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Building a future we can all trust

Thales talk all things communications

Soldier Mod caught up with Thales following the Soldier Modernisation Conference in London earlier in the year to get their thoughts on some of the topics from the event and their activities in the UK

Q: In the UK the MoD have been working for several years trialling and developing a DSA solution built around the Trellisware radio – are Thales involved in any of the DSA experimentation?

A: Like many suppliers we attended the industry days over the past several years and stand ready to support UK MoD.

Last year Thales completed a demonstration on Salisbury Plain providing multiple voice nets, location reporting and other data such as enemy locations, way-points and soldier logistic information for 128 users over a 20km^2 area.

The waveform we demonstrated was an adaption of our standard SquadNet waveform using time and frequency multiplexing. This enabled us to host over 120 users on a single flat MANET network without any increase in transmission bandwidth. This approach allowed us to achieve point to point ranges across Salisbury Plain of greater than 8kms thus minimising the reliance on networking or node density and maximising manoeuvrability for the dismounted soldier. The original SquadNet waveform was developed in the UK and the adaptions for the UK demonstration were also carried out in the UK, taking about 6 weeks to develop and field. The waveform ran on a fixed frequency mode, but can also run in frequency hopping modes for more discrete and resilient operations.

Q: At the Future Soldier Technology conference there was a buzz about wideband MANET radios for DSA - what are Thales doing?

A: Certainly the need for data on the battlefield is growing and wideband communication devices to support data transmission are becoming more prevalent. For dismounted users, data is most important in advance of contact to support commanders plan an attack for example but data is often less useful during contact where the situation can so fluid and intense there is neither the time to continually generate or view the data. Voice will be the most immediate and useful service during this high intensity period. With this in mind, and the need to ensure these voice services at all times, the questions regarding the detection and disruption of wideband MANET radios needs to be addressed or fielding such systems could have significant operation drawbacks particularly in near peer conflicts.

The speed of response and accuracy of modern military weapon systems means that the threat in the event that communications are detected is serious. The RF profile of equipment is becoming a beacon and like a visual signature needs to be managed to keep dismounted troops safe from being targeted. Also, it is very important on many operations to maintain the element of surprise which can dramatically increase the likelihood of success. Having a low RF profile to avoid detection is perhaps more important now than it has been in the past.

MANET is useful for dismounted users where rebroadcast capabilities can provide more robust communications in environments such as jungles, buildings and ships where RF communications are inherently difficult. However wideband MANET networks rely on node density for their robustness, which can constrain soldiers on the ground in a number of ways, including where they can manoeuvre, their maximum dispersal, and the requirement for a minimum number of users to be distributed appropriately over the battlefield to

maintain communications. In addition, there are practicalities in terms of burden and logistics associated with the power demand, the need for wideband channels in the spectrum and as mentioned detection/denial of service.

Thales in the UK developed a frequency hopping MANET solution in a narrowband waveform. This significantly improves point to point range compared to traditional MANET solutions, removing the need for a minimum node density or soldiers needing to be in the right place to relay communications. The solution is low Size, Weight and Power (SWaP), yet provides the voice, location and data services needed to support dismounted soldiers. The solution has also been incorporated into drones and not only enables commanders on the ground to see the location of the unmanned vehicle but also securely take control of it and direct it to support operations such as delivering stores to a specific point/person or to providing surveillance.

Q: Will Software Defined Radios (SDRs) deliver their promised flexibility to the user?

A: SDR technology is here. Modern military radios support a host of waveforms with different capabilities to improve mission success. Waveforms can be easily selected - typically with a channel change - so the use-ability of these products is improving. To get the most from the flexibility offered by an SDR radio, users need to think about ongoing product developments, particularly software and waveform enhancements and how to capitalise through-life on the flexibility and evolving capability offered by SDRs. Suppliers will continue to develop waveforms for their platforms, either through private funding or to meet other operational requirements. These waveforms may be made available and be beneficial to existing customer.

Through-life, specific customers may have their own particular needs to address new conflicts/threats and this may be achieved with a waveform change whether that be a new mix of services, larger network size, more relays, different security, low probability of detection or anti-jam capabilities. To realise these aspirations and get the full value from an SDR investment, supplier will need to be willing to work with customers and third parties to support and develop new capabilities.

Delivery of the through-life capability will not only impact the radio waveform but also the application where the capability is realised or controlled. Inflexibility or commercial unwillingness around either the waveform or the application will prevent new capabilities being implemented efficiently so the benefits and investment in SDR will not be realised.

Q: Will SDRs simplify the integration issue?

A: Radios supporting multiple channels and/or waveforms will simplify the hardware integration issues as potentially multiple radio can be replaced with a single radio. However, the flexibility of SDR platforms and new waveform techniques also provide users with more capability and complexity. Every user can have a data capability although some may be a data provider, providing information such as HUMS, stores or an environment sensor. Other users may need to review and act on the data and will require a display with decision support application(s). Data for decision support may be gathered locally but may also be from further away through remote sensors, data analysis tools delivered through other bearers. Integration of the various comms, data analysis tools, applications, display devices, power supplies and routing devices are key to delivering maximum capability and support to users. Thales in the UK is creating a Land Concept Demonstrator to connect various products together in different configurations to enable experimentation and benefit analysis for different solution configurations against specific use-cases. Products will be provided primarily from the Thales portfolio, particularly tactical communications products, but the demonstrator can also host products from other vendors. The demonstrator is configurable with capabilities designed around the key components including HQ, vehicle, UAV, dismounted commanders and the rifleman. This capability will enable us to collectively address the full integration scope, including reconfiguration of hardware for different roles and SW reconfiguration of hardware for new missions.

Q: What is unique about the Thales approach to tactical communications?

A: Thales' approach to address dismounted users' needs is different to other suppliers because it focuses on what soldiers really need: good voice, location tracking, and data for C2 applications in a low SWaP, long endurance package with a low spectrum requirement, good LPI and LPD and that do not constrain manoeuvrability. That's why we use multi-service narrow band waveforms. These waveforms are ▶

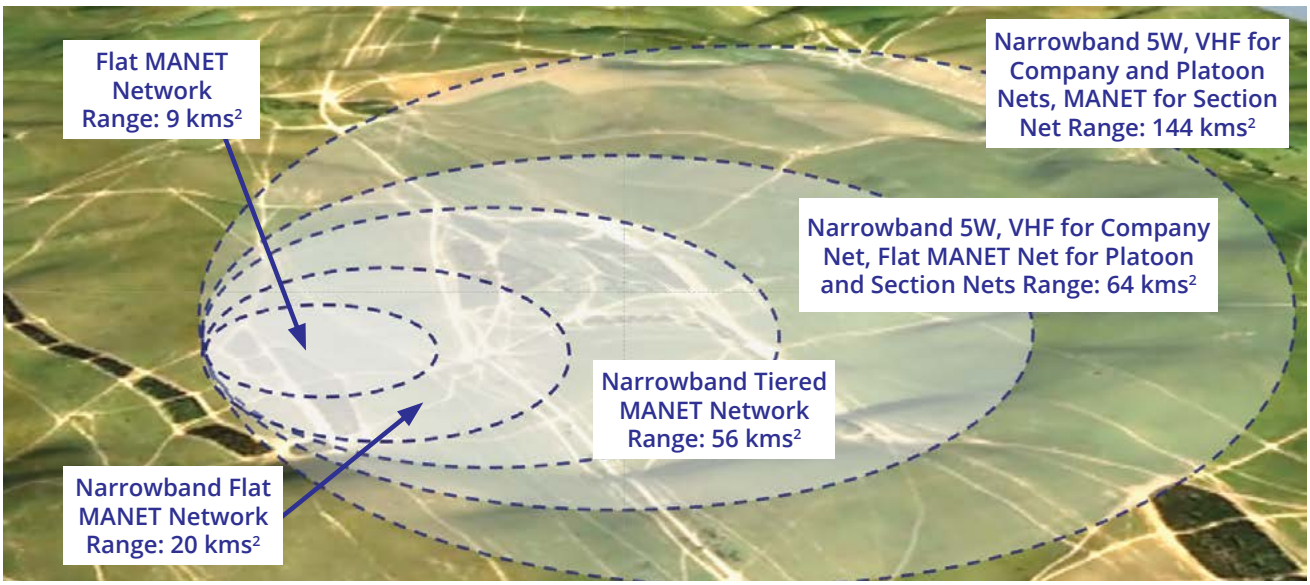

Figure 1 - Typical ranges seen during trials for different mixes of waveform technologies and network configuration all supporting company-wide Voice, PLI and C2 data

much better suited to the military user as they are inherently longer range, providing the most freedom of manoeuvre and removing any need for minimum node densities and manoeuvre constraints. They also support networking, so where the environment is difficult, such as in buildings or ships, networking can maintain team communications. Narrowband waveforms have very low duty cycles and can frequency hop so are very discrete to operate and difficult to direction find or interfere with. Practically, they use much less spectrum and have a much lower power drain hence longer battery life and autonomy.

Video services still require a wideband radio, but why burden everyone one with a wideband radio and its limitations and workarounds when only a small number of users need video? Where the threat is minimal, video services can most reliably and economically be provided by commercial technologies. This is where a "golf-bag" approach to communications can be very useful. Where the adversary is more challenging, maintaining core services is a focus. The use of multi-service, frequency hopping, narrowband waveforms (available in many Thales products) ensures these core services are in place and reliable. Elsewhere the NATO Narrow Band waveform and the US WREN Narrow Band programme are developing similar waveforms with simultaneous voice, PLI and Command and Control (C2) data with Electronic Counter-Countermeasures (ECCM) capacities.

Protecting wideband transmissions in the presence of a more capable adversary requires more specialist techniques. Commercial solutions cannot be relied on and can be disrupted even by a motivated amateur. Military level protection for wideband services are being developed but will be sensitive and expensive so limiting the use of this technology to the specialist / essential users.

Q: Are there any interesting technologies or developments that Thales are working on in the UK?

A: Thales in the UK has been working on adaptive bandwidth waveforms for the past 18 months and how this technology can be implemented in a low SWaP and lower cost package for dismounted soldiers and unmanned vehicles. We are currently building a prototype to provide a mix of multiplex services. This technology will enable dismounted commanders to manage communications based on the threat in a single SDR. To implement this kind of waveform we need to progress a new generation of SDR to not only take advantage of the latest processing capabilities but to develop a more configurable transceiver solution. Recent transceiver trend in the military market have been to provide wider frequency choice but this is detrimental to the performance across all the bands so range is traded for frequency flexibility. The Variable Bandwidth Waveform requires more control and performance in the transceiver design. Current transceivers are not flexible enough for this kind of waveform development. Many current transceivers used in military products tend to be developed for the commercial market so are not optimised for military users, particularly dismounted users, in terms of size, power consumption, performance and resilience.

Cognitive Radios - Thales UK is also using the flexibility offered by SDR platforms to develop a more cognitive radio approach to manage band usage according to interference and even waveform changes as threats evolve. We cannot guarantee that everyone will be in the network when a change channel/waveform command is given so we are building some intelligence into the radios to allow them to follow if they are left behind when the rest of the net changes. This transition needs to be secure so it is not exploited and the period needs to be minimised so nets do not get fragmented and information is lost.

Q: Will Thales be responding to the UK MoD's PRR RFI?

A: Thales has been engaged with UK MoD on dismounted communications solutions and demonstrations including the Army Warfighting Experiment over the past few years .The PRR RFI is welcome and Thales will respond. Currently we see the UK designed and manufactured SquadNet radio as a good fit but we will monitor the developing opportunity and requirements to ensure we offer the UK MoD the capability they require. ■