

ESG Economic Validation

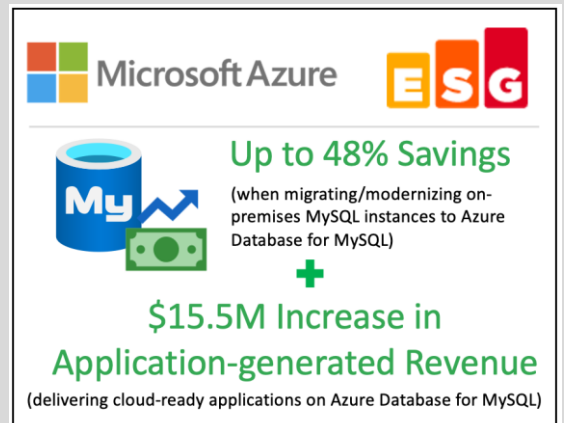
The Economic Value of Migrating and Modernizing On-premises Instances to Azure Database for MySQL

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Executive Summary

Many organizations have enjoyed great success building and operating their websites and business-critical database-driven web applications on the popular open-source MySQL database. While MySQL is a cost-effective, flexible, and scalable platform that is preferred by many developers, the burden of deploying, managing, maintaining, securing, protecting, and tuning the database and associated components often falls upon the developers themselves. For many organizations, managing a large number of on-premises MySQL instances has become complex and costly from an operational perspective. Developers' time is better spent developing applications and innovating new solutions rather than managing databases, resulting in improved developer productivity and faster application delivery, as well as improved product quality and capabilities.

ESG validated that, by migrating on-premises MySQL instances to the fully managed Azure Database for MySQL, organizations have reported significant operational savings, have reduced risk, and have improved the speed of application development and delivery. ESG's modeled scenario predicts that a medium-sized development organization with 26 developers and 200 MySQL instances could realize savings of up to 48% over a three-year period including an 86% lower cost of administration. They could also realize improved revenue of \$15.5M with earlier release of products, improved application uptime, and improved product quality by leveraging Azure Database for MySQL, resulting in a 92% return on investment (ROI).



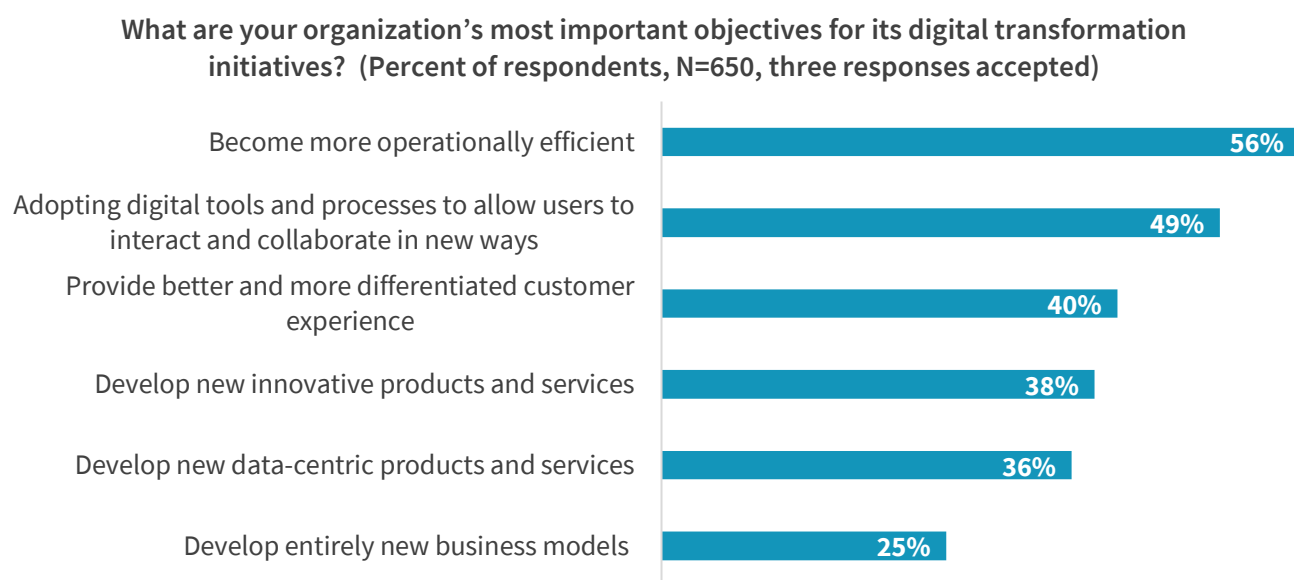
Introduction

This ESG Economic Validation focused on the quantitative and qualitative benefits organizations can expect when migrating on-premises MySQL instances to the fully managed Microsoft Azure Database for MySQL.

Challenges

The open-source MySQL relational database is a proven and popular choice for organizations to power their websites and business-critical web applications. In addition, to better support containerization and application modernization efforts, many organizations plan to move some of their costly and feature-rich enterprise commercial relational databases to MySQL instances in the cloud. MySQL provides interoperability with other relational databases and is cost-effective, customizable, feature rich, reliable, and scalable. While many developers have built the expertise required to deploy, manage, and maintain MySQL databases to power their applications, the burden of managing, updating, tuning, protecting, and ensuring high availability for MySQL instances across multiple applications takes valuable cycles away from development of core applications. In addition, having developers manage their own MySQL databases introduces risk and potential bottlenecks into DevSecOps workflows and interrupts streamlined application development and delivery, which are key goals of modern organizations looking to speed digital transformation efforts. Dedicated security and infrastructure teams can remove some burden away from developers, but this can greatly increase cost and limits developer agility when they must wait for resources. As shown in Figure 1, ESG's latest research finds that becoming more operationally efficient remains the most common objective for digital transformation initiatives.¹

Figure 1. Most Important Objectives for Digital Transformation Initiatives



Source: Enterprise Strategy Group

Continuing to operate MySQL instances on-premises limits the operational agility of transformed organizations due to the lack of support and expertise, dependency on valuable developers' time and efforts, and cost and effort required to manage and maintain on-premises infrastructure. Today's businesses and applications need to maximize agility. Running MySQL on cloud VMs eliminates the issues of physical infrastructure, but the challenges of managing and maintaining the operating system, middleware, and database still exist. More importantly, increasing security concerns, rapidly changing application requirements, and a need to capitalize on continually shifting windows of business opportunities demand that development organizations maximize operational efficiency to better support their needs. Transformed organizations

¹ Source: ESG Research Report, [2021 Technology Spending Intentions Survey](#), January 2021.

require a modern solution that allows developers to better focus on developing applications rather than supporting infrastructure and MySQL database instances.

The Solution: Migrate and Modernize MySQL Databases to Microsoft Azure

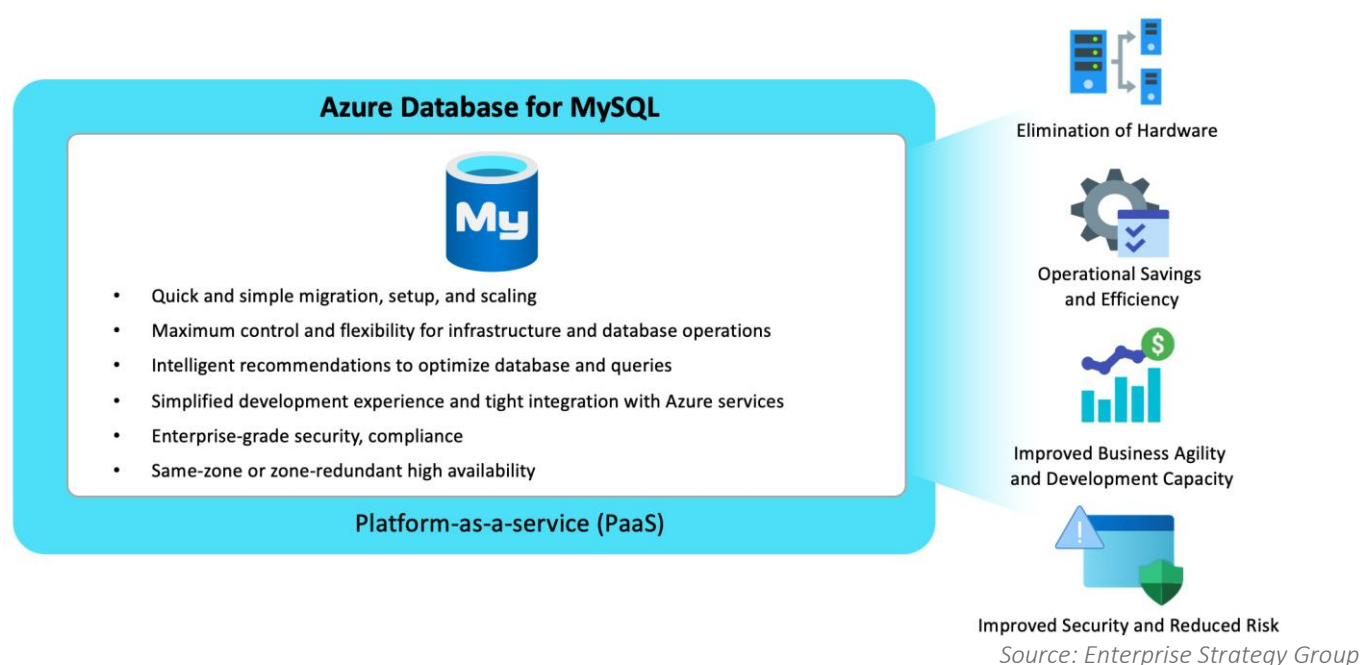
Microsoft Azure makes it simple, quick, and secure to lift and shift MySQL server workloads to a hosted virtual machine infrastructure-as-a-service (IaaS) or maximize operational agility and savings with a hosted platform-as-a-service (PaaS).

Azure Database for MySQL (PaaS) is a fully managed MySQL database engine based on the stable version of MySQL community edition. Azure Database for MySQL leverages the differentiated features of Azure and provides intelligent performance recommendations, the ability to query performance insights, simple integration with Azure services, and is available in two deployment modes:

- **Flexible Server** is a fully managed database service that provides granular control and flexibility over database management functions and configuration settings. The service provides control over scheduling maintenance windows, infrastructure choices, and security configurations. The flexible server architecture allows users to opt for high availability within the same availability zone and across multiple availability zones minimizing downtime for business-critical applications and workloads. Flexible Server also provides cost optimization controls with the ability to start/stop servers and burstable SKUs, which are ideal for workloads that do not need full compute capacity continuously. ESG's analysis in this report refers to the Flexible Server deployment option.
- **Single Server** is a fully managed database service with minimal capabilities for customizations of the database. The Single Server deployment option is designed to handle most of the database management functions such as patching, backups, high availability, and security with minimal user configuration and control.

MySQL on Azure VMs (IaaS): MySQL Server can be run inside a managed virtual machine on the Azure cloud platform. All recent versions and editions of MySQL can be installed in the virtual machine. While operational savings are achieved by eliminating hardware, MySQL instances must be managed, maintained, secured, and tuned as they would be on-premises.

Figure 2. Azure Database for MySQL



ESG Economic Validation

ESG completed a quantitative economic analysis on Azure Database for MySQL. ESG's Economic Validation process is a proven method for understanding, validating, quantifying, and modeling the economic value propositions of a product or solution. The process leverages ESG's core competencies in market and industry analysis, forward-looking research, and technical/economic validation. ESG conducted in-depth interviews with end-users to better understand and quantify their experiences when migrating on-premises and cloud VM installations of MySQL instances to Azure and learn how Azure Database for MySQL has provided savings and benefits to their organizations. The qualitative and quantitative findings were used as the basis for a simple economic model comparing the solutions.

Azure Database for MySQL Economic Overview

ESG's economic analysis revealed that organizations had greatly benefitted by migrating on-premises MySQL instances to Azure Database for MySQL. We found that customers reported savings and benefits in the following three categories:

Elimination of Costs, *Operational Savings*, and *Improved Business Agility*.



Elimination of Cost

ESG found that by migrating on-premises MySQL instances previously running on-premises to the Azure cloud, organizations were able to greatly reduce or eliminate costs in several areas:

- **Elimination of Hardware** – By moving to the Azure cloud, organizations no longer had to plan, purchase, deploy, maintain, operate, and refresh hardware, including servers, networking switches, storage, adapters, cables, and racks, to host the database. Hardware that was already owned could be repurposed or decommissioned.
- **Elimination of Infrastructure-related Costs** – By eliminating the need for hardware, customers were able to reduce or eliminate thousands of dollars per year, including costs for powering, cooling, and providing floorspace for the equipment to operate the hardware.
- **Elimination of Hypervisors** – By no longer running SQL databases on VMs on-premises, organizations could eliminate costly virtualization licenses, support contracts, and middleware.
- **Reduction in MySQL commercial subscriptions** – Those organizations that migrated to Azure Database for MySQL could save hundreds of thousands of dollars per year by not having to pay for annual commercial subscriptions that range from \$2K to \$10K per instance. Azure Database for MySQL includes many of the benefits that these subscriptions provided, especially for those environments that required advanced features, clustering, or high availability requirements.

“We used managed services because with our limited and small team, we could focus on the application and solving problems for our customers instead of spending time managing the infrastructure.”



Operational Savings

Perhaps one of the largest driving factors behind leveraging Azure Database for MySQL was the operational savings that could be achieved by application developers and operations teams tasked with managing, monitoring, maintaining,

tuning, securing, scaling, and protecting the database by greatly reducing or eliminating the need to perform many of the tasks that had been required on-premises. Customers reported operational savings were achieved as a result of:

- **No Infrastructure to Manage/Maintain** – Developers and operations teams no longer had to perform tasks around purchasing, deploying, configuring, updating, patching, and troubleshooting hardware for their databases, freeing up several person days of activity each month. Similarly, administrators did not need to manage, monitor, troubleshoot, and maintain hypervisors, the associated storage systems, and any integration with other components or middleware. In addition, Azure Database for MySQL eliminated the need to install, manage, and maintain an operating system for the database, as this was fully managed by Azure.
- **No Database to Manage/Maintain (PaaS)** – Azure Database for MySQL users no longer had to manage and maintain individual instances of MySQL database. Azure services provided fully tested and stable versions of MySQL with the single server option or more customizable versions of MySQL and compute instances to better accommodate the individual needs of applications and provide additional savings and benefits with Flexible Server. One customer reported a 25% reduction in resources required to manage MySQL when moving from Azure VMs to Flexible Server.
- **Simplified Security and Availability** – Customers identified security and availability as two areas in which they felt they lacked expertise and often lost sleep over. Azure cloud provided them with built-in security and availability, giving developers and administrators better peace of mind. In addition, Azure Database for MySQL offerings include built-in SLAs, and can provide enhanced security and availability options such as encryption, with the ability to bring your own key, zone-redundant high availability, and geo-redundant backup and restore.

“Now that we migrated to Microsoft Azure, I don’t need to worry about all the IT operational aspects, like backups and updates, and that’s a huge benefit for my team.”

Table 1 summarizes and compares some of the relative costs (indicated by a dollar sign ) and person-hour effort required (indicated by an administrator ) to operate SQL database instances on-premises and on Azure from a high level.

Table 1. Comparison of Costs and Effort to Operate MySQL Databases On-premises versus in Azure

	On-premises MySQL Instances	Azure Database for MySQL
Cloud Expenses	-	
Purchase, Manage, & Maintain Hardware	 	-
Purchase, Manage, & Maintain Hypervisor	 	-
Manage/Maintain OS		-
Purchase MySQL Commercial Subscriptions		-
Manage/Maintain Database		-
Optimize Performance	 	-
Manage Security	 	-
Manage Availability	  	-

Source: Enterprise Strategy Group



Improved Business Agility

While organizations reported significant cost savings and operational benefits, many were more excited to talk about some of the ways that Azure Database for MySQL has helped to modernize their applications and transform their business by allowing them to achieve new objectives and greatly improve business agility:

- **Faster Time to Value** – Organizations reported that they were able to deploy new database instances and scale existing database instances far quicker on Azure Database for MySQL, saving them weeks of planning, installing, configuring, etc. This means databases could begin to see value and improvements months earlier.
- **Faster Migration and Modernization** – Azure’s free migration tools, guides, and proven methodologies helped customers to quickly and seamlessly migrate their on-premises and cloud VM MySQL instances to Azure Database for MySQL while minimizing impact to existing operations and greatly reducing risk to the organization.
- **Improved Application Performance** – Tuning MySQL for optimal performance requires advanced knowledge and experience. Azure Database for MySQL is pre-configured and tuned and provides intelligent performance recommendations to ensure peak performance. When customers that had previously run MySQL on cloud VMs moved to Azure Database for MySQL on the same instance type, they immediately saw noticeable performance increases, saving the expense of contracting or hiring experts to optimize and tune the databases.
- **Increased Flexibility and Business Agility** – Azure Database for MySQL provided organizations the perfect balance between cost, hands-off operational savings, and the controlled flexibility to better meet specific sets of requirements demanded by specific applications. Customers were able to choose the best infrastructure and MySQL version to power their application, while maintaining control over maintenance windows and certain functional, availability, and security features. In addition, the ability to start and stop instances, scale up or scale back deployments, and scale storage IOPS independent of storage allowed organizations far better control over the cost of their solutions, especially when business demands changed dramatically.
- **Faster Integration of Azure Services** – Customers reported that they were easily able to integrate and take advantage of other Azure cloud-based services that helped to accelerate new development efforts and enable new and powerful features to be built into their applications. Hosted services like Active Directory enabled customers to further reduce operational costs. Azure’s powerful AI/ML services helped minimize time to build complex analytics features into applications, providing new insights to both organizations and their customers.
- **Increased Development Velocity** – By freeing developers and operations teams from many of the burdens of dealing with infrastructure, middleware, and databases, the customers we spoke with reported that they were able to spend more time developing code and supporting operations. This improved developer capacity led to earlier and more frequent release of new products as well as improved product features and functionality. This

“In gaming services, even a short delay in access can result in poor customer experience and make retention of customers difficult. Being able to control the maintenance window and have greater visibility into the memory state at the OS level allowed us to minimize any downtime to the customers, resulting in a big impact to the revenue of the game.”

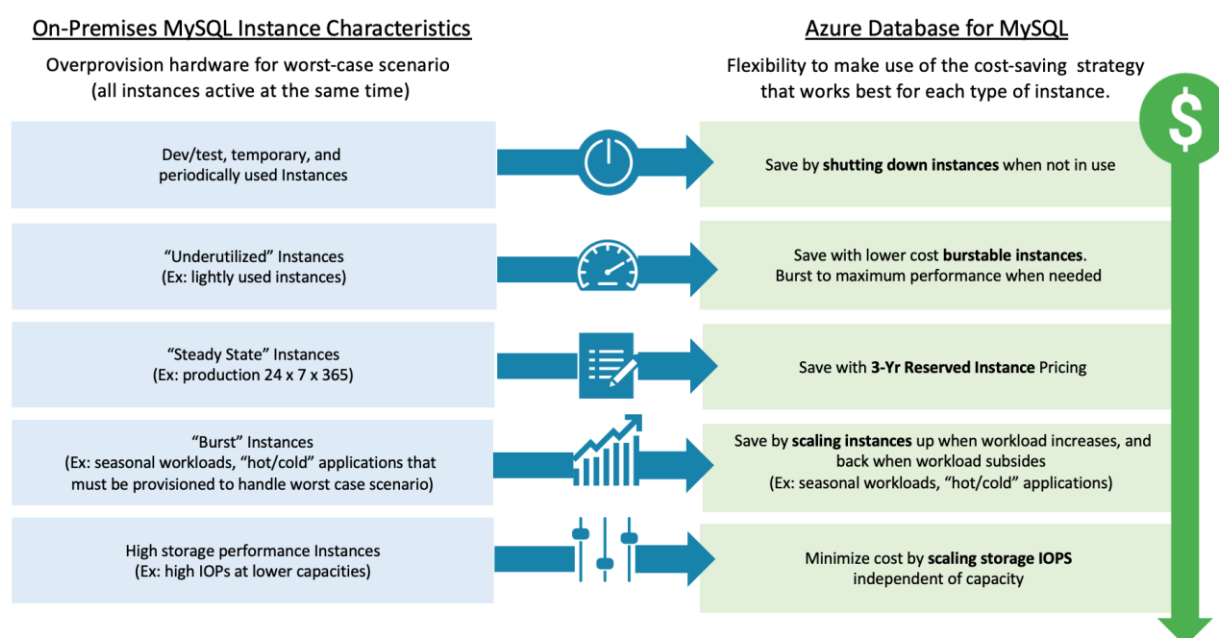
directly translated into earlier recognition of revenue, improved product differentiation, and improved product quality.

ESG Analysis

ESG leveraged the information collected through vendor-provided material, public and industry knowledge of economics and technologies, and the results of customer interviews to create a three-year TCO/ROI model that compares the costs and benefits of migrating on-premises MySQL instances to Azure Database for MySQL with the cost to continue to operate existing on-premises deployment and/or refresh the existing on-premises environment with the latest hardware. ESG's interviews with customers who have recently made the transition, combined with reviews of existing case studies, ESG's experience and expertise in economic modeling, and technical validation of similar Azure PaaS database offerings helped to form the basis for our modeled scenario.

Our modeled scenario was based on a mid-sized development organization with a total of 26 developers and a total of 200 active MySQL instances. We assumed the organization had a total of 100 instances being used for internal applications and operations with varying levels of criticality, 50 business-critical production instances providing services for commercial revenue-generating applications, and a total of 50 instances being used in development and testing of new application product features, bug fixes, and proofs of concept. Appendix Table 2 summarizes the assumptions and assumed usage characteristics used in our modeled scenario for each of the instance types. ESG started by modeling the costs to deploy, manage, and maintain on-premises hardware for all instances. While on-premises deployments must provision hardware to handle the worst-case utilization scenarios for all instances, MySQL instances on Azure Database for MySQL may benefit from a number of cost-saving strategies based on the performance and scaling characteristics, required uptime, and usage patterns of the instance. ESG took these into consideration when pricing the cost of the Azure solution. Steady state instances with rigid requirements can benefit greatly with 3-year reservation discounts of up to 61%, while underutilized instances can leverage economical burstable instances or save by being shut down when not in use. A summary of some of these instances and more cost savings measures used in our analysis is shown in Figure 3.

Figure 3. Cost-saving Strategies Provided by Azure Database for MySQL



Source: Enterprise Strategy Group

ESG's 3-year modeled scenario considered the following costs:

- **Cost of Purchasing and Operating On-premises Infrastructure:** This includes the cost to purchase new bare metal and virtualized servers, network and SAN switches, and SAN storage arrays to handle the requirements of all instances (on-premises refresh scenario only), as well as the cost of support/maintenance contracts, and power/cooling/floorspace for the hardware. While there would be no capital spending for the “continue to operate existing hardware” case, ESG assumed higher support and maintenance costs for extended contracts, as well as slightly higher power/cooling costs for older hardware.
- **Azure Cloud Spending:** ESG's model assumed the latest default East US pricing for the Azure Database for MySQL. ESG modeled the cost for compute (3-year reserved instances for steady state instances and pay-as-you-go for start/stop, burstable instances, and 3-year growth scenarios. Storage costs assumed an average of 50% of provisioned instance capacity was backups, and commercial instances required 1,500 IOPS per instance (additional IOPS beyond that provided with capacity priced at additional published cost).
- **MySQL Support and Maintenance:** ESG assumed that the majority of instances leveraged MySQL Community Edition, but 25% of internal and commercial production instances required the additional visibility, availability, and security functionality provided by the MySQL Standard and Enterprise Editions respectively. While this functionality is provided for free with Azure Database for MySQL, eliminating these costs, ESG did assume that Azure support contracts were maintained for these instances to provide quick resolution of any critical issues that arise.
- **Administration Costs:** ESG's detailed models predicted the cost to administer and maintain the on-premises hardware, networks, hypervisors, and operating systems based on known metrics provided by previous modelling and research. ESG's model of the cost of MySQL administration considered the one-time cost to install, deploy, and configure instances, as well as the time spent to manage user accounts, perform updates and maintenance, tune and balance for optimal availability and performance, perform backup and recovery tasks, and ensure security and availability of the deployment.

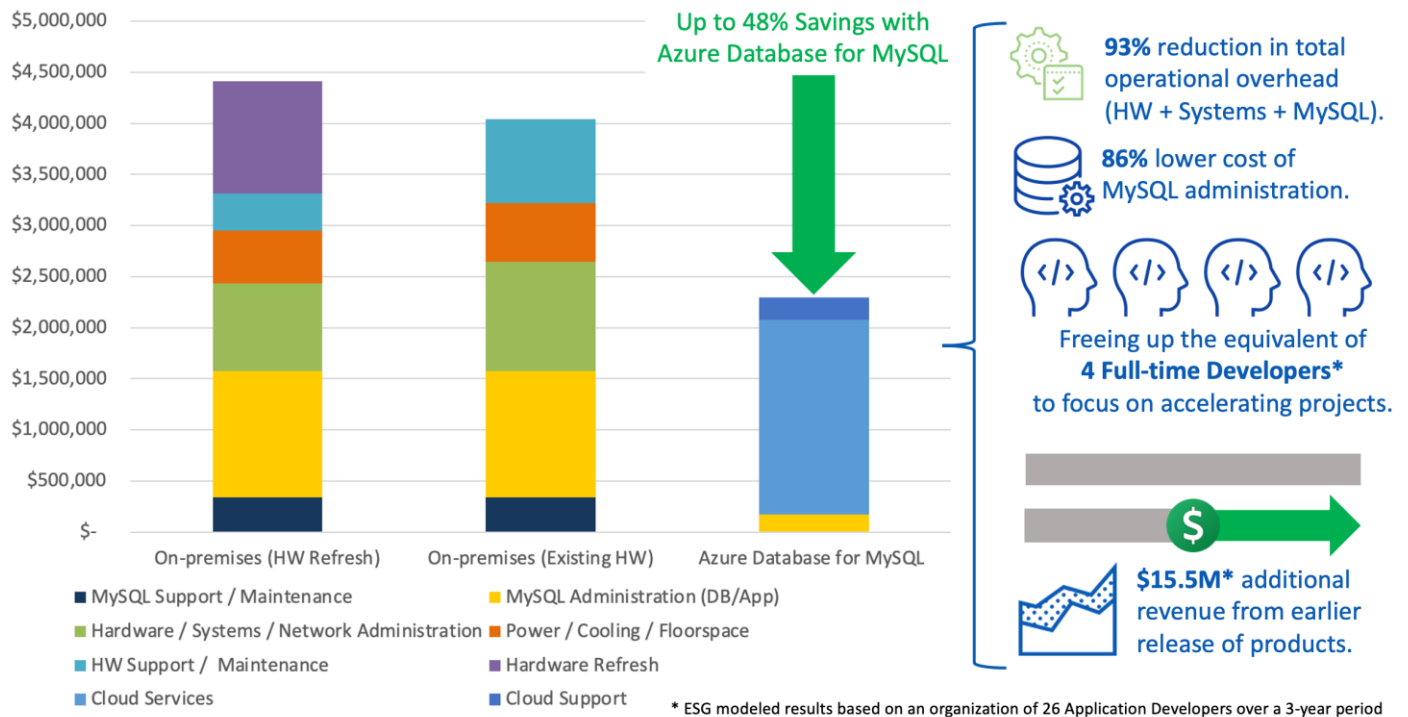
Why This Matters

Modern organizations need to develop software quicker to deliver the features and service levels demanded by their customers.

ESG's modeled scenario predicts that, by migrating on-premises workloads to Azure Database for MySQL, organizations can expect to reduce costs by up to 48% while eliminating up to 93% of the total operational overhead, allowing developers to focus on developing applications rather than managing the database.

ESG's conservative models found that Azure Database for MySQL provided up to a 48% lower total cost over a three-year period to deliver the services to host, secure, and protect MySQL instances. This included an enormous 93% reduction in the operational cost to deploy, manage, and maintain MySQL instances on on-premises infrastructure. Even if we do not consider the cost to deploy, manage, and maintain the infrastructure, operating systems, and virtualization layers that no longer need to be dealt with, Azure Database for MySQL offloads the majority of the work currently performed by developers, reducing the expected cost to administer, tune, secure, protect, and maintain the MySQL databases by up to 86%. This savings equates to roughly 4 full-time developers' worth of productivity saved, an overall 20% increase in development capacity. Using a standard hiring assumption of \$1M of annual revenue/developer, a 20% increase results in a \$15.5M in additional expected revenue for the organization of 26 developers over the three-year period. The results of ESG's modeled 3-year scenario are shown in Figure 4.

Figure 4. Expected 3-Year Savings and Benefits of Azure Database for MySQL



Source: Enterprise Strategy Group

Issues to Consider

While ESG's models are built in good faith upon conservative, credible, and validated assumptions, no single modeled scenario will ever represent every potential environment. ESG recommends that you perform your own analysis of available products and consult with your Azure representative to understand and discuss the differences between the solutions proven through your own proof-of-concept testing.

The Bigger Truth

As organizations look to modernize and support their business through successful digital transformation efforts, a number of critical factors must be addressed. These organizations are looking to streamline operations while reducing operational cost and improving business agility. Whether your organization has historically built applications powered by the cost-effective and open-source MySQL database or another relational database solution, hosting these services on-premises is costly, complex, and cumbersome. Modern organizations are now looking to the cloud and to MySQL to modernize and refactor their applications based on efficient microservice architectures that are dynamically hosted, scaled, protected, secured, and delivered on containerized Kubernetes platforms.

ESG validated that customers that have migrated and modernized their on premises MySQL databases to Azure Database for MySQL have achieved significant cost savings and operational benefits while accelerating their application development and delivery capabilities and improving business agility. ESG's three-year modeled scenario predicted a 48% reduction in cost to provide services for up to 200 commercial, internal production, and test/dev instances of MySQL databases with the added benefit of shortening the expected release time and increasing revenue by \$15.5M without the need to grow a team of 26 developers.

"With Azure Database for MySQL, our need for technical skills doesn't have to be extraordinary because we don't need to worry about how the infrastructure or database works to use it...It's serverless, and I don't need to spend time worrying about licensing, software, patches, disk space, or security."

If you are looking to migrate and modernize existing on-premises MySQL and relational databases to the cloud to reduce costs and optimize security, availability, and performance while maximizing the productivity of your developers and IT resources, ESG suggests that you consider the fully managed Azure Database for MySQL.

Appendix

Table 2. Summary of MySQL Instance Assumptions used in ESG's Modeled 3-Year Analysis

	Light Dev / Web Server	Dev / Test Instances	Internal Production Instances	Commercial Production Instances
Quantity of MySQL Instances	25	25	100	50
Average Annual Hours of Operation	4,380 (Avg. 50% Utilization)	4,380 (Avg. 50% Utilization)	8,760 (24 x 7 x 365)	8,760 (24 x 7 x 365)
Average Per-instance Requirements	• 2 Cores / Server • 4 GB Mem • 120 GB Storage	• 4 Cores / Server • 16 GB Mem • 240 GB Storage	• 8 Cores / Server • 32 GB Mem • 480 GB Storage	• 16 Cores / Server • 64 GB Mem • 800 GB Storage
On-Premises Deployment	• 100% Virtualized @ 8:1 • 13 Virtualized Servers • MySQL Community Edition Local R1 SSDs (OS/Virt.) • Shared SAN Storage Array	• 100% Virtualized @ 4:1 • 13 Virtualized Servers • MySQL Community Edition Local R1 SSDs (OS/Virt.) • Shared SAN Storage Array	• 60% Virtualized @ 4:1 • 40 Bare Metal Servers • 15 Virtualized Servers • MySQL Standard Edition (25%) and Community Edition (75%) • Local R1 SSDs (OS/Virt.) • Shared SAN Storage Array	• 60% Virtualized @ 4:1 • 20 Bare Metal Servers • 8 Virtualized Servers • MySQL Enterprise Edition (25%) and Community Edition (75%) • Local R1 SSDs (OS/Virt.) • Shared SAN Storage Array
Azure Database for MySQL Deployment	• B2S Burstable Instances • 120 GB Storage / Instance • MySQL Community Edition	• D4v4 • 240 GB Storage / Instance • MySQL Community Edition	• D8v4 • 480 GB Storage / Instance • MySQL Community Edition	• D16v4 • 800 GB Storage / Instance • MySQL Community Edition
Qty "Steady State" Instances (100% Resources for 3 years)	25 Pay as you go	0	40 3-Year Reserved Instance	25 3-Year Reserved Instance
Qty of "Start/Stop" Instances (Instances stopped for savings)	0	25 (stopped 50% of time) Pay as you go	40 (stopped 30% of time) Pay as you go	0
Qty of "Growth" Instances (Resources grow over 3 Years)	0	0	20 (50% annual growth) Pay as you go	25 (50% annual growth) Pay as you go

Source: Enterprise Strategy Group



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