



2019

State of Database DevOps

The latest survey on DevOps adoption
rates among SQL Server professionals



Foreword

DevOps is the union of people, process, and products to enable continuous delivery of value to our end users. The most important word of this definition is value. To deliver value you must deploy all changes, including those to your database.

Many that implement DevOps focus first on the items that are easy to deploy and change most often. This normally is the front end of the application. The infrastructure and databases change less frequently and are often excluded from the CI/CD pipeline. Because the frequency of change is lower, people do not always see the value in investing the time to automate these portions of their solution.

Ironically, if changes to the database and infrastructure were automated as well, the teams would feel empowered to change them more often. This freedom can enable more agility and innovation, as the teams no longer feel trapped by a static infrastructure and slow-moving database schema.

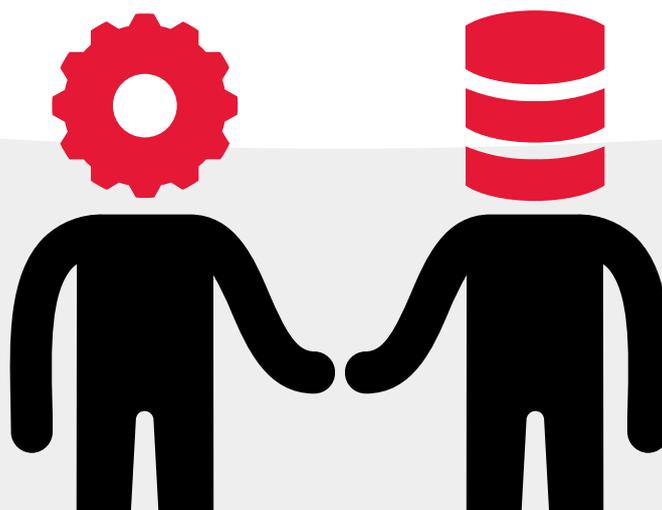
The same DevOps best practices you apply to your application can and should be applied to your database. Versioning the schema of your database enables changes to be reviewed alongside the code changes to the application. The deployment of the changes can now be tested and verified in development and staging environments before being executed in production.

As companies mature along their DevOps transformation, they must turn their focus to automating the deployment of their database changes.

This report shows that the majority of application developers are already involved in developing the database as well, and that DevOps practices like version control and continuous integration are being introduced for both the application and database.

The time to debate whether you should or should not implement DevOps is over. You either implement DevOps or you lose. And that includes the database too.

Donovan Brown
Principal DevOps Manager at Microsoft



Key Findings

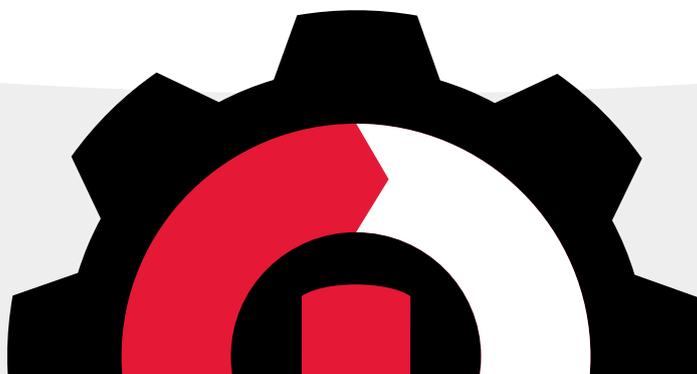
This is the third year the State of Database DevOps report has been produced, and the most important year so far for two reasons.

Firstly, the **2018 Accelerate State of DevOps Report**, which should be read in conjunction with this report, called out database development for the first time as a key technical practice which can drive high performance in DevOps.

Secondly, compliance has entered the picture with increasingly strict data protection legislation being introduced in different regions, countries, and states around the world. IT leaders now face the challenge of balancing the desire to deliver software quicker with the need to protect personal data.

The 2019 survey provides a valuable glimpse into DevOps in general, and Database DevOps in particular. Over 1,000 respondents from every industry sector and every company size across the world participated in the survey, and their responses give an insight into the challenges – and the opportunities – of adopting Database DevOps. Among the key findings are:

- **85%** of organizations have already adopted DevOps or plan to do so in the next two years, although there is a hardcore of 15% of organizations with no plans to introduce DevOps
- A wide range of stakeholders are involved in implementing a DevOps initiative, from IT Directors or Managers to Developers and the C-level, all of whom need to understand the benefits to be gained
- **77%** of application developers are also responsible for database development and building database deployment scripts
- **61%** of organizations think Database DevOps has a positive impact on meeting regulatory and compliance requirements, which rises to 66% among those who have already adopted DevOps
- The use of DevOps practices like automated provisioning, version control, and continuous integration in both application and database development has increased dramatically, as has the use of third-party tools
- **50%** of organizations are now taking advantage of the cloud, with 19% hosting their servers mostly or wholly in the cloud, and 31% using a combination of cloud and on-premises servers



1

Has your organization already adopted, or do you plan to adopt, a DevOps approach across any of your IT projects?



Yes

43%

Already adopted across some projects

15%

Already adopted across all projects



No

27%

Plan to adopt across some or all projects in the next two years

15%

Not adopted and no plans to adopt within the next two years

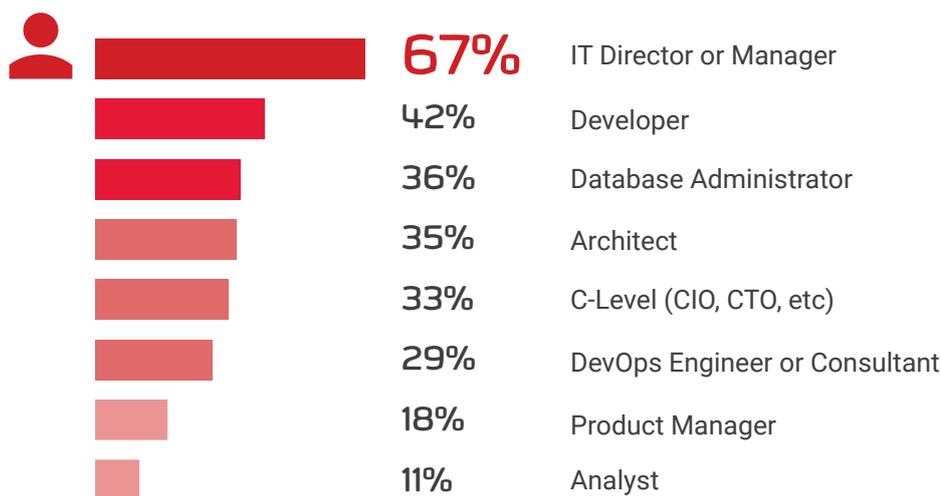
58% of respondents have already adopted a DevOps approach for some or all of their projects, an increase from 52% in last year's survey, and an overall increase of over 20% since 2016. A further 27% plan to adopt DevOps during the next two years, leaving just 15% of respondents having no current plans to adopt a DevOps approach. This compares to 20% in the first survey.

The industry sectors with the highest adoption rates are Media/Entertainment where DevOps practices are in place for some or all projects for 73% of respondents, and Technology/Telecommunications, and IT Services/Consulting at just under 70%. These leading sectors have demonstrated a substantial shift over the past 12 months, with last year's survey showing adoption rates of closer to 50%.

Much lower levels of adoption are seen in the Healthcare, Government, Education, and Non-Profit sectors, where just over 40% of respondents have adopted any kind of DevOps practices. These sectors also reflect the smallest change from last year where the figure was 39%. This may well reflect the need to comply with complex regulations, limited funding, and the long timescales often required to implement public sector initiatives.

The size of organizations is also a significant factor, with organizations of under 1,000 employees showing an average adoption rate of 54%, and those with over 1,000 employees showing an average adoption rate of 62%. This trend holds true when drilling into more detail too, with the lowest rate of adoption of DevOps across some or all projects being in organizations with 1-25 employees (51%), and the highest adoption rate being in organizations with more than 10,000 employees (70%).

2 Who is involved in the decision-making as part of implementing DevOps in your organization?*



* Respondents could give multiple responses to this question

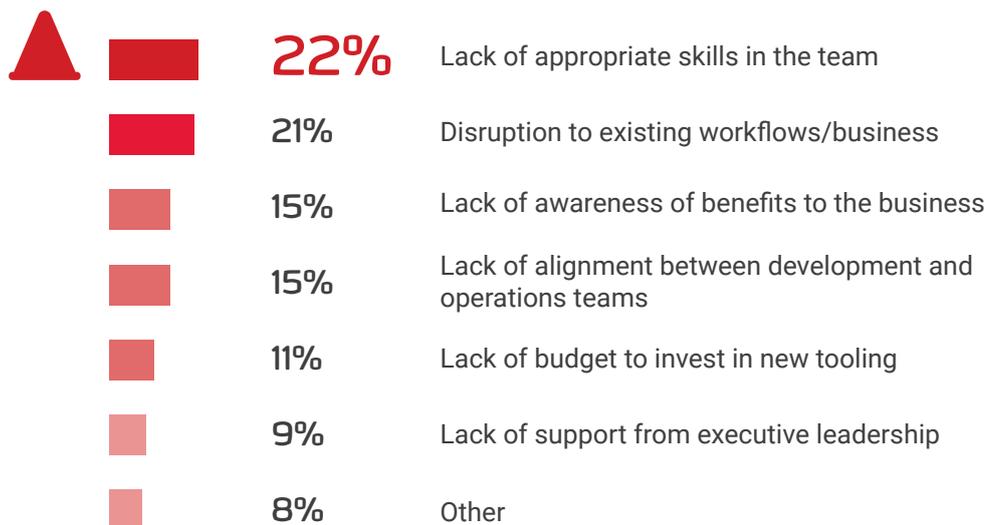
This is a new question for the 2019 survey because we wanted to find out the stakeholders involved in a DevOps implementation. Unsurprisingly, IT Directors or Managers play the biggest role and are involved in 67% of organizations.

Beyond this, there is a considerable distribution across hands-on technical roles such as Developers (42%), DBAs and Architects (36% and 35%), and senior, business strategy focused C-level roles.

The most interesting insight here is that even when you slice the data by industry, there is still a spread across a broad range of roles. It does seem that when adopting DevOps, and implementing the various technology and process changes that are required, stakeholders across the business all have a part to play. This is one of the reasons why a DevOps transformation or adoption can be a lengthy process, but it's clear that the benefits are beginning to be understood by each of the stakeholders involved, with adoption rates continuing to grow.

3

What was, or what would be, the main obstacle to implementing a DevOps approach in your organization?



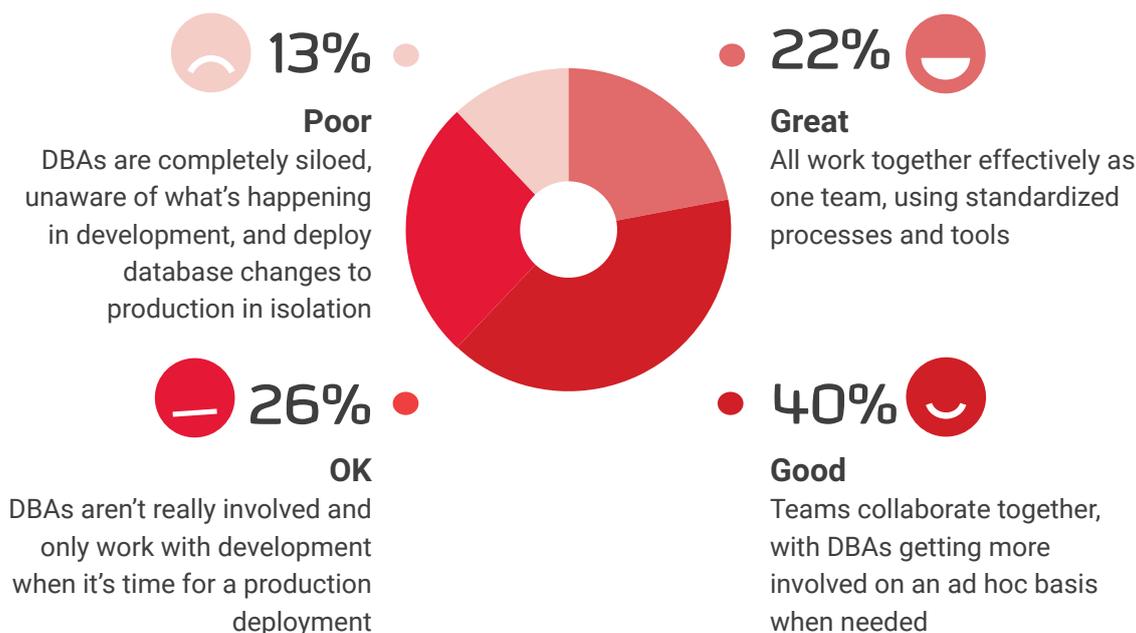
The results here are almost the same as the first two Database DevOps surveys, with the greatest obstacle to embracing DevOps being a lack of appropriate skills in the team, closely followed by a disruption to existing workflows or business.

The barriers were notably different between groups of respondents, however. Those who were planning to adopt DevOps practices in the next two years seemed most concerned about the disruption to existing workflows and business.

This is an interesting change from last year, when the biggest issue for the majority of those planning DevOps adoption was a lack of appropriate skills in the organization. This may suggest that for many organizations, the early stages of adopting DevOps have included acquiring the necessary skills, ahead of rolling out changes to processes and tooling.

For those respondents who have no plans to move towards a DevOps way of working, a lack of awareness of the business benefits of DevOps was cited as the main obstacle, accounting for close to 40% of the responses. The second highest response, from 15% of this group, was a lack of support from executive leadership. This suggests that until the benefits of DevOps are better understood, particularly by executives and leaders, organizations will simply not recognize the potential business advantages and return on investment that can be gained.

4 Which of these best describes how closely your developers and your database administrators (DBAs) are integrated?



The answers to this question are broadly similar to the last two surveys, with a slight uplift to 62% of those organizations which have great or good collaboration across teams. This is up from 58% in the first two surveys, indicating that as organizations adopt DevOps, increased collaboration and teamwork are introduced.

In teams that have adopted DevOps across all projects, the great and good collaboration rises to 76%, with 41% stating great collaboration – almost double the overall average.

IT Services/Consulting, Healthcare, Technology/Telecommunications, and Media/Entertainment lead the way, with just under 70% of respondents in all these sectors describing the integration between DBAs and developers as great or good. The lowest perceived levels of collaboration are seen in Retail, Energy/Utilities, Government, Education, and Non-Profit organizations, with approximately 50% of respondents in these sectors describing their DBA/developer integration as great or good.

5

Does your team include any developers that work across both databases and applications?



77%

Yes - our developers are responsible for both database and application development



23%

No - our team has dedicated database developers

This is another small uplift from the previous two surveys, which saw 75% of developers in the first survey, and 76% of those in the second survey, working across both the application and database.

There may be a natural ceiling, however, because a much higher number of respondents in the Financial Services, Healthcare, and Government sectors have dedicated database developers, probably because of the increased complexity of the databases involved and higher concerns about data privacy and legislative compliance.

It's also worth noting that there's a link between an organization's size and whether it has mostly dedicated developers or mostly full stack developers responsible for both database and application development. Smaller organizations tend to have mostly the latter, with just 16% of those with under 100 employees having dedicated database developers. The percentage then increases in correlation with organization size, rising to 34% for organizations with over 5,000 employees.

6

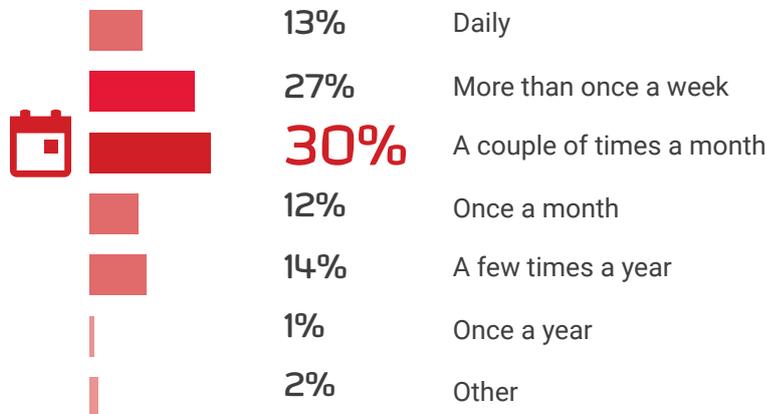
Who typically builds database deployment scripts?

Respondents could give multiple responses to this question



7

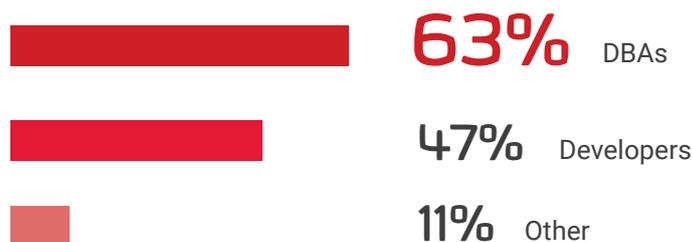
How frequently does your team deploy database changes, on average?



8

Who is responsible for the deployment of database changes to production?

Respondents could give multiple responses to this question



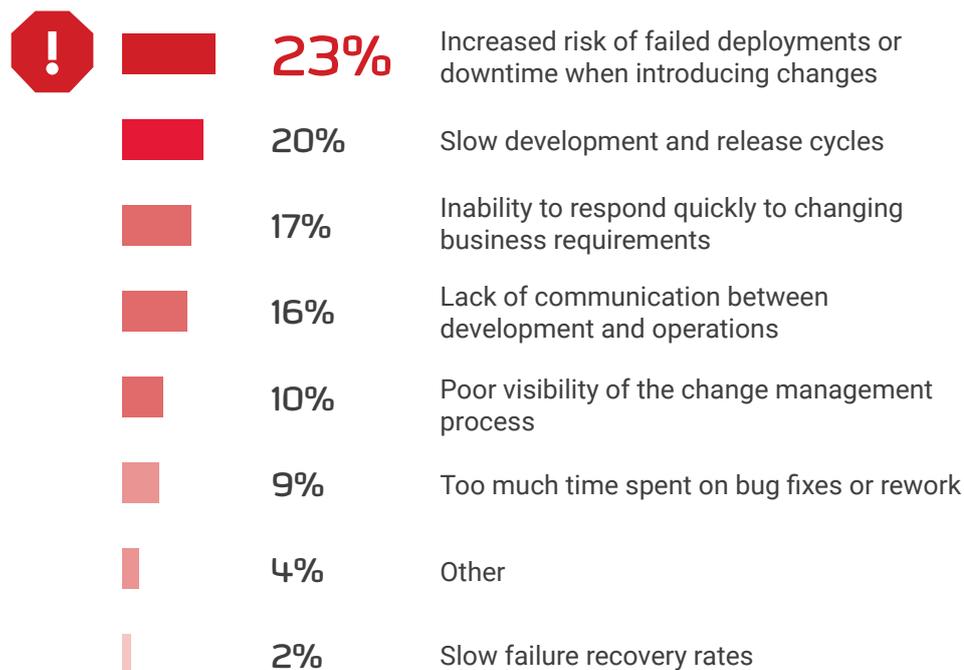
The second Database DevOps survey saw a jump in the number of developers building database deployment scripts from 60% to 75%. Likewise, a jump was seen in developers also deploying database changes from 39% to 47%.

This has remained the same in the latest survey, but when the results are examined by sector, an interesting picture emerges. As we saw with the number of developers who work across both the application and database, there is a marked decrease in the Financial Services, Healthcare, and Government sectors. This is particularly significant when looking at who is responsible for deploying database changes to production, with just 31% of respondents in these sectors answering that developers handle database deployments to production. Again, this may be due to the increased complexity of the databases involved and concerns about data privacy and compliance with legislation.

When looking at the frequency of database deployments, a promising picture emerges, with 40% of organizations now deploying changes daily or more than once a week, compared to 35% in last year's survey. This is probably due to the increasing acceptance and adoption of Database DevOps, as evidenced by its inclusion for the first time in DORA's 2018 Accelerate State of DevOps Report, mentioned in the introduction.

9

Which of these do you consider to be the greatest drawback in traditional siloed database development practices?



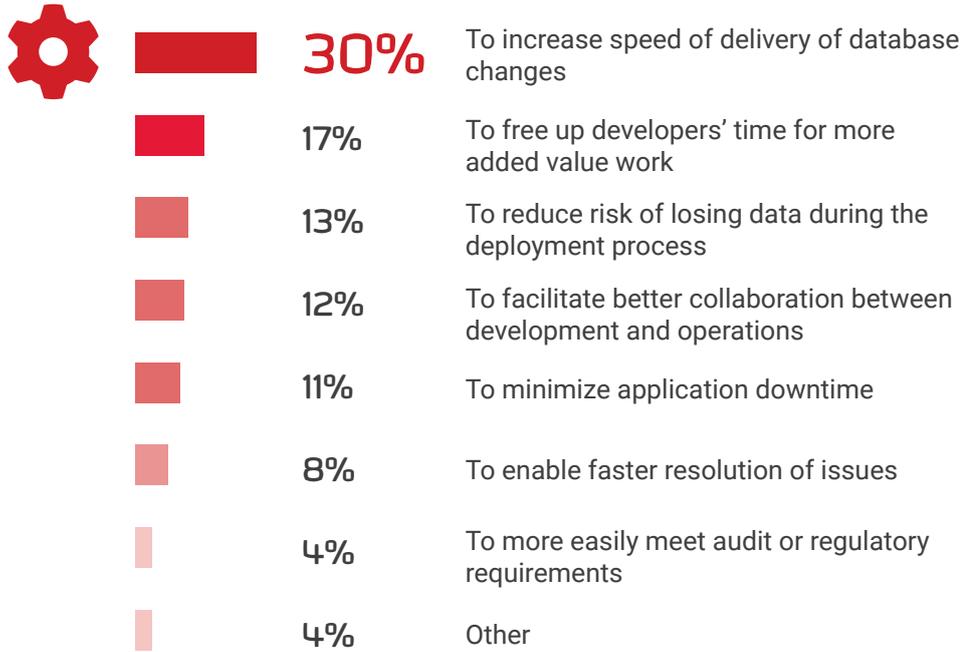
Traditional siloed database development prevents collaboration, discourages cooperation, and leads to poor integration between developers and DBAs. This in turn can affect the whole software development process as well as the business beyond it.

The drawbacks highlighted in the latest survey are in the same order and with broadly the same number of votes as the previous two surveys, with the increased risk of failed deployments, slow development and release cycles, and an inability to respond to changing business requirements cited as the top three.

Perhaps, however, this is a good sign. We saw earlier that integration between developers and DBAs is increasing, albeit at a slow pace. The drawbacks are known, the problems they cause are recognized, and organizations appear to be trying to correct it.

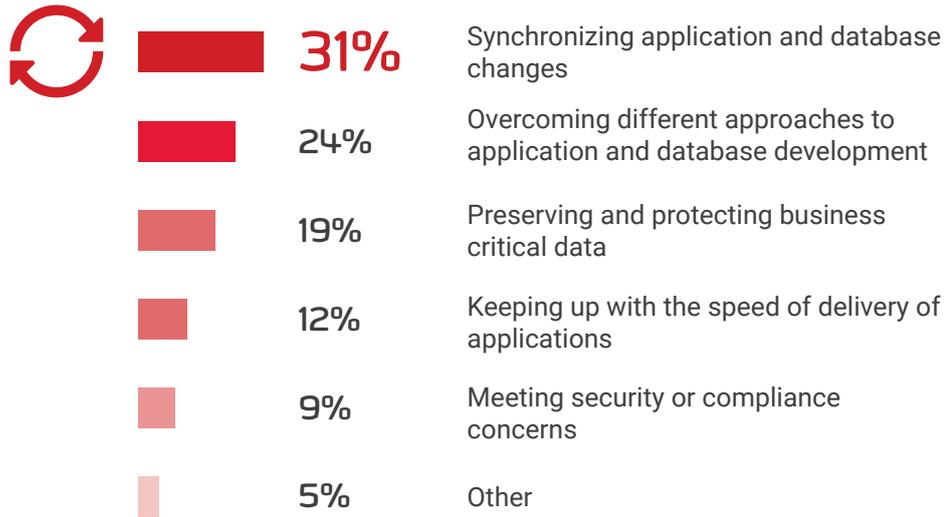
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Which of these would be the main driver for automating the delivery of database changes as part of a wider DevOps process?



11

What would you consider to be the greatest challenge in integrating database changes into a DevOps process?

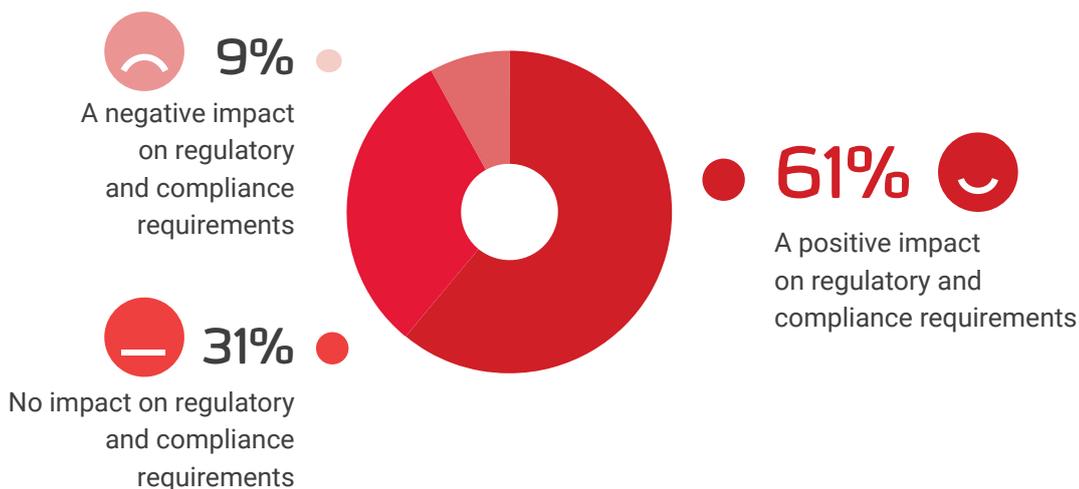


The drivers for automating the delivery of database changes, as well as the challenges in integrating database changes into DevOps, have remained almost the same as in the two previous surveys.

Increasing the speed of delivery of database changes and freeing up developers for added value work are seen as the major advantages to be gained, while synchronizing those changes and aligning application and database development are the biggest hurdles to be overcome.

This does vary by job role, however. At the C-level, the biggest driver is to free up developers' time for more added value work, while DBAs and developers are more concerned with increasing speed of delivery of database change.

12 What impact do you think a DevOps approach to the database would have on regulatory and compliance requirements?



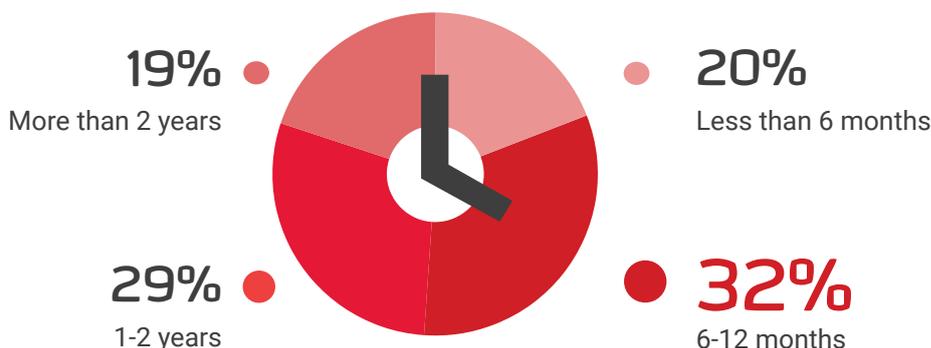
Meeting regulatory and compliance requirements is a challenge for many organizations and concerns are growing as further data protection legislation is introduced in different countries and regions around the world. Fortunately, the automation and audit trails which Database DevOps brings in align closely with the regulatory compliance that needs to be demonstrated.

The latest survey saw once again a majority believing Database DevOps will have a positive impact on compliance, with the number rising in organizations in more regulated sectors like Financial Services and Healthcare.

Those organizations which have already introduced DevOps also have a more positive view than those which have not, demonstrating that once adopted, DevOps helps organizations meet their compliance requirements.

13

How long do you estimate it would take your organization to move from traditional database development practices to a fully automated process for deploying database changes?



At first glance, it looks promising that 52% of organizations estimate it will take no more than 12 months to introduce a fully automated process for deploying database changes. Behind this headline figure, however, are two concerns.

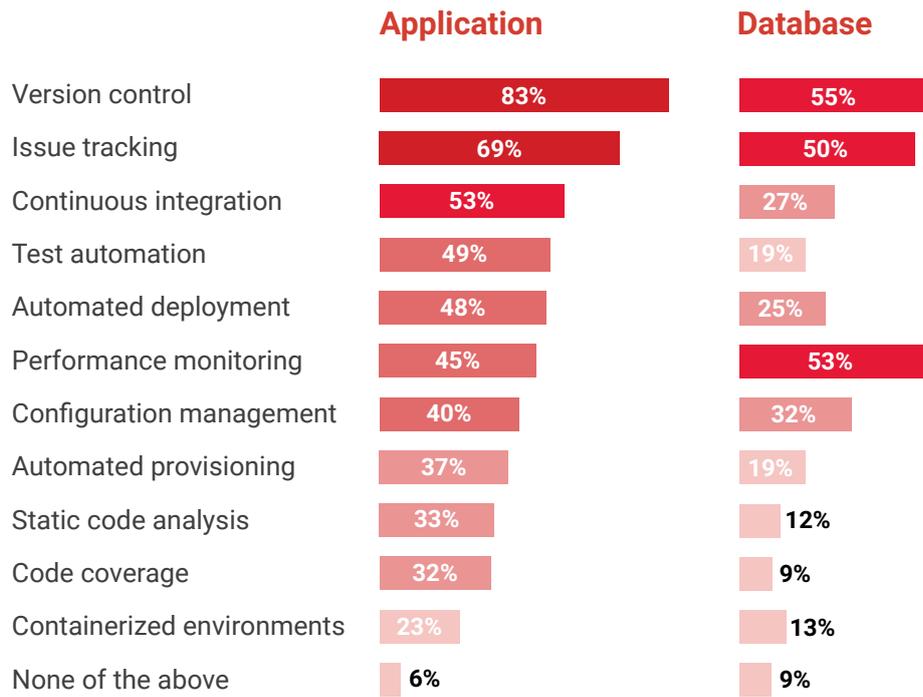
Firstly, the number of organizations which estimate it will take more than two years has remained stubbornly at around the 20% figure for three years – 19% in the 2017 survey, 22% in the 2018 survey, and 19% in the latest survey.

Secondly, that percentage rises to 42% among organizations which have no plans to adopt DevOps. This suggests that once DevOps is introduced, the advantages of then extending it to database development are recognized and the path to doing so is much shorter.

Interestingly, of those who have already adopted DevOps across all projects, 83% estimate it would take less than 12 months to move from traditional database development practices to a fully automated process for deploying database changes, with 45% saying it would take less than six months. This is encouraging, as it likely shows that there are considerable time savings and process efficiencies when DevOps is adopted for the full stack including the database.

14

Which, if any, of these practices are already in place for your application or database development?



15

Has your organization brought in third-party tooling to aid your application or database development in any of these areas?

	Application	Database
Version control tools	63%	43%
Issue tracking tools	48%	31%
Continuous integration tools	44%	23%
Deployment tools	43%	29%
Monitoring tools	39%	44%
Automated testing tools	37%	15%
Provisioning tools	25%	15%
Configuration management tools	24%	14%
Audit tools	18%	16%
None of the above	17%	18%

DevOps practices like automated provisioning, version control, and continuous integration are increasingly well understood, which is reflected in increases in adoption across all of them. There is a modest increase for version control for example, now used by 83% of respondents for application development, and 55% for database development. That compares to 81% and 53% in last year's survey. Particularly encouraging is the significant uptake in continuous integration – a cornerstone of DevOps – which is now used by 53% for application development and 27% for database development, up from 40% and 21% in the last survey.

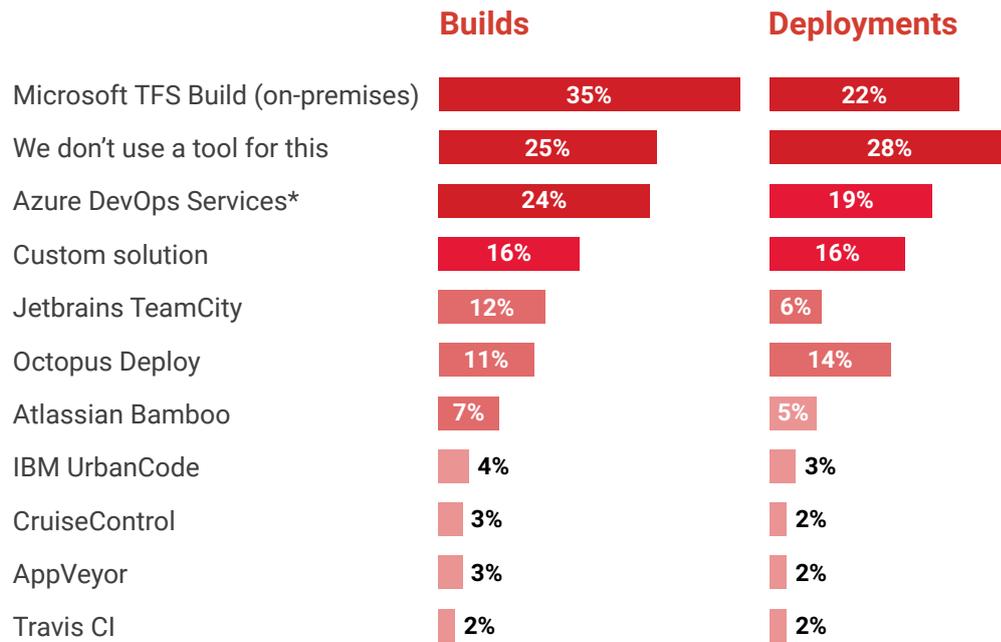
Another notable development is that the use of containerized environments is now well established, with an increase from 13% to 23% for application development. This year's data indicates that they're being used for database development for the first time – from 0% in last year's survey to 13% this year.

All this, in turn, has led to a rise in use of third-party tools at every stage. The most substantial year on year change is the use of third-party provisioning tools, which has doubled, from 12% for the application and 8% for the database last year, to 25% and 15% respectively this year.

Provisioning technology has recently seen major advances, making it easier and cheaper to implement. This likely contributes to the increase, as does the growing understanding of the benefits of automated provisioning, which covers data protection and compliance as well as key DevOps principles such as release frequency and mean time to recovery.

16

Which tools do you use to automate your builds and deployments?



* Previously Visual Studio Team Services

17 Is the database part of the automated build and deploy process?

 66% No

 34% Yes

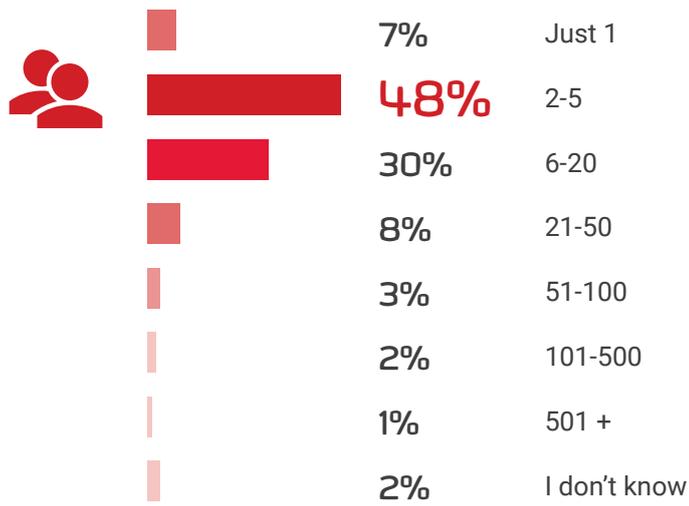
With DevOps gaining traction, we wanted to explore the tools being used to automate builds and deployments in this year's survey. The front runners are the usual suspects - TFS, Azure DevOps Services, and TeamCity - but it's interesting that 16% of organizations are using a custom solution for automating both builds and deployments.

Respondents were able to select more than one answer for this question, and it's worth noting that many organizations use multiple tools for builds and deployments, highlighting the complex nature and variety in projects any one organization delivers, and the need for flexibility in tech stacks.

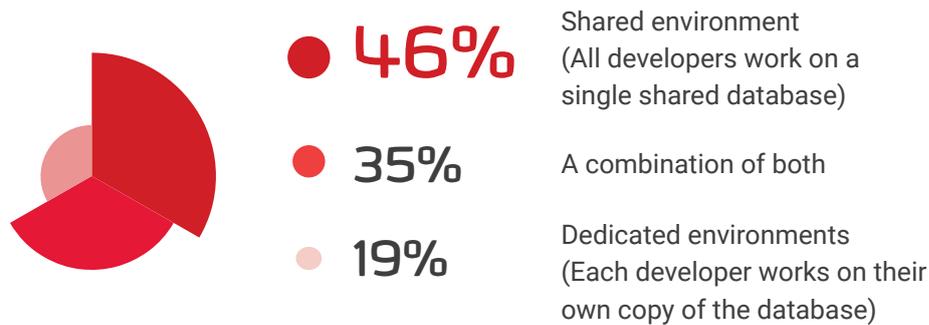
The database, however, lags behind and is included by only 34% of respondents in an automated build and deploy process. This figure does, however, rise among large organizations, with 42% of organizations of over 10,000 employees including databases in automated build and deployment processes.

18

On average, how many people work on the same code base?



19 Is database development work done in a shared environment or dedicated environments?

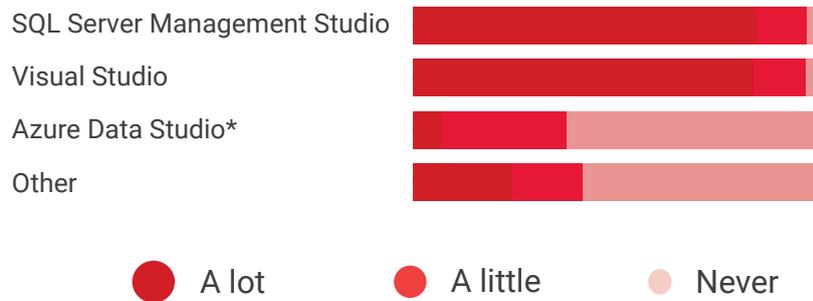


55% of organizations in the survey have small teams of 1-5 developers working on the same code base, and 43% have larger teams, the majority of them 6-20 people.

This would seem to align with the finding that 46% of organizations have a shared development model, with every developer sharing a single database to develop and test changes against. In small teams, this works relatively well, particularly if changes to the database are made infrequently. With larger teams there are significant advantages to working with dedicated development environments, particularly when implementing the continuous integration and continuous deployment practices that enable faster delivery of value through more frequent releases. The more automation is built in to the pipeline, the more important it is to ensure each developer is working in their own dedicated development environment, so that team members don't step on each other's toes, and only changes checked into source control having been tested in dedicated environments are deployed through the automated pipeline.

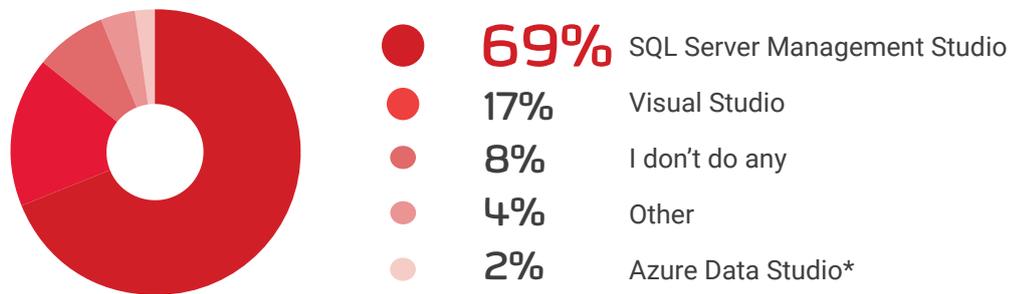
Looking a little deeper, however, it appears that the shared environment is particularly favored in the Financial and Healthcare sectors, where the privacy of data and compliance with legislation is more critical. This might suggest an issue with the ability to provision database copies for use in development where personal data needs to be masked or pseudonymized.

20 How often are these IDEs used in your organization?



* Previously SQL Operations Studio

21 Where do you do most of your SQL Server database development?



* Previously SQL Operations Studio

Unsurprisingly, perhaps, Visual Studio and SQL Server Management Studio (SSMS) are the most popular development environments, with SSMS being the favored option for database development.

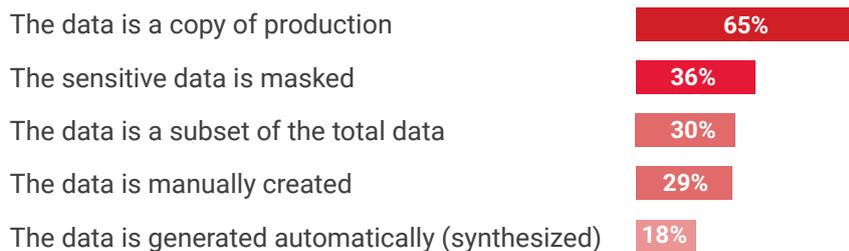
Azure Data Studio, however, is now entering the picture and, while only 7% use it frequently, 30% of developers say they use it now and again.

With Azure SQL Managed Instances now near 100% compatible with on-premises SQL Server, this may increase as organizations migrate to the cloud or use the cloud for new database projects.

22

Which of these describe the data in your development and test environments?

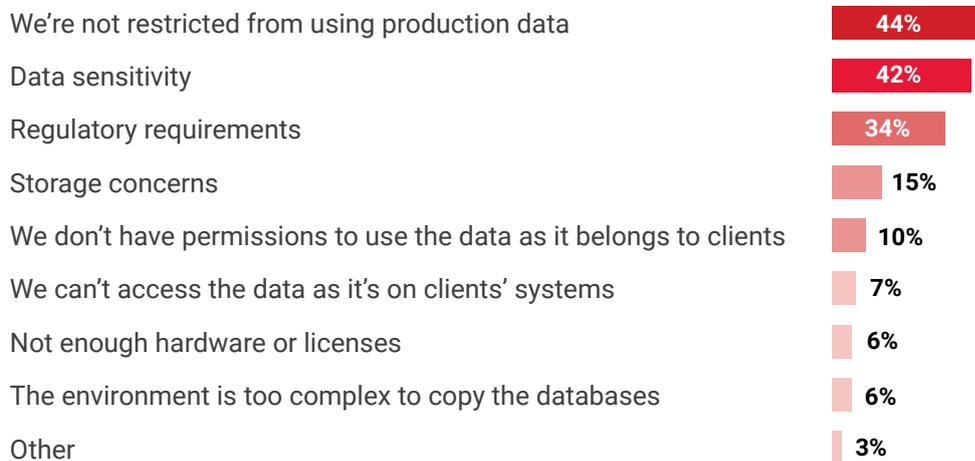
Respondents could give multiple responses to this question



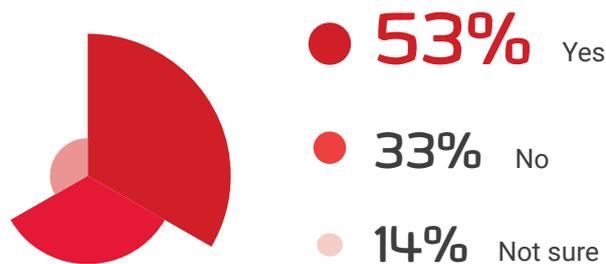
23

If you're restricted from using production data, why is that?

Respondents could give multiple responses to this question



24 Would your production data need to be modified or masked before use in development, test, or QA environments?



Data privacy is now a concern for many organizations, and there are increasingly stringent data protection regulations coming into force, so it's slightly concerning that 65% of respondents to the survey still use a copy of the production database in development and test environments. 44% also say they are not restricted from using production data, and a worrying 14% are not sure if production data needs to be modified or masked before use in development.

In the Financial sector, where the sensitivity of data is particularly high, the percentage of organizations where data is masked in copies of the production database rises to 64%.

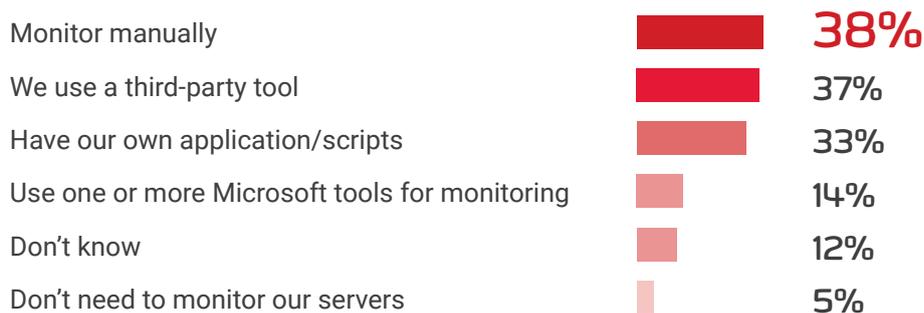
Interestingly, a far greater percentage of respondents in organizations that are practicing DevOps agreed that production data would need to be modified or masked before use in development, test, or QA environments than those who have no plans to adopt DevOps practices.

This suggests that once DevOps practices such as continuous integration and automating deployments have been implemented, awareness of data protection needs in database development is higher, and perhaps the understanding that data can be protected, and compliance achieved, without compromising the speed and agility of DevOps - using practices such as data masking and pseudonymizing - is stronger.

25

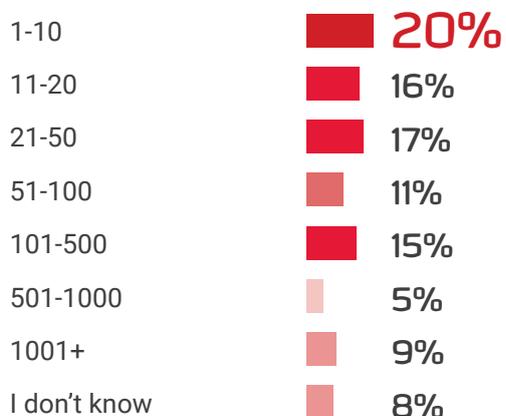
How are your SQL Server instances currently monitored for availability, performance, and other issues?

Respondents could give multiple responses to this question



26

How many servers does your organization have?



27

Where are the servers hosted?



- **31%** A combination of cloud and on-premises
- **28%** Mostly on-premises
- **22%** All on-premises
- **10%** All cloud
- **9%** Mostly cloud

The number of servers in use is particularly interesting, with only 20% of respondents having ten or fewer, 15% having between 101 and 500, and 14% having more than 500. 51% of organizations use Microsoft tools or a third-party tool to monitor their SQL Server estates, with the likelihood of using a third-party tool increasing with company size. Just 23% of organizations with ten servers or fewer are using third-party monitoring tooling, which rises to 51% in organizations with over 500 servers, highlighting the increasing need for a monitoring solution as the complexity of a SQL Server estate grows.

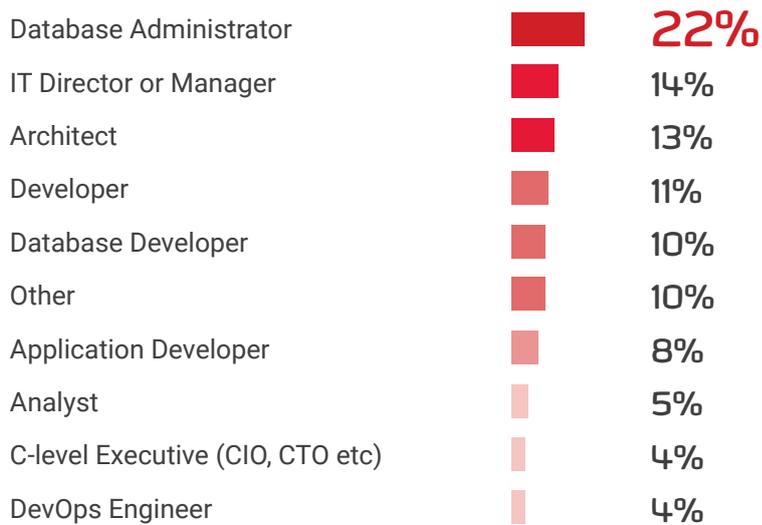
Where the servers are hosted is also notable, with 19% of server estates now either all or mostly cloud based, and a further 31% a combination of cloud and on-premises. The likelihood of using the cloud also increases in line with adoption rates of DevOps practices, with 43% of organizations that have adopted DevOps across some or all projects having server estates that are all or mostly cloud based. This compares to just 12% of organizations that have not yet adopted DevOps or have no plans to.

This correlation between cloud adoption and DevOps adoption suggests that changes in technology and processes are being considered together, as part of a wider digital transformation.

Survey Demographics

28

What is your primary job title?



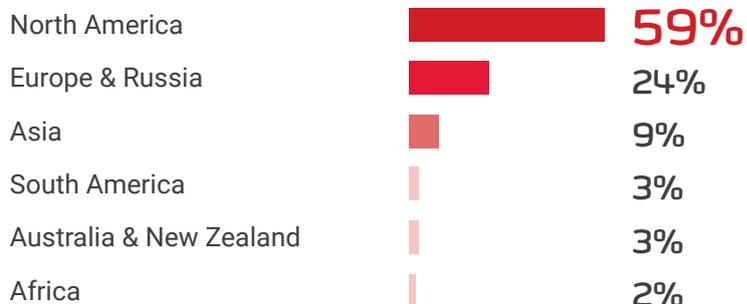
29

What is your organization's primary industry classification?



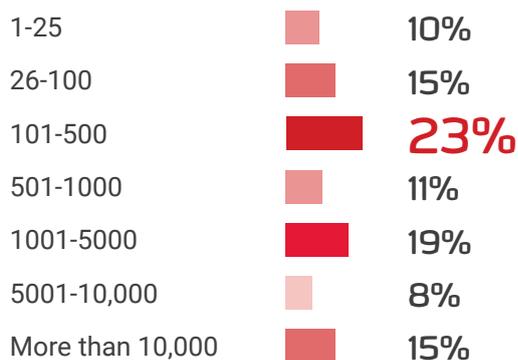
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What region are you based in?



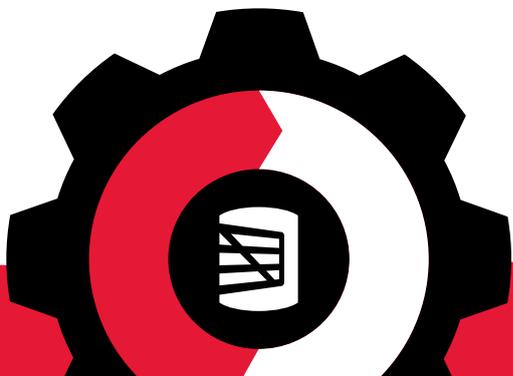
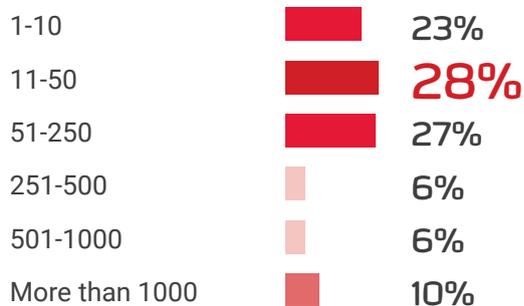
31

Approximately how many employees are in your organization (across all locations)?



32

Approximately how many of those employees are responsible for IT development, engineering, or operations?



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