



VERTIV WHITE PAPER

Transforming the Retail Edge: Enabling Point-of-Sale Continuity and IT Growth

Executive Summary

Retailers have long deployed local IT to support increasing customer data collection and inventory management. Therefore, the rapid growth in edge computing sites necessary to better manage these higher data volumes and minimize latency, is not as disruptive in retail as it is in other industries.

The retail edge, however, is undergoing a transformation as retailers adopt more in-store technology to streamline checkout processes, enhance the customer experience, and break down barriers between the online and physical retail experience. This retail revolution has the potential to create IT management challenges unless IT infrastructure issues are addressed in a way that maximizes continuity, enables growth, and simplifies management.

The opportunity exists in many locations as retailers consolidate multiple distributed point-of-sale (POS) protection systems into a centralized system that offers higher reliability and reduces the number and frequency of battery replacements. At the same time, the centralized infrastructure system enables retailers to easily adapt to the emerging technology systems that are being deployed to enhance the customer experience and increase operating efficiency, including retail IoT technologies, augmented reality, digital signage and machine learning.

An uninterruptible power supply (UPS) system that can deliver a high level of reliability while providing remote visibility into edge retail locations is at the heart of an infrastructure strategy that protects retail IT and point-of-sale systems. Depending on the specific systems being deployed, additional infrastructure may be required to organize, manage and protect retail technology, including half or full-size IT equipment racks, intelligent rack power distribution units, thermal management systems and environmental monitoring.

Maintaining Continuity at the Point of Sale

The immediate challenge for many retailers will be addressing gaps and opportunities in the infrastructure protecting edge retail POS systems. Here, two challenges are converging to drive the need for infrastructure upgrades.

Management Complexity

The first is the maintenance challenge created when separate uninterruptible power supply (UPS) systems have been deployed for each retail POS system. The UPS enables the POS system to continue operating during short power outages and conditions the power being delivered to POS systems to prevent surges and other power anomalies from damaging electronics or disrupting equipment operations.

Dedicating a single UPS to each edge POS system limits the impact of a UPS failure — only one checkout lane will be disabled — but increases maintenance costs and complicates management.

A key component of the UPS system is the battery, which provides the energy storage required to keep equipment operating during a utility outage. UPS batteries gradually degrade over time, and it can be difficult to precisely predict the lifespan of a battery in a certain application. The batteries used in most UPS systems today, known as valve-regulated lead-acid (VRLA) batteries, have an expected lifespan of about 3-5 years in most retail applications. However, longer lasting lithium-ion batteries are growing in popularity among retailers. Regardless of the chemistry, once batteries exceed their lifespan, they are prone to failure at exactly the time they are needed to maintain continuity.

In a retail store with more than two POS systems, it can be difficult and costly to manage battery replacements across multiple UPS systems. Many retailers are now finding it advantageous to move to a centralized architecture in which a single, larger UPS system located at the back of the store provides backup power and conditioning for POS systems.

Evolving POS Technology

The other challenge is the continued evolution of edge retail POS systems. One of the biggest complaints consumers have about the in-store retail experience is long lines at checkout, which can be alleviated through self-checkout technology and approaches such as scan-and-go systems. Research firm [ResearchandMarkets.com](https://www.researchandmarkets.com) forecasts a 10.2% compound annual growth rate for the self-checkout market from 2020-2025.

While addressing consumer concerns about lines, these retail technology solutions expose retailers to increased risk of shrinkage. To mitigate this risk, stores using autonomous or self-checkout must typically improve their security systems with additional cameras and supporting systems to deter theft. Some are even using [artificial intelligence](#) (AI) to enhance the ability of security systems to detect fraud at checkout. This added load likely requires infrastructure beyond the UPS that is designated for POS system protection.

A similar evolution is occurring in what is known as frictionless payment, or the use of mobile phones and digital wallets for payment. These systems are being embraced by consumers, and where multiple sales channels exist, enable retailers to sync online and in-store transactions, inventory and promotions. This may increase IT requirements within the store, and these new systems can be best protected through a centralized IT infrastructure system.

Benefits of Centralized Infrastructure

Where more than two retail POS systems exist, connecting all POS systems to centralized infrastructure has multiple benefits:

- **Higher reliability:** Larger UPS systems generally have higher reliability than smaller systems and deliver lower cost per kilowatt (kW), reducing maintenance requirements and total cost of ownership while enabling enhanced continuity.
- **Fewer battery replacements:** With a single UPS system, the challenge of maintaining UPS batteries becomes much simpler. Instead of managing battery lifecycles across multiple systems and potentially performing multiple battery replacements each year, there is only one UPS battery system to be maintained. The move to a centralized UPS system also creates the opportunity to transition away from VRLA batteries to [lithium-ion batteries](#). Lithium-ion batteries are displacing VRLA batteries in retail UPS systems because, among other benefits, they can operate at higher temperatures without degradation, offering a much longer lifespan. The longer life of lithium-ion batteries can eliminate 2-3 battery replacement cycles compared to VRLA batteries.
- **Simpler management:** One of the keys to the future of retail technology is remote monitoring and management, and this applies to physical infrastructure just as much as IT systems. While smaller UPS systems enable remote management, larger systems often offer better capabilities. Consider the difference in complexity if you have 100 retail stores with an average of five POS systems each. In a 1-to-1 UPS-to-POS support ratio, you would be remotely monitoring 500 systems. With a centralized strategy, you would be monitoring only 100.
- **Enhanced scalability:** When properly sized, a centralized infrastructure system provides more flexibility in supporting evolving POS systems and other new retail technologies.

Establishing the Foundation for Smart Retail

Advanced checkout systems aren't the only technology being implemented in retail environments. Facing increased pressure from the online channel, retailers with a brick-and-mortar presence are using retail technology solutions to gain deeper insights into customer behaviors allowing associates to be increasingly efficient when enhancing the in-store customer experience and helping them better manage costs. Here are just some of the technologies being considered or deployed today that could increase in-store IT requirements:

- **Video analytics:** Video is moving beyond security to become a tool in better understanding customer behaviors and managing inventory within the store. New camera systems connect to technology platforms that use video analytics to track merchandising programs, improve inventory management, and analyze how customers engage with the physical environment.
- **Machine learning:** As they are collecting more data on customer behaviors and product inventory, retailers are beginning to use machine learning to identify opportunities to improve the customer experience, eliminate operational inefficiencies, and more accurately forecast demand.
- **Digital signage:** Digital signage is being used to create a more dynamic retail experience while enhancing retailers' ability to quickly implement changes to the messages customers are seeing. They can be interactive to increase engagement, and because they are easy to change, create opportunities for more relevant and timely store displays.
- **Smart shelves:** Similar to what is happening with signage, the retail shelf is evolving into a dynamic information delivery system. For retailers these "smart shelves" allow prices to be updated digitally, minimizing the need for manual price changes. For consumers, they create the potential to replicate the information available to them online in the store. One electronics retailer has integrated smart shelves with its online platform to enable display of customer reviews on the shelf.
- **Mobile apps:** Mobile apps are being used to help customers navigate stores and create more seamless experiences between online and in-store shopping

- **Augmented and virtual reality:** These technologies are giving consumers the best of both worlds — the ability to physically inspect merchandise in the store combined with digital capabilities that enhance product selection. For example, smart mirrors allow in-store consumers to try different makeup colors virtually while augmented reality (AR) enables consumers to better visualize how furniture will look in their home. AR is also being used by some retailers to improve the efficiency of stocking and other processes.
- **Retail IoT:** Particularly in larger stores, IoT technology is being used to control lighting and monitor environmental conditions to reduce energy consumption.
- **Robotics:** Robots are being piloted in stores today for everything from scanning shelves to identifying restocking requirements to cleaning floors and automating fulfillment.

While retailers in different categories will gravitate to some of these technologies and may be slower to embrace others, the overall trend is the same: retailers are collecting and using more data across the store to better serve customers and reduce costs. While some processing will be offloaded to the cloud, latency and bandwidth issues will require growth in the technology systems being deployed in the store.

The days when stores could operate off a single server and router sitting on a desk in the back room are over. Today, the technology required to support retail stores with self-checkout, enhanced security, IoT, and smart retail technology is looking more and more like a micro data center. This makes decisions about in-store IT infrastructure more critical than ever.

Configuring In-Store Retail Infrastructure

Due to the wide variety in retail environments and technology requirements, no single solution will be appropriate for every environment. However, in almost all cases, the UPS system is the heart of retail continuity and should be the starting point when configuring retail edge infrastructure.

Determining UPS Requirements

Having the right UPS system in place across the retail network does more than just ensure continuity of operations. It enables new technologies to be added with minimal disruption and can provide centralized visibility into distributed retail locations. When selecting a UPS system for a retail store, consider the following factors:

Remote Management Case Study

A large [global retailer](#) that designs and sells ready-to-assemble furniture, kitchen appliances, and home accessories was steadily increasing the use of in-store technology in the form of kiosks and augmented reality displays. Simultaneously, stores were generating higher volumes of data.

To reduce the burden on data centers and address potential latency issues, the retailer added edge computing at the store level. With multiple servers being deployed at each location, the retailer needed a solution to minimize support costs, simplify management and maximize uptime.

Deploying serial consoles at each retail location connected to remote management software that provides centralized visibility met all three objectives. IT specialists can remotely monitor, manage, and troubleshoot in-store technology to achieve higher resiliency with lower costs.

- **Capacity:** The capacity of a UPS system is determined by the load of the equipment being supported, the UPS output power factor, and future expansion plans. UPS capacities are typically specified in terms of voltage, but most manufacturers also show capacity in terms of wattage. For example, a UPS with a maximum 3000 volt-ampere (VA) rating would also be rated at 2700 watts. When selecting a UPS that will deliver adequate capacity, a good rule of thumb is to multiply the total wattage of the IT equipment being supported by 1.2 to minimize the risk of overload. This calculation should also take into account the impact of new technology systems, such as those mentioned previously, that may be deployed in the future.
- **Topology:** The ability of the UPS to deliver clean, consistent power to the equipment it supports is determined by the “topology,” or internal design, of the system. [Three main topologies](#) are used in UPS systems for retail applications: standby, line interactive, and online double conversion. If the load is less than 1500 VA, a standby UPS provides a good, low-cost option for POS systems requiring low power capacity. If incoming power is relatively clean and stable, a line-interactive UPS may provide adequate protection. When power quality is poor, a double-conversion UPS may be required, as it protects against more types of power disturbances than a line interactive UPS.

- **Battery runtimes:** With many retail applications not supported by a backup generator, the battery system determines how long equipment and applications can continue to function in the event of an outage. Batteries are often considered the “weak link” in the critical power system in that their performance naturally degrades with time and usage. Monitoring battery performance is highly recommended to ensure batteries provide the required capacity and runtime when needed. Also, lithium-ion batteries should be considered as an alternative to VRLA batteries as they operate at higher temperatures and deliver much longer runtimes when only internal batteries are being used, reducing the frequency of battery replacements and lowering total cost of ownership over the life of the UPS.
- **Connectivity:** In a distributed IT environment such as retail, you’ll want a way to remotely monitor and manage your IT infrastructure. UPS systems from most major manufacturers can be purchased or retrofitted with communication cards that enable connectivity through various platforms for remote monitoring and management. You can also connect temperature and humidity sensors to the UPS, or a power distribution unit, to enable remote monitoring of environmental conditions.
- **Service and maintenance:** An additional factor that should be considered is how UPS service and battery replacements will be handled. Most retailers won’t be comfortable having store personnel perform even the simplest service tasks, so it’s a good idea to prepare for service before it is required. When selecting a service provider, evaluate their capabilities in proximity to the location of your stores. Not all vendors have fully developed service organizations that can provide local, time-sensitive support in all areas.
- **Power distribution:** As more IT equipment is deployed, the UPS may not have enough outlets to support all the equipment in a server rack. Basic [rack power distribution units](#) (rPDUs) are available in a variety of electrical and receptacle configurations, but serious consideration should be given to the value provided by an intelligent rPDU with remote monitoring capabilities. These rPDUs enable a comprehensive view of power usage at the rack or via remote access. Intelligent, switched rPDUs are also available and can deliver added value. In addition to monitoring, they provide the ability to remotely cycle equipment on and off through the rPDU web interface or turn off certain outlets to protect against overloading.
- **Thermal management:** When IT power consumption exceeds 1.5 kW, facility air conditioning may be unable to keep IT equipment within safe operating ranges and a dedicated cooling system will be required. There are a variety of solutions available for cooling IT systems in small spaces, such as wall-mount and ceiling-mount systems. There are also micro data center solutions available today that integrate cooling into an enclosed rack preconfigured with power protection, power distribution and monitoring systems, simplifying specification and deployment of retail edge infrastructure.
- **Network infrastructure visibility:** Remote infrastructure monitoring and management capabilities provide centralized IT specialists with visibility into equipment performance and can also enable tasks such as rebooting IT systems remotely. When equipped with [additional sensors](#), they can also generate alerts for situations that could put equipment at risk, such as elevated temperatures, water intrusion, or unauthorized access. Remote infrastructure monitoring can be performed through the UPS, intelligent rPDUs, or a dedicated monitoring solution. Devices, such as advanced serial consoles, and IT visibility platforms are also available to enable remote IT access and streamline troubleshooting as described in the remote management case study sidebar.

Other Infrastructure Considerations

For smaller stores, a centralized UPS system may be the only IT infrastructure system required, but as technology requirements grow, additional protection and capabilities may be warranted:

- **Physical security:** In many retail locations, IT equipment is vulnerable to access by unauthorized personnel. Lockable, full- and half-height server racks help prevent unauthorized access while improving [equipment organization](#). Another best practice is to deploy sensors on the door that trigger alerts when the door is open, which can be monitored locally and remotely.

Conclusion on Managing Retail Transformation

Retail stores that survive and thrive in the coming years will be those that use technology to deliver a better customer experience and improve operational efficiency. IT infrastructure is critical to ensuring availability and simplifying management of in-store technology.

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