Case Study:

Change Healthcare using Hyperledger Fabric to improve claims lifecycle throughput and transparency

Sponsor

Change Healthcare is inspiring a better healthcare system. The company operates one the largest healthcare networks in the country, linking 900,000 doctors and 5,500 hospitals to 2,200 payers. In 2017/18, the network handled nearly 14 billion healthcare transactions and claims worth $1 trillion. Change Healthcare is a key catalyst of a value-based healthcare system — working alongside our customers and partners to accelerate the journey toward improved lives and healthier communities.
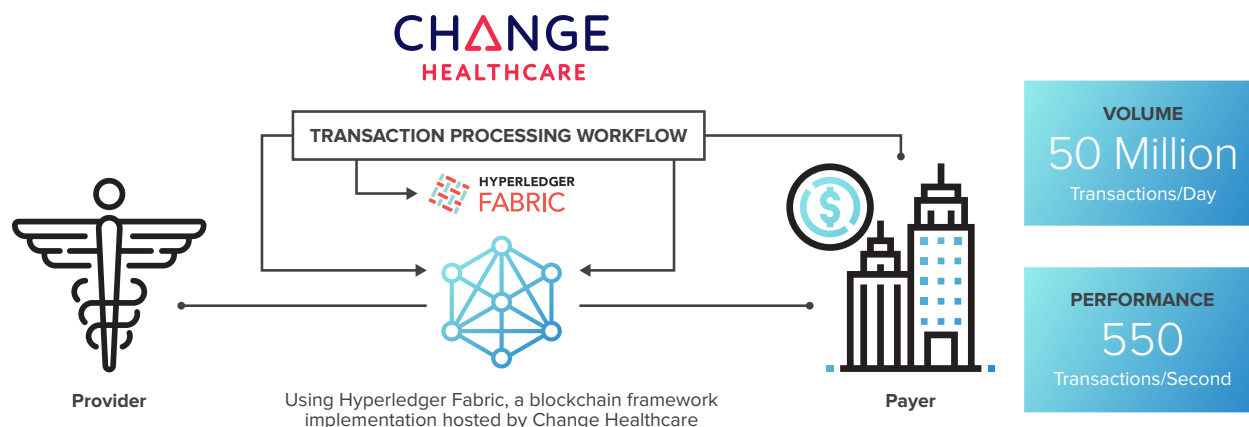
Goals

Demonstrate the feasibility of using a blockchain to process hundreds of healthcare transactions per second

Approach

- Define requirements for a blockchain platform for healthcare claims
- Choose the best platform for this use case: Hyperledger Fabric
- Test the system with many millions of transactions a day

Results

Implementing Hyperledger Fabric took just a couple of months. Since January 2018, the test network demonstrated the ability to process up to 50 million transactions a day—with throughput up to 550 transactions a second. That's enough capacity to handle all claims activity that occurs on the Change Healthcare Intelligent Healthcare Network.

CHANGE HEALTHCARE

TRANSACTION PROCESSING WORKFLOW

HYPERLEDGER FABRIC

Provider

Using Hyperledger Fabric, a blockchain framework implementation hosted by Change Healthcare

Payer

VOLUME
50 Million
Transactions/Day

PERFORMANCE
550
Transactions/Second

Any way you measure it, Change Healthcare is big. In 2017/18, the company processed 14 billion healthcare transactions for claims worth an eye-popping $1 trillion. Behind the scenes, the company's infrastructure links more than 900,000 healthcare providers and 5,500 hospitals with 2,200 government and commercial payers.

So, when the company decided to test a blockchain, they went big. Starting in January 2018, they have been running a claims-processing network based on Hyperledger Fabric that has shown the capability to handle up to 50 million transactions a day, with throughput up to 550 transactions a second.

And they think it can go even bigger.

> **"Fifty million transactions a day: You don't often see numbers on that order for blockchains."**
>
> — Aaron Symanski, *CTO of Change Healthcare*

The road to blockchain

A mission of Change Healthcare is to modernize the American healthcare system, which is plagued by inefficiency, fraud, and waste.

Patients, providers, and payers seldom see complete, up-to-date healthcare records. Incompatible file formats, data silos, and privacy concerns all hamper the free flow of information.

In fact, consulting firm McKinsey estimates that U.S. healthcare could save up to to $450 billion a year by using updated processes and technology. Change Healthcare wants to

play a leading role in this transformation, by extending its Intelligent Healthcare Network with blockchain technology to provide a faster, better experience for all.

When company executives heard about blockchain, they wondered if it could help. For several years, various teams discussed blockchain and created proofs of concept. Then they decided to see if a healthcare blockchain could run at true production speed.

"We wanted to step the conversation forward by putting blockchain into production on a massive amount of data, assets, volume, and activity," explains CTO Aaron Symanski.

His team started with an existing network linking providers to payers. That system did far more than simply store and forward claims. For example, both providers and payers could edit claims. Payers could approve some faster than others to help manage their revenue cycles.

The entire workflow helps both sides run more efficiently. And far beyond a sketch on a whiteboard, that system was already in production serving many thousands of users.

"We're not a startup saying, 'Hey, we have this great idea for a healthcare network built on blockchain!'" says Symanski. "We're already handling more transactions than anyone else."

So instead of building from the ground up, his team wanted to model their existing system with a blockchain and then see if it could stand up to real-world traffic.

> **"We looked at a bunch of private protocols, but with so many different payers and providers on our network, convincing everyone to buy the same software stack from the same vendor would be very challenging. Not only does open source leverage the great work of many people," says Symanski, "It also makes that adoption easier."**

Defining the requirements for blockchain

"When we bring blockchain into the mix, our hypothesis is that we can simplify claims processing, make it more efficient, enable services to be provided more quickly, and improve the cost points," says Symanski.

His team determined that for a blockchain to be successful the platform had to be really, really scalable, so it could handle millions of transactions between providers and payers every day. With each claim requiring multiple transactions, the team knew from years of experience the blockchain would need to support rapid throughput to expedite the claim's lifecycle.

And Change Healthcare could foresee one more big issue: Getting buy-in from thousands of different players, many of them competitors committed to different IT vendors.

"We looked at a bunch of private protocols, but with so many different payers and providers on our network, convincing everyone to buy the same software stack from the same vendor would be very challenging."

Since open source is by definition vendor-neutral, this pointed straight to Hyperledger.

"Not only does open source leverage the great work of many people," says Symanski, "it also makes that adoption easier."

REQUIREMENTS TO DESIGN A BLOCKCHAIN FOR THE HEALTHCARE INDUSTRY

Building a blockchain that could scale to Change Healthcare's business would require hundreds of thousands of providers, billions of transactions and almost $1 Trillion in claims processed. Here's what they designed for.

Easy To Adopt	Scalability	Speed to Market	Customizable	Real Time Transparency	Parallel Tests
The solutions would have to be used by thousands of providers which means affordability and vendor neutrality. Open source was the best option.	Must handle millions of transactions between payers and providers with high throughput. Change Healthcare scaled to 550 transactions per second.	It took a few months to build a test case on Hyperledger Fabric not a year. Critical for rapid prototyping and testing.	Change Healthcare added 30 different events that could be written into the blockchain for any claim.	API built for members of the network to query blockchain to check on the status of their claim.	Blockchain system runs in parallel to their current system, building adoption and scalability over time.

Choosing the best platform

Hyperledger Fabric met all those requirements for a blockchain platform. The only question mark was how scalable they could make it.

"A blockchain that could process two transactions every second would be a nice prototype, but it wouldn't work for us," says Symanski. "We wanted to put this into production."

In late 2017, as his team worked to build the blockchain system and link it to their existing network, they found the open source code efficient to work with.

"It didn't take years, it took a few months," says Symanski. "Working with Hyperledger Fabric was really easy and direct. We're using blockchain for what it was built to do: To store information, store it securely, and store it everywhere."

The new system makes all claims transparent to authorized users via APIs. This enables a hospital administrator, for example, to view the real-time status and remittance of all the hospital's claims as they move through the system. Every transaction of the claim's lifecycle, including any changes to a claim, are all securely recorded on the blockchain along with who made them when. The blockchain network is designed to underpin revenue cycle management software and is currently integrated with the Assurance Reimbursement Management™[1] claims submission solution for healthcare providers.

Such a trusted source shared among participants saves a lot of effort that used to be sunk into submitting, verifying, and reconciling data between companies. And it gives everyone the same view of every claim.

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[1] Assurance Reimbursement Management is a trademark of Change Healthcare LLC and/or one of it's subsidiaries.

Testing the system in production

Since January 2018, the blockchain-enabled network has been running in parallel with the company's traditional system in an extensive field test.

Thirty different types of events can be written to the blockchain for any claim. Change Healthcare created an API that network members can use to query the blockchain about any of their claims in process. This provides real-time transparency into any claim, which can potentially lower overhead, reduce duplication and errors, and cut costs.

The blockchain initially ran on six nodes in the company's data center in King of Prussia, PA and the team is exploring moving it to run in the cloud.

Emily Bailey is the blockchain product development director with Change Healthcare whose team built and tested the system. The key question: Could blockchain and Hyperledger Fabric keep up with the high throughput that the system demanded?

"The answer is yes," says Bailey, noting that the blockchain has shown the capability to process up to 550 transactions a second. "That proves this technology is real. We've built the first enterprise-scale blockchain in healthcare."

"You don't often see numbers on that order for blockchains, and that's one of the exciting things for us," says Symanski. "And we think we can get this quite a bit higher."

For example, AWS recently announced Amazon Managed Blockchain, a managed service that supports Hyperledger Fabric to build scalable blockchains in the cloud. Symanski's team is now working with AWS to find ways to boost the blockchain's throughput even higher.

> **"Our throughput proves this technology is real. We've built the first enterprise-scale blockchain in healthcare."**
>
> — Emily Bailey, *Product Development Manager, Change Healthcare*

Future directions

The blockchain was built in part to give Change Healthcare's customers a chance to work hands-on with the new technology. An ongoing goal is to migrate business partners from the older network to the blockchain, or as Symanski says, "to move providers slowly out of EDI and API ways of interacting with us."

As Change Healthcare continues to explore how to modernize healthcare, the company has other blockchain projects underway on various technologies. Their ultimate vision somewhere in the future is a healthcare network open to patients, doctors, payers, and every other stakeholder in the system.

The team realizes that there won't be "one blockchain technology to rule them all." Symanski says Hyperledger Sawtooth, a modular platform for building, deploying, and running distributed ledgers, has potential, and they're working with TIBCO Labs to make sure all their projects can interoperate.

"We look at blockchain as an important technology to have in our toolbox," says Symanski. "We want to be proficient at using it, better than our competitors are. We believe our market is going to be disrupted by blockchain."

And he sees a definite role for open source in that future.

"We think that it's important for blockchain to be open source. All in all, participating in Hyperledger makes a lot of sense for us," says Symanski. Now he says Change Healthcare is keen to give back to the open source community, in part to showcase the great technology they're building, and in part just to say thanks.

About Change Healthcare

Change Healthcare is one of the largest independent healthcare technology companies in the United States. The company provides software and analytics, network solutions, and technology-enabled services that help customers obtain actionable insights, exchange mission-critical information, control costs, optimize revenue opportunities, increase cash flow, and effectively navigate the shift to value-based healthcare. To learn more, visit www.changehealthcare.com/

About Hyperledger

Hyperledger is an open source effort created to advance cross-industry blockchain technologies. It is a global collaboration including leaders in banking, finance, Internet of Things, manufacturing, supply chains, and technology. The Linux Foundation, the nonprofit organization enabling mass innovation through open source, hosts Hyperledger. The Linux Foundation also enables a worldwide developer community to work together and share ideas, infrastructure, and code. To learn more, visit https://www.hyperledger.org/