' | b' b' b' b' b' b' b' | copyright
```

```

b''|b''b''-b''b''-b'' debhello.install
b''|b''b''-b''b''-b'' libsharedlib-dev.install
b''|b''b''-b''b''-b'' libsharedlib1.install
b''|b''b''-b''b''-b'' libsharedlib1.symbols
b''|b''b''-b''b''-b'' patches
b''|b'' b''|b''b''-b''b''-b'' series
b''|b''b''-b''b''-b'' rules
b''|b''b''-b''b''-b'' source
b''|b'' b''|b''b''-b''b''-b'' format
b''|b'' b''|b''b''-b''b''-b'' local-options
b''|b''b''-b''b''-b'' watch

```

2 directories, 13 files

The rest of the packaging activities are practically the same as the one in Abschnitt 8.8.

Here are the generated dependency list of all binary packages.

The generated dependency list of all binary packages (v=2.0):

```

$ dpkg -f debhello-dbgsym_2.0-1_amd64.deb pre-depends depends recommends con...
Depends: debhello (= 2.0-1)
$ dpkg -f debhello_2.0-1_amd64.deb pre-depends depends recommends conflicts ...
Depends: libsharedlib1 (= 2.0-1), libc6 (>= 2.2.5)
$ dpkg -f libsharedlib-dev_2.0-1_amd64.deb pre-depends depends recommends co...
Depends: libsharedlib1 (= 2.0-1)
$ dpkg -f libsharedlib1-dbgsym_2.0-1_amd64.deb pre-depends depends recommend...
Depends: libsharedlib1 (= 2.0-1)
$ dpkg -f libsharedlib1_2.0-1_amd64.deb pre-depends depends recommends confl...
Depends: libc6 (>= 2.2.5)

```

8.12 CMake (multi-binary package)

Here is an example of creating a set of Debian binary packages including the executable package, the shared library package, the development file package, and the debug symbol package from a simple C source program using CMake (**CMakeLists.txt** and some files such as **config.h.in**) as its build system. See Abschnitt 5.16.2.

Let's assume this upstream tarball to be **debhello-2.1.tar.gz**.

This type of source is meant to be installed as a non-system file, for example, as:

```

$ tar -xzf debhello-2.1.tar.gz
$ cd debhello-2.1
$ mkdir obj-x86_64-linux-gnu
$ cd obj-x86_64-linux-gnu
$ cmake ..
$ make
$ make install

```

Let's get the source and make the Debian package.

Download debhello-2.1.tar.gz

```

$ wget http://www.example.org/download/debhello-2.1.tar.gz
...
$ tar -xzf debhello-2.1.tar.gz
$ tree
.
b''|b''b''-b''b''-b'' debhello-2.1
b''|b'' b''|b''b''-b''b''-b'' CMakeLists.txt
b''|b'' b''|b''b''-b''b''-b'' data
b''|b'' b''|b'' b''|b''b''-b''b''-b'' hello.desktop
b''|b'' b''|b'' b''|b''b''-b''b''-b'' hello.png
b''|b'' b''|b''b''-b''b''-b'' lib
b''|b'' b''|b'' b''|b''b''-b''b''-b'' CMakeLists.txt
b''|b'' b''|b'' b''|b''b''-b''b''-b'' sharedlib.c
b''|b'' b''|b'' b''|b''b''-b''b''-b'' sharedlib.h
b''|b'' b''|b''b''-b''b''-b'' man

```

```

b''|b''  b''|b''  b''|b''b''-b''b''-b'' CMakeLists.txt
b''|b''  b''|b''  b''|b''b''-b''b''-b'' hello.1
b''|b''  b''|b''b''-b''b''-b'' src
b''|b''  b''|b''b''-b''b''-b'' CMakeLists.txt
b''|b''  b''|b''b''-b''b''-b'' config.h.in
b''|b''  b''|b''b''-b''b''-b'' hello.c
b''|b''b''-b''b''-b'' debhello-2.1.tar.gz

```

5 directories, 12 files

Here, the contents of this source are as follows.

src/hello.c (v=2.1):

```

$ cat debhello-2.1/src/hello.c
#include "config.h"
#include <stdio.h>
#include <sharedlib.h>
int
main()
{
    printf("Hello, I am " PACKAGE_AUTHOR "!\n");
    sharedlib();
    return 0;
}

```

src/config.h.in (v=2.1):

```

$ cat debhello-2.1/src/config.h.in
/* name of the package author */
#define PACKAGE_AUTHOR "@PACKAGE_AUTHOR@"

```

lib/sharedlib.c and lib/sharedlib.h (v=2.1):

```

$ cat debhello-2.1/lib/sharedlib.h
int sharedlib();
$ cat debhello-2.1/lib/sharedlib.c
#include <stdio.h>
int
sharedlib()
{
    printf("This is a shared library!\n");
    return 0;
}

```

CMakeLists.txt (v=2.1):

```

$ cat debhello-2.1/CMakeLists.txt
cmake_minimum_required(VERSION 2.8)
project(debhello)
set(PACKAGE_AUTHOR "Osamu Aoki")
add_subdirectory(lib)
add_subdirectory(src)
add_subdirectory(man)
$ cat debhello-2.1/man/CMakeLists.txt
install(
    FILES ${CMAKE_CURRENT_SOURCE_DIR}/hello.1
    DESTINATION share/man/man1
)
$ cat debhello-2.1/src/CMakeLists.txt
# Always define HAVE_CONFIG_H
add_definitions(-DHAVE_CONFIG_H)
# Generate config.h from config.h.in
configure_file(
    "${CMAKE_CURRENT_SOURCE_DIR}/config.h.in"
    "${CMAKE_CURRENT_BINARY_DIR}/config.h"
)

```



```
include_directories("${CMAKE_CURRENT_BINARY_DIR}")
include_directories("${CMAKE_SOURCE_DIR}/lib")

add_executable(hello hello.c)
target_link_libraries(hello sharedlib)
install(TARGETS hello
        RUNTIME DESTINATION bin
)
```

Let's package this with the **debmake** command.

```
$ cd debhello-2.1
$ debmake -b',libsharedlib1,libsharedlib-dev'
I: set parameters
I: sanity check of parameters
I: pkg="debhello", ver="2.1", rev="1"
I: *** start packaging in "debhello-2.1". ***
I: provide debhello_2.1.orig.tar.gz for non-native Debian package
I: pwd = "/path/to"
I: $ ln -sf debhello-2.1.tar.gz debhello_2.1.orig.tar.gz
I: pwd = "/path/to/debhello-2.1"
I: parse binary package settings: ,libsharedlib1,libsharedlib-dev
I: binary package=debhello Type=bin / Arch=any M-A=foreign
...
```

The result is similar to Abschnitt 8.8 but not exactly the same.

Let's inspect the notable template files generated.

debian/rules (template file, v=2.1):

```
$ cat debhello-2.1/debian/rules
#!/usr/bin/make -f
# You must remove unused comment lines for the released package.
#export DH_VERBOSE = 1
#export DEB_BUILD_MAINT_OPTIONS = hardening=+all
#export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
#export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed

%:
    dh $@

#override_dh_auto_configure:
#    dh_auto_configure -- \
#        -DCMAKE_LIBRARY_ARCHITECTURE="$(DEB_TARGET_MULTIARCH)"
```

Let's make this Debian package better as the maintainer.

debian/rules (maintainer version, v=2.1):

```
$ vim debhello-2.1/debian/rules
... hack, hack, hack, ...
$ cat debhello-2.1/debian/rules
#!/usr/bin/make -f
export DH_VERBOSE = 1
export DEB_BUILD_MAINT_OPTIONS = hardening=+all
export DEB_CFLAGS_MAINT_APPEND = -Wall -pedantic
export DEB_LDFLAGS_MAINT_APPEND = -Wl,--as-needed
DEB_HOST_MULTIARCH ?= $(shell dpkg-architecture -qDEB_HOST_MULTIARCH)

%:
    dh $@

override_dh_auto_configure:
    dh_auto_configure -- \
        -DCMAKE_LIBRARY_ARCHITECTURE="$(DEB_HOST_MULTIARCH)"
```

debian/control (maintainer version, v=2.1):

```

$ vim debhello-2.1/debian/control
... hack, hack, hack, ...
$ cat debhello-2.1/debian/control
Source: debhello
Section: devel
Priority: optional
Maintainer: Osamu Aoki <osamu@debian.org>
Build-Depends: cmake, debhelper-compat (= 13)
Standards-Version: 4.3.0
Homepage: https://salsa.debian.org/debian/debmake-doc

Package: debhello
Architecture: any
Multi-Arch: foreign
Depends: libsharedlib1 (= ${binary:Version}),
        ${misc:Depends},
        ${shlibs:Depends}
Description: example executable package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
 The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
.
 This package provides the executable program.

Package: libsharedlib1
Section: libs
Architecture: any
Multi-Arch: same
Pre-Depends: ${misc:Pre-Depends}
Depends: ${misc:Depends}, ${shlibs:Depends}
Description: example shared library package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
 The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
.
 This package contains the shared library.

Package: libsharedlib-dev
Section: libdevel
Architecture: any
Multi-Arch: same
Depends: libsharedlib1 (= ${binary:Version}), ${misc:Depends}
Description: example development package
 This is an example package to demonstrate Debian packaging using
 the debmake command.
.
 The generated Debian package uses the dh command offered by the
 debhelper package and the dpkg source format `3.0 (quilt)'.
.
 This package contains the development files.

```

debian/*.install (maintainer version, v=2.1):

```

$ vim debhello-2.1/debian/debhello.install
... hack, hack, hack, ...
$ cat debhello-2.1/debian/debhello.install
usr/bin/*
usr/share/*
$ vim debhello-2.1/debian/libsharedlib1.install
... hack, hack, hack, ...

```

```
$ cat debhello-2.1/debian/libsharedlib1.install
usr/lib/*/*.so.*
$ vim debhello-2.1/debian/libsharedlib-dev.install
... hack, hack, hack, ...
$ cat debhello-2.1/debian/libsharedlib-dev.install
###usr/lib/*/pkgconfig/*.pc
usr/include
usr/lib/*/*.so
```

This upstream CMakeList.txt needs to be patched to cope with the multiarch path.

debian/patches/* (maintainer version, v=2.1):

```
... hack, hack, hack, ...
$ cat debhello-2.1/debian/libsharedlib1.symbols
libsharedlib.so.1 libsharedlib1 #MINVER#
sharedlib@Base 2.1
```

Since this upstream source creates the proper auto-generated **Makefile**, there is no need to create **debian/install** and **debian/manpages** files.

There are several other template files under the **debian/** directory. These also need to be updated.

Template files under debian/. (v=2.1):

```
$ tree debhello-2.1/debian
debhello-2.1/debian
b' | b' | b' | b' | b' | README.Debian
b' | b' | b' | b' | b' | changelog
b' | b' | b' | b' | b' | control
b' | b' | b' | b' | b' | copyright
b' | b' | b' | b' | b' | debhello.install
b' | b' | b' | b' | b' | libsharedlib-dev.install
b' | b' | b' | b' | b' | libsharedlib1.install
b' | b' | b' | b' | b' | libsharedlib1.symbols
b' | b' | b' | b' | b' | patches
b' | b' | b' | b' | b' | 000-cmake-multiarch.patch
b' | b' | b' | b' | b' | series
b' | b' | b' | b' | b' | rules
b' | b' | b' | b' | b' | source
b' | b' | b' | b' | b' | format
b' | b' | b' | b' | b' | local-options
b' | b' | b' | b' | b' | watch

2 directories, 14 files
```

The rest of the packaging activities are practically the same as the one in Abschnitt 8.8.

Here are the generated dependency list of all binary packages.

The generated dependency list of all binary packages (v=2.1):

```
$ dpkg -f debhello-dbgsym_2.1-1_amd64.deb pre-depends depends recommends con...
Depends: debhello (= 2.1-1)
$ dpkg -f debhello_2.1-1_amd64.deb pre-depends depends recommends conflicts ...
Depends: libsharedlib1 (= 2.1-1), libc6 (>= 2.2.5)
$ dpkg -f libsharedlib-dev_2.1-1_amd64.deb pre-depends depends recommends co...
Depends: libsharedlib1 (= 2.1-1)
$ dpkg -f libsharedlib1-dbgsym_2.1-1_amd64.deb pre-depends depends recommend...
Depends: libsharedlib1 (= 2.1-1)
$ dpkg -f libsharedlib1_2.1-1_amd64.deb pre-depends depends recommends confl...
Depends: libc6 (>= 2.2.5)
```

8.13 Internationalization

Here is an example of updating the simple upstream C source **debhello-2.0.tar.gz** presented in Abschnitt 8.11 for internationalization (i18n) and creating the updated upstream C source **debhello-2.0.tar.gz**.

In the real situation, the package should already be internationalized. So this example is educational for you to understand how this internationalization is implemented.

Tipp



The routine maintainer activity for the i18n is simply to add translation po files reported to you via the Bug Tracking System (BTS) to the **po/** directory and to update the language list in the **po/LINGUAS** file.

Let's get the source and make the Debian package.

Download debhello-2.0.tar.gz (i18n)

```
$ wget http://www.example.org/download/debhello-2.0.tar.gz
```

```
...
```

```
$ tar -xzmf debhello-2.0.tar.gz
```

```
$ tree
```

```
.
├── debhello-2.0
│   ├── Makefile.am
│   ├── configure.ac
│   ├── data
│   ├── hello.desktop
│   ├── hello.png
│   ├── lib
│   │   ├── Makefile.am
│   │   ├── sharedlib.c
│   │   └── sharedlib.h
│   ├── man
│   │   ├── Makefile.am
│   │   └── hello.1
│   └── src
│       ├── Makefile.am
│       └── hello.c
└── debhello-2.0.tar.gz
```

5 directories, 12 files

Internationalize this source tree with the **gettextize** command and remove files auto-generated by Autotools.

run gettextize (i18n):

```
$ cd debhello-2.0
$ gettextize
Creating po/ subdirectory
Creating build-aux/ subdirectory
Copying file ABOUT-NLS
Copying file build-aux/config.rpath
Not copying intl/ directory.
Copying file po/Makefile.in.in
Copying file po/Makevars.template
Copying file po/Rules-quot
Copying file po/boldquot.sed
Copying file po/en@boldquot.header
Copying file po/en@quot.header
Copying file po/insert-header.sin
Copying file po/quot.sed
Copying file po/remove-potcdates.in
Creating initial po/POTFILES.in
Creating po/ChangeLog
Creating directory m4
Copying file m4/gettext.m4
Copying file m4/iconv.m4
Copying file m4/lib-ld.m4
Copying file m4/lib-link.m4
```

```

Copying file m4/lib-prefix.m4
Copying file m4/nls.m4
Copying file m4/po.m4
Copying file m4/progtest.m4
Creating m4/ChangeLog
Updating Makefile.am (backup is in Makefile.am~)
Updating configure.ac (backup is in configure.ac~)
Creating ChangeLog

Please use AM_GNU_GETTEXT([external]) in order to cause autoconfiguration
to look for an external libintl.

Please create po/Makevars from the template in po/Makevars.template.
You can then remove po/Makevars.template.

Please fill po/POTFILES.in as described in the documentation.

Please run 'aclocal' to regenerate the aclocal.m4 file.
You need aclocal from GNU automake 1.9 (or newer) to do this.
Then run 'autoconf' to regenerate the configure file.

You will also need config.guess and config.sub, which you can get from the CV...
of the 'config' project at http://savannah.gnu.org/. The commands to fetch th...
are
$ wget 'http://savannah.gnu.org/cgi-bin/viewcvs/*checkout*/config/config/conf...
$ wget 'http://savannah.gnu.org/cgi-bin/viewcvs/*checkout*/config/config/conf...

You might also want to copy the convenience header file gettext.h
from the /usr/share/gettext directory into your package.
It is a wrapper around <libintl.h> that implements the configure --disable-nl...
option.

Press Return to acknowledge the previous 6 paragraphs.
$ rm -rf m4 build-aux *~

```

Let's check generated files under the **po/** directory.

files in po (i18n):

```

$ ls -l po
/home/osamu/pub/salsa/debmake/debmake-doc/debhello-2.0-pkg2/step151.cmd: line...
total 60
-rw-rw-r-- 1 osamu osamu 494 Sep 28 23:51 ChangeLog
-rw-rw-r-- 1 osamu osamu 17577 Sep 28 23:51 Makefile.in.in
-rw-rw-r-- 1 osamu osamu 3376 Sep 28 23:51 Makevars.template
-rw-rw-r-- 1 osamu osamu 59 Sep 28 23:51 POTFILES.in
-rw-rw-r-- 1 osamu osamu 2203 Sep 28 23:51 Rules-quot
-rw-rw-r-- 1 osamu osamu 217 Sep 28 23:51 boldquot.sed
-rw-rw-r-- 1 osamu osamu 1337 Sep 28 23:51 en@boldquot.header
-rw-rw-r-- 1 osamu osamu 1203 Sep 28 23:51 en@quot.header
-rw-rw-r-- 1 osamu osamu 672 Sep 28 23:51 insert-header.sin
-rw-rw-r-- 1 osamu osamu 153 Sep 28 23:51 quot.sed
-rw-rw-r-- 1 osamu osamu 432 Sep 28 23:51 remove-potcdate.sin

```

Let's update the **configure.ac** by adding "**AM_GNU_GETTEXT([external])**", etc..

configure.ac (i18n):

```

$ vim configure.ac
... hack, hack, hack, ...
$ cat configure.ac
#                                     -*- Autoconf -*-
# Process this file with autoconf to produce a configure script.
AC_PREREQ([2.69])
AC_INIT([debhello],[2.2],[foo@example.org])
AC_CONFIG_SRCDIR([src/hello.c])
AC_CONFIG_HEADERS([config.h])

```

```

echo "Standard customization chores"
AC_CONFIG_AUX_DIR([build-aux])

AM_INIT_AUTOMAKE([foreign])

# Set default to --enable-shared --disable-static
LT_INIT([shared disable-static])

# find the libltdl sources in the libltdl sub-directory
LT_CONFIG_LTDL_DIR([libltdl])

# choose one
LTDL_INIT([recursive])
#LTDL_INIT([subproject])
#LTDL_INIT([nonrecursive])

# Add #define PACKAGE_AUTHOR ... in config.h with a comment
AC_DEFINE(PACKAGE_AUTHOR, ["Osamu Aoki"], [Define PACKAGE_AUTHOR])
# Checks for programs.
AC_PROG_CC

# desktop file support required
AM_GNU_GETTEXT_VERSION([0.19.3])
AM_GNU_GETTEXT([external])

# only for the recursive case
AC_CONFIG_FILES([Makefile
                  po/Makefile.in
                  lib/Makefile
                  man/Makefile
                  src/Makefile])
AC_OUTPUT

```

Let's create the **po/Makevars** file from the **po/Makevars.template** file.
po/Makevars (i18n):

```

... hack, hack, hack, ...
$ diff -u po/Makevars.template po/Makevars
--- po/Makevars.template      2020-07-13 00:39:17.026534688 +0900
+++ po/Makevars 2020-07-13 00:39:17.102533289 +0900
@@ -18,14 +18,14 @@
# or entity, or to disclaim their copyright. The empty string stands for
# the public domain; in this case the translators are expected to disclaim
# their copyright.
-COPYRIGHT HOLDER = Free Software Foundation, Inc.
+COPYRIGHT HOLDER = Osamu Aoki <osamu@debian.org>

# This tells whether or not to prepend "GNU " prefix to the package
# name that gets inserted into the header of the $(DOMAIN).pot file.
# Possible values are "yes", "no", or empty. If it is empty, try to
# detect it automatically by scanning the files in $(top_srcdir) for
# "GNU packagename" string.
-PACKAGE_GNU =
+PACKAGE_GNU = no

# This is the email address or URL to which the translators shall report
# bugs in the untranslated strings:
$ rm po/Makevars.template

```

Let's update C sources for the i18n version by wrapping strings with **_(...)**.
src/hello.c (i18n):

```

... hack, hack, hack, ...
$ cat src/hello.c
#include "config.h"

```

```
#include <stdio.h>
#include <sharedlib.h>
#define _(string) gettext (string)
int
main()
{
    printf(_("Hello, I am " PACKAGE_AUTHOR "!\n"));
    sharedlib();
    return 0;
}
```

lib/sharedlib.c (i18n):

```
... hack, hack, hack, ...
$ cat lib/sharedlib.c
#include <stdio.h>
#define _(string) gettext (string)
int
sharedlib()
{
    printf(_("This is a shared library!\n"));
    return 0;
}
```

The new **gettext** (v=0.19) can handle the i18n version of the desktop file directly.

data/hello.desktop.in (i18n):

```
$ fgrep -v '[ja]=' data/hello.desktop > data/hello.desktop.in
$ rm data/hello.desktop
$ cat data/hello.desktop.in
[Desktop Entry]
Name=Hello
Comment=Greetings
Type=Application
Keywords=hello
Exec=hello
Terminal=true
Icon=hello.png
Categories=Utility;
```

Let's list the input files to extract translatable strings in **po/POTFILES.in**.

po/POTFILES.in (i18n):

```
... hack, hack, hack, ...
$ cat po/POTFILES.in
src/hello.c
lib/sharedlib.c
data/hello.desktop.in
```

Here is the updated root **Makefile.am** with **po** added to the **SUBDIRS** environment variable.

Makefile.am (i18n):

```
$ cat Makefile.am
# recursively process `Makefile.am` in SUBDIRS
SUBDIRS = po lib src man

ACLOCAL_AMFLAGS = -I m4

EXTRA_DIST = build-aux/config.rpath m4/ChangeLog
```

Let's make a translation template file, **debhello.pot**.

po/debhello.pot (i18n):

```
$ xgettext -f po/POTFILES.in -d debhello -o po/debhello.pot -k_
$ cat po/debhello.pot
# SOME DESCRIPTIVE TITLE.
```

```
# Copyright (C) YEAR THE PACKAGE'S COPYRIGHT HOLDER
# This file is distributed under the same license as the PACKAGE package.
# FIRST AUTHOR <EMAIL@ADDRESS>, YEAR.
#
#, fuzzy
msgid ""
msgstr ""
"Project-Id-Version: PACKAGE VERSION\n"
"Report-Msgid-Bugs-To: \n"
"POT-Creation-Date: 2020-07-13 00:39+0900\n"
"PO-Revision-Date: YEAR-MO-DA H0:MI+ZONE\n"
"Last-Translator: FULL NAME <EMAIL@ADDRESS>\n"
"Language-Team: LANGUAGE <LL@li.org>\n"
"Language: \n"
"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=CHARSET\n"
"Content-Transfer-Encoding: 8bit\n"

#: src/hello.c:8
#, c-format
msgid "Hello, I am "
msgstr ""

#: lib/sharedlib.c:6
#, c-format
msgid "This is a shared library!\n"
msgstr ""

#: data/hello.desktop.in:3
msgid "Hello"
msgstr ""

#: data/hello.desktop.in:4
msgid "Greetings"
msgstr ""

#: data/hello.desktop.in:6
msgid "hello"
msgstr ""

#: data/hello.desktop.in:9
msgid "hello.png"
msgstr ""
```

Let's add a translation for French.

po/LINGUAS and po/fr.po (i18n):

```
$ echo 'fr' > po/LINGUAS
$ cp po/debhello.pot po/fr.po
$ vim po/fr.po
... hack, hack, hack, ...
$ cat po/fr.po
# SOME DESCRIPTIVE TITLE.
# This file is put in the public domain.
# FIRST AUTHOR <EMAIL@ADDRESS>, YEAR.
#
msgid ""
msgstr ""
"Project-Id-Version: debhello 2.2\n"
"Report-Msgid-Bugs-To: foo@example.org\n"
"POT-Creation-Date: 2015-03-01 20:22+0900\n"
"PO-Revision-Date: 2015-02-21 23:18+0900\n"
"Last-Translator: Osamu Aoki <osamu@debian.org>\n"
"Language-Team: French <LL@li.org>\n"
"Language: ja\n"
```



```

"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=UTF-8\n"
"Content-Transfer-Encoding: 8bit\n"

#: src/hello.c:34
#, c-format
msgid "Hello, my name is %s!\n"
msgstr "Bonjour, je m'appelle %s!\n"

#: lib/sharedlib.c:29
#, c-format
msgid "This is a shared library!\n"
msgstr "Ceci est une bibliothèque partagée!\n"

#: data/hello.desktop.in:3
msgid "Hello"
msgstr ""

#: data/hello.desktop.in:4
msgid "Greetings"
msgstr "Salutations"

#: data/hello.desktop.in:6
msgid "hello"
msgstr ""

#: data/hello.desktop.in:9
msgid "hello.png"
msgstr ""

```

The packaging activities are practically the same as the one in Abschnitt 8.11. You can find more examples in Abschnitt 8.14 for

- the POSIX shell script with Makefile (v=3.0),
- the Python3 script with distutils (v=3.1),
- the C source with Makefile.in + configure (v=3.2),
- the C source with Autotools (v=3.3), and
- the C source with CMake (v=3.4).

8.14 Details

Actual details of the examples presented and their variants can be obtained by the following.

How to get details

```

$ apt-get source debmake-doc
$ sudo apt-get install devscripts build-essentials
$ cd debmake-doc*
$ sudo apt-get build-dep ./
$ make

```

Each directory with the **-pkg[0-9]** suffix contains the Debian packaging example.

- emulated console command line activity log: the **.log** file
- emulated console command line activity log (short): the **.slog** file
- snapshot source tree image after the **debmake** command: the **debmake** directory
- snapshot source tree image after proper packaging: the **packge** directory
- snapshot source tree image after the **debuild** command: the **test** directory

Anhang A

debmake(1) manpage

A.1 NAME

debmake - program to make a Debian source package

A.2 SYNOPSIS

debmake [-h] [-c | -k] [-n | -a *package-version.orig.tar.gz* | -d | -t] [-p *package*] [-u *version*] [-r *revision*] [-z *extension*] [-b "*binarypackage, ...*"] [-e *foo@example.org*] [-f "*firstname lastname*"] [-i "*buildtool*" | -j] [-l *license_file*] [-m] [-o *file*] [-q] [-s] [-v] [-w "*addon, ...*"] [-x [01234]] [-y] [-L] [-P] [-T]

A.3 DESCRIPTION

debmake helps to build a Debian package from the upstream source. Normally, this is done as follows:

- The upstream tarball is downloaded as the *package-version.tar.gz* file.
- It is untarred to create many files under the *package-version/* directory.
- debmake is invoked in the *package-version/* directory, possibly without any arguments.
- Files in the *package-version/debian/* directory are manually adjusted.
- **dpkg-buildpackage** (usually from its wrapper **debuild** or **pdebuild**) is invoked in the *package-version/* directory to make Debian packages.

Stellen Sie sicher, dass die Argumente **-b**, **-f**, **-l** und **-w** durch Maskieren vor dem Einfluss der Shell geschützt sind.

A.3.1 optional arguments:

-h, --help show this help message and exit.

-c, --copyright scan source for copyright+license text and exit.

- **-c**: simple output style
- **-cc**: normal output style (similar to the **debian/copyright** file)
- **-ccc**: debug output style

-k, --kludge compare the **debian/copyright** file with the source and exit.

The **debian/copyright** file must be organized to list the generic file patterns before the specific exceptions.

- **-k**: basic output style
- **-kk**: verbose output style

-n, --native make a native Debian source package without **.orig.tar.gz**. This makes a “**3.0 (native)**” format package.

If you are thinking of packaging a Debian-specific source tree with **debian/*** in it into a native Debian package, please think otherwise. You can use the “**debmake -d -i debuild**” or “**debmake -t -i debuild**” commands to make a “**3.0 (quilt)**” format non-native Debian package. The only difference is that the **debian/changelog** file must use the non-native version scheme: *version-revision*. The non-native package is more friendly to downstream distributions.

-a package-version.tar.gz, --archive package-version.tar.gz use the upstream source tarball directly. (**-p, -u, -z:** overridden)

The upstream tarball may be specified as *package_version.orig.tar.gz* and **tar.gz**. For other cases, it may be **tar.bz2**, or **tar.xz**.

If the specified upstream tarball name contains uppercase letters, the Debian package name is generated by converting them to lowercase letters.

If the specified argument is the URL (<http://>, <https://>, or <ftp://>) to the upstream tarball, the upstream tarball is downloaded from the URL using **wget** or **curl**.

-d, --dist run the “make dist” command equivalents first to generate the upstream tarball and use it.

The “**debmake -d**” command is designed to run in the *package/* directory hosting the upstream VCS with the build system supporting the “**make dist**” command equivalents. (automake/autoconf, Python distutils, ...)

-t, --tar run the “tar” command to generate the upstream tarball and use it.

The “**debmake -t**” command is designed to run in the *package/* directory hosting the upstream VCS. Unless you provide the upstream version with the **-u** option or with the **debian/changelog** file, a snapshot upstream version is generated in the **0~%y%m%d%H%M** format, e.g., *0~1403012359*, from the UTC date and time. The generated tarball excludes the **debian/** directory found in the upstream VCS. (It also excludes typical VCS directories: **.git/**, **.hg/**, **.svn/**, **.CVS/**.)

-p package, --package package set the Debian package name.

-u version, --upstreamversion version set the upstream package version.

-r revision, --revision revision set the Debian package revision.

-z extension, --targz extension set the tarball type, *extension*=(**tar.gz|tar.bz2|tar.xz**). (alias: **z, b, x**)

-b "binarypackage[:type],...", --binaryspec "binarypackage[:type],..." set the binary package specs by a comma separated list of *binarypackage:type* pairs, e.g., in the full form “**foo:bin,foo-doc:doc,libfoo1:lib,libfoo-dev:dev**” or in the short form, “**-doc,libfoo1,libfoo-dev**”.

Here, *binarypackage* is the binary package name, and the optional *type* is chosen from the following *type* values:

- **bin**: C/C++ compiled ELF binary code package (any, foreign) (default, alias: **""**, i.e., *null-string*)
- **data**: Data (fonts, graphics, ...) package (all, foreign) (alias: **da**)
- **dev**: Library development package (any, same) (alias: **de**)
- **doc**: Documentation package (all, foreign) (alias: **do**)
- **lib**: Library package (any, same) (alias: **l**)
- **perl**: Perl script package (all, foreign) (alias: **pl**)
- **python3**: Python (version 3) script package (all, foreign) (alias: **py3**)
- **ruby**: Ruby script package (all, foreign) (alias: **rb**)
- **nodejs**: Node.js based JavaScript package (all, foreign) (alias: **js**)
- **script**: Shell script package (all, foreign) (alias: **sh**)

The pair values in the parentheses, such as (any, foreign), are the **Architecture** and **Multi-Arch** stanza values set in the **debian/control** file.

In many cases, the **debmake** command makes good guesses for *type* from *binarypackage*. If *type* is not obvious, *type* is set to **bin**. For example, **libfoo** sets *type* to **lib**, and **font-bar** sets *type* to **data**, ...

If the source tree contents do not match settings for *type*, the **debmake** command warns you.

-e *foo@example.org*, **--email** *foo@example.org* set e-mail address.

The default is taken from the value of the environment variable **\$DEBEMAIL**.

-f *"firstname lastname"*, **--fullname** *"firstname lastname"* set the fullname.

The default is taken from the value of the environment variable **\$DEBFULLNAME**.

-i *"buildtool"*, **--invoke** *"buildtool"* invoke *"buildtool"* at the end of execution. *buildtool* may be **"dpkg-buildpackage"**, **"debuild"**, **"pdebuild"**, **"pdebuild --pbuilder cowbuilder"**, etc.

The default is not to execute any program.

Setting this option automatically sets the **--local** option.

-j, **--judge** run **dpkg-depcheck** to judge build dependencies and identify file paths. Log files are in the parent directory.

- **package.build-dep.log**: Log file for **dpkg-depcheck**.
- **package.install.log**: Log file recording files in the **debian/tmp** directory.

-l *"license_file,..."*, **--license** *"license_file,..."* add formatted license text to the end of the **debian/copyright** file holding license scan results.

The default is to add **COPYING** and **LICENSE**, and *license_file* needs to list only the additional file names all separated by **" , "**.

-m, **--monoarch** force packages to be non-multiarch.

-o *file*, **--option** *file* read optional parameters from *file*. (This is not for everyday use.)

The content of *file* is sourced as the Python code at the end of **para.py**. For example, the package description can be specified by the following file.

```
para['desc'] = 'program short description'
para['desc_long'] = '''\
program long description which you wish to include.
.
Empty line is space + .
You keep going on ...
'''
```

-q, **--quitearly** quit early before creating files in the **debian/** directory.

-s, **--spec** use upstream spec (setup.py for Python, etc.) for the package description.

-v, **--version** show version information.

-w *"addon,..."*, **--with** *"addon,..."* add extra arguments to the **--with** option of the **dh(1)** command as *addon* in **debian/rules**.

The *addon* values are listed all separated by **" , "**, e.g., **"-w python3,autoreconf"**.

For Autotools based packages, **autoreconf** as *addon* to run **"autoreconf -i -v -f"** for every package building is default behavior of the **dh(1)** command.

For Autotools based packages, if they install Python (version 3) programs, setting **python3** as *addon* to the **debmake** command argument is needed since this is non-obvious. But for **setup.py** based packages, setting **python3** as *addon* to the **debmake** command argument is not needed since this is obvious and the **debmake** command automatically set it to the **dh(1)** command.

-x *n*, **--extra** *n* generate configuration files as templates. (Please note **debian/changelog**, **debian/control**, **debian/copyright**, and **debian/rules** are bare minimum configuration files to build a Debian binary package.)

The number *n* determines which configuration templates are generated.

- **-x0**: bare minimum configuration files. (default option if any of bare minimum configuration files already exist)

- **-x1**: all **-x0** files + desirable configuration files for the single binary package. (default option for the single binary package if none of bare minimum configuration files exist)
- **-x2**: all **-x1** files + desirable configuration files for the multi binary package. (default option for the multi binary package if none of bare minimum configuration files exist)
- **-x3**: all **-x2** files + unusual configuration template files. Unusual configuration template files are generated with the extra **.ex** suffix to ease their removal. To use these as configuration files, rename their file names to ones without the **.ex** suffix.
- **-x4**: all **-x3** files + copyright file examples.

-y, --yes “force yes” for all prompts. (without option: “ask [Y/n]”; doubled option: “force no”)

-L, --local generate configuration files for the local package to fool **lintian(1)** checks.

-P, --pedantic pedantically check auto-generated files.

-T, --tutorial output tutorial comment lines in template files.

A.4 EXAMPLES

For a well behaving source, you can build a good-for-local-use installable single Debian binary package easily with one command. Test install of such a package generated in this way offers a good alternative to the traditional “**make install**” command installing into the **/usr/local** directory since the Debian package can be removed cleanly by the “**dpkg -P ...**” command. Here are some examples of how to build such test packages. (These should work in most cases. If the **-d** option does not work, try the **-t** option instead.)

For a typical C program source tree packaged with autoconf/automake:

- **debmake -d -i debuild**

For a typical Python (version 3) module source tree:

- **debmake -s -d -b”:python3” -i debuild**

For a typical Python (version 3) module in the *package-version.tar.gz* archive:

- **debmake -s -a package-version.tar.gz -b”:python3” -i debuild**

For a typical Perl module in the *package-version.tar.gz* archive:

- **debmake -a package-version.tar.gz -b”:perl” -i debuild**

A.5 HELPER PACKAGES

Packaging may require installation of some additional specialty helper packages.

- Python (version 3) programs may require the **dh-python** package.
- The Autotools (Autoconf + Automake) build system may require **autotools-dev** or **dh-autoreconf** package.
- Ruby programs may require the **gem2deb** package.
- Node.js based JavaScript programs may require the **pkg-js-tools** package.
- Java programs may require the **java-helper** package.
- Gnome programs may require the **gobject-introspection** package.
- etc.

A.6 CAVEAT

debmake is meant to provide template files for the package maintainer to work on. Comment lines started by `#` contain the tutorial text. You must remove or edit such comment lines before uploading to the Debian archive.

The license extraction and assignment process involves a lot of heuristics; it may fail in some cases. It is highly recommended to use other tools such as **licensecheck** from the **devscripts** package in conjunction with **debmake**.

There are some limitations for what characters may be used as a part of the Debian package. The most notable limitation is the prohibition of uppercase letters in the package name. Here is a summary as a set of regular expressions:

- Upstream package name (**-p**): `[-+.a-z0-9]{2,}`
- Binary package name (**-b**): `[-+.a-z0-9]{2,}`
- Upstream version (**-u**): `[0-9][-+.:~a-z0-9A-Z]*`
- Debian revision (**-r**): `[0-9][+~a-z0-9A-Z]*`

See the exact definition in [Chapter 5 - Control files and their fields](#) in the “Debian Policy Manual”.

debmake assumes relatively simple packaging cases. So all programs related to the interpreter are assumed to be “**Architecture: all**”. This is not always true.

A.7 DEBUG

Please report bugs to the **debmake** package using the **reportbug** command.

The character set in the environment variable **\$DEBUG** determines the logging output level.

- **i**: print information
- **p**: list all global parameters
- **d**: list parsed parameters for all binary packages
- **f**: input filename for the copyright scan
- **y**: year/name split of copyright line
- **s**: line scanner for `format_state`
- **b**: `content_state` scan loop: begin-loop
- **m**: `content_state` scan loop: after regex match
- **e**: `content_state` scan loop: end-loop
- **c**: print copyright section text
- **l**: print license section text
- **a**: print author/translator section text
- **k**: sort key for debian/copyright stanza
- **n**: scan result of debian/copyright (“**debmake -k**”)

Use this as:

```
$ DEBUG=pdfbmec1ak debmake ...
```

See `README.developer` in the source for more.

A.8 AUTHOR

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A.9 LICENSE

Expat License

A.10 SEE ALSO

The **debmake-doc** package provides the “Guide for Debian Maintainers” in plain text, HTML and PDF formats under the `/usr/share/doc/debmake-doc/` directory.

See also **dpkg-source**(1), **deb-control**(5), **debhelper**(7), **dh**(1), **dpkg-buildpackage**(1), **debuild**(1), **quilt**(1), **dpkg-depcheck**(1), **pdebuild**(1), **pbuilder**(8), **cowbuilder**(8), **gbp-buildpackage**(1), **gbp-pq**(1), and **git-pbuilder**(1) manpages.