



After Call For Innovation  
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Capital One was born out of the idea that there had to be a better way to give people access to credit than the traditional restrictive methods, so its founders built a bank where data and analytics helped create their products for underserved populations.

That was 25 years ago. Now, Capital One is looking to be the leader in the financial sector for customer experience online and on mobile. It looks to adopt transformative technologies as early as possible.

Capital One CIO Robert Alexander has encouraged the company's IT department to operate like a startup and embrace open source software development.

The result has been several different project teams using Node.js to rapidly prototype and build new applications inside the business, cutting the time of the development cycle significantly and fostering a climate of innovation.

The low hanging fruit picked right away for Capital One's developers was to use Node.js as an orchestration layer, taking advantage of the asynchronous I/O to handle multiple server requests at once. It's also proven to be a great partner in Capital One's move to the public cloud; the company is saving money thanks to Node.js' performant and lightweight code.

Azat Mardan, a Technology Fellow at Capital One, said that the new instances of Node.js aren't necessarily replacing the systems the company spent decades building from scratch.

"We invested a lot in Java in the last 10 to 20 years; we're not going to redo everything in Node.js," Mardan said. "But with new projects, we are using Node.js. At this point, it is hard to find a business unit that is not using Node.js."



Node.js has found its way into a variety of applications across the business, according to Kaushik Shanadi, a Software Engineer on the information security engineering team at Capital One. Shanadi's team sees any application built internally to help get it ready for deployment.

“Node.js has exploded exponentially because our CEO has publicly stated the mission to move everything towards open source,” Shanadi said. “With open source, there tends to be a lot more information on how to solve problems that people run into to find new and better ways to solve problems. All the developers were really happy. Instead of being constrained to a tool we have to buy and pay for support, we can either build it ourselves, or go out and find something and use it.”

With more than 5,000 software developers working for the company, that's led to a major grassroots effort to begin simplifying code with Node.js.

## Performant Node.js Makes Cloud Computing Cost Effective

Capital One has two homegrown Java API frameworks called Chassis and eAPI that are tightly integrated with most applications in the business. For the most part, Capital One is using AngularJS to render the front end of its interactive applications, with a little ReactJS mixed in for good measure.

Sayek Banerjee, Principal Software Developer for Capital One Auto Finance, said most of the legacy applications are running Java as middleware too, using SpringMVC. But now that Capital One is running on Amazon Web Services, it's looking for opportunities to save server resources and money.

Banerjee's team has found two applications that are prime candidates to take advantage of Node.js' light footprint: an internal application for auto loan customer service reps called Titan, and a customer-facing application called Enterprise Auto Loan Servicing Experience, or EASE.



Banerjee and his team tackled EASE first, which has a smaller user base. The project is serving as a proof of concept for the larger Titan application, which will eventually be rewritten from the ground up in Node.js.

"Just to maintain [the EASE orchestration layer currently] we are running three Amazon EC2 instances in every cluster. There are many different clusters that we have to maintain for the orchestration layer and it's expensive to maintain just the middleware," Banerjee said. "This was a driving factor behind moving towards the Node.js-based orchestration: less complex and less costly."

Switching to Node.js has decreased the server load, but Marseld Dedgjonaj, another developer on the auto loan team, said server response time is also significantly lower.

"We have seen with our proof of concept a tremendous amount of improvement on the response times: for our current APIs we have a steady response of 2 seconds and the Node.js API that we hosted was responding within less than 100 milliseconds," Dedgjonaj said. "That's a very promising statistic for us."

## Faster Development Time Thanks to Ecosystem

Banerjee said another huge bonus of using Node.js has been the open source community supporting the project; they quickly found Walmart Labs' open source hapi.js, a framework for building API-based applications and services.

"I think what was easy was the sheer amount of time that it took for us to actually develop a new module. It makes it easy to develop new features in JavaScript because now we don't have to develop a piece of code and send it to the server," Banerjee said. "You just go and modify a script directly and use a utility called nodemon that automatically loads the changes. It was just really, really convenient. These small things are saving us so much time and enabling us to rapidly start developing things in Node.js, which we were not able to do with C Sharp or Java."



Shanadi and the information security engineering team has also been able to build more quickly with Node.js. Like Banerjee and Dedgjonaj, his team has been looking for opportunities to integrate Node.js into new projects they begin.

Shanadi built an internal application to help other developers find available ports for new applications. The system used to be run on a spreadsheet and quickly became unwieldy and confusing, where it had to be updated and shared via email after each new application was created across the entire organization.

Many internal dashboards are built on PHP, but Shanadi used the MEAN stack - MongoDB, Express, AngularJS and Node.js - to create the application. He said he was able to build the application quickly and efficiently thanks to using JavaScript on the client and the server.

## Node.js Enables More Team Talent to Work on Full Stack Development

Azat Mardan has been a major advocate for Node.js inside Capital One, encouraging developer teams to learn how to use the technology. He said Node.js is helping to unlock innovation inside his company because the development cycle is sped up and simplified.

Because Node.js is using JavaScript, applications built with the open source technology don't require a "Back-End Team" and a "Front-End Team." Instead, a single developer or a small team who knows JavaScript can build an entire app prototype and start to test it.

"It's just more natural to use one language," Mardan said. "You have smaller teams, you have more general developers and you can iterate faster. This leads to a reduced number of meetings and being more productive, and by using the vast universe of open-source modules, you can have something ready in a few hours instead of a few days."

Azat Mardan said the startup mantra of "fail faster" is alive and well in Capital One, and the shortened development cycle Node.js creates means the developers can easily try new things and not worry about too much wasted time on an idea that turns out to be a dud. Removing that fear of failure boosts creativity, he said.

"Capital One culture has changed dramatically in the last three years," he said. "In this day and age, whoever makes the most mistakes and learns from them, wins."