Case Study

U.S. Army

Graph Technology Keeps the Army Up and Running by Tracking and Analyzing Equipment Maintenance

INDUSTRY
Government & Defense

USE CASE
Bill of Materials / Supply Chain Management

GOAL
Modernize the U.S. Army's core procurement, budgeting and logistics processes

CHALLENGE
Existing mainframe-based system was slow, expensive, inflexible and unwieldy

SOLUTION
Neo4j provides accurate ordering, budgeting and rapid "what-if" analyses

RESULTS
– Time to carry out cost estimates and analyses down from 60 to 7-8 hours

– Ordering and replacing millions of parts is quicker, cheaper and more accurate, safeguarding lives

The U.S. Army procures and tracks millions of equipment components every year. This process is now being managed in a Department of Defense (DoD) information system that employs Neo4j graph technology, enabling the Army to save costs, plan and budget more accurately, and better safeguard its soldiers in the field.

The Organization

The United States Army is the largest branch of America's Armed Forces and one of the country's most important government organizations. With over 1 million active, guard and reserve soldiers and around 200,000 civilian staff, the Army also deploys a staggering amount of equipment – small arms, rifles and machine guns, tanks, trucks and armored vehicles, and thousands of ships, helicopters and aircraft.

The Challenge

Buying and managing this scale of equipment is a significant logistical challenge. It involves acquiring millions of parts for hundreds of thousands of weapons and vehicles every year, maintaining these components, sometimes in deadly, far-flung territories – and the responsibility of knowing that doing the job properly saves not just costs, but lives.

The Army recognized the need to modernize its core procurement, budgeting and logistics processes that represent 80% of total lifecycle costs. The challenge was to rapidly collect and combine this mass bill of materials (BoM) information – every component and its cost, what equipment it relates to, and its expected lifespan/average time to failure.

The Army also wanted to rapidly query connected data to more accurately forecast its budget needs and to answer vital "what-if" questions such as the cost of deploying certain forces to a new war zone; or when, say, tanks operating in a hostile, hot desert environment would likely need replacement parts. That way the Army has the right components ready in the right place at the right time, ordered much more cost-effectively.

This level of data management was becoming increasingly difficult, even impossible, on the Army's aging mainframe-based system. So it took advice from CALIBRE, a respected U.S.-based management consulting and IT solutions provider specializing in the defense and government markets.

The Solution

CALIBRE recommended that the Army move its core logistical processes to a hosted Neo4j graph database. CALIBRE is now in the final stages of transferring the full dataset into Neo4j, Case Study

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– Preston Hendrickson, Technical Lead, U.S. Army Project, CALIBRE

while supplying the reports and answering the Army's needs about this data. In the future, the Army's own procurement staff will access Neo4j directly.

The scale of the information Neo4j handles is vast, including a database of over **5.2 billion nodes**, **14.1 billion relationships** and **3TB database size**.

Preston Hendrickson, who leads CALIBRE's 15-person U.S. Army project team, said: "One file for the parts of a tank involved 10 million parts, creating more than 15 million possible relationships among the components...and that's just a small piece of the overall graph."

The Results

Thanks to Neo4j, the U.S. Army can now rapidly store, explore and visualize this wealth of logistical data. The contrast with their previous system is stark.

"Typically it would take 60 person-hours to load data so the Army could understand 'we're going to need to replace X, Y, or Z parts' or provide cost estimates and analyses," said Hendrickson. "Now it's down to seven to eight hours."

Components are ordered sometimes millions at a time. With Neo4j, the Army anticipates the demand for spare parts and spread it across multiple time periods, instead of one quarter at a time.

"The result is better ordering and budgeting," Hendrickson said. "The Army gets a fuller total cost estimate but it's also a more predictable total cost of ownership (TCO) as well."

Even maintaining the database infrastructure used to take nine people; now with Neo4j it is down to just two staff doing the same level of work.

Neo4j also enables CALIBRE and the Army to use modern languages and tools like Ruby, Python and QLik to visualize, access and query the data.

"If an analyst has a question, they get an answer immediately instead of having to figure out how to assemble the question before they actually ask it," Hendrickson said.

In the past, a new what-if scenario would also mean the data had to be reloaded and re-computed all over again; now queries and analyses can be done the same day.

"Neo4j enables analysts to save huge amounts of time," Hendrickson continued. "Now everything is in the graph, we are able to see more detailed data that previously had been glossed over. We now have original data, and much better detail in analysis. Answers are immediate. As a result, the parts delivery is more accurate and order turnaround is much faster."

There is an even more important benefit, he concluded: "If you have vehicles that are not going to break down in the middle of an action, lives are saved."

Questions about Neo4j?

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