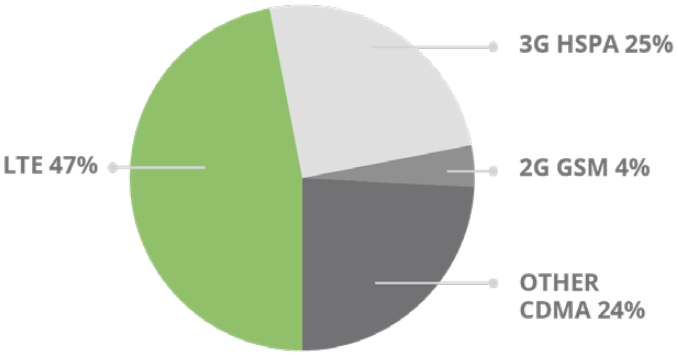
WIRELESS BUSINESS CONTINUITY

THE MARKET LANDSCAPE

The modern world is always on and always connected. Computing and communications have enabled exponential growth in the availability of information, resulting in a complex, data-driven environment. In the U.S., where major carriers have aggressively deployed fourth-generation (4G) LTE networks (Figure 1), and Wi-Fi has become almost ubiquitous, consumers can access the Internet, their social networks and streaming media almost anywhere.

FIGURE 1: NORTH AMERICA 2015 SUBSCRIBERS BY TECHNOLOGY



Source: Heavy Reading

This has changed the way consumers conduct their lives, the way they engage with each other and the way they engage with businesses. The advent of the bring-your-own-device (BYOD) movement in the workplace and the use of these devices within business processes have helped to make companies more agile by empowering employees instead of tethering them to their desks. It has required new thinking around how to provide employees with access to information, how to maintain the security of that information and how each device is managed both inside and outside of the corporate firewall.

In workplaces, shopping malls, hotels, transit centers and event venues, device users expect their personal devices to have access to high-speed broadband, and for these services to be supported and enabled by reliable connectivity. When using an ATM, paying for parking, renting a movie for the evening or watching a digital screen with directions and offers they can download to their phone, they expect it to work instantly, continuously and seamlessly.

If outcomes are not what users expect, they have the means to share their frustration or discontent with the world via social media. Whether it's a tweet or Facebook rant, it's bad news for any business if the rant goes viral. The unfortunate scenario is when a company can't do anything about the issue because it has lost connectivity with the location, site or device. In a world where IT operations use cloud platforms and applications to deliver rich content and drive quality experiences for the user, the weakest link is still the underlying connectivity. If the main connection is down, everything is at risk including revenue, brand reputation and customer loyalty.

This complex world is about to become even more complex with the growth of machine-to-machine (M2M) communications and the Internet of Things (IoT). M2M has been around for several years, connecting machines and devices using various protocols over wired and wireless networks. However, with the expansion of advanced communications and cloud technologies, it's now possible to link these discrete M2M silos with other systems and human users via the cloud.

The result is a combination of information and insights that were previously unattainable. For example, the ability to track people in a hotel or venue with beacon technology can be used to link to M2M-controlled heating, ventilation and air conditioning (HVAC), and lighting systems that adjust based on crowd density or proximity. Vodafone, a mobile operator and global leader in M2M applications, recently highlighted in its Barometer report that 90 percent of organizations believe that M2M is relevant to them, compared with 86 percent in 2014.

The key to survival in this new realm is the continuity of connectivity, ensuring that customer expectations are met and business operations can continue around the clock without interruption.

THE EVOLUTION OF RETAIL

The Internet initially presented challenges for the retail industry that many feared would lead to its demise. Instead, the industry has adapted and transformed, leveraging the Internet as an integral part of retail operations. With fewer people now using cash and having the ability to pay with NFC-based smart wallets and mobile points of sale, it's clear that wireless Internet connectivity is an essential lifeline for most retailers.

One of the fastest-growing trends in retail is the concept of omnichannel marketing. The "always on" consumer can shop, compare, experience and purchase a product across multiple devices, properties and websites throughout the day. The opportunity for brick-and-mortar retail locations to combine physical and digital experiences is slowly coming to fruition. The introduction of digital displays on counters and shelves will supplement physical inventory with dynamic content. By utilizing proximity beacons that tailor content to those shoppers who have already indicated interest in items online, it's possible to display promotional offers that make it easy to make a purchasing decision at the point of interaction.

The combination of technology and big data with analysis and insight enables completely different contextual shopping experiences. This evolving digitized shopping environment continues to blur our offline and online worlds, and also recognizes the distracted nature of the shopper by presenting digestible chunks of information that feed their need to be engaged, to participate and to enjoy an immersive experience that will ultimately convert them.

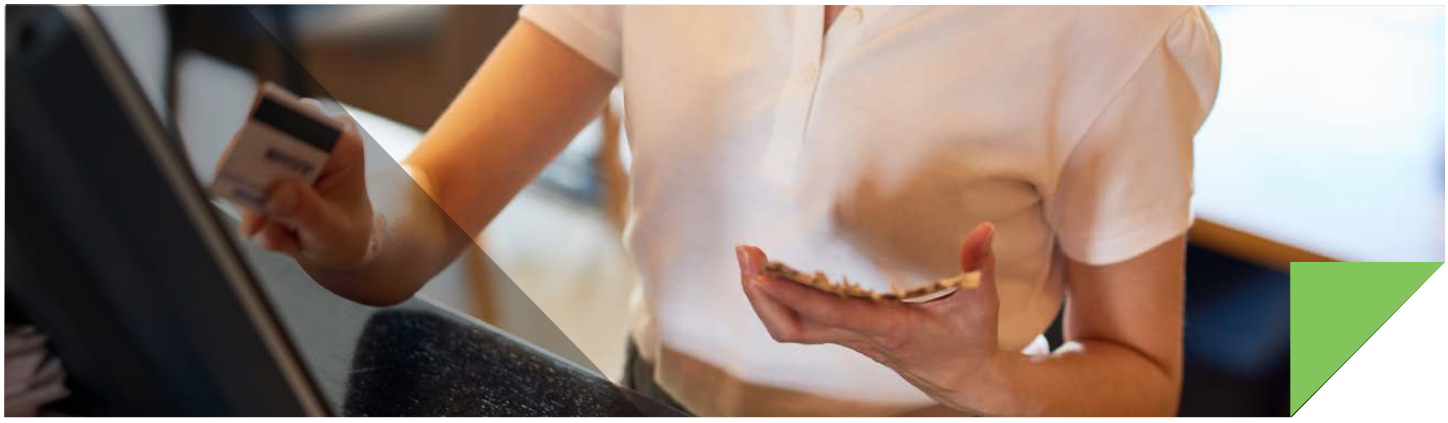
Being in the right location at the right time and creating an interactive environment has given rise to the concept of the "pop-up store" that brings its own network. This $8 billion business has been around since 2000, when they first started sprouting up around Europe as "flash stores." Pop-ups temporarily transform mobile spaces or vacancies in retail malls. They can also be vehicle-based deployments that tour farmers' markets, festivals and sporting events. In many fashionable locations, the pop-up retail trend is linked with the "recycled container" phenomenon that creates boutique-type bars and stores from practical lockups. In all of these situations, the concept of a permanent fixed Internet connection is both cost- and time-prohibitive.

The advent of high-speed 3G and increasingly pervasive 4G LTE mobile broadband from all four national carriers (as shown in Figure 2), has allowed these pop-up stores to use wireless broadband as a primary connectivity mechanism.

FIGURE 2: U.S. BROADBAND SPEEDS (MBIT/S)

	3G				4G LTE			
	AT&T (HSPA)	Sprint (CDMA)	T-Mobile (HSPA)	Verizon (CMDA)	AT&T	Sprint	T-Mobile	Verizon
Avg. DL speed	5.7	1.2	7.4	0.9	15	12.7	15.3	19.1
Avg. UL speed	1	0.6	14	0.5	6.8	5.3	12.3	10.5
Max. DL speed	16.2	2.7	31	2.8	99.2	72	100	94.4
Max. UL speed	2.3	1.1	4.4	17.6	21.4	19.3	39.6	44.8

Source: PC Magazine, June 2015; speeds tested in 30 cities and suburbs in the U.S.



For retail, the biggest challenges are broadband connection reliability and security, because business survival depends on it. In the case of a permanent retail location, a fixed link makes sense from a cost perspective, since it's usually not metered for the amount of data used. However, the cost of losing business through an outage can be severe. If a fixed-line provider only guarantees 99.5 percent uptime, that can translate into four hours of lost business per month. In 2014, U.S. retail business was worth approximately $4.5 trillion; assuming an average of 12 hours per day trading, this means that an hour of business is worth approximately $1 billion to the U.S. economy. On this basis, potential lost business could be equal to $48 billion per year.

Security hacking is another issue that's causing major headaches for retailers. The challenge is to protect consumer data without employing expensive IT personnel in every retail location. And they must comply with the latest version of the Payment Card Industry Data Security Standards (PCI DSS).

FAILOVER

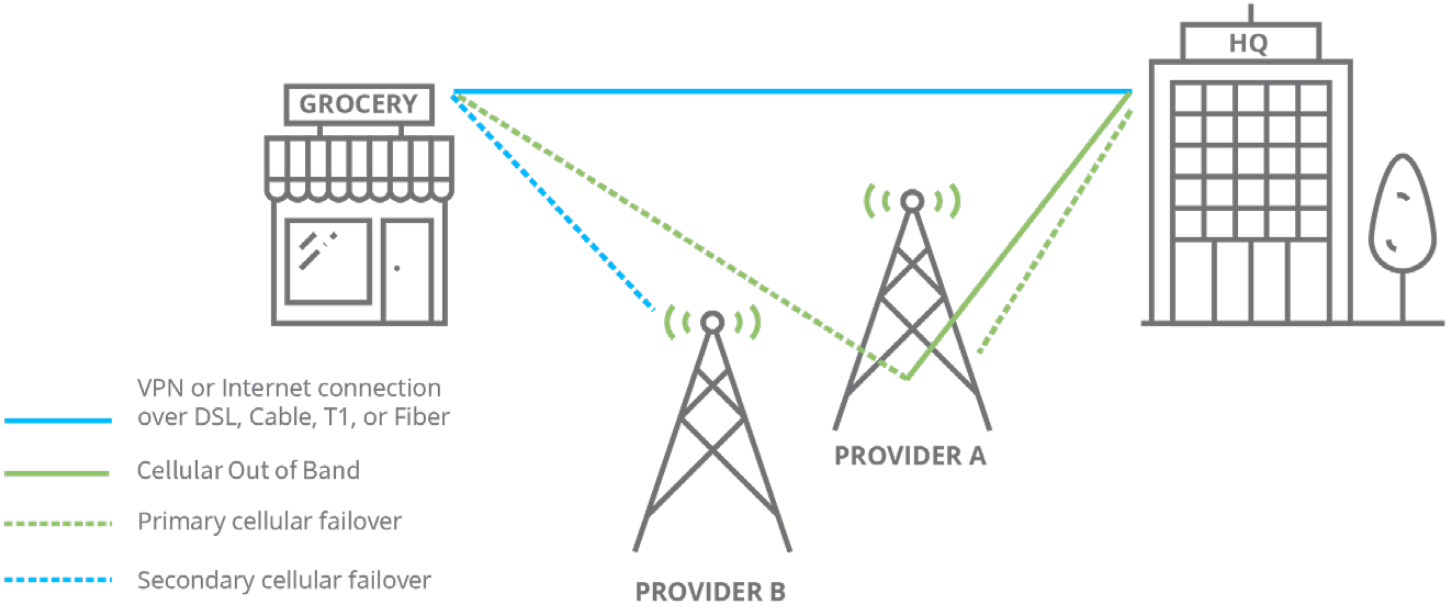
The case for continuous connectivity is readily apparent in retail, as well as in the branch office structure of most enterprises and banking institutions.

Currently, most businesses that have a requirement for real-time access to inventory and transaction processing systems or cloud applications have a fixed connection utilizing DSL, T1, fiber or cable connections. However, the reality is that disruptions to service can result from construction operations inadvertently hitting a buried cable, trees falling on service lines or bad weather. To overcome this, companies consider two alternatives. One alternative is network redundancy, achieved by having a second wired line that serves as a backup. This can be expensive and is prone to the same risks as the first line, since they are run in the same conduits or strung across the same poles. Repairs to strung connections can take hours or days, but buried lines could be out for weeks.

The second alternative is to utilize a wireless connection as a failover system so that as the wired system fails, the connections are automatically switched to a 3G or 4G LTE connection. Most wireless operators offer a "four-nines" connection, ensuring 99.99 percent reliability – which means that, when the fixed line goes down, a business has assured connectivity.

With the increasingly pervasive coverage of LTE in the U.S. and around the world, the difference between the speeds obtained on some fixed network connections and wireless connectivity is rapidly shrinking. Consequently, some companies are looking at using wireless connectivity as the primary connection. With new data plans and falling data rates, this formerly expensive option is becoming highly attractive.

FIGURE 3: BUSINESS CONTINUITY ARCHITECTURE



Source: Heavy Reading

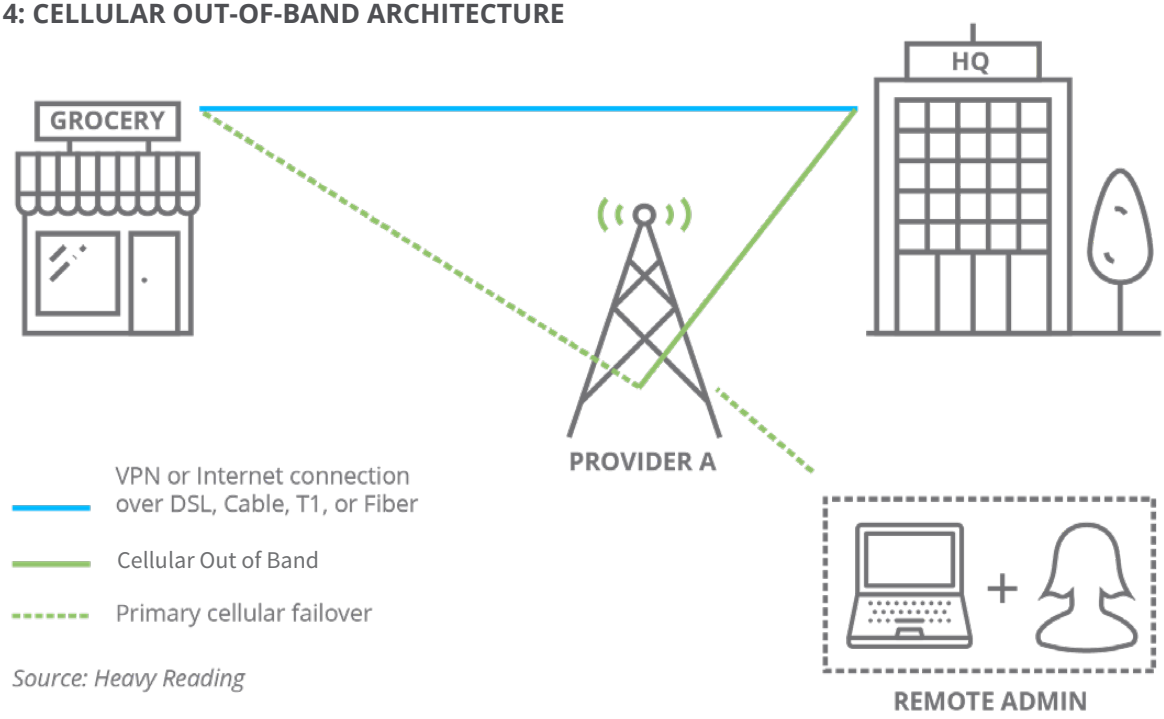
Wireless has one other advantage; (Figure 3), the option to have one or more providers of wireless coverage. The on-premises wireless router has the ability to connect with multiple carriers, which can be an advantage if one network is down or if an area has patchy coverage between carriers. There are several options to address this scenario. The simplest is switching SIM cards (or changing USB modules, depending on the technology used). This allows the selection of the provider with optimum signal strength at any particular time. An alternative option is to have a dual SIM router, with software provisioned based on rules. If the primary carrier's signal is lost, the router will automatically switch to the alternative provider, ensuring wireless failover.

Within the next couple of years, the adoption of e-SIM, a new standard promoted by the GSMA – the association that represents mobile network operators worldwide and supported by AT&T in the U.S. – could resolve this challenge. The e-SIM is an embedded SIM that cannot be removed, making it more secure for M2M applications. It's also capable of handling more than one phone number and is rewritable, allowing it to be updated via the network operator. The use of software that will switch network, according to how fast or cheap the service is, would be ideal for these applications, and enable close to 100 percent assurance of business continuity.

CELLULAR OUT OF BAND

Sometimes the cause of operational downtime is not related to connectivity. It's a result of equipment hardware or software issues. It could also be a human error that occurs either on-premises or remotely, where a configuration was inadvertently changed, so that the equipment is rendered inoperable. This would normally result in a technician being sent to investigate or using an analog telephone line to dial in and diagnose the situation.

FIGURE 4: CELLULAR OUT-OF-BAND ARCHITECTURE



Source: Heavy Reading

The availability of reliable, resilient and cost-effective 3G and 4G LTE is changing the paradigm (Figure 4). Now, it's possible to have an always-on connection that alerts headquarters and technicians to issue with connectivity in real-time, allowing them to perform in-depth diagnostics and troubleshooting from anywhere the company has resources. The wireless out-of-band device is often combined with failover modems, and can send a text message when predefined incidents occur. Usually, this requires that the other device is smart and can advise that it needs assistance. Since the out-of-band device is connected to the serial port of the main modem, this allows the technician to address issues and reconfigure the equipment remotely, reducing the downtime and the cost of data over the cellular network.

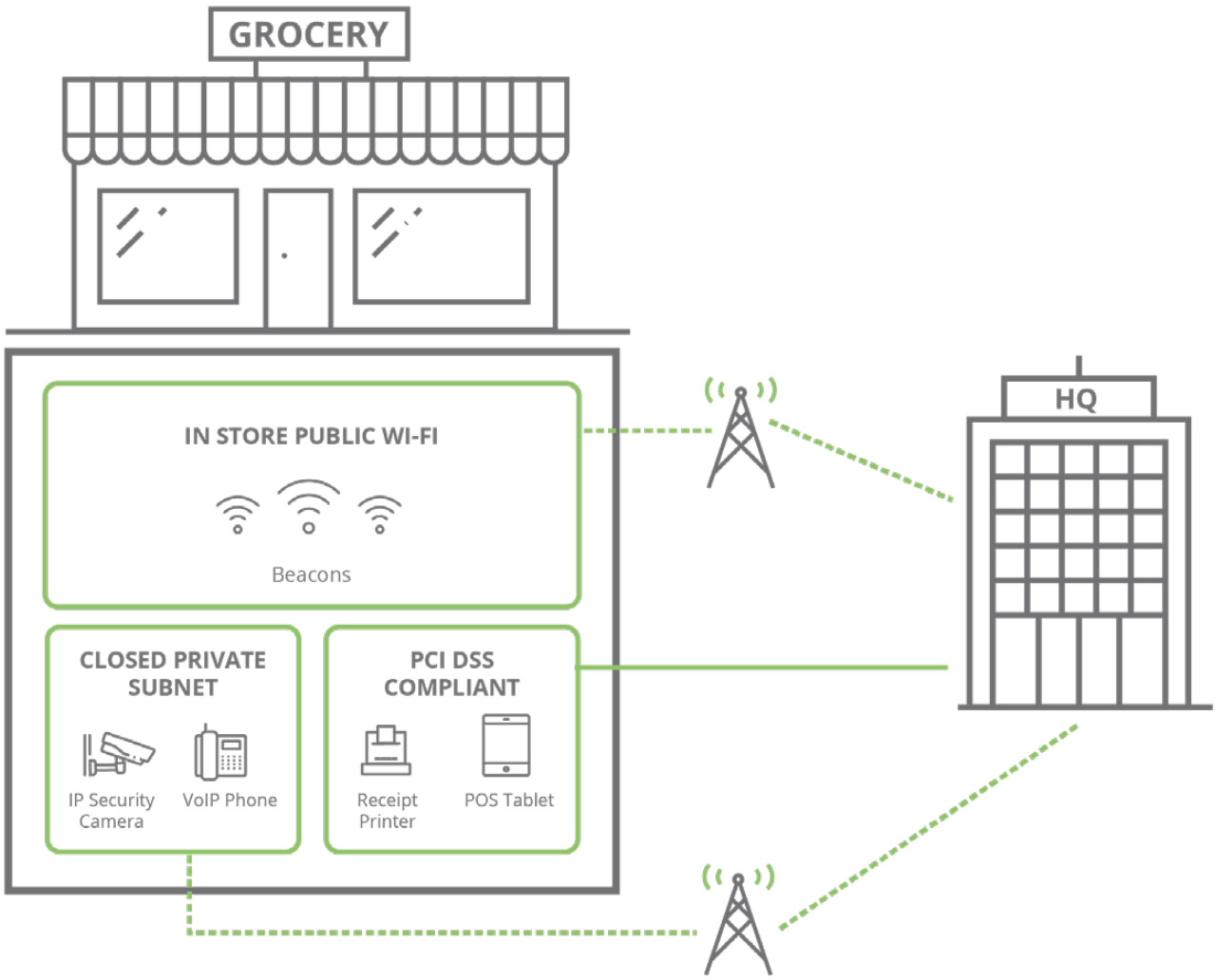
In environments such as retail, where downtime equals money lost, wireless out-of-band capabilities combined with wireless failover is a huge benefit because it addresses the "multiplier effect" from two perspectives: it reduces the cost of dedicated out-of-band management and it provides a cost-effective failover option, which, when multiplied by thousands of stores nationwide, can amount to significant savings.

EVOLUTION OF BUSINESS CONTINUITY

Development trends in retail have created other opportunities where the use of cellular connectivity can provide solutions to challenges facing the industry. Shoppers want to have Internet access within the store and increasingly expect free Wi-Fi access. For security reasons, this has to be separate from the main and sub networks that support point-of-sale and asset management systems. Dedicated cellular connections are widely recognized as a convenient option.

Figure 5 shows the creation of subnets that provide security through separate connectivity routes, which also means that data collected can be segregated for privacy and specific utilization. For example, having shoppers register on the in-store Wi-Fi provides them the opportunity to link their identity with beacon data that is on the same network. This allows stores to gather proximity and contextual data that links to online profiles and recent browsing habits, enabling the marketing system to feed shoppers specific information and personalized offers.

FIGURE 5: SEPARATE CONNECTIVITY DOMAINS IN RETAIL

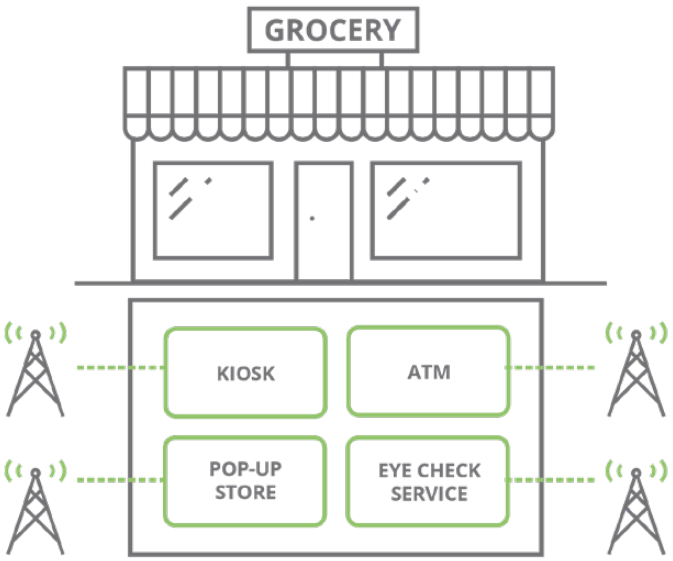


Source: Heavy Reading

Pop-up retail development, consumer requirements for convenient services, and retailer desires to maximize shop floor utilization have given rise to a new set of challenges for retail IT staff. Figure 6 depicts an independent pop-up or in-store service, such as eyesight testing, that can't be allowed access to the store's main network. Under these circumstances, the simplest solution is the bring-your-own-network (BYON) model. Once again, this leverages the benefit of cellular primary connectivity, ensures speed of setup, and eliminates any security risk for the tenant or the retail landlord.

This BYON model is also being used for ATMs and lottery kiosks, where location is key but there is usually no fixed-line connectivity. Another application, in both retail and other venues, is digital signage and smart kiosks, which provide the ability to swap out content from a remote location and extend brand presence without the cost of manually updating individual displays on site. Linked to the beacon technology, this enables retailers to deliver an omni-channel experience and increase consumer touch points. The use of digital signage also allows for rapid pricing adjustments that entice consumers into upselling scenarios.

FIGURE 6: BRING-YOUR-OWN-NETWORK (BYON) IN RETAIL



Source: Heavy Reading

Digital signage deployments can use cellular modems as a single point of connection on each display, or as an aggregation point in combination with secure Wi-Fi. It depends on location and deployment density for the digital signage, as well as the possibility of Wi-Fi being overloaded or subject to traffic interference. Each installation has to be assessed on a cost, usage, security and location basis.

The possibilities are endless, and the versatility means that signage can be placed virtually anywhere and repositioned easily as layouts are reconfigured. This versatility, together with being completely separate from corporate networks, and the ability to manage them remotely from a central point means they're being used in a variety of applications beyond retail, such as healthcare, corporate communications, warehouse and manufacturing facilities.

Digital signage and smart kiosks that enable not only a consumer touch point, but also an opportunity for interaction, are combining with new opportunities such as charging stations for electric vehicles (EVs). EV charging station deployments face the same challenges as pop-up stores: providing connectivity to a location that has no fixed-line capability so that people can pay for their electric charge. Cellular primary connection is a simple solution for all the reasons previously identified, but the engagement opportunity via a kiosk with EV drivers also presents a unique opportunity that media companies are finding hard to resist.

One evolution of the captive target audience concept is the connected bus shelter. Cisco has demonstrated such a shelter providing cellular connectivity and Wi-Fi for passengers and large digital signage to entertain and inform. The screen content could be tailored, based on what form of social media the passenger uses.

DIGI CONTINUITY IMPLEMENTATION

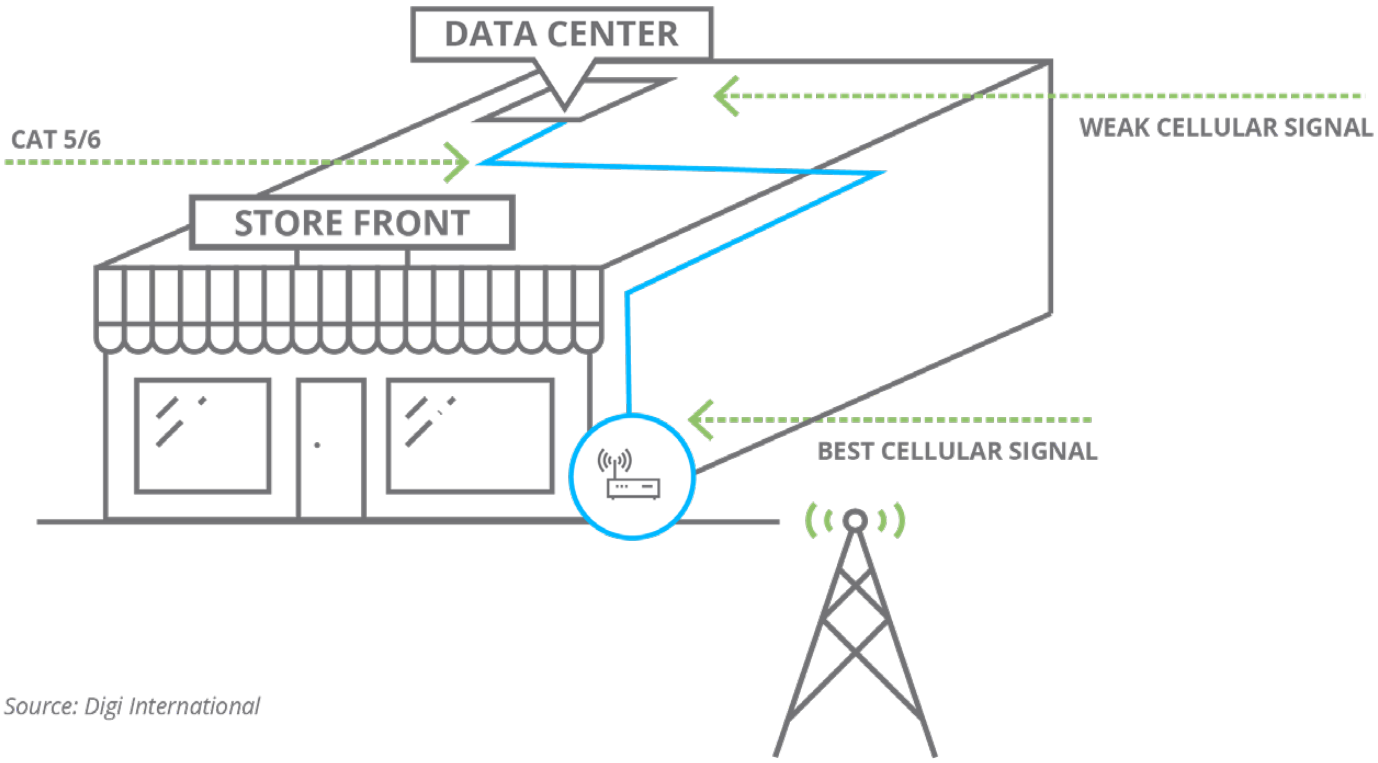
This section examines the Digi portfolio for addressing the fixed wireless connectivity, cellular failover and out-of-band remote management market.

While cellular connectivity is an extremely useful and reliable option for primary and failover situations, wireless signals are difficult to measure and identify, and are weakened by building structures. Consequently, when a retail operation has a data room with its computing and connectivity tucked away in the deep recesses of the building, this is usually the worst location to place a cellular modem.

Digi 6300-CX (which embeds carrier-certified LTE and 3G modems) has the ability to connect with all four major U.S. carriers, and provide either pass-through failover fixed-wireless connectivity or primary fixed-wireless connectivity. However, the reality is that placing this unit in the data center will not ensure the optimum signal. Equally, running an external antenna that extends more than 30 feet will not achieve any significant gain in signal.

The Digi solution is to place the Digi 6300-CX in the optimum position to receive the best possible signal (Figure 7). This will then connect with the data center utilizing a CAT5/6 cable that continuously powers the unit when linked to a passive-power-over-Ethernet injector cable. The unit is IPv4- and IPv6-capable, so it can handle future IoT applications. It has a fully

FIGURE 7: DIGI EXTENDED CELLULAR COVERAGE



Source: Digi International

configurable stateful firewall and VPN capabilities, and can be managed remotely using a cloud-based monitoring system, so that over-the-air updates and configuration are both easy to use and secure.

Digi products address the requirement for cellular connectivity with out-of-band remote management. Digi 5400-RM allows secure remote network management of devices and equipment using on-site, Ethernet-based connections or completely out-of-band, embedded 3G/LTE cellular failover technology. The Digi 5400-RM can deliver seamless broadband backup capabilities and simultaneous uninterrupted remote management from a centralized network operation facility using network cloud management during primary connection downtime.

SUMMARY

It's difficult to imagine that retail would present the cutting edge of where IoT is heading. Retail went from being the industry that the Internet would consume to the industry that has not only embraced the Internet's power, but learned to leverage it in innovative and productive ways. Retailers who were once concerned for their future learned to embrace the fundamental changes that the Internet imposed on their business model, adjusting to rapidly evolving technology, such as beacons, digital signage and tablets as point-of-sale terminals to create new and engaging experiences for their customers.

More fundamentally, the retail industry is exploring the interaction of consumers with this technology and trying to design frictionless experiences that

engage the customer to the point where they feel compelled to purchase in the moment. This relies on continuous connectivity to pinpoint consumers, feed relevant and updated content to displays, check inventory availability and, where possible, suggest upsell opportunities before seamlessly and securely completing consumers' purchase transactions.

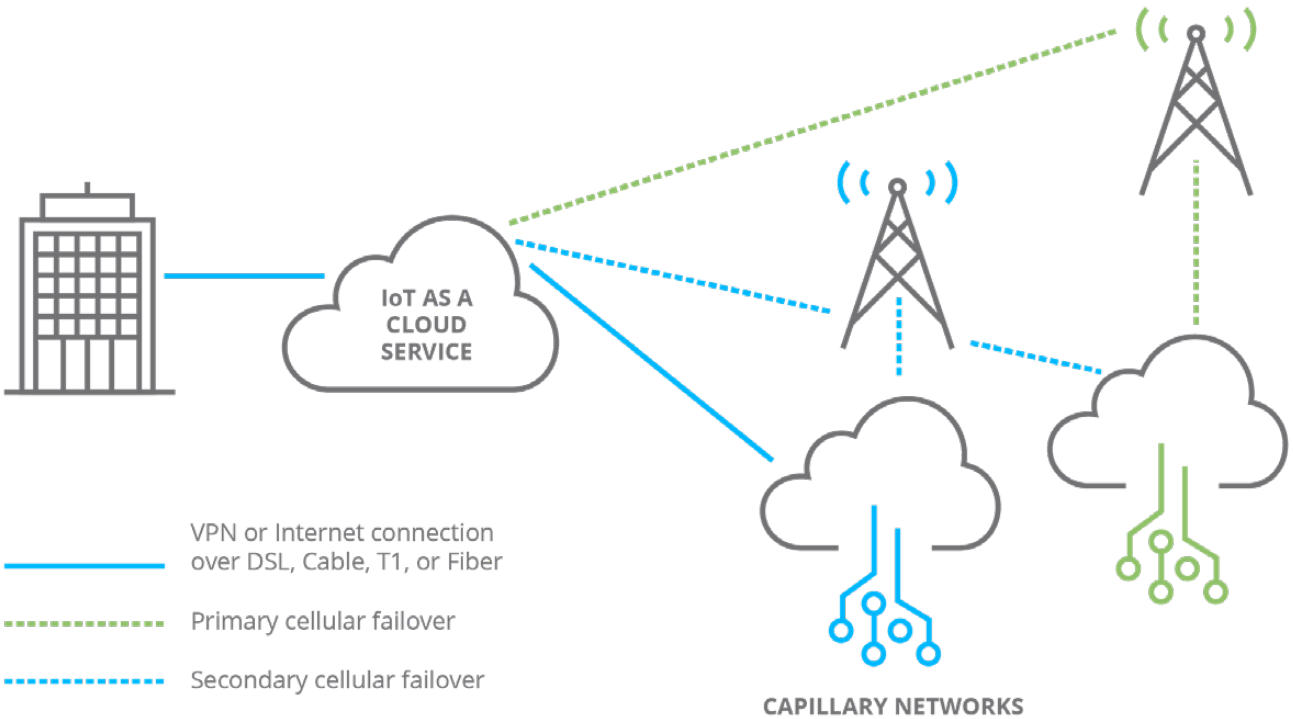
Connectivity availability is the critical element of a business continuity program that avoids expensive outages and downtime that impacts its reputation. Figure 8 shows the use of out-of-band technology, together with failover, as key components of a continuity solution for the IoT. As the IoT expands, these components will become a vital mechanism for backing up the intelligent edge gateways that will control and manage billions of sensors and devices in capillary networks, in a myriad of industries including retail, transportation, smart cities, manufacturing and agriculture.

ABOUT DIGI

Digi was formed in 1985, long before anyone coined the term "Internet of Things." Since the very beginning, we've been laser-focused on creating strategies and solutions to connect machines, devices and the people who use them.

As wireless data technologies began to spread throughout every modern industry, we evolved and innovated along with it. For customers taking the next step to build IoT enabled applications, and want to partner with a complete network connectivity solution provider, Digi offers options that integrate hardware, software, service and support right out of the box. We have continued expanding into sensor-based operations with sophisticated remote asset and device monitoring and management tools that complement all our IoT offerings.

FIGURE 8: FAILOVER AND THE INTERNET OF THINGS



Source: Heavy Reading

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