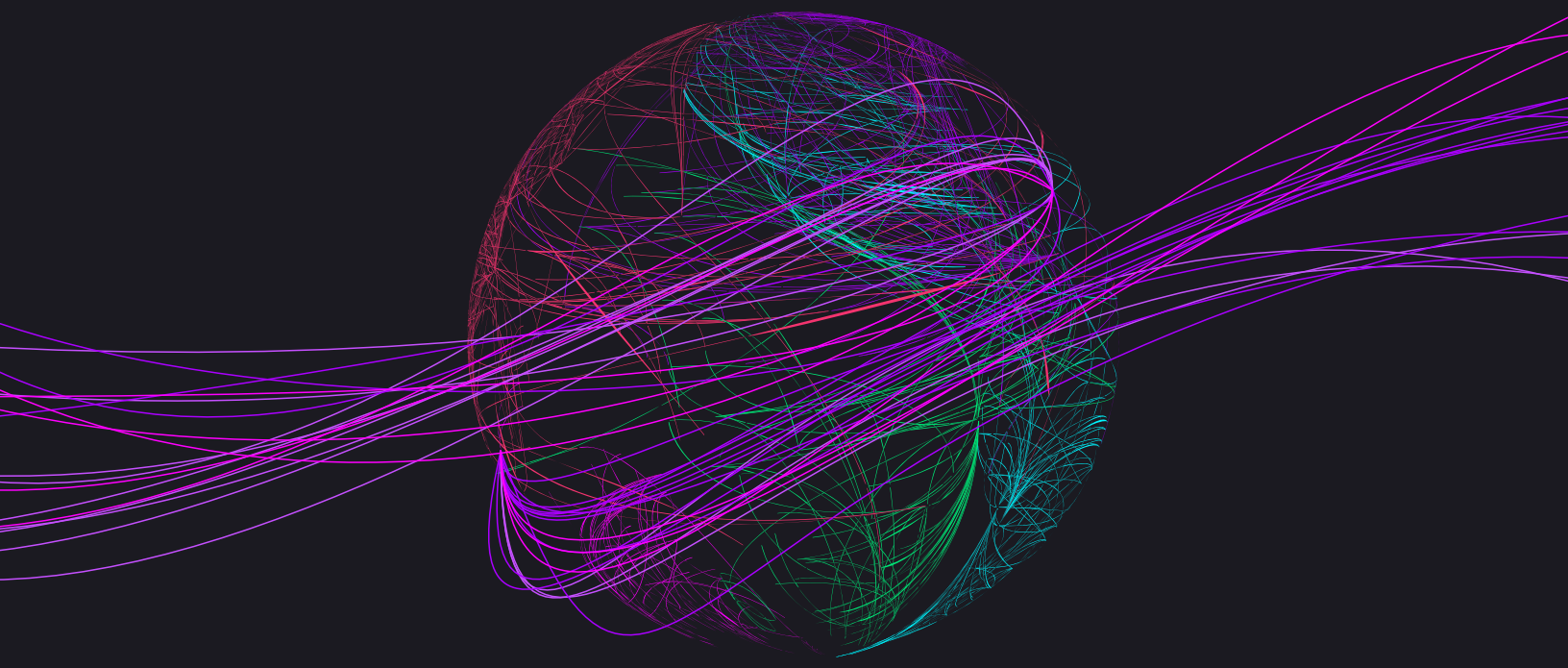
SingleStore

A 5-Step Guide to Supercharging Your SaaS Apps

Powering Modern Data Applications with SingleStoreDB



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Dear Fellow Developer and Database Technologist

When Tesla named their turbo mode "ludicrous" it sounded crazy — but people were more than pleasantly surprised to learn that it was indeed "ludicrously fast". Going from zero to 60 mph in 2.2 seconds literally takes your breath away, and leaves you in awe of the engineering marvel.

Wouldn't it be great to get that kind of customer reaction to your application experience?

Modern SaaS applications provide responsive, data-driven user experiences. They are cloud-native, distributed and composed of microservices and APIs. They are also data intensive in that the data processing of transactions and analytics is the gating factor, rather than being compute-bound or storage-bound, which the cloud has already solved. Modern SaaS apps are built to deliver real-time information and have the ability to scale to millions of users, on demand, everywhere. Whether users are choosing stocks or viewing the leaderboard, considering recommended content or redeeming points, those analytic queries present a constant challenge for Saas application developers to scale data infrastructure without slowing services or showing customers the dreaded spinning pinwheel.

Speed matters. In a competitive market, ludicrously fast customer experience (CX) is everything.

This eBook tells the story of three superstar application developers-Jack Ellis from Fathom Analytics,

Josh Blackburn of IEX Cloud and Gerry Morgan of Daily-Vest--who hit the accelerator on the analytics within their Saas products by improving the experience and speed by 50x and giving users the thrill of their own version of Ludicrous mode.

Read on to learn more about the 5 steps these developers took before choosing SingleStoreDB as the database engine to power their great customer experiences with real-time, interactive data analytics. Ludicrously fast.

Step 1: Scope the Problem
Step 2: Do Your Research
Step 3: Choose Wisely
Step 4: Talk With an Expert
Step 5: Migrate With Ease

Sincerely,
Domenic Ravita,
Field CTO

Meet the developers

Jack Ellis

fathom/

Jack is CTO and co-founder of Fathom Analytics, a SaaS firm that believes website analytics should be simple, fast and privacy focused. Fathom, now powered by SingleStoreDB, delivers a simple, lightweight, privacy-first alternative to Google Analytics. Jack chronicled his company's every step of their move from MySQL to SingleStoreDB in a detailed and very entertaining blog post, which also went viral in the developer community on Twitter. Here are a few highlights:

- First, there's the title of Jack's blog: "Building the world's fastest website analytics."
- The first sentence of the blog captures Fathom Analytics' enthusiasm for SingleStoreDB, too: "In March 2021, we moved all of our analytics data to the **database of our dreams.**"
- Of the SingleStoreDB sales process Jack said, "[T]his wasn't a sales call. This was a call where I could ask for help from engineers with 100x more knowledge than me, who have solved challenges for companies far larger than ours."

Josh Blackburn

iex cloud

Josh is co-founder and head of technology at IEX Cloud, a data infrastructure and delivery platform for financial and alternative data sets that connects developers and financial data creators. IEX Cloud is part of IEX Group, best known for the Investors Exchange. This US stock exchange was featured in Michael Lewis's book "Flash Boys", a literary bombshell that shook Wall Street.

Josh's team builds high-performance APIs and real time streaming data services used by hundreds of thousands of applications and developers-IEX Cloud has more than 130,000 users worldwide, and processes 1.2 billion API messages daily at 800,000 peak data operations per second.

In a webinar discussing why he chose SingleStoreDB Josh said, "The [SingleStoreDB] support for Apache Kafka has been phenomenal, especially as we are trying to **process hundreds of thousands of real-time prices.** That's just been an amazing feature. SingleStoreDB actually solved all of our problems for our use case, all in one database. It's very aptly named:'

Gerry Morgan

dailyVest

Gerry is lead developer at DailyVest, a fintech company using 401(k) participant data and analytics to improve the health and performance of retirement plans. Each month corporate clients upload investment and participant data to the cloud, where DailyVest assesses the "health" of each retirement plan; the firm analyzes the performance of $596 billion in assets, incorporating 3.3 billion transactions and the activity of 12.3 million anonymized participants. DailyVest then turns its customers' big data into digestible insights delivered via visual dashboards.

Sharing his experiences in a webinar with SingleStoreDB, Gerry said, "In initial benchmarking our stored procedures were up to three times faster, and we saw a **90% improvement in the time that it took to copy databases and restore them.** It was taking about an hour to do that in Azure SQL. The time is reduced to about four minutes in SingleStoreDB which, as far as we were concerned, was unbelievably good."

STEP 1

Scope the problem: A maxed-out database

They had all hit the wall.

Jack, Josh and Gerry all found SingleStoreDB through their individual quests to solve a common pain point: they had databases that could no longer keep up with the demands of their business.

What Fathom, IEX Cloud and dailyVest all have in common is that their applications qualify as data intensive — they need to offer fast, interactive experiences for thousands (or hundreds of thousands) of users on-demand, everywhere and in real time. And when it comes to powering these data-intensive applications, your underlying data engine makes all the difference.

Unfortunately, most organizations start with first-generation, open-source single-node databases to power their SaaS applications — quickly running into performance bottlenecks as analytics demands grow, or as applications need to scale. MySQL and PostgreSQL are among the most widely adopted and popular open-source databases on the planet, preferred by developers for how quickly, easily and cost-effectively they can get started. Unfortunately, these legacy, single-node architectures aren't built to handle analytics; as operations and data start to scale, their performance quickly deteriorates, leading to sluggish event-to-insight response times and rising costs. Even more, these databases aren't optimized to handle high throughput streaming ingestion, low-latency analytics and concurrency needs that digital disruptors — and their customers — demand.

Key Challenges With Legacy Gen-1 Data Engines

Streaming Ingestion

Inability to ingest, process and analyze streaming data necessary to power modern interactive SaaS applications

Low-Latency Query Performance

Lagging query performance as data or concurrency demands grow. Not optimized for low-latency queries

Challenges with Scaling

Built on single-node architectures and struggles to scale as your business or users grow

Minimal Analytical Capabilities

Offers little to no analytical capabilities to drive fast, interactive user experiences

fathom/

Fathom Analytics: Jack stumbled across SingleStoreDB on Twitter, where our Max Headroom ad had popped up in his feed. In his blog post Jack wondered: "What the hell does this even mean? Well, it's a play on a sci-fi TV show from the 80's called Max Headroom. I've never heard of it, my boomer friends, but it certainly made me click because, yes, I had indeed maxed out MySQL." Indeed, here's an example:

Despite keeping summary tables only (data rolled up by the hour), our [MySQL] database struggled to perform SUM and GROUP BY. And it was even worse with high cardinality data. One example was a customer who had 11,000,000 unique pages viewed on a single day. MySQL would take maybe 7 minutes to process a SUM/GROUP query for them, and our dashboard requests would just time-out. To work aroud this limitation, I had to build a dedicated cron job that pre-computed their dashboard data.

The first alternative Jack considered for scaling analytics for his app was Elasticsearch. While it might have solved part of the challenge, not having a standard SQL interface gave him pause. He writes, "This JSON approach and way of querying didn't feel good [in Elasticsearch]; high cardinality queries weren't performing as fast as I wanted, and I was sure I could get faster performance elsewhere,"

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Josh had hit a similar wall with MySQL running in Google Cloud. He explained:

*We average about **500,000 to 800,000 data ops per second**, typically during market hours. These could be really tiny requests, but you can see our ingress and egress rates; we're consuming a lot of data from multiple resources, but we're also passing a lot of that out the door. In our case, we've got to keep up not just with the stock market, with real-time prices, but also with everyone coming in and needing all that data in real time.*

Josh summed up his challenge, "We were in a tight spot to find something that would scale and had better performance, especially on the ETL side , because we're loading hundreds of gigs of data every day."

dailyVest

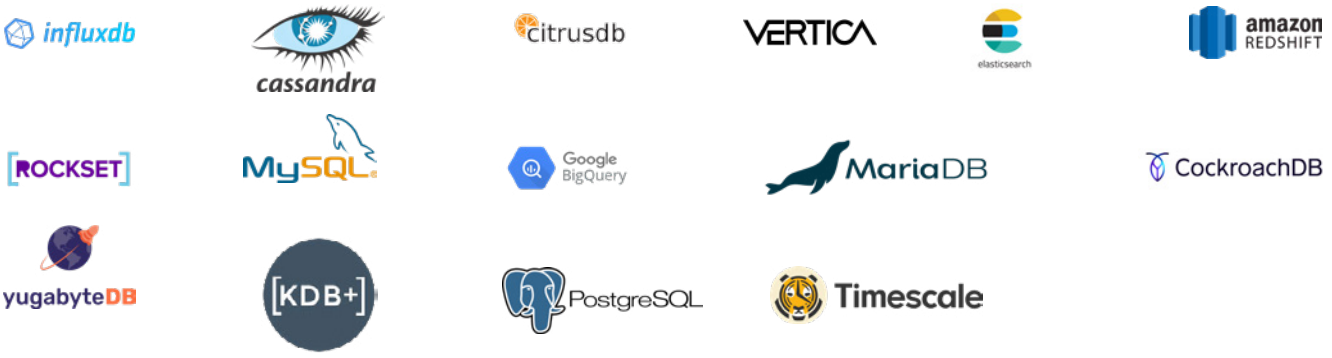
Data volumes are growing at 36% a year, fueled by billions of transactions. "What that meant for us was not just increasing resource requirements in our cloud environment, but also increasing costs [of Azure Cloud resources];' Gerry said. "What we were trying to do, in looking for a new database environment, was to maintain and even improve speed while reducing our monthly costs:' He added:

We were also seeing some performance degradation in Azure SQL. Not so much that our customers would have noticed, but we noticed there was some drop off in speed in our ingestion of data.We wanted to improve our ETL operation, but at the same time improve the customer experience-al/ customers will be happy if you make things faster, even if they haven't noticed if things were particularly slow.

90% PERFORMANCE IMPROVEMENT over Azure SQL with SingleStore

Do your research: Explore all the options

The developers chose SingleStoreDB after considering a multitude of alternative databases including:



Can we be friends?

The search for a "new friend" as Jack characterized it, included a lengthy list of non-negotiables.

- It must be ridiculously fast
- It must grow with us. We don't want to be doing another migration any time soon
- It must be a managed service. We are a small team, and if we start managing our database software, we've failed our customers. We're not database experts and would rather pay a premium price to have true professionals manage something as important as our customers' analytics data
- It must be highly available. Multi-AZ would be ideal, but high availability within a single availability zone is acceptable too
- Cost of ownership should be under $5,000/month. We didn't want to spend $5,000 off the mark, as this would be on top of our other AWS expenses, but we were prepared to pay for value
- The software must be mature
- Companies much larger than us must already be using it
- Support must be great
- Documentation must be well-written and easy to understand

Their needs differed

All three developers had specific requirements. For DailyVest, in addition to controlling costs, columnstore tables were a priority, in order to handle ad-hoc queries against large data volumes. IEX Cloud's data volumes demanded horizontal scalability, massive read and write speed, and support for bulk data loads.

Fathom Analytics' requirements went a layer deeper.

"For me;' Jack wrote, "I want the whole package. I like speed, but I also want to feel good about what I'm using. I want the people we're working with to be good people. And the technology has to fit into my existing knowledge in some way so that the learning curve isn't too large:'

STEP 3

Choose wisely: Recognize what matters most

As the developers put SingleStoreDB through its paces, each became more certain, and excited, about its potential to solve their challenges.

iex cloud

Perfect alignment.

For IEX Cloud, it quickly became clear that SingleStoreDB's capabilities aligned perfectly with the firm's needs. Josh said , "SingleStoreDB had all of the things we were looking for. And I'd been following SingleStoreDB for a long time:' He ran through the list of capabilities that won him over:

- From the very first call, I spoke with very knowledgeable people. [The SingleStoreDB sales engineer] was able to give recommendations, and **we were able to get SingleStoreDB up and running immediately because of its wire-support protocol for MySQL.**
- After only two years, IEX Cloud added **150,000 users in 120 countries, representing 20 million unique users downstream.**
- Ultimately, **choosing SingleStoreDB meant we didn't have months of migration time.** All the tools and support are already out there in the community.

Today, IEX Cloud **processes over 2.5B API requests daily,** with an 8ms average response time using SingleStoreDB — and a **10-15x increase in speed over their previous database.**

fathom/

Proof from peers.

Jack at Fathom Analytics was reassured by the success marquee-brand customers were already achieving with SingleStoreDB. He wrote:

[SingleStoreDB] gave specific use cases that made me confident they could handle us:

1. Comcast streaming **300,000 events per second**
2. Akamai handling **10,000,000 upserts per second**
3. A Tier-1 US bank handling real-time fraud protection with **50ms latency**

We are not even close to this level of scale. If these companies are using SingleStoreDB for that kind of scale, our use case should be a walk in the park.

With SingleStoreDB, Fathom ditched MySQL, Redis and DynamoDB to power their website analytics platform — **seeing a 1000x improvement in query performance and 60% reduction in database TCO.**

dailyVest

Requirements? Check.

DailyVest found that SingleStoreDB squarely met all of its requirements.

- Better performance: SingleStoreDB executes stored procedures up to three times faster than Azure SQL, and reduced copy-and-restore operations from one hour to four minutes, a **90% improvement.**
- Reduced TCO: SingleStoreDB total cost of ownership **saves DailyVest 35% over Azure SQL.**
- Hosted solution: Because it's a managed service, SingleStoreDB allows DailyVest to **avoid the expense and hassle of hosting a cluster in-house.**
- Stay in Azure Cloud: DailyVest could **switch to SingleStorDB from Azure SQL easily,** using existing client permissions for data storage in the Azure Cloud.

After moving to SingleStoreDB, dailyVest's batch process dropped from 4 hours and 12 minutes to **3 hours and 5 minutes,** resulting in **26.6% improvement.**

3X FASTER *SingleStoreDB executes stored procedures up to 3x faster than Azure SQL*

Choose wisely: Recognize what matters most

Break performance bottlenecks with SingleStoreDB

SingleStoreDB surpasses the limits of traditional data engines to drive up to 20-100x better performance, powering applications with analytics. SingleStoreDB offers a distributed, cloud-ready data platform with ANSI SQL compatibility that allows businesses to achieve fast ingest, ultra-fast query responses with high concurrency on real-time and historical data. SingleStoreDB supports analytics on streaming data by ingesting millions of rows per second on data-at-rest and data-in-motion. SingleStoreDB's architecture is designed to power data-intensive applications because of its unique ability to support both transactional and analytic workloads — all while enabling real-time analytics.

SingleStoreDB - Key Features

Patented Universal Storage: Both large-scale OLTP and OLAP are supported on this single, default table type. Universal Storage gives you the best qualities of row stores and column stores, while reducing data duplication, data movement and data latency.

SingleStoreDB Pipelines: Built-in parallel data ingestion technology natively ingests high-throughput, real-time data from external sources such as Apache Kafka, Amazon S3, Azure Blob, Filesystem, Google Cloud Storage and HDFS data source.

MySQL Compatibility: SingleStoreDB is wire-protocol compatible with MySQL/MariaDB which offers access to hundreds of languages, 100% compatibility on data types and 95% coverage of built-in functions to ease migrations.

Security & Compliance: Delivers enterprise-grade security with integrated user authentication, full encryption of data in transit and at rest, and SOC2, ISO27001, HIPAA, GDPR and CCPA compliance.

Separation of Storage and Compute for Transactions and Analytics: Allows users to effortlessly scale compute resources to meet the needs of any workload, while managing storage needs completely independently.

Distributed Ingest, Bulk or Streaming, with Lock-free/ Non-Blocking Reads and Concurrency: Offers a lock-free architecture that efficiently processes transactions and updates without locking or blocking concurrent reads — delivering the capability to perform bulk and/or streaming ingestion online, simultaneously with query workload.

Suspend & Resume Workloads Effortlessly: Clusters can be suspended and resumed nearly instantaneously, making all of your data available when you need it, minimizing costs when workloads are inactive.

Flexible Credit Pricing Model: Provides flexibility of on-demand, or with monthly credit bundles to handle dynamic and growing compute workloads at reduced TCO.

Latency-Free Analytics: SingleStoreDB lets you achieve ultra-fast query response with high concurrency across both live and historical data using familiar ANSI SQL.

Ultra-fast Event-to-insight Performance: Deliver against the toughest service-level agreements using parallel, distributed lock-free ingestion and real-time query processing.

Scale Limitlessly: Elastic scale-out architecture with distributed, massively parallel data processing delivers consistent, predictable responses under high ingest and user concurrency.

Ease of Use and Flexibility: SingleStoreDB brings simplicity and ease to your data processing by allowing transactional and analytical workloads to be processed using a single table type.

Tiered Storage: Three-tiered storage including in-memory, SSD Cache and the Cloud object store with separation of storage and compute (unlimited storage) and 80-90% data compression

Talk with an expert: A SingleStore engineer

Engineers trust engineers.

During the sales and implementation phases of their moves to SingleStoreDB, all of the developers were dazzled by the level of proactive, consultative help they received from SingleStoreDB's technical sales engineers and tech support team.

Superb technical support.

"We were very impressed with the technical support we were getting; it was really quite something;' said Gerry. During the early stages of DailyVest's implementation, he said, "we ran into a couple of problems which we didn't even notice ourselves. What we got was a proactive tech support call from SingleStoreDB:'

As it happens, DailyVest had many stored procedures that executed fastest in Azure SQL if the data was dumped into temp tables and later queried. Sometimes it's faster to use a common table expression (CTE)-in-memory queries that can then refer back to each other. "In SingleStoreDB you're always better off with CTEs" Gerry said. "The way I discovered this was from a call from SingleStoreDB, who said, "Hey, you're eating up most of the cluster with this temp table you keep creating and destroying.

That's a great way to do it in Azure SQL but not in SingleStoreDB: So we changed the code and now all of our stored procedures are CTE-based:'

Access to experts.

Jack at Fathom Analytics was impressed, too, with the access he had to SingleStoreDB experts. He wrote: "I fired off a few questions [to SingleStoreDB] a week or so after signing, and they came back with answers directly from a skilled engineer. The final cherry on top for me was when I sent them our schema. We had finalized it internally. We were going live in less than two weeks and needed an expert eye. Sarung Tripathi, [Principal Solutions Consultant at SingleStoreDB] checked it himself but also had their VP of Engineering [Robbie Walzer] look at it. Are you kidding me?"

"IEX Cloud got tremendous support, very knowledgeable technical support from the SingleStoreDB team;' Josh echoed. "We had our system, our unique build, up and running very quickly:'

Migrate with ease or don't migrate at all

Database migration is scary.

Why? Because it's risky. Migration weighs heavily on developers' minds as they evaluate new solut ions, because their business, reputation and sanity are all on the line.

Sometimes it just works.

Luckily, Josh sidestepped migration completely. SingleStoreDB is wire-compatible with MySQL, so IEX Cloud was able to "just get it up and running, and do a one-to-one comparison with what we already had in our system because it didn't require any code;' he said . " Ultimately, choosing [SingleStoreDB] meant that we didn't have months of migration time. There's a lot of tools and support already out there in the communit."

Sometimes it's a big deal.

Fathom Analytics' migration, on the other hand, was a 10-day marathon planned with a military level of precision. Jack detailed every step of the process in his blog, including code snippets. Here 's an abbreviated version of his migration story, which came off without a hitch:

This isn't my first rodeo. I've migrated countless high-value projects in the past. And even within Fathom, we've already done multiple migrations... But this migration was different because of the size of the data. We were dealing with hundreds of millions of rows, consisting of many billions of page views.

Many years ago, I read something from Tim Ferriss where he recommended imagining the worst possible case scenario for something, and then keep asking "and then." I use this technique for risk management in many areas of life and business, and I apply it to migrations too.

After finishing the migration, we were partying big time. This was months of work, doing research, implementations,and so much more. We couldn't believe we were finally migrated into a database system that could do everything we needed and was ready to grow with us. I spent the next few days watching the server metrics to ensure nothing would go wrong, and it was beautiful.

SingleStoreDB for Powering Your SaaS Applications

SingleStoreDB powers fast modern applications for over 100 leading SaaS players and Tier-1 enterprises around the globe. SingleStoreDB can effectively replace the need for multiple data engines to power your SaaS applications by enabling ultra-fast ingestion, super low-latency queries and multi-model support with unlimited storage. Customers can deploy SingleStoreDB in any of the leading cloud environments including AWS, Azure, GCP, or in a hybrid mode.

Key Attributes for Modern SaaS Apps	SingleStoreDB - Key Capabilities
Power Fast & Interactive Data Experiences	Distributed SQL platform bringing together fast transactions and analytics in the same engine in real time, with no data movement. See recent TPC Benchmarking results
Access to Real-Time Data	Parallel streaming ingestion up to millions of events/second using Pipelines, together with super-low latency queries
Scale Effortlessly	Infinite elasticity to scale your applications including scale-out HTAP, with separation of storage and compute (Unlimited Data Storage)
Handle Any Data, Run Anywhere	Multi-model; support multiple data types (JSON, time-series, geo, full-text search, relational) and run in multi-cloud or hybrid-clouds
Resiliency & Recoverability	Best-in-class resiliency to power enterprise apps including High Availability, Disaster Recovery, Limitless PITR and Multi-AZ failover
Frictionless Developer Experience	Simplicity and programmability including MySQL wire protocol and connectors to Spark, Kafka and dbt to quickly launch new apps

The Results: Faster, better, cheaper

Operation	Azure SQL vs SingleStoreDB		Latency Reduction	Performance Improvement
Generate cached financials, 1 plan, 12 months	59 mins, 27 s	3 mins, 15 s	-94.5%	18.3x faster
Data replication	60 mins	4 mins	-93.3%	15x faster
Sum of all transactions and group by month	64.3 s	47.9 s	-25.5%	1.3x faster
Count all participants and group by month	1062 ms	930 ms	-12.4%	1.15x faster
Generate all KPMs for latest month	4 hrs, 12 mins	3 hrs, 5 mins	-26.6%	1.3x faster

Gerry at DailyVest provided this summary table of his testing results.

Real Benefits. No Lie.

Fathom Analytics, IEX Cloud and DailyVest all have benefited from the performance improvements gained from SingleStoreDB; Gerry at DailyVest provided the summary table above, while Jack dove deep into details:

1. *We no longer need a dedicated data-export environment...We do our data exports by hitting SingleStoreDB with a query that it will output to 53 for you typically within less than 30 seconds. It's incredible. This means we can export gigantic (lies to 53 with zero concern about memory. We would regularly run into data export errors for our bigger customers in the past, and I've spent many hours doing manual data exports for them. I cannot believe that is behind me. I'm tearing up just thinking about it.*

2. *Our queries are unbelievably fast. A day after migrating, two of my friends reached out telling me how insanely fast Fathom was now, and we've had so much good feedback.*

3. *We can update and delete hundreds of millions of rows in a single query. Previously, when we needed to delete a significant amount of data, we had to chunk up deletes into DELETE with LIMIT. But SingleStoreDB doesn't need a limit and handles it so nicely*

4. *We used to have a backlog, as we used INSERT ON DUPLICATE KEY UPDATE for our summary tables...*

[W]e had to put sites into groups to run multiple cron jobs side by side, aggregating the data in isolated (by group) processes. But guess what? Cron jobs don't scale, and we were starting to see bigger pageview backlogs each day. Well, now we're in SingleStoreDB, data is fully real-time. So if you view a page on your website, it will appear in your Fathom dashboard with zero delays.

5. *Our new database is sharded and can filter across any (,eld we desire. This will support our brand new, Version 3 interface, which allows filtering over EVERYTHING.*

6. *We are working with a team that supports us. I often feel like I'm being cheeky with my questions, but they're always so happy to help. We're excited about this relationship.*

7. *SingleStoreDB has plans up to $119,000/month, which is hilarious. That plan comes with 5TB of RAM and 640 vCPU. I don't think we'll get there any time soon, but it feels good to see they're comfortable supporting that kind of scale. They're an exciting company because they're seemingly targeting smaller companies like us, but they're ready to handle enterprise-scale too.*

8. And as for price, we're spending under $2,000/month, and we're over-provisioned, running at around 10% - 20% CPU most of the day.

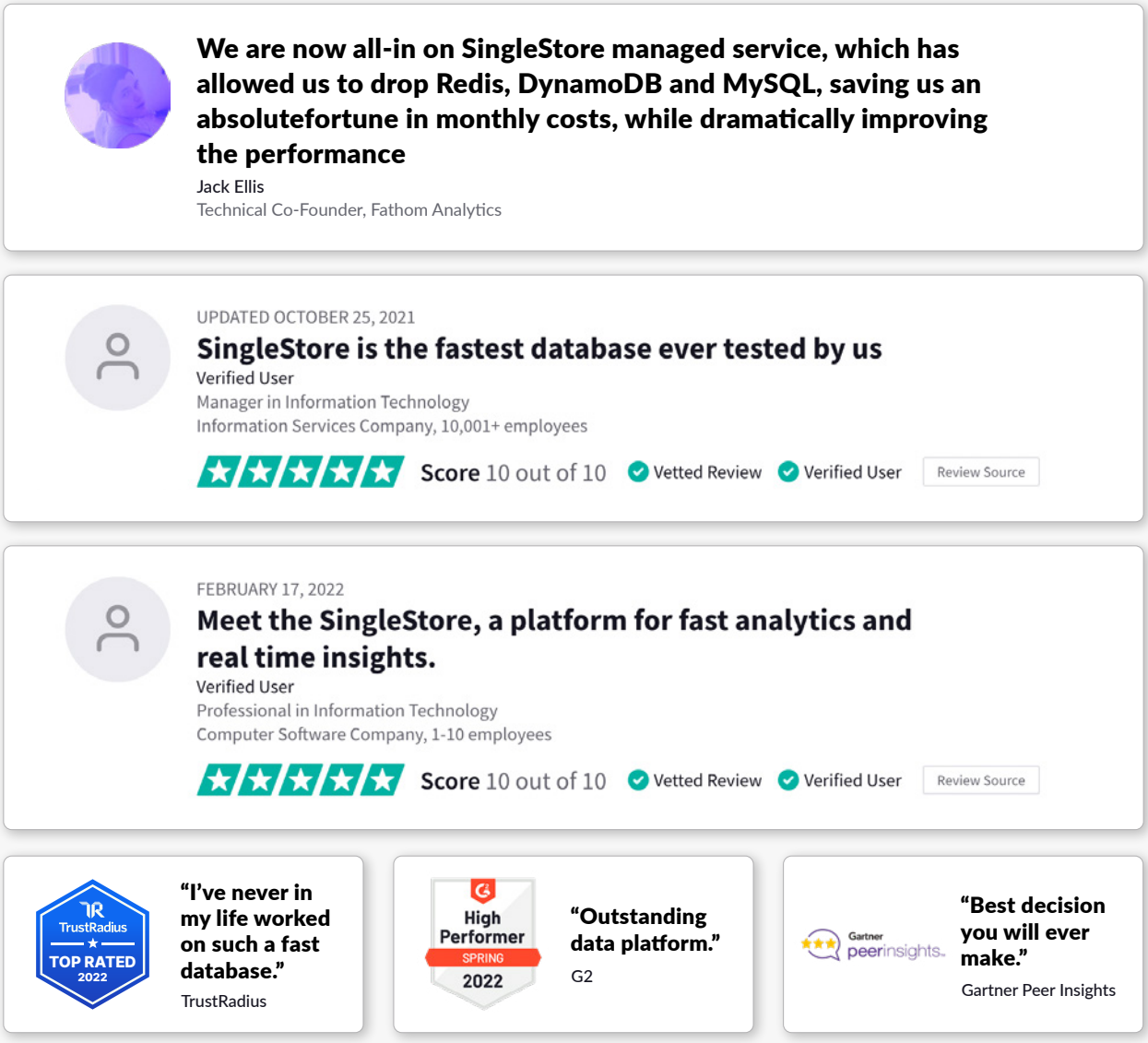
The Results: Faster, better, cheaper

It's not too good to be true.

Any application developer will tell you it's true: poor performance of in-app analytics translates into a poor customer experience, which is a direct threat to reputation and revenues.

Enormous efficiencies-all for you.

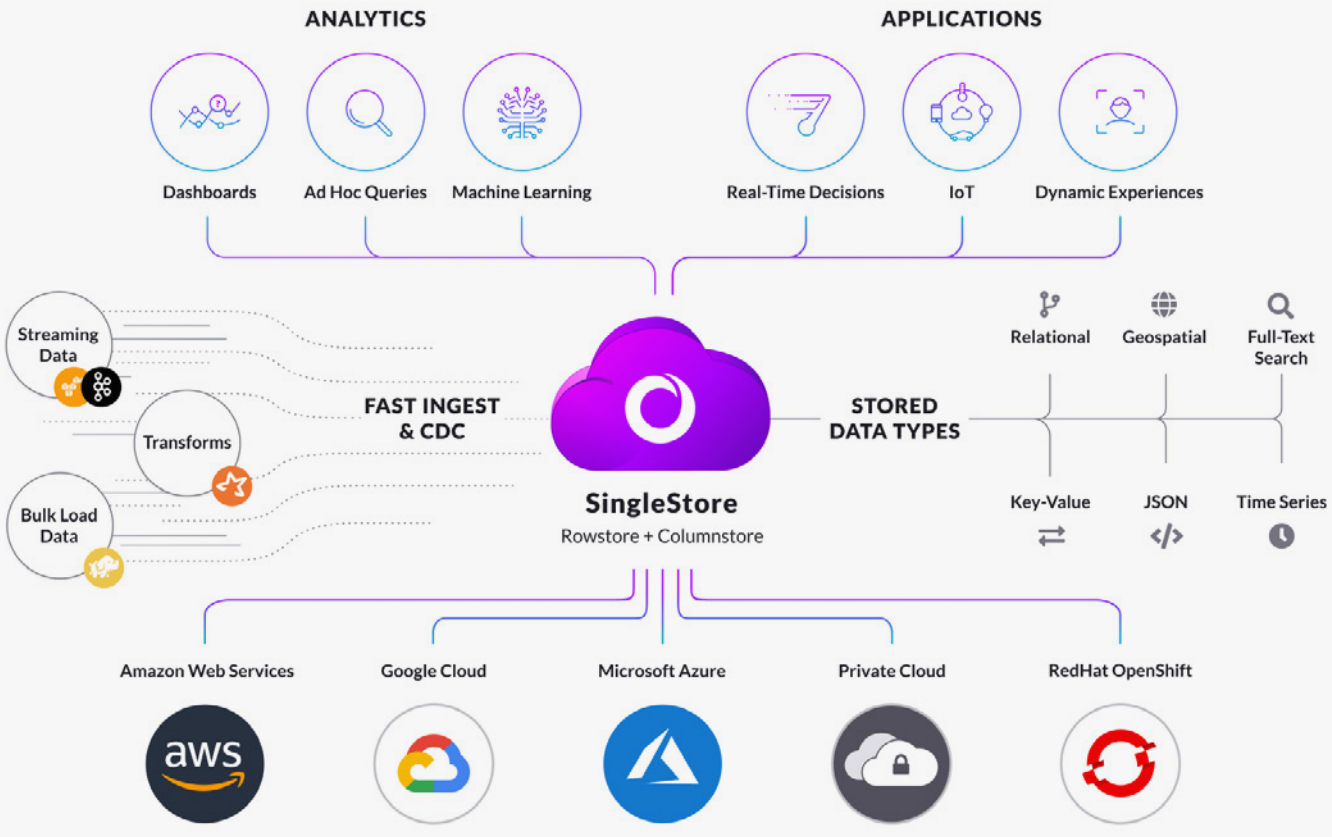
Josh summed up, "SingleStoreDB enables us to do monitoring and analysis in the same system that houses our historical data, and this creates enormous efficiencies for us. We've been able to consolidate multiple databases, run our platform faster, and speed the onboarding processes for new data sets."



About SingleStore: Ludicrously fast analytics

We've got you.

SingleStoreDB is the cloud-native database built with the speed and scale to power the world's data-intensive applications. With a distributed SQL database that unifies transactions and analytics, SingleStoreDB empowers digital giants like Uber, Hulu and Comcast to deliver memorable, limitless data experiences. Built to handle various data types, SingleStoreDB supports multiple data types (including JSON, time-series, geospatial and full-text search), and runs in multi-cloud environments.



Dramatic improvements.

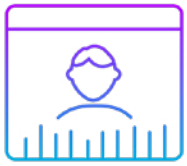
Fathom Analytics, IEX Cloud and DailyVest all have dramatically improved their applications' performance with SingleStoreDB's best-in-class speed, scale and capability, without the headaches of installing, configuring and maintaining software. To get started today, for free, visit www.singlestore.com/try-free.

About SingleStore: Who we are

SingleStoreDB delivers the cloud-native database with the speed and scale to power the world's data-intensive applications. With a distributed SQL database that introduces simplicity to your data architecture by unifying transactions and analytics, SingleStoreDB empowers digital leaders to deliver exceptional, real-time data experiences to their customers.

Used by the Most Innovative Companies In the World

Half of the Top 10 Banks



Streaming Media Leaders in Music, Video & Gaming

12 of the Fortune 50

Tech Innovators from Akamai and Uber

2 of the Top 3 Telcos

Experience SingleStore for yourself!

Install the SingleStoreDB for FREE or Deploy our managed Service with $500 in FREE credits.

SingleStore

For more details visit us at SingleStore.com