

# The GUCS: A Three-Hour Tour



# What are GUCS?

## # “Grand Unified Configuration Settings”

A large set of global and session database settings which live in:

`src/backend/utils/misc/guc.c`

## # Your main way of configuring and tuning the database.

in addition to compile options, system configuration and schema tuning!

## # Pronounced “gucks”

# 194 Switches and Levers



194 Settings?!?



Don't worry!



# Setting GUCS

8

6

5

# Eight types of GUCS

# Boolean

# Time

# Integer

# Strings

# Float

# ENUMs

# Memory / Disk

# Lists

# Eight types of GUCS

## # Boolean

take TRUE | FALSE or ON | OFF

enable\_seqscan = on

## # Integer

take whole numbers only

max\_connections = 700

# Eight types of GUCS

## # Float

take decimal values

```
random_page_cost = 3.75
```

## # Memory / Disk Size

can take integers

but can also take “computer units”: kB, MB, GB

```
work_mem = 512MB  
shared_buffers = 4096
```

# Eight Types of GUCS

## # Time

take time values (units vary)

units are often omitted

```
authentication_timeout = 30s
```

## # Strings

take unchecked strings

often refers to file locations or program names

```
log_directory = 'pg_log'
```

# Eight Types of GUCS

## # ENUMs

take a string value from a prescribed list

```
log_destination = 'csvlog'
```

## # Lists

take a list of values, either freeform or ENUM

```
search_path = 'main, archive, "$user"'
```

# Six GUCS Contexts

# user

# superuser

# sighup

# postmaster

# backend

# internal

# Six GUCS Contexts

## # user

can be set on per-session basis at runtime

## # superuser

can be set at runtime for the whole server, but only by the superuser

## # sighup

requires a soft restart of the postmaster to change

## # postmaster

can only be changed with a hard restart

# Six GUCS Contexts

## # backend

developer settings which have to be set before session start

## # internal

compile-time settings provided for reference.  
Unalterable.

# 5 Places of set GUCs

1.postgresql.conf file

2.SET

3.pg\_settings

4.ALTER objects

5.command-line switches & PGOPTIONS

# postgresql.conf

# \$PGDATA/postgresql.conf

can be relocated or symlinked

# Primary way to change GUCS

for performance

for logging

for defaults

# postgresql.conf

# just a big list of settings

# defaults are “# commented” out

# if a setting appears multiple times, the last one takes effect

# SET & SHOW

# Access GUCS in a SQL session

SET changes

only applies to user and superuser contexts

best way to change things for only one session

can be embedded in stored procedures

```
SET enable_mergejoin = false;
```

SHOW displays

SHOW ALL lets you see all GUCS

```
SHOW shared_buffers;
```

# pg\_settings

# Tabular representation of GUCS

a “system view”

can be queried

can be updated, which runs a SET on the relevant parameter

needs some clean-up (I'm working on it)

```
SELECT * FROM pg_settings  
WHERE name = 'work_mem';
```

```
UPDATE pg_settings SET setting = '12MB'  
WHERE name = 'work_mem';
```

# ALTER objects

# You can ALTER some objects to change their configuration settings

ROLES (users)

DATABASEs

FUNCTIONs

Changes configuration setting when that object is used (unless overridden by a SET)

```
ALTER ROLE "data entry" SET  
search_path = 'entry, public';
```

# ALTER objects

# Good way to discriminate between applications & users

set search\_path

sometimes for security

primitive resource management

change work\_mem, etc. for specific ROLES, applications or reports

localization

if different users have different desired displays

```
ALTER DATABASE sao_paulo SET timezone =  
'America/SaoPaulo';
```

# ALTER objects

```
CREATE FUNCTION check_password(uname TEXT,  
pass TEXT)  
RETURNS BOOLEAN AS $$  
DECLARE passed BOOLEAN;  
BEGIN  
    SELECT (pwd = $2) INTO passed  
    FROM pwds  
    WHERE username = $1;  
  
    RETURN passed;  
END;  
$$ LANGUAGE plpgsql  
SECURITY DEFINER  
-- Set a secure search_path: trusted  
-- schema(s), then 'pg_temp'.  
SET search_path = admin, pg_temp;
```

# command-line and pgoptions

# Set options when you start PostgreSQL

as command-line switches

using the PGOPTIONS shell variable

# Not generally recommended

hard to administrate or document

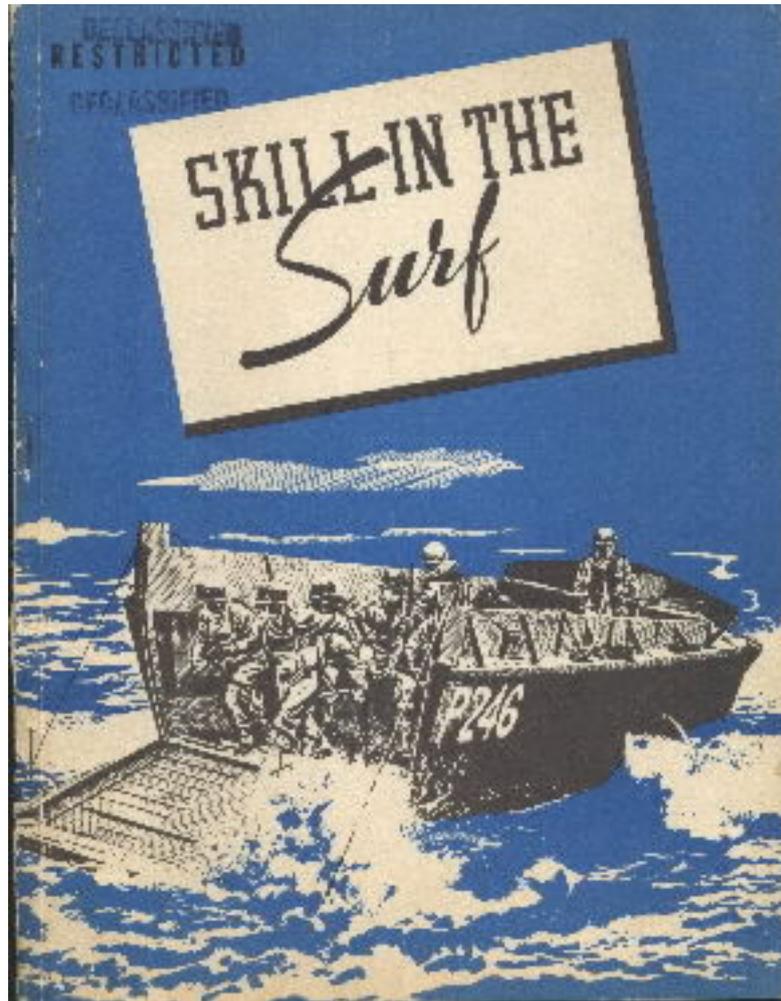
mainly for running automated tests

and for restarting with recovery options

```
postgres -c 'bgwriter_delay = 50ms'
```

```
export PGOPTIONS = '-c zero_damaged_pages = ON'
```

# GUCS Reference



# The 14 Settings

*most users need to adjust*

- (1) listen\_address
- (2) max\_connections
- (3) shared\_buffers
- (4) work\_mem
- (5) maintenance\_  
work\_mem
- (6) max\_fsm\_pages
- (7) synchronous\_commit
- (8) checkpoint\_segments
- (9) wal\_buffers
- (10) autovacuum
- (11) effective\_cache\_size
- (12) default\_statistics\_target
- (13) constraint\_exclusion
- (14) log\_destination & log settings

# Categories (new)

# file locations

# connection settings

# memory management

# maintenance

# WAL & checkpoints

# query tuning

# logging

# statistics

# locks

# locale & formatting

# other settings &  
defaults

# compatibility

# custom GUCS

# developer options

# presets

# GUCS: the Grand Tour



# Finale

- 1) config\_file
- 2) data\_directory
- 3) hba\_file
- 4) ident\_file
- 5) external\_pid\_file
- 6) listen\_addresses
- 7) port
- 8) max\_connections
- 9) superuser\_reserved\_connections
- 10) unix\_socket\_directory
- 11) unix\_socket\_group
- 12) unix\_socket\_permissions
- 13) bonjour\_name
- 14) authentication\_timeout
- 15) tcp\_keepalives\_count
- 16) tcp\_keepalives\_idle
- 17) tcp\_keepalives\_interval
- 18) db\_user\_namespace
- 19) password\_encryption
- 20) ssl
- 21) krb\_caseins\_users
- 22) krb\_realm
- 23) krb\_server\_hostname
- 24) krb\_server\_keyfile
- 25) krb\_srvname
- 26) shared\_buffers
- 27) work\_mem
- 28) temp\_buffers
- 29) max\_prepared\_transactions
- 30) max\_files\_per\_process
- 31) max\_stack\_depth
- 32) shared\_preload\_libraries
- 33) maintenance\_work\_mem
- 34) max\_fsm\_pages
- 35) max\_fsm\_relations
- 36) vacuum\_cost\_delay
- 37) vacuum\_cost\_limit
- 38) vacuum\_cost\_page\_dirty

# Contact

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# Upcoming Events

PGDay OSCON : July 20th, Portland

PGDay LWE : August 5, San Francisco

PGCon Brazil : September 27-28, Campinas

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