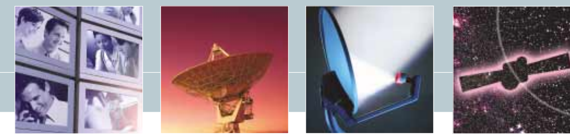

The all-encompassing network

Photo courtesy of Boeing.

Giovanni Verlini, Editor of Satellite Evolution Global, explores the crux of tomorrow's military communications: netcentricity.

There was a time when military communications were a relatively-speaking easy feat: a crackling radio contact between the headquarters and the deployed units in the field was all that was expected of the telecoms and engineering corps. Naturally, those days are long gone, as today's military strategists from all over world have it clear in their minds that military superiority and information superiority (made up in large part of state-of-the-art, enhanced communications capabilities) are synonymous by and large.

However, achieving communications superiority is easier said than done. For example, it is not enough to have capacity, consisting in communications channels available: that capacity needs to be arranged as part of an effectively-organised architecture to achieve the desired result. The experience accrued with the military campaigns of these past few years, in fact, clearly show that the problems encountered by the Armed Forces in modern theatres of war are diverse and challenging.

During operations Desert Shield and Desert Storm in the 1990s, for example, it became clear that there was a need for higher satellite communications and capacity/data rates. With operation Enduring Freedom, however, a need for highly mobile, interoperable communications emerged. In recent years, the challenging environments encountered in many theatres of war have generated other types of demand. When sandstorms disrupted other satellite communications for three days due to dust attenuation during operation Iraqi Freedom, the need for an all-weather, all-environment communications

became apparent. Similarly, the need for embedded mobile communications at unit-level emerged when outran communications capability resulted in Blue on Blue engagements.

In other words, there is an ever growing demand from the military for mobile communications that are secure and reliable, in which all elements deployed on the ground are part of an ever more sophisticated communications network. In particular, the demand is for solutions that can deliver all of the above at a unit level. In military jargon, this is known as distributed connectivity requirements.

Accordingly, a modern military communications system should have a series of features:

- Provide worldwide coverage;
- Be highly mobile, ie, providing Communications On The Move (COTM);
- Be an all-weather, reliable solution; and
- Be easy to use.

Besides, administrators would say that it is imperative that such solutions are delivered cost-effectively.

From a technical point of view, however, such communications system should also include the following features:

- Be made up of multicast/netted communications;
- Provide information assurance;
- Guarantee network access and protection;
- Offer a highly-secure encryption technology;
- Give the opportunity to prioritise amongst messages;
- Guarantee capacity and higher data rates; and
- Be interoperable with coalition communications systems.

All these features put together define what could be described as a network-centric system for the delivery of distributed communications services to the Armed Forces in the air, on the ground and in the sea.

Netcentricity

So what is exactly a network-centric system? How can netcentricity be defined? Colonel Patrick Rayermann, Chief, Space and Missile Defense Division, US HQDA, defines it as the ability to get information to forces on the ground: the information warfighters need, exactly when they need it. Frank Prautzsch, Director of Network Centric Systems, Rapid Initiatives Group, Raytheon, goes even further in his definition: netcentricity is the ability to get the right information to the right people, at the right time, using the right media, in the right language and at the right level of detail. If such a definition sounds a bit daunting, it is because it is: netcentricity is a highly-sophisticated communications architecture

As we saw in the previous paragraph, such a network needs to have a series of technical characteristics, such as provide mobility or incorporate encryption technology, that have been exhaustively listed. However, from an operational point of view a network-centric system can be simply defined as a network that allows the handling of information in a theatre of operation. The process of handling information, however, should be made up of two stages. The first, a relatively-speaking simple one, is the ability to distribute information at all levels in the field, be it to battalions, platforms or even the individual soldier. The second level, on the other hand, comprises elements on the ground gathering information (crucially, not necessarily elements who are specifically designated as information gathering agents), which is then sent to a central unit. This information is analysed, incorporated with existing intelligence, and then re-broadcast to the units deployed on the ground or channelled to targeted units via secure communications.

However, the architecture of this network should be an open one, allowing not just vertical communications (ie, those going along the line of command) but also peer-to-peer communications. According to this vision, all elements and units in a theatre of operation should be able to communicate with another deployed unit without having to go through a central office - provided that these communications links are authorised of course. This 'open' communication process is a rather complicated feat that only a highly-sophisticated netcentric architecture can enable.

Netcentricity, Rayermann strongly argued, is critical to modern Armed Forces: for example, the concept of modular force adopted by the US military in recent years (which came to the fore with the 2003 invasion of Iraq) is impossible to deliver without a netcentric structure, in which the real-time intelligence gathered on the ground is essential to direct the operation in the most effective way, focusing the firepower where it is most needed.

Given the increasing sophistication of netcentric information, which is predicted to be made up of voice, data, video and media-rich information, there is little room left for doubts: information traffic

Carnegie Mellon and Boeing were awarded US$5.5 million to build and test a prototype robotic unmanned ground combat vehicle. Photo courtesy of Boeing.

is growing exponentially, it has been doing so for quite sometimes now, and it will continue to do so. All this can mean only one thing: in the future, there will be an ever-escalating demand for satellite communications capacity in the military field.

Smart communications

Over the years, the development of communications systems within the military sector has evolved from the simple transmission of data, to the handling of information, through to the empowerment that derives from knowledge, to arrive eventually to a complete understanding of the battlefield. The overall aim of this intelligence drive is to get to a point where platform systems are smart enough to interact with each other and contribute to the communications stream of the network architecture.

This is a crucial point: the successful development and effective deployment of unmanned vehicles, be them airborne, on the ground or in the sea, depends on the ability to successfully integrate such platforms within a effective communications architecture. Naturally, these are extremely complicated architectures comprising hundreds of parts and different technologies. To have an idea of the complexity of a netcentric architecture it is worthwhile drawing what amounts to a far from exhaustive list of the individual systems involved in such an 'organism':

> "In other words, there is an ever growing demand from the military for mobile communications that are secure and reliable, in which all elements deployed on the ground are part of an ever more sophisticated communications network. In particular, the demand is for solutions that can deliver all of the above at a unit level."

- 3D Displays and Visualisation;
- Mobile and Fixed IP Systems;
- Lasercom and LIDAR;
- SDR Radios;
- IA and Authentication Systems;
- Bio Chemical Detection;
- Remote Sensing and Health monitoring;
- Robotics;
- Hyper-spectral Imagery;
- RFID technology;
- Data Fusion;
- Wireless Applications;
- Nano-systems;
- Unmanned vehicles;
- Anti-Terror Systems;
- Sona buoy Systems;
- Decision Support Systems;
- Ultra-Wideband Radios;
- Advanced Computing and Processing;
- Solid State RF and Modem Technology; and
- C2-on-the-Move Antennas.

Similarly, a list of all the technologies involved in the deployment of a netcentric architecture (in this case too, a far from exhaustive list) makes impressive reading:




ViaSat receives US$10.9m in additional orders for MIDS Tactical Data Links Terminals

ViaSat Inc. (Nasdaq: VSAT) has been awarded an additional order valued at approximately US$ 8.7 million for Multifunctional Information Distribution System (MIDS) terminals from the Space and Naval Warfare Systems Command (SPAWAR), San Diego.

The order augments the US$39.5 million Lot 7 delivery order announced on July 6, received by ViaSat as part of the MIDS annual Lot procurements. The Lot 7 add-on consists primarily of LVT(2) ground-based Low Volume Terminals and spares, along with LVT(4) and LVT(6) airborne terminals.

ViaSat has also been awarded an order valued at just over US$2.2 million for MIDS terminals from the Naval Surface Warfare Center, Crane Division. This order is for LVT(2) ground-based Low Volume Terminals and support equipment.

MIDS LVT is part of a tactical radio system that collects data from many sources and displays an electronic overview of the battlefield using secure, high capacity, jam resistant, digital data and voice. The system is used by the US Navy, US Air Force, US Army, as well as militaries of other nations. ViaSat is one of two US government-qualified manufacturers of Link-16 MIDS airborne terminals and is the only qualified manufacturer of the LVT(2) ground-based terminal.

- Industry at Large;
- 3G WCDMA;
- WIMAX;
- Near Space;
- Advanced Computing;
- Displays (2D/3D/Flex);
- IP V(6);
- Interoperability Devices and Interfaces;
- Security and Keying systems;
- Wireless Applications;
- Navigation Aids;
- Entertainment and HDTV;
- High Capacity Networks;
- Medical and Bio Medical;
- Homeland Security;
- Collaborative Networks;
- Communications over Power Networks;
- Weather Research;
- Composites and Syntactics;
- Miniaturisation /nano-devices;
- Voice Recognition and Speech Synthesis; and
- GIS Systems.

In other words, netcentricity is one of the most technologically advanced and sophisticated projects undertaken by communications engineers anywhere in the world.

The key requirements

But what is the final aim of netcentricity? What types of operations will it enable on the ground? How will warfighters benefit from such a complicated architecture? The list of the key operational requirements for a netcentric architecture is long and includes the following:

- Situational awareness;
- Self-synchronising ops;
- Information pull;
- Collaboration;
- Communities of Interest;
- Task, post, process, use;
- Only handle information once;
- Shared data;
- Persistent, continuous IA;
- Bandwidth on demand;
- IP-based Satcom;
- Diverse routing;
- Enterprise services; and
- COTS-based, net-centric capabilities.

Growing demand for satellite communications

However, netcentricity per se is far from being the only application putting a strain on military satellite communication providers: there is a whole breed of new and old bandwidth-hungry applications, some of which will feed into netcentricity, that are growing at at least the same rate: imagery, both terrestrial and space-acquired, video conferencing (which in military jargon is called collaborative planning), graphics and media-rich data, as well as data relating to the so-called blue force tracking, an information system developed to prevent friendly fire.

Interestingly, the requirement for military communications is, and in the future increasingly will be, extremely varied and articulated. Some of the capacity is needed for battlefield communications or protected military circuits. Other capacity is needed for plain unencrypted communications, while the rest could be used for logistics and administration purposes. Such diversity, a byword for complication, can be extremely difficult to handle. To address this issue, Rayermann explained, the US Armed Forces have come up with the so-called transformational communications architecture 2.0, a comprehensive architecture that facilitates improved allocation of bandwidth requirements and forecasting of needs. The system indicates which type of frequency band provides the optimal support for the systems/applications that are needed so that the military authorities can source it from the best supplier, be it a military-run system or a civilian architecture.

Conclusion

Of all current developments in military satellite communications, netcentricity is perhaps the most important of them all. The ability to deliver the information warfighters need, exactly when they need it will make the difference between defeat and victory. In the Armed Forces of the future, information superiority will increasingly mean communications superiority, with netcentricity being the key enabler for the transformation of data into intelligence. ■

"Interestingly, the requirement for military communications is, and in the future increasingly will be, extremely varied and articulated. Some of the capacity is needed for battlefield communications or protected military circuits. Other capacity is needed for plain unencrypted communications, while the rest could be used for logistics..."