

PostgreSQL 16 Backend Development

Basic Course



New features in DEV1-12 → DEV1-16 Course Materials

The DEV1-16 edition of the course incorporates a number of changes and additions related to new features in PostgreSQL versions 13–16. They are organized by topic in the table below. Additionally, relevant links to documentation and other information resources are provided.

Topic	Change Description	Version	Documentation	Additional Resources
Basic Toolset Overview				
01. Installation and Management, psql	psql: implemented the \dconfig command to display server variables (Mark Dilger, Tom Lane)	15	psql: \dconfig	PostgreSQL 15: Part 5, or Commitfest 2022-03: Access Permissions for Configuration Parameters (in Russian)
	Implementation of JSON format for log output. When jsonlog is enabled in log_destination, logging is performed in JSON format. Each log entry is serialized as a JSON object containing a set of keys and their associated values. JSON format output requires logging_collector to be enabled (Sehrope Sarkuni, Michael Paquier)	15	jsonlog	PostgreSQL 15: Part 4, or Commitfest 2022-01 (in Russian)
Architecture				
05. Logical structure	DROP DATABASE now supports forcibly dropping a database by disconnecting users from it (Pavel Stehule, Amit Kapila)	13	DROP DATABASE (FORCE)	
The Bookstore app				

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07. Data Schema and Interface	psql now allows control over the maximum width of headers in extended mode, managed by the xheader_width parameter. (Alvaro Herrera)	16	psql: xheader_width	PostgreSQL 16: Part 1, or Commitfest 2022-07: psql: \pset xheader_width
SQL				
08. Functions	SQL functions and procedures (routines) can now be defined using the standard-compliant syntax style. When a routine is created, its code is parsed and the parsed result is stored in the system catalog, eliminating the need to reparse it on each invocation (Peter Eisentraut)	14	CREATE FUNCTION CREATE PROCEDURE	PostgreSQL 14: Part 5, or "Spring Freeze" (Commitfest 2021-03) (in Russian)
09. Procedures	Introduction of new polymorphic data types: anycompatible, anycompatiblearray, anycompatiblenonarray, and anycompatiblerange. These types are useful for functions that accept compatible arguments (Pavel Stehule)	13	Pseudotypes	Is there much new in the Baker's Dozen? (in Russian)
	Support for defining output parameters (OUT) in procedures (Peter Eisentraut) Initially, these parameters were included in the routine signature (in version 14), but this was later removed (in version 15)	14 15	CREATE PROCEDURE	PostgreSQL 14: Part 3, or "The November Lull" (Commitfest 2020-11) (in Russian) PostgreSQL 15: Part 1, or Commitfest 2021-07 (in Russian)
	The psql \df command now accepts argument types for functions and procedures to filter the list of overloaded routines (Greg Sabino Mullane, Tom Lane)	14	psql: \df	PostgreSQL 14: Part 5, or "Spring Freeze" (Commitfest 2021-03) (in Russian)

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10. Composite Types	ALTER TABLE now supports a syntax to remove the GENERATED property from a column DROP EXPRESSION (Peter Eisentraut)	13	ALTER TABLE	Is there much new in the Baker's Dozen? (in Russian)
	Support for non-decimal integer literals (Peter Eisentraut) Examples: 0x42F, 0o273, and 0b100101	16	Numeric literals	PostgreSQL 16: Part 4, or Commitfest 2023-01: Input Formats for Integer Literals
PL/pgSQL				
11. Language Overview and Programming Structures	Improved parsing of expressions and assignments in PL/pgSQL (Tom Lane) Evaluation of simple expressions has been optimized	14	Expressions	PostgreSQL 14: Part 4, or "The January Offensive" (2021-01 Commitfest) (in Russian)
	Ability to omit aliases for subqueries in the FROM clause (Dean Rasheed) The SQL standard requires aliases for subqueries in the FROM clause, but this requirement can complicate migration from other database systems where aliases are optional.	16	SELECT	PostgreSQL 16: Part 1, or CommitFest 2022-07
	Support for underscores in integer and numeric literals (Peter Eisentraut, Dean Rasheed) Examples: 1_500_000_000, 3.14159_26535_89793, 0xffff_ffff, and 0b_1001_0001	16	Numeric literals	PostgreSQL 16: Part 4, or Commitfest 2023-01: Input Formats for Integer Literals
12. Query Execution	PL/pgSQL now allows retrieving a function's OID through the GET DIAGNOSTICS command via the new PG_ROUTINE_OID diagnostic item (Pavel Stehule)	16	Command Execution Status	PostgreSQL 16: Part 5 or Commitfest 2023-03: PL/pgSQL: GET DIAGNOSTICS... PG_ROUTINE_OID

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13. Cursors	<p>Changes to how PL/pgSQL bound cursor variables are defined (Tom Lane)</p> <p>Previously, the string value of such a variable had to match the variable name when the cursor was assigned. Now the name is assigned when the cursor is opened (OPEN) and doesn't have to match the variable name</p>	16	Opening a cursor	PostgreSQL 16: Part 4 or Commitfest 2023-01: PL/pgSQL: Cursor Variable Initialization
15. Arrays	<p>Improved parsing of expressions and assignments in PL/pgSQL (Tom Lane)</p> <p>Within a PL/pgSQL block, you can assign values to array elements of composite types and to array slices</p>	14	Assignments	PostgreSQL 14: Part 4, or "The January Offensive" (2021-01 Commitfest) (in Russian)
16. Error Handling	Error localization in the PL/pgSQL block initialization section (Pavel Stehule)	15	PL/pgSQL Structure Error Handling	PostgreSQL 15: Part 3, or Commitfest 2021-11 (in Russian)
17. Triggers	Addition of the MERGE SQL command for synchronizing one table with another (Simon Riggs, Pavan Deolasie, Álvaro Herrera, Amit Langote)	15	MERGE	PostgreSQL 15: Part 5, or Commitfest 2022-03: MERGE (in Russian) The Battle of MERGE (in Russian)
Access Control				
19. Overview	<p>Added the predefined role pg_database_owner, which includes only the current database owner (Noah Misch)</p> <p>It's particularly useful in template databases.</p>	14	Predefined roles	PostgreSQL 14: Part 5, or "Spring Freeze" (Commitfest 2021-03) (in Russian)

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	Revoked the PUBLIC role's privilege to create objects in the public schema, and made pg_database_owner the owner of the public schema (Noah Misch)	15	Schemas and Privileges	PostgreSQL 15: Part 2, or Commitfest 2021-09 (in Russian)
Backup				
20. Logical Backup	pg_dump now exports security labels and ownership information for the public schema (Noah Misch)	15	pg_dump	PostgreSQL 15: Part 1, or Commitfest 2021-07 (in Russian)
	The COPY command now supports the HEADER parameter for text format (Rémi Lapeyre)	15	COPY	PostgreSQL 15: Part 5, or Commitfest 2022-03: COPY: Header in the First Data Row (in Russian)