免費電子書

學習

postgresql

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#postgresql

1: postgresql

postgresql。

postgresql。 postgresql。

		EOL
9.6	2016929	202191
9.5	201617	202111
9.4		2019121
9.3	201399	201891
9.2	2012910	201791
9.1	2011-09-12	201691
9	2010-09-20	201591
8.4	2009-07-01	201471

Examples

GNU + Linux

GNU + LinuxPostgreSQL。

https //yum.postgresql.org/repopackages.php

```
yum -y install https://download.postgresql.org/pub/repos/yum/X.X/redhat/rhel-7-x86_64/pgdg-redhatXX-X.X-X.noarch.rpm
```

```
yum list available | grep postgres*
```

postgresqlXX postgresqlXX-server postgresqlXX-libs postgresqlXX-contrib

yum -y install postgresqlXX postgresqlXX-server postgresqlXX-libs postgresqlXX-contrib

postgres。 pg_ctl。

```
sudo -su postgres
./usr/pgsql-X.X/bin/pg_ctl -D /var/lib/pgsql/X.X/data start
```

CLIDB`psql`

Debian

Debian

```
sudo apt-get install postgresql
```

PostgreSQL。

。

PostgreSQLPGDG Yum。 。

OSXMacPortsPostgreSQL

OSXPostgreSQL。

。

```
sudo port list | grep "^postgresql[[:digit:]]\{2\}[[:space:]]"
```

```
postgresql80                    @8.0.26         databases/postgresql80
postgresql81                    @8.1.23         databases/postgresql81
postgresql82                    @8.2.23         databases/postgresql82
postgresql83                    @8.3.23         databases/postgresql83
postgresql84                    @8.4.22         databases/postgresql84
postgresql90                    @9.0.23         databases/postgresql90
postgresql91                    @9.1.22         databases/postgresql91
postgresql92                    @9.2.17         databases/postgresql92
postgresql93                    @9.3.13         databases/postgresql93
postgresql94                    @9.4.8          databases/postgresql94
postgresql95                    @9.5.3          databases/postgresql95
postgresql96                    @9.6beta2       databases/postgresql96
```

9.6PostgreSQL。

```
sudo port install postgresql96-server postgresql96
```

```
--->  Computing dependencies for postgresql96-server
--->  Dependencies to be installed: postgresql96
--->  Fetching archive for postgresql96
--->  Attempting to fetch postgresql96-9.6beta2_0.darwin_15.x86_64.tbz2 from
https://packages.macports.org/postgresql96
--->  Attempting to fetch postgresql96-9.6beta2_0.darwin_15.x86_64.tbz2.rmd160 from
https://packages.macports.org/postgresql96
--->  Installing postgresql96 @9.6beta2_0
--->  Activating postgresql96 @9.6beta2_0

To use the postgresql server, install the postgresql96-server port
```

```
--->  Cleaning postgresql96
--->  Fetching archive for postgresql96-server
--->  Attempting to fetch postgresql96-server-9.6beta2_0.darwin_15.x86_64.tbz2 from
https://packages.macports.org/postgresql96-server
--->  Attempting to fetch postgresql96-server-9.6beta2_0.darwin_15.x86_64.tbz2.rmd160 from
https://packages.macports.org/postgresql96-server
--->  Installing postgresql96-server @9.6beta2_0
--->  Activating postgresql96-server @9.6beta2_0

To create a database instance, after install do
 sudo mkdir -p /opt/local/var/db/postgresql96/defaultdb
 sudo chown postgres:postgres /opt/local/var/db/postgresql96/defaultdb
 sudo su postgres -c '/opt/local/lib/postgresql96/bin/initdb -D
/opt/local/var/db/postgresql96/defaultdb'

--->  Cleaning postgresql96-server
--->  Computing dependencies for postgresql96
--->  Cleaning postgresql96
--->  Updating database of binaries
--->  Scanning binaries for linking errors
--->  No broken files found.
```

。

```
sudo mkdir -p /opt/local/var/db/postgresql96/defaultdb
sudo chown postgres:postgres /opt/local/var/db/postgresql96/defaultdb
sudo su postgres -c '/opt/local/lib/postgresql96/bin/initdb -D
/opt/local/var/db/postgresql96/defaultdb'
```

```
sudo port load -w postgresql96-server
```

```
su postgres -c psql
```

postgres

```
psql (9.6.1)
Type "help" for help.

postgres=#
```

。

```
postgres=#SELECT setting FROM pg_settings WHERE name='data_directory';
```

```
               setting
----------------------------------------
/opt/local/var/db/postgresql96/defaultdb
(1 row)
postgres=#
```

\ q

```
postgres=#\q
```

shell。

OS / XPostgreSQL。

Mac OSXPostgres.app

Postgres.appMacPostgreSQL。
PostgreSQL。

WindowsPostgreSQL

UnixLinuxBSDWindowsPostgreSQL。

EnterpriseDBWindows http //www.enterprisedb.com/products-services-training/pgdownload
PostgreSQLWindows。

Beta9.5.3。 Win x86-6432WindowsWin x86-32。

Beta。 。

- > - > - >Windows3264“## - bit Operating System”。 Windows 7Windows。

。

- pgAdmin https://www.pgadmin.org GUI。 9.6。
- PostGIS http://postgis.net GPSGIS。
- PL / PythonPL / PerlPL / Tcl。
- pgAgentpgBouncerSlony。

“Application Stack Builder”。

PL / V8 PL / Lua PL / Java。

pgAdmin。 “PostgreSQL 9.5localhost5432。

PostgreSQLUp and Running2nd Edition http://shop.oreilly.com/product/0636920032144.do 。

PostgreSQL。 Web。 。

PostgreSQLPCPostegreSQL。

。

“”“”。 …

“” - >“” - >“”。

“”“” - >“”。

“”“”。

postgresql-x ## - 9.“postgresql-x64-9.5”。

postgresProperties - > Startup type - > Manual - > Apply - > OK。 。

PostgreSQL“pgbouncer”“PostgreSQL Scheduling Agent - pgAgent”PostgreSQL。 。 PostgreSQL。

“”。

“”。 。 。 Windows。

postgres“”。

。

EDB PostgreSQLPostgreSQLpythonEBD 。

Macbrewpostgresql

Homebrew' *macOS* '。 。 `brew`PostgreSQL

```
brew update
brew install postgresql
```

Homebrew。 `brew search postgresql`。 PostgreSQL`brew info postgresql`。 Homebrew。

```
brew services start postgresql
```

PostgreSQL

```
psql
```

psql`createdb` 。

LinuxSourcePostgreSQL

- GNU Make Version> 3.80
- ISO / ANSI Cgcc
- targzip
- zlib-devel
- readline-devel oder libedit-devel

9.6.3

```
tar -xzvf postgresql-9.6.3.tar.gz
```

PostgreSQL

- `--prefix=PATH--prefix=PATH`
- `--exec-prefix=PATH` architectur-dependet`--exec-prefix=PATH`
- `--bindir=PATH--bindir=PATH`
- `--sysconfdir=PATH--sysconfdir=PATH`
- `--with-pgport=NUMBER`
- `--with-perl` add perl support
- `--with-python`python
- `--with-openssl`openssl
- `--with-ldap`ldap
- `--with-blocksize=BLOCKSIZE`KBpagesize
  - `BLOCKSIZE`2132
- `--with-wal-segsize=SEGSIZE`WAL-SegmentMB
  - `SEGSIZE`1642

cofigure

```
./configure --exec=/usr/local/pgsql
```

`make`

`make install`PostgreSQL

`make clean`

`cd contrib makemake install`

postgresql https://riptutorial.com/zh-TW/postgresql/topic/885/postgresql

2: EXTENSION dblinkpostgres_fw

- dblink'dbname = name_db_distance port = PortOfDB host = HostOfDB user = usernameDB password = passwordDB''MY QUESRY'
- dbname =
- port =
- host =
- user =
- password ='
- =SELECTINSERT...

Examples

dblink

dblink EXTENSION

1 - dblink

```
CREATE EXTENSION dblink;
```

2 -

```
SELECT * FROM
dblink ('dbname = bd_distance port = 5432 host = 10.6.6.6 user = username
password = passw@rd', 'SELECT id, code FROM schema.table')
AS newTable(id INTEGER, code character varying);
```

FDW

FDWdblink

1 -

```
CREATE EXTENSION postgres_fdw;
```

2 -

```
CREATE SERVER name_srv FOREIGN DATA WRAPPER postgres_fdw OPTIONS (host 'hostname',
dbname 'bd_name', port '5432');
```

3 - postgres

```
CREATE USER MAPPING FOR postgres SERVER name_srv OPTIONS(user 'postgres', password
'password');
```

4 -

```
CREATE FOREIGN TABLE table_foreign (id INTEGER, code character varying)
SERVER name_srv OPTIONS(schema_name 'schema', table_name 'table');
```

5 -

```
SELECT * FROM table_foreign;
```

db。

1. EXTENSION

```
  CREATE EXTENSION postgres_fdw;
```

2.

```
  CREATE SERVER server_name FOREIGN DATA WRAPPER postgres_fdw OPTIONS (host 'host_ip',
  dbname 'db_name', port 'port_number');
```

3.

```
  CREATE USER MAPPING FOR CURRENT_USER
  SERVER server_name
  OPTIONS (user 'user_name', password 'password');
```

4. DB

```
 CREATE SCHEMA schema_name;
```

5.

```
   IMPORT FOREIGN SCHEMA schema_name_to_import_from_remote_db
   FROM SERVER server_name
   INTO schema_name;
```

6.

```
  SELECT * FROM schema_name.table_name;
```

。

EXTENSION dblinkpostgres_fdw https://riptutorial.com/zh-TW/postgresql/topic/6970/extension-dblinkpostgres-fdw

3: JSON

JSON - JavaPostgresql9.2JSON。JSON。 ->JSON。 ->>JSON Column。

Examples

JSON

JSONJSONB

```
CREATE TABLE mytable (data JSONB NOT NULL);
```

```
CREATE INDEX mytable_idx ON mytable USING gin (data jsonb_path_ops);
```

。

JSON

JSON

```
CREATE TABLE mytable (data JSONB NOT NULL);
CREATE INDEX mytable_idx ON mytable USING gin (data jsonb_path_ops);
INSERT INTO mytable VALUES($$
{
    "name": "Alice",
    "emails": [
        "alice1@test.com",
        "alice2@test.com"
    ],
    "events": [
        {
            "type": "birthday",
            "date": "1970-01-01"
        },
        {
            "type": "anniversary",
            "date": "2001-05-05"
        }
    ],
    "locations": {
        "home": {
            "city": "London",
            "country": "United Kingdom"
        },
        "work": {
            "city": "Edinburgh",
            "country": "United Kingdom"
        }
    }
}
$$);
```

```
SELECT data->>'name' FROM mytable WHERE data @> '{"name":"Alice"}';
```

```
SELECT data->>'name' FROM mytable WHERE data @> '{"emails":["alice1@test.com"]}';
```

```
SELECT data->>'name' FROM mytable WHERE data @> '{"events":[{"type":"anniversary"}]}';
```

```
SELECT data->>'name' FROM mytable WHERE data @> '{"locations":{"home":{"city":"London"}}}';
```

@>->->>

WHERE@> ->->>◦

```
SELECT data FROM mytable WHERE data @> '{"name":"Alice"}';
SELECT data FROM mytable WHERE data->'name' = '"Alice"';
SELECT data FROM mytable WHERE data->>'name' = 'Alice';
```

◦

->

```
SELECT data->'locations'->'work' FROM mytable WHERE data @> '{"name":"Alice"}';
SELECT data->'locations'->'work'->>'city' FROM mytable WHERE data @> '{"name":"Alice"}';
```

JSONb

```
DROP DATABASE IF EXISTS books_db;
CREATE DATABASE books_db WITH ENCODING='UTF8' TEMPLATE template0;

DROP TABLE IF EXISTS books;

CREATE TABLE books (
  id SERIAL PRIMARY KEY,
  client TEXT NOT NULL,
  data JSONb NOT NULL
);
```

```
INSERT INTO books(client, data) values (
    'Joe',
    '{ "title": "Siddhartha", "author": { "first_name": "Herman", "last_name": "Hesse" } }'
),(
    'Jenny',
    '{ "title": "Dharma Bums", "author": { "first_name": "Jack", "last_name": "Kerouac" } }'
),(
    'Jenny',
    '{ "title": "100 años de soledad", "author": { "first_name": "Gabo", "last_name":
"Marquéz" } }'
);
```

```
SELECT * FROM books;
```

id integer	client character varying	data jsonb
1	Joe	{"title": "Siddhartha", "author": {"last name": "Hesse", "first name": "Herman"}}
2	Jenny	{"title": "Dharma Bums", "author": {"last name": "Kerouac", "first name": "Jack"}}
3	Jenny	{"title": "100 años de soledad", "author": {"last name": "Marquéz", "first name": "G

->JSON

1

```
SELECT client,
    data->'title' AS title
    FROM books;
```

	client character varying	title jsonb
1	Joe	"Siddhartha"
2	Jenny	"Dharma Bums"
3	Jenny	"100 años de soledad"

2

```
SELECT client,
   data->'title' AS title, data->'author' AS author
   FROM books;
```

client character varying	title jsonb	author jsonb
Joe	"Siddhartha"	{"last_name": "Hesse", "first_name": "Herman"}
Jenny	"Dharma Bums"	{"last name": "Kerouac", "first name": "Jack"}
Jenny	"100 años de soledad"	{"last name": "Marquéz", "first name": "Gabo"}

-> VS ->>

->JSON->>◦

NESTED

->

```
SELECT client,
   data->'author'->'last_name' AS author
   FROM books;
```

client character varying	author jsonb
Joe	"Hesse"
Jenny	"Kerouac"
Jenny	"Marquéz"

JSON

```
 SELECT
 client,
 data->'title' AS title
 FROM books
  WHERE data->'title' = '"Dharma Bums"';
```

WHERE->JSON `'"Dharma Bums"'`

`->>'Dharma Bums'`

client character varying	title jsonb
Jenny	"Dharma Bums"

JSON

```
SELECT
 client,
 data->'title' AS title
 FROM books
  WHERE data->'author'->>'last_name' = 'Kerouac';
```

client character varying	title jsonb
Jenny	"Dharma Bums"

```
CREATE TABLE events (
  name varchar(200),
  visitor_id varchar(200),
  properties json,
  browser json
);
```

。。。

```
INSERT INTO events (name, visitor_id, properties, browser) VALUES
(
  'pageview', '1',
  '{ "page": "/" }',
  '{ "name": "Chrome", "os": "Mac", "resolution": { "x": 1440, "y": 900 } }'
),(
  'pageview', '2',
  '{ "page": "/" }',
```

```
  '{ "name": "Firefox", "os": "Windows", "resolution": { "x": 1920, "y": 1200 } }'
),(
  'pageview', '1',
  '{ "page": "/account" }',
  '{ "name": "Chrome", "os": "Mac", "resolution": { "x": 1440, "y": 900 } }'
),(
  'purchase', '5',
  '{ "amount": 10 }',
  '{ "name": "Firefox", "os": "Windows", "resolution": { "x": 1024, "y": 768 } }'
),(
  'purchase', '15',
  '{ "amount": 200 }',
  '{ "name": "Firefox", "os": "Windows", "resolution": { "x": 1280, "y": 800 } }'
),(
  'purchase', '15',
  '{ "amount": 500 }',
  '{ "name": "Firefox", "os": "Windows", "resolution": { "x": 1280, "y": 800 } }'
);
```

```
SELECT * FROM events;
```

name character varying(200)	visitor_id character varying(200)	properties json	browser json
pageview	1	{ "page": "/" }	{ "name": "Chrome", "os": "Mac", "resolution
pageview	2	{ "page": "/" }	{ "name": "Firefox", "os": "Windows", "resol
pageview	1	{ "page": "/account" }	{ "name": "Chrome", "os": "Mac", "resolution
purchase	5	{ "amount": 10 }	{ "name": "Firefox", "os": "Windows", "resol
purchase	15	{ "amount": 200 }	{ "name": "Firefox", "os": "Windows", "resol
purchase	15	{ "amount": 500 }	{ "name": "Firefox", "os": "Windows", "resol

JSON+ PostgreSQL

JSONPostgreSQL。RDBMS。

- ```
  SELECT browser->>'name' AS browser,
    count(browser)
    FROM events
    GROUP BY browser->>'name';
  ```

browser text	count bigint
Firefox	4
Chrome	2

- ```
  SELECT visitor_id, SUM(CAST(properties->>'amount' AS integer)) AS total
  FROM events
  WHERE CAST(properties->>'amount' AS integer) > 0
  GROUP BY visitor_id;
  ```

visitor_id character varying(200)	total bigint
5	10
15	700

-

```
SELECT AVG(CAST(browser->'resolution'->>'x' AS integer)) AS width,
  AVG(CAST(browser->'resolution'->>'y' AS integer)) AS height
FROM events;
```

width numeric	height numeric
1397.3333333333333	894.666666666666667

。

JSON https://riptutorial.com/zh-TW/postgresql/topic/1034/json

4: postgresql

COMMMENT。

。 COMMENT。

COMMENT ON ROLECREATEROLE。

- database_object";

http //www.postgresql.org/docs/current/static/sql-comment.html

Examples

table_name IS";

TABLE;

。

postgresql https://riptutorial.com/zh-TW/postgresql/topic/8191/postgresql

5: PostgreSQL

Examples

PostgreSQL

-
  -
    -
    - WAL
  - `createuser -U postgres replication -P -c 5 --replication`

    ```
    + option -P will prompt you for new password
    + option -c is for maximum connections. 5 connections are enough for replication
    + -replication will grant replication privileges to the user
    ```

  - `mkdir $PGDATA/archive`
  - **pg_hba.conf**

    。

    ```
    #hosttype    database_name     user_name       hostname/IP      method
     host        replication       replication     <slave-IP>/32    md5
    ```

  - **postgresql.conf**

    PostgreSQL。

    `wal_level = hot_standby`

    。

    ```
    `hot_standby` logs what is required to accept read only queries on slave server.

    `streaming` logs what is required to just apply the WAL's on slave.

    `archive` which logs what is required for archiving.
    ```

    `archive_mode=on`

    `archive_command`WAL。

    `archive_command = 'test ! -f /path/to/archivedir/%f && cp %p /path/to/archivedir/%f'`

    `archive_command`WAL。

    `wal_senders = 5`WAL。

    。

-

primay

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。 。 。

- **pg_basebackup**

  pg_basebackup。

  ```
  $ pg_basebackup -h <primary IP> -D /var/lib/postgresql/<version>/main -U replication -v -P
  --xlog-method=stream
  ```

```
    -D: This is tells pg_basebackup where to the initial backup

    -h: Specifies the system where to look for the primary server

    -xlog-method=stream: This will force the pg_basebackup to open another connection and
stream enough xlog while backup is running.
                         It also ensures that fresh backup can be started without failing back
to using an archive.
```

- postgresql.confrecovery.conf。

  ```
  hot_standby = on
  ```

  - **recovery.conf**

    ```
    standby_mode = on
    ```

    。IP。replication

    `primary_conninfo ='host = port = 5432 user = replication password ='

    ```
    trigger_file = '/tmp/postgresql.trigger.5432'
    ```

    trigger_file。“”。pg_ctl promote。

-

PostgreSQL。3.0。

PostgreSQL https://riptutorial.com/zh-TW/postgresql/topic/5478/postgresql

6: Postgres

Postgrespgcrypto。 CREATE EXTENSION pgcrypto;

Examples

DIGEST()。 。

```
digest(data text, type text) returns bytea

digest(data bytea, type text) returns bytea
```

- `SELECT DIGEST('1', 'sha1')`
- `SELECT DIGEST(CONCAT(CAST(current_timestamp AS TEXT), RANDOM()::TEXT), 'sha1')`

Postgres https://riptutorial.com/zh-TW/postgresql/topic/9230/postgres

7: Postgres

Examples

PostgresDATEADD

- `SELECT CURRENT_DATE + '1 day'::INTERVAL`
- `SELECT '1999-12-11'::TIMESTAMP + '19 days'::INTERVAL`
- `SELECT '1 month'::INTERVAL + '1 month 3 days'::INTERVAL`

```
SELECT
    string_agg(<TABLE_NAME>.<COLUMN_NAME>, ',')
FROM
    <SCHEMA_NAME>.<TABLE_NAME> T
```

postgres

```
DELETE
    FROM <SCHEMA_NAME>.<Table_NAME>
WHERE
    ctid NOT IN
        (
        SELECT
            MAX(ctid)
        FROM
            <SCHEMA_NAME>.<TABLE_NAME>
        GROUP BY
            <SCHEMA_NAME>.<TABLE_NAME>.*
        )
;
```

Postresql。

```
    update <SCHEMA_NAME>.<TABLE_NAME_1> AS A
    SET <COLUMN_1> = True
    FROM <SCHEMA_NAME>.<TABLE_NAME_2> AS B
    WHERE
        A.<COLUMN_2> = B.<COLUMN_2> AND
        A.<COLUMN_3> = B.<COLUMN_3>
```

```
select
    (
        (DATE_PART('year', AgeonDate) - DATE_PART('year', tmpdate)) * 12
        +
        (DATE_PART('month', AgeonDate) - DATE_PART('month', tmpdate))
    )
from dbo."Table1"
```

```
select (DATE_PART('year', AgeonDate) - DATE_PART('year', tmpdate)) from dbo."Table1"
```

//

```
CREATE EXTENSION DBLINK;
```

```
INSERT INTO
    <SCHEMA_NAME>.<TABLE_NAME_1>
SELECT *
FROM
    DBLINK(
    'HOST=<IP-ADDRESS> USER=<USERNAME> PASSWORD=<PASSWORD> DBNAME=<DATABASE>',
    'SELECT * FROM <SCHEMA_NAME>.<TABLE_NAME_2>')
    AS <TABLE_NAME>
    (
    <COLUMN_1> <DATATYPE_1>,
    <COLUMN_1> <DATATYPE_2>,
    <COLUMN_1> <DATATYPE_3>
    );
```

Postgres https://riptutorial.com/zh-TW/postgresql/topic/7433/postgres

8: UPDATE

Examples

column_name = value

```
UPDATE person SET planet = 'Earth';
```

```
UPDATE person SET state = 'NY' WHERE city = 'New York';
```

col=val

```
UPDATE person
   SET country = 'USA',
       state = 'NY'
WHERE city = 'New York';
```

```
UPDATE person
SET state_code = cities.state_code
FROM cities
WHERE cities.city = city;
```

person citycities city◦ personstate_code◦

UPDATE https://riptutorial.com/zh-TW/postgresql/topic/3136/update

9:

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PostgreSQL

https://www.postgresql.org/docs/9.3/static/event-trigger-definition.html

Examples

DDL

-

- DDL_COMMAND_START
- DDL_COMMAND_END
- SQL_DROP

DDL_COMMAND_STARTDDL_COMMAND_START 。

```
CREATE TABLE TAB_EVENT_LOGS(
  DATE_TIME TIMESTAMP,
  EVENT_NAME TEXT,
  REMARKS TEXT
);

CREATE OR REPLACE FUNCTION FN_LOG_EVENT()
  RETURNS EVENT_TRIGGER
  LANGUAGE SQL
  AS
  $main$
    INSERT INTO TAB_EVENT_LOGS(DATE_TIME,EVENT_NAME,REMARKS)
      VALUES(NOW(),TG_TAG,'Event Logging');
  $main$;

CREATE EVENT TRIGGER TRG_LOG_EVENT ON DDL_COMMAND_START
  EXECUTE PROCEDURE FN_LOG_EVENT();
```

https://riptutorial.com/zh-TW/postgresql/topic/9255/

10:

Examples

Npgsql.NETPostgresql

Postgresql.NETNpgsql ADO.NET.NET。

。 C

```
var connString = "Host=myserv;Username=myuser;Password=mypass;Database=mydb";
using (var conn = new NpgsqlConnection(connString))
{
    var querystring = "INSERT INTO data (some_field) VALUES (@content)";

    conn.Open();
    // Create a new command with CommandText and Connection constructor
    using (var cmd = new NpgsqlCommand(querystring, conn))
    {
        // Add a parameter and set its type with the NpgsqlDbType enum
        var contentString = "Hello World!";
        cmd.Parameters.Add("@content", NpgsqlDbType.Text).Value = contentString;

        // Execute a query that returns no results
        cmd.ExecuteNonQuery();


        /* It is possible to reuse a command object and open connection instead of creating
new ones */

        // Create a new query and set its parameters
        int keyId = 101;
        cmd.CommandText = "SELECT primary_key, some_field FROM data WHERE primary_key =
@keyId";
        cmd.Parameters.Clear();
        cmd.Parameters.Add("@keyId", NpgsqlDbType.Integer).Value = keyId;

        // Execute the command and read through the rows one by one
        using (NpgsqlDataReader reader = cmd.ExecuteReader())
        {
            while (reader.Read())   // Returns false for 0 rows, or after reading the last row
of the results
            {
                // read an integer value
                int primaryKey = reader.GetInt32(0);
                // or
                primaryKey = Convert.ToInt32(reader["primary_key"]);

                // read a text value
                string someFieldText = reader["some_field"].ToString();
            }
        }
    }
}    // the C# 'using' directive calls conn.Close() and conn.Dispose() for us
```

C-APIPostgreSQL

C-APIPostgreSQL。

`pg_config --includedir`PostgreSQL。
PostgreSQLUNIX`libpq.so` Windows`libpq.dll` 。 PostgreSQL`pg_config --libdir`。

`libpq.so` `libpg.so` 。

`coltype.c`

```
gcc -Wall -I "$(pg_config --includedir)" -L "$(pg_config --libdir)" -o coltype coltype.c -lpq
```

GNU C`-Wl,-rpath,"$(pg_config --libdir)"`

```
cl /MT /W4 /I <include directory> coltype.c <path to libpq.lib>
```

WindowsMicrosoft Visual C.

```
/* necessary for all PostgreSQL client programs, should be first */
#include <libpq-fe.h>

#include <stdio.h>
#include <string.h>

#ifdef TRACE
#define TRACEFILE "trace.out"
#endif

int main(int argc, char **argv) {
#ifdef TRACE
    FILE *trc;
#endif
    PGconn *conn;
    PGresult *res;
    int rowcount, colcount, i, j, firstcol;
    /* parameter type should be guessed by PostgreSQL */
    const Oid paramTypes[1] = { 0 };
    /* parameter value */
    const char * const paramValues[1] = { "pg_database" };

    /*
     * Using an empty connectstring will use default values for everything.
     * If set, the environment variables PGHOST, PGDATABASE, PGPORT and
     * PGUSER will be used.
     */
    conn = PQconnectdb("");

    /*
     * This can only happen if there is not enough memory
     * to allocate the PGconn structure.
     */
```

```
    if (conn == NULL)
    {
        fprintf(stderr, "Out of memory connecting to PostgreSQL.\n");
        return 1;
    }

    /* check if the connection attempt worked */
    if (PQstatus(conn) != CONNECTION_OK)
    {
        fprintf(stderr, "%s\n", PQerrorMessage(conn));
        /*
         * Even if the connection failed, the PGconn structure has been
         * allocated and must be freed.
         */
        PQfinish(conn);
        return 1;
    }

#ifdef TRACE
    if (NULL == (trc = fopen(TRACEFILE, "w")))
    {
        fprintf(stderr, "Error opening trace file \"%s\"!\n", TRACEFILE);
        PQfinish(conn);
        return 1;
    }

    /* tracing for client-server communication */
    PQtrace(conn, trc);
#endif

    /* this program expects the database to return data in UTF-8 */
    PQsetClientEncoding(conn, "UTF8");

    /* perform a query with parameters */
    res = PQexecParams(
        conn,
        "SELECT column_name, data_type "
            "FROM information_schema.columns "
            "WHERE table_name = $1",
        1,            /* one parameter */
        paramTypes,
        paramValues,
        NULL,        /* parameter lengths are not required for strings */
        NULL,        /* all parameters are in text format */
        0            /* result shall be in text format */
    );

    /* out of memory or sever communication broken */
    if (NULL == res)
    {
        fprintf(stderr, "%s\n", PQerrorMessage(conn));
        PQfinish(conn);
#ifdef TRACE
        fclose(trc);
#endif
        return 1;
    }

    /* SQL statement should return results */
    if (PGRES_TUPLES_OK != PQresultStatus(res))
    {
```

```
        fprintf(stderr, "%s\n", PQerrorMessage(conn));
        PQfinish(conn);
#ifdef TRACE
        fclose(trc);
#endif
        return 1;
    }

    /* get count of result rows and columns */
    rowcount = PQntuples(res);
    colcount = PQnfields(res);

    /* print column headings */
    firstcol = 1;

    printf("Description of the table \"pg_database\"\n");

    for (j=0; j<colcount; ++j)
    {
        if (firstcol)
            firstcol = 0;
        else
            printf(": ");

        printf(PQfname(res, j));
    }

    printf("\n\n");

    /* loop through rosult rows */
    for (i=0; i<rowcount; ++i)
    {
        /* print all column data */
        firstcol = 1;

        for (j=0; j<colcount; ++j)
        {
            if (firstcol)
                firstcol = 0;
            else
                printf(": ");

            printf(PQgetvalue(res, i, j));
        }

        printf("\n");
    }

    /* this must be done after every statement to avoid memory leaks */
    PQclear(res);
    /* close the database connection and release memory */
    PQfinish(conn);
#ifdef TRACE
    fclose(trc);
#endif
    return 0;
}
```

psycopg2pythonPostgreSQL

。

```
import psycopg2

db_host = 'postgres.server.com'
db_port = '5432'
db_un = 'user'
db_pw = 'password'
db_name = 'testdb'

conn = psycopg2.connect("dbname={} host={} user={} password={}".format(
                        db_name,  db_host, db_un, db_pw),
                        cursor_factory=RealDictCursor)
cur = conn.cursor()
sql = 'select * from testtable where id > %s and id < %s'
args = (1, 4)
cur.execute(sql, args)

print(cur.fetchall())
```

```
[{'id': 2, 'fruit': 'apple'}, {'id': 3, 'fruit': 'orange'}]
```

Pomm2PHPPostgreSQL

pomm 。 /。

Pommcomposer

```
<?php
use PommProject\Foundation\Pomm;
$loader = require __DIR__ . '/vendor/autoload.php';
$pomm = new Pomm(['my_db' => ['dsn' => 'pgsql://user:pass@host:5432/db_name']]);

// TABLE comment (
// comment_id uuid PK, created_at timestamptz NN,
// is_moderated bool NN default false,
// content text NN CHECK (content !~ '^\s+$'), author_email text NN)
$sql = <<<SQL
SELECT
  comment_id,
  created_at,
  is_moderated,
  content,
  author_email
FROM comment
  INNER JOIN author USING (author_email)
WHERE
  age(now(), created_at) < $*::interval
ORDER BY created_at ASC
SQL;

// the argument will be converted as it is cast in the query above
$comments = $pomm['my_db']
    ->getQueryManager()
    ->query($sql, [DateInterval::createFromDateString('1 day')]);

if ($comments->isEmpty()) {
```

```
    printf("There are no new comments since yesterday.");
} else {
    foreach ($comments as $comment) {
        printf(
                "%s has posted at %s. %s\n",
                $comment['author_email'],
                $comment['created_at']->format("Y-m-d H:i:s"),
                $comment['is_moderated'] ? '[OK]' : '');
    }
}
```

PommSQL。PHPPostgres。。\ DateTime。

https://riptutorial.com/zh-TW/postgresql/topic/2014/

11:

pg_dumpallpg_dump

pg_start_backup()pg_stop_backup()。 ;ZFSFreeBSD。

PostgresPostgres。 。

Examples

```
pg_dump -Fc -f DATABASE.pgsql DATABASE
```

-Fc“”SQL;pg_restore。 vanilla SQL

```
pg_dump -f DATABASE.sql DATABASE
```

```
pg_dump DATABASE > DATABASE.sql
```

```
psql < backup.sql
```

-1。 -fshell。

```
psql -1f backup.sql
```

-dpg_restore

```
pg_restore -d DATABASE DATABASE.pgsql
```

SQL

```
pg_restore backup.pgsql > backup.sql
```

。

postgresqlpg_dumppg_restore。

```
$ pg_dumpall -f backup.sql
```

pg_dump。

cron

```
$ postgres-backup-$(date +%Y-%m-%d).sql
```

◦ Postgresql - WAL

pg_dumpallPostgres`$PGDATA pg_hba.confpostgresql.conf` ◦

```
postgres=# SELECT pg_start_backup('my-backup');
postgres=# SELECT pg_stop_backup();
```

Postgres◦

CSV

```
COPY <tablename> FROM '<filename with path>';
```

/home/user/user_data.csvuser

```
COPY user FROM '/home/user/user_data.csv';
```

```
COPY user FROM '/home/user/user_data' WITH DELIMITER '|';
```

`with delimiter,`

```
COPY user FROM '/home/user/user_data' WITH DELIMITER '|' HEADER;
```

◦ `QUOTE`;CSV◦

o / p

COPY <tablename> TO STDOUTDELIMITER'|';

COPYTO STDOUTDELIMITER'|';

COPYFROM'/ home / user / user_data'with DELIMITER'|';

SQL

COPYsqlTO'<>';

COPYSELECT * FROM user WHERE user_name LIKE'A'TO'/ home / user / user_data';

COPYTO PROGRAM'gzip> /home/user/user_data.gz';

gzip。

psql

psql。

csvcsv

```
psql -p \<port> -U \<username> -d \<database> -A -F<delimiter> -c\<sql to execute> \> \<output
filename with path>

psql -p 5432 -U postgres -d test_database -A -F, -c "select * from user" >
/home/user/user_data.csv
```

-A-F。

```
-F
```

```
-A or --no-align
```

。 。

https://riptutorial.com/zh-TW/postgresql/topic/2291/

12: WITH

Examples

SELECT

。

```
WITH sales AS (
  SELECT
    orders.ordered_at,
    orders.user_id,
    SUM(orders.amount) AS total
  FROM orders
  GROUP BY orders.ordered_at, orders.user_id
)
SELECT
  sales.ordered_at,
  sales.total,
  users.name
FROM sales
JOIN users USING (user_id)
```

WITH RECURSIVE

```
create table empl (
    name text primary key,
    boss text null
        references name
            on update cascade
            on delete cascade
        default null
);

insert into empl values ('Paul',null);
insert into empl values ('Luke','Paul');
insert into empl values ('Kate','Paul');
insert into empl values ('Marge','Kate');
insert into empl values ('Edith','Kate');
insert into empl values ('Pam','Kate');
insert into empl values ('Carol','Luke');
insert into empl values ('John','Luke');
insert into empl values ('Jack','Carol');
insert into empl values ('Alex','Carol');

with recursive t(level,path,boss,name) as (
        select 0,name,boss,name from empl where boss is null
    union
        select
            level + 1,
            path || ' > ' || empl.name,
            empl.boss,
            empl.name
        from
```

```
            empl join t
                on empl.boss = t.name
) select * from t order by path;
```

WITH https://riptutorial.com/zh-TW/postgresql/topic/1973/-with-

13:

Coalescenone null。null。nullnull。

Examples

null

```
PGSQL> SELECT COALESCE(NULL, NULL, 'HELLO WORLD');

coalesce
--------
'HELLO WORLD'
```

null

PGSQL> SELECT COALESCENULLNULL'first non null'nullnull'second non null';

```
coalesce
--------
'first non null'
```

```
PGSQL> SELECT COALESCE(NULL, NULL, NULL);

coalesce
--------
```

https://riptutorial.com/zh-TW/postgresql/topic/10576/

14: PostgreSQLCSV

Adminermysqlcsvpostgresql。postgresqlCSV。

Examples

PostgreSQLcsv

```
COPY products(is_public, title, discount) TO 'D:\csv_backup\products_db.csv' DELIMITER ',' CSV
HEADER;

COPY categories(name) TO 'D:\csv_backup\categories_db.csv' DELIMITER ',' CSV HEADER;
```

csv

```
COPY products TO 'D:\csv_backup\products_db.csv' DELIMITER ',' CSV HEADER;

COPY categories TO 'D:\csv_backup\categories_db.csv' DELIMITER ',' CSV HEADER;
```

```
copy (select oid,relname from pg_class limit 5) to stdout;
```

PostgreSQLCSV https://riptutorial.com/zh-TW/postgresql/topic/8643/postgresqlcsv

15: JavaPostgreSQL

JavaAPIJDBC。

APIJDBC。

JARJAVA。

JDBC。

JDBC URL

JDBC URL

- `jdbc:postgresql:// host [: port ]/[ database ][ parameters ]`

  *host*localhost *port*5432。
  *host*IPv6。
  。

  host [: *port*]。
  。

- `jdbc:postgresql: database [ parameters ]`

- `jdbc:postgresql:/[ parameters ]`

  localhost 。

parameterskey [= *value*]??&。 *value* true 。

```
jdbc:postgresql://localhost/test?user=fred&password=secret&ssl&sslfactory=org.postgresql.ssl.NonValidat
```

- JDBC http //download.oracle.com/otndocs/jcp/jdbc-4_2-mrel2-eval-spec/
- PostgreSQL JDBC https //jdbc.postgresql.org/
- PostgreSQL JDBC https //jdbc.postgresql.org/documentation/head/index.html

Examples

java.sql.DriverManager

。

java.sql.DriverManager 。

java.lang.Class.forname(*<driver class name>*) 。

```
/**
 * Connect to a PostgreSQL database.
 * @param url the JDBC URL to connect to; must start with "jdbc:postgresql:"
 * @param user the username for the connection
 * @param password the password for the connection
 * @return a connection object for the established connection
 * @throws ClassNotFoundException if the driver class cannot be found on the Java class path
 * @throws java.sql.SQLException if the connection to the database fails
 */
private static java.sql.Connection connect(String url, String user, String password)
    throws ClassNotFoundException, java.sql.SQLException
{
    /*
     * Register the PostgreSQL JDBC driver.
     * This may throw a ClassNotFoundException.
     */
    Class.forName("org.postgresql.Driver");
    /*
     * Tell the driver manager to connect to the database specified with the URL.
     * This may throw an SQLException.
     */
    return java.sql.DriverManager.getConnection(url, user, password);
}
```

JDBC URL`getConnection`。

java.sql.DriverManagerProperties

`java.util.Properties`URL

```
/**
 * Connect to a PostgreSQL database.
 * @param url the JDBC URL to connect to. Must start with "jdbc:postgresql:"
 * @param user the username for the connection
 * @param password the password for the connection
 * @return a connection object for the established connection
 * @throws ClassNotFoundException if the driver class cannot be found on the Java class path
 * @throws java.sql.SQLException if the connection to the database fails
 */
private static java.sql.Connection connect(String url, String user, String password)
    throws ClassNotFoundException, java.sql.SQLException
{
    /*
     * Register the PostgreSQL JDBC driver.
     * This may throw a ClassNotFoundException.
     */
    Class.forName("org.postgresql.Driver");
    java.util.Properties props = new java.util.Properties();
    props.setProperty("user", user);
    props.setProperty("password", password);
    /* don't use server prepared statements */
    props.setProperty("prepareThreshold", "0");
    /*
     * Tell the driver manager to connect to the database specified with the URL.
     * This may throw an SQLException.
     */
    return java.sql.DriverManager.getConnection(url, props);
}
```

javax.sql.DataSource

JNDI`javax.sql.DataSource`。

```
/**
 * Create a data source with connection pool for PostgreSQL connections
 * @param url the JDBC URL to connect to. Must start with "jdbc:postgresql:"
 * @param user the username for the connection
 * @param password the password for the connection
 * @return a data source with the correct properties set
 */
private static javax.sql.DataSource createDataSource(String url, String user, String password)
{
    /* use a data source with connection pooling */
    org.postgresql.ds.PGPoolingDataSource ds = new org.postgresql.ds.PGPoolingDataSource();
    ds.setUrl(url);
    ds.setUser(user);
    ds.setPassword(password);
    /* the connection pool will have 10 to 20 connections */
    ds.setInitialConnections(10);
    ds.setMaxConnections(20);
    /* use SSL connections without checking server certificate */
    ds.setSslMode("require");
    ds.setSslfactory("org.postgresql.ssl.NonValidatingFactory");

    return ds;
}
```

```
/* get a connection from the connection pool */
java.sql.Connection conn = ds.getConnection();

/* do some work */

/* hand the connection back to the pool - it will not be closed */
conn.close();
```

JavaPostgreSQL https://riptutorial.com/zh-TW/postgresql/topic/9633/javapostgresql

16:

Examples

INSERT

person

```
CREATE TABLE person (
    person_id BIGINT,
    name VARCHAR(255).
    age INT,
    city VARCHAR(255)
);
```

```
INSERT INTO person VALUES (1, 'john doe', 25, 'new york');
```

```
INSERT INTO person (name, age) VALUES ('john doe', 25);
```

NOT NULL。

```
INSERT INTO person (name, age) VALUES
  ('john doe', 25),
  ('jane doe', 20);
```

select

select

```
INSERT INTO person SELECT * FROM tmp_person WHERE age < 30;
```

select。 `tmp_personperson` 。

COPY

COPYPostgreSQL。 `INSERT`。

。

```
cat > samplet_data.csv

1,Yogesh
2,Raunak
3,Varun
4,Kamal
5,Hari
6,Amit
```

。

```
CREATE TABLE copy_test(id int, name varchar(8));
```

。

```
COPY copy_test FROM '/path/to/file/sample_data.csv' DELIMITER ',';
```

stdin

```
COPY copy_test FROM stdin DELIMITER ',';
Enter data to be copied followed by a newline.
End with a backslash and a period on a line by itself.
>> 7,Amol
>> 8,Amar
>> \.
Time: 85254.306 ms

SELECT * FROM copy_test ;
 id |  name
----+--------
  1 | Yogesh
  3 | Varun
  5 | Hari
  7 | Amol
  2 | Raunak
  4 | Kamal
  6 | Amit
  8 | Amar
```

```
COPY copy_test TO 'path/to/file/sample_data.csv'  DELIMITER ',';
```

COPY

INSERTRETURING

。

my_table

```
CREATE TABLE my_table
(
id serial NOT NULL, -- serial data type is auto incrementing four-byte integer
name character varying,
contact_number integer,
CONSTRAINT my_table_pkey PRIMARY KEY (id)
);
```

my_tableid

```
INSERT INTO my_table(name, contact_number) VALUES ( 'USER', 8542621) RETURNING id;
```

id。

◦

◦

```
postgres=# select * from my_table;
 c1 | c2 | c3
----+----+----
  1 |  1 |  1
  2 |  2 |  2
  3 |  3 |  3
  4 |  4 |  4
  5 |  5 |
(5 rows)

postgres=# copy my_table to '/home/postgres/my_table.txt' using delimiters '|' with null as
'null_string' csv header;
COPY 5
postgres=# \! cat my_table.txt
c1|c2|c3
1|1|1
2|2|2
3|3|3
4|4|4
5|5|null_string
```

UPSERT - INSERT .....

9.5 postgresINSERTUPSERT◦

my_table◦ PK

```
b=# INSERT INTO my_table (name,contact_number) values ('one',333) RETURNING id;
 id
----
  2
(1 row)

INSERT 0 1
```

```
b=# INSERT INTO my_table values (2,'one',333);
ERROR:  duplicate key value violates unique constraint "my_table_pkey"
DETAIL:  Key (id)=(2) already exists.
```

Upsert

```
b=# INSERT INTO my_table values (2,'one',333) ON CONFLICT (id) DO UPDATE SET name =
my_table.name||' changed to: "two" at '||now() returning *;
 id |                        name                             | contact_number
----+---------------------------------------------------------------------------------------
------------------+----------------
  2 | one changed to: "two" at 2016-11-23 08:32:17.105179+00 |            333
(1 row)

INSERT 0 1
```

https://riptutorial.com/zh-TW/postgresql/topic/2561/

17:

PostgreSQL。CREATE TYPEPostgreSQL。

https://www.postgresql.org/docs/9.6/static/datatype.html

Examples

smallint	2		-32768+32767
integer	4		-2147483648+2147483647
bigint	8		-9223372036854775808+9223372036854775807
decimal			131072;16383
numeric			131072;16383
real	4		6
double precision	8		15
smallserial	2		132767
serial	4		12147483647
bigserial	8		19223372036854775807
int4range			
int8range		bigint	
numrange			

/

timestamp	8		4713	294276	1/ 14
timestamp	8		4713	294276	1/ 14
date	4		4713	5874897	1
time	8		00:00:00	24:00:00	1/ 14
time	12		000000 + 1459	240000-1459	1/ 14

interval	16		-178000000	1.78	1/ 14
tsrange					
tstzrange					
daterange					

point	16		XY
line	32		{ABC}
lseg	32		X1Y1X2Y2
box	32		X1Y1X2Y2
path	16 + 16n		X1Y1...
path	16 + 16n		[X1Y1...]
polygon	40 + 16n		X1Y1...
circle	24		<xyr>

cidr	719	IPv4IPv6
inet	719	IPv4IPv6
macaddr	6	MAC

character varying(n) varchar(n)	
character(n) char(n)	
text	

PostgreSQL。Array。

```
SELECT integer[];
SELECT integer[3];
SELECT integer[][];
SELECT integer[3][3];
SELECT integer ARRAY;
SELECT integer ARRAY[3];
```

```
SELECT '{0,1,2}';
SELECT '{{0,1},{1,2}}';
SELECT ARRAY[0,1,2];
SELECT ARRAY[ARRAY[0,1],ARRAY[1,2]];
```

PostgreSQLn`array[1]array[n]`◦

```
--accesing a spefific element
WITH arr AS (SELECT ARRAY[0,1,2] int_arr) SELECT int_arr[1] FROM arr;

int_arr
---------
        0
(1 row)

--sclicing an array
WITH arr AS (SELECT ARRAY[0,1,2] int_arr) SELECT int_arr[1:2] FROM arr;

int_arr
---------
    {0,1}
(1 row)
```

```
--array dimensions (as text)
with arr as (select ARRAY[0,1,2] int_arr) select array_dims(int_arr) from arr;

array_dims
------------
       [1:3]
(1 row)

--length of an array dimension
 WITH arr AS (SELECT ARRAY[0,1,2] int_arr) SELECT array_length(int_arr,1) FROM arr;

 array_length
 --------------
              3
 (1 row)

--total number of elements across all dimensions
 WITH arr AS (SELECT ARRAY[0,1,2] int_arr) SELECT cardinality(int_arr) FROM arr;

 cardinality
 -------------
             3
 (1 row)
```

https://riptutorial.com/zh-TW/postgresql/topic/8976/

18:

Examples

to_char()timestampinterval

```
SELECT to_char('2016-08-12 16:40:32'::timestamp, 'DD Mon YYYY HH:MI:SSPM');
```

“201681204:40:32 PM”。;。

```
SELECT to_char('2016-08-12 16:40:32'::timestamp,
               '"Today is "FMDay", the "DDth" day of the month of "FMMonth" of "YYYY');
```

“2016812”。 - “I”“D”“W”。。

TM。PostgreSQL。

```
SELECT to_char('2016-08-12 16:40:32'::timestamp, 'TMDay, DD" de "TMMonth" del año "YYYY');
```

“Sábado12 de Agostodelaño2016”。

。

```
SELECT (date_trunc('MONTH', ('201608'||'01')::date) + INTERVAL '1 MONTH - 1 day')::DATE;
```

201608。

SELECT date_trunc'week'<>AS“Week”count*FROM <> GROUP BY 1 ORDER BY 1;

https://riptutorial.com/zh-TW/postgresql/topic/4227/-

19: /

“”“”char_lengthcharacter_length。

Examples

```
1 SELECT char_length('ABCDE')
```

```
2 SELECT character_length('ABCDE')
```

/ https://riptutorial.com/zh-TW/postgresql/topic/9695/-

20:

- +
- prodDir22-11-2016-19h55
- **+**
-
- dbprod22-11-2016-19h55.backup
- dbprod22-11-2016-19h55.sql **sql**
- **19-1155**
- /save_bd/prodDir22-11-2016-19h55/dbprod22-11-2016-19h55.backup
- /save_bd/prodDir22-11-2016-19h55/dbprod22-11-2016-19h55.sql

SAVE_DB	
dbProd	
dbprod	
/opt/postgres/9.0/bin/pg_dump	pg_dump
-H	localhost
-p	TCPUnix5432
-U	。

1. HDPSSymantec Backup。

。

3。

```
rm -R / save_db / *
```

2. cron 。

cron。

```
crontab -e
```

11。

```
0 23 * * * /saveProdDb.sh
```

Examples

saveProdDb.sh

pgAdmin。linuxsh

- **SQL** PostgreSQL。
- 。

```
#!/bin/sh
cd /save_db
#rm -R /save_db/*
DATE=$(date +%d-%m-%Y-%Hh%M)
echo -e "Sauvegarde de la base du ${DATE}"
mkdir prodDir${DATE}
cd prodDir${DATE}

#dump file
/opt/postgres/9.0/bin/pg_dump -i -h localhost -p 5432 -U postgres -F c -b -w -v -f
"dbprod${DATE}.backup" dbprod

#SQL file
/opt/postgres/9.0/bin/pg_dump -i -h localhost -p 5432 -U postgres --format plain --verbose  -f
"dbprod${DATE}.sql" dbprod
```

https://riptutorial.com/zh-TW/postgresql/topic/7974/

21: PL / pgSQL

PL / pgSQLPostgreSQL。SQL。。

PostgreSQLPL / PythonPL / PerlPLV8PL / pgSQLPostgreSQLSQL。PL / SQLOraclePL / SQL OraclePL / pgSQLPL / SQL。

PL / pgSQLPL / pgSQLPostgreSQL。PL / pgSQLPL。

PL / pgSQL

- https //www.postgresql.org/docs/current/static/plpgsql.html
- w3resource.com http //www.w3resource.com/PostgreSQL/pl-pgsql-tutorial.php
- postgres.cz http //postgres.cz/wiki/PL/pgSQL_en
- PostgreSQL2 https //www.packtpub.com/big-data-and-business-intelligence/postgresql-server-programming-second-edition
- PostgreSQL https //www.packtpub.com/big-data-and-business-intelligence/postgresql-developers-guide

Examples

PL / pgSQL

PL / pgSQL

```
CREATE FUNCTION active_subscribers() RETURNS bigint AS $$
DECLARE
    -- variable for the following BEGIN ... END block
    subscribers integer;
BEGIN
    -- SELECT must always be used with INTO
    SELECT COUNT(user_id) INTO subscribers FROM users WHERE subscribed;
    -- function result
    RETURN subscribers;
EXCEPTION
    -- return NULL if table "users" does not exist
    WHEN undefined_table
    THEN RETURN NULL;
END;
$$ LANGUAGE plpgsql;
```

SQL。

```
select active_subscribers();
```

PL / pgSQL

```
CREATE [OR REPLACE] FUNCTION functionName (someParameter 'parameterType')
```

```
RETURNS 'DATATYPE'
AS $_block_name_$
DECLARE
    --declare something
BEGIN
    --do something
    --return something
END;
$_block_name_$
LANGUAGE plpgsql;
```

PL / pgSQL

- `Datatype Datatype`
- `Table(column_name column_type, ...)`
- `Setof 'Datatype' or 'table_column'`

'P2222'

```
create or replace function s164() returns void as
$$
begin
raise exception using message = 'S 164', detail = 'D 164', hint = 'H 164', errcode = 'P2222';
end;
$$ language plpgsql
;
```

errm

```
create or replace function s165() returns void as
$$
begin
raise exception '%','nothing specified';
end;
$$ language plpgsql
;
```

```
t=# do
$$
declare
 _t text;
begin
  perform s165();
  exception when SQLSTATE 'P0001' then raise info '%','state P0001 caught: '||SQLERRM;
  perform s164();

end;
$$
;
INFO:  state P0001 caught: nothing specified
ERROR:  S 164
DETAIL:  D 164
HINT:  H 164
CONTEXT:  SQL statement "SELECT s164()"
PL/pgSQL function inline_code_block line 7 at PERFORM
```

P0001P2222。

http //stackoverflow.com/a/2700312/5315974

PL / pgSQL https://riptutorial.com/zh-TW/postgresql/topic/5299/pl---pgsql

22:

Examples

```
create table wf_example(i int, t text,ts timestamptz,b boolean);
insert into wf_example select 1,'a','1970.01.01',true;
insert into wf_example select 1,'a','1970.01.01',false;
insert into wf_example select 1,'b','1970.01.01',false;
insert into wf_example select 2,'b','1970.01.01',false;
insert into wf_example select 3,'b','1970.01.01',false;
insert into wf_example select 4,'b','1970.02.01',false;
insert into wf_example select 5,'b','1970.03.01',false;
insert into wf_example select 2,'c','1970.03.01',true;
```

```
select *
  , dense_rank() over (order by i) dist_by_i
  , lag(t) over () prev_t
  , nth_value(i, 6) over () nth
  , count(true) over (partition by i) num_by_i
  , count(true) over () num_all
  , ntile(3) over() ntile
from wf_example
;
```

```
 i | t |           ts           | b | dist_by_i | prev_t | nth | num_by_i | num_all | ntile
---+---+------------------------+---+-----------+--------+-----+----------+---------+-------
 1 | a | 1970-01-01 00:00:00+01 | f |         1 |        |   3 |        3 |       8 |     1
 1 | a | 1970-01-01 00:00:00+01 | t |         1 | a      |   3 |        3 |       8 |     1
 1 | b | 1970-01-01 00:00:00+01 | f |         1 | a      |   3 |        3 |       8 |     1
 2 | c | 1970-03-01 00:00:00+01 | t |         2 | b      |   3 |        2 |       8 |     2
 2 | b | 1970-01-01 00:00:00+01 | f |         2 | c      |   3 |        2 |       8 |     2
 3 | b | 1970-01-01 00:00:00+01 | f |         3 | b      |   3 |        1 |       8 |     2
 4 | b | 1970-02-01 00:00:00+01 | f |         4 | b      |   3 |        1 |       8 |     3
 5 | b | 1970-03-01 00:00:00+01 | f |         5 | b      |   3 |        1 |       8 |     3
(8 rows)
```

dist_by_i `dense_rank() over (order by i)`row_number。 i `count(DISTINCT i)` wold。 。

prev_t `lag(t) over ()`t。 。

nth `nth_value(i, 6) over ()`i

num_by_i `count(true) over (partition by i)`i

num_all `count(true) over ()`

ntile `ntile(3) over()`3

vs dense_rank vs rank vs row_number

。

wf_example

```
select i
  , dense_rank() over (order by i)
  , row_number() over ()
  , rank() over (order by i)
from wf_example
```

```
 i | dense_rank | row_number | rank
---+------------+------------+------
 1 |          1 |          1 |    1
 1 |          1 |          2 |    1
 1 |          1 |          3 |    1
 2 |          2 |          4 |    4
 2 |          2 |          5 |    4
 3 |          3 |          6 |    6
 4 |          4 |          7 |    7
 5 |          5 |          8 |    8
```

- *dense_rank***iVALUES** ◦ `i=1`dense_ranknexti`dense_rank`*1* - FIRST◦ `i=2` `dense_rank`2◦ 6`i=3` 3.*i* ◦ `dense_rank`*i*◦
- *row_number***ROWS** ◦
- *rank*`dense_rank`**iROW NUMBER** ◦ 44`i=2` ◦ 6`i=3`◦

https://riptutorial.com/zh-TW/postgresql/topic/7421/

23:

Examples

minmaxavg

。

individuals

17
14
20

```
SELECT min(age), max(age), avg(age)
FROM individuals;
```

14	20	17

string_agg

string_agg()。

individuals

15	
14	
20	

SELECT ... GROUP BY/

```
SELECT string_agg(name, ', ') AS names, country
FROM individuals
GROUP BY country;
```

GROUP BYstring_agg()。

PostgreSQL

regr_slopeYXXY

regr_slopeYX。Java。postgres。

。

```
    ^
    |
s   |  Legend:
i   |  *  - data point
z   |  -- - trend
e   |
(   |
b   |                 *
y   |                     --
t   |                   --
e   |              * --    *
s   |           --
)   |       *--      *
    |     --    *
    |  -- *
   ---------------------------------------->
                     time
```

```
CREATE TABLE heap_histogram (
    -- when the heap histogram was taken
    histwhen timestamp without time zone NOT NULL,
    -- the object type bytes are referring to
    -- ex: java.util.String
    class character varying NOT NULL,
    -- the size in bytes used by the above class
    bytes integer NOT NULL
);
```

。 HAVING> 0。。

```
-- epoch returns seconds
SELECT class, REGR_SLOPE(bytes,extract(epoch from histwhen)) as slope
    FROM public.heap_histogram
    GROUP BY class
    HAVING REGR_SLOPE(bytes,extract(epoch from histwhen)) > 0
    ORDER BY slope DESC ;
```

```
         class             |        slope
---------------------------+---------------------
 java.util.ArrayList       |     71.7993806279174
 java.util.HashMap         |     49.0324576155785
 java.lang.String          |     31.7770770326123
 joe.schmoe.BusinessObject |     23.2036817108056
 java.lang.ThreadLocal     |     20.9013528767851
```

java.util.ArrayList71.799。

https://riptutorial.com/zh-TW/postgresql/topic/4803/

24:

Examples

```
CREATE TABLE person (
    person_id BIGINT NOT NULL,
    last_name VARCHAR(255) NOT NULL,
    first_name VARCHAR(255),
    address VARCHAR(255),
    city VARCHAR(255),
    PRIMARY KEY (person_id)
);
```

`PRIMARY KEY`

```
CREATE TABLE person (
    person_id BIGINT NOT NULL PRIMARY KEY,
    last_name VARCHAR(255) NOT NULL,
    first_name VARCHAR(255),
    address VARCHAR(255),
    city VARCHAR(255)
);
```

◦ `Person "Person"` PostgreSQL◦

psql◦

```
\d tablename
```

```
\d+ tablename
```

psql\ dd◦

select

person

```
CREATE TABLE person (
    person_id BIGINT NOT NULL,
    last_name VARCHAR(255) NOT NULL,
    first_name VARCHAR(255),
    age INT NOT NULL,
    PRIMARY KEY (person_id)
);
```

30

```
CREATE TABLE people_over_30 AS SELECT * FROM person WHERE age > 30;
```

◦ write-ahead◦

```
CREATE UNLOGGED TABLE person (
    person_id BIGINT NOT NULL PRIMARY KEY,
    last_name VARCHAR(255) NOT NULL,
    first_name VARCHAR(255),
    address VARCHAR(255),
    city VARCHAR(255)
);
```

◦

Agency◦

```
CREATE TABLE agencies ( -- first create the agency table
  id SERIAL PRIMARY KEY,
  name TEXT NOT NULL
)

CREATE TABLE users (
  id SERIAL PRIMARY KEY,
  agency_id NOT NULL INTEGER REFERENCES agencies(id) DEFERRABLE INITIALLY DEFERRED -- this is
going to references your agency table.
)
```

https://riptutorial.com/zh-TW/postgresql/topic/2430/

25:

- `CREATE ROLE name [ [ WITH ] option [ ... ] ]`
- `CREATE USER name [ [ WITH ] option [ ... ] ]`
- `where option can be: SUPERUSER | NOSUPERUSER | CREATEDB | NOCREATEDB | CREATEROLE | NOCREATEROLE | CREATEUSER | NOCREATEUSER | INHERIT | NOINHERIT | LOGIN | NOLOGIN | CONNECTION LIMIT connlimit | [ENCRYPTED | UNENCRYPTED] PASSWORD 'password' | VALID UNTIL 'timestamp' | IN ROLE role_name [, ...] | IN GROUP role_name [, ...] | ROLE role_name [, ...] | ADMIN role_name [, ...] | USER role_name [, ...] | SYSID uid`

Examples

`postgres ◦ ◦ niceusernamevery-strong-password`

```
CREATE ROLE niceusername with PASSWORD 'very-strong-password' LOGIN;
```

`psql.psql_history`PostgreSQL◦

`\password◦ ◦`

```
CREATE ROLE niceusername with LOGIN;
\password niceusername
```

◦

shell

```
$ createuser -P blogger
Enter password for the new role: ********
Enter it again: ********

$ createdb -O blogger blogger
```

`pg_hba.conf`

```
# TYPE  DATABASE        USER            ADDRESS                 METHOD
host    sameuser        all             localhost               md5
local   sameuser        all                                     md5
```

◦

1. > admin
2. > read_write
3. > read_only

```
--ACCESS DB
REVOKE CONNECT ON DATABASE nova FROM PUBLIC;
```

```
GRANT  CONNECT ON DATABASE nova  TO user;
```

。

```
--ACCESS SCHEMA
REVOKE ALL     ON SCHEMA public FROM PUBLIC;
GRANT  USAGE   ON SCHEMA public  TO user;
```

read_write。

```
--ACCESS TABLES
REVOKE ALL ON ALL TABLES IN SCHEMA public FROM PUBLIC ;
GRANT SELECT                         ON ALL TABLES IN SCHEMA public TO read_only ;
GRANT SELECT, INSERT, UPDATE, DELETE ON ALL TABLES IN SCHEMA public TO read_write ;
GRANT ALL                            ON ALL TABLES IN SCHEMA public TO admin ;

--ACCESS SEQUENCES
REVOKE ALL   ON ALL SEQUENCES IN SCHEMA public FROM PUBLIC;
GRANT SELECT ON ALL SEQUENCES IN SCHEMA public TO read_only; -- allows the use of CURRVAL
GRANT UPDATE ON ALL SEQUENCES IN SCHEMA public TO read_write; -- allows the use of NEXTVAL and
SETVAL
GRANT USAGE  ON ALL SEQUENCES IN SCHEMA public TO read_write; -- allows the use of CURRVAL and
NEXTVAL
GRANT ALL    ON ALL SEQUENCES IN SCHEMA public TO admin;
```

search_path

search_path。

1. 。

```
postgres=# \c postgres user1
You are now connected to database "postgres" as user "user1".
postgres=> show search_path;
  search_path
----------------
 "$user",public
(1 row)
```

2. alter usersearch_pathmy_schema

```
postgres=> \c postgres postgres
You are now connected to database "postgres" as user "postgres".
postgres=# alter user user1 set search_path='my_schema, "$user", public';
ALTER ROLE
```

3. 。

```
postgres=# \c postgres user1
Password for user user1:
You are now connected to database "postgres" as user "user1".
postgres=> show search_path;
 search_path
```

```
-------------
 my_schema, "$user", public
(1 row)
```

```
postgres=# set role user1;
postgres=# show search_path;
 search_path
-------------
 my_schema, "$user", public
(1 row)
```

◦

three users

1. admin > admin
2. > read_write
3. > read_only

◦

```
ALTER DEFAULT PRIVILEGES IN SCHEMA myschema GRANT SELECT                     ON TABLES TO
read_only;
ALTER DEFAULT PRIVILEGES IN SCHEMA myschema GRANT SELECT,INSERT,DELETE,UPDATE ON TABLES TO
read_write;
ALTER DEFAULT PRIVILEGES IN SCHEMA myschema GRANT ALL                        ON TABLES TO
admin;
```

◦

```
ALTER DEFAULT PRIVILEGES FOR ROLE admin GRANT SELECT  ON TABLES TO read_only;
```

```
CREATE USER readonly WITH ENCRYPTED PASSWORD 'yourpassword';
GRANT CONNECT ON DATABASE <database_name> to readonly;

GRANT USAGE ON SCHEMA public to readonly;
GRANT SELECT ON ALL SEQUENCES IN SCHEMA public TO readonly;
GRANT SELECT ON ALL TABLES IN SCHEMA public TO readonly;
```

https://riptutorial.com/zh-TW/postgresql/topic/1572/

26:

function_name。

- https //www.postgresql.org/docs/current/static/sql-createtrigger.html
- https //www.postgresql.org/docs/current/static/plpgsql-trigger.html

Examples

PL / pgSQL

。

```
CREATE OR REPLACE FUNCTION my_simple_trigger_function()
RETURNS trigger AS
$BODY$

BEGIN
    -- TG_TABLE_NAME :name of the table that caused the trigger invocation
IF (TG_TABLE_NAME = 'users') THEN

    --TG_OP : operation the trigger was fired
  IF (TG_OP = 'INSERT') THEN
    --NEW.id is holding the new database row value (in here id is the id column in users
table)
    --NEW will return null for DELETE operations
    INSERT INTO log_table (date_and_time, description) VALUES (now(), 'New user inserted. User
ID: '|| NEW.id);
    RETURN NEW;

  ELSIF (TG_OP = 'DELETE') THEN
    --OLD.id is holding the old database row value (in here id is the id column in users
table)
    --OLD will return null for INSERT operations
    INSERT INTO log_table (date_and_time, description) VALUES (now(), 'User deleted.. User ID:
' || OLD.id);
    RETURN OLD;

  END IF;

RETURN null;
END IF;

END;
$BODY$
LANGUAGE plpgsql VOLATILE
COST 100;
```

users

```
CREATE TRIGGER my_trigger
AFTER INSERT OR DELETE
ON users
FOR EACH ROW
```

```
EXECUTE PROCEDURE my_simple_trigger_function();
```

- BEFOREBEFORE - ;
- AFTER-;
- INSTEAD OF◦

- FOR EACH ROW;
- FOR EACH STATEMENTonde◦

```
CREATE TABLE company (
    id          SERIAL PRIMARY KEY NOT NULL,
    name        TEXT NOT NULL,
    created_at  TIMESTAMP,
    modified_at TIMESTAMP DEFAULT NOW()
)

CREATE TABLE log (
    id          SERIAL PRIMARY KEY NOT NULL,
    table_name  TEXT NOT NULL,
    table_id    TEXT NOT NULL,
    description TEXT NOT NULL,
    created_at  TIMESTAMP DEFAULT NOW()
)
```

1

```
CREATE OR REPLACE FUNCTION add_created_at_function()
  RETURNS trigger AS $BODY$
BEGIN
  NEW.created_at := NOW();
  RETURN NEW;
END $BODY$
LANGUAGE plpgsql;
```

2

```
CREATE TRIGGER add_created_at_trigger
BEFORE INSERT
ON company
FOR EACH ROW
EXECUTE PROCEDURE add_created_at_function();
```

3

```
INSERT INTO company (name) VALUES ('My company');
SELECT * FROM company;
```

1

```
CREATE OR REPLACE FUNCTION add_log_function()
  RETURNS trigger AS $BODY$
DECLARE
  vDescription TEXT;
  vId INT;
  vReturn RECORD;
BEGIN
    vDescription := TG_TABLE_NAME || ' ';
     IF (TG_OP = 'INSERT') THEN
        vId := NEW.id;
        vDescription := vDescription || 'added. Id: ' || vId;
        vReturn := NEW;
    ELSIF (TG_OP = 'UPDATE') THEN
        vId := NEW.id;
        vDescription := vDescription || 'updated. Id: ' || vId;
        vReturn := NEW;
    ELSIF (TG_OP = 'DELETE') THEN
        vId := OLD.id;
        vDescription := vDescription || 'deleted. Id: ' || vId;
        vReturn := OLD;
    END IF;

    RAISE NOTICE 'TRIGER called on % - Log: %', TG_TABLE_NAME, vDescription;

    INSERT INTO log
        (table_name, table_id, description, created_at)
        VALUES
        (TG_TABLE_NAME, vId, vDescription, NOW());

    RETURN vReturn;
END $BODY$
  LANGUAGE plpgsql;
```

2

```
CREATE TRIGGER add_log_trigger
AFTER INSERT OR UPDATE OR DELETE
ON company
FOR EACH ROW
EXECUTE PROCEDURE add_log_function();
```

3

```
INSERT INTO company (name) VALUES ('Company 1');
INSERT INTO company (name) VALUES ('Company 2');
INSERT INTO company (name) VALUES ('Company 3');
UPDATE company SET name='Company new 2' WHERE name='Company 2';
```

```
DELETE FROM company WHERE name='Company 1';
SELECT * FROM log;
```

https://riptutorial.com/zh-TW/postgresql/topic/6957/

27:

Examples

```
WITH RECURSIVE t(n) AS (
    VALUES (1)
  UNION ALL
    SELECT n+1 FROM t WHERE n < 100
)
SELECT sum(n) FROM t;
```

https://riptutorial.com/zh-TW/postgresql/topic/9025/

28:

Examples

WHERESELECT

```
CREATE TABLE sch_test.user_table
(
  id serial NOT NULL,
  username character varying,
  pass character varying,
  first_name character varying(30),
  last_name character varying(30),
  CONSTRAINT user_table_pkey PRIMARY KEY (id)
)

+----+------------+-----------+----------+------+
| id | first_name | last_name | username | pass |
+----+------------+-----------+----------+------+
| 1  | hello      | world     | hello    | word |
+----+------------+-----------+----------+------+
| 2  | root       | me        | root     | toor |
+----+------------+-----------+----------+------+
```

```
SELECT * FROM schema_name.table_name WHERE <condition>;
```

```
SELECT field1, field2 FROM schema_name.table_name WHERE <condition>;
```

```
-- SELECT every thing where id = 1
SELECT * FROM schema_name.table_name WHERE id = 1;

-- SELECT id where username = ? and pass = ?
SELECT id FROM schema_name.table_name WHERE username = 'root' AND pass = 'toor';

-- SELECT first_name where id not equal 1
SELECT first_name FROM schema_name.table_name WHERE id != 1;
```

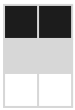
https://riptutorial.com/zh-TW/postgresql/topic/9528/

29:

PostgreSQL http //stackoverflow.com/a/3075248/653378

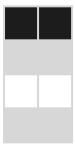
Examples

```
CREATE TABLE users (username text, email text);
CREATE TABLE simple_users () INHERITS (users);
CREATE TABLE users_with_password (password text) INHERITS (users);
```



simple_users

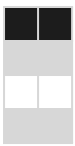
users_with_password



```
CREATE TABLE users (username text, email text);
CREATE TABLE simple_users () INHERITS (users);
```

```
ALTER TABLE simple_users ADD COLUMN password text;
```

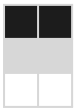
simple_users



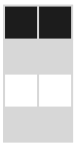
```
ALTER TABLE users ADD COLUMN password text;
```

“simple_users”“password”

```
ALTER TABLE users DROP COLUMN password;
```



simple_users



`simple_users` PostgreSQL。

`password`。

https://riptutorial.com/zh-TW/postgresql/topic/5429/

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