Improving database performance and value with an easy migration to Azure Database for MySQL – Flexible Server with AMD EPYC

Migrating from Azure Database for MySQL – Single Server to a Flexible Server solution was quick and provided performance and cost benefits

If your organization currently uses Azure Database for MySQL – Single Server, the time has come to migrate your databases onto new Azure Database for MySQL – Flexible Server instances. Microsoft has scheduled Single Server for retirement on September 16, 2024, so moving your MySQL databases now can ensure you maintain business continuity.[1]

At Principled Technologies, we completed hands-on performance testing of both Flexible Server and Single Server, explored the cost differences between the two solutions, and migrated a database to Flexible Server using Azure Database for MySQL Import.

Using the sysbench benchmark, we found that Azure Database for MySQL – Flexible Server with AMD EPYC™ processors significantly improved online transaction processing (OLTP) performance at multiple thread counts and offered better performance per dollar than comparable Single Server instances. Plus, using the Azure Database for MySQL Import method made the migration from Single Server to Flexible Server quick and easy. Because Azure Database for MySQL – Flexible Server with AMD EPYC improves performance, offers better value, and makes the migration process easy, organizations needn't fret and put off moving to the new solution any longer. Move from Single Server to Flexible Server today to ensure no disruption to your business operations.

*Compared to the Azure Database for MySQL - Single Server instance we tested

Stronger OLTP performance
Up to 117% better performance on sysbench*

Better value
Up to 266% better performance per dollar*

Quick and easy database migration
Azure Database for MySQL Import migrated a 50GB database in just 9m 10s*

What can Azure Database for MySQL – Flexible Server offer your organization?

Like Single Server, Azure Database for MySQL Flexible Server is a fully managed database service—but it offers more control and flexibility over management and configuration than the Single Server option. Flexible Server supports MySQL versions 5.7 and 8.0, features pay-as-you-go pricing, and includes on-demand automatic IOPS scaling that could be ideal for workloads that do not need continuous provisioned storage and I/O capacities.[2]

According to Microsoft, Azure Database for MySQL – Flexible Server provides enterprise-grade security for data at rest and in motion, and facilitates management for large-scale deployments with advanced monitoring and automation. The service also includes customizable maintenance windows, automated backups, point-in-time restores for up to 35 days, and automatic patching and maintenance for hardware, operating systems, and the database engine.[3]

Other benefits of Flexible Server over Single Server include:[4]

- High availability within a single availability zone with the ability for users to choose their desired availability zones for application colocation
- Increased time to stop servers—up to 30 days, compared to a 7-day limit in Single Server
- A burstable compute tier and an automatic IOPS scaling features called autoscale IOPS
- Compute scaling across all tiers, while Single Server restricted scaling in the Basic tier
- For data encryption, service-managed methods instead of the customer-managed keys that Single Server required
- Accelerated logs that can enhance performance by placing logs on local disks instead of remote disks to increase query performance and reduce latency

For more information about Azure Database for MySQL and the Flexible Server option, visit https://azure.microsoft.com/products/mysql/.

How we tested

Using the sysbench benchmark, we compared the OLTP performance of two solutions:

- Flexible Server (Standard_D8ads_v5 with autoscale IOPS): General Purpose,v5, 8 vCores, 128 GB of storage, 32 GB of memory, Autoscale IOPS, using AMD EPYC processors
- Single Server (GP_Gen5_8): General Purpose, Gen 5, 8 vCores, 4,266 GB of GPv2 storage, 40 GB of memory, 12,800 IOPS

We provisioned the Flexible Server instance with a 128GB volume, with Autoscale IOPS and storage autogrowth enabled. To match the Flexible Server instance's maximum disk IOPS of 12,800, we provisioned the Single Server instance with a 4,266GB volume.

After performance testing, we used the Azure Database for MySQL Import tool to complete an example migration of a 50GB database from Single Server to Flexible Server. For more information about the configurations we used as well as step-by-step performance and migration details, read the science behind the report.

About sysbench

Sysbench is an open-source, scriptable, multi-threaded benchmark tool. According to the tool's GitHub repository, sysbench has "low overhead even with thousands of concurrent threads" and can generate and track hundreds of millions of events per second.[5] Users can "evaluate any MySQL database with sysbench to determine the associated reads, writes, queries/second (QPS), transactions/second (TPS), and latency."[6]

Flexible Server offers stronger database performance: Sysbench testing results

The first question your organization may have when planning your move to Azure Database for MySQL – Flexible Server with AMD EPYC processors is what database performance will look like on Flexible Server instances. To find out, we used the sysbench benchmark with a 5-minute run time at multiple thread counts, ranging from 4 threads to 128 threads. Sysbench simulates OLTP performance and reports data in transactions per second (TPS) as well as queries per second (QPS). Sysbench also shows latency, in milliseconds (lower latency is better). We ran each test three times and report the median of three runs. Table 1 shows a summary of our test results, which we expand on below.

Table 1: Median sysbench results at various thread counts with a 5-minute run time. Higher TPS and QPS are better and lower latency is better. Source: Principled Technologies.

Sysbench results Flexible Server (autoscale IOPS enabled) vs. Single Server						
Threads	4	8	16	32	64	128
8vCPU Flexible Server (128GB) (with autoscale IOPS enabled)						
TPS	314.80	616.49	1,104.58	1,709.32	2,073.65	2,180.52
QPS	6,296.07	12,329.74	22,091.59	34,186.37	41,472.97	43,610.48
Latency (ms)	12.70	12.98	14.48	18.72	30.86	58.69
8vCPU Single Server (4266GB)						
TPS	144.73	283.73	564.04	1,076.71	1,586.37	1,905.61
QPS	2,894.69	5,674.63	11,280.74	21,534.25	31,727.84	38,113.42
Latency (ms)	27.63	28.19	28.36	29.72	40.34	67.16
Flexible Server TPS win %	117.51%	117.28%	95.83%	58.75%	30.72%	14.43%

Figure 1 shows the TPS that each solution achieved at different thread counts. These results show that Azure Database for MySQL – Flexible Server offers significant increases in performance that could give users of your MySQL database applications a better overall experience. This could mean that your ecommerce sites can handle more sales, your reservation sites can help customers more easily secure a hotel room, or your online banking applications can handle more customers making transactions.

Sysbench performance | *Transactions per second, higher is better*

■ Flexible Server ■ Single Server

	4 threads	8 threads	16 threads	32 threads	64 threads	128 threads
Flexible Server	314.80	616.49	1,104.58	1,709.32	2,073.65	2,180.52
Single Server	144.73	283.73	564.04	1,076.71	1,586.37	1,905.61

Figure 1: Sysbench transactions per second during testing with a 5-minute runtime at various thread counts. Higher is better.
Source: Principled Technologies.

Figure 2 shows the latency in milliseconds that the instances reported during testing. Across thread counts, Flexible Server offered lower latency than Single Server, which could translate to faster load and response times for database users.

Latency | *Milliseconds, lower is better*

■ Flexible Server ■ Single Server

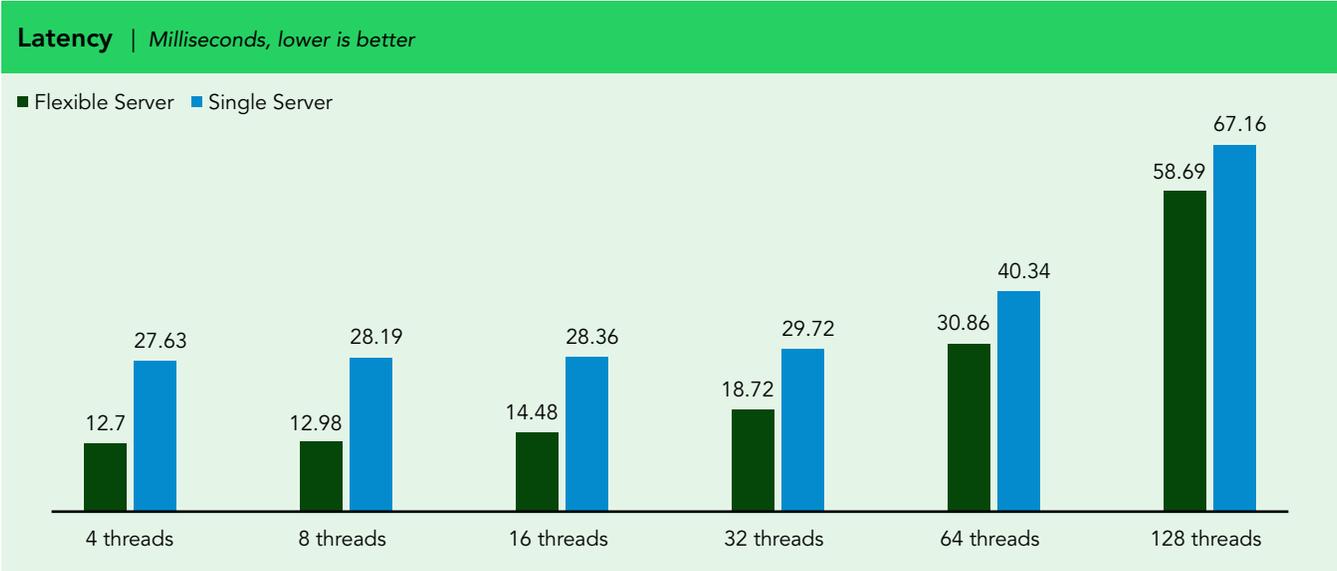|	4 threads	8 threads	16 threads	32 threads	64 threads	128 threads
Flexible Server	12.7	12.98	14.48	18.72	30.86	58.69
Single Server	27.63	28.19	28.36	29.72	40.34	67.16

Figure 2: Latency (in milliseconds) during sysbench testing with a 5-minute runtime at various thread counts. Lower is better.
Source: Principled Technologies.

About the AMD EPYC 7763 processor

In our tests, the Flexible Server instance used the 3rd Gen AMD EPYC 7763v processor—a version of the 7763. The AMD EPYC 7763 features 64 cores, 128 threads, and 256MB cache. Its base speed is 2.45 GHz with a maximum boost clock speed of up to 3.5 GHz.[7] The AMD EPYC 7763v processor powers both General Purpose and Memory Optimized Flexible Server instances for Azure Database for MySQL – Flexible Server. Both instance types offer a range of 2 to 96 vCores and up to 900 MiB/second of I/O bandwidth, while General Purpose instances have up to 384 GB of memory and Memory Optimized instances have up to 672 GB of memory. To learn more about the AMD EPYC 7763 processor, visit https://www.amd.com/en/products/cpu/amd-epyc-7763.

But at what cost? No worries, Flexible Server offers better value

Now that you know you can get better database performance with Azure Database for MySQL – Flexible Server, it's time to look at cost concerns. Our results show that once again, Flexible Server with AMD EPYC provides a better option than keeping your databases on Single Server. In this scenario, we examine the monthly cost to run each instance at peak performance for 1 hour per business day and at 25 percent of peak performance for 7 hours per business day.

For Flexible Server instances using Autoscale IOPS, the number of IO requests affects price, so we estimated cost with that in mind. To approximate the requests portion of the cost estimate, we looked at metrics provided in the Azure portal and took the peak 12 million requests per hour we observed in our testing as our peak performance number. We then used that number in the scenario described above, combined with the monthly cost of compute and storage for the instance, to obtain an estimate of monthly usage to compare to the static monthly cost of the Single Server instance. Using this method, we estimated that the total monthly cost of Flexible Server solution would be $712.87 and the cost of the Single Server solution would be $1,202.49. For more details, see the science behind the report.

Table 2 shows the normalized performance per dollar that each instance achieved at different thread counts (higher TPS/dollar is better). Across the numerous thread counts we tested, Flexible Server with AMD EPYC would improve performance/dollar by a range of 93 to 266 percent. With Azure Database for MySQL – Flexible Server, organizations could pay up to 266 percent less for the same performance, helping them accomplish more work while remaining in budget. This data shows that organizations moving to Flexible Server can likely expect better value than they are currently getting by continuing to use Single Server instances.

Table 2: Performance per dollar comparison of Azure Database for MySQL – Flexible Server vs. the older Single Server offering. Higher numbers are better. Source: Principled Technologies.

Performance per dollar			
Number of threads	Flexible Server TPS/dollar	Single Server TPS/dollar	% win
4	0.44	0.12	**266.9%**
8	0.86	0.24	**266.5%**
16	1.55	0.47	**230.3%**
32	2.40	0.90	**167.7%**
64	2.91	1.32	**120.5%**
128	3.06	1.58	**93.0%**

Energy usage with AMD EPYC processors

Recent tests have shown that two-socket AMD EPYC 7763 processor-powered servers demonstrated up to 85% better energy efficiency than the most comparable non-AMD-based servers.[8] AMD studies show organizations were able to consolidate multiple servers onto fewer servers, reducing energy and green house gas emissions and thereby reducing operating expenditures including power usage, rack footprint, and more.[9]

To learn about AMD energy efficiency initiatives, visit https://www.amd.com/en/campaigns/epyc-energy-efficiency.

Using Azure Database for MySQL Import service for a quick and easy migration

If you are concerned about migrating your organization's databases from existing Single Server instances onto new Flexible Server instances, don't be. Azure Database for MySQL Import, a command-line interface function the Microsoft recently released, makes it easy to move your databases onto the newer solution.

The time to migrate a 50GB database from an 8vCPU Single Server instance to a similarly configured Flexible Server instance with AMD EPYC using Azure Database for MySQL Import was just 9 minutes and 10 seconds, which shows how quickly and easily you can have your database running on the new instance.

According to Microsoft, Azure Database for MySQL Import can "efficiently migrate large data sets, keep data private, and ensure data integrity"[10] while streamlining the process of data migration. To see how we completed our migration using Azure Import, read our step-by-step guide in the science behind the report.

To learn more about Azure Database for MySQL Import, visit https://azure.microsoft.com/en-us/products/storage/import-export.

Make the easy move to Azure Database for MySQL – Flexible Server and reap performance and cost benefits

Don't put off migrating your databases from Azure Database for MySQL – Single Server until the last minute— which is September 2024, when the service will end. Our hands-on testing shows that moving to Azure Database for MySQL – Flexible Server is a simple process that can actually improve your overall database performance and offer better value. With as much as 117 percent better OLTP performance on sysbench and up to 266 percent better performance per dollar, migrating your database to Azure Database for MySQL – Flexible Server with AMD EPYC processors can help you serve more database users and potentially improve your operating budget compared to the expiring Single Server option.

1. Microsoft, "What's happening to Azure Database for MySQL – Single Server?," accessed February 1, 2024, https://learn.microsoft.com/en-us/azure/mysql/single-server/whats-happening-to-mysql-single-server.

2. Microsoft, "What is Azure Database for MySQL – Flexible Server?," accessed February 1, 2024, https://learn.microsoft.com/en-us/azure/mysql/flexible-server/overview-single.

3. Microsoft, "What is Azure Database for MySQL – Flexible Server?"

4. Microsoft, "What is Azure Database for MySQL – Flexible Server?"

5. Github, "akopytov/Sysbench," accessed January 29, 2024, https://github.com/akopytov/sysbench.

6. Hussein, Bashar, "Benchmarking Azure Database for MySQL – Flexible Server using Sysbench," accessed January 29, 2024, https://techcommunity.microsoft.com/t5/azure-database-for-mysql-blog/benchmarking-azure-database-for-mysql-flexible-server-using/ba-p/3108799.

7. AMD, "AMD EPYC 7763," accessed February 2, 2024, https://www.amd.com/en/products/cpu/amd-epyc-7763.

8. AMD, "AMD EPYC 7003 Series Processors," accessed February 20, 2024, https://www.amd.com/en/processors/epyc-7003-series.

9. AMD, "Data Center Sustainability," accessed February 1, 2024, https://www.amd.com/en/corporate/corporate-responsibility/data-center-sustainability.html#:~:text=In%20addition%20to%20the%20environmental,and%20may%20require%20fewer%20servers.

10. Microsoft, "Azure Import/Export," accessed February 1, 2024, https://azure.microsoft.com/en-us/products/storage/import-export#features.

Read the science behind this report at https://facts.pt/XwV3mP5 ▶

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