WHITE PAPER
Intel® Core™ Processor Family
Retail Industry

Generating More Vending Machine Revenue

Intel® Vending Hardware Reference Design incorporates digital signage and video analytics technologies to increase sales

Figure 1. Intel® Vending Hardware Reference Design

Increasing the revenue potential of vending machines, the adoption of digital signage is expected to draw in more customers and generate a new source of advertising income for vending operators. Located in high foot traffic areas, vending machines are valuable to service operators and product manufacturers who want to grab the attention of customers. Large screen digital signage combined with video analytics is a next generation advertising medium that can present compelling and targeted information to people in its field of view. However, this technology requires more computing performance than what is typically in vending machines today.

Using the Intel® Vending Hardware Reference Design, shown in Figure 1, it is relatively easy to add high definition (HD) digital signage and video analytics. Furthermore, this platform based on Intel® Core™ processors brings new technologies and features, such as secured cashless payment, a seamless interface with touchscreens or Auto-S3D display panels, and the ability to incorporate I/O devices from different vending machines. This paper explores how these solutions open up new possibilities for vending machines and provides an overview of the key technologies in the reference kit.

Intelligent Vending

Moving away from static front panels, the latest intelligent vending machines have large touchscreen displays showing targeted content that automatically changes based on the viewer's demographics (e.g., gender, age). This content, a mix of product information, attractive backgrounds and advertisements, can be interactive and very appealing to potential customers. For instance, a vending machine at the zoo may attract more business if it plays ads of interest to children, whereas an identical machine at a fitness center can cater to adults.

After giving their machine panels a facelift with more attractive HD displays, vending operators may see increased sales and additional ad purchases from product manufacturers. This advancement enables the following key capabilities for the vending industry:

- **Attract more attention:** Large high definition ads draw in people from afar.
- **Play targeted ads:** The machine plays ads and promotes products based on the viewer's demographics.
- **Increase interactivity:** Customers tap and swipe the touchscreen to learn more about the products (e.g., nutrition).
- **Generate business intelligence:** The system sends anonymous data about buyers, what they bought and when.
- **Sell ad timeslots:** No longer limited by static machine displays, operators can sell advertising time to anyone.

What's more, installing a large digital signage display at a new site can be challenging from an installation perspective. Vending machines, on the other hand, are already located at sites with high foot traffic; and by incorporating digital signage, both advertising and selling functions benefit.

Intelligent vending machines will typically enable a host of additional features. These include cashless payment via near field communication or a credit/debit card, and real-time data collection and telemetry, such as inventory status and alerts when a machine goes down or is vandalized. Vending machine manufacturers can implement the aforementioned capabilities with the help of the Intel Vending Hardware Reference Design, which is described in the next two sections.

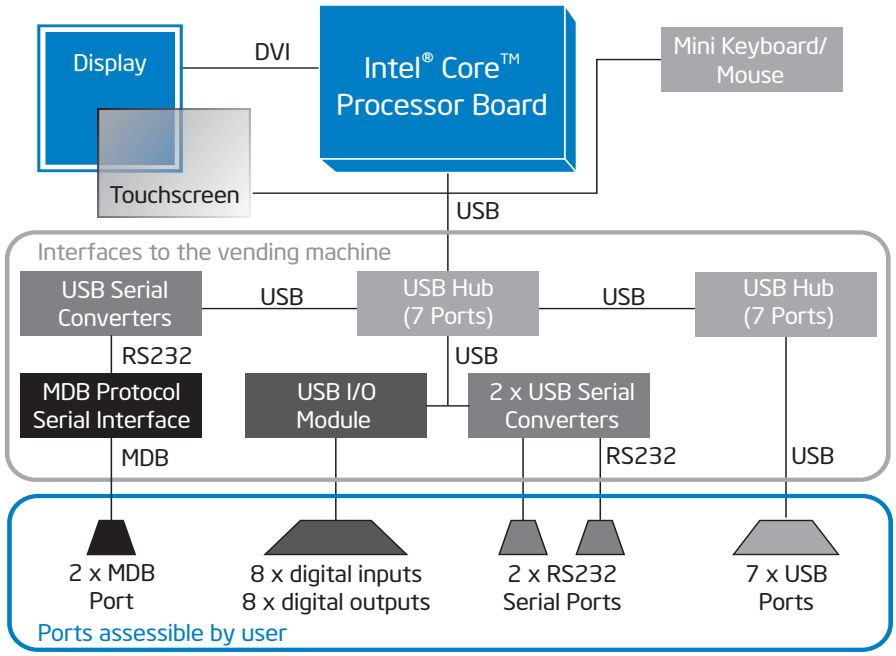

Figure 2. Reference Design Block Diagram

Intel® Vending Hardware Reference Design

Today, a majority of vending machines are controlled by microcontrollers that manage systems involving motors, actuators, sensors and other devices. With few modifications to these electromechanical systems, manufacturers can add an Intel Core processor-based board capable of supporting compute-intensive digital signage and video analytics. Minimizing the integration effort, the Intel Vending Hardware Reference Design is designed to interface to legacy machine electronics, or if desired, also replace the current microcontroller system.

The reference design has several ports that connect to various systems in an existing vending machine, as shown in Figure 2. The RS232 port can be used to communicate with the microcontroller, actuators, motors and compressors; 16 general purpose I/O pins interface to sensors; and the USB and Multi-Drop Bus (MDB) protocol ports connect to different modules, such as bill acceptors, card readers and coin changers. The reference kit provides software for these interfaces.

The reference design board supports various wireless interfaces, including WiFi/WiMAX, 3G and Bluetooth*, allowing high bandwidth communication with a central server. There are also four display interface options (HDMI, DVI, DisplayPort and VGA), providing a high level of flexibility and outstanding display quality. The board layout and component placement maximizes thermal solution effectiveness and board space efficiency.

For vending machine manufacturers, designing and validating a hardware platform is typically resource-intensive and time-consuming. Now, it is possible to dramatically reduce development effort by leveraging a commercial off-the-shelf (COTS) board from an Intel® Embedded Alliance member (**www.intel.com/design/network/ica**) based on the reference kit.

Intel® Vending Software Reference Design

Enabling vending machine manufacturers to build their own application, Intel and Silkron* jointly developed a vending software development kit (SDK) that provides a rich set of application programming interface (API) libraries running on either Linux* or Microsoft* Windows* operating systems. Vending companies have the ability to write or customize applications based on the vending SDK. By leveraging the vending SDK, vending machine manufacturers can rapidly convert their existing conventional vending machines into the intelligent ones, integrated with the advanced capabilities and functionalities as highlighted in this paper.

Running a Vending Machine With Silkron* Vendron* Software

The reference design includes an intelligent vending application, which was developed by Silkron using the Vending SDK. According to Silkron, the application supports digital signage and typical vending machine functions, as well as advanced remote management features. The digital signage display on the machine's front panel is split into two, where the upper half plays advertisements and the lower half is an interactive touchscreen used by customers to make purchases and view product information. The screen allows customers to get more detailed product information, view animations and generally have a more interactive experience. The software handles cash and cashless transaction types, such as credit cards, prepaid cards and in the future, mobile phones.

Digital Signage

Vendron* software manages all of the images and video content displayed, including ads, product images, auxiliary product information and transaction processing menus. Using the software, operators can remotely download ads and play them according to a play list or specific time slots. Optionally, the software can be integrated with a third party video analytics application so that when customers approach the vending machine, the anonymous video analytics application sends data to the Vendron software, which then can make recommendations based on their demographics or what they just purchased, for cross-selling purposes.

Vending Machine Management

The reference design connects to a central server over a secured Internet connection (e.g., Wifi, WiMAX or 3G), which also provides remote accessibility via a Silkron web-based remote manageability solution that utilizes Intel® Active Management Technology (Intel® AMT)[1]. This capability allows a remote technician to monitor many machines in different locations and check inventory levels and cash on-hand, along with other sales information. The software suggests routes and stocking volumes for replenishing machines and sends alerts when cash should be picked up. In addition, it is possible to perform remote diagnostics and system repair using the advanced features enabled by Intel AMT.

REFERENCE DESIGN HIGHLIGHTS

- **Processor:** Power-efficient Intel® Core™ processors deliver the high computing performance needed for anonymous video analytics and multi-zone signage
- **Vending SDK:** Provides the API used to access, setup and manage various vending machine components (e.g., the payment transaction module, dispenser mechanism)
- **Anonymous video analytics software:** Generates business intelligence data used to increase advertising effectiveness and product sales
- **Remote management:** Avoids expensive on-site repairs with Intel® Active Management Technology (Intel® AMT)[1]
- **Virtualization technology:** Isolates software programs to improve machine reliability

The machine is managed through an easy to use graphical user interface (GUI), shown in Figure 3. The Admin tab is used to set up database connection, email notifications, hardware maintenance interval and event logs, among other things. The Sale tab sets timers for media downloads and play lists, and exports sales records, charts and other data. The Inventory tab allows users to add/delete products and images, enter prices and storage locations in the machine, and set conditions for low stock and expiry notifications. The Reports tab provides inventory status, history and expiry information, and the Tools tab tests connections (e.g., serial, MDB and I/O) and other systems components.

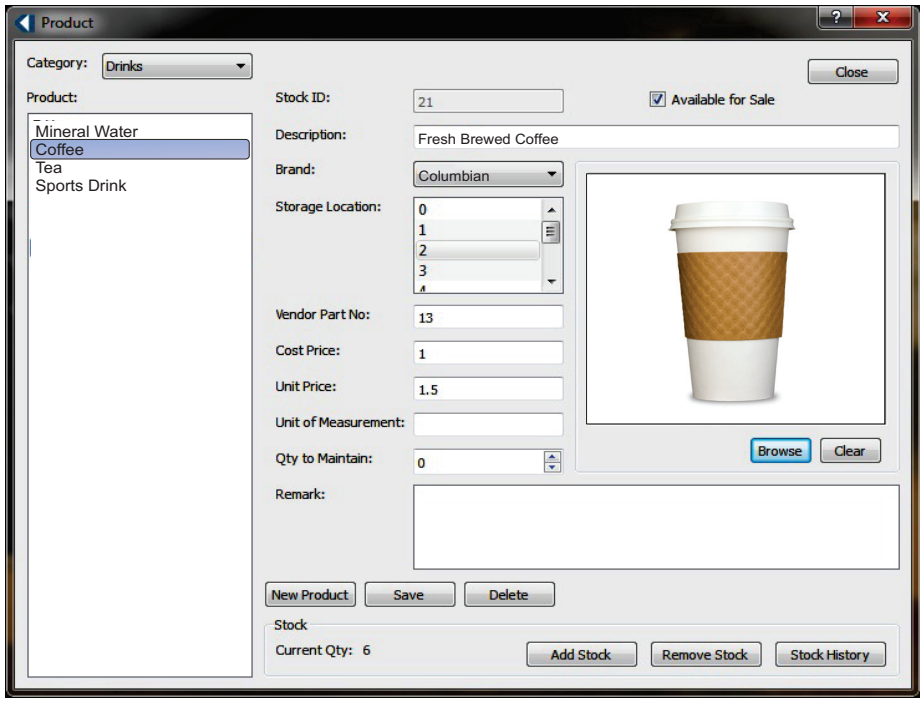

Figure 3. Silkron* Vendron* Software GUI

Developing More Intelligent Vending Machines

Manufacturers can speed up the integration of advanced vending management, digital signage and video analytics technologies using the Intel Vending Hardware Reference Design, which includes vending machine software from Silkron and anonymous video analytics software from Intel. The reference kit interfaces to the electromechanical systems of an existing machine or can be used as the basis for a new machine design. It is available through an Intel loaner program, details of which can be obtained through an Intel field sales representative or by contacting Silkron.

For more information about Silkron software products, please visit **vending.silkron.com** or email **vending@silkron.com**

For more information, please visit **www.intel.com/go/ic**

1 Intel® Active Management Technology (Intel® AMT) requires the computer system to have an Intel AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. It may also require modifications of implementation of new business processes. With regard to notebooks, Intel AMT may not be available or certain capabilities may be limited over a host OS-based VPN or when connecting wirelessly, on battery power, sleeping, hibernating or powered off. For more information, see www.intel.com/technology/platform-technology/intel-amt/.

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