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 GUUCS

8
6
5
Eight types of GUUCS

# Boolean
# Integer
# Float
# Memory / Disk
# Time
# Strings
# ENUMs
# 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 GUICS

# 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 GUCCS

# 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 GUCLS 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 GUCLS 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 GUUCS
  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 GUCL 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 GUCLs

    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';
```
# 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';
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 GUICS
# developer options
# presets
GUCS: the Grand Tour
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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