SupplyChainDigest™
The Supply Chain Technologist – December 9, 2004

Can an RFID System Play Well with the Rest of Your Network?

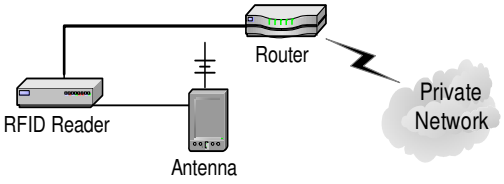
By Mark Fralick
SupplyChainDigest Contributing Editor

That is certainly the question in the mind of many IT departments. Simply stated, IT departments have two major RFID-related concerns. First, they are concerned about the flood of data that might take place when they plug an RFID solution into their network. The potential for generating overwhelming, unrelenting streams of data flying around the network as readers pick up tags should be cause for concern. The fact that you really can't, in some cases, effectively turn the readers off, just adds to the data challenge.

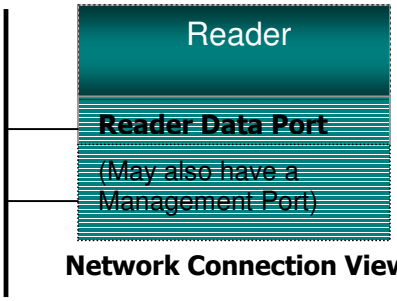
The second major RFID data issue concerns what to do with the potentially huge amount of enterprise-level EPC data. This column addresses the first issue, around network scalability. In a few weeks I'll be following up with some columns on Enterprise-level RFID Framework issues.

Understand Potential Bottlenecks

When preparing for an RFID deployment, it is important to have a sense of where the potential data bottlenecks will be. The aim of the series of columns is to give you a very pragmatic view of the issues and prepare you to make sound deployment decisions. It should also arm you with questions to pose to your IT network staff and your RFID vendor(s). Let's start with the readers and take a look at how a typical RFID reader interacts with the network.



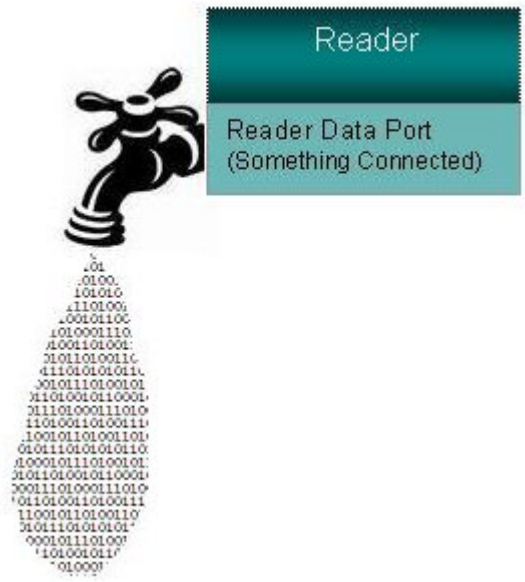
Topographic View



Network Connection View

A reader essentially works by creating an RF fields and sampling them for a prescribed time period. During this time the reader is always attempting to collect data (i.e. it is continuously attempting to energize tags and read them). However, it is important to realize that this, in and of itself, does not pose a problem to your network. If no one is listening for tags by connecting to the reader data port, there is no impact on the network. In Essence, without connecting to the data port, the data traffic stays localized between the antenna array and the reader. Think of the reader as a pipe and the reader's port as a spigot that is off until someone places a bucket under it.

Once you turn on the spigot, however, watch out! You must understand how much data is coming at you. Any tag being energized by the field has the potential of being communicated via the reader. To make matters worse, while individual tags are in the field, they can be read many, many times. It is conceivable that the reader reports a tag hundreds or even thousands of times while the field is being sampled. This is one of the biggest reasons for RFID Middleware to exist: to make sense out of the data stream coming out of the spigot and attempt to manage it. These functions are typically referred to as smoothing and filtering. Yes, RFID Middleware has a place and will continue to have a place for the foreseeable future. However, Middleware doesn't itself solve the scalability problem. The network hop between the reader and the node running the Middleware will potentially still have to deal with a great deal of raw RFID data.



Additionally, at some point within the process the RFID data will need to be stored. You'd like to do this when the data is as clean and filtered as possible. In order for you to do this, you may need to take into consideration contextual information (input from photoeyes for example) that takes place outside of the local RFID world. This may lead to a situation where you need data persisted (stored temporarily or perhaps permanently) multiple times and/or sent to multiple systems.

RFID System "Domains"

At this point, it may be helpful to examine an RFID domain model. Below is a slightly altered version of IBM's well-known version. I've found this model to be one of the most helpful in understanding the RFID scalability issue. The specific domains in this model that I am dealing with in this column are the Antenna/Reader and Edge domains. As mentioned above, once the spigot is turned on, there is the potential for generating huge amounts of data. And this truly is just data - not information. This is almost entirely raw, unprocessed, and unfiltered tag data coming at you whether you want it or not. With all of this raw data flowing from the Reader domain to the Edge it is easy to see that a potentially huge scalability issue exists between these two domains. This, in my opinion, will be one of the most significant drivers for joining the reader and edge domains. In fact, now that there is a viable standard for the edge to communicate (called ALE, expected to be release through EPC Global in early 2005) you will start to see announcements for 'embedded' edge-ware in the next several months. This will be a boon to the wireless device manufacturers who have been struggling with many of these same scalability concerns.

Tag Object Domain	Antenna and Reader Domain	Edge Domain	Execution Domain	Business Process Integration Domain	Enterprise and Collab-oration Domain
The **Tagged Object Domain** contains the tagged products in a supply chain; or any other assets or locations will be tracked via tags.	The **Antenna and Reader Domain** is the interface between the world of Radio Frequency and the world of the corporate network.	The **Edge Domain** is responsible for filtering and the aggregation of the volumes and volumes of data from the readers.	The **Execution Domain** can be thought of as the application domain and is the intermediary between the Edge and the rest of the Enterprise.	The **Business Process Domain** provides the connective tissue for the RFID information to fit into the context of business processes.	The **Enterprise and Collab-oration Domain** provides the abilities for the enterprise to operate within the Supply Chain community.
	The **System Management Domain** exists horizontally across the other domains and provides remote management, monitoring, software/firmware upgrades, etc for hardware (readers, antennas, concentrators, servers, etc.)				

RFID Domain Model Data Volumes

Raw, Unpersisted Data	Lots	Some	None	
Clean, Persisted Data	None	Some	More	Lots

With RFID, "Context" is Critical

With a sense for the physical aspects of RFID readers and middleware, let's talk about context. Consider now a network of RFID readers, all picking up tags whenever enter the field. What tags are meaningful? What tags have 'context' within a given application?
Consider the contrast to bar code scanners. Scanners have an attribute that makes them extremely easy to deal with: they only report one thing at a time (the barcode they are currently aimed at). They also are typically connected to a single application (WMS, conveyor control, etc.). This gives the application accepting the scanner data a clear context in which to operate. Either the application was suppose to get this particular data or not.

In the RFID world, when you turn on a reader, you may read the tag you are after along with 10 other tags that may have been in the general area at the time the field was sampled. Or, a given read may be important to one application, but not others. How do we make sense of this? With context! We create a physical context (like photo-eyes) to tell us when it makes sense to sample the field, or by using logical context (I know this pallet should be in this location – I can just look for the pallet tag), or use a combination. The type of context used and who performs the check will impact network utilization and scalability. It is very important that context is used properly and at the correct level.

Next time, we'll talk more about context and how to use the domain model to plan a scalable RFID infrastructure.

Mark Fralick is president of ROI Solutions and a SuppyChainDigest Contributing Editor. Having operational, implementation and software development experience, along with detailed understanding the workings of software and services companies, puts ROI Solutions in a unique position to stand strongly on the customer's side in the battle for ROI in system selection and implementation. Learn more at www.GetUsROI.com, or email Mark Fralick at Mark.Fralick@GetUsROI.com.

About SupplyChainDigest

SupplyChainDigest™ is the industry's premier interactive knowledge source, providing timely, relevant, in-context information. Reaching tens of thousands of supply chain and logistics decision-makers each week, our flagship publications - *SupplyChainDigest* and *SupplyChainDigest – Logistics Edition*, and web site (www.scdigest.com) deliver news, opinions and information to help end users improve supply chain processes and find technology solutions.

For more information, contact SupplyChainDigest at:

937-885-3253
www.scdigest.com
email: info@scdigest.com