Next-Generation Infrastructure Solutions Enable the Store of the Future

A virtualization solution for edge computing that provides cost-effective simplicity, availability, and scalability ideally suited for the retail environment

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Overview

In 1998, Amazon opened its virtual doors to eCommerce for the first time. That move changed the world. Today, it would be difficult to find a retailer or wholesaler larger than a mom-and-pop store that *does not* have an online sales presence. However, sellers are not the only ones whose sales experience has evolved over the years.

Consumers, who once had no choice but to buy from physical stores, learned to appreciate the advantages of ordering online (no need to drive to a store, gifts shipped directly to the recipient, easy price and feature comparisons, and so on). Now, however, consumers expect more. As major retailers (such as The Home Depot, Walmart, and others) have shown, many consumers want the ability to order online and then pick up the items at a nearby store. This combines the advantages of online purchasing with those of physical stores.

For example, buyers look for items online. If they find something that interests them, they can visit a store during a lunch break to see and touch the items in person. They can try on clothing to see how it fits, or pick up a chainsaw to feel how heavy it is. If they do not have time to wait in line to purchase it, they can order online later for store pick-up the next day on the way home from work. This approach provides a better overall user experience while saving them the cost and time delay of having the goods shipped from warehouse to home.

However, despite the advances in customer experience over the past two decades, little has changed within the typical seller’s infrastructure.

Necessity is the Mother of *Innovation*

Retailers who continue to do things as they did a decade ago are being surpassed by those that take advantage of the latest innovations to do things they were unable to do before. In today’s globally interconnected world of eCommerce, it is no longer a matter of competing against the retailer down the street. Businesses large and small must compete against retail giants *and* mom-and-pop stores that can be located anywhere in the world.

To thrive in this environment, businesses must evolve to offer an enhanced user experience that was impossible earlier, to conduct business more efficiently than ever, to appeal to a wider audience, and to do things faster and better than the competition. *Moreover,* they have to do it cost-effectively in this age of static or shrinking IT budgets.

Innovations such as instant in-store promotions downloaded to the consumer’s phone, in-store Wi-Fi, and self-checkout are a good start. However, if layered on top of the store’s old IT infrastructure, the constraints of that infrastructure limit the benefits to both the consumer and the retailer. Infrastructure, too, must evolve with the times.

It needs to be flexible, scalable, and secure, yet easy to use. Only then will it be ready to support in-store innovations and the new applications that will create tomorrow’s customer experience. New technologies—such as edge computing and the use of IoT devices—are required to meet the needs of today’s consumer.

Retailers have gotten more options over the past few years to help them modernize their data centers, ranging from virtualized hardware and software “as a service”; to public, private, and hybrid clouds; and others. Edge computing can streamline retail operations even more, as well as enhancing the customer experience.

Edge Computing

So what is edge computing, and why is it important to retail? Edge computing is the use of IT resources outside of a data center, such as in a remote office, branch office or retail store. It may consist of as little as one IoT device or it could be more like a “micro data center”, with several computing devices linked together. Edge computing can be used in conjunction with building management, video surveillance systems, point-of-sale (POS) terminals, and various other IoT devices.

Why not simply use a cloud? Clouds offer tremendous scalability and elasticity and are appropriate in many environments—but not all. In some cases, internet connectivity issues and long latencies are serious problems. In addition, many businesses have concerns about security, privacy, and data protection when using the public cloud, and ongoing costs can be higher than for on-premises solutions.

Keeping the data within the store walls minimizes these concerns. Performance is more consistent and generally faster as well. If you are accessing your data in the public cloud, and your Internet connection is severed due to external events, then what? You cannot afford to have your business suddenly stop due to a lack of data access, and you certainly don’t want to risk losing online consumers because of latency issues.

On the other hand, when you store the data in-house, it is up to *you* to keep everything running, Also, what if the location is too small—whether physically or economically—to justify even one on-site IT person? What can you do? The answer is to implement a virtualized infrastructure that is easy to set up and maintain without IT staff, using a cloud for backup, just in case. Virtualization streamlines operations via automated tasks, high availability, and simplified scalability.

To be cost-effective, edge computing—especially in a retail environment—requires cost-effective hardware, ease of use, and low operational expenses. Using a lightweight, nimble, and purpose-built edge computing solution enables data analysis locally, without the expense and latency of continually retrieving data from the data center. IoT-driven backroom technologies (such as RFID chips and smart shelving systems) improve the accuracy of inventory tracking throughout the supply chain, and they do so efficiently and inexpensively. Edge computing can even help you reduce or prevent shortages of popular items during holidays and other peak times. By setting thresholds in inventory management, items can be reordered automatically when supplies drop below those quantities, without having to wait for a manual inventory check.

Unfortunately, many existing virtualized solutions are designed for full data centers with IT staffs and big budgets. These solutions are not appropriate for edge computing, because they require too many computing resources, too much floor space, and too much hands-on time. Moreover, because they were designed for heavy-duty data center use, they cannot be scaled down enough to be competitive in an edge environment.

The Future of Retail is Interconnected

To keep up with the competition, or better yet race ahead of them, retailers need to find newer, better ways to increase efficiencies while also enhancing the customer experience. After all, a happy customer is a returning customer.

The typical monolithic legacy retail app that has been upgraded, modified, and patched many times over the years is a huge inhibitor to innovation. It can do only one thing: warehouse management, for example, or scanning and pricing. These apps typically do not work together with newer ones as efficiently as they should, and a complex network of point-to-point interfaces interconnects the systems often. This sort of infrastructure makes it nearly impossible for a retailer to respond rapidly to changing business and consumer needs.

Application Innovation

Edge-designed apps, combined with IoT hardware, can accomplish much more than traditional ongoing legacy apps ever could. For example, many retailers are using innovative solutions to reduce heating and air conditioning costs. The downside is that these solutions typically require specialized onsite hardware that adds to the cost of the solution and introduces more hardware to maintain, along with more complexity. Instead, the right virtualized solution can *reduce* costs and complexity.

Data protection is another area where software innovation is crucial. A cyber-attack resulting in a security breach can have wide-ranging implications. Not only can hackers steal sensitive company, employee, and consumer data, but the damage to a retailer’s reputation can result in lost sales for years to come. The use of IoT devices offers tremendous opportunities for retailers, but it also creates additional opportunities for hackers to slip past firewalls and other security measures. Real-life examples of hacked IoT devices that have enabled, or could enable, data center intrusions include a casino’s fish tank thermometer, smart sockets, internal security cameras, and other non-IT devices.

Likewise, instead of worrying that consumers who check out competitor pricing online while in a retailer’s store will end up purchasing elsewhere, retailers should be innovating to enhance a

customer’s experience while they are physically in the store. An enhanced experience can easily offset slightly lower prices elsewhere and cement buyer loyalty.

For example, location-based beacon technology uses IoT sensors that enable retailers to track consumer traffic patterns within the store. This provides information that the retailers can use to redesign the store for more effective traffic flow. If there is a strong tendency for consumers to go directly from produce to meats, or music to game consoles, moving those sections closer together would benefit consumers (and thereby the retailer) by reducing shopping times and increasing convenience. Alternatively, the retailer could put another section containing high-profit or deeply discounted items between the two, increasing the visibility of those items.

Another example is intelligent electronic labels placed on a shelf or product. They allow a retailer to track when a consumer picks up a toaster or takes a suit off a rack for a closer look. As soon as the consumer replaces the product they were looking at, the label would coordinate with intelligent micro digital signage (MDS) devices on the shelf or rack to offer that consumer a customized one-time special offer for that very item.

Shopping list apps enable consumers to create a list before heading to the store. Today, they are mostly static files that simply reside on the user’s mobile device. However, there is the potential for them to do much more. For example, once the consumer arrives, the app could automatically connect to the store’s consumer interface to find the most efficient route to all of the products on the shopping list and display a store map showing the location of the item.

Then, daily or weekly, the retailer could anonymously aggregate the information collected about which purchases were and were not on the consumers’ respective shopping lists. The retailer could also learn which items were planned purchases and which were impulse buys. This information would then supply analytics software with data to help the retailer make adjustments to such things as pricing and promotions, based on historical sales trends by day of the week (or even time of day), as well as store layout.

What is the Answer?

So far, we have explored what is *wrong* with current retail infrastructures and how edge computing and virtualization in general can help with these shortcomings. Now it is time for

specific solutions. How does Lenovo help you improve efficiencies, enhance the customer experience and reap the other benefits, while also reducing complexity and costs?

A Purpose-Built Virtualized Solution for Retail Environments

The Scale Computing HC3® Edge Platform from Lenovo is a suite of customized hardware, software and services that provides a customized solution that can be as simple as a single node or as sophisticated as a multi-node micro data center. Lenovo is working closely with Scale Computing to deliver a customized, highly flexible and reliable virtualized edge computing solution at an aggressive price.

Our solution for edge computing combines dependable performance, simplicity, easy scalability, and integration with public, private, and hybrid clouds.

There are other edge computing solutions on the market, but the Scale Computing HC3 Edge Platform from Lenovo offers unique capabilities and opportunities:

- **Minimal resources —** The solution runs lean, requiring minimal hardware, floor space, energy, and other resources.
- **Maximum uptime —** The virtualized cluster provides built-in replication; cluster-wide redundancy; automated, nondisruptive rolling updates; thin storage provisioning; continuous replication; and other high-availability features that work together to keep your business running day after day. Among them are self-healing features that automatically diagnose and correct many system faults and other issues. After all, a “solution” that is down solves nothing. Designed for ultra-reliability, Lenovo x86 servers have been the *#1 most reliable* in the industry for six years running.
- **Virtualization for the masses —** Virtualization used to be too expensive for most retail sites. Now, the Scale Computing HC3 Edge Platform from Lenovo makes the advantages of virtualization available to even small retail locations. Embedded KVM-based virtualization is standard, so there is no additional hypervisor license cost. The built-in virtualization software is so easy to run and manage through the supplied web-based unified management console that no specialized virtualization training is necessary. Virtualization can be up and running in under an hour. You can create a new

VM in minutes from the central node and then automatedly push it out to the other nodes in the on-site cluster—and even to clusters in other locations.

- **Simple scalability —** The innovative design of the HC3 solution enables scalability simply by plugging new HC3 nodes into the cluster. The new resources are then available for the first time to the cluster within minutes with no disruption to the existing resources.
- **Protected data —** Data replication and failover capabilities are built in, with the option of off-site cloud backup. Other optional data protection features include UPS systems from APC, and security solutions from F5 running as a virtual machine on the cluster.
- **Centralized management —** The single, unified web-based management interface enables you to manage thousands of micro data centers from a single location, quickly and easily.
- **Cost efficiency —** The HC3 solution offers an extremely economical, expandable, and resilient solution. In addition to the aggressive initial price, implementation and operating expenses are very low, offering significant savings. The combination of embedded hypervisor, simplicity, and automation means a retail location can run efficiently and cost-effectively without an IT professional on site.
- **Performance —** Great solutions are not so great if they cannot keep up with the performance demands of your business. We have you covered there as well, with the *#1 fastest line of servers in the industry*. In fact, Lenovo is the *#1 provider of servers on the TOP500 supercomputing list*.
- **Customer Satisfaction —** We do not stop supporting you once the solution is delivered to your doorstep. Our experts will ensure that the solution is deployed and optimized to meet your needs. Because of this level of dedication to our customers’ needs, Lenovo has been rated #1 in customer satisfaction for the 10th consecutive time in the survey conducted by TBR Research among North American customers, and for the fourth straight survey in Asia/Pacific.

Summary

The pace of change in retail, as in all other aspects of modern life, is accelerating every day. To stay competitive and even thrive, a retailer must innovate constantly. Combining virtualization,

IoT, and edge computing with an adaptable infrastructure offers a way to streamline retail IT operations at the storefront level, and provides major opportunities to enhance the consumer experience while also lowering costs.

The HC3 solution is ideal for edge computing in retail environments, providing the simplicity, flexibility, availability, scalability, and data protection you need, with dependable performance and cost-effective operation. Moreover, we do it with the fastest servers, the highest reliability, and the best customer satisfaction in the industry.

For more information about the Scale Computing HC3 Edge Platform from Lenovo, contact your Lenovo sales representative, an authorized Lenovo dealer, or visit http://lenovo.com to chat with a sales representative or download the data sheet.