RFID Series

EXECUTIVE SUMMARY

Active RFID

Market, Solutions and Major Players

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ChainLink Research, Inc. is a Supply Chain research organization dedicated to helping executives improve business performance and competitiveness through an understanding of real-world implications, obstacles and results for supply-chain practices, processes, and technologies. The ChainLink Inter-Enterprise Model is the basis for our research. It is a unique, real-world framework that describes the multi-dimensional aspects of the links between supply chain partners. For more information, contact:

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Executive Summary

Of all the RFID solutions in the marketplace today, Active RFID comprises one of the larger RFID market sectors. Active RFID solutions are used in government, business and by consumers.

Active RFID has the reputation of being expensive. This is because the non-users of Active RFID look at the cost of an individual device, rather than the cost-per-use and long-term value of re-usable Active RFID devices. Unlike many Passive RFID device implementations, Active RFID projects can enable a business to realize significant process improvements and long-term business value. In addition, the reality is that many Active devices are fairly inexpensive and overall, as a new generation of devices enters the market, the prices are *significantly* cheaper.

Everyday solutions—from car clickers, which are Real-Time Locating Systems, to toll collection Fast Lanes, which is a choke point system—represent the larger portion of the Active RFID market. Active RFID solutions are also widely used for tracking during transport in global transportation systems such as ocean containers, highway trucking and rail systems.

Since the explosion of RFID communications in the early 2000s, Active RFID has gotten a boost from its sister technology, Passive RFID. The business community learned about Passive RFID while implementing track and trace technology for shipments to the government and large retailers. As business leaders became aware of Passive RFID's limitations, they became more interested in the value of a more robust, functional and global solution.

Active RFID has several complimentary technologies, such as GPS, Cellular, Wi-Fi and sensors. When combined with software applications and a communications backbone, these technologies represent an exploding segment of the technology industry, in which long-term functionality and value are just beginning to be discovered.

In this report, we will delve into Active RFID and explore a few of the key concepts you need to grasp in order to implement this exciting technology:

- ***Prime Benefits:*** In this section we will explore what is unique about Active RFID and what are its prime benefits.

- ***How it works:*** RFID has several solution models—Zonal or Choke Point and Real Time Locating Systems. This section will describe these capabilities, as well as explain how Active RFID fits in with other wireless technologies.

- ***Middleware and the Software Backbone:*** There are several software elements that make Active RFID work on an enterprise or global basis, and these elements will be explored.

- ***Active RFID Market:*** What are the market segments? How well is the market doing?

- ***Major Player Profiles:*** That are the players and what's different about them? How do they charge for their solutions?

There is a tremendous amount of information to absorb about RFID, and Active RFID is a category worthy of volumes. This report will give you a great head start on the basics.

HOW DID WE CREATE THIS REPORT?

ChainLink has spent over five years working with Active RFID, participating as the market has grown, walking the ports, on cargo ships, in a variety of installations, working with end-user organizations that have built extremely large implementations. So we have first-hand knowledge of the technology and its value. In addition, we have taught numerous hands-on classes about working with the technology. We have spent significant time with several of the key vendors to understand how their solutions really work, what is special about each one, and what's in their labs for the future. In working with both end-user and technology communities, we have developed deep expertise in this sector (not an ivory tower analyst's view, but real hands-on knowledge) as well as a strategic view of the future direction of the solutions and markets.

Introduction

The growth of the RFID market has been exciting. The number of companies that have entered this market very recently is exploding, and investors are putting big money into RFID technology. Over half of those dollars have been spent in the Active RFID market. With over $1B in various types of investment dollars, RFID is looking more and more interesting.

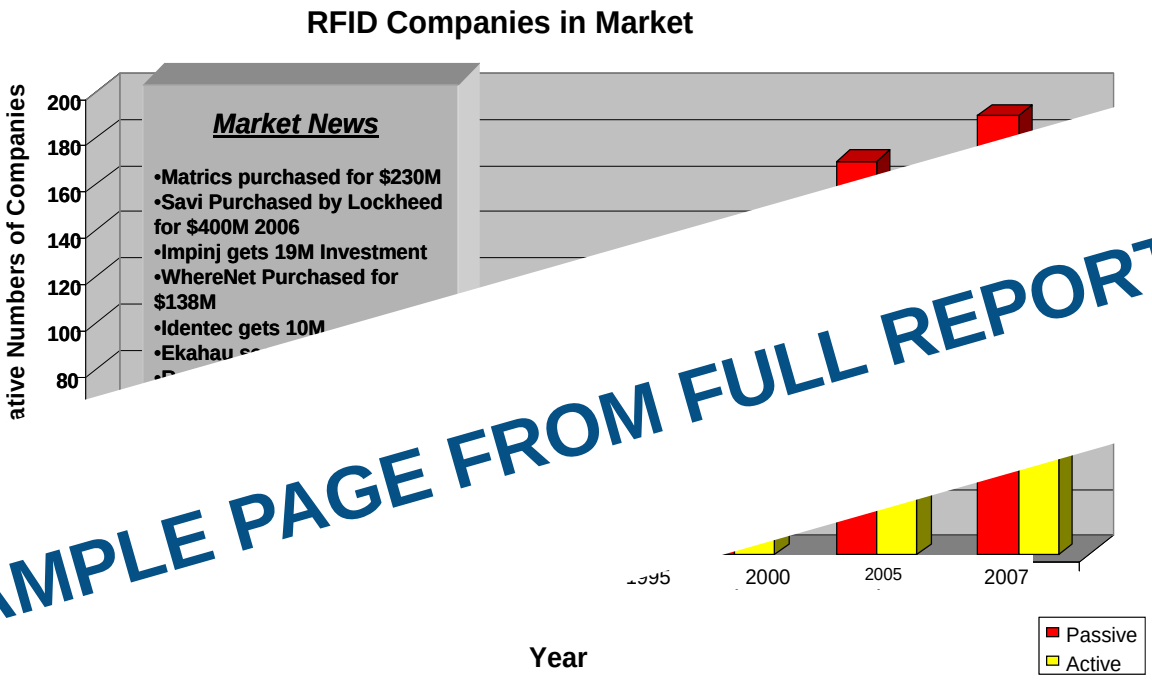

Figure 1—Companies in Passive and Active RFID

Although we are very positive on the RFID market, we caution both investors and entrepreneurs about the expected valuations and availably of cash. The RFID market is not the Internet market. Many of the players that are in the device and wireless market have been there for many years, and are already public companies. RFID represents a very small percent of what they do. Examples are Hitachi, Motorola, Intermec, ST Microelectronics, Avery Dennison and TI. We doubt that these companies will see an increase in valuation because of RFID any time soon. (This does not mean RFID is not important to them.)

However, emerging markets are filled with innovations—the kind of innovations that can be game changers. These innovations are brought out by young entrepreneurs, and if those enterprises can execute well, they will be the successful high-valuation companies of tomorrow. End-users should welcome these companies into their evaluation processes, since in many cases, they represent the real problem-solvers. We do note, though, that whole clusters of companies in various markets are truly “me too” companies, and will be unlikely to introduce really new or novel ideas. And they will learn on your dollar.

CAPABILITY/FREQUENCY CHOICES AND HOW THEY ARE USED

When selecting devices, the most critical choices are frequency and capability. Energy conservation for achieving long battery life is an obsession with providers.

Frequency	Range	How Used	Discussion	Example Players
124 kHz	2-10 ft	Signpost/Exciter/ Activator	Additional hardware to 'wake up' the tag as it approaches choke points; Signpost Slow data rate and signal drop-off	AeroScout Identec WhereNet Hi-G-Tek
315 MHz		Locating		
				Hi-G-Tek RF Code Mark IV
	Could be longer range	Access Control Asset Tracing	OK for short range active; Good for choke points	Identec TansCore
2.4 GHz	100 ft 300 RFID	Indoor Active Outdoor Active Locating systems	Leverages 802.11 indoors Too much traffic on this frequency Ranges from 100-300 ft	WhereNet AeroScout TransCore
5.9 GHz	30 ft	Toll choke point	Future deployment	TransCore

Table 1—Frequency Options in the Active Market

RFID uses a method called 'signposts' to activate or wake up the tag, so that it can be ready to transmit or receive communications, which saves energy. Most providers have some version of a signpost in their product line. However, some solutions require the tag to send signals regularly. This is called using a beacon. Beaconing can be set based on various time intervals, but beaconing shortens the tag's battery life. Note: Active tags are always

Total RFID Market

	2005	2006	2007	2008	2009	2010	2011
Active HW Outdoor	$620 M	$770 M	$920 M	$1,120 M	$1,360 M	$1,590 M	$1,720 M
Active HW Indoor	$200 M	$300 M	$440 M	$620 M	$910 M	$1,240 M	$1,420 M
Active HW Total	$820 M	$1,070 M	$1,360 M	$1,740 M	$2,270 M	$2,830 M	$3,140 M
Passive HW Total	$630 M	$1,080 M	$1,880 M	$2,230 M	$2,640 M	$3,050 M	$3,760 M
RFID Hardware Total Market	**$1,450 M**	**$2,150 M**	**$3,240 M**	**$3,970 M**	**$4,910 M**	**$5,880 M**	**$6,900 M**
Integrators/Service	$50 M	$100 M	$180 M	$324 M	$583 M	$875 M	$1,312 M
Middleware	$40 M	$80 M	$100 M	$120 M	$160 M	$180 M	$200 M
Security	$4 M	$7 M	$12 M	$50 M	$90 M	$130 M	$170 M
Software and Services	**$94 M**	**$187 M**	**$292 M**	**$494 M**	**$833 M**	**$1,185 M**	**$1,682 M**
Total RFID Market (Rounded)	**$1,540 M**	**$2,340 M**	**$3,530 M**	**$4,460 M**	**$5,740 M**	**$7,060 M**	**$8,580 M**

Source: ChainLink Research

Table 3—Total RFID Market

Active and Passive RFID device pricing is alre
the population of end-users does n
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quite
RFID becomes
others these markets are
functionality (sensors), and improve-
will continue to make this a viable market. Having
this about what market they should participate in, since RFID,
large technology sector. However, RFID coupled with other types of busi-
markets can be quite large over time.

For example, over time the self-service market that is learning now about both Active and Passive RFID will find even more uses for RFID. Many of these solutions may be embedded in other types of devices.

There are a few dimensions beyond industry that help to size and segment the market:

- **Overall Market Consumer vs. Business vs. Government**—car clicker and toll collection vs. the rest
- **Indoor vs. Outdoor**—with the major dollars in Outdoor
- **RTLS**—with both Indoor and Outdoor

Choke point control: As items/devices pass through reader fields, Active RFID allows bi-directional communication to control activities (such as restricting access) on the ground.

Closed-loop systems: RFID tracking systems set up within a process where the item and tag return to the source. It may not need technology based on open standards.

EPC: Electronic Product Code

EPCglobal: A non-profit organization set up the Uniform Code Council and EAN International, the two organizations that maintain barcode standards, to comm
ize EPC technology, now GS1. EPCglobal is made up of chapters
tries and regions. It is commercializing the technology
Auto-ID Center.

EPCglobal Netwo
compa

, on intermodal shipping containers
contents throughout the entire shipping

GEO Satellite Systems: A geosynchronous or geostationary satellite that stays in the same overhead position relative to a location on the surface of the earth, at approximately 22,000 miles over the earth. Used for the transmission of high-speed data, television signals and other wideband applications.

Global Positioning System (GPS): A world-wide radio-navigation system that was developed by the U.S. Department of Defense. In addition to military purposes, it is widely used by marine, terrestrial navigation and location-based systems.

GPS: See Global Positioning System (above).

Intrinsically Safe: The danger of accidental actuation of electro-explosive devices or otherwise electrically activated ordinance because of RF electromagnetic fields. This unintended actuation could have safety (premature firing) or reliability (duding) consequences. Also called HERO. (Hazards of Electromagnetic Radiation to Ordnance).

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