



Produced in Association with:



VERTIVTM



A Guide to Mission Critical IT in Retail Environments

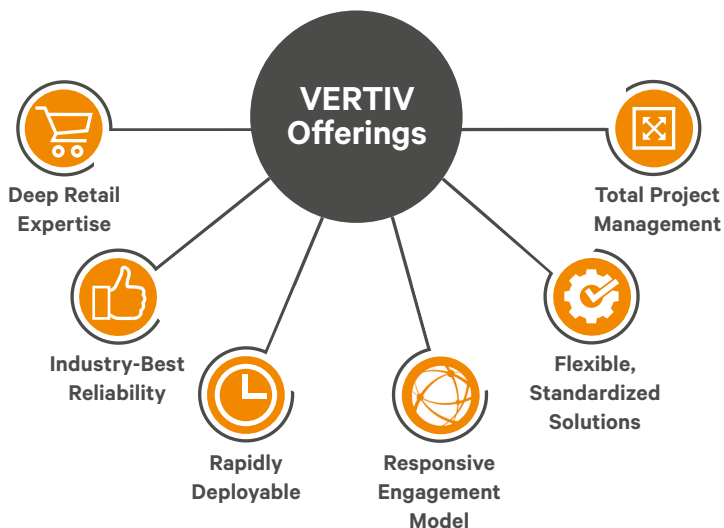


89% OF FORTUNE 500 RETAILERS USE VERTIV

Power, cooling and infrastructure management solutions for retail digital transformation.

Benefits

- Faster time to Market
- Higher IT Protection
- Less Project Complexity
- More Efficient use of Resources
- Lower Operating Costs



Welcome

This eBook is part of the DCD>Verticals series exploring mission critical IT infrastructure within different industry sectors. Digital transformation is driving new models for the deployment and ownership of infrastructure; this eBook examines this in retail.

We would like to thank Vertiv - a leading global provider of critical infrastructure technologies and lifecycle services for information and communications technology systems - for supporting this educational project.

For more information on DCD please visit www.datacenterdynamics.com



04

Retail - a technology revolution

New tools reconnect consumers and suppliers

08

Retail robots

Stores fight back against the online challenge



09

Tech? A piece of cake!

How one of the world's first computers found employment in the retail industry

10

Four faces of infrastructure

Data centers, colo, cloud & the edge

14

The retail distribution sector is ahead of the digital transformation curve



16

Seven technologies that will define the future of retail



20

Image author: Kakidai

How Gap uses cloud and open source to thrive in the digital age



23

Image source: Ocado Group

Robots and software: How Ocado is creating new business models

26

Making it Mission Critical

Vertiv's views on the future of retail

Retail - a technology revolution



Traditional industries are changing under the influence of digital technologies, and none are changing as fast as retail. Global brands that have dominated the market for decades are under threat, undermined by the convenience and speed of online shopping.

Toys R Us, RadioShack, Maplin and Claire's are already gone. Others are on shaky ground in what is being called the "retail apocalypse."

In the US, 2017 saw a record number of store closures – 6,885 shut their doors by the 1st of December (Deloitte), as giants like Macy's, J.C.Penney and Sears shed unprofitable outlets.

In the UK, a report from delivery specialist ParcelHero predicted that, by 2030, half of the country's stores will have been swallowed by e-commerce and home delivery.

At the same time, things aren't looking all that great for online

retailers either. The new nobility of the online world have to compete against the likes of Amazon and Alibaba. The former is busy making online shopping near-instantaneous; the latter is enabling customers to contact manufacturers directly, bypassing large swathes of the supply chain.

In 2017, Amazon emerged as the third largest retailer in the world after Walmart and CVS (according to Forbes), while Alibaba was sixth.

How fast are things changing? Walmart was founded in 1962 and CVS began in 1964. Three decades later, Amazon was established by Jeff Bezos in his garage in 1995, and last year brought in almost \$178 billion in revenue. Alibaba was started by Jack Ma, a former English teacher, in 1999.

In Deloitte's list of the top five fastest-growing retailers, three don't have any brick-and-mortar stores at all. China's Vipshop and JD.com, and Germany's Zalando only sell online, supported by shipping and warehousing networks.

These brands are built to appeal to millennials - a generation that grew up with the Internet and smartphones. Millennials are killing entire industries, we are told. They don't go to casual dining chains

like Applebee's (closing up to 135 restaurants), they don't eat cereal or marmalade, don't buy diamonds, drink less beer and more rosé, and watch Netflix instead of cable.

Millennials are making new demands on the companies that supply them with products and services, and these demands have technology at their core.

Technology is now essential to success in retail - providing the tools, business models, and new revenue streams that could save the household names.

With analytics, online retailers can personalize the shopping experience and offer the most relevant products for each customer. With in-store customer tracking, store owners can count the number of people coming through the doors, and track each journey across the shop floor. 'Proximity marketing' can push a notification when a customer is near a target location.

Augmented Reality creates a digital overlay for the physical world. In a retail environment, this can be used to guide the customer while pointing out special offers. Displays can boost sales by showing discounts or advertising. Touchscreens can add an interactive element, going further to replicate the online environment.



The road to smart retail

Every part of the retail industry is changing fast



In store

Immersive apps bring the online experience into the real world



At home

E-commerce turns the living room into a shopping mall



Warehouse

A storage facility is now virtual aisles in the store



Delivery

Goods move direct to the consumer from store or warehouse

Since they can't beat websites on convenience, some physical stores are transforming to deliver shopping as an experience. Apple, one of the world's most valuable companies, is a great example: all of its products can be purchased online, and yet its retail stores are among the most profitable on the planet.

A lot of the success is down to architectural choices and interior design, but Apple stores also feature digital signage, incredibly dense Wi-Fi networking, solid power infrastructure that can keep hundreds of devices online, iPads serving as Point-of-Sale terminals and a single software platform running it all - not just one store, but the entire retail network. For Apple, retail stores are not a liability but a selling point, giving the brand a physical presence while its competitors remain virtual concepts.

Whole Foods, now owned by Amazon, also trades in experiences - the design language invokes

images of idyllic country life, but in fact the visual merchandizing is fine-tuned to appeal to millennials. It continues to attract customers despite its premium pricing on everyday items.

To remain successful in this new world, many traditional retailers are turning to tools and skills that were previously the domain of IT companies. When Gap

switched its operations to the cloud, it crafted a private platform to run its websites, using its own infrastructure, in-house expertise and popular open source tools.

Gap now has control of its infrastructure. In 2017, its retail store sales shrank by 1.2 percent, while online sales grew 18.8 percent. E-commerce is now 20 percent of total revenue.

Meanwhile, Marks & Spencer invested in its apps, its website and logistics, while closing 10 percent of its retail space.

73%
of retailers say
Big Data is
business critical

Further reading



Infrastructure for distributed IT in retail

The Edge Of Simplicity
Click on the PDF to download.



Retail robots

Other retailers use emerging technologies to try something completely different: British retailer Ocado started in 2000 as an online supermarket and evolved into a technology-based logistics company.

Ocado has never owned a retail store - instead it designs and runs highly automated warehouses similar to those operated by Amazon. At first, the company created robots for internal use, but quickly realized it could make more money by selling this capability to competitors with larger shares of the market, who lagged behind in digital transformation.

Today, major Ocado customers include Waitrose and Morrisons in the UK, Casino Group in France and Sobeys in Canada. In May 2018, a new deal with retail giant Kroger boosted its share price by 44 percent. Ocado is not a retailer, but a retail robotics specialist.

In our own research, we found that retail giants have already

introduced sensor systems to track operations, real-time inventory management and are using the cloud for data collected by IoT devices.

Physical retail operations are less advanced, but are beginning to direct customer focus through customer tracking, demand analytics, and AI.

Along with augmented reality, smart shelves, IoT and cloud services, this is the next wave of the retail revolution.

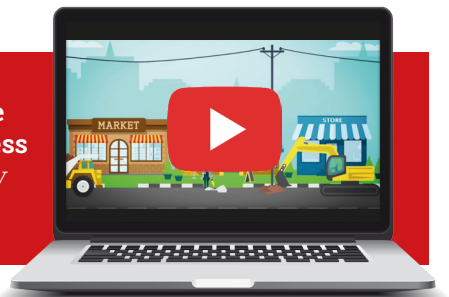
Digital infrastructure will be a core consideration for the retail outlets of the future, whether physical or online, and this makes the job of keeping it online that much more important. Changes in retail will elevate the role of the infrastructure professional - there will be many more elements to deserve the label of 'mission-critical.'

Further viewing



The Competitive Advantage for Successful Retail Business

Click on the computer to view the video.



Tech? A piece of cake!

In 1951, retail led the world in harnessing computers. LEO revolutionized the Lyons tea shop chain

The relationship between computing and the retail industry goes back further than you might think. In fact, it goes back to the very first modern computer - the electronic delay storage automatic calculator (EDSAC).

Developed by a team led by Sir Maurice Vincent Wilkes at the University of Cambridge in the UK in the late 1940s, EDSAC was inspired by the work of Hungarian scientist John von Neumann. It was the first stored program computer, with read-write memory.

The EDSAC was programmed with punched-paper tape, and output to teleprinter. It processed 650 instructions per second – a marked improvement on mechanical calculators. It was first used by scientists, and three Nobel Prize laureates acknowledged it in their acceptance speeches.

The project also had a commercial sponsor: J. Lyons and Co. – a British grocery company with a chain of tea shops,

restaurants and hotels across London. Lyons was first to see how computers could reshape business.

In 1951, the company received a return on its investment - a machine based on the EDSAC, called Lyons Electronic Office I, or simply LEO.

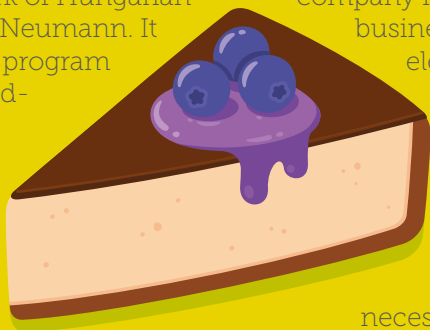
Lyons promptly applied the system to track the value of the weekly output of bread and cakes from its bakeries, becoming the first company in the world to run a

business application on an electronic computer – a fact recorded by the Guinness World Records.

The company didn't just refine the EDSAC design, it also wrote all of the

necessary software from scratch. Later, the same machine was used for the more critical task of payroll automation.

The experiment was so successful that, by 1954, Lyons formed LEO Computers Ltd to market LEO I and its successors to other companies. This family of machines changed ownership several times, but continued to serve business customers for nearly thirty years.



Four faces of infrastructure

Once, IT equipment in retail was limited to stock tracking and accounting in the corporate back-office. Now the world is online, servers and data centers are essential to a successful retail operation.

The state of its digital infrastructure can make or break a retail company. Retail executives can no longer afford to remain ignorant about their digital assets.

The retail sector's IT resources range from the multi-megawatt hyperscale facilities of major public cloud providers, to small modules in warehouses, shops and branches.

Here are the four types of data centers you might see as part of a retail operation:

In-house data center

The traditional place to house digital infrastructure is on the company premises. The business has to take responsibility for the entire process: installing cables and cabinets, and deploying servers, storage and network switches.

IT teams will have to choose their operating system and the

type of virtualization, and that's before they start using any actual business software. Important considerations also include cooling and backup power – likely meaning Uninterruptible Power Supply (UPS) systems and their batteries.

This option is still favored by two types of organization. Very large firms can afford to build their own fully-featured data centers and are confident in their ability to attract the right talent to run them. Meanwhile, very small companies only need a few racks, and can easily manage them in their own office.

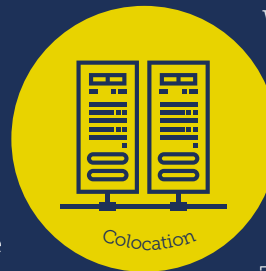


Colocation

Wouldn't it be great if all you had to do was buy the IT equipment, and then leave it to someone else to ensure the right ambient temperature and make a reliable supply of power available?

This is exactly the service offered by colocation providers. In this scenario, a third-party data center serves as a hotel for your servers.

This model is suitable for organizations that have outgrown their in-house data center, but still



want to maintain as much control as possible over their hardware. Colocation providers charge for space, power and cooling, but the servers are still managed by customers.

Colocation facilities usually offer a choice of carrier networks – something you won't get in an in-house data center.

Public cloud

Public cloud services – like those offered by AWS, Google Cloud and Microsoft Azure – are provided from hyperscale data centers. A single hyperscale facility can house tens of thousands of machines, serving thousands of customers.

The main benefit is the price: cloud providers can negotiate with utility companies directly to source the cheapest electricity, and economies of scale keep the equipment costs down.

When you buy cloud services, the hardware layer is completely abstracted and you deal with virtual machines – there are no servers to think about. Such services are almost always priced on a pay-as-you-go basis and won't tie you down with lengthy contracts.

While a few businesses have migrated all of their workloads

to public infrastructure, most organizations practice some form of hybrid IT – a combination of public cloud and other types of digital resources.

Edge computing

Data takes time to travel across the network, and if your data is located on the other side of the world, it will cause high latency – a delay in accessing information. It will also result in considerable network congestion.

Edge computing is a relatively new paradigm, aiming to solve these issues by distributing digital resources and placing servers as close as possible to the point where data is used.

This often means fitting small data centers into spaces that previously didn't have any data center capability, using miniature enclosures and all-in-one designs.

However, data centers located centrally in large population centers could also be seen as edge facilities.

Today, edge computing is primarily used for content delivery – for example video streaming services like Netflix or Hulu – or environments where delays are unacceptable – such as in automated warehouses staffed by robots.



Data center drivers & topologies

	Corporate	Bricks & Mortar
Major IT functions?	<ul style="list-style-type: none"> - HR - Back Office - Communications - AI - Rewards - Accounting & Finance - Research & Development 	<ul style="list-style-type: none"> - IoT - AI - Rewards/CRM systems - Marketing
DX Transformation priorities	<ul style="list-style-type: none"> - DC Automation - AI/Machine learning - IoT systems - Visualisation & reporting - IoT/big data analytics programs 	<ul style="list-style-type: none"> - 360° customer experience - Augmented ('virtual') systems - Chatbots - IoT systems - Price comparison automation - Sensor tracking systems - Smart shelving/ signage
Key drivers for their deployment	<ul style="list-style-type: none"> - Supporting an omnichannel or multi-channel experience - Build use of Big Data analytics for decision making - Easier to use and operate systems - Faster speed to market - Reduce operational/labor costs 	<ul style="list-style-type: none"> - Improved reliability/availability of systems - Improved security - Influence customers closer to the point of decision - It is no longer an option not to
Cost of downtime	<ul style="list-style-type: none"> - Loss of productivity - Loss of client 	<ul style="list-style-type: none"> - Loss of client
Where do platforms reside?	<ul style="list-style-type: none"> - Centrally 	<ul style="list-style-type: none"> - Distributed
Data center deployment options	<ul style="list-style-type: none"> - Enterprise data center - Colocation 	<ul style="list-style-type: none"> - Micro-edge deployments - Private cloud
Are they considered 24/7?	<ul style="list-style-type: none"> - Yes 	<ul style="list-style-type: none"> - No



Defining four edge archetypes and their technology requirements

Click on the PDF to download.



Distribution

- Robotics
- IoT
- Logistics & Supply Chain

- Data Inventory and warehousing automation
- Blockchain-type systems
- IoT systems
- Automated visualization & reporting
- Real-time inventory access
- Robotics/ co-robotics

- Ability to predict & respond to up-chain requirements more accurately
- Greater supply chain control/tracking
- Improved reliability/availability of systems
- Improved security
- Reduce waste and 'missing' stock

- Loss of productivity

- Centrally

- Micro-edge
- Containerized DC

- Yes

Online

- Hosting
- Apps
- Rewards/CRM systems
- Marketing

- Chatbots
- End-to-end app performance topology
- Price comparison automation
- Deliver system integration

- Improved reliability/availability of systems
- Greater supply chain control/tracking
- Easier to use and operate systems
- Faster speed to market
- Customer loyalty

- Loss of client
- Loss of market share

- Centrally

- PaaS
- Enterprise data center

- Yes



Data center infrastructure solutions

Click on the PDF to download.



New research suggests retail distribution is ahead of the curve

In its efforts to keep up with the changing habits of customers, the retail sector has been quick to embrace emerging technologies like analytics, customer tracking, augmented reality applications and the Internet of Things. These technologies rely on a wide range of data center environments – from small in-house facilities to hyperscale data centers that house tens of thousands of servers, run by major cloud providers.

But there are clear distinctions between the ways technology is used by physical retail outlets, online retailers, and warehousing and logistics specialists. This project aims to establish which digital infrastructure models are favored by specific types of organizations within the retail industry, and how far these organizations have progressed in their digital transformation initiatives.

The research paper is based on in-depth interviews with IT decision makers representing 50 of the world's largest 'brick and mortar'

retail companies. Between them, these organizations are responsible for 332,000 square meters of data center white space, and a combined IT budget of \$40.2 billion.

According to research carried out by *DCD*, retail distribution centers are ahead of the curve in terms of technologies that enable digital transformation, with a higher average evolutionary score. This part of the industry has embraced IoT, with sensor-based asset tracking systems implemented widely across warehouses and delivery vehicles. This is no surprise as the retail industry is essentially tasked with getting a product from the manufacturer to the consumer, and low inventory means higher margins.

The distribution sector is also increasingly using robots - still a rare sight in customer-facing operations - to automate time-consuming warehouse tasks.

Our research suggests that data centers supporting 'brick and mortar' facilities are less advanced in their digital transformation

20%
of respondents
said they used
public cloud
services

initiatives, with a lower average evolutionary score. At the same time, these organizations are blazing a trail in the adoption of emerging technologies like customer tracking, augmented reality and artificial intelligence, and new types of physical assets like smart shelves and interactive digital signage.

Almost all of the organizations in this category (95 percent) have an in-house data center, but just 20 percent of respondents said they used public cloud services.

Online and omni-channel retailers are fairly advanced in their digital transformation initiatives. According to research by *DCD*, organizations in this category rely on a combination of in-house data centers and managed services. They are also proficient in the use of public cloud, and often depend on cloud resources when demand for products is especially high - for example, during the notorious Thanksgiving Weekend, otherwise known as Black Friday. Every single respondent in this category said that data centers became more critical to their business in the past two years.

Our research also found that retailers in product categories where customer demands change

rapidly, like fashion and lifestyle, are ahead in digital transformation, when compared to retailers that sell groceries or household goods.

The next two years will see a marked decrease of 27 percent in the proportion of data center footprint supporting corporate retail operations, and a marginal decrease in the proportion of footprint supporting physical retail. At the same time, there will be a strong increase in the footprint of data center space supporting online retail (20 percent) and distribution/logistics (10 percent).

The number of physical stores is expected to increase marginally over the next two years, by 0.4 percent. However, stores will decline in numbers and staffing will be reduced as retailers move forward with digital transformation.

This contrasts with a high increase in the number of distribution centers and warehouses, by 25.8 percent, as retailers will attempt to stock goods in closer proximity to customers to cut down on delivery times.



**To get the full results
of our research report,
Click here to download.**



7 technologies that will define the future of retail

The world of retail is changing at an incredible speed. With online sales cannibalizing profits on the main street, shop owners have to rapidly increase their investment in IT infrastructure.

On one hand, they have to offer a top-notch online shopping experience, backed by analytics and personalization, and always available; on the other, they have to breathe new life into brick-and-mortar stores, using digital tools to make shopping more exciting for a tech-savvy generation of customers.



What's the critical IT requirement for each technology?



Analytics

Point-of-Sale terminals, customer loyalty programs and of course, online shopping websites all produce valuable data. It is not enough to just stockpile this information - it needs to be used. That's where retail analytics comes in: it looks at things like inventory levels, supply chain movement, market demand and consumer demographics to enable organizations to make informed procurement decisions, and avoid stockpiling unwanted merchandise.

Analytics also enables online retailers to personalize the shopping experience and offer the most relevant products for each customer.

In the past few years, the retail industry has discovered new sources of data, like sensors and IoT devices, both on the shop floor and in the supply chain. All of these require storage and processing infrastructure, often residing in the core corporate data center.



Core infrastructure, standardization



Insights to Data Center Transformation

Click on the computer to view the video.



In-store customer tracking

Stores can count customers coming in and track them across the floor with affordable high-resolution video cameras, Wi-Fi access points and Bluetooth 'beacons.'

Wi-Fi access points can track any mobile device with Wi-Fi enabled – even if it is not connected.

Cheap Bluetooth beacons can also track devices that publish their presence, including gadgets like smartwatches and activity trackers.

This allows 'proximity marketing' to push alerts to an app when the customer is near a target location.

Video surveillance networks can yield the most accurate tracking results. Analyzing footage has been resource-intensive, and has raised privacy concerns, but is likely to get more popular as video analysis tools start to integrate machine learning and artificial intelligence algorithms.

Best of all, these technologies can comply with data protection laws, if their data is anonymized.

Interactive signage, smart labels

Advances in display manufacturing and subsequent reductions in price mean that even the smallest stores can now afford interactive digital signage.

Displays can be used to engage customers by showing special offers or advertising, leading to increased sales. Touchscreens can add an interactive element, going further to replicate the online shopping experience. They can be used to compare different products, or to display additional information on request.

Meanwhile, smaller screens function as smart labels that can change the price or offer a discount on a particular product in seconds, once again making traditional brick-and-mortar stores as agile as their online competitors.

All of these devices represent a part of the Internet of Things, and require specialized software and reliable network connectivity to be managed appropriately.



Edge computing, standardization



Connectivity, availability, simplicity



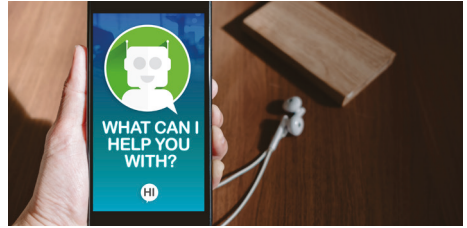
Smart Mirrors

According to AlertTech, shoppers who use fitting rooms are almost seven times more likely to make a purchase than those who just browse the sales floor.

'Smart mirrors,' 'virtual mirrors' or 'magic mirrors' enable customers to try on clothing, accessories and footwear without having to undress first. They integrate a high resolution video camera and an infrared sensor which capture the shopper's body dimensions and position. The 'mirror' then superimposes clothing over the customer's on-screen image.

Some of these devices can map the joints, including elbows and knees, much like motion-capture used in TV and film, allowing a fair amount of movement while wearing virtual garb.

The technology has been tested by a number of retailers including Tesco, John Lewis, Rebecca Minkoff and Uniqlo, among others.



Chatbots

Advances in speech synthesis, machine learning and artificial intelligence research have led to the emergence of chatbots – computer programs designed to conduct conversations, often designed to convincingly simulate how a human would behave. Personal assistants like Alexa and Siri can be seen as particularly sophisticated chatbots.

In online retail, chatbots can replace filters, forms and drop-down menus, helping customers in their search for a particular product. They can also be used in customer support and marketing, all while lowering costs of retail operations.

However, it's not all plain sailing: a recent Google I/O presentation caused outrage when a chatbot based on the company's Duplex technology was seen as too successful at pretending to be human, and was branded deceitful and unethical.



Edge computing



Core infrastructure



Augmented Reality (AR)

Augmented Reality creates a digital overlay for the physical world. In retail, AR can guide customers round the shop. Combined with the shopping cart functionality, it can speed and improve shopping trips.

Already, AR apps can analyze products on the shelves, for example, fitness apps show the nutritional content of food and drink, based on a barcode.

Last year, flat-pack furniture specialist Ikea launched an augmented reality app that lets anyone place 3D models of more than 2,000 items of furniture in their home. Like 'smart mirrors' this lets customers try a physical product digitally before they buy.

The same technology can display location-based notifications, for example detailing that a certain product has just appeared in stock or gone on sale.

Unlike VR, Augmented Reality doesn't need special equipment – only a smartphone with a camera.

Alternative payments

Cryptocurrencies are still under development, but likely to become increasingly important as future payment systems.

Some online retailers have jumped the gun: in the US, at least 13 companies take Bitcoin. These include Overstock.com, eGifter, Newegg... and most notably Microsoft, which accepts Bitcoin for entertainment and software in Windows and Xbox stores.

Meanwhile, the physical retail industry is working to eliminate cashiers and enable reliable in-store biometric payments. Facial recognition, iris scanners and fingerprint scanners have been in tests for years.

Amazon Go is leading the way – a retail chain without any tills at all.

In an automated store customers scan their phone when they arrive, and then a variety of cameras and sensors track the items they pick up, automatically charging them when they leave the store.



Core infrastructure, connectivity



Security, standardization

How Gap uses cloud and open source to thrive in the digital age

When a retail organization decides to switch to a cloud architecture, there's a great temptation to outsource the process, and simply start buying resources from one of the market leaders – like AWS, Google or Microsoft.

American clothing and accessory retailer Gap, which has been part of the American Main Street for nearly 50 years, did the opposite – it decided to craft a custom private cloud platform to run its websites, using its own infrastructure, in-house expertise and popular open source tools like OpenStack and Cloud Foundry. Today, this cloud platform is powering one of the largest consumer retail experiences in the world.

“We have a mixture of data centers. We own a data center, we also collocate at a data center, and then there's a data center at our HQ. I have clouds at all three of

those locations,” Elijah Elliott, cloud domain architect and SME at Gap, revealed at the recent OpenStack Summit in Vancouver.

To be fair, OpenStack is not the only kind of cloud at Gap: as a whole, the organization uses a combination of cloud providers, including Microsoft Azure, and has an ongoing partnership with

Rackspace. But in terms of new applications, Elliott says “almost everything” now runs on OpenStack.

Gap began using OpenStack in 2013, making it one of the early adopters - the open source project started in 2010. It is not a monolithic, all-encompassing platform, but a system of more than 40 interdependent modules developed by the community, each serving a narrowly defined purpose, like Nova for compute, Neutron for networking and Swift for object storage. To put it simply, OpenStack gives anyone the parts to build the exact cloud they need.



E-commerce now represents nearly **20%** of the company's total revenue



Vertiv™ Smartcabinet™ for retail

A Vertiv Application Brief

[Click here to download.](#)



Image author: Kakidai

Elliott said Gap required an environment that could create new virtual machines in minutes, not hours. This drove the infrastructure team to experiment with open source software. "Spin up a VM from the pipeline, put up the new code, test it extensively, tear it down - I'm not saying anything that anyone hasn't heard before - but it was a big difference in the paradigm at Gap."

The retail giant used the open source platform to build a cloud based on microservices, enabling developers to rapidly modernize apps. Around the same time,

Gap began shifting its operations to Cloud Foundry, the open source cloud application platform that's become the darling of the CI/CD (continuous integration / continuous delivery) movement.

Cloud Foundry manages engineering, deployment and the lifecycle of cloud-native software - but it is nothing if not versatile. Among other things, Gap uses it

for price optimization based on local customer demand, making thousands of price adjustments every hour.

"We're expanding Cloud Foundry," Elliott said, "and we plan to use containers."



"We own a data center, we also collocate at a data center, and then there's a data center at our HQ"

In the process of building a private cloud, engineers at Gap had to make sure that the infrastructure had all the reliability expected from a commercial cloud service; they architected high availability into software, and tested the results in the chaos of Black Friday and the Thanksgiving weekend. The DIY approach enabled the retailer to create infrastructure that is affordable and remains under total

control, but requires investment in people and skills.

It looks like this investment is paying off: Gap.Inc reported that its retail store sales shrunk 1.2 percent over the course of fiscal 2017; at the same time, online sales grew 18.8 percent. E-commerce now represents nearly 20 percent of the company's total revenue.

Robots and software: How Ocado is creating new business models



Image source: Ocado Group

Online retail is a relatively new industry - companies operating in this space have to embrace emerging technologies to keep ahead of the competition, or perish. But some go further: instead of simply consuming technological products, they start inventing their own, creating new business models and revenue generation opportunities.

British retailer Ocado is one such organization. It started in 2000 as an online supermarket and gradually evolved into a technology company focused on logistics, with

ambitions to sell its own software platform, and its own proprietary brand of robots.

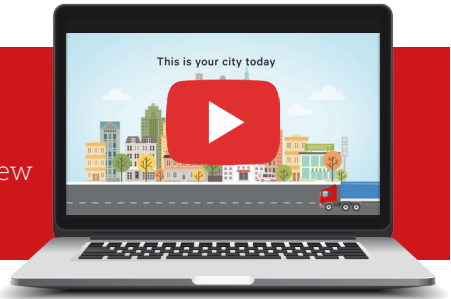
Imagine a warehouse staffed by units the size of a washing machine, running on top of a rail-based grid system, constantly talking to each other and transporting boxes in the most efficient way possible. When their batteries are empty, the units automatically dock to recharge. This vision is a reality at Ocado, and it was created by the company from scratch.

"It's all very much 'just in time' processing. If you've ordered a



A quick introduction to Machine Learning

Click on the computer to view the video.



pen, a box of pens will be brought out at just the right time to go past the picker, so they can pick a pen for a specific box with all of your groceries in it. It's a very efficient way of storing many products – we sell 50,000 different items," Anne Neatham, chief operating officer at Ocado, told *DCD*.

"And if they happen to break down, we have a special little bot that looks like a bumblebee; it goes out and collects them."

Ocado has never owned a retail store - instead, it structured its business around deliveries, designing and running highly automated warehouses similar to those operated by Amazon, the world's third largest retailer. The company got into robotics as it was planning to build its own online grocery empire, but soon realized it could make more money by selling its proprietary software and hardware to less agile competitors - helping 'brick and mortar' retailers compete against the onslaught of e-commerce.

Today, major Ocado customers include Waitrose and Morrisons

in the UK, Casino Group in France and Sobeys in Canada. In May 2018, Ocado announced a deal with US retail giant Kroger, causing its share price to jump 44 percent.

"We're an unusual organization in the UK – a lot of the Silicon Valley companies like us, because very similarly to them we are trying to push the envelope," Neatham said. "We started out, like lots of other people, trying to go online by buying software. And we realized, probably 15 years ago, that we are just going to have to do it ourselves, because nobody had actually done it and made money out of it before."

Like a true technology company, Ocado runs its own digital infrastructure, with two modular data centers per warehouse to control the robots. The servers are housed in repurposed shipping containers and equipped with all the necessary power and cooling equipment. Meanwhile, core enterprise systems and websites are hosted in the cloud.

"In our warehouses, we have small data centers because of the latency – if we are going to run

robots, we can't afford the latency that the cloud would give us," Neatham explained.

Ocado's software is based on APIs and microservices, and the company has been running on a platform designed entirely in-house since 2014. It also wrote proprietary communications protocols for its robots. "A lot of that is our own specific IP that we sell to others," Neatham said. That doesn't mean the company is not well-versed in open source – it uses Kubernetes across its infrastructure stack, and has released some of its own code to the open source community,

sharing Kubermesh - a tool designed to simplify data center architectures for smart factories.

At the moment, Ocado's robots can only deliver boxes – groceries still need to be 'picked' and packaged by human workers. But the company is developing 'soft hand' manipulation robots that will be able to identify and handle individual products, completely eliminating human labor from its warehouses. "We will become a large manufacturer of robots at some point – I think we already might be," Neatham said.



Inside Ocado's Andover CFC3 automated warehouse

Copyright: Ocado Technology

Adapt to Survive: New Infrastructure Approaches

Vertiv Interview



Commerce has entered a new age, where retailers compete not just on the products they offer, but also on the technology they use to sell and deliver those products to achieve their desired customer experience. The convenience of online shopping has raised our collective expectations, and plenty of businesses are suffering because they are failing to invest sufficient amounts of capital in digital infrastructure.

Technology also makes for good marketing: for example, Amazon Go stores or Apple Stores attract

customers through the clever use of in-store displays, smart shelves and alternative payment methods, and the high degree of personalization, creating an experience that few of their competitors can match and ensuring these physical outlets keep generating cash.

With so many retail organizations going out of business, it looks like adopting the right kind of technology is no longer a matter of prosperity – but a matter of survival.

“Retailers have to create reasons for people to visit the store, rather than just getting on their computer and ordering online,” Joe

Ackerman, business development director at Vertiv, told DCD. "Most retail sales are still done in on-site stores, but those stores are now just part of a broader and deeper customer experience."

Vertiv, which designs, builds, and services critical infrastructure that enables vital applications, works with some of the world's largest retail organizations, offering power, cooling and software innovations and infrastructure lifecycle management services to help retailers accelerate their digital transformation.

Ackerman agrees with the findings of the research by DCD that suggest that applying digital transformation to logistics operations can deliver the most immediate benefit to retailers.

"The supply chain needs to be faster, more responsive. The Amazon effect means every retailer

is going to offer 1-2 day delivery," he said. "Look at Walmart – it's getting easier, and they guarantee two day delivery. It is getting easier at Target and others too. Companies are ramping up their ability to have products in your house within two days – everything from furniture to cereal."

"You're going to see FedEx and UPS in retail locations - they are going to have drop-off sites and they are going to have pick-up lockers. And that's all going to be automated."

According to Ackerman, retailers are particularly interested in physical infrastructure systems that are affordable, can be scaled up in a short period of time and are highly flexible in their configurations, indicating that these organizations simply don't know their future infrastructure requirements.

"All of my retailers ask: what are



Joe Ackerman | Vertiv business development director

Further viewing



How to effectively respond to business continuity needs

Click on the computer to view the video.



you seeing in the future, are we putting enough capacity to handle what's coming? I'm dealing with many of the largest retailers in the United States, and they all want to make sure that whatever they put in, it is expandable."

The pace of transformation at the store level is so fast that large retailers are also turning to partners for comprehensive "white glove" services – the ability to deliver, stage, integrate and install technology – while managing the entire process across multiple locations. "Major retailers are dependent on Vertiv to bring total solutions and some have asked us to manage their upgrade projects from concept through installation. We are being asked to be consultants and not just be a supplier of products," Ackerman said.

With an increasing number of data-hungry devices in logistics and customer-facing operations,

retail also presents the perfect environment for growth and development of edge computing.

"They are going to move more and more power into the stores, to communicate with customers and drive sales at the point of use," Ackerman said. "We talk a lot about the edge, and I'm doing financials around that with my customers, and we're seeing it – that's where the dollars are going. Our forecast for the next couple of years shows, probably, two extra dollars going into edge computing and distribution versus [one dollar] into the data center."

And finally, the fast-changing nature of retail – especially in sectors like apparel and accessories - will inevitably cause many retailers to 'lift and shift' their infrastructure to the public cloud, to take advantage of its agility and flexible pay-as-you-go pricing.

"I think you are going to see more and more [retail] companies





89% OF FORTUNE 500 RETAILERS USE VERTIV

Power, cooling and infrastructure management solutions for retail digital transformation.

Benefits

- Faster time to Market
- Higher IT Protection
- Less Project Complexity
- More Efficient use of Resources
- Lower Operating Costs



do that – they have a finite amount of IT and marketing spend, and they are going to put that where the customer can see it – not in their data centers,” Ackerman told DCD. “Maybe keep some things in-house, but they are going to take a lot of what they historically put in the data center, and place it in other locations. This frees up that capital to put into customer-facing or supply chain activities.”

But power protection seems like such an abstract concept – how much impact could it really have on your shopping trip? Turns out, quite an impact.

“I was in a supercenter store a couple of weeks ago and a thunderstorm came through, and immediately someone was on intercom saying ‘you have 15 minutes to checkout – or you might not be able to checkout with the products you have in your cart.’

They just kept saying it over and over. I bought a couple of items, and as soon as I got through the checkout line, the registers went down and the store went black.

“There were probably 50 people with full carts still waiting to get

through. So, in that location, the retailer made the decision that 15 minutes is all you’re going to get. No generator, just 15 minutes of power backup at the registers.

“Most of the retailers I deal with, they are going to want to make sure that you are going to leave with what you came in for.

While they aren’t

looking for data center-levels of power availability – Tier 3 or 4 – store systems are becoming more critical and Tier 2 levels with 30-plus minutes of backup power is common. The customer experience fails if the power goes out.”

“Our forecast for the next couple of years shows, probably, two extra dollars going into edge computing and distribution versus [one dollar] into the data center.”



International retailer
A Vertiv™ Case Study
Click on the PDF to download.

Don't forget to read the full results of our research report



Click here to download.



Produced in Association with:

