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# Airwaves open up to radio interoperability

Nato continues to edge towards a new waveform standardisation agreement (STANAG) that will allow radio interoperability among ground troops from different coalition members. **Dr Phil Vigneron** of the VHF/UHF Waveform Standardisation Group at Nato reveals the latest developments to Nigel Ash.

**I**t is claimed that, as the 1914 commander of the British Expeditionary Force Sir John French was being driven away from an early meeting of the Anglo-French top brass, his ADC bemoaned the fact that very few generals on either side could speak the others' language. Sir John responded curtly that this was definitely a Good Thing, given the need, wherever possible, for the British Army to preserve the utmost secrecy.

Times have changed. In the air segment of Nato there has been long experience of international interoperability. In the current Indian Ocean operations against

Somali pirates, Nato vessels now have a radio standardisation agreement (STANAG), which not only permits vessels to contact each other individually but also allows up to a dozen ships to share a single expensive satcom link.

The big challenge remains radio interoperability between ground forces, the importance of which has been demonstrated in Afghanistan among the 22 national units of the International Security Assistance Force (ISAF).

One key part of the joint tactical radio system (JTRS) is designed to overcome technical and hardware disparities in the handheld, manpack and small form fit

(HMS) radio equipment of Nato-member ground forces by producing a new secure waveform, which can be used alongside the existing national waveforms.

### Interoperable waveforms

Dr Phil Vigneron is the Canadian representative on the VHF/UHF Waveform Standardisation Group at Nato. Most existing proprietary systems, he says, do not talk to each other and are still based on a broadcast rather than a network model. "In the future, there will continue to be national systems and national information or crypto-domains," he says. "These might be used for

**Voice versus text**

Text messaging, with its lower power requirement and immediate language translation has been put forward as an alternative to voice communications. However, Phil Vigneron reveals that something intangible can be lost along the way. “What comes back from commanders is that they really need to hear the tone of the troops’ voices,” he says. “They want to know if there is fear and they need to give commands with a certain amount of emotion. Therefore they want voice communications.”

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There are practical as well as economic constraints on upgrading systems. “Nations are not going to scrap their national systems and buy a new one all at once,” says Vigneron. With software defined radios (SDRs), however, the practical challenge of upgrading systems is reduced, in that both national and coalition waveforms can be ported together. As countries procure the newer software defined radios in small numbers, they can still talk to the national systems, and at the same time talk to their allies. This allows for a gradual replacement of existing systems over decades.

Vigneron points out that, even before the recession hit, Nato had been highly cost-conscious, choosing to have the basic waveform development undertaken by different national laboratories, and in some cases industry bodies, and then planning to tweak the work to internationalise it.

“Nato working groups are stitching these parts together to make sure that it all makes sense from a technical point of view,” he says. “Nato is trying to do this in the most economical way possible, in order to put enough mature designs or actual software into this network waveform, to allow for any procurement in any nation, or actual prototyping by industry.” This could very well involve off-the-shelf equipment.

**Risk and reward**

The whole JTRS project is, says Vigneron, highly ambitious. Given that it involves

the design of new radios, new waveforms, new security and new hardware, the combination of technical risks is considerable.

Each technology in itself carries a risk that makes it unsurprising that the road has proved bumpy. In the US, for instance, there have been major cost overruns on the development of new tactical radios and ground mobile radios.

In focusing on the waveform and the security within it, Nato might not be aiming high but it is dedicated to producing something that will provide seamless coalition communications. One key advantage of SDR systems is that they can be upgraded, if necessary on the hoof.

Subject to using the right frequencies, Vigneron says: “The whole philosophy of SDR is that you have the generic radio hardware, and you have software that is being written and implemented in a generic way, even though it performs very specific tasks. Then you can put different waveforms on the same hardware.

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“This is the approach of industry for the proprietary systems now. The only thing is that with these proprietary systems they don’t tell you the rules for upgrading the hardware and the approach. So the idea of a publicly defined software organisation is that which is being followed by JTRS. This is what is driving the Nato work and I would say all standards work these days.”

Within the security component of the new Nato waveform is the ability to detect and reject intruders, along with an enhancement of the existing power to automatically and quickly blank radios that have been captured.

“The security architecture is an important piece of the puzzle,” says Vigneron, “specifically what type of crypto and where it will go in the network organisation. We currently have an approach that is under consideration by

national security agencies, who have the final say on this, and by Nato security staff. I would say that this is also fairly well along, but it is hard to say when it will be finalised.”

**Distance no object**

For the moment, the prime objective is to produce a system that can communicate reliably over long distances.

“So far,” explains Vigneron, “we have agreed upon the modem, the physical layer, offering a very good range and resilience and power efficiency. It is a CPM long-distance communications modem where we hope to be able to communicate 30 or 40km on the ground, which is quite extraordinary for a VHF radio. We have this written up as a draft STANAG.

“We also have a TDMA (time division multiple access) MAC (medium access control) channel access layer above. A draft standard for that will be released, probably in March 2012.”

Vigneron emphasises Nato’s ambition to produce a waveform that carries a low technical risk and as low a cost as possible. “I expect that when the new waveform is actually procured by members, it will be a different story in every country. The trend that we have seen in communications is that the smaller countries are much more eager to procure an interoperable waveform sooner, because their way of doing military operations has been primarily coalition. Among the larger nations, who are more used to doing operations on their own, or leading them, they are standing back.

“But there is a clear subset of the Nato nations that appears to be interested in procuring this waveform sooner. So our job in the standards group is to put together something that will make that as low a cost proposition as possible.” ■