Innovating with Embedded RFID

Mercury® xPRESS Platform Simplifies and Accelerates Embedded RFID Product Development

In a sign of RFID’s growing maturity, embedded RFID technology -- where RFID functionality is built-in to original product design specs -- is becoming widely adopted by developers and original equipment manufacturers. Industry analysts indicate that RFID is on its way to becoming a $8 billion industry within five years and embedded RFID is seen as contributing strong and sustainable growth across virtually all industry verticals.

Clearly, RFID is no longer considered an add-on technology for after-market applications as it is increasingly being identified as a required feature for handheld devices, mobile and stationary printers, parking and tolling solutions, security and access control applications, and a wide variety of consumer, industrial and business process automation solutions.

The value of RFID may be plain to see, but it’s been a lack of robust development tools that make it easy and cost effective to integrate that’s kept some from exploiting its full potential.

The Mercury® xPRESS Platform addresses these challenges by delivering the first extensible platform for developing low cost, high performance, application specific RFID solutions.

Despite continued adoption and increasing use cases that validate RFID’s benefits, challenges remain when it comes to the paths taken to incorporate the technology into a product or solution.

Consider, for example, that OEMs developing products with an RF chip and reference design can find the development process to be a lengthy, complex and expensive initiative. The internal engineering or outside contractor resources required to build an RFID reader from scratch can be extremely costly and inflate the overall cost of an end customer deployment. This is especially true when you consider the costly impact development delays can have on an overall solution implementation.
Design and cost challenges are also encountered with “low-end” modules. Often times, these products deliver limited performance, lack robust integration tools, do not meet the requirements for global certification and are not optimized for high volume manufacturing. While these products may initially appear to be a good choice for cost sensitive projects, they tend to not perform well in real-world applications.

While using a finished reader may seem to be a logical option to reduce overall development costs, most general-purpose readers are quite expensive (costing in the thousands of dollars) yet are not optimized for many of the solutions into which they are deployed. End users across markets often spend much more than needed on major deployments by paying the additional cost for general-purpose readers that include unneeded features for the intended application.

**The solution: The Mercury® xPRESS Platform**

With these challenges in mind, ThingMagic, a worldwide leader in UHF RFID modules, has introduced the Mercury® xPRESS Platform, a *first of its kind* flexible and extensible development platform designed to make it easier for OEMs and solution developers to bring application specific RFID readers and RFID-enabled solutions to market.

The Mercury xPRESS Platform combines a microcontroller-based motherboard with the industry-leading ThingMagic Mercury6e Series of UHF RFID modules and an integrated software development environment built on the ThingMagic Mercury C API.
Delivered as an extensible development environment with reference design files, this platform reduces the need for developers to have significant RFID domain expertise, which can facilitate the rapid integration of RFID with a variety of products and complementary wireless communication technologies.

With this platform, developers can bring up a fully functional RFID reader in minutes and testing and proof of concept using sample applications from the software library can start almost immediately. Reference design files allow developers to select the elements needed for their design and advance rapidly to application specific product design and development.

Representing a significant cost savings opportunity and time-to-market advantage, developers can now select and optimize the features and RFID performance needed most for their applications, no longer paying for unneeded features of general purpose readers or settling for modules that offer limited performance or lack robust integration tools.

Further, Mercury xPRESS is an extensible platform that developers can use for ongoing and future product development. To support future innovation, the integrated development tools, device drivers and application software of the Mercury xPRESS Platform will be enhanced with regular future updates that expand capabilities and enable development of a wider range of end products.

Mercury xPRESS Components:

| Microcontroller based motherboard with integrated RFID Module | Micro & Micro-LTE modules with carrier board | Universal power adapter | Antenna cable (antenna and RFID tags sold separately) | Optional Bluetooth plug-in module |

The Mercury xPRESS Platform supports the entire ThingMagic Mercury6e Series of embedded UHF RFID modules, including the M6e, Micro & Micro-LTE. Micro and Micro-LTE modules are mounted on a carrier board. Universal power supply and antenna cable adapter are included. An optional Bluetooth plug-in module is available today and additional and communication plug-ins will be supported in future releases.
Key Components

- Microcontroller-based motherboard, including:
  - Integrated ThingMagic UHF RFID module
  - USB interface
  - Ports for up to 2 additional plug-in data transport interface modules
- MCU preloaded with sample keyboard wedge application
- An optional Bluetooth plug-in module
- Downloadable software toolkit and SDK
- Downloadable reference design files including schematics, layout files, Gerber files, bill of material, component data sheets

Hardware
The xPRESS Platform provides all of the hardware needed to move beyond evaluating RFID and into a full design and development environment:

- Microcontroller based motherboard
- Integrated ThingMagic Mercury6e Series RFID module
- USB interface and ports for up to two additional plug-in data transport interface modules
- Universal power adapter
- Antenna adapter cable
- Optional Bluetooth plug-in module

Software Development Tools
Built on ThingMagic’s Mercury C API, the xPRESS SDK is intuitively designed, well documented and requires little RFID expertise. With the xPRESS SDK developers can rapidly design and test:

- Reader and tag commands
- Advanced read functionality such as setting antennas, protocols and filtering criteria
- Advanced tag operations (kill and lock tags)
- Privacy and security features
- Performance and memory optimization

The xPRESS SDK also provides a debug console for error logs and monitoring, microcontroller communication drivers, and a pre-loaded keyboard wedge sample application.
Developer Solutions

ThingMagic Developer Kits allow users to evaluate ThingMagic RFID modules, learn Gen2 settings and RFID basics, and test and tune module performance.

The Mercury xPRESS Platform operates as an extension to ThingMagic module DevKits, giving users the tools needed to design and develop low cost, high performance, application specific RFID readers.

**Hardware Development Tools**

With reference design files, developers can select the elements needed for their product design and advance rapidly to application specific end product design and development. Hardware reference design files include:

- Schematic diagrams
- Layout files
- Gerber files
- Bills of material
- Component data sheets

**Extensibility & Consistent Infrastructure**

The Mercury xPRESS Platform will be enhanced with regular updates. In its initial release, the xPRESS Platform supports USB and Bluetooth transport interface applications while support for Wi-Fi, POE and other interfaces such as GPRS, GPS, 4G/LTE will be included in the future. Mercury xPRESS is also designed to support a library of sample applications. As noted, a native keyboard wedge is available with the first release while asset tracking or other sample applications may be included in the future.

The xPRESS Platform offers a strong complement to ThingMagic’s RFID module developer kits. While DevKits allow users to evaluate RFID and test and tune RFID performance, the xPRESS Platform provides the tools to move rapidly into product development. The typical development path for users is:

1. Test and optimize RFID functionality and performance with a module Developer Kit
2. Write a MercuryAPI C application using the settings/tunings discovered through testing
3. Cross-compile the MercuryAPI application using the xPRESS SDK

The xPRESS Platform board is a full microcontroller (uC) board with a uC connected to the module. This allows embedded MercuryAPI C applications to be run on the uC controlling the module. Communications to external hosts can be designed into the MercuryAPI application based on product requirements.
ThingMagic UHF RFID Modules

The Mercury xPRESS Platform supports the full line of ThingMagic’s Mercury6e Series of embedded UHF RFID modules. ThingMagic modules deliver a high degree of reliability, enabling ship-to-stock of a family of RFID products in a range of form factors and performance characteristics.

Available in multiple configurations, ThingMagic RFID modules provide the easiest and most cost effective way to add RFID to your product or solution.

<table>
<thead>
<tr>
<th>World’s Highest Performance, small form factor UHF RFID modules</th>
<th>M6e</th>
<th>Micro</th>
<th>Micro-LTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (L x W x H mm)</td>
<td>69 x 43 x 7.5</td>
<td>46 x 26 x 4</td>
<td>46 x 26 x 4</td>
</tr>
<tr>
<td>Antenna Ports</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Interface</td>
<td>UART USB</td>
<td>UART USB</td>
<td>UART USB</td>
</tr>
<tr>
<td>Power (dBm)</td>
<td>31.5</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Read Rate (tags/sec)</td>
<td>750</td>
<td>750</td>
<td>50</td>
</tr>
<tr>
<td>Read Range</td>
<td>30 ft</td>
<td>30 ft</td>
<td>30 ft</td>
</tr>
<tr>
<td>Protocol Support</td>
<td>Multiprotocol</td>
<td>Multiprotocol</td>
<td>Multiprotocol</td>
</tr>
</tbody>
</table>

**ThingMagic Firmware Advantage**

ThingMagic RFID module firmware adds valuable real-world features to the primary functions delivered by the radio chips in our products. This added functionality gives customers an enhanced set of tools to develop innovative and customized RFID solutions for worldwide deployment.

Key ThingMagic firmware advantages include multiprotocol support, multi-regional support, an automated Fast Search algorithm for applications with fast moving tags, advanced data collection for each tag inventory, tag write, lock, and kill features, and custom command support for a variety of RFID tags.
Driving profitability through a stronger ROI

The Mercury xPRESS Platform is designed to deliver innovation in a way that disrupts the conventional RFID market. Leveraging over a decade of RFID technology advancements and development expertise, our product research and development teams have identified nearly every obstacle associated with embedded RFID. The major benefits of the xPRESS Platform include:

**Optimized technology:** The xPRESS Platform supports the technologies specific to the application, rather than a general-purpose approach. Developers can use the Platform repeatedly, first designing a reader for a specific market and developing a reader for an entirely different industry or application at a later time.

**Lower unit cost:** The xPRESS Platform lowers the overall costs of deploying an embedded RFID solution by eliminating the need to use (and pay for) unneeded features and functions of a general-purpose reader.

**Reduced development costs and strong ROI:** By utilizing the xPRESS Platform, OEM’s eliminate the need to source and select a processor and develop schematics for their application, which can be time consuming and costly, and require a unique skill set often not found within many organizations.

**Shorter time to market:** By eliminating many of the obstacles associated with embedded RFID in products, the xPRESS Platform enables faster time to market, which equates to faster revenue generation. The xPRESS Platform is designed to remove approximately 50 percent of the time required to bring a product to market and allows users to demonstrate proof of concept easily and quickly.

**Consistent infrastructure:** The xPRESS Platform minimizes risks with future device and solution development, and offers added value from new features in future platform releases. Integrated development tools, device drivers and application software will be enhanced with regular future updates that expand capabilities and enable development of a wider range of end products.
Conclusion: Innovation will drive embedded market

Supported by new product requirements and higher levels of awareness among the end-user community, the market opportunity for embedded RFID is ramping up quickly. Potential use cases are increasing sharply across a number of industries and product categories as RFID finds a permanent and productive home inside innovative solutions around the globe.

ThingMagic understands that removing barriers to incorporating RFID into existing and new solutions is important to the ongoing growth of the RFID industry and, as the value of RFID becomes clearer, it is crucial to support the market with a set of tools that simplify its application. To support innovation, the xPRESS Platform will be enhanced with a series of releases, each delivering progressively improved hardware and software features and functionality.

We expect the Mercury xPress Platform will drive new product development to occur faster and easier. By providing advanced and optimized tools for OEM’s to incorporate RFID into their products and solutions in a more timely and cost effective way, the Mercury xPRESS Platform delivers a new standard for RFID product development.

Contact Us Today to see how the Mercury xPRESS Platform can help you develop and optimize your RFID solution. For more information, visit www.thingmagic.com, email salesteam@thingmagic.com or call 1-866-833-4069 (International callers dial +1 617-499-4090).

About ThingMagic

Trimble’s ThingMagic Division is a leading provider of UHF RFID reader engines, development platforms and design services for a wide range of applications. ThingMagic develops products for demanding high-volume applications and provides consulting and design services to create solutions for challenging applications. ThingMagic’s customers include some of the world’s largest industrial automation firms, manufacturers, automotive companies, retailers, and consumer companies. Located in Cambridge, Massachusetts, the ThingMagic business was founded in 2000 by a group of visionary PhD graduates from Massachusetts Institute of Technology’s Media Lab. ThingMagic is "The Engine in RFID™".

©2013 ThingMagic – a division of Trimble Navigation Limited. ThingMagic and The Engine in RFID are registered trademarks of Trimble Navigation Limited. Other marks may be protected by their respective owners. All Rights Reserved.