"The hardware-based security and manage-ability capabilities of Intel® vPro™ technology can significantly lower system support costs for retailers."

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Reducing TCO in Retail with Intel® vPro™ Technology

The HP* rp5800 Retail System incorporates the latest technologies to deliver high performance, advanced manageability and longevity that retailers demand, while being safe to use and environmentally sound

In the fiercely competitive retail industry, technology is being used to squeeze the last bit of margin out of every transaction. Throughout the store, computing and networking technology helps increase revenue and decrease costs by improving the customer experience, transaction processing and inventory management, among other benefits. Point-of-sale (POS) and other computer-based systems have become an essential part of operations, and their top and bottom-line impact is of great importance to retailers.

Delivering the functionality to meet even the most demanding retail environments, the HP* rp5800 Retail System provides exceptional performance, expandability, stability, manageability and usability. The system[1] includes select components designed for energy efficiency such as 2nd generation Intel® Core™ processors and a 90 percent efficient power supply. Helping lower total cost of ownership (TCO), Intel® vPro™ technology enables advanced remote management and a higher level of system reliability and security.

This paper reviews the TCO-saving, energy-efficient features and performance-oriented technologies incorporated in the HP rp5800, a retail system that can be used for POS, self-service, digital signage and back office applications.

Intel® vPro™ Technology in Retail

Managing and protecting retail systems and securing data are among the great challenges for IT organizations supporting store locations. Now, Intel vPro technology delivers a set of security and manageability capabilities built into the 2nd generation Intel® Core™ processor family, Intel® chipsets and Intel® Network Adapters. Since these capabilities are hardware-based, they offer particular advantages over software-only solutions, some of which are include in Table 1.

When a retail system has Intel vPro technology, it incorporates a number of Intel® technologies, including:

- Intel® Active Management Technology (Intel® AMT)[2]

  » **offers** flexible remote management and energy saving capabilities

- Intel® Virtualization Technology (Intel® VT)[3]

  » **improves** the efficiency and security of virtualized environments

- Intel® Trusted Execution Technology (Intel® TXT)[4]

  » **supplies** additional security protections for virtualized environments

Together these technologies provide unprecedented hardware support for advanced management functions, comprehensive security protection and software integration – leading to retail solutions that are reliable, trusted and cost-effective.

Intel vPro technology …

√ enables IT to remotely troubleshoot and repair retail systems, even when they won't boot

√ provides a reliable mechanism to turn systems on/off when stores are closed to save power

√ allows IT technicians to quickly deploy security patches, remotely unlock encrypted drives and manage data security settings

√ gives IT help desk personnel complete control over a retail system with features like keyboard-video-mouse (KVM) remote control

√ improves system reliability by running applications safely in isolation so they can't interfere with one other

√ implements an extra layer of hardware-based security protection that supplements software-based solutions

Factors Affecting Retailer TCO

Although not a life-long commitment, retail IT managers know their choice of POS system will be around for a long time, an average of seven years according to Leslie Hand of IDC Global Retail Insights*.[5] A lot can happen over this period of time, so it makes sense to shop around and look for a retail solution that will keep more money in the company's coffers. It is important to weigh a large number of considerations when selecting new POS systems since the initial capital spend is just one factor affecting the cost equation that spans the operational lifetime of the equipment. In fact, the initial purchase price of a POS system represents just 20-45 percent of the overall TCO, suggests Hand.[5]

	With Intel® vPro™ Technology
Remote Management	• Remotely repair a system when the OS is corrupted • Access system when the system is powered off
Virtualization	• Increase performance of virtualized applications via faster context switching • Prevent malware from accessing vital data by restricting direct memory access
Trusted Platform	• Encrypt and store system secrets without OS intervention • Use an independent hardware device to ensure platform has not been breeched

Table 1. Benefits of Intel® vPro™ Technology Over Software-Only Solutions
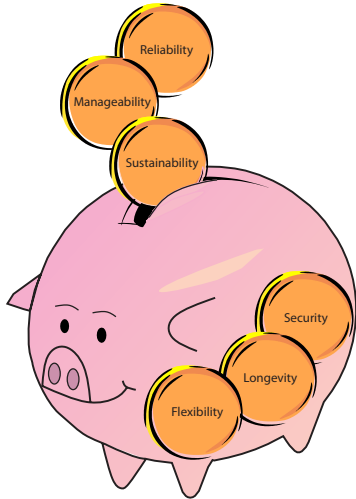
Figure 1. Factors Impacting the TCO of a Retail System

Although there are many factors impacting the TCO of a retail system, according to Intel and HP there are some that mitigate indirect cost exposure over the lifetime of POS equipment:

- **Longevity:** ensures equipment performs to planned replacement cycle
- **Reliability:** maximizes up-time and keeps checkout lines running smoothly
- **Flexibility:** supports functionality additions that allow systems to be repurposed within the store
- **Manageability:** decreases IT support costs and gets systems back on line faster
- **Security:** increases protection against hardware and data theft
- **Sustainability:** reduces energy consumption and lowers carbon footprint

With these factors in mind, HP designed the rp5800 Retail System to help lower TCO by integrating the latest computing technologies from Intel into a flexible, retail-hardened POS platform, shown in Figure 2. The following describes the technologies and features that enable retailers to cost-effectively run their business.

Greater Longevity through Performance Headroom

For most retailers, the longer a POS solution can be used, the greater its return on investment (ROI). An important caveat is POS systems often have to support a changing retail environment; otherwise, their inability to implement new services and business processes – to increase sales and improve productivity – may generate hidden costs. One way to avoid such operational obsolescence is to ensure it has a high performance processor with computing headroom for future functionality; therefore, a software build change late in a system's lifecycle won't necessitate an early upgrade to a new platform.

Boosting performance, the HP rp5800 is equipped with the latest 2nd generation Intel Core processors that provide power-efficient performance, excellent media and 3D graphics, and I/O flexibility. For example, the Intel® Core™ i7-2600[Δ] processor

has four times more performance capabilities, and by utilizing Intel® HD Graphics 3000, offers five times greater graphics performance compared to the Intel® Core™2 Duo processor E7400 used in the prior generation HP rp5700.

Higher Reliability though Rigorous Testing

The retail environment can be tough on a POS system, where ambient temperatures can reach 40° C/104° F or more, and systems are expected to run all day long. HP is committed to offering systems that are designed, manufactured and tested to meet the demands of the retail market. Ensuring systems are "retail hardened", HP has a comprehensive methodology to help ensure they are reliable, durable and can withstand the long-term wear and tear of a typical retail environment.

Retail hardening starts with the selection of components and materials such as the steel chassis and gold-plated connectors that will be able to withstand extended use and extreme temperatures. Conscious of the space limitations within a retail environment, HP uses connectivity components that allow for flexibility, yet provide the power and security features needed in a retail setting. Thorough testing is performed on internal systems, and exterior materials and components. Systems are also subjected to power and thermal variations, as well as drop, impact and vibration tests, among others. For more information, please download the whitepaper at http://www.hp.com/sbso/solutions/pc_expertise/pos/hp-retail-hardening.pdf.

> "The HP* rp5800 Retail System is built to last, designed with reliable, retail-hardened engineering that helps reduce downtime and keeps stores running smoothly."
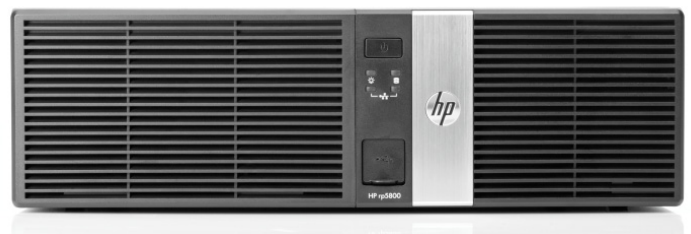>
> *Emily Dart*
> *Director, Worldwide Marketing*
> *Retail Solutions Business Unit*
> *Personal Systems Group*

Figure 2. HP* rp5800 Retail System

More Flexibility through Connectivity/Expandability Options

As the retail industry evolves, new checkout line requirements will likely emerge and impact transaction processing or hardware (e.g., display and peripheral mix). POS systems that protect a retailer's investment need to be flexible and expandable to support these changes by running new software applications and integrating new hardware.

The HP rp5800 provides many connectivity options and expandability capabilities that enable retailers to meet the future needs of the business. There are VGA and DisplayPort* interfaces for displays, and a range of I/O interfaces, including 12V/24V-powered and standard USB 2.0, PCI Express*, line in/out, RJ12 cash register port, RS 232 and RJ-45 Ethernet LAN.

The RS232 COM1 and COM2 ports are power configurable to 5V/12V in BIOS (i.e., no jumpers to move as with previous products). The system supports two full height PCI slots or two full height PCI Express x1 slots with a configurable riser. There is also an optional COM3/COM4 card (shown in the bottom full-height slot in Figure 3) that is power configurable to 5V/12V and an optional card with six 12V-powered USB ports (shown on the left). Further customization is possible through the use of memory slots, multiple PCI Express slots, 3.5"/5.25" bays and optional optical drives.
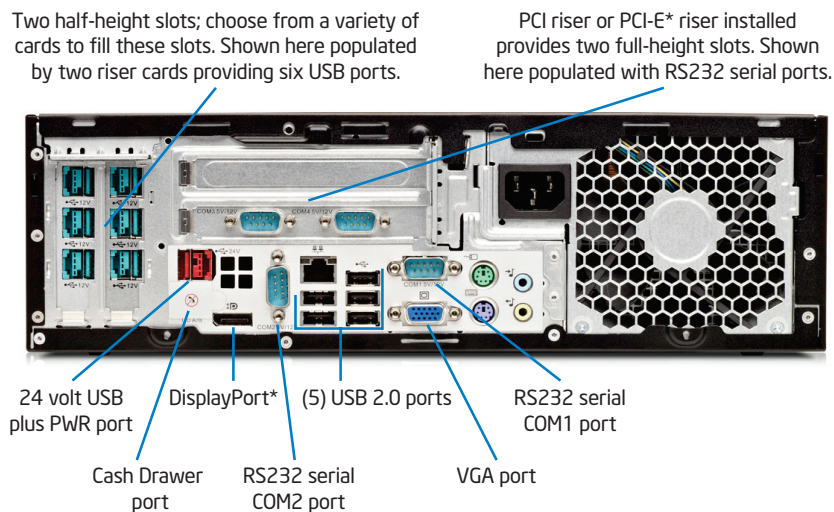
Two half-height slots; choose from a variety of cards to fill these slots. Shown here populated by two riser cards providing six USB ports.

PCI riser or PCI-E* riser installed provides two full-height slots. Shown here populated with RS232 serial ports.

24 volt USB plus PWR port

DisplayPort*

(5) USB 2.0 ports

RS232 serial COM1 port

Cash Drawer port

RS232 serial COM2 port

VGA port

Figure 3. Rear View of the HP* rp5800

Improved Manageability through Advanced Remote Management

Today, almost every retail system – POS, kiosk, digital signage and back office – is connected to a network, and therefore can be managed remotely. Instead of sending a technician to the store to service a system, a variety of industry-standard manageability tools, such as HP Client Automation, can be used to remotely diagnose and fix problems that traditionally required an onsite visit.

Now, with the advanced manageability and maintenance features of Intel AMT[2], it's possible to query, restore, upgrade and protect devices remotely, even when they are not functioning, powered off or experiencing software failures. This is in contrast to other available management solutions that require a system to be fairly functional in order to communicate with it.

Further reducing IT support cost, all of the systems (Figure 4) can be managed from a central location (e.g., corporate office), which is particularly valuable when stores are in distant locations. Intel AMT is one of the technologies that comprise Intel vPro technology.

The HP rp5800 also supports Intel AMT KVM redirection, which permits the keyboard-video-mouse (KVM) for an IT console to interact with the graphical user interface (GUI) of a retail system in the field. This feature allows service desk technicians to work on remote systems as if they are right in front of them; they can control a system more easily and see what's happening, which can greatly reduce the time needed for the service call.
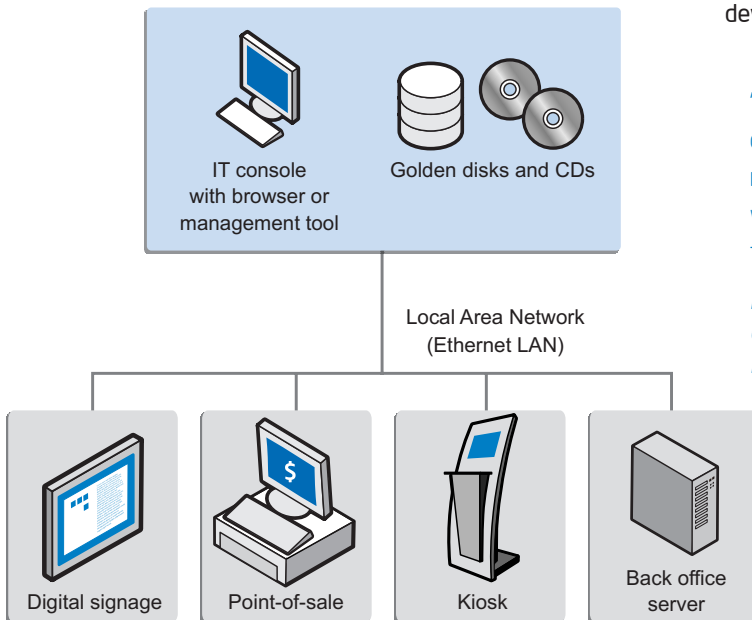
How it works

Providing a significant remote management breakthrough, Intel AMT implements a unique capability (i.e., circuit) in the Intel chipset that can access and control the system, even when the system is dysfunctional or switched off. This circuit establishes a link that allows the system to communicate with a management console without relying on the system's standard networking functionality.

Reduce Repair Costs

When a retail system doesn't boot due to corrupted software (e.g., OS, driver or critical application), the usual remedy is to send a technician onsite to reload the software image. Using Intel AMT, it's possible to remotely boot a device from a networked drive, called a golden disk, with known good software, which greatly aids troubleshooting. IT can also remotely change BIOS configuration settings and reload a driver or operating system, whether or not the system is running.

Gather Inventory Data without Physical Interaction

For many retailers, performing a fixed asset inventory can be time consuming and resource intensive, especially when equipment resides in geographically dispersed stores. Similarly, a Help Desk responding to a service call must ask the caller for system data (e.g., OS, patches, RAM), and this can take a considerable amount of time. Eliminating human intervention, Intel AMT enables management systems to generate a comprehensive list of hardware and software components for any AMT-enabled device that's plugged into the network and an electric socket. This capability also enables IT departments to track software, by version and license, for every AMT-enabled device on the network.

> "It is important to remember that many retail stores don't have onsite IT departments. Intel® AMT enables maintenance and upgrades over the network connection without the intervention of a technician or a truck-roll to the site."
>
> *Michelle Tinsley*
> *General Manager*
> *Intel Embedded Computing Division*

Figure 4. Remote Management in Retail using Intel® Active Management Technology (Intel® AMT)

Lower Utility Costs

Although most retailers could power down some systems at the close of business to save power, many don't because IT departments typically send software and data updates during off hours. A solution is to configure remote management software, based on Intel AMT, to turn systems off after work hours and turn them back on when IT requires access. This feature, combined with the power-efficiency of Intel® processors, can generate considerable cost savings and reduce a system's CO_2 footprint.

Increasing Reliability with Virtualization

A POS system runs different applications at the same time, some of which may include transaction processing, back office communications and a digital signage player. The transaction processing application is perhaps the most critical, since keeping the checkout line up and running smoothly is the most important task a POS system performs. It is possible to keep critical applications from being impacted by other system software, which is one of the capabilities enabled by Intel VT[3].
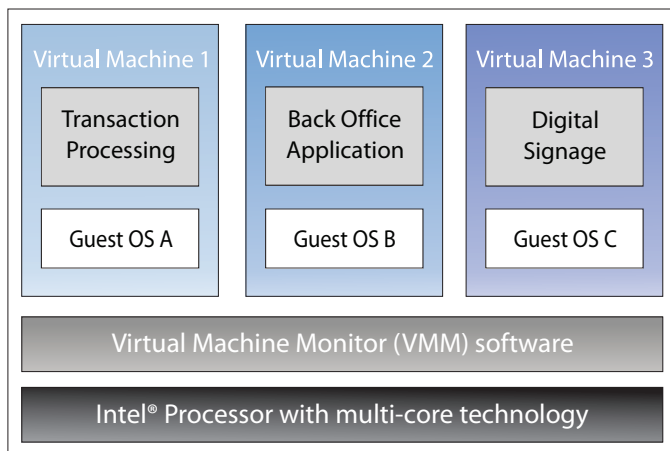
A software application may negatively impact the others by hanging or crossing over memory boundaries, forcing a system reboot. This can be avoided by isolating applications on the system using Intel VT, an ingredient of Intel vPro technology. For instance, when applications run in secure partitions, labeled virtual machines in Figure 5, their memory space is protected by hardware features in Intel processors and Intel VT.

This means software components running in virtual machines only have access to their own code and data regions, which increases security by preventing an application from breaching another. Improving system reliability, if one application fails it is often possible to reboot it independently while the other applications continue to run. In this way, it may not be necessary to reboot the whole system when a non-critical application, like a digital signage application, hangs.

How it works

Intel Virtualization Technology performs various virtualization tasks in hardware, like memory address translation, which reduces the overhead and footprint of virtualization software and improves its performance. For instance, switching between two operating systems is significantly faster when memory address translation is performed in hardware rather than in software. In order to maximize performance, Intel developed three different, yet complementary, virtualization technologies that are built into multiple platform components, including processor, chipset and network interface controllers (NICs).

Virtual Machine 1	Virtual Machine 2	Virtual Machine 3
Transaction Processing	Back Office Application	Digital Signage
Guest OS A	Guest OS B	Guest OS C
Virtual Machine Monitor (VMM) software		
Intel® Processor with multi-core technology		

Figure 5. Virtualization Isolates Applications

Increased Security Monitoring using Intel® Trusted Execution Technology (Intel® TXT)

Whether from a targeted attack on the POS or an opportunistic infection from malware, the threat to a retailer is the same: a hit to reliability and interference with normal business operations. If the POS is engineered around critical software operations (e.g., payment processing), a merchant needs to know the integrity of the POS platform in order to protect sensitive information and processes. While anti-virus, anti-malware, firewalls and other security products offer protections at higher application layers, Intel TXT[4] offers a layer of security designed for low level, infrastructure and similar critical platform software.

How it works

Intel Trusted Execution Technology is a set of capabilities that is integrated into the Intel processor, chipset and platform-level components, which work in tandem to verify critical software components have not been modified before allowing their execution. Typically, this is used to verify infrastructure components such as hypervisors in virtualization solutions and the operating system kernels in Linux* environments. In these advanced application deployments, Intel TXT performs a measurement of the critical software, compares that measurement to a known good result, and offers the platform a chance to take different actions based on a configurable policy. The end result is that the platform is made aware when things are not as they should be, thus it can avoid performing sensitive tasks, like processing payments.

Environmentally Sound Design Using Energy Efficient Components

Customer loyalty is increasingly linked to companies practicing greater social responsibility, and retailers understand how eco-friendly solutions can positively impact customer perception and satisfaction. In response, retailers are taking a closer look at greener solutions that are not only good for the environment, but also reduce TCO.

> "The HP* rp5800 with the latest Intel® processors consumes less than half the idle power of its predecessor in the same configuration, allowing us to achieve an Energy Star* 5.0 rating."
>
> *Tony Anuez*
> *Product Engineering Manager*
> *HP*

Figure 6. HP* Power Assistant

The HP rp5800 includes select components designed for energy efficiency that draw less power while in operation such as a 2nd generation Intel Core processor and a 90 percent efficient power supply. In fact, the latest Intel processors consume less than half the idle of the Intel processor HP previously used. This reduction in energy consumption allows the HP rp5800 to achieve a higher Energy STAR* compliance rating of 5.0.

Furthermore, retailers can cut the energy consumption by using HP Power Assistant and Intel AMT to shutdown and wake up systems during off hours from a remote location without human intervention. The application (Figure 6) measures and logs AC power usage, time on, estimated energy cost and estimated carbon footprint.

The HP rp5800 is EPEAT* Gold and Energy STAR qualified. In addition, the chassis of the HP rp5800 is BFR (chemical flame retardant) and PVC (low cost, durable plastic) free.[6]

Taking a Bite Out of TCO

There are many factors that impact the total cost of ownership, where the initial purchase price of a retail system represents just a fraction. Engineers at HP took a holistic approach to lowering TCO, addressing performance, reliability, connectivity/extendibility, supportability and security. The result is the HP rp5800, which helps lowers the total cost of ownership through:

√ Exceptional performance with 2nd generation Intel Core processors

√ Expandability, stability and energy efficiency through HP reliable, retail-hardened engineering

√ Advanced remote manageability with Intel vPro technology

The system is designed to provide a high-quality, robust, long-lifecycle solution that's designed specifically for the retail environment.

Figure 7. HP* rp5800 Retail System

For more information about the HP rp5800, visit **http://h10010.www1.hp.com/wwpc/us/en/sm/WF05a/12454-12454-359465-338958-359467-5081352.html?jumpid=ex_r2515_RetailProductMarketing_rp5800Vanity**

For more information about retail solutions from Intel, visit **www.intel.com/go/ic**

For more information about Intel vPro technology, visit **www.intel.com/embedded/technology/vPro.htm**