Understanding the Components of a WMS

This section explains each of the three major components of a WMS — software, radio frequency communications, and automatic identification — and their functions and capabilities.

An automated WMS is the integration of the following three major components:

- Software
- Radio frequency (RF) communications
- Automatic identification technology.

Software

The system software has the capability to optimize the warehouse and warehouse-related operations. It functions as the brains of a WMS and typically comprises two components: a relational database and program code. The database stores information about the relationships between the products in inventory, the physical characteristics of the warehouse, and the labor that is operating within it. The information is stored in many data tables. Some of the most critical data tables are the product characteristics or item master table, the location table, and the task management table.

The item table includes every aspect of each stockkeeping unit (SKU) in the system. This includes SKU number, SKU description, weight, containerization, dimensional characteristic, and control considerations — e.g., velocity zoning, lot tracking, serial number tracking, hazardous materials, FIFO (first in first out), etc.

The location master table defines every location in the system, including location identification, numerical sequence, dimensional characteristics, and weight characteristics. Some WMS packages also include zoning characteristics in this table as well.

The task management table defines predetermined priorities for each operator. These priorities establish the queue of work for each operator within the warehouse.

The second component of WMS software, the program code, utilizes the information stored in the database. The program code is typically modular software and is arranged around the four basic functions that all warehouses perform: (1) receive product, (2) store product, (3) pick product, and (4) ship product.

The receiving module of the software provides accurate receipt information and reduces the time products spend in staging. WMS software takes this accurate receipt information and uses it to optimize the warehouse's space and labor utilization.

The storage module resolves a common problem in many warehouse operations — the lack of an effective stock location system. Knowing not only what or how much is in the warehouse but also where it is, is fundamental to the success of the operation. The storage module of WMS software provides the following capabilities:

- Positive identification and tracking of loads.
- Automatic selection of storage locations.
- Stock location system that tracks the identity and quantity of each SKU by unique storage location.
- Cycle counting.
- Real-time update of inventory, lot, and stock location.

The picking module of WMS software is designed to minimize picker travel time between

picks and maximize actual time spent picking. The typical picking needs this module addresses are:

- Pre-routing and pre-posting of customer orders.
- Selection of specific storage locations for picking based on pre-set parameters.
- Case picking and less-than-full case picking.

The shipping module is used to maximize control of orders moving through packing, checking, and loading. The software reduces labor and improves accuracy by providing the following capabilities:

- The routing of picked goods to specific staging lanes for order control and consolidation.
- Automatic bill-of-lading generation.
- Automatic updating of open customer order files throughout the day.

Of course if you have WMS software, you need a computer to run it on. Computer platforms range from multimillion dollar mainframes to popular mid-range platforms to the least expensive option, personal computers.

Radio Frequency Communications

The second major component of a superior WMS is RF communications. It can improve inventory and stock location accuracy, labor management, and responsiveness, and in doing so, significantly cut costs.

RF communication technology uses radio frequencies to transmit data collected by barcode scanning devices. The obvious advantage of this technology is the real-time access to data wherever it is collected without the use of wires. Because it works in real time, it eliminates the need to bring data to the host computer via paper or batch collection terminals. It also allows you to detect discrepancies and immediately correct them.

The components of a RF network are:

- Master radio transmitter and receiver (RF base station).
- Radio transceivers or antennas.
- Barcode scanning devices with radio transmitter and receiver functions.
- A host computer.

RF applications can be divided into two different architectures: narrow band and spread spectrum. Narrow band applications use a specific set of frequencies to send and receive data. These frequencies are licensed by the Federal Communications Commission (FCC). Spread spectrum applications operate over a range of frequencies. No FCC license is required for spread spectrum applications.

Narrow band is the older technology. It offers a wider coverage range from a single base station than spread spectrum (3,000 feet versus 1,500 feet). However, spread spectrum offers a greater throughput rate. It also is less susceptible to interference. The range for both technologies can be extended through the use of additional base stations.

An essential step in establishing a RF system is a site survey to determine the correct number of transceivers or antennas to avoid “dead zones.” At the same time, the optimal placement of the RF base station is determined.

Automatic Identification Technology

The most significant benefit from the use of automatic identification technology, such as barcodes or radio frequency identification, is the effective support of data collection and real-time RF communications. Eliminating the need for manual terminal key strokes increases productivity and accuracy. The data contained within the barcode, for example, can directly translate to parts numbers and purchase orders. Additional information also can be included in the data. Of the numerous barcodes used today, four are used extensively in warehousing. They are code 2 of 5, code 39, Universal Product Code (UPC), and code 128.

These barcodes are typically used to identify a single piece of information, such as a SKU, purchase order, or carton number. They serve as “pointers” or “license plates” that are used to locate specific records or information in the WMS database.

Newer types of high-density barcodes can be used to encode large amounts of information, such as sortation and manifest data.

An Introduction To Selecting A WMS Computer Platform

Warehouse management systems can run on various computer platforms and systems. To help you make a selection and think about the choices, this section includes criteria for platform selection, technical considerations, and types of platforms.

You should select your warehouse management system before beginning your computer platform selection process. Usually, this choice will make short work of most computer hardware decisions, as the WMS software you select will likely affect your computer platform options. The alternatives are:

• Packaged WMS from an outside vendor. Vendors of packaged WMSs continue to move toward a simpler, user-implemented and -maintained product. Typically, these vendors have certified a computer hardware platform, or at a minimum suggested hardware, for their WMS applications. It is generally wise to follow the lead of the WMS vendor in hardware selection as not doing so may lead to future support issues. If you must go against the recommendations of the WMS vendor, make sure that the system support responsibilities are fully spelled out in the agreement.

The other benefit of a packaged WMS is that vendors offer systems that operate on a number of computer platforms. If you have a platform in place that you wish to keep, you may be able to find an acceptable WMS that will operate on the platform, instead of custom-developing a WMS to meet your needs.

• Custom developed by outside vendor. Some WMS vendors will write a custom application for a specific hardware platform. This freedom, at what may be a significant cost, allows a company to leverage an already installed hardware platform.

• Developed internally. Although systems developed in-house are a rare exception these days, a few companies still go this route. In this case, the IT department will be the sole source of expertise and hardware choice will usually be limited to the hardware platform already supported in-house.

Evaluating Hardware Platforms

There are many factors which need to be considered in the system configuration. This can be difficult as there may be a number of choices, which in the end can seem like a bewildering array of features and options. If not evaluated correctly, your choices can significantly add to the cost of the system, without any improvement in performance or reliability.

For each hardware platform under consideration, you should carefully review the following items:

• Stability. How reliable will the proposed configuration be? The operating system, development environment, and hardware should be reviewed for its track record in the field. If one of these components has not been around long enough to have an established track record, you may want to avoid it.

• Availability/fault tolerance. How good are the normal operational parameters of the system configuration? If the system requires downtime, that needs to be fully understood and documented. The platform should offer fault tolerance through system redundancy. Hardware redundancy can be attained at the component level, the system level, or at the operation level. Depending on how critical the WMS application is and

the scale of the WMS operation, redundancy is usually designed into the component and system level, at the very least. Deciding which combination is correct should be done in conjunction with the WMS vendor and your IT department. Underbuying or overbuying will either lead to the system being unavailable (when it could have been prevented) or spending more than is needed.

• Scalability. How well will the platform handle the current number of users and tasks? How much effort and cost is associated with revising the platform to handle more users or functions? Can a single system be used at multiple facilities? Can you use the system to run other software that you may need in the future?

• Relative cost. What is the cost of the platform compared to other platforms?

• Relative cost of support. What is the ongoing cost of supporting the platform on a long-term basis for WMS uses? How does this compare with the support costs of other platforms?

• Development environment. Can the platform run multiple copies of the system for the purposes of testing, training, etc.?

• Number of vendors. How many WMS vendors market products for the platform?

You should carefully evaluate these features for each proposed hardware platform. Apply a weighting system that reflects the concerns and conditions that are applicable to your specific situation. This should help narrow your field to the point where an informed decision can be made.

Types Of Platforms

There are several computer platforms available for running WMS software. Here are some of the more common options:

•Mainframe systems. Mainframes generally run a wide range of critical applications in a time-sharing fashion, and as such are rarely dedicated to WMS requirements. The advantages of mainframe systems are that they are stable, have a high fault tolerance and good redundant systems capabilities, and support multiple users across multiple facilities. The downside is that they are expensive to purchase and support, and have in the past offered a limited development environment.

• Proprietary mid-range systems. As the name implies, these platforms are typically less costly than mainframes but more expensive than personal computers. Their advantages are that they can run multiple environments, have a high fault tolerance, integrate exceptionally well with a variety of external hardware, and scale well until they reach many hundreds of users.

• Mid-range UNIX systems. This is one of the most popular market segments. These platforms run some variant of the UNIX operating system. Note that in many cases, these systems may represent identical physical hardware to the proprietary mid-range systems.

• PC systems/UNIX operating systems. As the PC continues to grow in power and capability, price and performance improves with every generation. There is a broad range of offerings here from IBM, HP, Sun, and Dell. These systems can run UNIX-based operating systems, as well as the UNIX-like operating system Linux. Support, features, and stability vary considerably from vendor to vendor.

• Multiplatform distributed solutions. This covers a wide variety of newer options. It encompasses two- and three-tier client/server models, thick and thin clients, and a number of other recent technologies. The common thread within the WMS marketplace is the use of one or more servers on the back end and graphical user interface clients (generally PC-based) performing user-interface functions.

Network configuration considerations

For any system configuration, an important aspect is the quality and availability of the network that the system is going to run on. Network connectivity (local, remote, and physical interfaces), speed (local and remote), redundancy (failover), protection (firewalling and filtering), and support (diagnostic aids, training, and manpower) need to be formally considered as part of the overall system configuration so that any weaknesses can be addressed.

