

Extend your PostgreSQL: The world of PostgreSQL extensions

Devrim Gündüz Postgres Expert @ EDB PGConf.DE May 2025

Linkedin:https://www.linkedin.com/in/devrimgunduz/

Instagram: devrimgunduztr

Bluesky: https://bsky.app/profile/devrim.gunduz.org

Introducing WarehousePG

https://github.com/warehouse-pg/warehouse-pg/



April 2025

WarehousePGNew Open Source Project

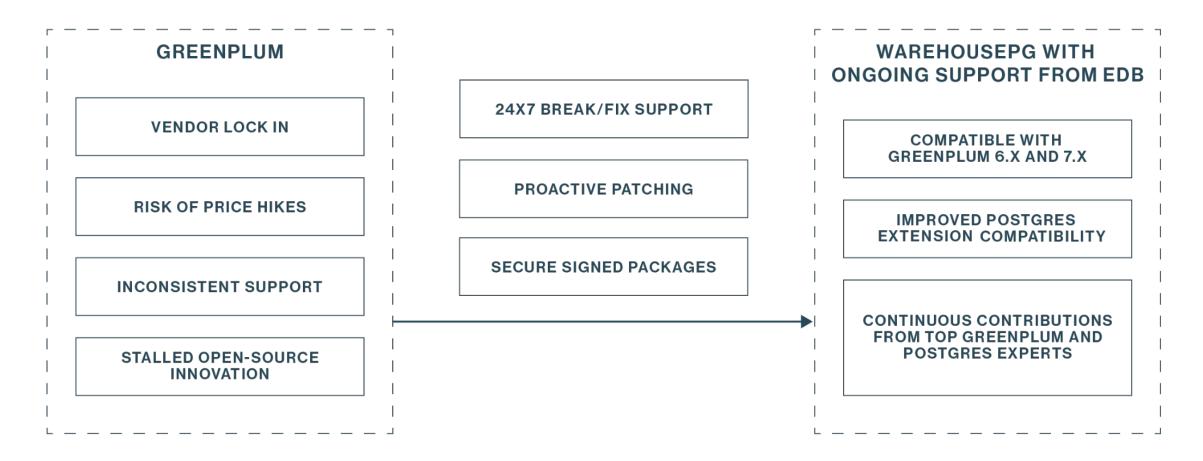
A new Apache 2-licensed fork of the formerly open source Greenplum Database.

Binary compatibility with the legacy Greenplum versions most widely deployed by customers (6.x and 7.x) — plus net-new functionality and integrations.



EDB POSTGRES AI: SUPPORT FOR GREENPLUM WORKLOADS

TRANSITION TO COMMERCIALLY SUPPORTED OPEN-SOURCE WAREHOUSEPG





WarehousePG Highlights





Petabytes scale with high-speed /-concurrency performance, via MPP Cluster topology

Postgres Fork based on PG 12.12

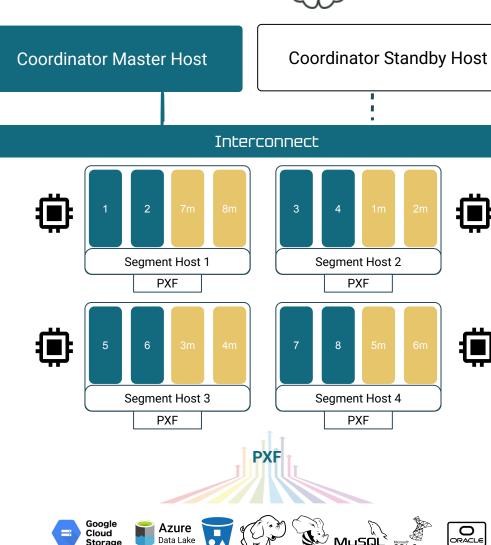
Master (coordinator) for query optimization and parallel plan and distribution

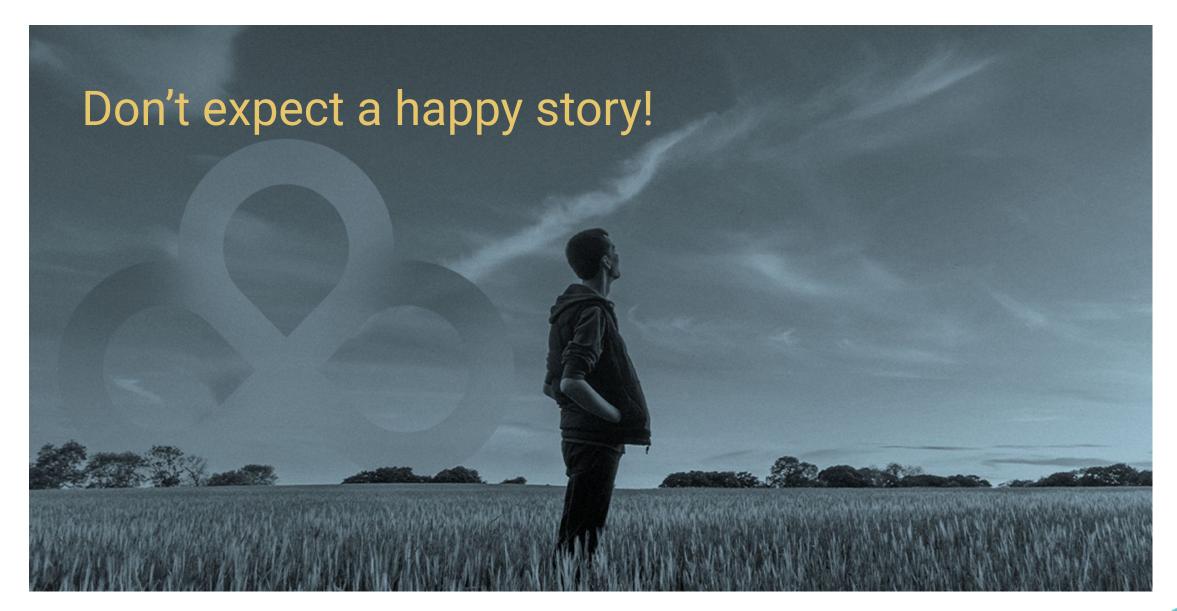
Multiple Segments

- Segment is a Postgres Process which holds data
- Own CPUs, Hard disk and RAM
- Scalable

HA achieved through Standby for Master and Mirror for Segments

High-speed Interconnection for continuous data processing pipelining









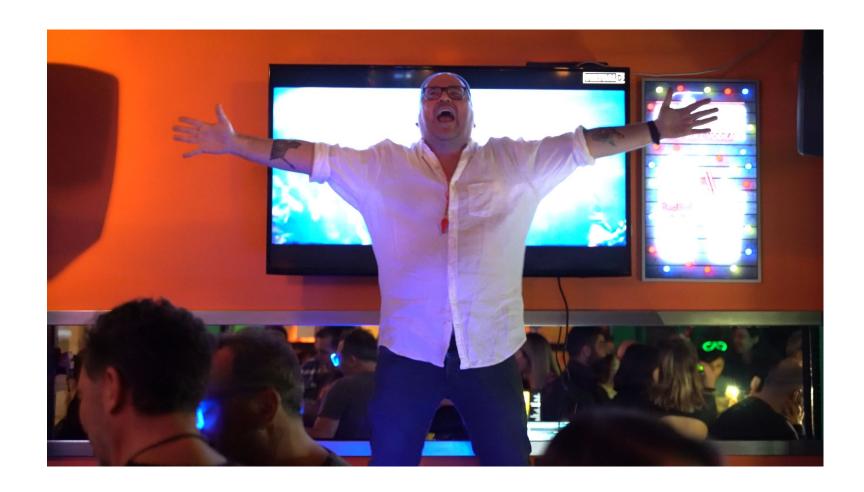
Self Introduction

- PostgreSQL Major Contributor
- Responsible for PostgreSQL RPM repos (Red Hat, Rocky, AlmaLinux Fedora and SLES)
- Fedora and Rocky Linux contributor
- PostgreSQL user since 1998
- PostgreSQL community member
- Postgres expert @ EDB
- "The guy with the PostgreSQL tattoo"
- Serial traveller
- London, UK / Istanbul, TR / Chicago, US / Airport lounges, around the world.

...and sometimes:

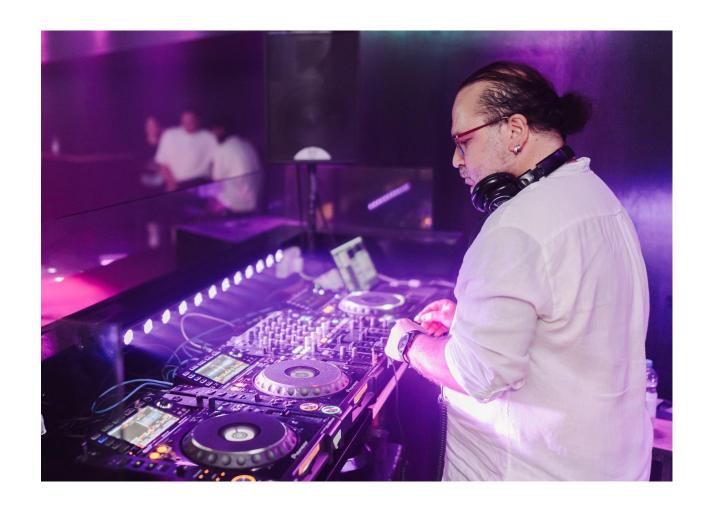


DJing!





DJing!







Agenda

- History
- Introduction to extensions
- Extension issues
- Favourite extensions
- RPMified extensions

Are you using PostgreSQL extensions?



Extensions

• Of course!



Extensions

- Of course!
- "Everyone is a pg_stat_statements fan, even if they are not. Even if you ask the Oracle guys, they are also a fan of pg_stat_statements" © 2025 Devrim Gunduz



Extensions

- Of course!
- "Everyone is a pg_stat_statements fan, even if they are not. Even if you ask the Oracle guys, they are also a fan of pg_stat_statements" © 2025 Devrim Gunduz
 - Replace pg_stat_statement with your most favourite extension!



Pre-extension era: Contrib modules



• Included in the tarball



- Included in the tarball
- Could include:
 - new data types
 - new operator(s)
 - new function(s)
 - new index AM
 - 0 ..



- Included in the tarball
- Could include:
 - new data types
 - new operator(s)
 - new function(s)
 - new index AM
 - o ..
- "not in core"



- Included in the tarball
- Could include:
 - new data types
 - new operator(s)
 - new function(s)
 - new index AM
 - 0 ...
- "not in core"
- "but in core-ish"



- Invoke individual install/uninstall SQL scripts
 - extension_name.sql
 - uninstall_extension_name.sql



- Invoke individual install/uninstall SQL scripts
 - extension_name.sql
 - uninstall_extension_name.sql
- Versioning issues



- Invoke individual install/uninstall SQL scripts
 - extension_name.sql
 - uninstall_extension_name.sql
- Versioning issues
- Dependency issues



- Invoke individual install/uninstall SQL scripts
 - extension_name.sql
 - uninstall_extension_name.sql
- Versioning issues
- Dependency issues
- Hard to add a new one into the core



- Invoke individual install/uninstall SQL scripts
 - extension_name.sql
 - uninstall_extension_name.sql
- Versioning issues
- Dependency issues
- Hard to add a new one into the core
- Historically has been very hard to merge into the core
 - tsearch2



Not included in the tarball



- Not included in the tarball
- External development



- Not included in the tarball
- External development
- Same installation/uninstallation procedures



- Not included in the tarball
- External development
- Same installation/uninstallation procedures
- Same issues



- Not included in the tarball
- External development
- Same installation/uninstallation procedures
- Same issues
- PGXS: PostgreSQL Extension Build System





• 9.1 (13.5 years!)



- 9.1 (13.5 years!)Title: "Packages of external objects"



- 9.1 (13.5 years!)
- Title: "Packages of external objects"
- "...make it easier to add and remove plugins, data types, functions etc with minimum fuss and without needing to compile things yourself." (Simon Riggs)



- 9.1 (13.5 years!)
- Title: "Packages of external objects"
- "...make it easier to add and remove plugins, data types, functions etc with minimum fuss and without needing to compile things yourself." (Simon Riggs)
- Contrib modules became extensions
 - still in contrib/ directory



- 9.1 (13.5 years!)
- Title: "Packages of external objects"
- "...make it easier to add and remove plugins, data types, functions etc with minimum fuss and without needing to compile things yourself." (Simon Riggs)
- Contrib modules became extensions
 - still in contrib/ directory
- Easier to maintain from user point of view



• Dependency checking (via control file)



- Dependency checking (via control file)
- Contents:
 - o "C" code
 - Could be skipped for extensions that does not require a .so file



- Dependency checking (via control file)
- Contents:
 - o "C" code
 - Could be skipped for extensions that does not require a .so file
 - SQL commands



- Dependency checking (via control file)
- Contents:
 - o "C" code
 - Could be skipped for extensions that does not require a .so file
 - SQL commands
 - .control file



- Dependency checking (via control file)
- Contents:
 - o "C" code
 - Could be skipped for extensions that does not require a .so file
 - SQL commands
 - .control file
- In-core PostgreSQL extensions:
 - https://www.postgresgl.org/docs/current/contrib.html



• A few basic properties of the extension.



- A few basic properties of the extension.
- extension_name.control



- A few basic properties of the extension.
- extension_name.control
- Must be available separately for each major PostgreSQL version



- A few basic properties of the extension.
- extension_name.control
- Must be available separately for each major PostgreSQL version
- Dependency tracking
 - Example: h3_postgis.control:requires = 'h3, postgis, postgis_raster'



extension_name--version.sql



- extension_name--version.sql
- Installation scripts



- extension_name--version.sql
- Installation scripts
- Upgrade scripts



- extension_name--version.sql
- Installation scripts
- Upgrade scripts
- Located under \$installation_dir/share/extension (example: /usr/pgsql-17/share/extension/



List of available extensions

• pg_available_extensions



List of available extensions

- pg_available_extensionspg_available_extension_versions



State of the PostgreSQL Extensions



Github



- Github
- Gitlab



- Github
- Gitlab
- OSGeo Gitea



- Github
- Gitlab
- OSGeo Gitea
- PGXN



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge
- PostgreSQL git repo (...)



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge
- PostgreSQL git repo (...)
- PyPI



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge
- PostgreSQL git repo (...)
- PyPI
- Their own websites



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge
- PostgreSQL git repo (...)
- PyPI
- Their own websites
- Bitbucket



- Github
- Gitlab
- OSGeo Gitea
- PGXN
- Sourceforge
- PostgreSQL git repo (...)
- PyPI
- Their own websites
- Bitbucket
- Laptops (yeah)



Sometimes all I find is a tarball somewhere



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:





- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



...and there is no recent commit!



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



...and there is no recent commit!

There is a very recent release on PGXN, so I asked the author:



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



...and there is no recent commit!

There is a very recent release on PGXN, so I asked the author (*facepalm*)

The sources are in the zip package included.



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



...and there is no recent commit!

There is a very recent release on PGXN, so I asked the author (*facepalm*)

The sources are in the zip package included.

Keep pestering, but:



- Sometimes all I find is a tarball somewhere
- There is a git repo, but:



...and there is no recent commit!

There is a very recent release on PGXN, so I asked the author (*facepalm*):

The sources are in the zip package included.

- Keep pestering, but:
- I. Yor tone seems that you think you are my boss which you are not!



Is this all?



Platform support

"It must not be hard"

```
%if 0%{?fedora} == 39
BuildRequires:
                      zlib-devel
Requires:
                      zlib
%endif
%if 0%{?fedora} == 40
BuildRequires:
                      zlib-ng-compat-devel
Requires:
                      zlib-ng-compat
%endif
%if 0%{?rhel} >= 8
BuildRequires:
                      zlib-devel
Requires:
                      zlib
%endif
%if 0%{?suse_version} >= 1315
BuildRequires:
                      zlib-devel
Requires:
                      libz1
%endif
```



Let's move on



Is this all?







Developer: "I've got a great idea! Let me write an extension for that"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"
- Packagers: "There is a new PostgreSQL release and it does not compile"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"
- Packagers: "There is a new PostgreSQL release and it does not compile"
- Developer: "ZzzzzzZZzzzzz"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"
- Packagers: "There is a new PostgreSQL release and it does not compile"
- Developer: "ZzzzzzZZzzzzz"
- Packagers: "PostgreSQL \$NewMajorVersion.0 is due soon"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"
- Packagers: "There is a new PostgreSQL release and it does not compile"
- Developer: "ZzzzzzZZzzzzz"
- Packagers: "PostgreSQL \$NewMajorVersion.0 is due soon"
- Users: "GA is out! We want to upgrade!"



- Developer: "I've got a great idea! Let me write an extension for that"
- Users: "Yay!"
- Users: "It works like a charm! Let's deploy it to the production!"
- Users: "There is a new PostgreSQL release and it does not compile"
- Packagers: "There is a new PostgreSQL release and it does not compile"
- Developer: "ZzzzzzZZzzzzz"
- Packagers: "PostgreSQL \$NewMajorVersion.0 is due soon"
- Users: "GA is out! We want to upgrade!"
- Developer: "..."





• A major problem



- A major problem
- Extensions get stalled



- A major problem
- Extensions get stalled
- Some good people send a PR, but doors are closed



- A major problem
- Extensions get stalled
- Some good people send a PR, but doors are closed
- Fork?



Not good for the users



- Not good for the users
- Not good for the community



- Not good for the users
- Not good for the community
- Not good for the packagers









Wrong slide, sorry!



- Wrong slide, sorry!
- We do some actual work



- Wrong slide, sorry!
- We do some actual work
- Actually it is a lot of work
 - APT based distros
 - RPM based distros
 - Windows
 - MacOS



Let the breakage begin



New PostgreSQL release



- New PostgreSQL release
- New GCC version



- New PostgreSQL release
- New GCC version
- New LLVM version



- New PostgreSQL release
- New GCC version
- New LLVM version
- New "dependency" version



Wish it was that easy...



- https://wiki.postgresql.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)



- https://wiki.postgresql.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP) We start annoying the extension authors along with the beta cycle



- https://wiki.postgresgl.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)
- We start annoying the extension authors along with the beta cycle
- Many extensions just work
 - Work: builds fine and passes tests



- https://wiki.postgresgl.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)
- We start annoying the extension authors along with the beta cycle
- Many extensions just work
 - Work: builds fine and passes tests
- We start annoying the extension authors



- https://wiki.postgresgl.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)
- We start annoying the extension authors along with the beta cycle
- Many extensions just work
 - Work: builds fine and passes tests
- We start annoying the extension authors
- Good people already follow the development of PostgreSQL, so they apply the fixes immediately



- https://wiki.postgresql.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)
- We start annoying the extension authors along with the beta cycle
- Many extensions just work
 - Work: builds fine and passes tests
- We start annoying the extension authors
- Good people already follow the development of PostgreSQL, so they apply the fixes immediately
- But then:

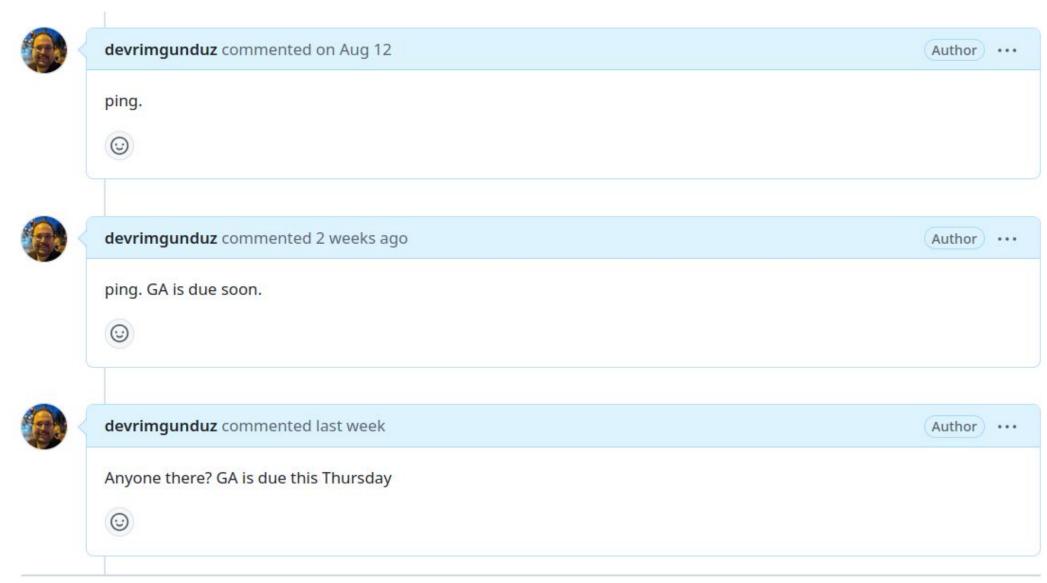


Road to the major release

- https://wiki.postgresql.org/wiki/PostgreSQL_17_Extension_Bugs
- https://wiki.postgresql.org/wiki/PostgreSQL_18_Extension_Bugs (WIP)
- We start annoying the extension authors along with the beta cycle
- Many extensions just work
 - Work: builds fine and passes tests
- We start annoying the extension authors
- Good people already follow the development of PostgreSQL, so they apply the fixes immediately
- But then:
- GOTO -1



Slackers!





Slackers!

Known PostgreSQL 17 problems in extension modules [edit]

Extensions that fail to build [edit]

■ wal2mongo https://github.com/HighgoSoftware/wal2mongo/issues/4 🗗



Sure. Take your time. No rush. We can wait. Users can wait. Everyone can wait.

@devrimgunduz Thank you for your report. We have already started for supporting PostgreSQL 17 using its on beta version and it works fine but the source code is not published yet. We are planning to release ne PostgreSQL 17.0 was released and tested SQL 17.0 was r





So, what did I do?





Please complain to the extension author, not the packagers, if your favourite #PostgreSQL extension cannot be installed against v17.

See the full list of the extensions here which fail to build against v17:

wiki.postgresql.org/wiki/PostgreSQ...



...

Installing an extension



- First of all: Install the extension package for the specific PostgreSQL version
 - o Preferred: RPM, DEB, etc.
 - o Compilation from source
 - Other installation options



- First of all: Install the extension package for the specific PostgreSQL version
 - o Preferred: RPM, DEB, etc.
 - Compilation from source
 - Other installation options
- May require adding extension name to shared_preload_libraries and restarting the server

[postgres] # CREATE EXTENSION citus;

ERROR: Citus can only be loaded via shared_preload_libraries

HINT: Add citus to shared_preload_libraries configuration variable in postgresql.conf in master and workers. Note that citus should be at the beginning of shared_preload_libraries.



- First of all: Install the extension package for the specific PostgreSQL version
 - o Preferred: RPM, DEB, etc.
 - Compilation from source
 - Other installation options
- May require adding extension name to shared_preload_libraries and restarting the server

[postgres] # CREATE EXTENSION citus;

ERROR: Citus can only be loaded via shared_preload_libraries

HINT: Add citus to shared_preload_libraries configuration variable in postgresql.conf in master and workers. Note that citus should be at the beginning of shared_preload_libraries.

- May require dependencies to be installed
 - Package managers often solve this problem



- CREATE EXTENSION
 - o VERSION
 - o CASCADE
 - SCHEMA



- CREATE EXTENSION
 - VERSION
 - CASCADE
 - SCHEMA
- Dependencies:

[postgres] # CREATE EXTENSION h3_postgis;

ERROR: required extension "postgis_raster" is not installed HINT: Use CREATE EXTENSION ... CASCADE to install required extensions too.



- CREATE EXTENSION
 - VERSION
 - CASCADE
 - SCHEMA
- Dependencies:

[postgres] # CREATE EXTENSION h3_postgis; ERROR: required extension "postgis_raster" is not installed HINT: Use CREATE EXTENSION ... CASCADE to install required extensions too.

• CASCADE:

[postgres] # CREATE EXTENSION h3_postgis CASCADE; NOTICE: installing required extension "postgis_raster"



or, read!



Find many information in one website

Installing PostgreSQL Extensions via RPMs

This document includes detailed information about installing and configuring PostgreSQL extensions on RPM based systems.

Extension how-to docs

- · Foreign Data Wrappers
- DBA Tools
- Application Developers
- · Data types and extra functions
- Replication
- Procedural Languages
- Monitoring
- Analytics
- Oracle compatibility
- Indexes
- Security
- Geospatial
- Major Features
- · Other features

https://yum.postgresql.org/extensions





Install the updated extension



- Install the updated extension
- ALTER EXTENSION ... UPDATE;



- Install the updated extension
- ALTER EXTENSION ... UPDATE;
- Some extension versions may not need this



- Install the updated extension
- ALTER EXTENSION ... UPDATE;
- Some extension versions may not need this
 - "Upgrade path"



- Install the updated extension
- ALTER EXTENSION ... UPDATE;
- Some extension versions may not need this
 - "Upgrade path"
 - "NOTICE: version "12.1-1" of extension "foobar" is already installed"



- Install the updated extension
- ALTER EXTENSION ... UPDATE;
- Some extension versions may not need this
 - "Upgrade path"
 - "NOTICE: version "12.1-1" of extension "foobar" is already installed"
 - o Problem?
 - Restart?



- Install the updated extension
- ALTER EXTÉNSION ... UPDATE;
- Some extension versions may not need this
 - "Upgrade path"
 - "NOTICE: version "12.1-1" of extension "foobar" is already installed"
 - o Problem?
 - Restart?
- Duplicate .so files?



Uninstalling an extension



• DROP EXTENSION ...;



- DROP EXTENSION ...;
- Dependencies:

```
[postgres] # DROP EXTENSION postgis_raster;
```

ERROR: cannot drop extension postgis_raster because other objects depend on it

DETAIL: extension h3_postgis depends on extension postgis_raster

HINT: Use DROP ... CASCADE to drop the dependent objects too.



```
    DROP EXTENSION ...;
    Dependencies:

            [postgres] # DROP EXTENSION postgis_raster;
            ERROR: cannot drop extension postgis_raster because other objects depend on it DETAIL: extension h3_postgis depends on extension postgis_raster HINT: Use DROP ... CASCADE to drop the dependent objects too.

    CASCADE:

            [postgres] # DROP EXTENSION postgis_raster CASCADE;
            NOTICE: drop cascades to extension h3_postgis DROP EXTENSION
```



```
    DROP EXTENSION ...;
    Dependencies:

            [postgres] # DROP EXTENSION postgis_raster;
            ERROR: cannot drop extension postgis_raster because other objects depend on it DETAIL: extension h3_postgis depends on extension postgis_raster HINT: Use DROP ... CASCADE to drop the dependent objects too.

    CASCADE:

            [postgres] # DROP EXTENSION postgis_raster CASCADE;
            NOTICE: drop cascades to extension h3_postgis DROP EXTENSION

    CASCADE: Also drops objects that depends on the extension!
```



So, favourite extensions



PLs

- PL/pgSQL (only default "extension")
- PL/Python
- PL/Perl
- PL/TCL
- PL/Java
- PL/Lua
- PL/Bash (sh)
- PL/R

Also:

- plpgsql_checkplprofiler



PostGIS

- Really an extension?;)
 Spatial database "extender" for PostgreSQL
- https://postgis.net



pgRouting

- Extends PostGIS, with routing and network analysis functionality.
- Comes with great number of routing algorithms.
- Available in many packaging formats, including RPMs.
- Depends on CGAL and Boost (...)
- https://www.pgrouting.org



pg_stat_statements

- A must-install for everyoneIf you disagree with it, just do agree :)



pgvector

- Vector similarity search for Postgres Stores your vectors with the rest of your data



pg_partman

- Makes PostgreSQL partitioning manageable and usable Actively developed



Citus

- Horizontal scaling of PostgreSQLsharding & replication
- 100% open source



TimescaleDB

- PostgreSQL based time-series database
- Partial open source
- automatic partitioning across time and space (partitioning key)



pgAudit

- Auditing extension for PostgreSQL
 - Very extensive!
- Recently changed versioning numbers
 - o pgaudit 17.x:PostgreSQL 17
 - o pgAudit 16.x : PostgreSQL 16
 - o pgAudit 1.7.x : PostgreSQL 15
 - o pgAudit 1.6.x: PostgreSQL 14
 - 0 ..



FDWs

- postgres_fdw
- oracle_fdw
- tds_fdw
- mysql_fdw
- hdfs_fdw
- mongo_fdw
- sqlite_fdw
- firebird_fdw
- jdbc_fdw
- odbc_fdw
- ogr_fdw
- pgbouncer_fdw
- file_fdw



Some other extensions

- count_distinct
- credcheck
- ddlx
- emaj
- h3-pg
- hll
- hypopg
- ip4r
- login_hook
- multicorn2
- pg_cron
- pg_dbms_job
- pg_dbms_lock
- pg_catcheck
- pg_background
- postgresql-anonymizer

- pg_auth_mon
- pg_extra_time
- pg_tle
- pg_repack
- pg_ivm
- pg_net
- pg_squeeze
- pg_uri
- pgtt
- rum
- set_user
- topn
- wal2json
- wal2mongo
- postgresql-unit



Some other extensions

- plproxy
- pg_readonly
- pg_qualstats
- pg_prioritize
- pg_hint_plan
- pg_store_plans
- pg_stat_kcache
- pgplsh
- pg_statement_rollback
- pgmemcache
- pgl_ddl_deploy
- pgauditlogtofile
- pgsphere
- pgsodium

- pldebugger
- plpgsql_check
- plprofiler
- pgsql_http
- pgsql_gzip
- pgsql_tweaks
- pointcloud
- semver
- PL/xslt
- pgpcre
- q3c
- pg_roaringbitmap
- icu_ext
- ..



Thank you.





Extend your PostgreSQL: The world of PostgreSQL extensions

Devrim Gündüz Postgres Expert @ EDB SCaLE 22x March 2025

Linkedin:https://www.linkedin.com/in/devrimgunduz/

Instagram: devrimgunduztr

Bluesky: https://bsky.app/profile/devrimgunduz.bsky.social