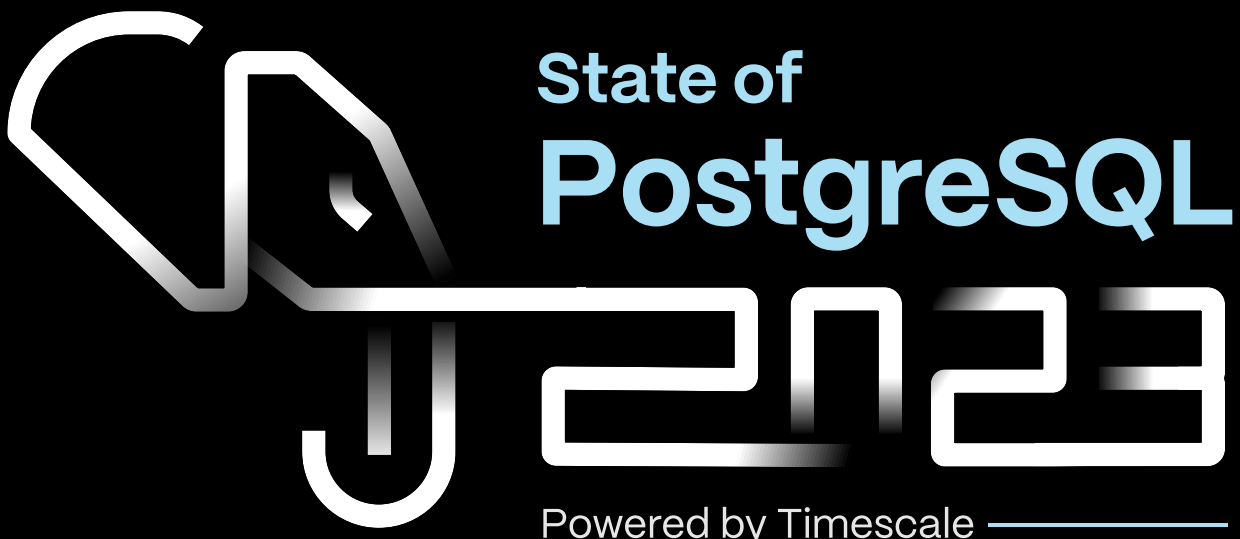

State of
PostgreSQL
2023
Powered by Timescale

Contents

Survey methodology

In 2019, Timescale—the company behind TimescaleDB, the relational database for time series and events—launched the first State of PostgreSQL report, advancing our desire to provide greater insights into the vibrant and growing PostgreSQL user base. Following a one-year hiatus due to the pandemic, we resumed the initiative in 2021 and have been asking questions about the community's experience with PostgreSQL every year since.

The 2023 survey ran for six weeks, between August 1 and September 15. During that time, 888 people provided responses, which we (Timescale) aggregated to generate this report.

We extend our heartfelt gratitude to these supporters who helped us distribute the survey: Aiven, Basedash, Command Prompt, EDB, Grant Fritchey, OnGres, Postgres Weekly, Supabase, Timbira, and Postgres Conference. Their invaluable support and collaboration have amplified our reach, enabling us to connect with more developers across diverse channels. Thank you, supporters, for your dedication to knowledge-sharing and community building.

In addition to sending the survey to past participants and through our supporters, we promoted the survey on social media, email newsletters (our own and third-party), Timescale and PostgreSQL Slack channels, PostgreSQL mailing lists, Reddit, and Hacker News.

The 2023 survey includes many of the same questions to capture how responses evolve over time (we've noted where the question format changed). We have also included new questions about learning resources, third-party tools, production systems, and the use of AI.

Please note that some of the percentages are rounded to the nearest full number for simplicity. We made minor grammatical edits to featured responses (e.g., capitalization, punctuation) but did not change the wording. The raw data includes wholly unedited responses.

This is the fourth State of PostgreSQL report. Check out the second and third report editions.

We look forward to issuing the survey annually and continuing to provide valuable insights for both new and experienced PostgreSQL users.

Summary

In a world where software longevity isn't long at all, the resilience of PostgreSQL, one of the world's leading open-source databases, is nothing short of remarkable. With more than 30 years of active development, PostgreSQL has stood the test of time, establishing a rich ecosystem of connectors and tools, honing a second-to-none developer experience, and maintaining the unmatched reliability it is well-known for.

These and other features have earned the open-source database a loyal following of enthusiasts and contributors, of which Timescale is proud to be a part of. Currently in its fourth edition, the State of PostgreSQL survey is our way of giving back to a community that has always supported us. By sharing the users' experience with PostgreSQL and how it's evolving, we hope to make it more inclusive, innovative, and successful.

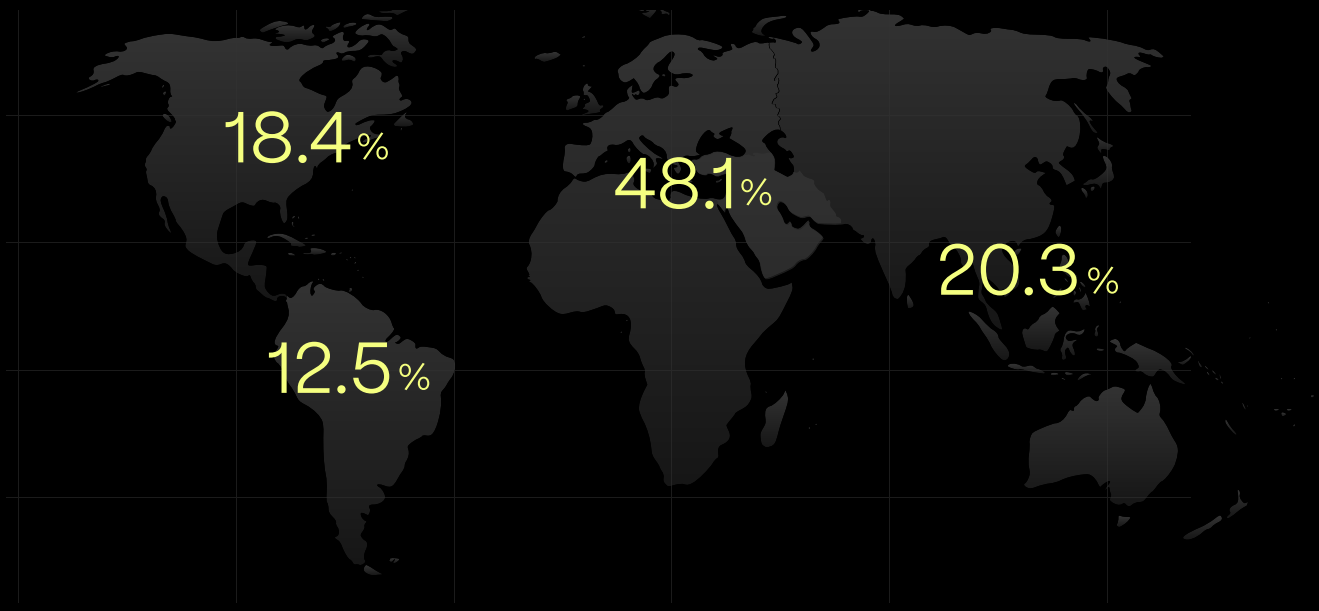
Here are some of the main takeaways from the 2023 survey:

- Most users rate their first experience with PostgreSQL as positive, with an average rating of 3.7 on a scale of 1-5.
- PostgreSQL's usage is on the rise: 51.2% of respondents said that they use the open-source database more or a lot more today than a year ago.
- More than one-third of PostgreSQL users use AI tools in their workflow.

We hope these insights pique your interest in the full report. Keep reading to learn what the State of PostgreSQL is in 2023.

03
PostgreSQL experiences

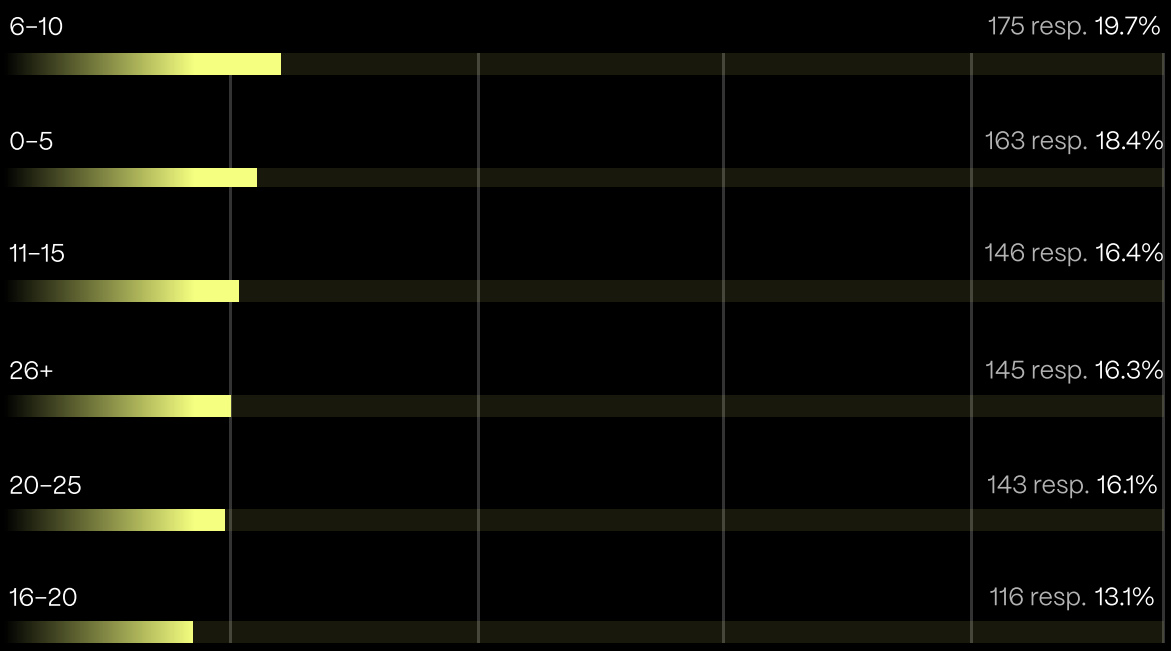
What is your primary geographic location?



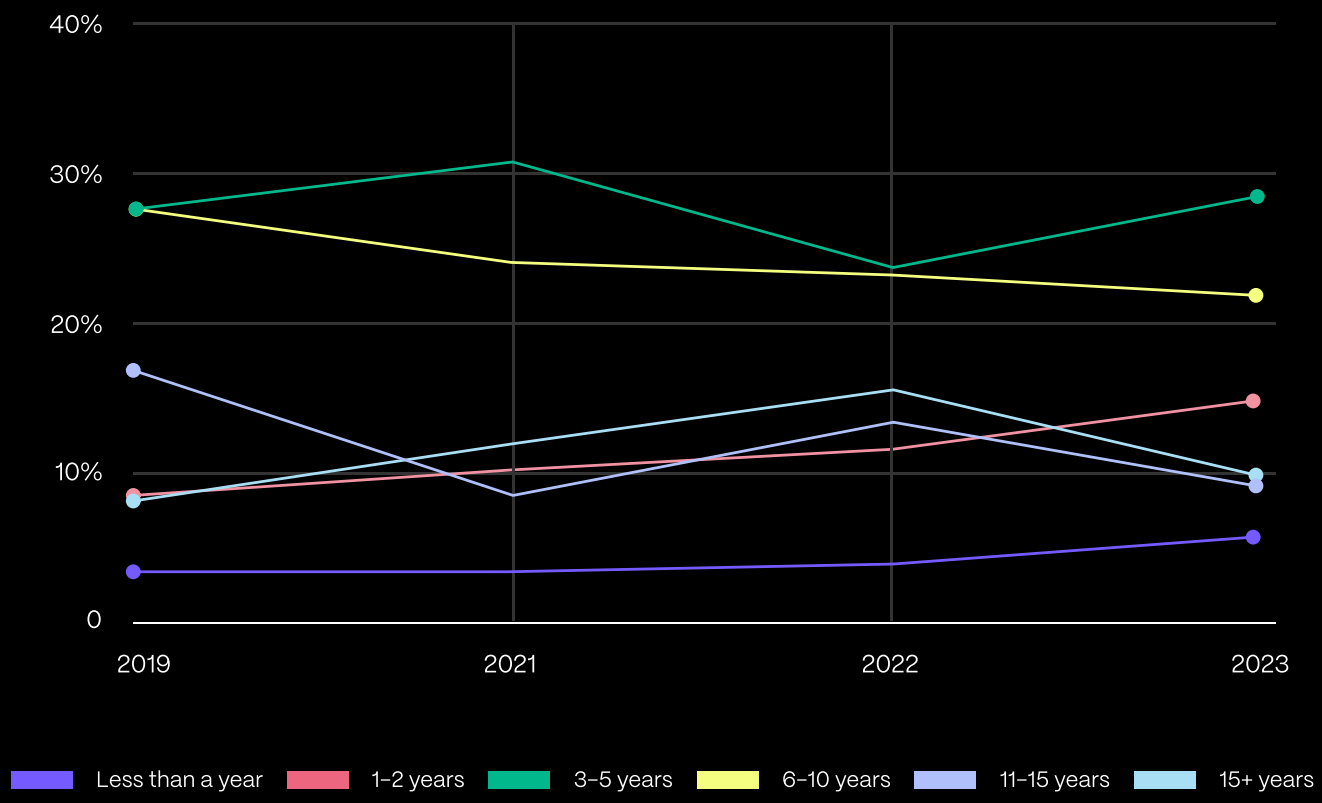
Mirroring the 2021 and 2022 survey results, respondents from EMEA (Europe, Middle East, Africa) account for almost half of all respondents, but this year APAC (Asia-Pacific) has increased to 20.3%, up 9.3 percentage points from last year (11%).

How many years have you been working in tech?

Note: In 2023, we added a new option of 26+ years.



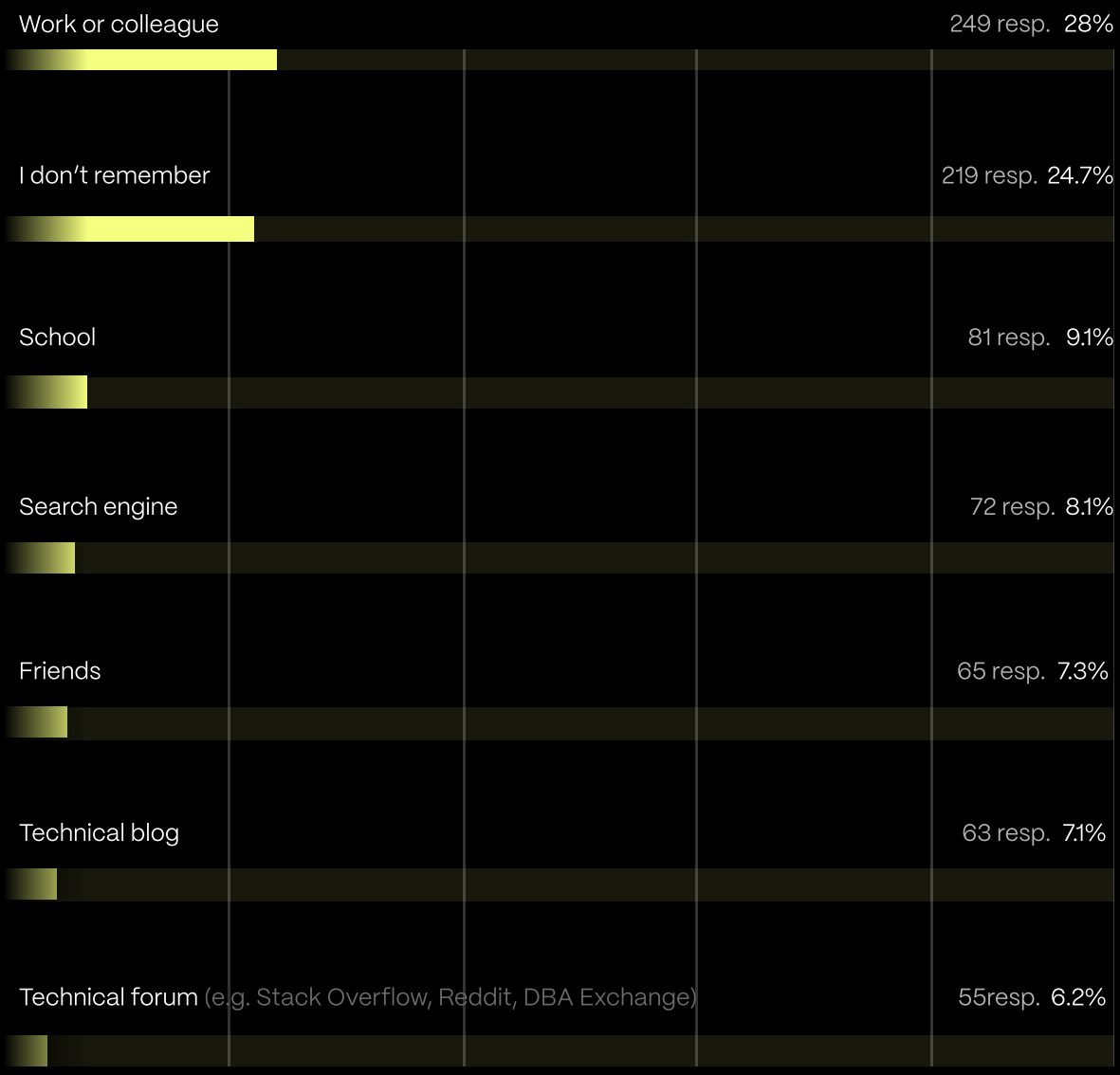
How long have you been using PostgreSQL?



According to DB engines, PostgreSQL's popularity remains steady. Unsurprisingly, the number of new PostgreSQL users experimenting with the database for less than a year has grown from 6.1% in 2021 to 6.4% in 2022 and now 8.1% in 2023.

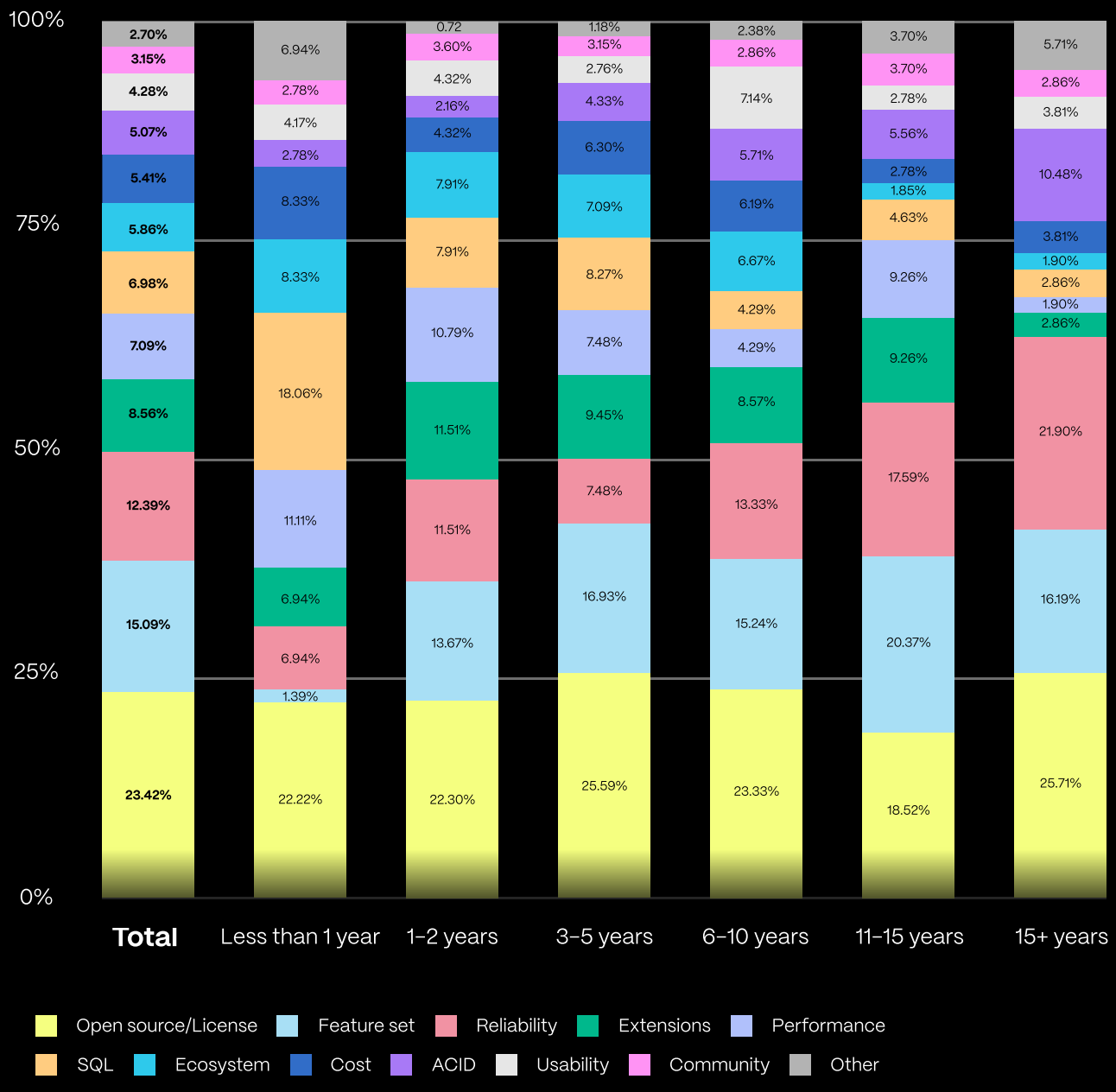
How did you first find out about PostgreSQL?

This year, fewer respondents said they learned about PostgreSQL at work or from a colleague (28%), down 9.4 percentage points from last year (37.4%).



What is the main reason you chose to use PostgreSQL over other options?

This is the second year in a row that the #1 reason people choose PostgreSQL is because it's open source (23.4%), up 4.1 percentage points from last year (19.3%). Feature set is the #2 highest ranked (15.1%), followed by reliability (12.4%), down 4.1 percentage points from last year (16.5%).



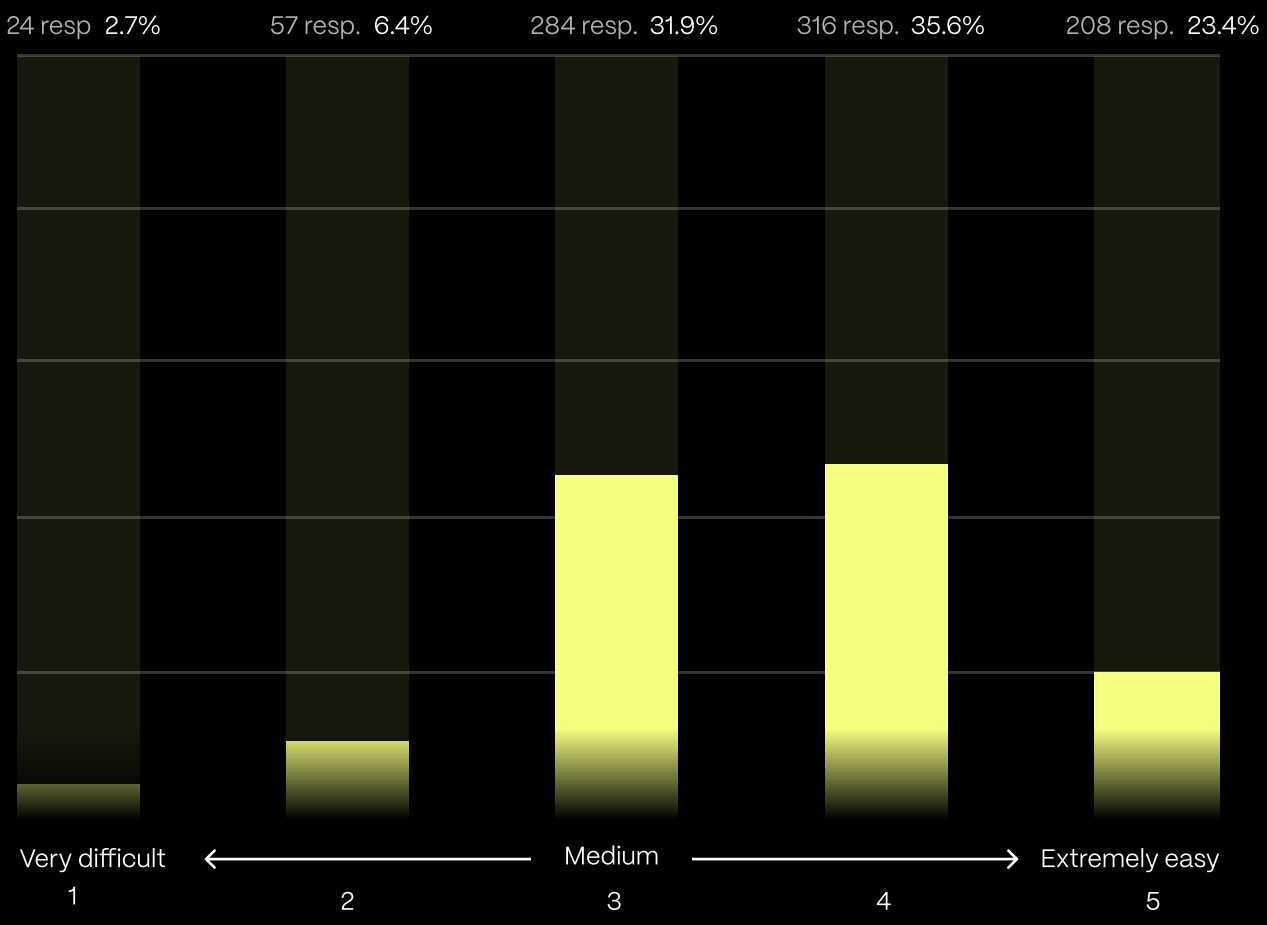
Interestingly, the reason why people choose PostgreSQL changes as the experience grows. Open source is the most important factor for choosing PostgreSQL for those who started using PostgreSQL in the past five years. Reliability and open source are essential for those using PostgreSQL for 6–10 years. And finally, people who have been using PostgreSQL for 11–15 years choose it for its reliability.

Note: In 2023, we added features set and merged open source and license into one option.

How would you rate your first experience with PostgreSQL?

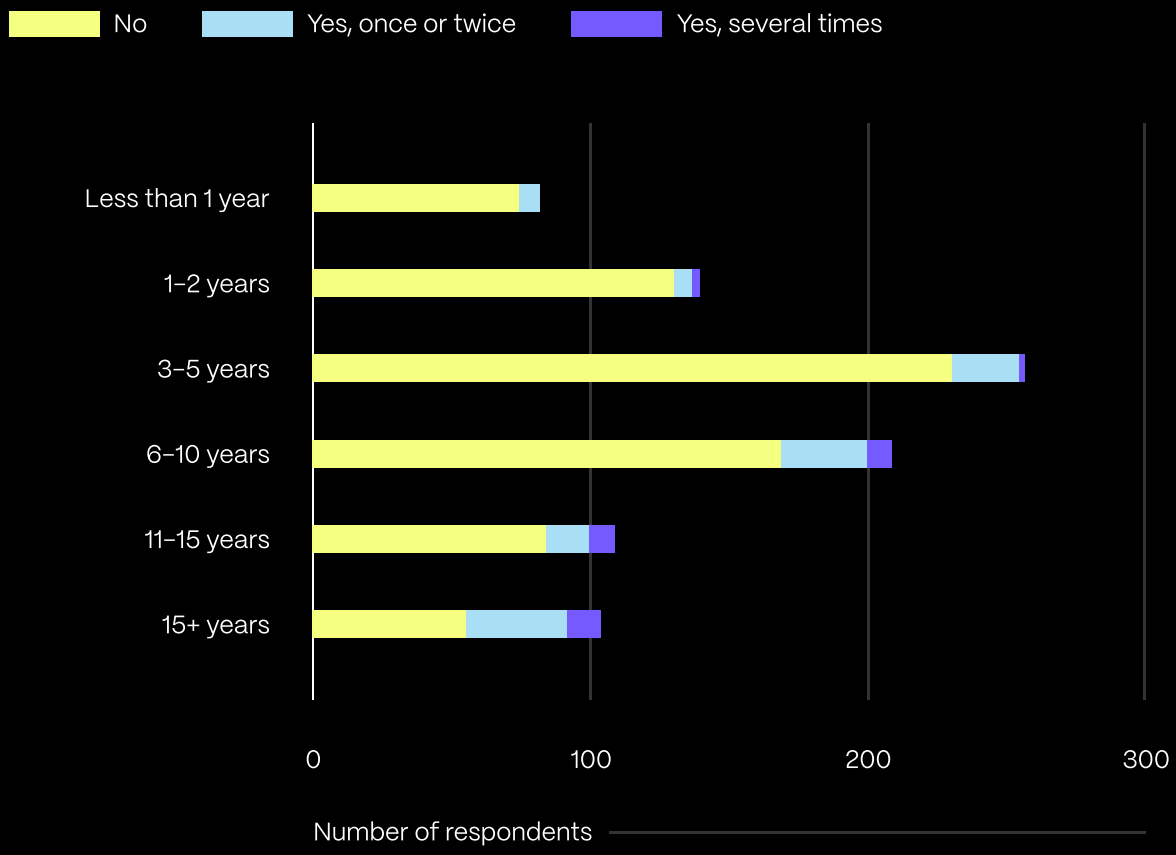
PostgreSQL's reputation as a developer-friendly database remains rock-solid. The resounding majority of respondents (~91 %) rated their first experience with PostgreSQL as positive, ranging from medium to extremely easy. The average experience is rated at 3.7 (on a 1-5 scale).

888 out of 888 people answered this question



Have you ever contributed to PostgreSQL?

Forty-four percent of PostgreSQL users with 15+ years of experience have contributed to PostgreSQL at least once. In fact, regardless of their experience, users across the board have contributed to the PostgreSQL community.



Note: The graph above combines data points from two questions, "Have you ever contributed to PG?" and "How long have you been using PG?"

A total of 497 respondents shed light on what they like the most about the PostgreSQL community and where they see room for improvement to make it more welcoming for newcomers. Here's what some of them had to say:

> Dedication and willingness to help with questions and also advancing the database itself.

> Commitment to open-source collaboration, innovation, and user support.

> The vast number of blog posts, tutorials, documentation, and examples to help me achieve my development goals using PostgreSQL.

> There is a core of solid professional- level people dedicated to actively participating in the community.

> Technical professionals erring on the side of correctness over speed or cutting corners.

> No fluff, no nonsense, just a bunch of knowledgeable people prepared to help each other.

04

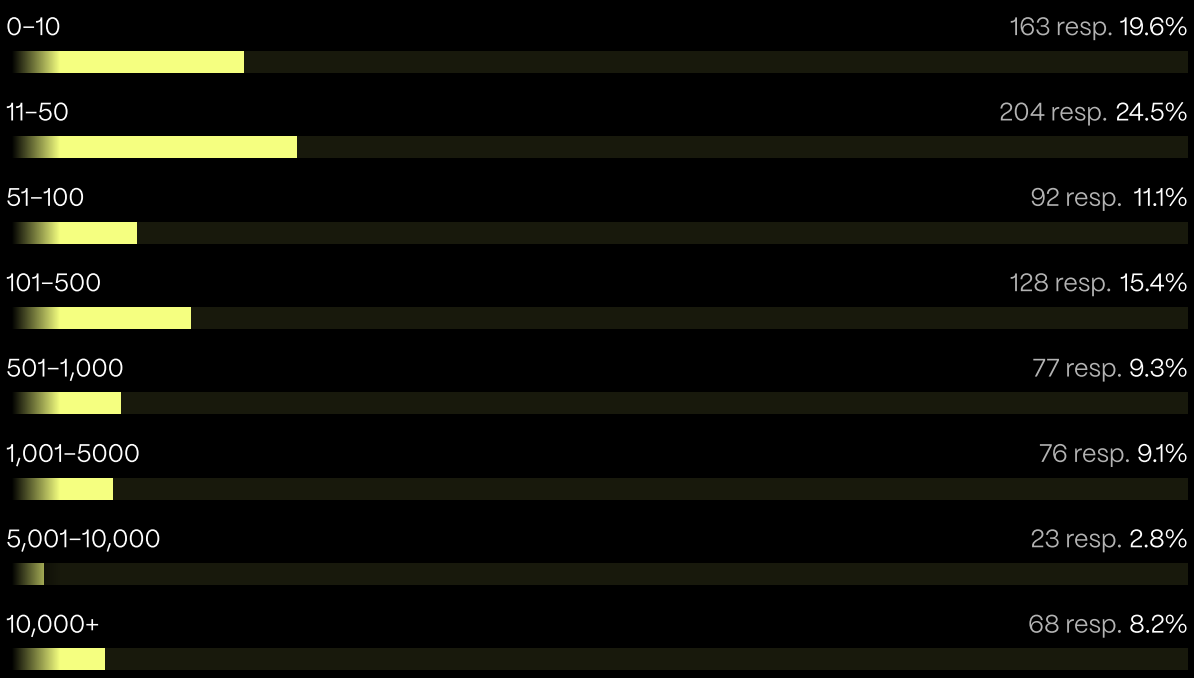
PostgreSQL at work

What is your current profession or job status?

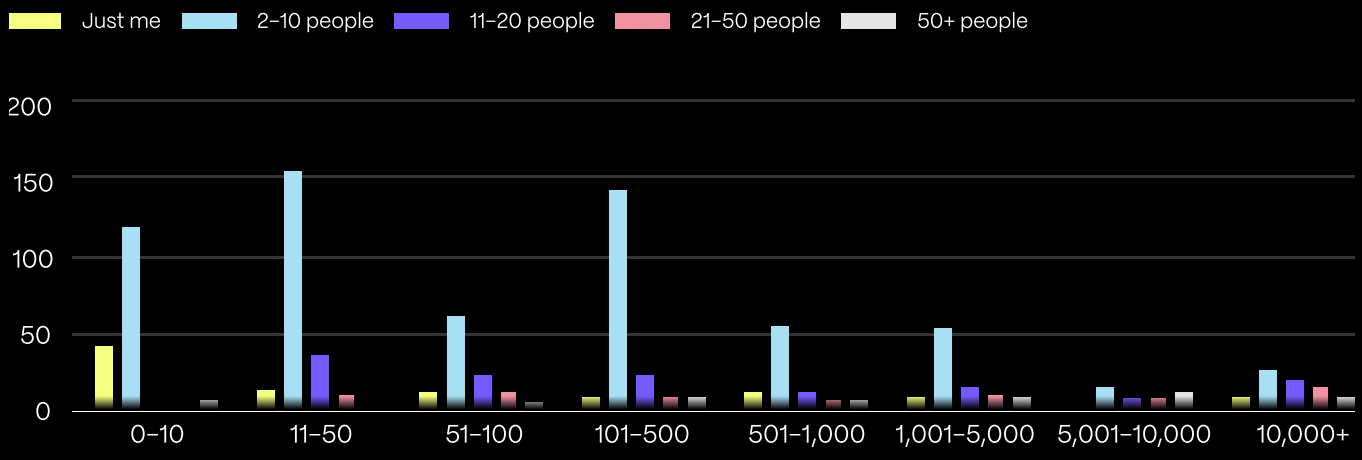
Backend Software Developer/Engineer (28.3%), Fullstack Software Developer/Engineer (17.8%), and Management [C-level, VP, Director, (Co)Founder] (9.7%) were the top three job titles.

Note: In 2023, we added four new options: Backend Software Developer/Engineer, Frontend Software Developer/Engineer, Fullstack Software Developer/Engineer, and Management [C-level, VP, Director, (Co)Founder].

How many total employees are in your organization?



How big is your team?

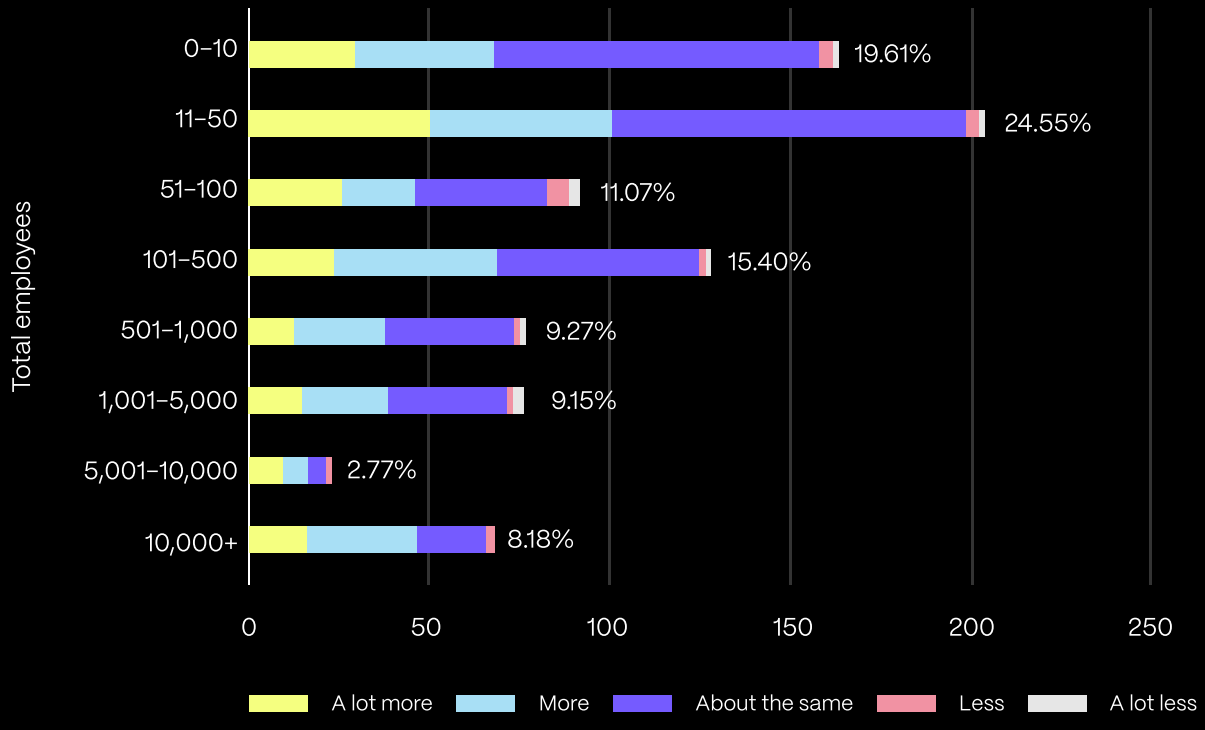


Almost half of respondents (44.1%) work in organizations with 50 or fewer employees.

Regardless of the company's size, respondents reported usually working on a team of 2–10 people.

Compared to one year ago, is PostgreSQL being used more or less in your organization?

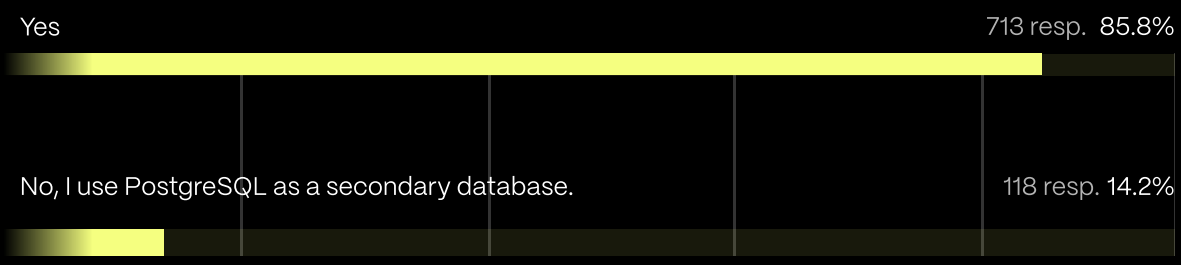
A total of 51.2% of respondents said that PostgreSQL is being used more or a lot more today in their organizations than a year ago. Small and medium businesses (0–50 employees) continue to use PostgreSQL more today than one year ago.



Is PostgreSQL the main database you use for your current projects?

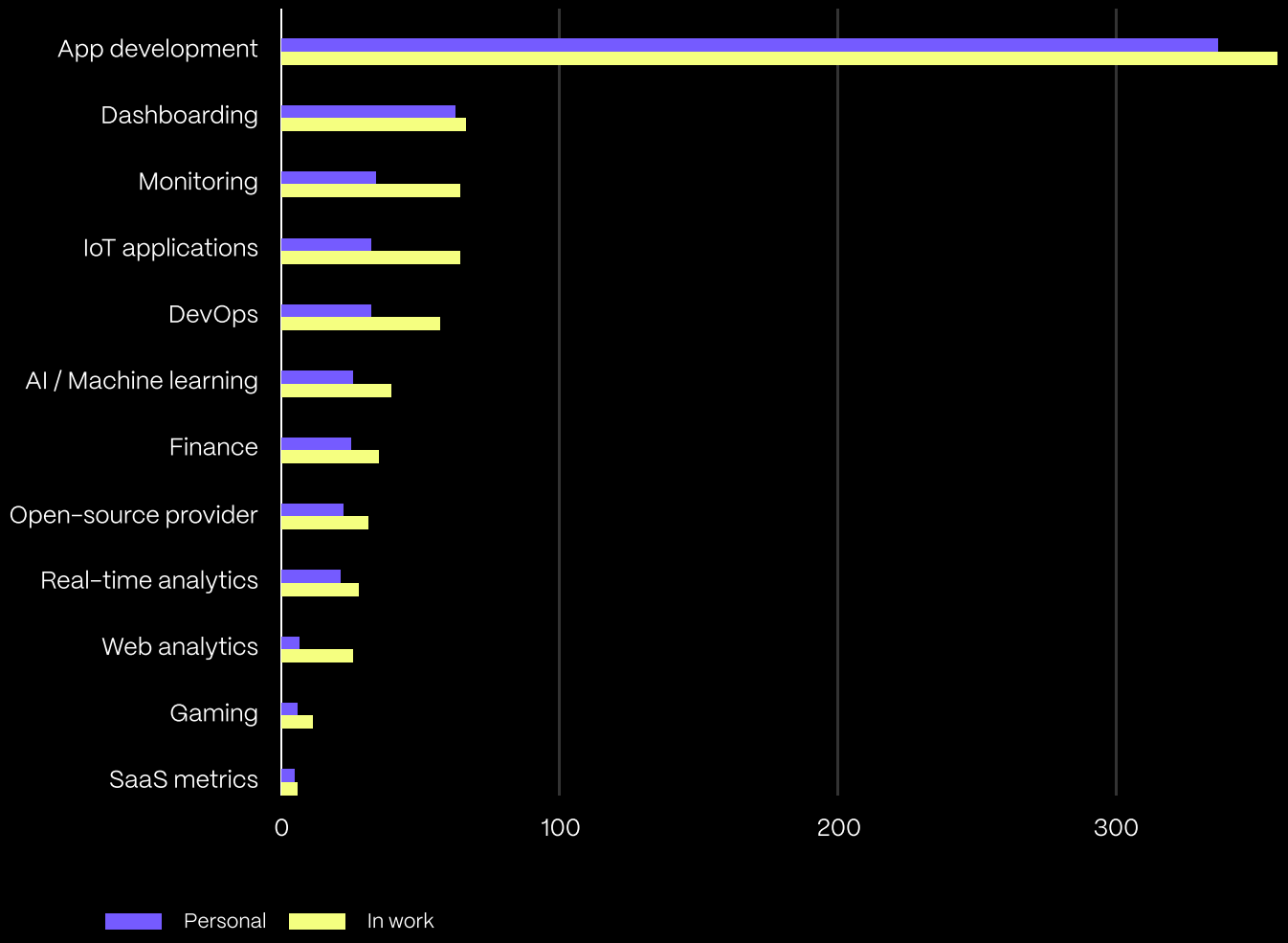
A staggering 85.8% of participants use PostgreSQL as their primary database in production.

831 out of 888 people answered this question



05
Use cases

How would you define your personal and professional use case?



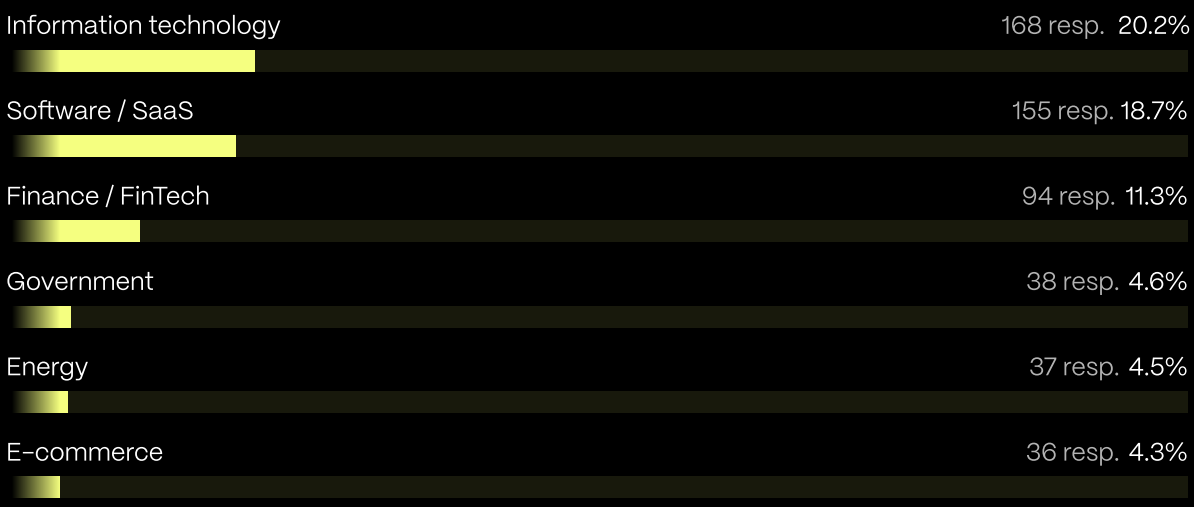
Seventy-three percent of respondents report using PostgreSQL for personal projects, while ninety-four perfecnt use PostgreSQL at work. Forty percent use PostgreSQL for both personal and professional projects.

This year's top five results mirror those of 2022. App development and dashboarding remain in the top two spots for personal and professional use cases. The AI/Machine Learning category is new to the survey this year and seems to be gaining traction in the top six.

Which best describes the industry your organization is in?

In 2023, we added a few new options, Academia & Research, E-commerce, Government, Information Technology, Non-profit organization, and Security.

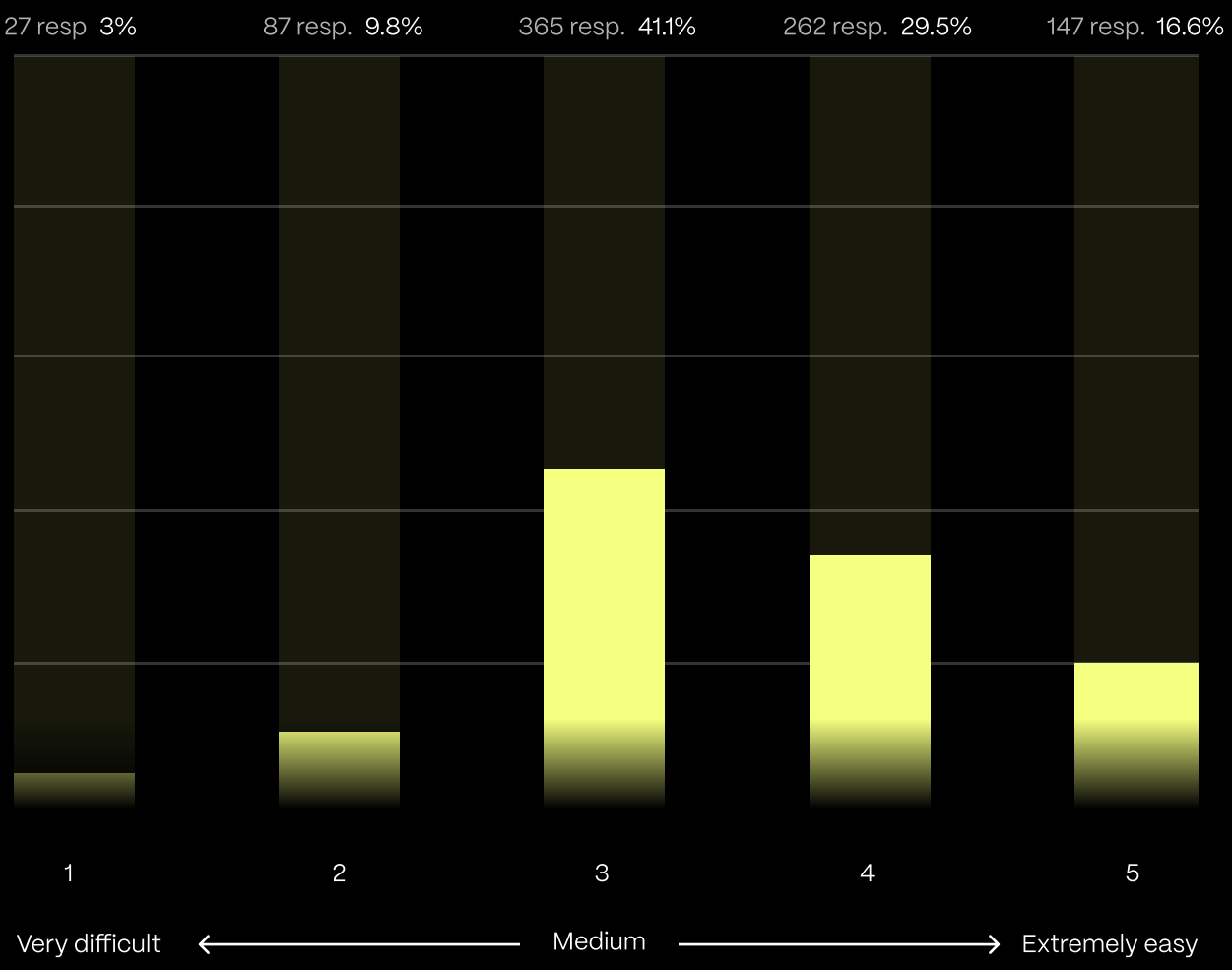
Here is a visual of the top six industries.



06
Community

How would you rate your ability to connect with the PostgreSQL community?

888 out of 888 people answered this question.



In the last three years, connecting with the PostgreSQL community has become increasingly difficult. After looking at previous years, we noticed a slight tilt away from "extremely easy" responses to "medium." This year has seen the most significant increase in medium responses (41.1%) compared to 2022 (36.2%).

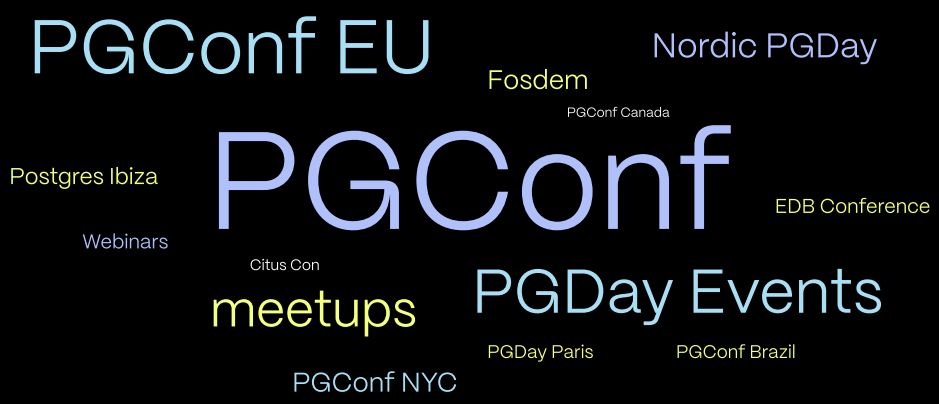
In the past year, what type of PostgreSQL events have you attended?

Mirroring the 2021 and 2022 survey results, two-thirds of respondents said they had not attended any event in the past year, but we are seeing a revival of in-person events. This year, in-person conferences and meetups replaced virtual conferences and webinars as the most popular gatherings among PostgreSQL users.

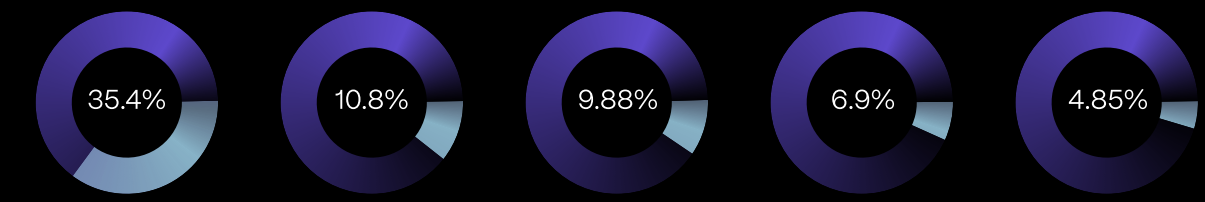
Which PostgreSQL events would you recommend friends and colleagues attend?

A total of 175 respondents shared their top "recommended" events. PGConf Europe, PGCon, and Nordic PGDay are among the top three initiatives that PostgreSQL users would confidently recommend to friends and coworkers.

Check out the upcoming events on the PostgreSQL events page.



Which PostgreSQL information sources do you value so highly that you'd recommend them to friends and colleagues?



Over half of the respondents (536) took the time to share their favorite sources for getting information about PostgreSQL. The PostgreSQL official documentation is the users' go-to source, being recommended by 35.4% of respondents.

Some of the other sources recommended by survey participants were:

The Postgres Weekly newsletter

Stack Overflow's documentation

Mailing lists (hackers, general, postgres admin)

The Planet PostgreSQL blog aggregator

Stack Overflow

Twitter profiles (@postgreSQL and @raisepostgresql)

Blogs (the Citus blog, Crunchy Data, The Art of PostgreSQL, Depesz blog, Cybertec, pganalyze, and the Supabase blog)

Reddit (r/PostgreSQL, r/databases, r/database)

The Timescale Community Forum

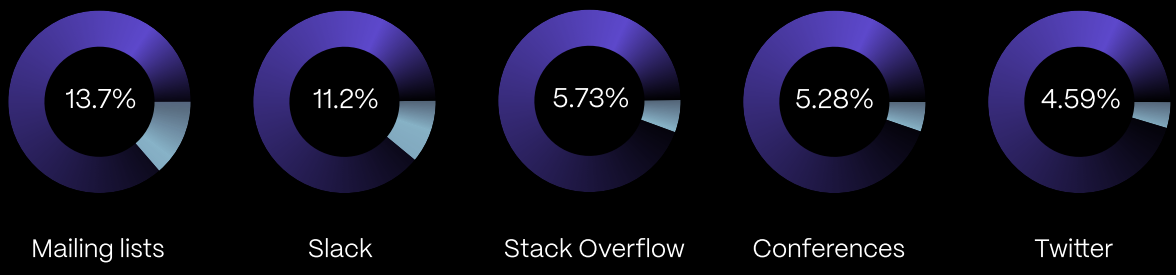
Newsletters (pgMustard, Citus, Timescale newsletter)

YouTube (PostgresTV, Citus Data, Supabase, freeCodeCamp.org)

Podcasts (Postgres.FM)

Websites (postgresqltutorial.com, use-the-index-luke.com, postgrescheatsheet.com)

How do you engage or interact with the PostgreSQL community?



Although 10% of respondents to this question said they do not actively interact with the community, 13% still suggest using the PostgreSQL mailing lists as a way to engage.

Other notable areas that people engage in include Slack (11%), Stack Overflow (5%), conferences (5%), Twitter (4%), and Reddit (4%).

In your experience, what's the best thing about the PostgreSQL community / what do you like the most?

Over 489 respondents shared one or more aspects of the community they like the most. We have included a few responses below.

> I love how easy it is to find solutions to Pgsql bugs, how the community takes time to break it down and back up the answers with documentation.

> There is a lot of knowledge throughout the worldwide community and people are more and more willing to share.

> The people are very friendly, polite, and the expertise/quality of answers is very high in forums, Stack Overflow, mailing lists, you name it.

> One of the best things about the PostgreSQL community is its strong commitment to open-source collaboration and innovation.

> No fluff, no nonsense, just a bunch of knowledgeable people prepared to help each other.

> Dedication and willingness to help with questions and also advancing the database itself.

Where do you see room for improvement in the PostgreSQL community?

Over 278 respondents shared one or more aspects of the community where they see challenges and room for improvement. We have included an assortment of responses below.

> Official documentation is good but could be more friendly, with more examples and visuals.

> They must be more receptive to new ideas and methods of contributing to PostgreSQL.

> The communication and collaboration processes are very dated. The exclusive use of mailing lists is a large barrier to entry.

> We could make more room for newbies.

> Maybe more resources dedicated to fostering communities of PostgreSQL users that are application developers and their application and DevOps needs that would be common across deployment types.

> Allow for the community to contribute examples to the docs, so you see the theory and the practice in one single place.

What would make the PostgreSQL community better and/or more welcoming to newcomers? Why?

Over 301 respondents shed light on where they see room for improvement to make the community more welcoming for newcomers. Here are a few suggestions.

> For new users, we could probably do a better job promoting our community channels in software development forums for different languages.

> Introductory level tutorials, update the community participation page. Make sure everyone is communicating in the same place.

> Easier ways to get started, more features part of core PostgreSQL.

> Easy to follow tutorials, video trainings, sessions, meetups, etc.

> Learning resources targeted at different database needs, for learning sysadmin, to data engineering, to optimizing query performance.

> Encourage more developers to contribute to it, and have sessions to discuss the internals of the postgresql.

07

Ecosystem and tools

What are your top three favorite or most frequently used PostgreSQL extensions?

Respondents shared their favorite PostgreSQL extensions in this freeform question. The 2023 top 10 responses were quite different from the previous year, with several new extensions such as pg_fdw, pg_repack, and pg_cron making the list this time around.

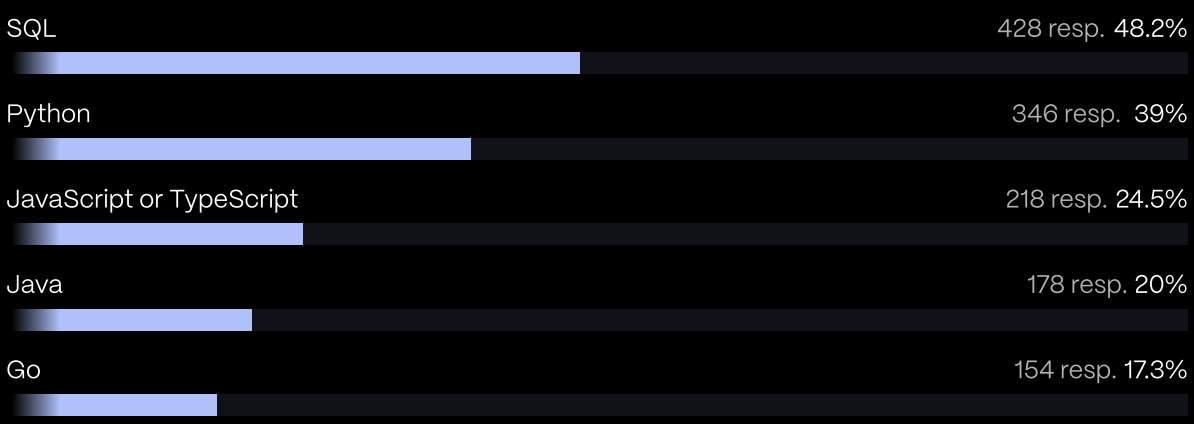
Explore more PostgreSQL extensions

01 postgis
02 timescaledb
03 pg_stat_statements
04 uuid-ossp
05 pgcrypto
06 pg_trgm
07 postgres_fdw
08 pg_repack
09 pg_cron
10 citus

What languages do you most frequently use to access PostgreSQL?

Consistent with responses from the previous two years, SQL, Python, Java, and JavaScript/TypeScript were cited as the most commonly used languages to access PostgreSQL. New to the top five list is Go. PostgreSQL users with 0–5 years of experience are more likely to use JavaScript or TypeScript than Java.

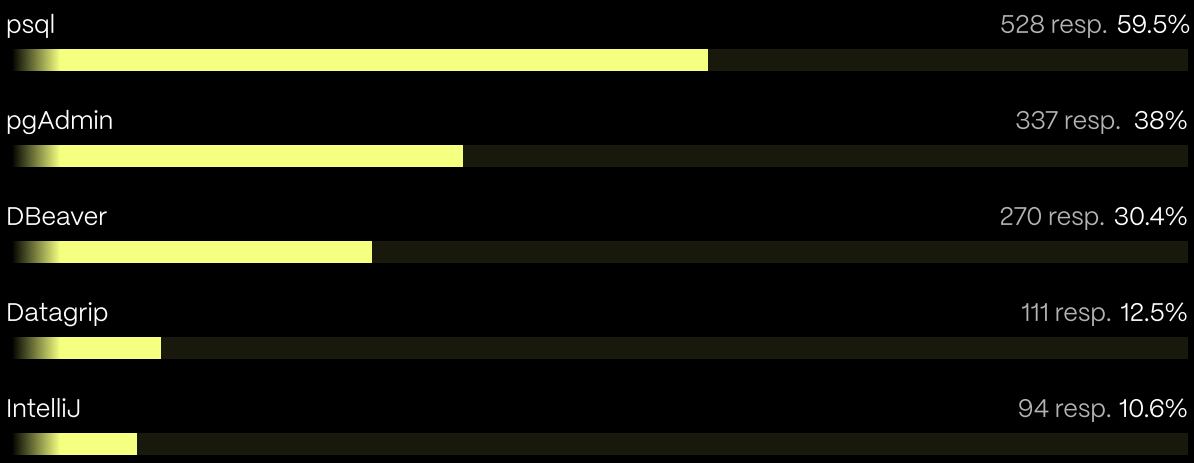
Users with 6+ years of experience are more likely to use shell scripts to access the database than less experienced users.



Which of the following tools do you use most often to connect to PostgreSQL?

Responses to this question are consistent with results from 2022. The highest percentage of respondents said they use psql to connect to the PostgreSQL database. Other top answers include pgAdmin, DBeaver, Datagrip, and IntelliJ.

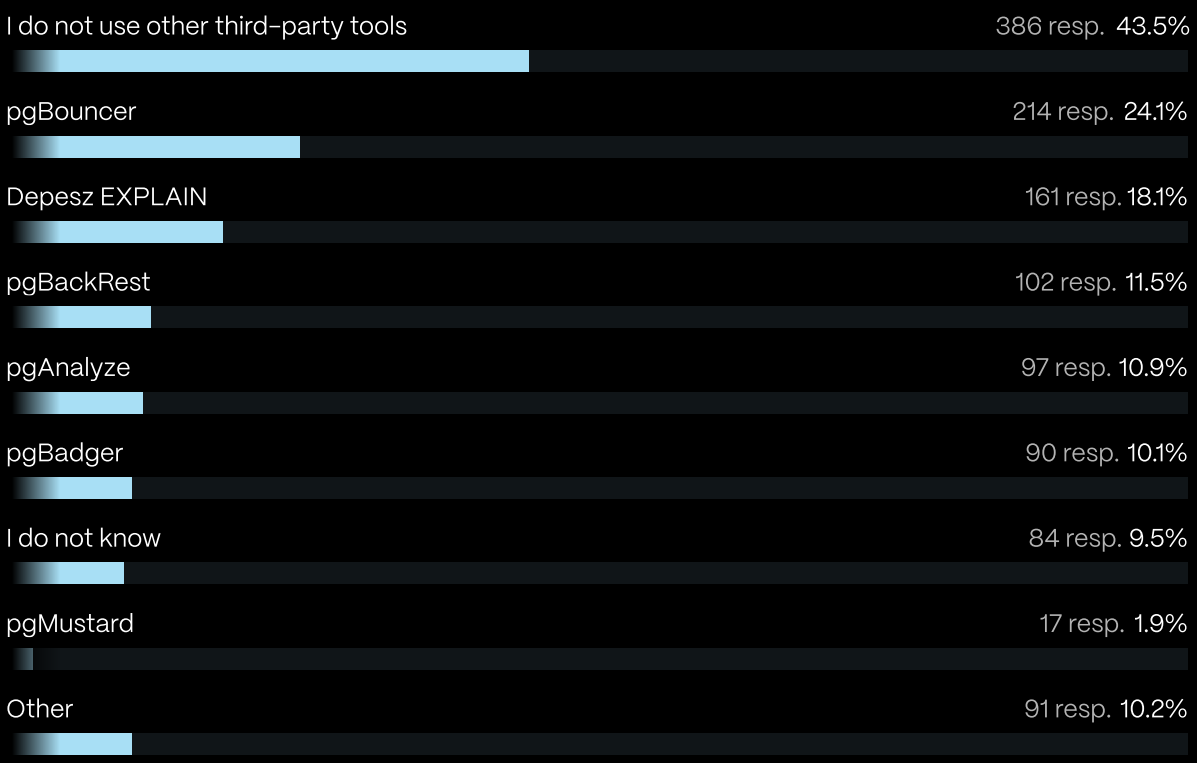
Check out our blog post about the top 13 tools that are not psql



Note: Respondents could select as many options as desired.

What other third-party tools do you regularly use with PostgreSQL to assist with application development?

Almost half of the respondents (43.5%) said they do not use other third-party tools—of those who use one, Depesz EXPLAIN and pgBouncer were the most common responses.

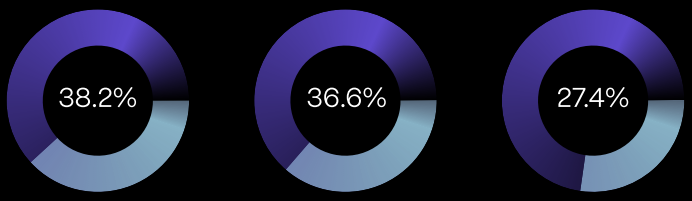


Note: Respondents could select as many options as desired.

Which visualization tools do you use?

While 18% of respondents do not use visualization tools, of those who do, Grafana, pgAdmin, and DBeaver are still the tools they most likely use. These results are consistent with 2021 and 2022 responses.

Get started with Grafana with our guide to Grafana videos



Note: Respondents could select as many options as desired.

What versions of PG do you use at the moment?

This year, we introduced a question to learn which PostgreSQL versions are more popular among the community. The results show that, both for production and for development applications, the most used versions of PostgreSQL were the most recent ones when the survey was conducted: PostgreSQL 15 and PostgreSQL 14. (Take into account that PostgreSQL 16 was not fully launched when we rolled out the survey.)

	In development	In production	I don't use it
PG16 beta	12.6%	1.5%	85.9%
PG15	28.6%	40.7%	30.7%
PG14	14%	47.2%	38.9%
PG13	7.7%	31.4%	60.9%
PG12	5.2%	24.9%	69.9%
PG11	4.6%	18.4%	77%
PG10 or older	3.5%	12.3%	84.2%

What are the top challenges you face when using PostgreSQL?

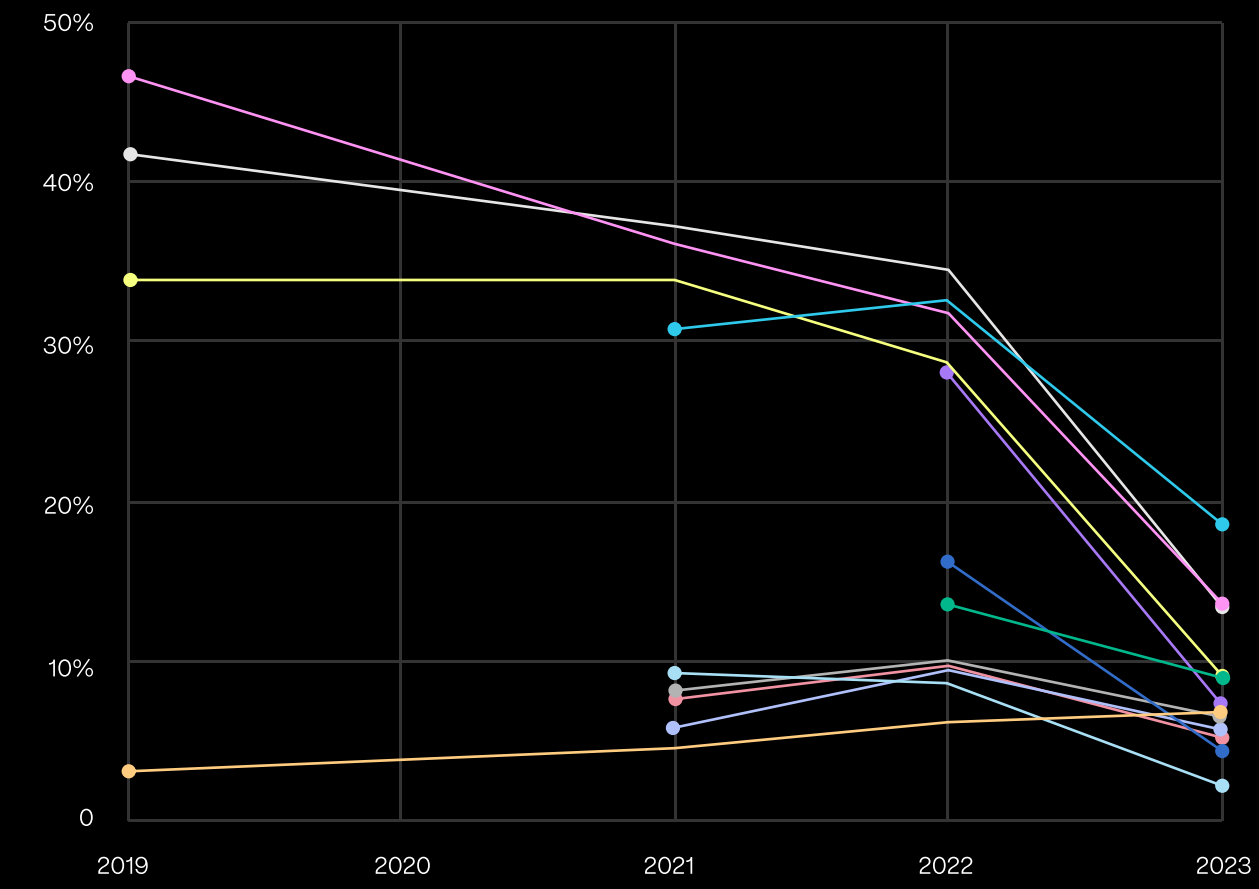
This year, we wanted to learn more about the aspects of PostgreSQL that the community finds challenging. The PostgreSQL community highlights query optimization as a main difficulty, followed by maintenance tasks and fine-tuning PostgreSQL parameters. Database management is also problematic for the respondents, especially connection pooling and backups/restores.

How do you deploy PostgreSQL?

Compared to 2021 and 2022, fewer respondents reported self-managing the PostgreSQL database. It appears that PostgreSQL users are increasingly using DBaaS providers to deploy PostgreSQL.

Note: In 2023, we added AWS Aurora and Supabase to the list of responses.

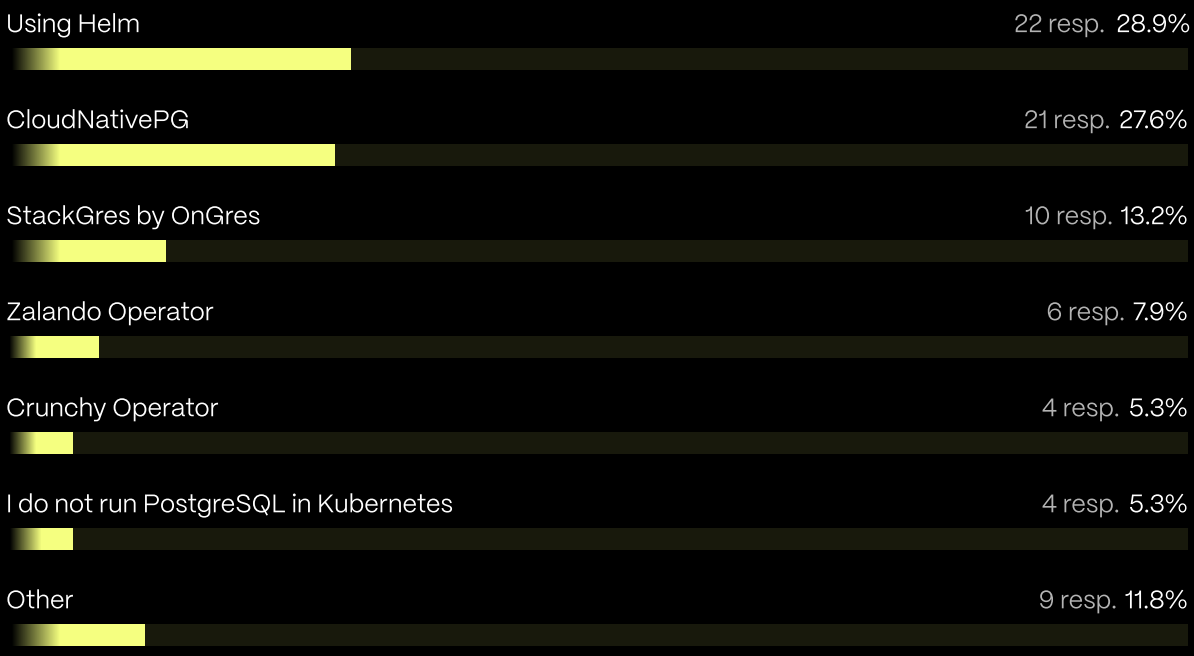
*We expect that responses for Supabase may be slightly skewed, having added Supabase as a response option two weeks into the survey being launched. Respondents could select as many options as desired.



- Self-managed on-site
- Self-managed in a private data center
- Self-managed PostgreSQL on a public cloud (AWS, GCP, Azure, etc.)
- AWS RDS
- Google Cloud PostgreSQL
- Heroku Postgres
- Azure Database for PostgreSQL
- Timescale Cloud or Managed Service for TimescaleDB (MST)
- Virtual Machine
- Container without Kubernetes
- Container with Kubernetes
- Other

How do you run PostgreSQL in Kubernetes?

Of those who deploy PostgreSQL as a Kubernetes container, the percentage of Helm users (28%) went down 16 percentage points from last year (44%). CloudNativePG came in strong this year at 27% compared to 6% last year, knocking Crunchy Operation off its #2 spot.



What automated failover solutions do you use?

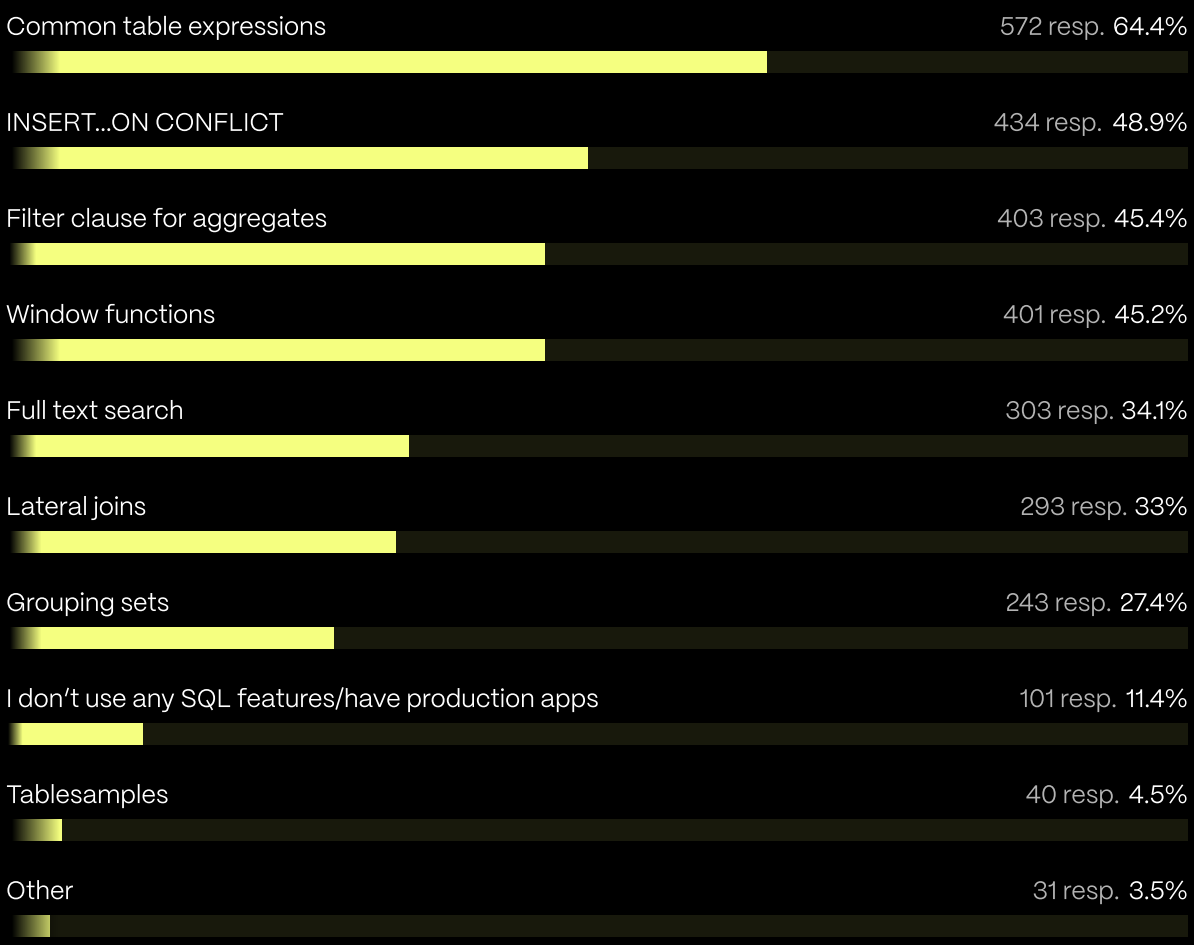
Consistent with 2021 and 2022 survey results, the majority of respondents reported not using automated failover solutions—of those who use one, Patroni is still the most common response.

Note: In 2023, we asked this question only to those who self-manage PostgreSQL databases. Respondents could select as many options as desired.

Which of these SQL features do you use in your production apps?

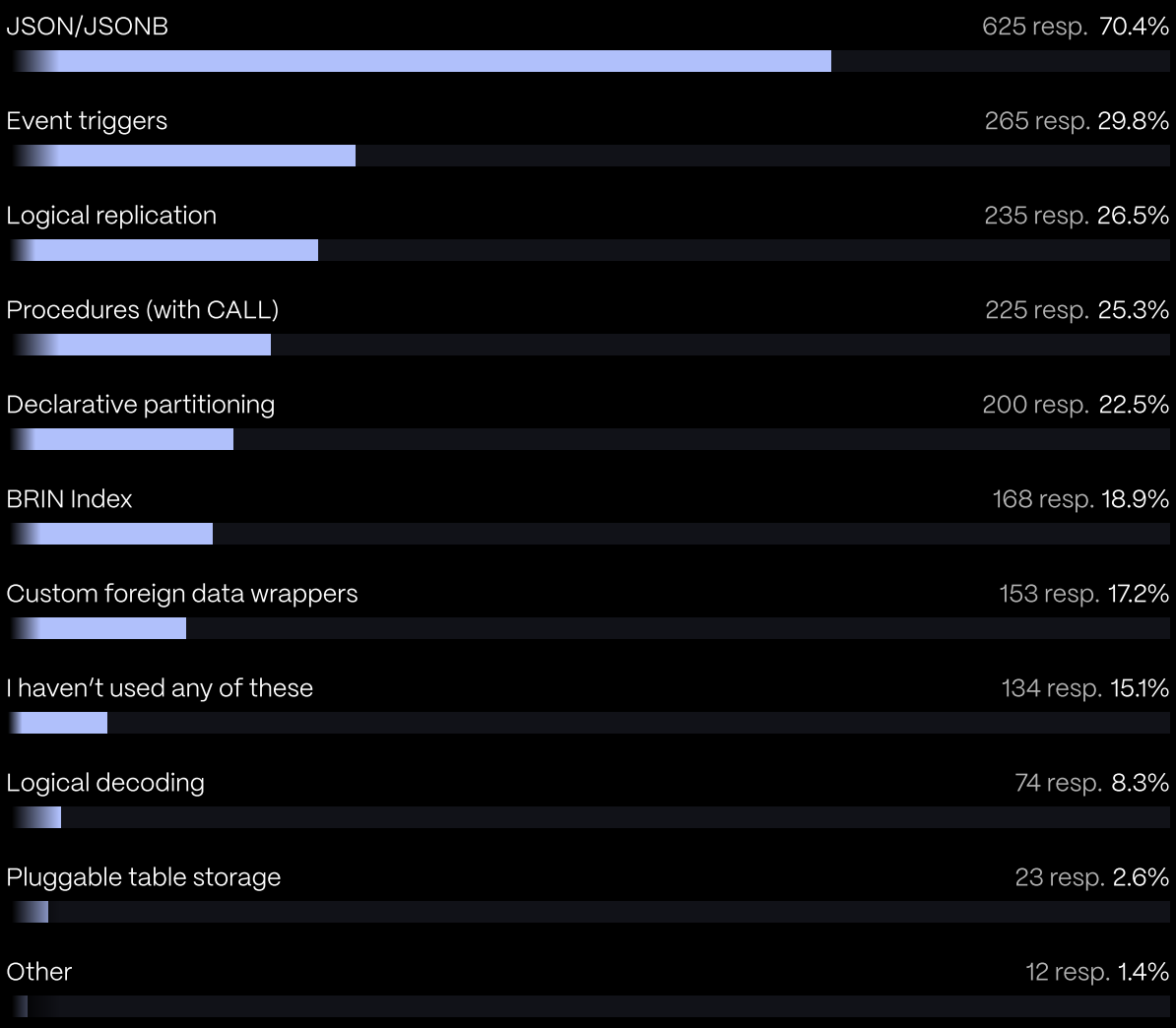
Common Table Expressions, Window functions, INSERT... ON CONFLICT, and the Filter clause for aggregates are used the most often among surveyors.

Note: Respondents could select as many options as desired.



Which of these features have you used to organize and access data for your production apps?

Even with 15% saying they haven't used them, the results are similar to last year's where JSON/JSONB, Event triggers, Procedures (with CALL), and Logical replication hold the top spots in the survey.



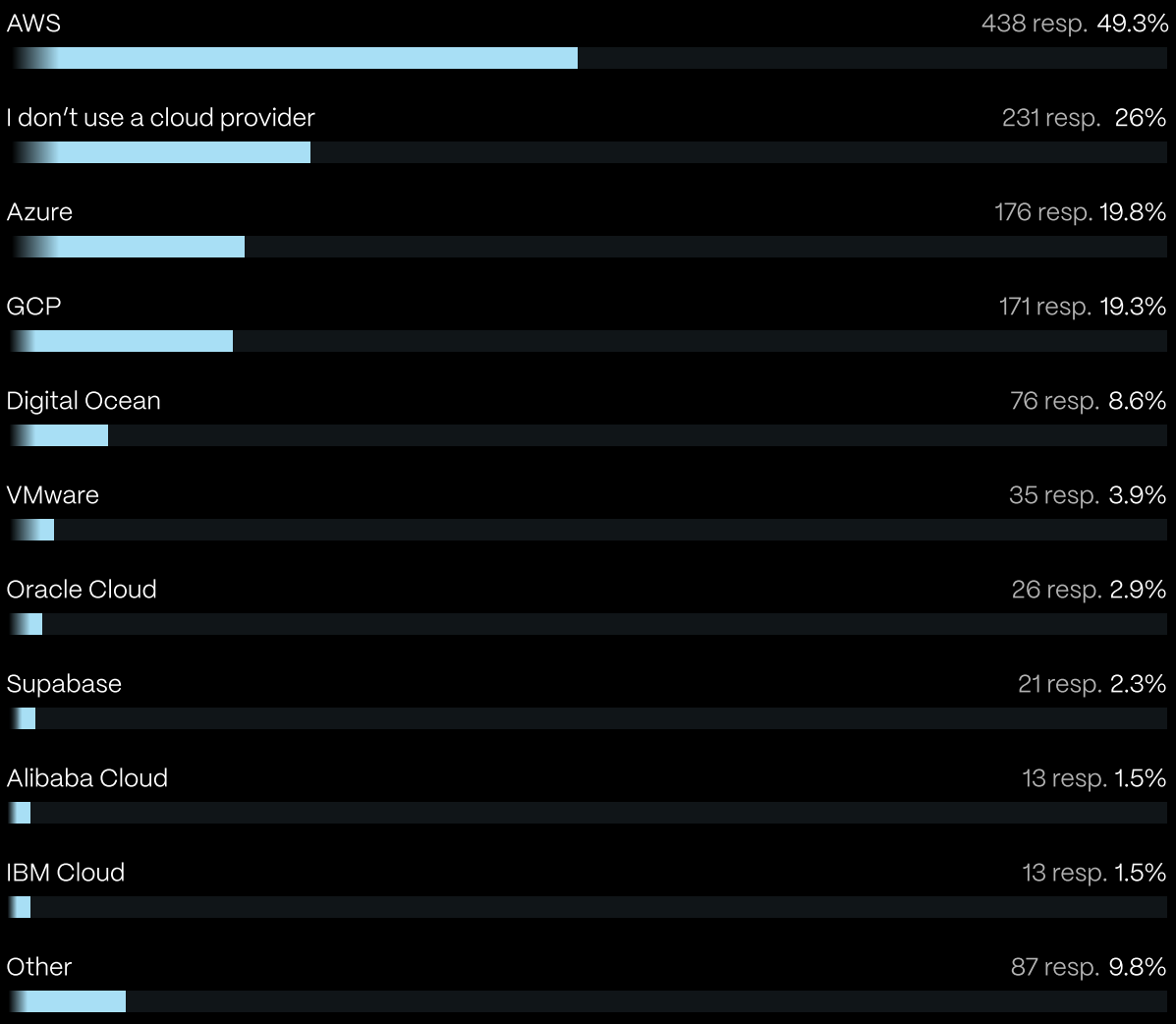
Note: Respondents could select as many options as desired.

What cloud provider(s) do you currently use?

This year's results are in line with the 2021 and 2022 responses, except for Supabase making the list this year.

Note: Respondents could select as many options as desired.

**We expect that responses for Supabase may be slightly skewed, having added Supabase as a response option two weeks into the survey being launched. Our apologies to the Supabase team and early survey respondents!*



Do you currently use any of the following SQL databases?

PostgreSQL loyalty runs deep among surveyors, with 37.6% not using any other SQL database. For those who do, MySQL (29.8%), SQLite (27.1%), and SQL Server (21.8%) are the top choices.

Note: New question to this survey.

Note: Respondents could select as many options as desired.

How would you classify your PostgreSQL database deployment size?

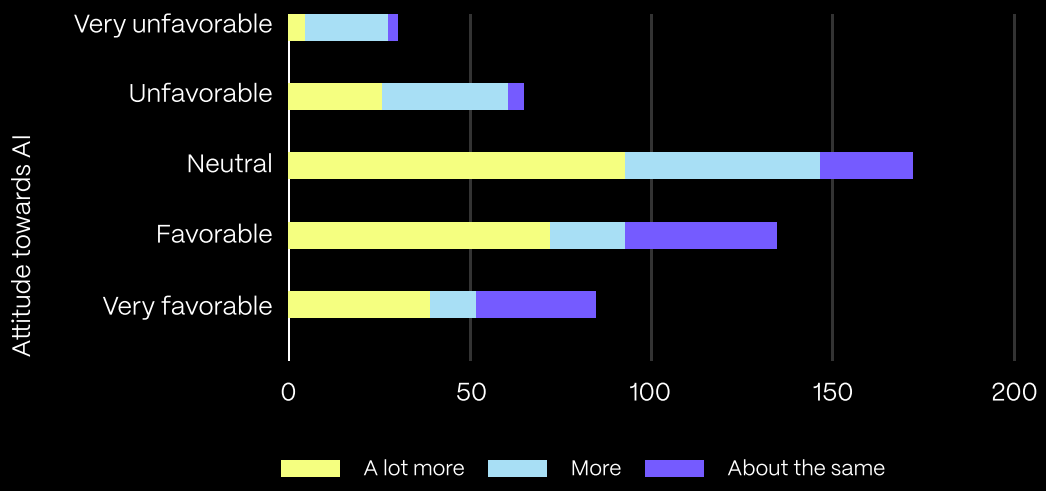
According to the results of this new question, the community is using PostgreSQL for databases of all sizes, but especially for small to medium-sized databases. Forty percent of the respondents claim to be working with small databases (< 100GB) while 37% work with medium-size databases (100 GB-1 TB).

Note: New question to this survey.

08

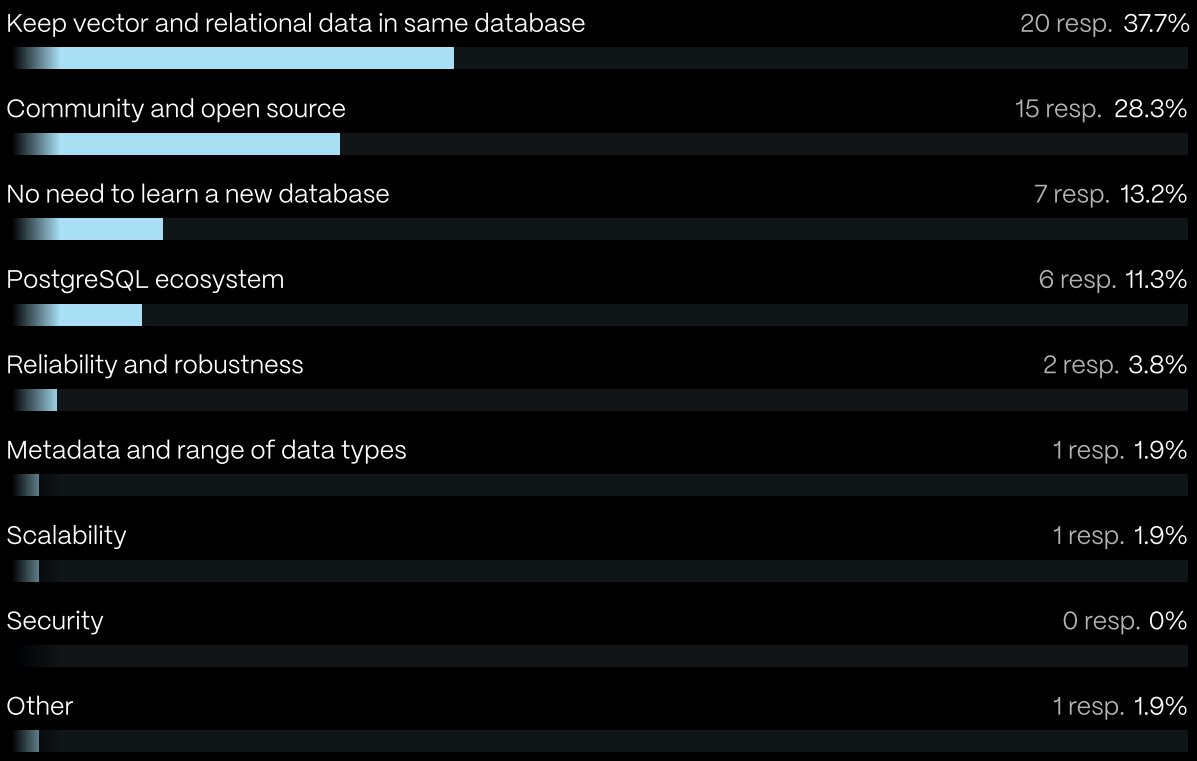
PostgreSQL and AI

Do you currently use AI tools and what's your attitude toward them?



It turns out that 45% of respondents have a favorable attitude toward AI tools, 35.2% are neutral, and only 19.7% have an unfavorable opinion. And even though there's a higher number of favorable views, 36.9% say they are currently using AI tools in their workflow, versus the 63.1% that say they aren't.

What are the main benefits you receive from using pgvector and PostgreSQL for AI/ LLM workloads?



Note: Respondents could select as many options as desired.

Of those who responded yes to having used pgvector and PostgreSQL as your vector database for AI/ LLM workloads, a little over one-third (37.7%) said the main benefit is the ability to keep vector and relational data in the same database.

Supporters

Thank you to everyone who promoted the State of PostgreSQL 2023 survey.

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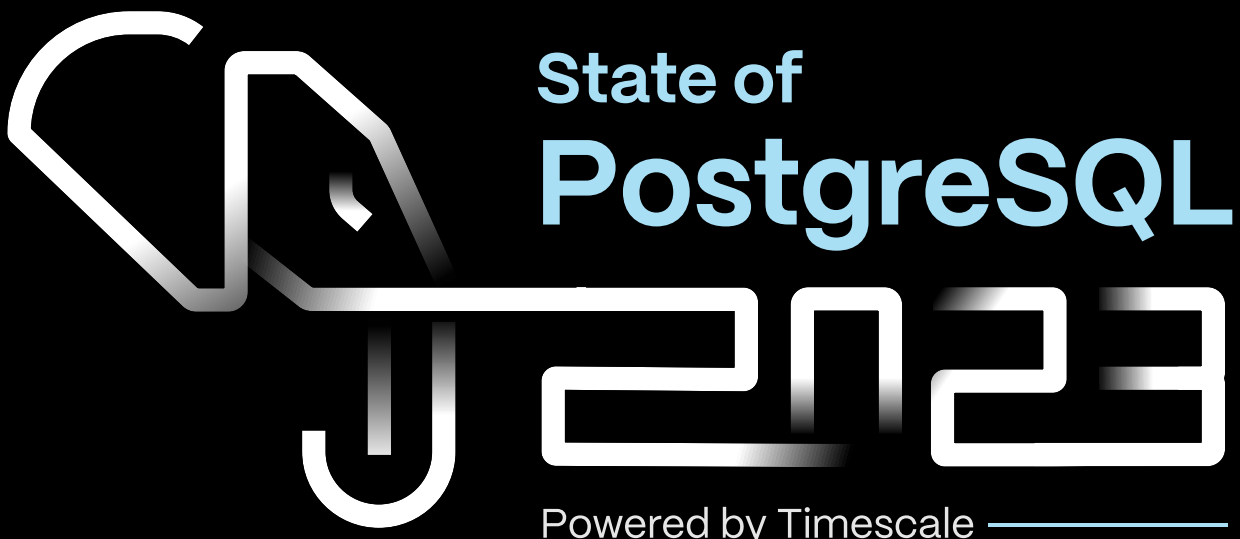

Thanks for reading!