Point of Sale in the Cloud: Designing a system to grow with Technology

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Info 614

26 May 2013
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What is Point of Sale?

Nearly every modern business which requires a check-out system for exchange of goods and services uses a Point of Sale (POS) system to accomplish the task. Patented in 1976, “a point-of sale terminal system [includes] one or more keyboard terminals and associated cash drawers in communication with a control chassis having a micro-computer, a printer, and power supply.”¹ Original systems were equipped with minimal storage, allowing the register to suspend a handful of transactions and return to them later. Business owners could access the computer’s memory to analyze their daily sales. This is the original concept of the POS system, which today has grown to include a wide variety of software and hardware options, including QR (Quick Response) and RFID (Radio Frequency Identification) code scanners, biometric technology, and wireless checkout systems.

In the retail industry, the POS system has become essential to the everyday function of most retail stores. POS systems are advantageous as they offer the ability to connect with inventory systems, bookkeeping, analytics and store-specific programs. Hardware required for a typical system includes a server, multiple workstations, credit card readers, receipt printers, cash drawers, scanners, and pin pads. These systems can also be used to communicate with vendors for ordering purposes.

POS networks generally function as distributed computing systems within a local area network. Once established, the system must tolerate a failure in an individual computer, i.e. if one register goes down; the rest must stay up and connected to the network. The topology of the POS network can vary widely due to the wide array of systems available. While they were once

the basis for a POS network, LAN’s are often avoided now by major companies because of the need for special programmers, and hardware investment. Since the inception of POS, new options have gradually become available for companies seeking a more sophisticated system; they no longer have to invest in a personal distributed network. Tomax Technologies introduced a Retail POS enterprise system in the early 1990’s that allows for a central processor to support all workstations across a wide area network, rather than using a local network. Major companies, such as Office Max, took advantage of the WAN-based POS to share data throughout all of their stores across the country. Wide Area Networks with a continuous connection reduce the wait time for previously used dial-up POS networks. In addition to this improvement, utilizing a WAN reduces data loss in intermittent dial-up information-transfers. By making the transition, Office Max can use frame-relay protocols for data transfer over an existing network, rather than having to wire their own.

While utilizing a Wide Area Network for the POS infrastructure is efficient for many retail chains, the advent of POS Cloud systems is the best solution in today’s ever growing tech-world. The use of cloud computing to store information online completely eliminates the need for stores to purchase their own servers to store data. With cloud networking, POS can even be available on mobile devices. Some stores even simply use tablets with credit card terminals attached in lieu of standard cash registers. Cloud-based POS software can work both online and offline, allowing for more flexibility. With Cloud computing, POS is available for a low monthly fee, and all a company needs is internet access.

In a nation with such a wide array of wireless devices available, how can we design an ideal Point of Sale system for a small to medium sized retail store that will tailor to a growing

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3 Cavanaugh, 34.
This paper will review the standardized requirements for a Point-of-Sale system, and match them with the available tech hardware available for the design of an efficient, affordable and secure checkout system based in the cloud.

**Requirements**

UnifiedPOS (Unified Point of Service) is the current standard for all point of sale systems, and serves as an “architectural specification for application interfaces to point-of-services devices that are used in the retail environment.”

This document provides the technical specifications for designers of retail networks and POS software. Figure 1 below illustrates the components necessary for a standard system according to the Association for Retail Technology Standards (ARTS). Figure 2 shows an example of an ideal event transfer within the system.

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Leaving aside conforming to the ARTS standards, basic requirements of a functioning Cloud-based POS system are as follows:⁷

- Ability to work both online and offline
- Have a backup system available to prevent data loss if network goes down
- Offer a monthly fee for service, rather than purchasing hardware and software outright
- Process purchases with minimal delay in order to reduce customer waiting time
- Organize stock and ordering, provide information on buying trends
- Create labels, allow for easy import of data
- Paper free options at checkout such as emailed receipts
- Allow store managers to monitor and manage various locations from a single console
- Maintain a secure system including firewalls and encryption for credit card transactions
- Ability to work on mobile devices such as tablets or smart phones

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• Have scanners that work for UPC, QR and RFID Codes

• Ability to adapt to new security technologies such as biometrics

This is a lengthy list, but it is most important to focus on connectivity, hardware, and security issues as these are the most important. How well will the system work in the cloud? How can the company minimize hardware costs but still achieve the desired outcome? And how can the store be assured that the system is secure, especially with processing credit and debit transactions?

Point of Sale in the Cloud

The advent of cloud computing had led many to believe that it is the beginning of the industrialization of the computer industry. “Cloud services include the delivery of software, infrastructure, and storage over the Internet (either as separate components or a complete platform) based on user demand.” The primary characteristics of Cloud computing as it applies to POS software is the consolidation of servers into a centralized system for the express use of subscribers. These data centers are then accessed over an internet connection, rather than a wired local network connection as would previously have been used (See Figure 3 below for an example of public and private cloud networks). Cloud computing is virtually the same concept as distributed networks, except that it runs through an existing network (the internet) rather than building a new network for each customer. Initially intended for only short-term use, cloud computing has grown popular among companies who require a reliable network connection for a low cost. Cloud-based products can be off-the-shelf, or customized for customer use. Their

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functionality varies widely based on cost of subscription, the availability of infrastructure, and the locality of the customer.\textsuperscript{11}

Cloud computing is elastic, meaning it has the ability to be scaled to a customer’s needs. Scalability also means that the cloud-based POS service can change when additional users are added (a chain opens a new store) or if requirements were to change.\textsuperscript{13} This is perhaps the greatest advantage of POS on the cloud. Previously, it was extremely expensive to change a POS service to update to a newer application as all hardware and wiring had to be replaced. Now, companies can switch to a newer and better service on a whim, as they pay only a month-to-month fee, and can keep the same hardware.

In addition to being an elastic service, Cloud computing has self-service provisioning, meaning users of POS in the cloud can obtain, use and discard the software needed at their discretion. Unfortunately, the ease at which a user can access software on the cloud means a heightened security risk. Previously, employees of a company could only access encrypted information while they were at work and directly connected to the company network. Now they only need an internet connection, and can they access the company software from virtually anywhere.

The cloud network exclusively utilizes the Application Programming Interface which provides instructions on “how two application or data sources can communicate with each other.” This standardized interface allows the customer to easily link to a cloud service without the need for any custom programming, another advantage of using POS on the cloud. It cuts the expense of having to pay programmers to design individual systems for each company. Because information is stored in only a few, or in some case a single housing center, as long as those servers have backup power, data is not lost. This provides security to customers of cloud-based POS systems, as in the event of a system failure within their own store, data is still protected. In August of 2003, a power surge took down a large power grid in the northeast, but the owners of the POS software Retail.net were able to continue to provide service to their customers through the use of backup generators. As an additional backup, each register has its own small data cache in case of connection loss, further securing the network.

While traditional data centers must constantly move data around to allow for disaster recovery because of the wide array of workloads they must support, cloud networks can handle

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data workloads consistently. There is a single global policy for backups and it is handled automatically. Registers typically sync data consistently providing instant updates, in some software this feature even works offline.

**POS Hardware and Software**

Traditionally, most businesses refresh their hardware and software on a regular basis to keep up with changing technology. This is not generally true for retail stores utilizing a POS system, as the hardware is not only expensive to update, but little effort is made to make technological improvements requiring such a purchase. “Hardware for a typical client-server system, where the cash register is a computer with a hard drive that processes and stores transactions...starts at about $2000 and can easily go above $5000.” Alternatively, cloud-based hardware tops out around $1500. Not only is the hardware less expensive, but it is easier to move around and replace as needed. Software is easily updated, as multiple copies are not needed, all users share one copy via the network. Interconnectivity allows users to track sales, supplies, employee hours and more by tapping in remotely with internet-ready devices. The only downside to not owning the software is that “you can say ‘I don’t want to communicate with this company or pay them anymore.’ You have to, otherwise your software doesn’t work.” Alternatively, some companies offer Point-of-Sale-As-A-Service, meaning you can rent both hardware and software for a monthly fee.

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19 Demetrakakes, 1.
There are a growing number of companies which offer cloud-based POS software. Some examples include Leaf, which manages operations using a pre-programmed tablet, a ready-to-go system right out of the box. The “LeafPresenter” tablet is able to process cash, credit and debit payments from anywhere in the store and send receipts to mobile phones. The tablets encourage feedback and encourage customers to share information about their purchase online. This system is available for the low cost of only $50 per month. Other tablet-based systems include NCR Silver, Shopkeep, and Revel Systems. All of which offer monthly subscription services and are able to perform a wide array of retail functions such as inventory and sales volume tracking. See Figure 4 below for an example of a tablet-based checkout system.

Figure 4

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Today’s POS systems are not just the traditional cash register and back-office computer combinations anymore. The systems have expanded to include mobile devices such as RFID guns, tablets and even smart phones. At Home Depot, if the checkout line gets too long, an associate can “step up to customers and scan their merchandise using a Symbol handheld computer that is equipped with a barcode reader. The associate then gives the customer a plastic card with a UPC. When the person reaches the register, the cashier scans the card and process the payment.”

In 2000, Compaq demonstrated a system that could handle a credit-card transaction with digital receipt delivery using only a tablet. Compaq claims their system can process a transaction within two seconds. Today, many retail chains offer an emailed copy of your receipt in lieu of paper.

Self-service checkouts and kiosks are also becoming more prevalent in the retail world and beyond. Now not only can you locate the peanut butter in your nearest grocery store via a touch screen kiosk, but you can also check nutrition information at McDonalds, purchase that embarrassing wart remover discreetly, print your own luggage tags at the airport, and even bail a friend out of jail. In addition to these independent checkout methods, the introduction of QR (Quick Response) tags on everything from candy bars to shampoo are making their way into the retail world. QR tags can be read with simple devices, like a cell phone camera and usually link to an internet page. They also function in a POS system, as with these tags, contactless payment is made available. “A cashless transaction is initiated and completed without physical contact between the payment media (card, tag or fob) and a POS terminal.”

RFID tags, another type of

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25 Greengard, 49.
tech, are available in popular products like Mobil’s “speedpass” and ATM credit cards with “paypass” technology. These tags are an example of Near Field Communication technology, a short-range wireless connection (2-4 inches). This is mostly found on small devices like cell phones as the technology requires a power-supply. Figure 4 shows a POS terminal using a tablet as a register. (Figure 5 below illustrates the difference between an RFID Tag, a QR code and a regular UPC).

Figure 5 (From left to right, RFID Tag, UPC and QR Code)²⁹

One company taking full advantage of touch-less pay technology is Starbucks who recently struck up a deal with Square Inc. (a leading cloud-based POS company). Customers are able to download the Square app and pay using only their Smartphone by scanning a QR code. The company “installed scanners at the 7,000 or so outlets it controls (more are run as franchises). The scanners read the 2D tags produced by Starbucks’ Smartphone app, which can

²⁹ RFID/UPC/QR Tags. <http://www.inspectall.com/assets/RFID_Barcode_QR_code_scan_asset-edf10b56faf7de6f2f1316bc5c056b00.png>. (22 May 2013).
be linked to an online account with real or virtual stored-value cards.”

Using square means reduced transaction costs (just 2.75% per transaction), and more convenience for customers who no longer have to carry a method of payment with them. The most attractive part of this new system is that when the internet connection to the store’s POS system fails, users can still pay with a card using the connection on their smart phone or wireless device.

**Network Security**

Network Security in cloud-based POS systems takes on a whole new level over older local area networks set up within individual retail chains. Because clients are able to connect to the cloud network from virtually anywhere, that means there is a threat from unwelcome entry into the system. In a closed LAN connection, the POS system may have only been accessed from inside the store itself, closing off access to include only employees at that location. This means tougher security is needed in the cloud. Nevertheless, we must remember that a completely secure system will have limited function ability, so designers must pick and choose their security options. Cloud systems must follow three basic security areas. It must remain dependable under typical operating conditions; it should have little vulnerability and be resistant to malicious codes; and it needs to be resilient enough to quickly recover when damaged and keep data loss to a minimum.

One of the primary security functions of a POS system is to encrypt data and cardholder information to process secure credit card transactions across an open, public network. “Encryption involves scrambling messages so that they cannot be read by an unauthorized entity,

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30 “Starbucks circles Square: Retail payments” *The Economist Online*, (10 August 2012).
even if they are intercepted.” Apart from adapting stricter security protocols, new technology is also emerging to assist in validating a customer’s identity. Though expensive now, biometric reading systems are slowly coming into play in the retail world. It may be possible for a customer to sign for a transaction by scanning a fingerprint, or an imbedded microchip under the skin. Other options include “an innovative hybrid card [which] features an embedded fingerprint scanner, microchip and magnetic strip built into a plastic card.” The whole payment process can operate without the card ever leaving the owners hands. This reduces liability for the store which can avoid processing stolen credit card transactions, and makes consumers more confident in using digital methods of payment, rather than carrying cash.

Conclusion: The ideal Cloud-Based POS Network

The best solution for a retail store is to make the move to a cloud-based POS system. With very few disadvantages, and many opportunities for growth, it is the obvious choice in this fast-paced tech-savvy market. An ideal system will offer low-cost hardware, with Near-Field field communication functionality (if the store chooses to implement the choice of touch-less payment), the option for wireless checkout systems, and have ideal network security to prevent unwanted access. For now, the company should resist implementing biometric scanning options, as the technology is still in its early phases, and is not likely to be used by many customers. Nevertheless, because of the low-cost of implementing and updating the service, cloud-based POS offers the opportunity to add this technology in the future.

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