

+ DATABASE DECISIONS: IMPROVING SUPPLY CHAIN EFFICIENCIES TO COMBAT MEDICAL WASTE



Problem:

Achieve read-write scale across data centers with a SQL database that maintains strict transactional consistency

Databases Considered:

Amazon Aurora, MemSQL, Oracle 12c, MySQL + Percona XtraDB Cluster

Solution:

NuoDB's elastic SQL database natively supports active-active deployment in the cloud and can scale out quickly and elastically

In the medical device industry, coordination is critical. Ensuring that every implant and instrument required for a surgery is planned, sourced, delivered, and used effectively is not just challenging – it's critical to patient survival. Yet given the rising costs of healthcare, the industry is constantly looking for ways to streamline the process, eliminate waste, and simplify operations. For the medical device industry, driving supply chain efficiency can be an effective means for achieving such goals.

Movemedical has taken on the tough challenge of reducing healthcare costs by minimizing waste in the implant device industry due to inefficient, manual, and disconnected systems. Transitioning from a custom application that successfully coordinated more than four million successful orthopedic implant surgeries to a cloud-based platform, Movemedical needed a cloud database that combined the reliability and trustworthiness of traditional relational database with elastic scale, simple cloud deployment, and active-active support across data centers. They turned to NuoDB.

TACKLING A \$5 BILLION PROBLEM

In an industry where efficiency is always perceived as competing against patient outcomes, driving change can be a challenge. In a single surgery involving a medical implant, for example, more than a dozen discrete tasks – and associated task owners – are involved, from sales, billing, and warehousing on the manufacturer's side to procedure scheduling, inventory management, and returns on the healthcare provider side.

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CEO & Founder
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In addition, an average surgery typically includes overprovisioning of supplies to ensure adequate coverage for whatever might be needed. It's no wonder that in the medical implant space alone, one study estimates more than \$5 billion in waste per year.

“These complicated surgeries include a wide array of components – some disposable, but many reusable that need to be returned – and that complexity makes normal inventory management solutions inadequate to managing medical implants,” said Mareo McCracken, revenue leader for Movemedical. “As a result, these hospitals overprovision by 30-40% because they can't risk not having the right equipment on hand for a given surgery.”

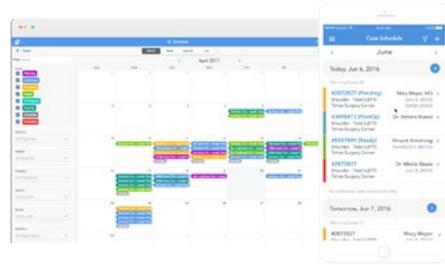
To combat this problem, Movemedical has developed a comprehensive supply chain management platform for the medical device industry that helps manufacturers and healthcare providers coordinate inventory, logistics, consignment management, billing, surgery metrics, and more using HIPAA-compliant communications and tools.

By offering the visibility, transparency, and accountability required for health care providers and medical device manufacturers to coordinate, plan, and execute more efficiently, Movemedical expects to increase inventory visibility and significantly reduce supply chain inefficiencies to lower healthcare costs as a whole. Just by having a current, accurate accounting of what a hospital has and what it needs per surgery, organizations can reduce what they ship in and out by 25 percent.

GRAND AMBITIONS FOR A GLOBAL PROBLEM

Having already custom-built a similar software solution for clients, Movemedical drew upon the experience of more than 7,000 users and four million orthopedic implant surgeries when building its new manufacturer-agnostic Moveplatform.

“We knew that to make a dent in the billions of dollars wasted, we needed to provide a better tool that naturally incorporated best practices for process improvement,” said Bo Molocznik, Movemedical CEO and founder. “Only by building such a platform – one that made the supply chain process simpler and easier to follow for the dozens of people that touch a given surgery could we be sure to succeed.”



Medical procedures are scheduled around the clock. With NuoDB, Movemedical can depend on having data that is continuously available and accurate.

EVALUATING THE OPTIONS

With a successful custom application in place as a “prototype” for their new cloud offering, the Movemedical team needed a database that could capitalize on the experience they already had while adding improvements in performance, availability, and on-demand scalability. While their custom-built solution was built on top Oracle 12c, the team struggled with regular performance outages and high licensing costs, and also recognized that Oracle was a poor choice for a cloud-centric application.

As a result, the team was looking for migration simplicity, in the form of a SQL interface for example. Since the platform manages implantable medical devices and surgical data, ACID compliance and strict transactional consistency was also critical to ensure 100 percent accuracy. In addition, the team wanted a product that would be able to operate in an active-active capacity across multiple data centers as usage expands.



Movemedical's user friendly dashboard.

“We never even considered a NoSQL database,” said Toan Truong, lead systems engineer at Movemedical. “ACID compliance is mandatory. We deal with individual logical entities that may go into a patient’s body. There can’t be any room for error.”

The first database partner Movemedical considered was Amazon Aurora. It had a speed advantage over MySQL, which was a plus. It also had redundancy and an ability to scale, to go along with minimal operational overhead. But Aurora’s inability to write to the database in a multi-master architecture across multiple regions was an issue.

Movemedical also considered Percona XtraDB Cluster. An open-source MySQL option, it hit many of Movemedical’s requirements. However, Percona stumbled in meeting Movemedical’s strict application performance requirements. It also presented increased operational complexity when compared with the winner: NuoDB.

THE PERFECT PARTNER: NUODB’S ELASTIC SQL DATABASE

To support Movemedical’s mission of helping health care focus on health care, the company needed its database to make the process easier, not hinder it. The only solution that fit all the stringent requirements for Movemedical was NuoDB.

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With such a high volume of users on the Movemedical application, it is vital that the database is able to scale, while maintaining availability.

can maintain availability, and make expansion easier. NuoDB's memory-centric architecture addresses Movemedical's performance requirements, and increasing capacity by adding more nodes within a data center or across data centers is simple and fast. In addition, NuoDB lets the company adjust database size and performance on demand, in the cloud, and without sacrificing data integrity or transactional consistency.

"We really wanted a database that could support an active-active deployment," said Truong. "With other options, we'd either need to shard the database or purchase expensive replication software and complicate our overall architecture. NuoDB natively supports us writing to the same database from multiple data centers – that was a huge win."

Truong continued, "With its robust SQL interface and ACID guarantees, NuoDB is naturally built for OLTP workloads and connects easily to our application. We get great performance because transaction processing is conducted in memory and we have even been able to dedicate a transaction processing node to give our customers real-time reports within the application."

PARTNERING FOR SUCCESS

Today, Movemedical is fully deployed on NuoDB and running in Amazon Web Services. The application topology is multi-tiered: a single-page application front end hosted on AWS CloudFront; JVM Application Servers on AWS EC2; Message Queuing on AWS SQS; Persistent Storage on AWS S3; and the NuoDB database on AWS EC2.

The benefits have been as advertised. The scale-out capabilities have performed as well or better than expected. As Movemedical expands, they're able to quickly add nodes to keep up with demand, and estimate that they'll be able to support up to 300,000 users before they need to make any significant changes. This keeps costs low (as

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The first step was scaling. Movemedical's application is used by nearly two dozen different user profiles, including surgery coordinators at the hospital, warehouse operations, billing, the manufacturer's production team, hospital IT teams, sales reps for the manufacturer, and more. As more medical device manufacturers come on board, they bring with them more healthcare providers.

As Movemedical adds new customers and users worldwide, it faces many potential pitfalls and needs a database that won't choke on the extra volume,

	Oracle 12c	Percona XtraDB Cluster	Amazon Aurora	NuoDB
SQL	✓	✓	✓	✓
ACID compliance with strict consistency	✓	✓	✓	✓
Migration simplicity	✓	✓	✓	✓
Active-active	✓	✓	✗	✓
Scale-out	✗	✓	✓	✓
Lower Costs	✗	✗	✗	✓
Cloud-Centric	✗	✗	✓	✓
Transaction Performance	✓	✗	✓	✓
Continuous Availability	✗	✗	✓	✓
Minimal Operational Complexity	✗	✗	✓	✓

Movemedical assessed database options with the following features in mind.

they won't have to pay for compute or storage resources until they need them) and expansion on track, while still allowing the company to leverage all the benefits of the cloud.

This has all led to a much lower total cost of ownership than Movemedical would have achieved with Amazon Aurora or Percona XtraDB. Movemedical estimates that they're saving 40% over either of those two options.

When it comes to Movemedical's mission of driving down healthcare costs, they're already well on their way there too. The new cloud application is already on track to help eliminate more than \$100 million in waste over the next two years, and one customer has been able to reduce their shipment volume by about 25 percent.

"The Movemedical platform is solving the industry by providing innovative ways to work with data," McCracken said. "With NuoDB's robust, performant, scalable platform, we'll never worry about delivering results as we look for the next problems to solve."



NuoDB's elastic SQL database for cloud applications helps customers get applications to market faster and reduce their total cost of ownership. Software vendors and ecommerce companies rely on NuoDB to obtain the combination of scale-out simplicity, elasticity, and continuous availability that cloud applications require, with the transactional consistency and durability that databases of record demand.

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