

# Cavium Intelligent Ethernet Adapters Accelerate Hart's Network and Application Performance as Much as 10X



Hart dramatically accelerates application performance and achieves rapid, cost-effective scalability while significantly reducing deployment costs in their Big Data environment to successfully meet growth objectives.

## BACKGROUND

Hart is a health utility that connects people with their health. Providers, patients, and consumers all use Hart to improve health outcomes with solutions such as medication adherence, remote monitoring of in-home patients, and secure peer-to-peer video. The huge data flows this generates were creating a bottleneck for Hart's network and impacting application performance. In addition, high infrastructure costs were becoming an obstacle to Hart's ability to rapidly scale, a key component of their business strategy.

## SOLUTION

Hart deployed Cavium™ FastLinQ® QLE3442-CU-CK 10Gb Intelligent Ethernet Adapters, which helped accelerate network and application performance by as much as 10X, while reducing network complexity, infrastructure costs, and time-to-deploy.

## RESULT

Patient information queries that had been requiring up to two minutes were completed in seconds, allowing near real-time application response. At the same time, infrastructure deployment costs dropped from \$180-\$200K per rack to \$150K per rack, with time-to-deployment reduced by 40%.

## INTRODUCTION

Hart currently provides medication management and remote monitoring of in-home patients to enable healthcare providers to improve care and reduce hospital readmissions. In addition, Hart has a number of applications under development for the consumer healthcare space. These both require Hart to store, access, analyze, process, and share huge amounts of patient data. For example, a single, remote monitoring patient may have an e-chart with 50 years of patient history containing tens of thousands of records, and numerous MRI images (one high-resolution MRI scan can be over 200MB).



At the same time, users of Hart's solutions – home health agencies, providers, consumers, etc. – need accessibility to the data and

reports in near real time. To balance the demands for instant access and massive storage, Hart initially built a 1Gb Ethernet (1GbE) network infrastructure to support their architecture. This consisted of a lightweight NodeJS front end with a Cassandra data base on the back end to provide moment-to-moment data availability with Hadoop to deliver archiving of massive data sets.

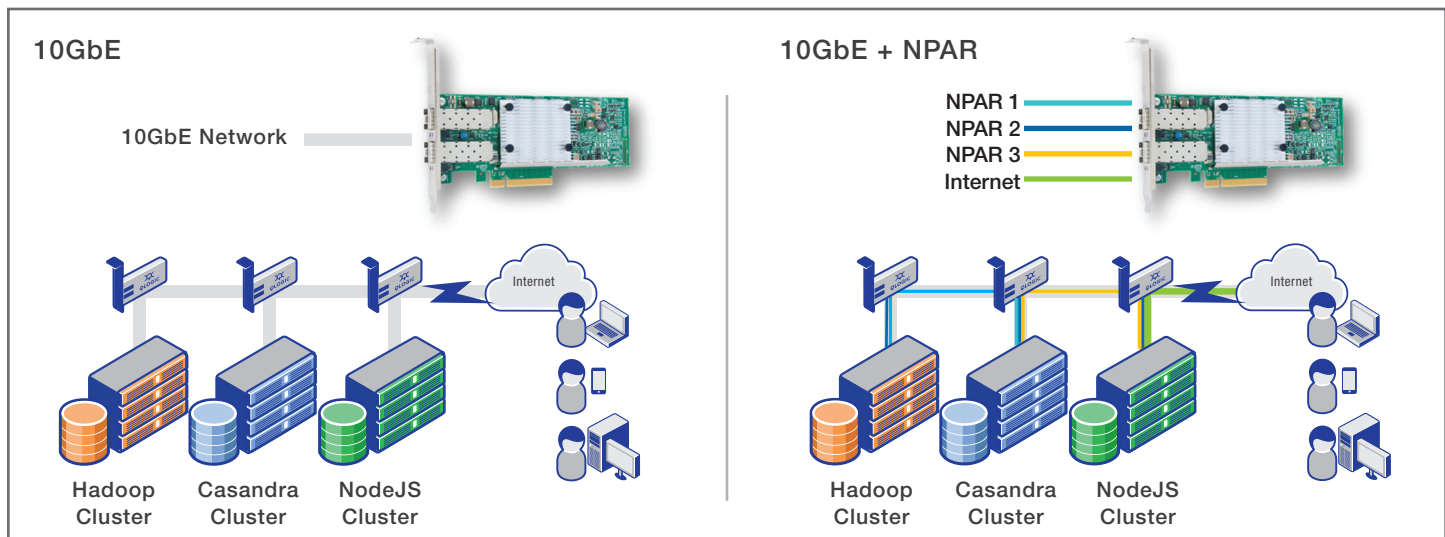


Figure 1. **TODAY.** Cavium Intelligent Ethernet Adapters provide high-performance connectivity between Hadoop, Cassandra, and NodeJS Clusters to accelerate network and application performance up to 10X for Hart.

Figure 2. **FUTURE.** As Hart expands to consumer markets, Switch Independent NIC Partitioning (NPAR) technology will enable Hart to separate network workloads yet still guarantee bandwidth to critical applications across a single network wire, further improving performance.

Mohamed Alkady, President of Hart explains the challenge: “As our business grew, we found our 1GbE infrastructure simply insufficient to support the network demands of our growing customer-base and current application roll out. We needed to be able to store and access data as close to real-time as possible. Because we’re continually moving massive amounts of data to deep archive with Hadoop, our network is always busy. The internal Hadoop data transfers were causing our routers and switches to get bogged down, which slowed our external data flows. This was negatively impacting the performance of our browser-based software, which is delivered from our Network Operations Center.”

ultimately made Mohamed choose Cavium adapters over other 10GbE offerings is how well they fit into Hart’s new data center design plan and architecture.

In addition to performance challenges, Mohamed and his team needed to find a way to improve network scalability: “To overcome the bottlenecks we were experiencing, we first looked at creating two networks to separate internal and external data flows, but that solution was not scalable, and our hardware as well as operating expenses would grow exponentially. In addition, having to develop for the two separate networks would put an extra burden on our Dev Ops team.”

Mohamed explains: “We are developing applications for consumers. There are no major players in that market right now and it’s a huge opportunity. But the amount of data we will need to store, analyze, and process for consumer applications is going to be exponentially larger than the already massive data sets we are working with now. It’s pretty clear that we will be managing more than a petabyte of data within a few years and there is no way we would be ready to take that step without the NPAR technology in Cavium 10GbE adapters.” Switch independent NIC Partitioning (NPAR) technology will enable Hart to separate their network workloads, yet still guarantee bandwidth to critical applications across a single wire. “With NPAR, we’ll save on costs and avoid the hassle of additional adapters and cables...while still meeting Service Level Agreements (SLAs) for our customers.”

## SOLUTION

Hart made the decision to upgrade to the newest generation of 10Gb Intelligent Ethernet Adapters from Cavium. Mohamed describes the installation process as a breeze: “It only took about a half a day to get the new adapters deployed, tested, and operating.” More importantly, Hart immediately saw an increase in network performance, which allowed them to increase the storage capacity per server, significantly cutting hardware.

As for why Hart chose to deploy Cavium PCI adapters versus taking a LAN-on-Motherboard (LOM) approach, Mohamed points to the greater flexibility, performance, and reliability of Cavium: “The LOM options we encountered didn’t have support for NPAR. And even if they did, we prefer to build custom servers from best-of-breed components to meet our specific requirements. By adding an integrated controller on the motherboard, we would limit our options and put ourselves at greater risk with extra points of failure. If something goes wrong with that controller, or I want to upgrade to the next generation of Ethernet, I have to replace the entire motherboard. Not only is this impractical, it’s just not cost effective. On the other hand, Cavium PCI-based adapters help us avoid the complexity of added integration, single points-of-failure, and extra hardware on a motherboard. So we can easily change when technology changes.”

“Now we are able to pull in data incredibly fast. For example, we recently received 4.5 million records from a partner to analyze, and it would have taken so much longer without the Cavium 10GbE adapters.” While the move to 10GbE satisfied Hart’s immediate bandwidth needs and boosted overall application performance in the current environment, what

Mohamed comments on some people's questions about the supposedly higher costs of 10GbE adapters: "My perspective is, if you're moving vast amounts of data, can you afford not to have 10 Gigabit Ethernet? I think too many people don't see the hidden costs of not having such a network. But if you focus on all the efficiencies that you get with 10GbE – getting to market faster, higher server and storage density per rack, the need for less cables, fewer points of failure, less power and cooling – if you're truly doing Big Data, mass arrays, then 10GbE is a fantastic way to go."

### RESULTS

Hart has realized a number of significant business and operational benefits since implementing the Cavium adapters. "Performance has increased dramatically and there are no more data issues," reports Mohamed. "Processes that used to take 4 to 5 hours now get completed in minutes. Another example: one key algorithm that used to take up to two minutes to run now takes 15 to 30 seconds at most. Reports aggregating multiple queries that would require 20 minutes to generate can now be completed in seconds. We're always trying to achieve real-time performance and the Cavium adapters are helping us get there. For our Dev Ops team, that's a real advantage. Before they had to create a queue system to alert users when those 20 minutes of processing were finished. Not anymore. Even our delivery of data to Akamai is faster – we use them to accelerate our Web-based software – which helps make them an even more productive asset for us."

On the scalability and infrastructure side of the equation, the results are just as positive. "Before, it would cost about \$180,000 to \$200,000 to deploy a rack," says Mohamed. "Now, the cost is down to \$150,000 per rack. The way I look at it, every \$50,000 we save on a rack contributes to one third of the next rack. And those are just the savings on hardware. The Cavium adapters help us achieve roughly 40% more efficiency with our time when it comes to installation and operations. As for power and cooling savings, we haven't had time to quantify those yet, but we know they're there."

All in all, the move to Cavium has been a huge win for Hart. The ability to deliver results in near real-time for current clients is critical to Hart's maintaining their competitive advantage. Mohamed sees even greater potential down the road, "In our labs, we are testing the new application design that NPAR makes possible. We are very excited with the improved performance we are seeing in trials. We believe the significant gains from NPAR will be key to our future success as we scale out for consumer markets."

### KEY BENEFITS

- 5X average performance improvements with some reaching as high as 10X
- Faster delivery to the Akamai network
- \$30,000-\$50,000 savings per rack of servers deployed
- 40% reduction in network OPEX
- Ability to rapidly and cost-effectively scale to meet aggressive growth objectives while sustaining competitive advantage
- Reduced demands on the Dev Ops team, allowing them to focus on delivery of higher value capabilities

### ABOUT CAVIUM

Cavium, Inc. (NASDAQ: CAVM), offers a broad portfolio of infrastructure solutions for compute, security, storage, switching, connectivity and baseband processing. Cavium's highly integrated multi-core SoC products deliver software compatible solutions across low to high performance points enabling secure and intelligent functionality in Enterprise, Data Center and Service Provider Equipment. Cavium processors and solutions are supported by an extensive ecosystem of operating systems, tools, application stacks, hardware reference designs and other products. Cavium is headquartered in San Jose, CA with design centers in California, Massachusetts, India, Israel, China and Taiwan.

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