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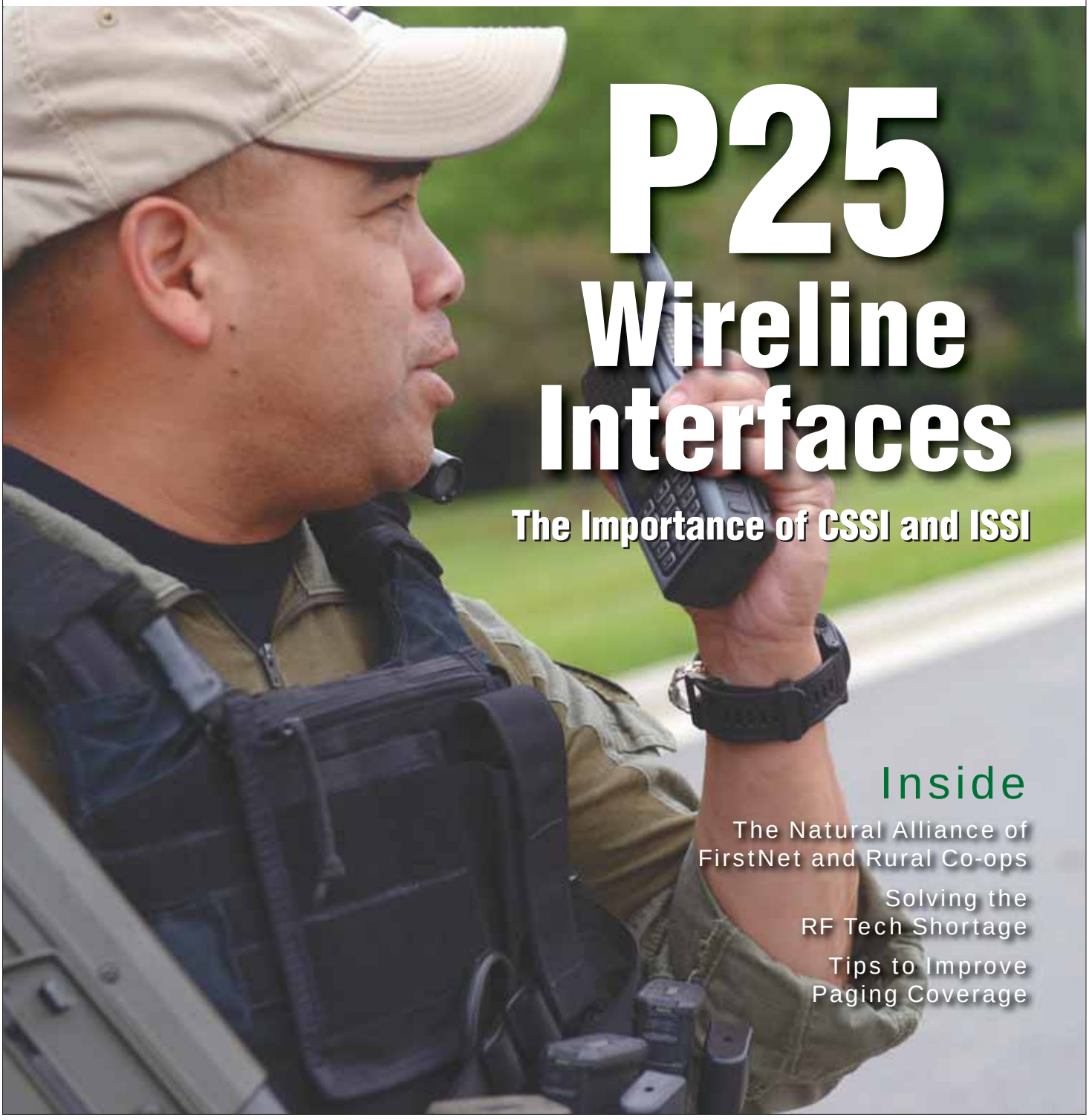

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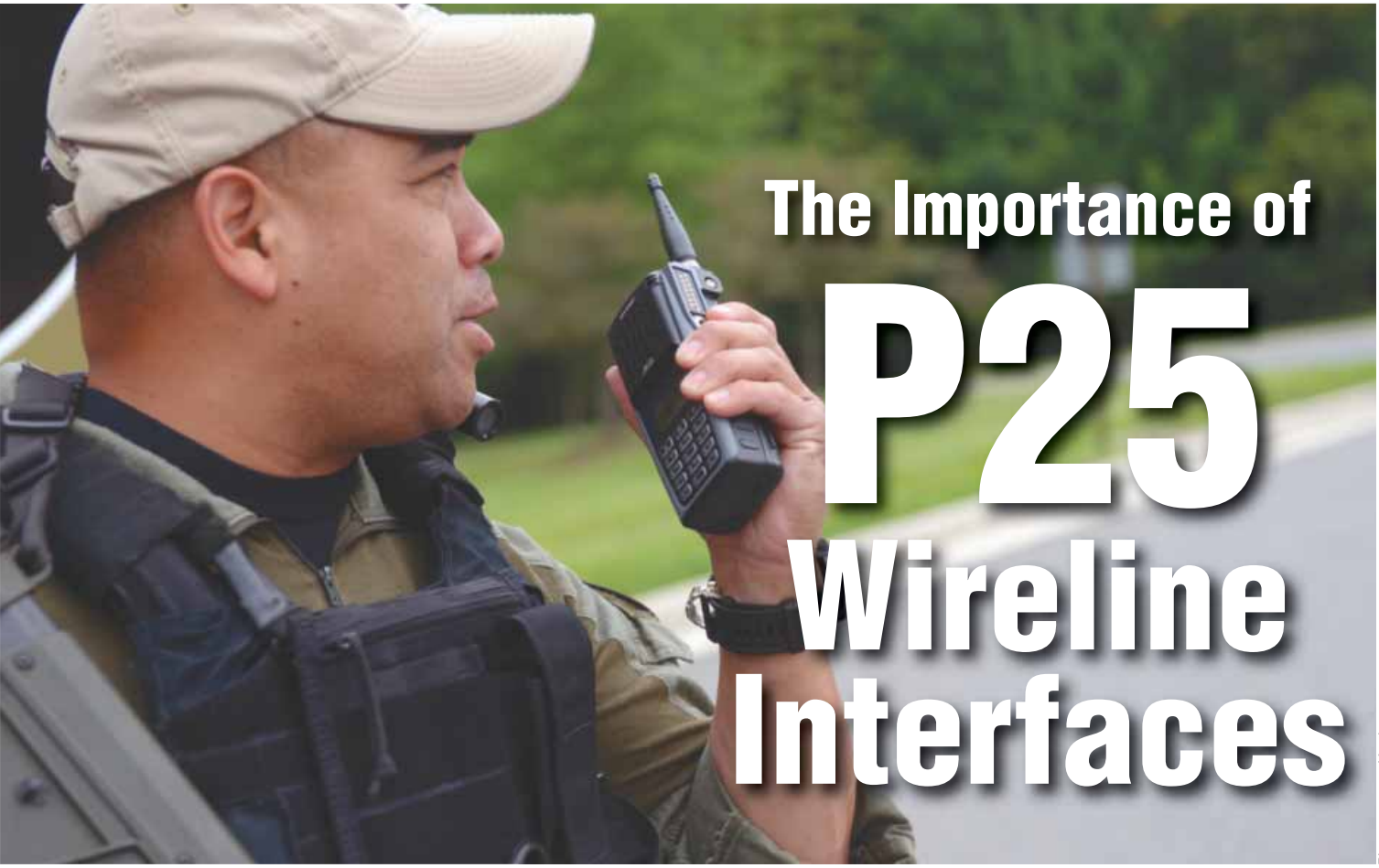


The Importance of P25 Wireline Interfaces

Photo courtesy Harris

The Project 25 (P25) Console Subsystem Interface (CSSI) and Inter RF Subsystem Interface (ISSI) require investment from manufacturers and customers to ensure widespread adoption.

By Mike Schools

Everyone dreads them: Large meetings where people from across the organization come together to talk about "the project." Things begin slowly, but as the intrusiveness of the project is revealed and the imminent threat to the status quo is exposed, discussions heat up and the gloves come off.

As a project team continues to work together, solutions begin to take shape, and assumptions, limitations and compromises are reluctantly agreed upon, and real progress can be seen. But sometimes the length and scope obscures objectives, and a process check is required to see if the project is still on track.

In many projects, the design participants work for the same organization and presumably have the same or similar strategic goals. But as the benefits of cooperation and open standards have been recognized, more projects consist of participants who work for different companies and may include customers and governmental agencies, as well as manufacturers and suppliers. When participants work for competing organizations, their natural instinct is extreme caution. Consequently, developing open standards is a long-term commitment that can span years.

The Project 25 (P25) team is to be congratulated for all that has been accomplished in overcoming tremendous obstacles, finding common ground, creating workable standards and continuing to persevere for more than 25 years. Many changes have happened in those 25 years, not only in the LMR industry but also with information technologies and other communications industries. Project 25 (P25) is at a crossroads with several wireline interfaces. The purpose of this article is to do a process check on the progress of several P25 interfaces. Where does the industry stand in adopting and using the standards that have thus far been created? Do customers have a clear understanding of P25 that allows them to make informed decisions? What are P25's critical next steps?

P25 Common Air Interface

One of the first major components of P25 that was developed and the first chapter in P25's success story is the specification for the common air interface (CAI). The CAI describes the wireless, digital voice and data that flows between mobiles, portables and repeaters. The assumption that all P25-compatible equipment will use CAI to communicate in both conventional and trunked modes is well accepted by

customers and manufacturers. The CAI's core features work between manufacturers and support a mechanism for vendor-specific features.

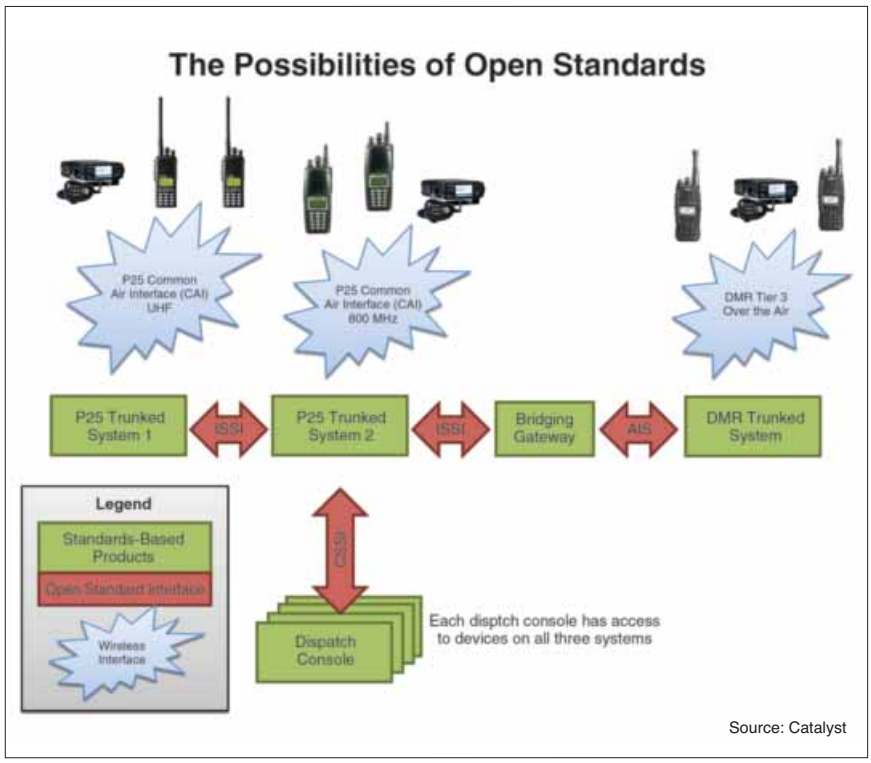
P25 mobiles and portables from multiple manufacturers work on a trunked system made by another manufacturer. Configuration isn't trivial and sometimes requires help from the radio manufacturers, but it again demonstrates that manufacturer cooperation and open standards work. Universal adoption of the CAI as the only over-the-air (OTA) interface for P25 by manufacturers and customers has removed a barrier to entry for radio manufacturers to get subscriber units access to another vendor's P25 trunked radio system.

But what if a customer wants to use a dispatch console on a P25 trunked radio system provided by a different manufacturer? And what if functionality that is only possible through an infrastructure (wireline) level interface is needed? Or what if a user needs to connect to the P25 trunked radio system of another municipality built by another radio manufacturer? The user then needs to consider the P25 wireline interfaces Console Subsystem Interface (CSSI) and Inter RF Subsystem Interface (ISSI).

Wireline Interfaces

The gains possible from using wireline interfaces are potentially even more far reaching than an OTA interface. Wireline interfaces are RF technology agnostic. What frequency band is this trunked site? The wireline interface doesn't care. Is it FDMA or TDMA? The wireline interface doesn't need to know. The wireline interface mainly needs to know the vocoder — the algorithm used to digitally encode and decode voice — that is being used and the encryption key for encrypted voice.

Many dispatch console and radio gateway providers have developed their own implementations of the CSSI/ISSI and integrated with multiple vendors. The specification for these standard interfaces works, but because the documents do not spell out every minute detail, connection to each vendor's implementation of the interface must be separately tested and qualified.



The Economics

There is an economic component for each manufacturer in developing and deploying these interfaces that often isn't considered. Building, qualifying and testing the interfaces are expensive, resource intensive and time consuming. So when manufacturers discuss how products can integrate with each other, the first technical question asked is: What is a common standard interface that we both have developed? A common interface potentially allows companies to integrate immediately and address a business opportunity. And even if one organization must develop an interface to communicate with the other's product, that new development is more likely to be on the table if the companies use an open standard that promotes opportunities with other vendors as well. Gone are the days of asking, "We need to interface with you guys. What hardware should we use, and what should message number one look like?"

Theoretically, for new systems, a handful of open interfaces that could run the gamut of communications paradigms could be used for all applications such as push to talk (PTT) and telephony. Manufacturers would focus on making their core interfaces work reliably and robustly. Having to support only these foundational interfaces would free resources for substantive issues and critical features: enhanced and more intuitive user interfaces, innovative user devices, better in-building tracking and coverage, improved security and other technology needs. IP has shown that when everyone uses a standard communications interface, creative solutions to technically challenging problems become the focus rather than communications incompatibilities. Similar to the CAI, the CSSI and ISSI should be candidates for classification as core interfaces. However, many vendors continue to use their own internal, proprietary interfaces.

Next Steps, Refinements

The CSSI and ISSI standards are defined in largely P25-centric ways: limited to using only P25 vocoders, providing OTA data that is largely superfluous in the wireline world. What exists is a tremendous step forward and a great foundation, but some limitations, such as considering connections only between P25 systems, should be eliminated in future revisions. Fortunately, these are living standards that can and will need to be refined and extended if, similar to the

CAI standard, they are to become the only way that P25-compliant subsystems communicate to other subsystems. Future standards work should be done to replace proprietary console and intersystem interfaces.

System designers know that the less the interfacing subsystem needs to know about the technology being used on the other side of the interface, the better. A subsystem interface that hides implementation and technology details about the subsystem it is communicating with is said to have low coupling. When two subsystems communicate such that each is highly dependent on the internals, timing and technology of the other, they are said to be highly coupled.

Managing coupling is critical in software program development as well. Experienced software developers know that the lower the coupling between modules and the more abstract the interface, the easier it is to create and maintain the programs in which they are used. Two big payoffs come to systems that adopt a low coupling approach:

■ Major changes to the innerworkings of a subsystem can be made completely transparent to connecting subsystems as long as the interface does not change.

■ Subsystems not planned for or even in existence at the time of interface development may use the interface if the new subsystem can emulate a supported subsystem at its interface.

As an example of the second payoff, a P25 trunked system and Digital Mobile Radio (DMR) trunked system can be connected using ISSI and the Application Interface Specification (AIS), DMR's wireline interface, even though these two systems were never designed to interoperate with each other. To the P25 trunked system, the DMR radios look like P25 subscriber units, and to the DMR trunked system the P25 radios look like DMR subscriber units. Subscriber units won't roam onto the other system because of RF-side limitations, but customers benefit from this type of seamless interoperability.

The gains possible from using wireline interfaces are potentially even more far reaching than an over-the-air (OTA) interface.

A Watershed Moment

Open standards offer benefits that are difficult to overstate: freedom of choice for customers; lower overall cost of development, which is ultimately paid for by customers; vendor confidence that development can be re-used and refined; and freedom for both customers and vendors to focus on real issues including innovations that reduce costs and enhance productivity. The results of our process check indicate that P25 standards are off to a great start, but require more investment, further refinement and full adoption.

These potential benefits materialize only if the standard is adopted extensively, not only by manufacturers but also by customers and the consultants who advise them. In the consumer world you can see many examples of standards that thrived because customers invested in products that used them. VHS succeeded over Betamax not because it was a superior technology, but because customers bought and invested in it first. Blu-ray won out over HD-DVD for more complex reasons, but ultimately customers only embraced Blu-ray. Cutting-edge technologies in their day, eventually both became reliable and inexpensive. But customer buy-in and acceptance was critical to continued investment and additional refinements by industry. No matter what the technical potential of a solution, adoption and economics drive its development and maturation.

Every technical person in every industry I've ever worked in believes at some level that their industry or organization has special requirements that just aren't like anyone else's and that they need a custom, special-purpose solution. Technology is expensive to build, maintain and support. Simply put, accommodating proprietary interfaces is more expensive than using one standard interface.

Adoption enables our industry to expand its available offerings by leveraging the combined efforts of every vendor in the industry. That would mean that the wireline P25 standards — CSSI, ISSI and the Fixed Station Interface (FSI) — should be the only interfaces used for core P25 wireline communications, regardless of what vendor supplies the individual pieces of the subsystem, though manufacturers could continue to differentiate using proprietary extensions to the standards.

If customers are not buying and supporting these interfaces, they are locking themselves or their successors into purchasing from a single vendor for 20 years. Users could be forced to throw out a perfectly good radio system, when all that is really needed is to update one piece of it. The most important way to help our industry thrive is for consultants and customers to embrace P25's open standards. ■

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