

Supermarket Infrastructure - Web Technology

Today's grocery supermarket is a complex place handling thousands of customers a day, many are open 24 hours a day, and they have tens of thousands of products with a high turnover rate. For the most part the stores handle this quite well with existing technology. Because of their small operating margins, the stores must do whatever they can to reduce waste, control inventory, and reduce cost wherever they can. I will address three areas where new technology can assist them. The areas are the inventory problem, heating and cooling costs, and reduction of spoilage in freezers and walk-in coolers. The technology used will be embedded Internet and web technologies.

SUPERMARKET APPLICATIONS

The modern grocery supermarket is the ideal place to install embedded Internet technology. Supermarkets handle thousands of people per day and must provide everything they are shopping for plus a comfortable environment. At the same time, these stores run on thin margins so they must have high turnover of inventory and be able to control spoilage. Here are three applications for the use of embedded Internet technology that may be used in a grocery supermarket. (See Figure 1)

The collection of data from the customers, to price the goods, and to maintain inventory count is done by bar code scanners. It is how these scanners are connected to the mainframe computers and the suppliers are where Internet technology is used.

Keeping the environment pleasant for the customers is not a difficult task but now the control of that environment is made easier using Internet technology.

The last application described is the remote monitor-

ing and control of all the freezers, coolers, and walk-in coolers found in the store.

Scanners

Safeway stores in the UK have implemented a unique way to speed customers through the checkout line. They have installed barcode scanners on the grocery carts the customer pushes around the store. The customer scans each product they buy and a receipt is printed as they pick up their groceries. But what happens to the data the being collected?

Data such as customers purchases are usually batch transmitted to a mainframe computer where it is sorted and inventories adjusted. But that data can be identified at collection time using XML tags and then transmitted to the mainframe computer. From there is can be sent to the various suppliers and reorders can be created to keep the inventory current at proper levels. By identifying the data at the collection point and using industry standard tags for identification the data can be shared with the home office, vendors, and others in the

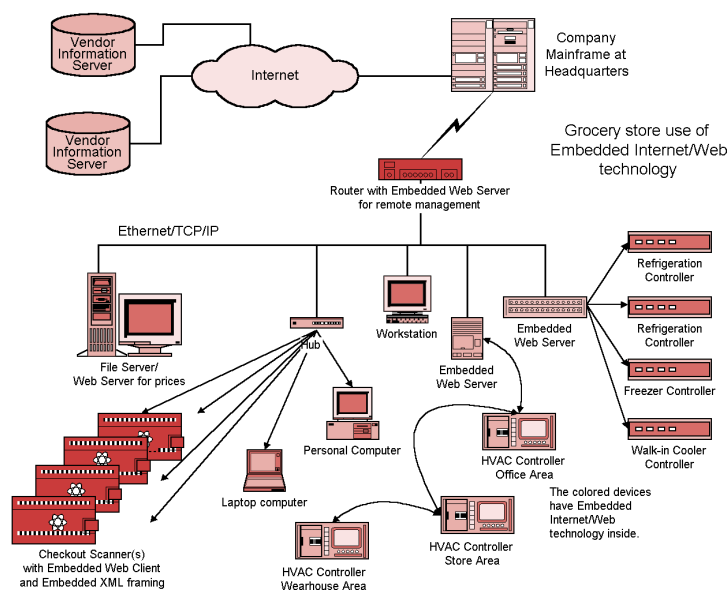


Figure 1. Supermarket network using embedded Internet/Web applications.

supply chain. Where tags have not been standardized there are products such as the Microsoft BizTalk server that will convert the data tags for use between incompatible systems.

XML is fast becoming the most efficient format for businesses to exchange data and transactions dynamically. Most company executives realize that the more they integrate applications with those of their business partners, the less time and money must be spent on converting, re-entering, or otherwise manipulating information.

The scanner, whether a portable unit such as in Safeway or the more typical cash register style, has an embedded microprocessor doing the conversion of laser scans into unique product numbers. That same microprocessor can be an embedded web client and use an embedded XML framer to format or tag the data. It can then send each record to a host web server and from there, to each supplier.

The scanners in use in stores today already support a network, thus all that is needed is another 25KB of code to support the web client and XML parser. Most existing designs can add another 25KB of code without a hardware change. Adding a web client and embedded XML parser may only cost a small amount of software development time.

HVAC

Customer comfort in a grocery supermarket is important. Depending on building construction and orientation of the building, a passing rain shower can cause a building to cool in a matter of minutes. One often needs to override the automatic thermostats to adjust for such changes. Large spaces such as supermarkets have multiple zones of control. If one had to make manual adjustments they would have to run around the store going to each thermostat control, make a decision whether to change this one or not. Then when the cause passes they would have to run around again and restore the original settings. Andover Controls, a supplier of automated heating, ventilation, and air-conditioning systems is using embedded Web technology to give users control of all these functions from their desk or wherever there is a web browser.

They provide the usual control system but that control system has an embedded web server and HTML pages to display floor plans and current environment readings. An office manager can read and set the temperature in any specific area. They can turn on and off fans, monitor whether there is motion in the area (inside a walk-in refrigerator), and control lighting - all from their desktop computer.

This same system can be collecting data from a central weather service to set heating and cooling controls and from the home office to know when the store is open or when employees are to be inside. With this information the inside and outside lighting can also be controlled.

Cooler and Freezer Control

Refrigeration and freezing is another application that has used technology for control for many years. Like HVAC most of the automation consists of mechanical thermostats located on the refrigeration unit. Remote control of these units can be accomplished using both an embedded web server and HTML pages or with an embedded web client gathering its information from a web server. Functions as dehumidifying, air exchange, and defrosting can be scheduled according to store hours, deliveries, and maintenance schedules. These can be either set using a browser or stored in a server and delivered to the web client. Information about temperature, number of accesses, and coolant levels can be sent to a server or on demand to a browser depending on the type of embedded Internet/web automation selected.

Danfoss of Denmark has developed the electronic ADAP-KOOL© refrigeration control systems technology for supermarkets as a combination of constant monitoring and controlling of the refrigeration process. This ensures food safety, product quality, and stable operation - that even makes the electric meter slow down. In the U.S., Danfoss is now working on incorporating embedded web server technology into this system.

Using embedded Internet and web technology permits users to have better control and direct control of the store environment and food storage. The data collected at the checkout area can now be easily shared with the home office, distributors, and vendors for better product turnover and bigger margins ■

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