

PGXN ARCHITECTURE

David E. Wheeler
PGXN, Tembo

PGXN Components

Meta Spec — pgxn.org/spec

Manager — manager.pgxn.org


Root Mirror — master.pgxn.org

Search API — api.pgxn.org

Site — pgxn.org

CLI — pgxn.github.io/pgxnclient

CI/CD Tools — github.com/pgxn/docker-pgxn-tools



META SPEC

Meta Spec

pgxn.org/spec

Inspired by CPAN

Lives in META.json

Sole requirement to publish

All other data derived

```
{
  "name": "pair",
  "version": "0.1.8",
  "abstract": "A key/value pair data type",
  "description": "This library contains a single PostgreSQL extension, a key/val",
  "maintainer": [
    "David E. Wheeler <david@justatheory.com>"
  ],
  "license": "postgresql",
  "provides": {
    "pair": {
      "abstract": "A key/value pair data type",
      "file": "sql/pair.sql",
      "docfile": "doc/pair.md",
      "version": "0.1.2"
    }
  },
  "prereqs": {
    "runtime": {
      "requires": {
        "PostgreSQL": "9.1.0"
      }
    }
  }
}
```

The background features a vibrant, abstract design with overlapping organic shapes in shades of pink, magenta, and orange. The shapes are fluid and rounded, creating a dynamic and modern aesthetic. The word 'MANAGER' is prominently displayed in white, bold, uppercase letters on a large, dark pink shape on the left side of the image.

MANAGER

Manager

manager.pgxn.org

Manages extension distributions

Release, own, grant

Enforces unique names

Basic Auth, simple API

Most complicated component

Not just because user auth

No other part need be complex



PGXN Manager

Release it on PGXN!

Upload a Distribution

Your Distributions

Show Permissions

Edit Account

Change Password

Upload a Distribution

So you've developed a PGXN extension and what to distribute it on PGXN. This is the place to upload it! Just find your distribution archive (.zip, .tgz, etc.) in the upload field below and you'll be good to go.

Don't know what this means? Want to know how to create great PostgreSQL extensions and distribute them to your fellow PostgreSQL enthusiasts via PGXN? Take a gander at our [How to](#) for all the juicy details. It's not hard, we promise.

Upload a Distribution Archive

Archive: no file selected

PGXN::Manager v0.31.1. [Distributed](#) under the

**Submit archive
with META.json**

HOW DOES PUBLISHING WORK?

Upload Processing

manager.pgxn.org

Extracts uploaded archive

Converts to zip

Ensures {name}-{version} prefix

Validates META.json

Calls SQL function `add_distribution()`

Writes files to root mirror

add_distribution()

manager.pgxn.org

Validates META.json

Inserts the record

Adds SHA-1, user, date

Queues notification

Checks permissions

Returns files to write

Release Files Updated

manager.pgxn.org

**All written to
root mirror**

META.json

Distribution Releases

Extension Releases

User Releases

Tag Releases

Recent Releases

Summary Stats

Consumer

manager.pgxn.org

Consumes queued messages

Releases, new user, new mirror

Dispatches to handlers

Mastodon, Twitter (🪦 RIP)

Extensible; add Webhooks?

<https://botsin.space/@pgxn>

ROOT MIRROR

ROOT MIRROR

master.pgxn.org

Directories of JSON files

Fully static REST API

META.json

Zip file

Derived metadata

Release, user, tags, etc.

index.json

```
{  
  "download": "/dist/{dist}/{version}/{dist}-{version}.zip",  
  "readme": "/dist/{dist}/{version}/README.txt",  
  "meta": "/dist/{dist}/{version}/META.json",  
  "dist": "/dist/{dist}.json",  
  "extension": "/extension/{extension}.json",  
  "user": "/user/{user}.json",  
  "tag": "/tag/{tag}.json",  
  "stats": "/stats/{stats}.json",  
  "mirrors": "/meta/mirrors.json",  
  "spec": "/meta/spec.{format}"  
}
```


Mirroring

```
mkdir pgxn && cd pgxn  
rsync -az rsync://master.pgxn.org/pgxn .  
python -m http.server 8000
```

```
0 20 * * * /usr/bin/rsync -az --delete rsync://master.pgxn.org/pgxn /pgxn
```

/dist/{dist}.json

```
> curl -s http://localhost:8000/dist/pair.json | yq -oj
```

```
{  
  "name": "pair",  
  "stable": [  
    { "version": "0.1.5", "date": "2011-11-11T17:56:30Z" },  
    { "version": "0.1.4", "date": "2011-11-11T06:52:41Z" },  
    { "version": "0.1.3", "date": "2011-05-12T18:55:30Z" },  
    { "version": "0.1.2", "date": "2011-04-20T23:47:22Z" },  
    { "version": "0.1.1", "date": "2010-10-29T22:44:42Z" },  
    { "version": "0.1.0", "date": "2010-10-19T03:59:54Z" }  
  ]  
}
```

**Also: testing,
unstable**

/extension/{extension}.json

```
> curl -s http://localhost:8000/extension/pair.json | yq -oj
```

```
{  
  "extension": "pair",  
  "latest": "stable",  
  "stable": {  
    "dist": "pair",  
    "version": "0.1.7",  
    "sha1": "5b9e3ba948b18703227e4dea17696c0f1d971759"  
  },  
  "y"
```

```
    "0.1.2": [  
      { "dist": "pair", "version": "0.1.7" },  
      { "dist": "pair", "version": "0.1.6" },  
      { "dist": "pair", "version": "0.1.5" },  
      { "dist": "pair", "version": "0.1.4" },  
      { "dist": "pair", "version": "0.1.2" }  
    ]  
  }  
}
```

Releases containing v0.1.2

```
    "0.1.1": [  
      { "dist": "pair", "version": "0.1.1" }  
    ]  
  }  
}
```

Releases containing v0.1.1

/dist/{dist}/{version}/META.json

```
> curl -s http://localhost:8000/dist/pair/0.1.7/META.json | yq -oj
{
  "name": "pair",
  "abstract": "A key/value pair data type",
  "description": "This library contains a single PostgreSQL extension, a key/value pair data
  "version": "0.1.6",
  "date": "2018-11-10T20:55:55Z",
  "maintainer": [
    "David E. Wheeler <david@justatheory.com>"
  ],
  "release status": "stable",
  "user": "theory",
  "sha1": "bdfc5babdd536dbe53a558cb9fefaedcc0bd8731"
  "license": "postgresql",
  "prereqs": {
    "runtime": {
      "requires": {
        "PostgreSQL": "8.3.0"
      }
    }
  }
}
```

/user/{user}.json

```
> curl -s http://localhost:8000/user/furstenheim.json | yq -oj
```

```
{  
  "nickname": "furstenheim",  
  "name": "Gabriel Furstenheim",  
  "email": "furstenheim@gmail.com",  
  "uri": "https://github.com/furstenheim",  
  "twitter": "furstenheim",  
  "releases": {  
    "is_jsonb_valid": {  
      "stable": [  
        { "version": "0.0.1", "date": "2017-08-17T17:12:06Z" }  
      ]  
    },  
    "jsonb_deep_sum": {  
      "stable": [  
        { "version": "0.0.2", "date": "2020-02-22T16:23:16Z" },  
        { "version": "0.0.1", "date": "2017-06-15T20:40:03Z" }  
      ]  
    }  
  }  
}
```

All releases by user

/tag/{tag}.json

```
> curl -s http://localhost:8000/tag/messaging.json | yq -oj
```

```
{  
  "tag": "messaging",  
  "releases": {  
    "pg_message_queue": {  
      "stable": [  
        { "version": "0.2.1", "date": "2013-01-19T11:15:54Z" },  
        { "version": "0.2.0", "date": "2013-01-04T06:06:18Z" },  
        { "version": "0.1.0", "date": "2012-09-21T09:48:00Z" }  
      ]  
    },  
    "pgmq": {  
      "stable": [  
        { "version": "1.1.1", "date": "2024-01-11T19:55:54Z" },  
        { "version": "0.2.0", "date": "2023-02-26T01:48:04Z" }  
      ]  
    }  
  }  
}
```

**All releases
with tag**



DEMO

SEARCH API

API

api.pgxn.org

It's a mirror!

Syncs every five minutes

Iterates over rsync log

Transforms things

Robust API

No database!

API Release Sync

api.pgxn.org

Validates Checksum

Unpacks zip file

Extends META.json

Doc files

Special files

Release history

Updates older release histories

Extends tag and user JSON

Release abstracts

Extends extension JSON

Doc files

Release dates

Markup Processing

api.pgxn.org

Finds markup files

Generates HTML

Saves for API

Uses Text::Markup

Many formats:

AsciiDoc

BBcode

Creole

HTML

Markdown

MediaWiki

MultiMarkdown

Pod

reStructuredText

Textile

Trac

Full Text Indexing

api.pgxn.org

Also indexes text

Apache Lucy (🪦 RIP)

“Loose C” Lucene port

Local index files

No separate service

Super Fast

Indexes:

Distributions

Extensions

Tags

Documentation

Users

User List

api.pgxn.org

Updates user list

Indexed by first letter

{letter}.json files

Lists each username

```
> curl https://api.pgxn.org/users/q.json \
-s | yq -oj
[
  {
    "name": "qaxwforc1w",
    "user": "qaxwforc1w"
  },
  {
    "name": "Quinn Weaver",
    "user": "qdw"
  },
  {
    "name": "qsqcmsopjc",
    "user": "qsqcmsopjc"
  }
]
```

index.json

```
{  
  "dist": "/dist/{dist}.json",  
  "download": "/dist/{dist}/{version}/{dist}-{version}.zip",  
  "extension": "/extension/{extension}.json",  
  "htmldoc": "/dist/{dist}/{version}/{+docpath}.html",  
  "meta": "/dist/{dist}/{version}/META.json",  
  "mirrors": "/meta/mirrors.json",  
  "readme": "/dist/{dist}/{version}/README.txt",  
  "search": "/search/{in}/",  
  "source": "/src/{dist}/{dist}-{version}/",  
  "spec": "/meta/spec.{format}",  
  "stats": "/stats/{stats}.json",  
  "tag": "/tag/{tag}.json",  
  "user": "/user/{user}.json",  
  "userlist": "/users/{letter}.json"  
}
```

Root /dist/{dist}.json

```
{
  "name": "pair",
  "releases": {
    "stable": [
      { "version": "0.1.7", "date": "2020-10-25T21:54:02Z" },
      { "version": "0.1.6", "date": "2018-11-10T20:55:55Z" },
      { "version": "0.1.5", "date": "2011-11-11T17:56:30Z" },
      { "version": "0.1.4", "date": "2011-11-11T06:52:41Z" },
      { "version": "0.1.3", "date": "2011-05-12T18:55:30Z" },
      { "version": "0.1.2", "date": "2011-04-20T23:47:22Z" },
      { "version": "0.1.1", "date": "2010-10-29T22:44:42Z" },
      { "version": "0.1.0", "date": "2010-10-19T03:59:54Z" }
    ]
  }
}
```

/dist/{dist}.json

```
> curl -s https://api.pgxn.org/dist/pair.json | yq -oj
```

```
{  
  "abstract": "A key/value pair data type",  
  "date": "2020-10-25T21:54:02Z",  
  "description": "This library contains a single PostgreSQL extension, a  
  "docs": {  
    "README": {  
      "title": "pair 0.1.7"  
    },  
    "doc/pair": {  
      "abstract": "A key/value pair data type",  
      "title": "pair 0.1.2"  
    }  
  },  
  "license": "postgresql",  
  "maintainer": [  
    "David E. Wheeler <david@justatheory.com>"  
  ]  
}
```

Merges META.json

Adds docs

`/dist/{dist}/{version}/{+docpath}.html`

```
> curl -s https://api.pgxn.org/dist/pair/0.1.7/doc/pair.html | head -20
```

```
<div id="pgxndoc">  
  <div id="pgxntoc">  
    <h3>Contents</h3>  
    <ul class="pgxntocroot">  
      <li><a href="#pair.0.1.2">pair 0.1.2</a>  
        <ul>  
          <li><a href="#Synopsis">Synopsis</a></li>  
          <li><a href="#Description">Description</a></li>  
          <li><a href="#Usage">Usage</a></li></ul></li>  
    </ul>  
  </div>  
  <div id="pgxnbod">  
<h1 id="pair.0.1.2">pair 0.1.2</h1>  
  
<h2 id="Synopsis">Synopsis</h2>
```

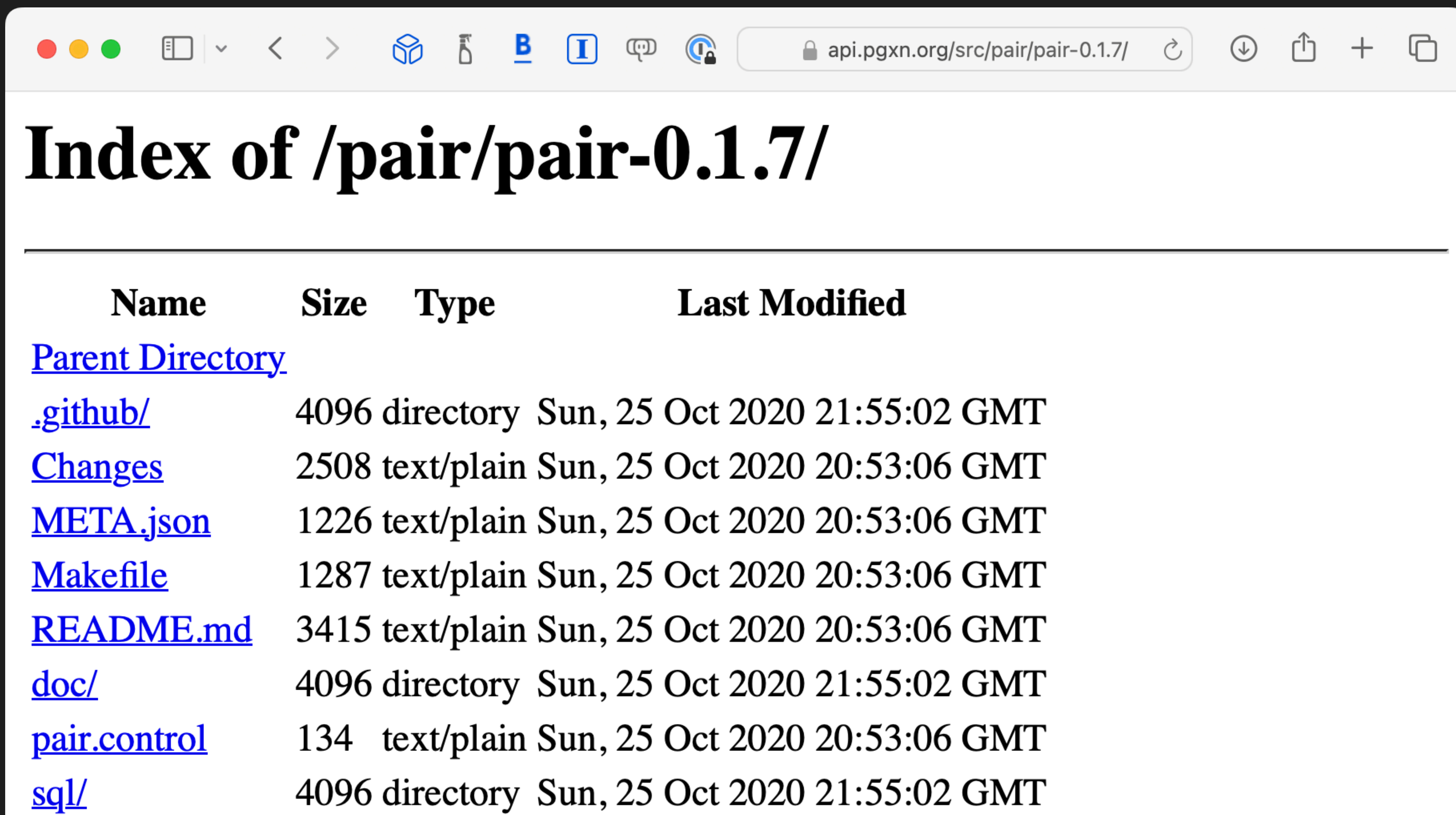
**Generated from
Markdown file**

/extension/{extension}.json

```
> curl -s https://api.pgxn.org/extension/pair.json | yq -oj '.stable'
{
  "dist": "pair",
  "sha1": "5b9e3ba948b18703227e4dea17696c0f1d971759",
  "version": "0.1.7",
  "abstract": "A key/value pair data type",
  "docpath": "doc/pair"
}
```

**Injected by
API**

/src/{dist}/{dist}-{version}/



The image shows a screenshot of a web browser window. The address bar contains the URL "api.pgxn.org/src/pair/pair-0.1.7/". The main content area displays the title "Index of /pair/pair-0.1.7/" followed by a table listing the contents of the directory. The table has four columns: Name, Size, Type, and Last Modified. The entries include a parent directory link, a .github/ directory, a Changes file, a META.json file, a Makefile, a README.md file, a doc/ directory, a pair.control file, and a sql/ directory.

Name	Size	Type	Last Modified
Parent Directory			
.github/	4096	directory	Sun, 25 Oct 2020 21:55:02 GMT
Changes	2508	text/plain	Sun, 25 Oct 2020 20:53:06 GMT
META.json	1226	text/plain	Sun, 25 Oct 2020 20:53:06 GMT
Makefile	1287	text/plain	Sun, 25 Oct 2020 20:53:06 GMT
README.md	3415	text/plain	Sun, 25 Oct 2020 20:53:06 GMT
doc/	4096	directory	Sun, 25 Oct 2020 21:55:02 GMT
pair.control	134	text/plain	Sun, 25 Oct 2020 20:53:06 GMT
sql/	4096	directory	Sun, 25 Oct 2020 21:55:02 GMT

/search/{in}/q={query}

```
> curl -s 'https://api.pgxn.org/search/extensions?q=pair' | yq -oj
```

```
{  
  "query": "pair",  
  "count": 2,  
  "items": [  
    {  
      "extension": "pair",  
      "score": "3.691",  
      "user": "theory",  
      "abstract": "A key/value pair data type",  
      "user_name": "David E. Wheeler",  
      "docpath": "doc/pair",  
      "id": "2020-10-25T21:54:00Z",  
      "excerpt": "A key/value <strong>pair</strong> data type",  
      "version": "0.1.1",  
      "dist": "pair"  
    },  
    {  
      "extension": "unnest_ordinality",  
      "score": "0.144",  
      "date": "2013-04-19T16:39:07Z",  
      "docpath": "doc/unnest_ordinality",  
      "excerpt": "turn an array into a set of (element_number, element) <strong>pairs</strong>".  
      "version": "1.0.1",
```

Also limit & offset

API DOCS

github.com/pgxn/pgxn-api/wiki

SITE

Site

pgxn.org

Thin layer over API

Just give it the URL

Read-only

Mostly static

FAST!

```
> bin/pgxn_site_server \  
  --errors-to err@pgxn.org \  
  --errors-from www@pgxn.org \  
  --feedback-to pgxn@pgxn.org \  
  --api-url https://api.pgxn.org \  
  --base-url http://localhost
```

DEMO

COMMAND LINE CLIENT

CLI

pgxn.github.io/pgxnclient

By Daniele Varrazzo

Python app

Uses API

Git-like commands

install

uninstall

search

mirror

And more!

Extensible

search --ext pair --verbose

```
> pgxn search --ext pair --verbose
```

```
DEBUG: opening url: https://api.pgxn.org/index.json
```

```
DEBUG: opening url: https://api.pgxn.org/search/extensions/?q=pair  
pair 0.1.7
```

```
    A key/value *pair* data type
```

```
unnest_ordinality 1.0.1
```

```
    turn an array into a set of (element_number, element) *pairs*
```

pgxn install

```
> pgxn install pair --pg_config /usr/local/pgsql/bin/pg_config
INFO: best version: pair 0.1.7
INFO: saving /tmp/tmpov1gen3m/pair-0.1.7.zip
INFO: unpacking: /tmp/tmpo112222/pair-0.1.7
INFO: building extension
cp sql/pair.sql sql/pair--0.1.2.sql
INFO: installing extension
/bin/gmkdir -p '/data/pgsql-16share/extension'
/bin/gmkdir -p '/data/pgsql-16share/extension'
/bin/gmkdir -p '/data/pgsql-16share/doc/extension'
/bin/ginstall -c -m 644 ./pair.control '/data/pgsql-16share/extension/'
/bin/ginstall -c -m 644 ./sql/pair--0.1.2.sql ./sql/pair--unpacked--0.1.2.sql
data/pgsql-16share/extension/'
/bin/ginstall -c -m 644 ./doc/pair.md '/data/pgsql-16share/doc/extension/'
```

GET /dist/pair-0.1.7.zip

GET /dist/pair/

./configure && make install 1.7.zip

pgxn load

```
> pgxn load -d david -h localhost pair
```

```
INFO: best version: pair 0.1.7
```

```
CREATE EXTENSION
```

```
> psql -d david -c "SELECT pair('foo', 'bar')"
```

```
pair
```

```
-----
```

```
(foo,bar)
```

```
(1 row)
```

Utils

github.com/guedes/pgxn-utils

Development tools

By Dickson Guedes

Ruby app

Uses Upload API

Extends pgxn CLI:

skeleton (init)

change (metadata)

bundle

release

Needs Ruby 3 update

pgxn-utils skeleton

```
> pgxn skeleton --git --template=fdw fdw_pgxn
```

```
create fdw_pgxn
```

```
create fdw_pgxn/fdw_pgxn.control
```

```
create fdw_pgxn/.gitignore
```

```
create fdw_pgxn/.template
```

```
create fdw_pgxn/META.json
```

```
create fdw_pgxn/Makefile
```

```
create fdw_pgxn/README.md
```

```
create fdw_pgxn/doc/fdw_pgxn.md
```

```
create fdw_pgxn/sql/fdw_pgxn.sql
```

```
create fdw_pgxn/sql/uninstall_fdw_pgxn.sql
```

```
create fdw_pgxn/src/fdw_pgxn_fdw.c
```

```
create fdw_pgxn/test/expected/base.out
```

```
create fdw_pgxn/test/sql/base.sql
```

```
init /dev/pgxn/fdw_pgxn
```

```
commit initial commit
```

PG_CONFIG Makefile

PGXN

recommended

structure

pgxn-utl change

```
> pgxn change fdw_pgxn --maintainer "David Wheeler" --license bsd
  conflict META.json
Overwrite /dev/pgxn/fdw_pgxn/META.json? (enter "h" for help) [Ynaqdh]
  "abstract": "A short description",
  "description": "A long description",
  "version": "0.0.1",
-  "maintainer": "The maintainer's name",
+  "maintainer": "David Wheeler",
-  "license": "postgresql",
+  "license": "bsd",
  "provides": {
    "fdw_pgxn": {
      "abstract": "A short description",
Retrying...
Overwrite /dev/pgxn/fdw_pgxn/META.json? (enter "h" for help) [Ynaqdh]
  force META.json
  identical fdw_pgxn.control
```

META Modified

pgxn-utils release

```
> pgxn bundle fdw_pgxn  
  create /dev/pgxn/fdw_pgxn-0.0.1.zip
```

```
> pgxn release fdw_pgxn-0.0.1.zip
```

```
Enter your PGXN username: theory
```

```
Enter your PGXN password: *****
```

```
Trying to release fdw_pgxn-0.0.1.zip ... released successfully!
```

```
Visit: https://manager.pgxn.org/distributions/fdw\_pgxn/0.0.1
```



CI/CD TOOLS

The background features a stylized mountain range with various peaks and valleys. The mountains are rendered in different shades of purple and blue, creating a sense of depth and atmosphere. The overall color palette is cool and modern.

CI/CD Tools

github.com/pgxn/docker-pgxn-tools

Docker image

Run Postgres 8.2–17

Utilities

pgxn CLI

pg_prove

Task Scripts

pg-start

pg-build-test

pgxn-bundle

pgxn-release

CI WORKFLOW

```
name: CI
on: [push, pull_request]
jobs:
  test:
    strategy:
      matrix:
        pg: [16, 15, 14, 13, 12, 11, 10, 9.6, 9.5, 9.4, 9.3, 9.2, 9.1, 9.0,
name: Start PostgreSQL ${{ matrix.pg }}
runs-on: ubuntu-latest
container: pgxn/pgxn-tools
- name: Start PostgreSQL ${{ matrix.pg }}
  run: pg-start ${{ matrix.pg }}
- name: Check out the repo
  uses: actions/checkout@v4
- name: Test on PostgreSQL ${{ matrix.pg }}
  run: pg-build-test
```

make all
make install
make installcheck

Jobs

- ✓ PostgreSQL 16
- ✓ PostgreSQL 15
- ✓ PostgreSQL 14
- ✓ PostgreSQL 13
- ✓ PostgreSQL 12
- ✓ PostgreSQL 11
- ✓ PostgreSQL 10
- ✓ PostgreSQL 9.6
- ✓ PostgreSQL 9.5
- ✓ PostgreSQL 9.4
- ✓ PostgreSQL 9.3
- ✓ PostgreSQL 9.2
- PostgreSQL 9.1
- PostgreSQL 9.0
- PostgreSQL 8.4
- PostgreSQL 8.3
- PostgreSQL 8.2

RELEASE WORKFLOW

```
name: 🚀 Release on PGXN
```

```
on:
```

```
push:
```

```
tags: ['v[0-9]+.[0-9]+.[0-9]+']
```

```
jobs:
```

```
  release:
```

```
    name: Release on PGXN
```

```
    runs-on: ubuntu-latest
```

```
    container: pgxn/pgxn-tools
```

```
    steps:
```

```
    - name: Check out the repo
```

```
      uses: actions/checkout@v4
```

```
    - name: Bundle the Release
```

```
      run: pgxn-bundle
```

```
    name: Release on PGXN
```

```
    env:
```

```
      PGXN_USERNAME: ${{
```

```
      PGXN_PASSWORD: ${{
```

```
    run: pgxn-release
```

```
pgxn validate-meta
```

```
git archive --format zip
```

```
curl -F archive=@zipfile \
```

```
https://manager.pgx.org/upload
```

RELEASE IT!



PGXN

@pgxn@botsin.space



Released: pgmq 1.1.1



A lightweight message queue like AWS SQS or RSMQ, but on Postgres



By tembo

pgxn.org/dist/pgmq/



PGXN: PostgreSQL Extension Network

pgmq: A lightweight message queue like AWS SQS or ...

A lightweight message queue for PostgreSQL, like AWS SQS or RSMQ, but ...

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THANK YOU

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