

Certified Interoperability: UHF Gen 2 Achieves Another Milestone

Here's what it means, and why it matters.

By John Schroeter

Sept. 16, 2006—Multi-vendor interoperability: This was always the vision for UHF Gen 2. It is, after all, what an open standard is all about. So it's not without some fanfare that the first raft of interoperability certifications have been awarded by the standard's keeper, [EPCglobal](#). But what, exactly, does that mean? Why does interoperability certification matter, especially considering that Gen 2 *compliance* certification is a prerequisite to interoperability testing? In answering these and other questions, it's helpful to understand Gen 2's bigger deployment picture.

Long before the standard was ratified, EPCglobal outlined a multiphase certification program that would serve both the development and the deployment of high-quality Gen 2 products. One can think of this program as a roadmap for building a winning sports team: First, individual athletes must qualify to join the team. Second, the team members must play well together. And third, those teams with the best-performing athletes will be expected to prevail on the field of play. In many respects, this is the very model adopted by EPCglobal.

In this case, individual product qualification is determined via compliance testing, team play via interoperability testing, and finally, getting to the big game by performance testing. The earliest Gen 2 compliance certifications were awarded in September 2005, with the first interoperability certifications being awarded almost exactly a year later. The third leg, performance testing, will occur in early 2007. All this is intended to ensure that end users have everything they need to field the best-performing, most robust RFID solutions available.

UHF Gen 2 Goes Plug-and-Play

RFID hardware interoperability determines the ability of tags and readers manufactured by different suppliers to work interchangeably—to be, in fact, plug-and-play. This is critically important to end users, who simply need to know that the Gen 2 readers they've installed in their warehouses, distribution centers or retail stores will read *all* the Gen 2 tags that come through their doors—regardless of which companies manufactured them. And products are either *fully* interoperable, or they're not interoperable at all.

In order to achieve an interoperability certification, a tag must pass all 267 test suites (defined by EPCglobal and their testing partner, [MET Labs](#)) with each reader and each printer-encoder. Likewise, a reader or printer-encoder must pass its set of test scenarios with every tag. When they do, they earn the right to bear EPCglobal's UHF Gen 2 interoperability mark.

Compliance Testing is a Good Start

Although all products submitted to interoperability testing must first be certified for compliance to the Gen 2 standard, it's not uncommon for some manufacturers to misinterpret certain elements of the specification, preventing their tags, for example, from interoperating with other Gen 2 devices. Furthermore, certain tags

and readers may be interoperable with each other, but not with all other Gen 2 devices. As such, the scope of interoperability tests was designed to exercise, as much as possible, the full functionality of the Gen 2 spec—including operation at timing limits—with a prime objective of assuring true multi-vendor compatibility.

While the authors of the Gen 2 spec worked to make it as explicit and unambiguous as possible, there remains the opportunity for misinterpretation. What's more, there are a great many variables in any sequence of commands a reader might issue. In fact, given the complexity of options and modes of operation available in Gen 2, there is practically an *infinite* number of possibilities in the way a reader can communicate with a tag, both in terms of the commands it can send and what it can ask the tag to do.

So what good is conformance testing? Plenty. At minimum, it's a critical filter ensuring that a reader and/or a tag meet the essential aspects of the Gen 2 spec, that products issue the correct wave forms, and that they exhibit the right timing parameters and properly exercise key elements of the protocol. And while a number of products were certified in the first round of submissions, the process actually sent many of them back to the drawing board. As such, earning the conformance certification is an appropriate first hurdle for products to clear. The early availability of certified products also enabled a great many deployment pilots, which was critical to building out and testing the new UHF infrastructure. The fact that interoperability testing is underway now is a significant indicator of the industry's maturity. In short, with multiple Gen 2 products currently available, interoperability testing can pick up where conformance testing left off.

Inside Interoperability

The process of interoperability certification allows EPCglobal to verify the correct operation of tags with a reference reader system, and of readers with a reference tag system. [Impinj's Monza tag silicon](#) and Speedway reader were key elements in this reference system, and were the first to receive interoperability certification. The interoperability testing covers the vast majority of cases users can expect to see in the field, providing the assurance that both tags and readers—even those from various manufacturers—will respond properly.

To this end, test suites are created by assembling a group of test cases that exercise the major functionality subsets of the Gen 2 protocol. Four test suites were defined for certification purposes: Select/Inventory, Memory Access, Permalock/Kill and Special (optional). Each test suite is run for a given set of reader-tag air-interface conditions. The set of parameters defining the air-interface settings is called the *mode*, which establishes both the user-settable reader-to-tag characteristics (data rates, modulation schemes, etc.), and the tag-to-reader characteristics.

What's Next?

Clearly, certified UHF Gen 2 interoperability is a major milestone in the development of RFID systems. As important as that is, though, performance is still what matters most to RFID deployments. RFID hardware must have a high degree of *receptivity*, meaning both tags and readers are not only extremely sensitive to each other's signals, they are also able to reject the interference from other RF sources operating in the area.

EPCglobal, recognizing the critical importance of receptivity to system performance, created a working group to address these and other issues. In the process of defining minimum requirements, they'll address not only the performance of tags applied to various classes of products—such RF-friendly materials as paper, plastic, wood and so forth, as well as more problematic materials such as liquids and metals—but also the key aspects of tag performance: sensitivity, interference rejection, orientation, electrostatic discharge (ESD) and others parameters. Once the objectives are defined, the [EPCglobal Hardware Action Group](#) will draft the specifications for performance testing. This will complete the promise outlined by the framers of the UHF Gen 2 standard.

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RFID chips and technology. Prior to joining Impinj, Schroeter held marketing management posts at UTMC, Seattle Silicon and Fairchild Semiconductor's memory and high-speed logic division. He is the author of the Prentice Hall book Surviving the ASIC Experience.

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