Automatic Data Capture in The IT Infrastructure

Introduction

Information technology management centers on optimizing resources while keeping technology affordable and available. Making this more and more complicated is achieving balance between accessibility and security. Not withstanding concerns for security, many organizations also struggle reacting to and locating problems related to servers and other critical infrastructure components simply because of the difficulty locating specific devices in a timely fashion.

With advances in automatic data capture (ADC) it is now both affordable and practical to utilize ADC technologies such as radio frequency identification (RFID) within the IT environment.

The use of low-cost passive RFID tags and network-enabled interrogators enable the IT professional to compile real-time information for tagged devices such as servers and laptops.

Thanks to stringent standards and conventions RFID has evolved into a reliable, non-proprietary uniform technology that specifies strict protocol guidelines that RFID tag and equipment manufacturers alike conform with.

EPCglobal is leading the development of industry-driven standards for the Electronic Product Code™ (EPC) to support the use of Radio Frequency Identification (RFID) in today's fast-moving, information rich, trading networks. EPCglobal is a subscriber-driven organization comprised of industry leaders and organizations focused on creating global standards. The most notable is the current RFID standard known as EPC Gen 2.

The work of the members of EPCglobal has greatly reduced the risks for the IT organization by enabling the organization to choose vendor-neutral products while alleviating compatibility issues.

Technology

Barcode and RFID technologies can be used in tandem, combined into single tags, called Smart Tags. The data stored by either technology can be read by the same handheld or fixed location devices and consolidated. Smart Tags come in many forms. Their general characteristics include information being presented in human-readable form, in barcode format and in stored logically data embedded in the RFID chip. Smart Tags enable the individual to visually read asset tags, scan them using barcode readers and/or automatically detect their location using embedded RFID chips.

Standards-based RFID technologies employ several standards; HF and UHF

High frequency (HF) - functions in the 13.5 MHz frequency range. HF is designed for very short-range detection, normally measured in inches. HF is not recommended for PBC because of limitations to read distances.

Ultra-high frequency (UHF) - functions in the 900 MHz range. UHF is designed for longer range detection, which varies depending on the type of asset tags utilized such as passive or active tags, and the types of antennas (often referred to as read points) that are deployed.

RFID-enabled asset tags are comprised of an electronic chip that stores information and is linked to an embedded antenna. RFID tags employ two architectures – passive tags and active tags.

Passive tags have no internal power source and are substantially less expensive than active tags. In order to transmit information contained in an embedded chip, passive tags must be within range of a stationary or portable RFID detection device. Passive tags tap into the signal being emitted from the detection device as their source of power. The tags can come in many physical formats. Typically, they are comprised of clear vinyl peel-and-stick material inlayed with an embedded chip and antenna, are combined with an overlay such as a bar coded label, or are encased in plastic or ceramic in order to protect them from harsh treatment or environments. Passive tag ranges are impacted by several factors such as the size and type of embedded antenna - the larger the tag the larger the embedded antenna and detection range.

Active tags require an internal battery power source, which enables them to transmit independently of their distance from detection devices. While this greatly improves the functional flexibility and ADC distance, these tags still have transmission distance limitations. In addition, battery life and, therefore, service maintenance become major factors. Because of increased complexity, active

tags are significantly more expensive than passive tags - costing several times more and become a single point of failure if battery power is lost.

Regardless of the type of RFID technology that is deployed, its use will substantially improve the ability to automatically gather and accumulate accurate information. Because detection units collect tag information on a continual basis, the potential exists for the rapid accumulation of massive amounts of information - some useful and some not. The sheer magnitude of the information will overload network and data management systems. Establishing automatic software filters to discard unnecessary information makes the data accumulation and its application completely manageable.

Two concepts are central to the usefulness of automatic data capture, and information management and response. These are:

-Sorting, organizing and converting information into actionable knowledge

-Enabling a user to receive automatic notifications through a concept known as event detection - which is based upon actionable knowledge - and setting up automatic responses to various events.

Following is an example of how RFID-based ADC, event detection and event notification technology can be used with backend data management software to accomplish full asset management. Consider the case where all PBC laptop computers are tagged with RFID labels and all building entrances and exits (egress points) are equipped with RFID detection devices, called readers. As each laptop passes an egress point, the reader would capture the information stored in the asset's RFID chip. The reader would then package the information together with a date and time stamp, and the reader's unique ID. The software would translate the ID to a specific egress location and then send the information across an IP network to a database server. Software on the server would interpret the data packet, convert and store the information, analyze and evaluate it for application to pre-defined business rules, such as:

- movement is non-essential → record to audit trail and ignore
- movement requires location update → adjust and record
- movement is restricted for this specific sensitive/classified asset and a violation has occurred → send automated alert
- movement was expected but not detected → record error and send alert
- other user defined actions to be taken

Information management and event detection have greater implications than just working in collaboration with ADC technology. For example, where asset schedules such as routine maintenance, cleaning schedules, periodic calibration, contract expirations and lease maturities are pending, these can be automatically

monitored by the software. The software is governed by a set of business rules that are used to sort, organize and evaluate stored information. This software uses the information to determine actionable knowledge. Using defined rules for cross-referencing and comparison to thresholds or conditions, it automatically reacts and is able to construct and send e-mail notifications, construct and distribute reports and documents and even interface with building security and alarm systems.

These concepts, when combined with ADC, are fundamental to proactive asset tracking and management.

Automatic Data Capture Building Blocks

I. Standards

ADC Electronic Product Code (EPC) standards as devised by the universally acknowledged non-profit standards board EPCGlobal include:

- Bar coding protocols 128 and 39
- Ultra high frequency (UHF), passive Gen 2 RFID

II. Tags

Lockwood frequency deploys a variety of passive EPC-compliant Gen 2 UHF types of Smart Tags depending upon the nature of the IT asset to be tagged and the surrounding environment. Generally speaking these represent peel and stick tags that depict information in human-readable form using a pre-defined asset numbering system, a unique barcode, and embedded RFID chip. IT assets require tags that feature an insulated backing in order to isolate the embedded RFID chip from close proximity to metal surfaces, as metal has the tendency to detune the chip thus impacting its proper functioning. Backing material can be as simple as foam for stationary items to a more robust substrate for portable devices such as laptop computers.

III. Stationary Tag Readers

Fixed location RFID readers can be deployed at key facility entrances and exits. A configuration consisting of a fixed reader and several antennae is commonly referred to as a portal. Using a building block approach, the ADC infrastructure can be expanded, altered, adjusted or decreased upon demand once the core software and infrastructure is in place. This is accomplished by simply adding, moving or removing readers and/or antennas as needed or, by adding portals

whereby a control point is deemed necessary or useful. A standard stationary reader is able to coordinate up to four read points and attaches directly to the

existing internal LAN/WAN. The reader; functions just like any other network node, requires standard house power, and is easily configured and moved. Readers can be surface-mounted under false ceilings for concealment. Portals (readers and antennae) can be configured to include high-power antennas in order to accommodate required ranges for all egress points. Portal units can be moved and/or acquired and quickly deployed just as any other new IP device on the network. Lockwood implements readers that are; multi-protocol devices, compatible with the Gen 2 protocol, are based on open architecture standards and are compatible with MS Windows CE.

IV. Portable Tag Readers

Lockwood deploys portable data collection detection devices that feature built in digital imaging, barcode scanning, RFID read/write capabilities, and an optional low cost global positioning (GPS) bolt-on. Theses units combine data capture and 802.11 wireless technologies for ease of data transmission to the user's own network for reconciliation with the users' databases. The devices are compatible with Windows Mobility 2003 and features a full 1/4 VGA screen and alphanumeric keypad features rugged impact-resistant design and IP64-rated seal protection and can withstand multiple 6 ft drops to concrete. Lockwood recommends this unit for the purposes of conducting cycle counts, annual physical inventories and reconciliations, and for processing transactions on a mobile basis anywhere

Value Proposition

Common objectives to be derived from implementing ADC within the traditional IT infrastructure are increased *security* and real-time knowledge of *current location* and awareness of *movement*. Implementing event management maximizes the usefulness of both in any number of means. Here are few sample scenarios to consider:

I. Security

Limit restricted assets from passing selected portals, whereby violations would automatically be detected (without human intervention) and in turn trigger; alerts, cameras and building security systems and so on…

Link authorized personnel to specific restricted assets while enabling movement within selected portal spheres. Pairing of people to specific assets would be monitored and the activity would automatically be detected causing the system to record the activity as well as react to unauthorized pairings or movement.

Define zones (series of portals) enabling movement within selected areas. In effect the system provides the ability to "fence" assets into captivity areas, all-the-while restricting movement into or out others such as a room or a building.

II. Location

Location detection can be achieved both through fixed portals as well through the use of handheld portable detectors. Benefit examples pertaining to each are depicted here using an example of spare IT assets, such as laptops, being stored in a supply depot (such as a closet or room). The egress to the depot features a portal.

The portal detects movement of laptop leaving the depot the system automatically 1) updates the laptop's record in a master database to reflect the activity (change location update asset disposition flag from idle to active, etc.) and 2) trigger the Event management software to evaluate the action for authorization. If the transaction was not authorized the Event Manager activates sending automated alerts and follow any other pre-defined action path(s). If the action was authorized the event determines if this represents a *temporary loan* or a *permanent consumption* of the laptop

- ✓ **Temporary loan path** - the action causes an update the laptop's

record and then starts a loan timer monitoring for expected return

- If the return occurs as planned the portal detects it and causes an update of the laptop's record location, resets the laptop's disposition from active to Idle and then closes out the loan transaction

- If the return does not occur as planned (i.e. the portal does not detect the laptop re-entering the depot) the Event Manager activates and follows a pre-planned escalation route which often includes sending automatic alerts to the appropriate personnel for further action

✓ **Permanent loan path** - the action causes an update the laptop's record and closes out the transaction without human intervention

An IT professional has been dispatched to account for, and reconcile, all depot assets. Using a handheld computer featuring embedded bar code scanner and RFID detection unit the IT professional enters the depot room number into the unit and then proceeds through the room while activating the unit. The unit will automatically detect all RFID enabled tags within 10 foot radius without the benefit of line of site while spare assets that have bar code only tags (no RFID) are scanned manually using the bar code scanner. Once the physical count is complete, the handheld unit reconciles the results to master database (this can be batch uploaded or wireless) highlighting variances on the screen of the handheld for immediate resolution by the IT professional.

An IT professional needs a loaner laptop for a client, yet finds all depot laptops are currently in use (active). The IT professional triggers an event which will monitor for the return of a loaned laptop. The event will in turn auto-notify him/her accordingly. As the client returns the loaned laptop to the depot, the portal detects the returning laptop. The portal triggers an update to master database resetting the laptop's location and changing its disposition flag from active to idle. The portal also triggers the Event manager to analyze the action which will result in it creating and sending a notification (text message, email, page, etc.) to be sent to the waiting IT professional indicating that a laptop is now available for use.

An IT professional has been dispatched to locate a specific IT asset. Using a handheld computer, featuring embedded RFID detection capability, the IT Professional enters the unique identify of the IT asset into the handheld unit. Then as he/she proceeds through the depot room the unit will detect all RFID tags within 10 feet radius (without line of site) searching for a match.

When the IT professional is in range of a match the unit begins to emit a rapid audile signal indicating the search is over and the IT asset has been located.

These are bit a few selected examples of the benefits to be derived and are not meant to be inclusive. References to the Event Manager are specific to software available from Lockwood Technology Corporation.

The use of UHF passive RFID technology was sited in this document for the purposes of cost controls, yet the benefit examples can be realized with both passive as well as active technologies.

Power requirements and radio frequency ranges will vary dependent upon local regulations.