How To Manage Complex Database Environments Effectively
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Take control of database complexity

Thousands of databases. Sprawling environments. One team to manage it all.

Year after year, modern data-driven organizations have vastly increased in complexity as databases proliferate and scale up and out across cloud, on-premises, and hybrid environments. As someone on the front lines of this growth, you’ve seen firsthand how it has fragmented your database environments and also your team as you struggle to keep your databases under control.

Working in reactive mode is the norm as you try to balance the demands of developers and others (themselves pressured to do more) while ensuring performance and high availability (HA). Meanwhile, the business suffers as costs and downtime increase, security is compromised, and application development is slowed because you’re too busy firefighting to fix the underlying issues.

Fortunately, it’s possible to efficiently manage this complexity, maximize your team’s effectiveness, and meet your Service Level Objectives (SLOs).

In this guide, you’ll learn:

• four critical business impacts of database complexity
• approaches to managing database complexity
• seven tips for evaluating a multi-database vendor

Let’s go!

Three common reasons for database complexity

• Too many specialized databases. As developers create modern applications, they often turn to specialized databases, which can be easy to set up and deploy and help get applications up and running fast. The cloud has only exacerbated database proliferation because it allows developers to spin up resources quickly.

• Pressure to keep up with security and data governance requirements. With cybersecurity attacks on the rise and continued pressure to meet time-to-market goals, security, development, and operations are turning up the heat on database teams to ensure that databases are protected, high performing, consistent, and trustworthy.

• Changes driven by digital transformation. Over the past several years, the drive toward digital transformation has introduced many new services, systems, applications, and data formats that must be integrated across increasingly sprawling architectures.
Four critical business impacts of database complexity

Databases are the bedrock of successful business, which is why database complexity is so harmful to the bottom line. Understanding its real-world impacts on the business helps you know where to look for problems and how to optimize your architecture. Taking control of complexity also makes it harder for others to point at you when things go wrong.

1. Performance and availability

Keeping your databases performant and highly available is vital to meeting SLO commitments, maintaining a good reputation, controlling costs, and avoiding penalties, such as customer fee reductions, service credits, or contract termination. But complexity can impede information about your environment and visibility into query performance. Issues that could be remediated faster take longer to diagnose and resolve if you are stretched for time and lack the expertise and tools for quickly isolating and remediating problems.

The results are more points of failure and poor query response time, which leads to dissatisfied end users. Slow query processing is particularly troublesome for e-commerce sites, where customers may quickly abandon their shopping carts, share their bad experiences with others, and flee to competitors.

2. Security

What you don’t know may hurt you, and where databases are concerned it probably will. Being in the dark about what’s happening in your database environment inevitably creates security problems.

Old database versions, insecure backend access, misconfigurations, bad password and anonymous user policies, and lack of insight into vulnerabilities all are security hazards that can result in dire consequences like ransom attacks and privacy leaks.

In fact, attacks on misconfigured databases are increasing as hackers use free or cheap tools to breach public databases, usually unintentionally left unsecured by developers. Over the past several years, database misconfigurations have exposed billions of user data records to cybercriminals and cost organizations an average of $4.24 million per incident.

DID YOU KNOW?
Data breaches cost organizations on average $4.24 million per incident, and it takes on average 287 days to find and contain a breach.

IBM and Ponemon Institute, 2021

DID YOU KNOW?
According to Amazon, every 100ms of latency costs 1% in sales. If you’re a mid-size enterprise (per Gartner’s definition) with annual revenues of $50 million, that’s a half-million-dollar loss in sales as a result of a mere 0.001 minutes in downtime.
3. Cost

As discussed, downtime and slow query response time negatively impact user experience and, in turn, sales. Many companies throw good money after bad to fix performance and availability problems – buying beefier nodes, for example – instead of optimizing their architectures.

Incurring variable infrastructure costs may seem smart at first but eventually will cut into margins, especially as your company or product offerings scale. For example, spending $50K per month when factoring in things like additional nodes may look reasonable, but investing in infrastructure upfront may cost $30K per month over the course of a year.

Consider also the opportunity costs that result from the inability of your teams to focus on developing new applications. Continual innovation is not just a nice-to-have. Delivering the latest and greatest products and services is a must in highly competitive markets, where your competitors will easily outcompete you if you don’t enable your team to work smarter and faster.

4. Developer velocity

You’re not alone in being stymied by complexity. Developers are feeling it too as they face rising pressure from the business to pick up the pace. Developers need things to work, not in a day or two, but now. They need to iterate faster with fewer cross-team handoffs to meet their deadlines. And they need your team to provide expertise and quick response time so they’re empowered to create customer value immediately instead of filing tickets and waiting for support.

Obviously, being held up by administrative roadblocks can dramatically impact a developer’s ability to meet business objectives and lead to missed opportunities. But it also creates a situation where they feel forced to go around you, which can encourage “Shadow IT,” further increasing costs and security risks.

In short, if the database is a bottleneck, developers are going to be delayed and frustrated, so you need to prioritize helping them increase velocity.

Clearly something must be done. Forward-thinking organizations are moving away from complex architectures and pushing back against sprawl. Whatever option a company chooses, one thing’s certain: Most database environments as they currently exist are not sustainable.

DID YOU KNOW?
Organizations lose more than $2 million per year due to ineffective data management. 

Vanson Bourne survey for Veritas, 2019

DID YOU KNOW?
21% of organizations experienced cyber events due to an unapproved IT resource.

IBM Forbes Insight Survey, 2019
Solutions for managing database complexity

From single and multi-database vendors to public Database as a Service (DBaaS) providers and generic application performance monitoring (APM) tools, you have many options for managing complexity. This section helps you sort through them to find what’s best for you.

Single proprietary database vendors

Using just one kind of database would seem to have the advantage of simplicity. After all, there’s only one database to learn and one vendor to call when you run into issues. Easy, right?

The problem is you’re handing too much control to the vendor. Open-core or proprietary vendors may offer you unique features that are only available in their enterprise editions, locking you into non-portable platforms or environments. Still others may try to dictate your IT strategy by pushing you hard toward their cloud solution instead of running on-premises. Some may even tempt you with high-demand offerings like DBaaS as a way of binding you to expensive contracts and oppressive annual support obligations. But what happens in a year or two when you want to change? How much time and money will it cost to reclaim and move your data? A single database may look good at first glance, but it’s important to ensure you’re never held hostage by a vendor. Buyer beware.
Public DBaaS vendors

Using a public DBaaS vendor offers the promise of being cheaper and easier to administer, but the drawbacks are many:

**Doesn’t solve the single vs. multiple database dilemma.**
Some companies use a public DBaaS thinking they’re outsourcing operational management for multiple database technologies. However, public DBaaS does not solve the complexity of developing against many technologies or the work of the developer/application DBA (e.g., query design and database schema). Although cloud vendors manage operational automation and day-to-day tasks, you still own ensuring the performance and availability of your applications. You also own the security in the cloud vs. the security of the cloud for which the cloud provider is responsible. In other words, even when using a public DBaaS, you still need to provide your own staffing and expertise to support your deployments.

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**May not meet data sovereignty requirements.**
Regulatory compliance regimes sometimes require in-country, in-region, in-state residency of data. If the DBaaS is not available in those geographies, it will not meet your compliance needs.

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**May not meet data locality.**
Data needs to be near running applications to minimize latency and provide a highly performant user experience. When deciding where your data should sit relative to your applications, moving to a public DBaaS is not a one-size-fits-all solution because the DBaaS may not be available in every location where you need it.

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**Risks data lock-in and gravity.**
Cloud providers charge extremely high egress fees, which can make it financially impossible to move your data. Data gravity refers to the idea that applications are attracted to data; the more data you have in the cloud, the more applications will become cloud based, and the more serious the consequences of lock-in.
Generic APM or infrastructure monitoring tools

Ensuring performance and high availability requires advanced tools for both monitoring and observability. Monitoring tools or technical solutions allow you to watch and understand the state of your systems based on predefined sets of metrics or logs. The ability to gather this information about systems and check on their status is important, but it tells you only that something is not working, not why it’s not working.

Observability tools give you deep visibility into the internal states of your systems, helping you actively discover the “unknown, unknowns,” answering questions you could not think to ask. They allow you to explore properties and patterns not defined in advance so you can actively debug your systems.

Generic APM and infrastructure-monitoring solutions don’t offer database-focused tooling for in-depth troubleshooting and investigation, which you need to fully understand the health of your infrastructure. Some of the metrics required for proper monitoring might be available but aren’t included on any dashboard, meaning that those dashboards are not designed in a way that helps you troubleshoot.

Signs that your vendor is committed to delivering an open source solution that won’t lock you in:

1. Offers unbiased multi-database expertise focused on finding solutions that will fit your needs versus selling you their solutions stack
2. Provides a single-source of deep expertise on all your databases
3. Offers 24x7x365 enterprise-class support and services for multiple open source databases
4. Compatible with all major cloud providers
5. Champions a true open source database community where individual contributors from many companies collaborate to create the best possible software

Multi-database vendors

Using a multi-database vendor avoids the problem of vendor lock-in and centralizes your vendor interactions, but it doesn’t automatically ease complexity.

Many vendors provide the databases but not support, expertise, or tooling, such as backup, monitoring, performance analysis, and management. So if you choose the wrong vendor, you’re basically on your own. Complexity will still exist and will contribute to problems with performance and availability, as well as with security, cost, and developer velocity.

On the other hand, choosing the right vendor means you get a trusted partner who gives you the flexibility to choose the right tool for the job. That tool may be a multimodal database or multiple databases that are well integrated and come with a consistent management and monitoring experience.

Overall, a good vendor helps you find the best solution for optimizing your environment with more success and less stress. Below are tips for choosing a multi-database vendor.
Seven tips for choosing a multi-database vendor

1. Look for a support staff with expertise across all database environments.
   As with any company running applications in complex database environments, eventually you’ll need help keeping things running smoothly. That’s why it’s so important to have the right support staff and expertise in place. That staff should:
   - Have real-world experience with all types of database environments, including those that combine different software and architectures. They should enable a “one-stop-shopping” experience in which all your experts are consolidated under a single vendor.
   - Offer deep experience across databases. Experts should be recognizable names with articles and/or interviews in technical blogs, in media and book publications, and on podcasts. Many will have also presented at key community conferences and meetups.
   - Be fully committed to helping you avoid vendor lock-in.
   - Be experts in tuning and optimizing database applications to prevent performance bottlenecks, as well as comprehensive operational knowledge to help ensure uptime and availability.
   - Bring extensive technical and architectural expertise and the ability to help you write better applications that boost performance, avoid problems, and protect your data.
   - Support your databases in any context: on-premises, in the cloud, in a DBaaS, on bare metal, virtualized, or containerized.
   - Support all major cloud vendors and augment existing support agreements to guarantee that your environment is getting the maximum performance for the minimum cost.
   - Provide all support customers with round-the-clock support for production outages and the option for real-time access to technical support.
   - Help you realize ROI benefits from the highest levels of database optimization and efficiency.

DID YOU KNOW?
“Highly evolved firms make heavier use of internal platforms for their engineers, enabling developers to access authentication (62 percent), container orchestration (60 percent), and service-to-service authentication (53 percent), tracing and observability (49 percent), and logging request (47 percent) services via self-service.” Puppet 2021 State of DevOps Report

2. Check that they support hybrid cloud.
   These days, only a handful of companies deploy their databases only on-premises or only in a single cloud. Most run in mixed environments, either multi-cloud or in a combination of contexts, such as two clouds or one cloud plus on-premises. Make sure your vendor can support you wherever and however you run.

3. Ask if they can be your single source of accountability for both software and services.
   With a trusted multi-database vendor, there’s no reason to chase multiple vendors and consultants around to get help because nobody will take ownership. Make sure your vendor supports both software and services, so you’re not bogged down by blame games and people passing the buck.
4. Evaluate their commitment to open source.
Open source is here to stay, and a good vendor knows it’s the future of technology. Open source is cost-effective, avoiding licensing fees and offering data portability that gives companies the freedom to deploy anywhere, any time they want. Open source projects are driven by a community of volunteer contributors, users, and inventors focused on innovation and creating high quality software. Rather than being controlled by a single company that’s beholden to its shareholders, open source communities are collaborative groups built on honesty, transparency, and trust for the sake of all members and users. A vendor who is fully committed to open source receives benefits from using the technology but places a high priority on paying back the community as an active contributor themselves.

5. See if they offer developer self-service.
As mentioned, developers need the ability to deliver applications to market faster. Ask vendors you’re considering if they provide a self-service platform that allows developers to easily provision and manage databases across test and production instances without waiting for internal services.

6. Check whether they include complimentary monitoring and observability tools.
As discussed, monitoring tools (which alert you to the status of your systems according to predefined metrics) and observability tools (which give you deep insight into system problems for proactive debugging) are critical for ensuring performance and high availability. Ask vendors whether they offer these tools and, if so, whether they’re provided on a complimentary basis.

7. Ask if they offer a unified solution that spans database environments.
The cure for complexity is unification of the entire database experience. After all, why manage solutions across different vendors when that’s just fighting complexity with more complexity? Unification is essential to optimizing your database environment and increasing developer velocity. An effective multi-database vendor offers a holistic approach to database management. They bring together all your databases, as well as all of the solutions, tools, support, and services needed to run your environment on any infrastructure at peak performance.

How Percona Platform can help
Percona Platform makes it easier to run complex database environments. It unifies enterprise-ready distributions of MySQL, PostgreSQL, and MongoDB and a range of open source tools for database monitoring, data backup, and management into a subscription-based offering.

Percona Platform helps DBAs deliver consistent and reliable performance and availability, meet the ever-increasing demands of developers to move faster, and ensure strategic business goals are met. Best of all, there’s no upfront commitment or fees to begin using Percona Platform. And because everything we do is built on our commitment to open source innovation, there’s never any risk of vendor lock-in.

Discover how Percona Platform can make database management easier for you
For more information please contact us at: +1-888-316-9775 (USA), +44 203 608 6727 (Europe), or via email at sales@percona.com