Challenges in herding a vast number of packages between the Debian and PostgreSQL ecosystems

Christoph Berg, myon@debian.org, christoph.berg@credativ.de

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Abstract

The Debian PostgreSQL Maintainers group is maintaining 70+ source packages in Debian unstable. At the same time, this set of packages (and a few more) is maintained in the apt.postgresql.org repository, where packages are built for Debian stable and oldstable, and the supported Ubuntu releases.

We will talk about how quality assurance is important for managing this number of packages, and which challenges are faced in keeping packages compatible both with Debian unstable on one end, and Debian (old)oldstable and Ubuntu (old)old-LTS at the other end.

myon@debian.org

- ▶ DD since 2005
- ▶ at credativ since 2007
- ▶ PostgreSQL consultant
- ▶ involved in PostgreSQL packaging since 2012
- ▶ apt.postgresql.org since 2012
- ▶ most packaging done at work :)

PostgreSQL in Debian

Packages overview for Debian PostgreSQL Maintainers

Debian PostgreSQL Maintainers <team+postgresql@tracker.debian.org> — Bugs: open - RC - all - submitted - WNPP - [img] — Reports: Dashboard - Buildd - Lintian - Debtags - Piuparts - DUCK - Contributions - Repology - Portfolio

main (78)

Source Name	Bugs		Version					VCS	Binary Package	Buildd	Lintian	Deb check	Piu parts	CI	Popcon	Watch
	All	RC	oldstable	stable	testing	unstable	exp				E+W			Rep		
plr*	- [img]	-	1:8.3.0.15-4	1:8.3.0.17-1		1:8.3.0.18-2	1:8.4-1	Git ✔	1	23×✔ ⚠⚠✔✔✔✔✔✔✔⚠⚠ ✔✔✔✔✔✔✔✔	✔	U	X	✔✔ ✔	10	8.4
postgresql-pgmp*	- [img]	-	1.0.1-6	1.0.2-3	1.0.2-6 Excuse	1.0.2-7	-	Git ✔	1	⚠✔✔✔✔✔✔✔⚠⚠ ✔✔✔✔✔✔✔✔	✔	U	W	✔✔ ✔	7	1.0.2
prefix*	- [img]	-	1.2.3-3	1.2.5-1	1.2.8-3 Excuse	1.2.9-1	-	Git ✔	1	⚠✔✔✔✔✔✔✔⚠⚠ ✔✔✔✔✔✔✔✔	✔	U	✔	✔✔ ✔	10	1.2.9
pgbackrest*	- [img]	-	-	1.12-1	2.10-1 Excuse	2.14-1	-	Git 2.13-1+2	1 2	✔✔✔✔✔✔✗✔⚠⚠ ✔✔✔✔✔✔✔N✔✔	✔	✔	✔	✔✔ ✔	38	2.14
psqlodbc*	- [img]	-	1:09.03.0300-1	1:09.05.0400-2		1:11.00.0000-1	1:11.01.0000-1	Git ✔	1	23×✔ ⚠⚠✔✔✔✔✔✔✔⚠⚠ ✔✔✔✔✔✔✔✔	✔	U	✔	✔(✔) ✔	4288	11.01.0000
pgformatter*	- [img]	-		-		3.3-1	3.4-1	Git ✔	1	1×✔ 1×✔	0+1	U	✔ MA	-- --	17	4.0
pg-partman*	- [img]	-		2.6.3-1		4.0.0-1	4.1.0-1	Git ✔	1	23×✔ ⚠⚠✔✔✔✔✔✔✔✔ ✔✔✔✔✔✔✔✔	✔	U	✔	✔✔ ✔	12	4.1.0
pspg*	- [img]	-				1.6.3-1	1.6.5-1	Git ✔	1	23×✔ ⚠⚠✔✔✔✔✔✔✔⚠⚠ ✔✔✔✔✔✔✔✔	✔	U	✔	-- --	60	1.6.5
postgresql-pllua*	- [img]	-	1:1.0-5	1:1.0-9		1:2.0.1-1	1:2.0.4-1	Git ✔	1	✔✔✔✔✔✔✔N✔✔ N✔✔✔✔✔✔✔N✔✔ ⚠⚠✔✔✔✔✔✔✔N✔✔ ✔✔✔✔✔✔✔N✔✔	✔	U	✔	✔✔ ✔	7	2.0.4
postgresql-common*	22 (23) [img]	-	165+deb8u3	181+deb9u2 181+deb9u1		200+deb10u1	201	Git #4 ✔1 ✔	1 2 3 4 5 6 7 8	1×✔ 1×✔	✔	S U	✔	✔✔ ✔	27490	-
postgresql-11*	3 [img]	-	-	-		11.3-1	-	Git failed ✔	1 2 3 4 5 6 7 ... 14	24×✔	✔	✔	✔	✔✔ ✔	108849	11.3

PostgreSQL in Debian

- ▶ Debian PostgreSQL Maintainers team
- ▶ 78 team packages in unstable
- ▶ more related packages maintained by other teams/individuals
- ▶ PostgreSQL server packages
- ▶ postgresql-common
- ▶ applications (somewhat boring)
- ▶ libraries (more interesting)
- ▶ PostgreSQL server modules/extensions (fun)

PostgreSQL server

- ► C
- ► huge built-in testsuite (make check-world)
- ► pg_regress
- ► TAP
- ► tests running at build-time

pg_regress

```
============== creating database "regression"        ==============
CREATE DATABASE
ALTER DATABASE
============== running regression test queries        ==============
test tablespace                   ... ok       240 ms
parallel group (20 tests):  int2 name varchar oid char int4 pg_lsn regproc f
     boolean                      ... ok       414 ms
     char                         ... ok       111 ms
     name                         ... ok        90 ms
     varchar                      ... ok       100 ms
     text                         ... ok       152 ms
     int2                         ... ok        89 ms
     int4                         ... ok       121 ms
     int8                         ... ok       165 ms
                                  ... ok       101 ms
```

TAP

```
cd /<<PKGBUILDDIR>>/build/../src/bin/pg_basebackup && TESTDIR='/<<PKGBUILDDI
t/010_pg_basebackup.pl ... ok
t/020_pg_receivewal.pl ... ok
t/030_pg_recvlogical.pl .. ok
All tests successful.
Files=3, Tests=140, 20 wallclock secs ( 0.06 usr  0.00 sys +  3.75 cusr  3.0
Result: PASS
```

PostgreSQL server versions

- ▶ we support installing different PG major releases in parallel
- ▶ separate source package postgresql-$version (postgresql-11, postgresql-12, ...)
- ▶ /usr/lib/postgresql/$version/{bin,lib}
- ▶ /var/lib/postgresql/$version/...
- ▶ /etc/postgresql/$version/...
- ▶ however, only one libpq5.deb package
- ▶ supported by upstream

postgresql-common

- ▶ Debian's "manage multiple PG versions and instances per host" infrastructure
- ▶ Perl (messy)
- ▶ pg_createcluster, pg_lsclusters, pg_ctlcluster
- ▶ large (1000?) Test::More testsuite
- ▶ tests pg_*cluster and PostgreSQL
- ▶ autopkgtest on installed packages

postgresql-common

```
=== Running test 010_defaultport_cluster.t ... ===
1..14
ok 1 - psql --version
ok 2 - pg_wrapper selects highest available version number
ok 3 - env LC_MESSAGES=C psql -h 127.0.0.1 -l
ok 4 - connecting to localhost fails with no clusters
ok 5 - env LC_MESSAGES=C PGCLUSTER=12/127.0.0.2:5431 psql -l
ok 6 - pg_wrapper uses host and port from PGCLUSTER
ok 7 - env LC_MESSAGES=C PGCLUSTER=12/127.0.0.2:5431 psql --cluster 12/127.0
ok 8 - pg_wrapper uses --cluster from the command line
ok 9 - env LC_MESSAGES=C PGCLUSTER=12/127.0.0.2:5431 psql -h 127.0.0.3 -l
ok 10 - pg_wrapper ignores PGCLUSTER with -h on the command line
ok 11 - env LC_MESSAGES=C PGCLUSTER=12/127.0.0.2:5431 psql --host 127.0.0.3
ok 12 - pg_wrapper ignores PGCLUSTER with --host on the command line
```

7.0.0.2:5431 PGHOST=127.0.0.3⁰ psql

applications

- testsuites are rare
- autopkgtest sometimes impossible (ncurses, GUI apps)
- manual smoke-tests (and hope for the best)

libraries

- testsuites!
- autopkgtest!
- standard packaging practise

PostgreSQL server modules/extensions

- compiled server modules are specific to PostgreSQL server version
- Debian supports several server versions in parallel
- module packages need to be aware
- common practice:
    - source: postgresql-foo.dsc
    - binaries: postgresql-$version-foo.deb

pg_buildext

- ▶ packaging helper making debian/{control,rules} aware of PG major versions
- ▶ debian/pgversions
    - ▶ `all`
    - ▶ `9.5+`
- ▶ debian/control.in
- ▶ debian/rules

debian/control.in

```
Source: postgresql-unit
Maintainer: Christoph Berg <myon@debian.org>
Build-Depends: bison (>> 2:3), debhelper (>> 9), flex,
 postgresql-server-dev-all (>= 153~),

Package: postgresql-PGVERSION-unit
Architecture: any
Depends: ${misc:Depends}, ${shlibs:Depends}, postgresql-PGVERSION
Description: SI Units for PostgreSQL
```

▶ pg_buildext updatecontrol

debian/rules

```
#!/usr/bin/make -f
include /usr/share/postgresql-common/pgxs_debian_control.mk

override_dh_auto_build:
    +pg_buildext build build-%v

override_dh_auto_test:

override_dh_auto_install:
    +pg_buildext install build-%v postgresql-%v-unit

%:
    dh $@
```

problems with debian/rules

- ▶ Makefiles often not out-of-tree build safe
  - ▶ pg_buildext loop
- ▶ `make installcheck` needs package installed
- ▶ defer pg_regress run to autopkgtest

pg_virtualenv

- ▶ creates throw-away PG instance (and runs a shell or a command)
- ▶ `pg_virtualenv make installcheck`
- ▶ loop over supported PG major versions
- ▶ `pg_buildext installcheck`

autopkgtest

- ▶ debian/tests/control

```
Depends: @, postgresql-server-dev-all
Tests: installcheck
Restrictions: allow-stderr
```

- ▶ debian/tests/installcheck

```
#!/bin/sh
pg_buildext -i '--locale=C.UTF-8' installcheck
```

autopkgtest

```
### installcheck 11 ###
Creating new PostgreSQL cluster 11/regress ...
/usr/lib/postgresql/11/bin/initdb -D /tmp/pg_virtualenv.G8cOpu/data/11/regre
============== creating database "contrib_regression" ==============
CREATE DATABASE
ALTER DATABASE
============== running regression test queries      ==============
test extension                ... ok
test tables                   ... ok
test unit                     ... ok
=====================
 All 18 tests passed.
=====================
Dropping cluster 11/regress
```

more complex autopkgtest

```sh
#!/bin/sh
set -eu

for v in $(pg_buildext supported-versions); do
    echo "### $v ###"
    pg_virtualenv -v $v <<-EOF
        set -eux
        psql -c 'CREATE EXTENSION postgis'
        psql -c 'CREATE EXTENSION pgrouting'
    EOF
done
```

more complex autopkgtest

```
### 9.5 ###
Creating new PostgreSQL cluster 9.5/regress ...
/usr/lib/postgresql/9.5/bin/initdb -D /var/lib/postgresql/9.5/regress --auth
...
Ver Cluster Port Status Owner    Data directory                Log file
9.5 regress 5432 online postgres /var/lib/postgresql/9.5/regress /var/log/po

+ psql -c 'CREATE EXTENSION postgis'
ERROR:  could not access file "$libdir/postgis-3": No such file or directory
Dropping cluster 9.5/regress ...
```

salsa CI

salsa CI

- debian/gitlab-ci.yml:

```
include: https://salsa.debian.org/postgresql/postgresql-common/
                               raw/master/gitlab/gitlab-ci.yml
```

- new, DebCamp: put into all packages, fixed the debris, added blhc
- should should look into cron'ing runs
- salsa-ci-team pipeline has more tests (piuparts, reprotest)

combinatorial explosion aka apt.postgresql.org

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combinatorial explosion aka apt.postgresql.org

- ▶ 8 Debian+Ubuntu releases (sid, buster, stretch, jessie, disco, cosmic, bionic, xenial)
- ▶ 3 architectures (amd64, i386, ppc64el)
- ▶ 5 PostgreSQL major versions (9.4, 9.5, 9.6, 10, 11)
- ▶ everything gets built about 100 times
- ▶ tests tests tests

Jenkins

PGDG Apt Repository Buildhost

All	Auxilary	Binaries	Binaries-Beta	**Default**	PostgreSQL	Sources	Testsuite	Testsuite-Beta	+

S	Name ↓	Last Success	Last Failure
🔴	amcheck	1 yr 4 mo - #1	1 yr 0 mo - #2
🟢	apache2-running	2 hr 25 min - #2144	N/A
🟢	apgdiff	7 mo 29 days - #4	N/A
🟢	apt.postgresql.org	5 days 21 hr - #351	N/A
🟢	apt.postgresql.org-jobs	5 days 21 hr - #367	N/A
🟢	barman	15 days - #11	N/A
🟢	bgw-replstatus	6 mo 5 days - #4	N/A
🔴	bucardo	N/A	6 mo 9 days - #2
⚪	build-binary-from-apt	N/A	N/A
🟢	build-one-dist	5 days 15 hr - #130	5 days 21 hr - #127
🟢	build-source-and-one-dist	3 mo 8 days - #137	N/A
🟢	builddebcheck	9 hr 48 min - #1266	N/A
🟢	cgal-source	5 days 21 hr - #3	6 days 1 hr - #1
🟢	check-pgactivity	4 mo 0 days - #3	N/A
🟢	check-postgres	10 mo - #6	10 mo - #5

Jenkins

- ▶ group of jobs for each source package, inspired by mika's jenkins-debian-glue
- ▶ foo-source
  - ▶ matrix job with distribution axis
  - ▶ 1.0-1.pgdg90+1
- ▶ foo-binaries
  - ▶ matrix job with distribution and architecture axes
  - ▶ loop over PG major versions handled by pg_buildext
  - ▶ sbuild in schroot on tmpfs
  - ▶ autopkgtest running in same session
- ▶ foo
  - ▶ pipeline orchestrating foo-source, foo-binaries, and dput
- ▶ foo-autopkgtest
  - ▶ triggered monthly on repository packages

Project pgloader-binaries

Build Debian binary packages of pgloader

Configuration Matrix	amd64	i386	ppc64el
sid	🟢	🟡	⚪
buster	🟢	🟡	⚪
stretch	🔴	🔴	⚪
jessie	🔴	🔴	⚪
disco	⚪	⚪	⚪
cosmic	🟢	⚪	⚪
bionic	🔴	🔴	⚪
xenial	🔴	🔴	⚪

tweaks

- ▶ source from unstable is used for all distributions
- ▶ built separately for each distribution (1.0-1.pgdg90+1)
- ▶ sometimes modifications needed
- ▶ generate-pgdg-source adds tweaks

```
barman)
  case $distribution in jessie|trusty)
    # Use Python 2 sequencer and rename all the packages
    sed -i -e 's/--with python3/--with python2/' debian/rules
    sed -i -e 's/python3/python/' debian/control debian/rules
    sed -i -e 's/Python 3/Python 2/' debian/control
    TWEAK+=("Revert migration to Python 3")
    ;;
  esac
```

reprepro trickery

- ▶ each postgresql-$v source builds libpq5.deb
- ▶ can't put them into main
- ▶ move them to different components in the repository (9.6, 10, ...)
- ▶ users shouldn't need them anyway

debcheck

- ▶ nightly debcheck and builddebcheck run
- ▶ mostly relevant for unstable/testing
- ▶ occasionally problems on newly added packages
  - ▶ often incomplete test coverage
- ▶ rarely real problems, but really cool QA tool
- ▶ some trickery needed to check packages depending on backports
- ▶ output format somewhat weird

debcheck

```
report:
 -
  package: omnidb-common
  version: 2.15.0+ds-1.pgdg90+1
  architecture: all
  status: broken
  reasons:
   -
    missing:
     pkg:
      package: omnidb-common
      version: 2.15.0+ds-1.pgdg90+1
      architecture: all
      unsat-dependency: python3-pyaes
```

packaging workflow

- ▶ uscan spots new version on DDPO
- ▶ test locally, upload to unstable, push to git
- ▶ `repo/bin/whats-newer-in-sid` (perl script diff'ing Sources files)
- ▶ trigger build in Jenkins
- ▶ packages are put into {sid,buster,stretch,...}-pgdg-testing suites
- ▶ `repo/bin/what-needs/promotion` (same perl script)
- ▶ "promote" action copies packages to {sid,buster,stretch,...}-pgdg

new PostgreSQL major release in Debian

- new postgresql-12 source package
- "supported_versions" updated in postgresql-common
- all extension packages need upload with debian/control updated from debian/control.in
- basically a sourceful binNMU

supporting beta versions on apt.pg.o

- more Jenkins jobs
- foo-binaries-beta with PG_SUPPORTED_VERSIONS=12
- initial status: 25 ok, 12 build but tests fail, 20 fail, and 2 depend on a module that failed
- foo-autopkgtest-beta
- catalog version bump expected in 12beta2
- package put into "12" component in repository so users won't accidentally use it in production
- more debcheck trickery needed to test installability

pain points

- PGXS `make installcheck` at *build* time
- jessie has DH 9 only
- jessie builds take 4min longer than everything else (no idea)
- Jenkins setup pretty complex, bus factor
- reprepro doesn't allow multiple versions per package (#570623, patch by bdrung)
- deprecating PG majors and architectures causes extension package bitrot

Links

- https://qa.debian.org/developer.php?login=team%2Bpostgresql@tracker.debian.org
- https://apt.postgresql.org == https://wiki.postgresql.org/wiki/Apt
- Jenkins: https://pgdgbuild.dus.dg-i.net/ (Debian SSO)