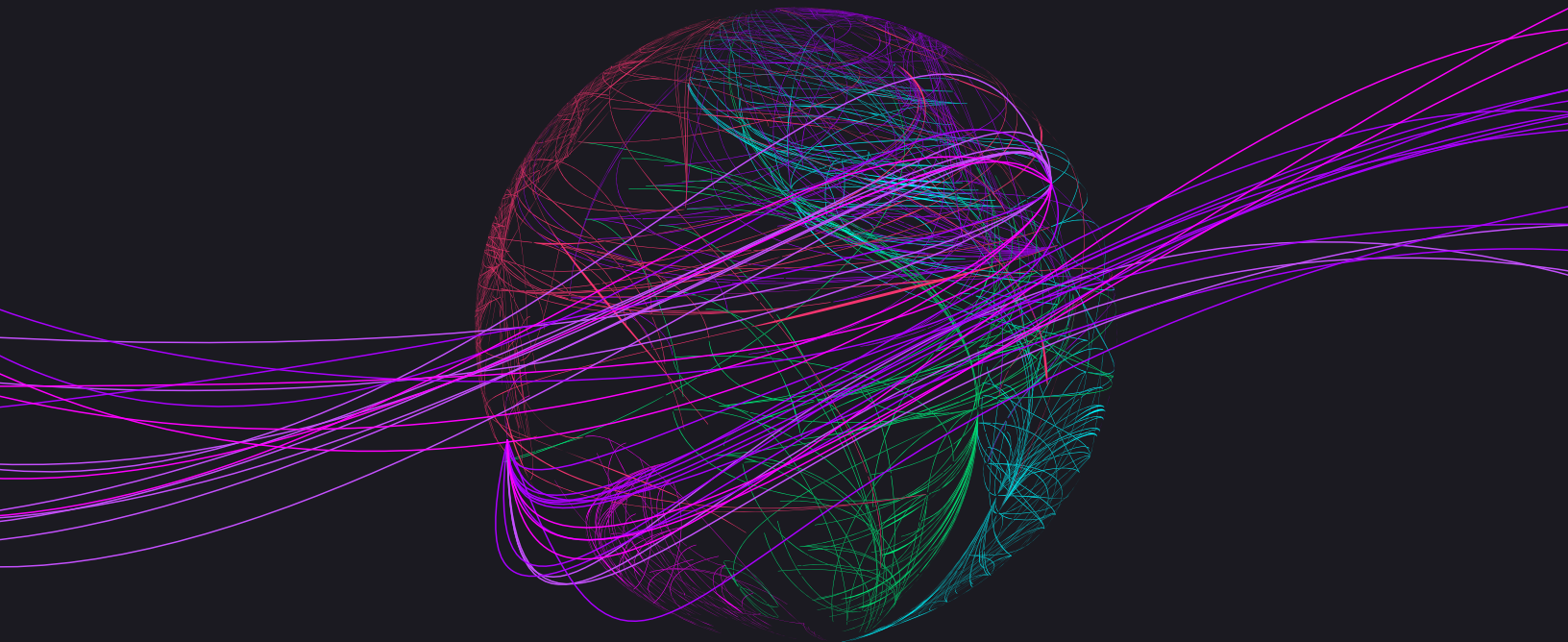




SingleStore

Ludicrously Fast Analytics: A 5-Step Guide for Developers of Modern Applications

How three very different SaaS firms achieve
singularly great data driven customer experiences



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 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 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 DailyVest—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 SingleStore 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



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 SingleStore, delivers a simple, lightweight, privacy-first alternative to Google Analytics. Jack chronicled his company's every step of their move from MySQL to SingleStore 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 SingleStore, too: "In March 2021, we moved all of our analytics data to the **database of our dreams.**"
- Of the SingleStore 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



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 SingleStore Josh said, "The [SingleStore] 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. SingleStore actually solved all of our problems for our use case, all in one database. It's very aptly named."



Gerry Morgan



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 SingleStore, 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 SingleStore which, as far as we were concerned, was unbelievably good."

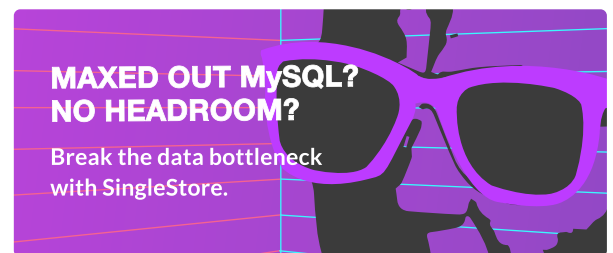
Scope the problem: A maxed-out database

They had all hit the wall.

Jack, Josh and Gerry all found SingleStore 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.

fathom/

Fathom Analytics: Jack stumbled across SingleStore 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 80s 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 around 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.”

IEX Cloud

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.”

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—all customers will be happy if you make things faster, even if they haven’t noticed if things were particularly slow.

DailyVest achieved a
90% performance improvement
over Azure SQL with SingleStore.

Do your research: Explore all the options

The developers chose SingleStore 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 example, 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.”

Choose wisely: Recognize what matters most

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



Perfect alignment.

For IEX Cloud, it quickly became clear that SingleStore's capabilities aligned perfectly with the firm's needs. Josh said, "SingleStore had all of the things we were looking for. And I'd been following SingleStore 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 SingleStore sales engineer] was able to give recommendations, and we were able to get SingleStore up and running immediately because of its wire-support protocol for MySQL.*
- *We could get SingleStore up and running and do a one-to-one comparison. It's true—a one-to-one comparison with what we already had in our system because it didn't require any code changes. We could evaluate SingleStore quickly.*
- *Ultimately, choosing SingleStore meant we didn't have months of migration time. All the tools and support are already out there in the community.*



Proof from peers.

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

[SingleStore] 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 SingleStore for that kind of scale, our use case should be a walk in the park.

Requirements? Check.

DailyVest found that SingleStore squarely met all of its requirements.

- *Better performance: SingleStore 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: SingleStore total cost of ownership saves DailyVest 35% over Azure SQL.*
- *Hosted solution: Because it's a managed service, SingleStore allows DailyVest to avoid the expense and hassle of hosting a cluster in-house.*
- *Stay in Azure Cloud: DailyVest could switch to SingleStore from Azure SQL easily, using existing client permissions for data storage in the Azure Cloud.*

3x faster

SingleStore executes stored procedures
up to 3x faster than Azure SQL.

Talk with an expert: A SingleStore engineer

Engineers trust engineers.

During the sales and implementation phases of their moves to SingleStore, all of the developers were dazzled by the level of proactive, consultative help they received from SingleStore’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 SingleStore.”

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 SingleStore you’re always better off with CTEs” Gerry said. “The way I discovered this was from a call from SingleStore, 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 SingleStore.’ 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 SingleStore experts. He wrote: “I fired off a few questions [to SingleStore] 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 SingleStore] 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 SingleStore 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 solutions, because their business, reputation and sanity are all on the line.

Sometimes it just works.

Luckily, Josh sidestepped migration completely. SingleStore 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 [SingleStore] meant that we didn't have months of migration time. There's a lot of tools and support already out there in the community.”

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.

The results: Faster, better, cheaper

Operation	Azure SQL	vs SingleStore	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 SingleStore; 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 SingleStore with a query that it will output to S3 for you typically within less than 30 seconds. It's incredible. This means we can export gigantic files to S3 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 SingleStore 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 SingleStore, 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 field we desire. This will support our brand new, Version 3 interface, which allows filtering over EVERYTHING.*

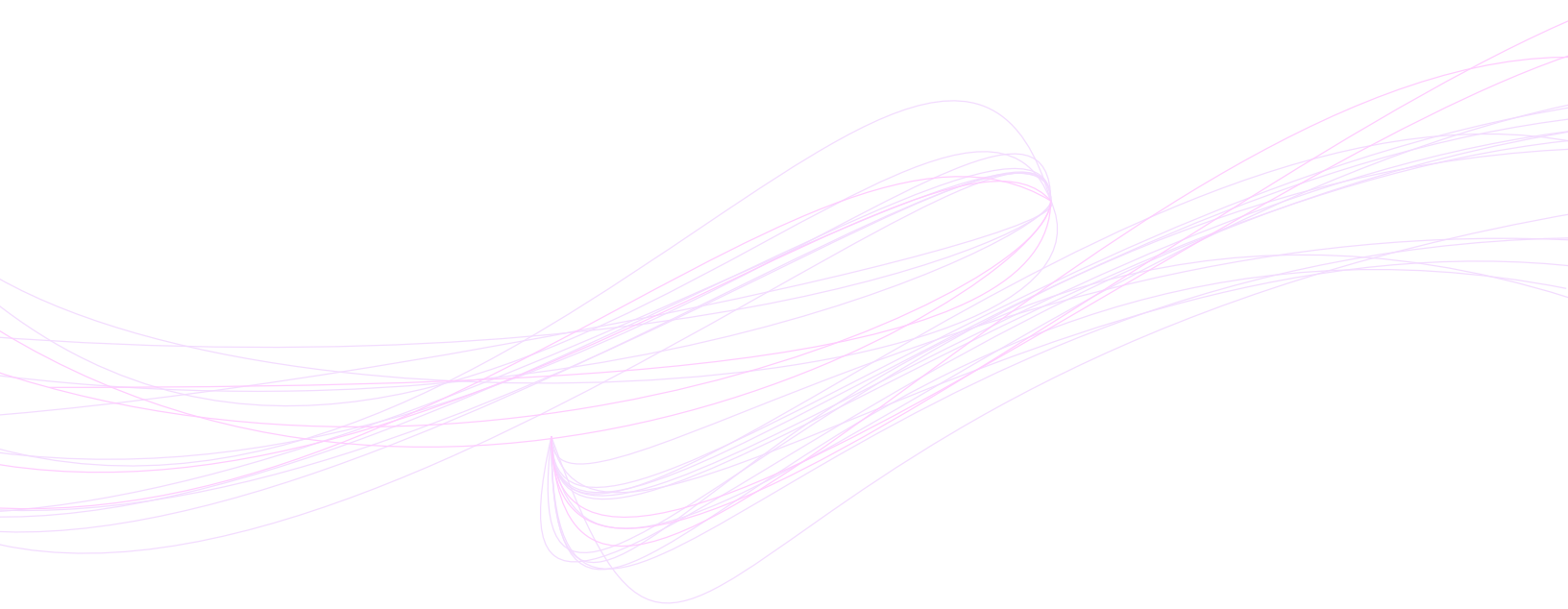
6. *We are working with a team that supports us. I often feel like I'm being cheeky with my questions, but they're always so happy to help. We're excited about this relationship.*
7. *SingleStore has plans up to \$119,000/month, which is hilarious. That plan comes with 5TB of RAM and 640 vCPU. I don't 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.*

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.

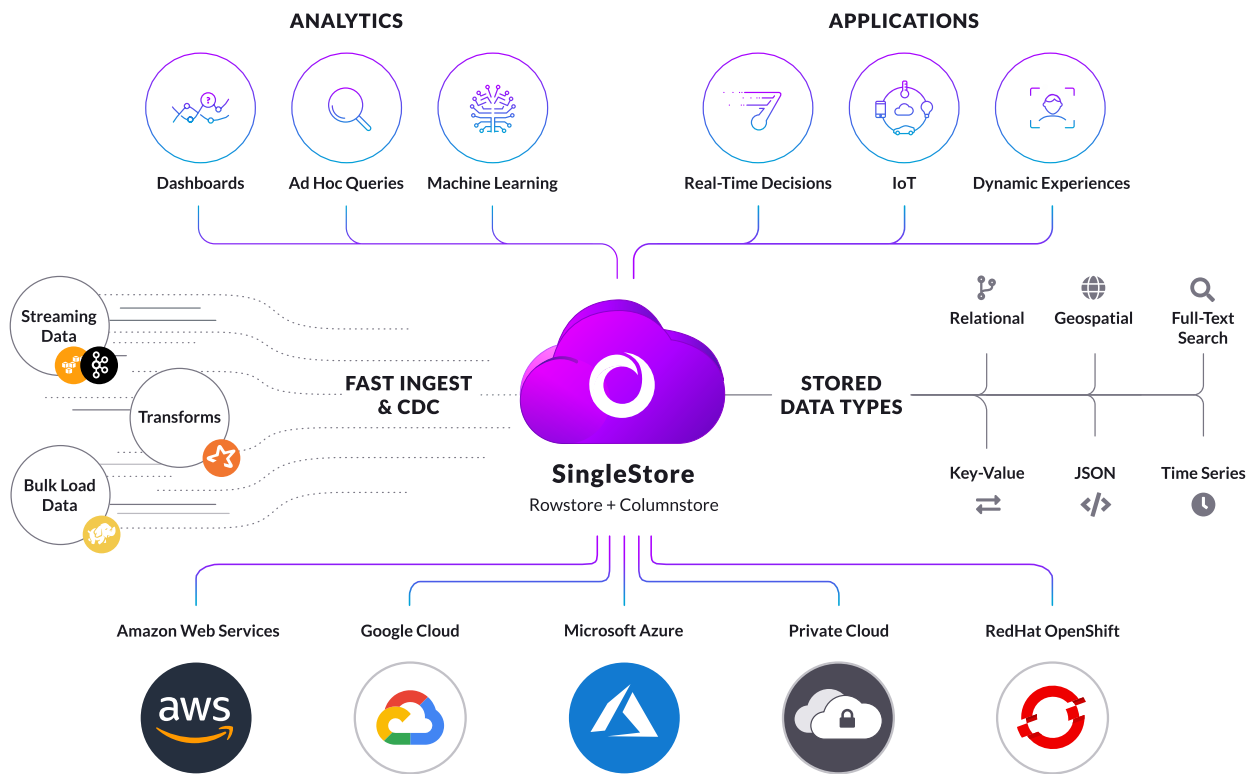
Josh summed up, "SingleStore enables us to do monitoring and analysis in the same system that houses our historical data, and this creates enormous efficiencies for us. We've been able to consolidate multiple databases, run our platform faster, and speed the onboarding processes for new data sets."



About SingleStore: Ludicrously fast analytics

We've got you.

SingleStore is the fully managed, on-demand cloud database service for fast analytics on the cloud of your choice. Available as a managed service, on premises and in hybrid environments, SingleStore is a scalable SQL database that ingests data continuously to perform operational analytics for the front lines of your business. With it you can ingest millions of events per second with ACID transactions while simultaneously analyzing billions of rows of data in [relational SQL](#), [JSON](#), [geospatial](#), and [full-text search](#) formats.



Dramatic improvements.

Fathom Analytics, IEX Cloud and DailyVest all have dramatically improved their applications' performance with SingleStore'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

SingleStore is dedicated to helping businesses adapt more quickly, embrace diverse data, and accelerate digital innovation by operationalizing all data through one platform for all of their moments that matter. These capabilities are provided as a service on Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform, and Red Hat and through your own deployments with SingleStore Managed Service and SingleStore DB. Visit www.singlestore.com or follow us [@SingleStoreDB](https://twitter.com/SingleStoreDB)

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